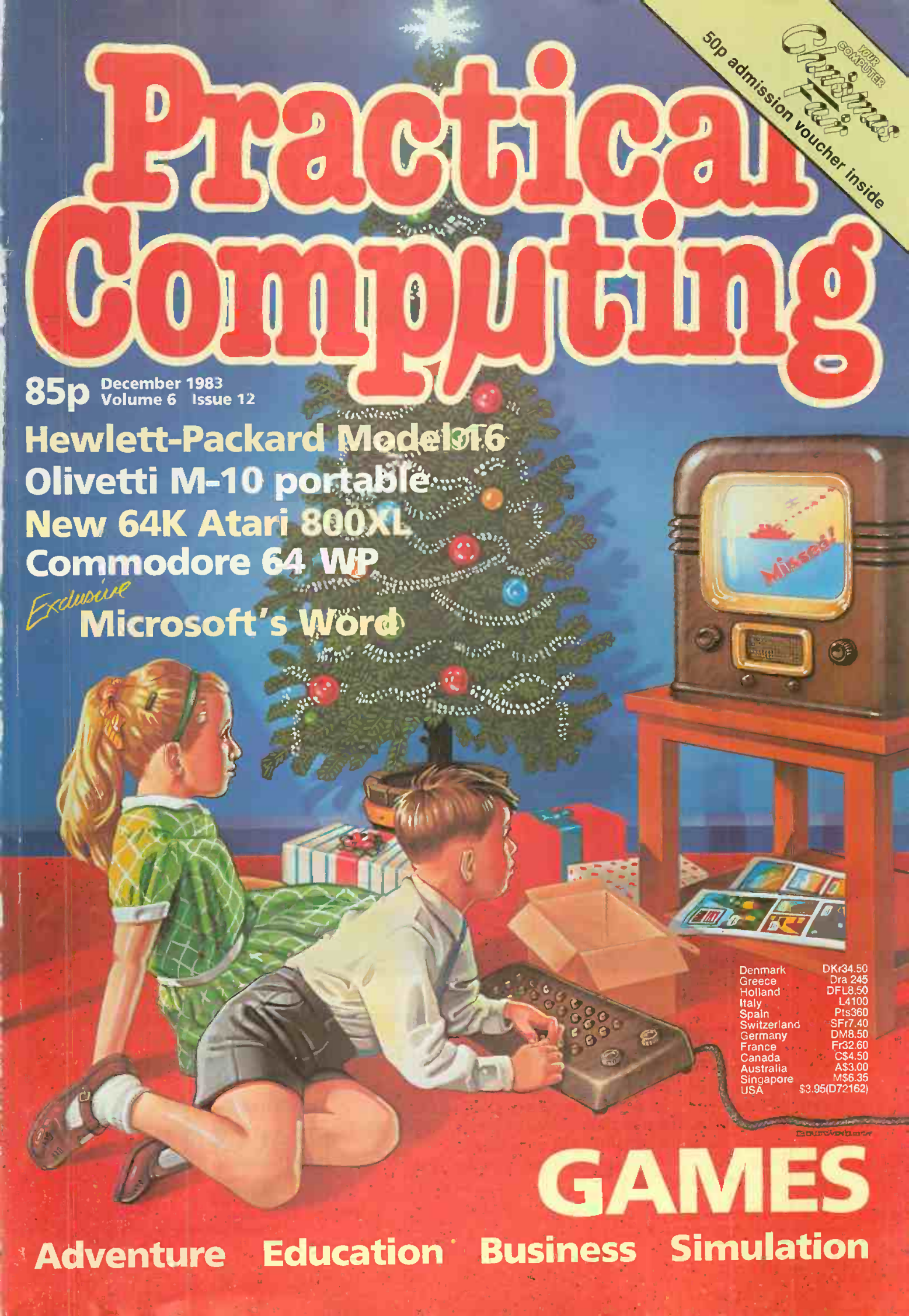
Practical Computing

85p December 1983
Volume 6 Issue 12

Your Computer Christmas Fair
50p admission voucher inside

Hewlett-Packard Model 216
Olivetti M-10 portable
New 64K Atari 800XL
Commodore 64 WP
Exclusive
Microsoft's Word



Denmark	DKr34.50
Greece	Dra 245
Holland	DFL8.50
Italy	L4100
Spain	Pts360
Switzerland	SFr7.40
Germany	DM8.50
France	Fr32.60
Canada	C$4.50
Australia	A$3.00
Singapore	M$6.35
USA	$3.95(D72162)

GAMES

Adventure Education Business Simulation

IS THIS LEVEL OF RELIABILITY REALLY NECESSARY?

ACCUTRACK

If you've ever lost data due to a faulty disk, you know how important reliability can be.

That's why Accutrack disks are critically certified at 2-3 times the error threshold of your system. Why they're precision fabricated for higher signal quality, longer life and less head wear. And why we take such extra steps as testing single-density mini disks at double-density levels. So you don't have to worry about the reliability of your media.

Accutrack disks. OEMs have specified them for years. You can trust them for your data.

Distributed in the United Kingdom by:
Penbie International (C.A.) Ltd.
23 Addington Road
Reading RG1 5PZ
Berkshire
Tel: (734) 664361

ACCUTRACK
Dennison KYBE (UK)
9 Colonial Way
Watford WD2 4JY
Tel: (923) 50596
Telex: 923321
Offices and representatives worldwide

Circle No. 101

>LIST

PRACTICAL COMPUTING DECEMBER 1983

>NEWS

13 SOFTWARE NEWS
From the sewer to the Christmas stocking.

15 HARDWARE NEWS
Meet the Octopus from LSI, and other new micros.

29 FINANCIAL TIMES CONFERENCE REPORT
Jack Schofield went to a two-day conference on personal computing.

30 MICROMOUSE IN MADRID
John Billingsley reports on the European finals.

37 MICROCHESS IN LONDON
A report on the recent European computer chess championship by David Levy.

69 IBM NEWS
Communications, software, and more profits for Big Blue.

>GAMES

115 OUT TO PLAY
An introduction to this month's special section — and how their range makes games important.

116 EDUCATION
Lorraine Boyce looks at the impact of games in schools.

120 CHESS
Neville Maude surveys the field, with special reference to cassette programs for the BBC Micro.

122 FLIGHT SIMULATORS
Experienced pilot Ian Beattie-Edwards looks at what's available, and recommends a selection for various micros.

124 BUSINESS STRATEGIES
How games can provide both amusement and business training.

126 ADVENTURES IN THE MUD
A look into the future with a Multi-User Dungeon Adventure, run at Essex University by Andrew Bartle.

133 TOP 10 GAMES
Jack Schofield offers his selection of the top games for micros.

>FEATURES

104 COMPETITION RESULTS
Readers' reports on micros from the class of 1988.

108 COMPUTER FRAUD
Martin Edwards describes how criminals are exploiting the new information technology.

110 THE BBC MICRO SHAPES UP
John Leach presents a couple of utilities for handling graphics.

113 TRUTH IN ONE LINE
True/false logic is the basis for Philip Musk's one-line Apple game.

137 FICTION — THE COSMIC CIRCLE
John Hooper eavesdrops on the Great Programmer in the Sky.

>REVIEWS

70 ON THE WORD OF MICROSOFT
With or without a mouse, Microsoft's program has something special, as Chris Bidmead finds.

76 HEWLETT-PACKARD SERIES 200 MODEL 16
HP's compact micro is the fastest thing yet at running Benchmarks. Ian Stobie looks for other qualities too.

84 ATARI 800XL HOME MICRO
Is the 800XL really better than the old 800? Jack Schofield finds out.

88 OLIVETTI'S NEW LAP COMPUTER
Ian Stobie previews the M-10, a portable to rival the Epson HX-20 and the Tandy 100.

93 EIGHT CBM 64 WORD PROCESSORS
Barbara Conway reviews the packages currently available.

100 dBASE II ENCHANCEMENTS
Software add-ons for this popular database program, examined by Mike Lewis.

195 LOGO BOOKS
Christopher Roper looks into books about this enjoyable and educational language.

>REGULARS

5 EDITORIAL RESOLUTIONS
Some you could make for next year.

7 FEEDBACK
Readers bite back. Plus, ways to calculate pi.

45 CHIP-CHAT
Ray Coles looks at the possibilites for 32 bits.

145 OPEN FILE
Free software for Commodore, BBC, Apple, Tandy, Sinclair, Research Machines the Epson HX-20 and others.

203 LAST WORD — ON EDUCATION
Brian Boyde-Shaw on what happens when micros take over the schools.

Cover artwork by Michael Brownlow.

For those who thought choosing a user friendly, high capacity, software compatible, multi-user, business computer was a black and white decision:

The RAIR Business Computer...

in colour.

The RAIR Business Computer incorporates both 16-bit and 8-bit microprocessors, up to 1024K bytes of user memory, 20M bytes of disk storage, and supports up to four workstations running CP/M*, MP/M* or MS-DOS* compatible software.

*CP/M and MP/M are trademarks of Digital Research, MS-DOS is a trademark of Microsoft.

For details of your nearest Authorised RAIR Business Computer Dealer contact Phil Harris, Rair Ltd., 6 - 9 Upper St. Martin's Lane, London WC2H 9EQ or telephone 01-836 6921

• Circle No. 102

Practical Computing

EDITORIAL 01-661 3609

Editor
Jack Schofield
Assistant Editor
Ian Stobie
Art Editor
Steve Miller
Production Editor
John Liebmann
Sub-editor
Sally Clark
Editorial Secretary
Sue Jordan
Consultants
Chris Bidmead
Peter Laurie
ADVERTISING 01-661 3612
Advertisement Manager
Ian Carter 01-661 3021
Advertisement executives
Mike Crimp 01-661 8425
Jacqui Ball 01-661 3633
Erica Vickers 01-661 3468
Advertisement Secretary
Janet Thorpe
Midlands office:
David Harvett 021-356 4838
Northern office:
Geoff Aikin 061-872 8861
PUBLISHING DIRECTOR
Chris Hipwell

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

Distributed by Business Press International Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Subscriptions: U.K. £13 per annum; Overseas £19 per annum; selling price in Eire subject to currency exchange fluctuations and VAT; airmail rates available on application to Subscription Manager, Business Press International Ltd, Oakfield House, Perrymount Road, Haywards Heath, Sussex RH16 3DH. Tel: 0444 459188.

Printed in Great Britain for the proprietors Business Press International Ltd by Eden Fisher (Southend) Ltd, Southend-on-Sea. Typeset by Centrepoint Typesetters, London EC1.

© Business Press International 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 £35 per published page. Submissions should be typed or computer-printed and should include a tape or disc of any 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.

Next year...

CHRISTMAS IS COMING, the stocks are in the shops. All the manufacturers have their fingers crossed that people will be fighting over the last few of the millions of micros to be sold. And, frankly, so are we.

But after Christmas comes the New Year which, as everyone knows, is a time for resolutions. Anyone short of ideas is welcome to adopt one of the following.

We, the manufacturers, resolve not to announce our new micro, place lots of adverts in the press, and cash lots of cheques until we actually have the machine in production. OK, well, a prototype at least. Er, well, not before the design's finished. In principle, that is.

We, the games software houses, resolve not to rip off other people's games. Or at least, we promise to pay royalties if we do: after all, people are entitled to something for their skill, originality and sheer hard work. Of course, that doesn't apply to arcade games like Pacman, Donkey Kong, Missile Command, Space Invaders. That's not really stealing. Anyway we write our own code. Well, most of it.

We, the pirates, resolve not to copy any more commercial software and sell it. Of course we'll still need to crack the protection schemes to take copies for back-up purposes — and one or two for a few mates at the club. You can't stop people from giving software away, and if people want to give you something in return, well, it's embarrassing to refuse. It's ungrateful. Anyway, don't tell us you've never photocopied an article from a magazine or taped a record. The top ten Spectrum games? Only a tenner.

We, the business software houses, resolve to debug software fully before we sell it, or at least, provide free or cheap upgrades to plug gaping holes in the specification — as long as the customers' demands are feasible. Obviously that doesn't cover providing a £ sign on American systems costing under about £5,000. And they can't expect anything fancy like a package that prints fractions. Who uses fractions in this day and age? Be reasonable!

We, the advertising agencies, resolve to tell the truth, or at least not exaggerate too much. Perhaps saying a push-button keyboard is "professional" or that a ZX Sinclair could run a power station is going just a touch too far, but there has to be some poetic licence. After all, a micro can do almost anything if you give it the right instructions, and Basic is practically plain English. Even a child can use it. Anyway, we're not experts. We have to believe what the manufacturers tell us, really.

We, the publishing corporations, resolve not to launch any more micro magazines, as there are too many already. Though actually, there isn't a magazine for Electron users, so we might make an exception there. Plus we have to do a Spectrum magazine, but this one will be really different. It will be on tape, for a start, and come with a free partwork, and a pop record — possibly a video too. How does *Personal Computer Tapes* sound? And why stop at the Spectrum? Anyway, if we don't launch them someone else will.

We, the magazine editors, resolve to try and get most of the articles right, for a change. Of course we can only skim through the text because it would take too long to run the programs, even if we had the machines available. Well, it's not a problem really. Readers like programs to have a few bugs because then it's a challenge to make them work. Anyway, no one follows listings exactly. It's like cookery recipes, where you take the bits you want and see what you can make out of them. Talking of food, if you're buying lunch the pubs will be open in five minutes.

We, the readers, resolve to buy *Practical Computing* every month because it is, after all, the only worthwhile magazine. Well, *PCW* is good too. Then there's the club's newsletter, the user group magazine and the manufacturer's magazine — and one or two that come free with the job. Of course you have to keep an eye on the others. Some of them have good articles every few months or so, if only there was time to read them. Did you see that piece about how a ZX-81 is really better than an IBM PC? Or that one where the cleaning lady did the bench tests? Amazing.

5 Years ago...

Our Nascom-1 was a week late being delivered. Not a criticism, but more a worry as our deadlines seem earlier each month. It is not surprising, though, that the machine was late, as it reflects the phenomenal success story of the Nascom-1.

Very fortunately for us the review kit delivered was not a kit, but a ready-built and working machine, because the Nascom-1 is not a trivial kit to assemble.

That is its major disadvantage, as it arrives as a box of parts, some 203 components for the CPU board, which ammounts to approximately 1,310 solder points in construction. On a board roughly the size of this page with that number of components — 55 are integrated circuits — the layout packing is very tight and the printed circuit tracks very thin. The construction notes supplied suggests a total of 20 hours required for construction; I think they are optimistic.

Remember, part of the price the purchaser pays is the tedious work of putting together the kit. Obviously, the kit is not insuperably difficult as there are many satisfied customers but it needs careful and patient construction.

Practical Computing Volume 2 Issue 1.

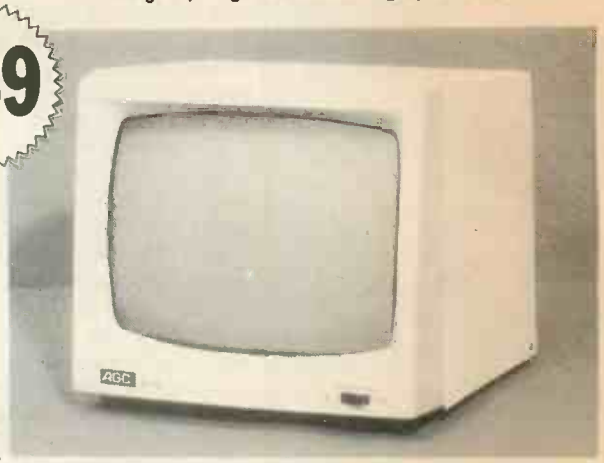
HIGH QUALITY GREEN SCREEN VIDEO MONITORS

Designed for use with Professional and Personal Microcomputers where a high resolution display is required. Ideal for applications requiring 80 column mode or higher, high resolution graphics, etc.

CHECK THESE FEATURES:–

- ANTIGLARE SCREEN
- P31 GREEN FOR MINIMUM FATIGUE
- VIDEO RESPONSE 10Hz - 22MHz ± 3db
- SUPERB RESOLUTION – UP TO 132 CHARS/LINE
- EXCELLENT GEOMETRY/LINEARITY
- HIGH STABILITY
- 230 VOLT 50Hz MAINS OPERATION
- COMPOSITE VIDEO 0.5/2.0V INPUT
- FLICKER FREE DISPLAY

£89



▲ 12" MODEL HM123

£87

▲ 9" MODEL HM910

£85

▲ 9" MODEL HM911

ADD £5 Carriage/Postage

DEALER ENQUIRIES WELCOME

THE LOWEST PRICE ANYWHERE

£349

ADD £9 Carriage/Insurance

FOR A PC WITH THESE FEATURES . . . . LOOK AT THE SPEC. OF THE AMAZING **UNITRON 2200** . . . .

Dual processors – 6502 and Z80

- 64K of RAM
- 24K ROM with softswitch control
- Selectable 80 or 40 column text display
- Detachable keyboard
- Apple® II-compatible
- CP/M® compatible
- High and low resolution graphics capabilities
- Two disk I/O for your disk drives
- Game paddles/cassette/video interfaces

Prices exclusive of VAT
Same day despatch. Access welcome.

CHILTERN ELECTRONICS

HIGH STREET, CHALFONT ST. GILES, BUCKS. HP8 4QH
TELEPHONE: 02407 71234 TELEX: 262284

● Circle No. 336

Quids in — for whom?

HAS NO ONE else noticed the inability of WordStar to produce a £ sign on the IBM printer? I understand that if you use a standard Epson everything is alright but the changes made by IBM mean that the ASCII value of the £ sign is too high and is trapped by WordStar.

It's a bit of a cheek that after spending some £4,500 you cannot even print your own national monetary symbol. Like many others I bought the IBM package under the impression that the software designed for the IBM would be compatible with it. It should be possible for Micropro to produce a patch which overcomes the problem — I suppose it all depends on how much they value U.K. custom.

John Lewis,
Oxford.

Easy as pi

HAD MR MEHEW reread my letters of March and August he would not have wasted time and effort by barking, however eloquently, up the wrong tree in his letters of May and October.

My first letter had the single aim of correcting the statement made by another contributor in an earlier issue that, if you had a 10-digit display on your computer, then 22/7 gave you π to 10 significant digits. For the possible interest, not use, of readers I then wrote: "*If* you *really* want a *rational fraction* that approximates π to 10 digits, use 3,235,853 / 1,030,004." I italicise the words that have been overlooked.

I fail to see how anyone, even with the worst will in the world, could interpret this as meaning that I, or anyone else, would use this fraction other than under considerable duress. Inverse tangents, not being rational fractions, are clearly irrelevant here, though ingenious combinations of inverse tangents are the usual means of calculating π to many digits. However, calculating $\pi/4$ from arctan(1) is a textbook example of inefficient computation. Even on the Apple it takes some seconds to produce nine-digit accuracy in this way.

Of course, when operating an Apple the keystrokes

4*ATN(1)

invoke π quite quickly, but only because they do not initiate any actual calculation of π. Some operations involve a value of $\pi/2$ stored as a five-byte constant in locations −3997 through −3993.

So neither the Apple nor, indeed, the Apple Corporation actually calculate π. Presumably they looked it up in some reliable source. The difference between calculation, look-up of something already calculated, and when to use one and when the other, are important problems. One should keep one's mind clear about them.

Mr Mehew asks whether anyone knows the exact value of π. It has no finite exact value, being a transcendental number. However many digits you compute, there are always more to be computed, and you cannot find out what digit is in a particular place without first computing all the digits that precede it. The literature about π and its calculation is vast, but the essentials are readily accessible in public libraries. I'm sure Mr Mehew would enjoy them.

R A Fairthorne,
Farnborough,
Hampshire.

IN HIS continued advocacy of

4*ATN(1)

as an equivalent to π S Mehew says "it ... will evaluate to as many places as the computer can handle". True: but there is no guarantee that they will be correct, for ATN is worked out from a complicated polynomial approximation to the ATN function, and such approximations often result in slight errors.

A check can be made by printing out the values of the bytes of the internal floating-point representation of ATN(1). The mantissa bytes should agree with the sequence:
201,15,218,162,33,104,194,52,
196, 198, ...
which were worked out from πcorrect to 40 decimal places. These bytes may be inspected by Peeking, if you know where they are. Otherwise my short program will print them out. N should be one more than the number of mantissa bytes that your computer uses. Thus for the ZX-81, which uses four-byte mantissas, N = 5 gives

210,15,218,162,0

confirming that

ATN(1) = π/4

correct to the number of bytes used.

If ATN(1) is in error, one of the series of rational approximations to π is safe: 104,348/33,215 has an error of about 3×10^{-10} and will give the correct value for a four-byte mantissa: 80,143,857 / 25,510,582 has an error of about 6×10^{-16} and will give the correct value for a six-byte mantissa.

W E Thomson,
Aldeburgh,
Suffolk.

```
LET Q = ATN(1)
FOR I = 1 TO N
LET Q = 256 * Q
LET B = INT(Q)
PRINT B
LET Q = Q - B
NEXT I
```

Dissatisfied customer...

EVERYONE must now have heard about the infamous "28-day delivery" quoted by Sinclair and others, but may not realise the depths to which the mail-order situation has recently fallen. I refer in particular to the Oric 1 and its software. Having now managed to sort out the problems with the 16K Oric, Oric Products International and its software house, Tansoft, now seem to have put all their efforts into plumbing new depths of bad service with the software packages Oric Forth and Oricmon.

These programs were advertised in the magazine early in June, quoting the usual "delivery within 28 days". I sent off my order to Tansoft, for the Forth and Monitor packages, on June 11. About two weeks later a confirmation of the order was received and stated that delivery would be within 28 days of the date of this confirmation.

Five weeks later still, having received nothing and being unable to phone Tansoft during the day, I wrote asking what had happened. A further week elapsed before the unexpected arrival of Oric Forth. There was no covering letter to explain what had happened to Oricmon, but at least I could now use Forth.

The documentation was well down to the very low standard set by the original Oric Programming Manual. The label on the cassette itself said that the program was recorded at Fast speed. After half an hour of unsuccessfully trying different playback levels I changed to Slow speed and obtained a good load first time. The contents page of the manual says that loading instructions were to be found on pages 1 and 2. My manual began at page 3, pages 15/16 being considered so important that Tansoft had included them twice.

The manual begins as though assuming no knowledge on the part of the user, but quickly becomes so confused and disorganised that beginners are soon on their own. Now, some 11 weeks after my first order and four weeks after receiving Forth, I am very pleased with the software, but making sense of the manual was very hard work.
Oricmon, but at lease I could now use Forth.
labelled correctly and loaded first time at Fast speed. It also seems to work, but the covering letter began "Please find enclosed your Oricmon tape.

(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 on previous page)

The manual will be sent on to you in about four weeks when we receive it from the printers . . ." so I cannot be sure.

I shall avoid Tansoft like the plague in future. Why should users pay top prices for software and then get this pathetic service? Why can Tansoft not answer enquiries about non-delivery of goods? Why is there no department to answer the inevitable technical queries brought about by the very poor documentation? Why does "delivery within 28 days" mean delivery in about 15 weeks, if you're lucky?

Perhaps Tansoft might bother to answer you.

A P Hill,
Braunton,
Devon.

...and a happy one

YOUR CORRESPONDENCE columns are full of complaints about retailers of computing equipment. There are, however, dealers who offer a service that goes way beyond even excellence.

I purchased a BBC Micro hoping that I would be able to use it for professional purposes. After a short while it became apparent that I needed a random-access filing system. This was beyond my very limited capabilities so I responded to an advertisement for a book on the subject with demo disc from The Computer Room in Newthorpe. One of the programs on the disc was almost what I needed, but trying to modify it produced only system crashes.

However, a letter to the author, to my astonishment — I have had previous experience of major retailers — produced by return of post a most helpful reply. Within a week I had been sent a personalised system on two discs which fulfils all my needs. No payment was asked for.

I have had no previous connection with Mr Morris of The Computer Room. I might add that the failure was in no way due to the book — but to my Basic ignorance. My faith in the computer industry is almost restored.

J J Hamblin,
Westcliff-on-Sea,
Essex.

Sad accident

MANY THANKS for including Husky in the excellent British Micro supplement to the October issue. Unfortunately, the photograph you published fails to show Husky to the best advantage. It is a shot of a unit that had previously been run over by a fork-lift truck during shipment, and had been sent to you with an associated press release describing this unfortunate incident.

While it is remarkable how little damage the Husky suffered in this event, the LCD screen is not normally supplied in the smashed form illustrated in your article.

David Viewing,
DVW Microelectronics,
Coventry.

Unimpressed

IF ONLY the world were full of customers like H J Challen I'd give up my job and move into software straight away.

If one follows his example of marketing disc-drive manuals, I could produce a computer and justifiably provide it with no documentation. All I'd have to do is manufacture a TV set — in very limited quantities, like the Acorn 80-track disc drives — and give the computer documentation with that.

The Acorn DFS is only supplied by Acorn. Having paid £98 for a chip I expect some docmentation telling me what it does. By all means insist that the disc-drive manufacturer provides a manual telling you how to operate the disc drives but not, for pity's sake, a software product he has not attempted to sell to a customer. None of the manufacturers selling alternative DFS systems insist you buy a disc drive from them to find out what the ROM chip you have paid for does.

Mr Challen also likes the way the Forth book and cassette are separately charged items. He would presumably be happy to have the added flexibility of receiving the language cassette one month, and the accompanying docmentation over six months later. He'd be even happier on receipt of his documentation to find that his cassette is now being made available in disc and ROM format for little extra cost.

Finally, Mr Challen thinks it admirable that Acorn charges him £9.95 for 256 bytes of code that enable him to use his £60 word processor properly.

Ian Smith,
Alkhobar,
Saudi Arabia.

Factorials.

```
  10 PRINT AT 2,10;"FACTORIALS"
  20 PRINT AT 4,1;"N","FACTORIAL
 N"
  30 LET L=LN 1000
  40 INPUT N
  50 LET E=0
  60 IF N=0 THEN LET NF2=1
  70 IF N=0 THEN GOTO 140
  80 IF N<0 OR N<>INT N THEN GOT
O 40
  90 LET NF1=((1/(N+12))+N+(LN
N-1))+LN (SQR (2*PI*N))
 100 LET E=INT (NF1/L)
 110 LET NF1=NF1-(E*L)
 120 LET E=3*E
 130 LET NF2=EXP NF1
 140 PRINT N,NF2,,"E+";E
 150 GOTO 40
 160 SAVE "SUPER FACTORIAL"
 170 FAST
 180 GOTO 10
```

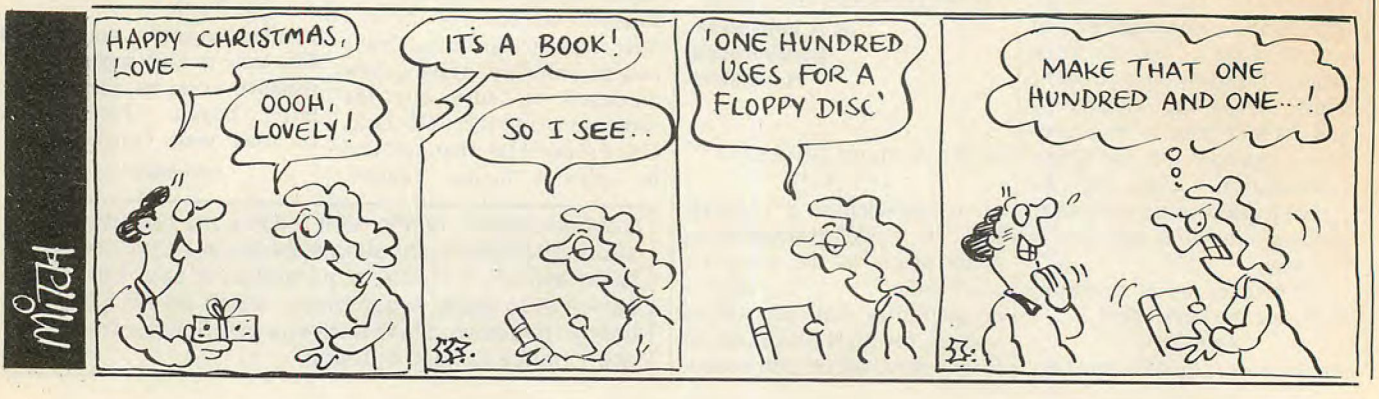
Factorials

THE COMMENT by Owen Bishop concerning the limitations imposed on the calculation of factorials by microcomputers are appropriate only when using the direct method shown in his examples. Lifting these limitations to the speed of computation and size of numbers factorialized is not difficult, as demonstrated in my program.

The program uses Jewett's approximation rather than the more often cited Stirling's method and an exponent-stripping routine. Lines 10 to 80 print the heading, initialise the variables and perform sanity checks. Line 90 computes LN N!, while lines 100 and 110 strip as many LN 1000 as possible from LN N! putting the answer in standard engineering notation. Line 120 adjusts the exponent. Line 130 takes the EXP of LN N! less all possible integral multiples of LN 1000.

The error factor using Jewett's approximation is always less than the magnitude of N and so rapidly becomes insignificant.

Marshall P Brown,
Dhahran,
Saudi Arabia.



If your microcomputer job involves managing information, you'll need a Compsoft Data Management System. It's your guarantee that computerisation will be a success.

Compsoft are world leaders when it comes to easy to use database programs. There is nothing quite so genuinely user friendly, and nothing quite as powerful. And Compsoft were the winners of the 1983 RITA (Recognition of Information Technology Achievement) Awards 'Software Product of the Year'.

We can give your *Computer the power to breeze through the management of any record keeping situation, – effortlessly, efficiently, and more accurately than you ever dreamed possible. From sales ledger to stock control, purchaser ledger to personnel, clubs to customers, and in a thousand other ways, we can lend a helping hand.

You don't have to be a computer expert to use Compsoft's DMS or Delta. Both programs offer fast, accurate and elegant database power for both first time computer users and professional systems designers.

You owe it to yourself to know more. Either return the coupon to us, or simply telephone the office and we'll send you a complete guide to our versatile database programs – today.

* Delta is available for almost any microcomputer with the MSDOS, PCDOS, CP/M, or MP/M operating systems, including IBM, DEC Rainbow, SIRIUS, XEROX, ICL, EPSON and many others.

DMS is also available for Commodore computers.

Compsoft Limited
Hallams Court
Shamley Green
Nr Guildford, Surrey
England GU4 8QZ
Telephone: Guildford (0483) 898545
Telex: 859210 CMPSFT

Please send me further details

Company _____

Contact _____

Address _____

_____

PC _____ Tel No. _____

● Circle No. 103

Personal and Profe

MTX512: 64K RAM - £315
MTX500: 32K RAM - £275

Please phone for the address of your nearest Dealer

MEMOTECH LTD STATION LANE WITNEY OXON OX8 6BX TEL· 0993-2977 TLX· 83372 MEMTEC G

The All-Purpose System

The MTX Series is a new departure in micro-computer technology. Whether your needs as a user are for personal programming, games playing, scientific or process control, educational or business use the MTX Series is already capable or very easily adaptable to almost every application. Glance through the standard features below - you'll see what we mean.

Hardware - 32K RAM on the MTX500, 64K on the MTX512.

The MTX500 has 32K of user RAM as standard (64K on the 512), expandable to 512K plus 16K of video RAM, controlled by a separate Video Processor. Sixteen colours, 40 column text, 256 x 192 high resolution graphics with all sixteen colours available, and 32 easily moveable user defined graphics characters (Sprites) combine to make effective screen displays quick and simple to achieve. Standard outputs are centronics printer port, two joystick ports, an uncommitted I/O port, 2400 Baud Cassette port, separate TV and Video Monitor ports, 4 channel sound with hifi output plus a dedicated cartridge port. Other standard features include the Z80A processor running at 4MHz, real time clock, full moving key keyboard with 79 keys including eight 2-function keys and separate numeric pad.

Software

The MTX's 24K ROM contains several languages and routines which enable the novice or the experienced programmer to make full use of the machine. Standard languages are MTX BASIC, MTX LOGO commands, NODDY. ROM routines include an ASSSEMBLER/DISASSEMBLER with screen display of the Z80 CPU registers, memory and program,which can be manipulated from the keyboard. Machine code programs can be stepped through one instruction at a time, and easily called from within BASIC programs. A further feature is the Virtual Screen facility which enables the programmer to split the screen into a maximum of eight sections to work independently whilst maintaining all full screen facilities. Pascal is available as an add-on ROM pack.

The Disc Based Computers from Memotech

Designed to use the full power of the MTX computers the FDX and HDX make perfect business systems at prices which make perfect business sense. Both feature the CP/M operating system, giving instant access to a wide range of proven application software. Available in October these feature:

- *Full Western Digital floppy disc controller set with SASI interface for 4 drives, CP/M types 0-13.*
- *minimal latency, very high data transfer rates*
- *optional Colour 80 Column Board*
- *optional Silicon Discs (1/4 Mb) which dramatically increase the efficiency of 8 bit software to those of 16/32 bit software; increases life and reliability of mechanical drive*
- *permits single disc CP/M operation*

FDX— Floppy Disc System

1 or 2 5 1/4" Qume drives 500K unformatted, 347K formatted.

HDX—Hard Disc System

5 1/4" Qume drive, 500K unformatted, 347K formatted, 5 1/4" Winchester which may be 5, 10, or 20 Mb

All Memotech products are designed and manufactured in Oxfordshire, England

CP/M is a trademark of Digital Research Inc.

MEMOTECH MTX SERIES

● Circle No. 104

CONTINENTAL SOFTWARE

We're not just playing games...

BLOBBO
A fast maze chase with untold perils and hazards.

TOADO
Get the toad back to his nest – but don't get run over or drown on the way.

SUPER MINEFIELD
You may have seen other Minefield games but ours has tanks that lay invisible mines, and spiders that are *very* tricky to avoid.

CONTINENTAL INVADERS
Classic arcade action, with all the features that make this game so popular.

KILOPEDE
This one is very fast – its not easy to get past level two.

RADAR/SONAR
Eliminate submarines with a combination of radar screen and sonar, very realistic.

FLIGHT SIMULATOR
Take off, navigate and land your high powered light aircraft. All the features of true flight.

ALSO AVAILABLE:
RESCUE, BEAVER, CONTINENTAL RAIDERS, PILE UP, SIGNAL MAN and many more.

we mean business too.

MTXCALC
Sophisticated and powerful, the professional spreadsheet program.

MTX WORD PROCESSOR
All necessary features are included to give a powerful business tool.

ACCOUNTING PACKAGE
Sales and Purchase Ledgers, stock control, payroll – the complete business system.

PROJECT PLANNER
Speaks for itself, and helps you achieve deadlines efficiently and effectively.

STRATEGY BOARD GAMES
CHESS, BACKGAMMON, OTHELLO, DRAUGHTS.

EDUCATION PROGRAMS
MATHS 1 PHYSICS 1
The first two programs in a series of specially written software designed to teach at the pace and level best suited to the user.

Software for the MTX SERIES

CONTINENTAL SOFTWARE UNIT 24 STATION LANE WITNEY

• Circle No. 105

Arab RAM for ZX-81

BASIC PROGRAMMING in Arabic is now possible using the Sinclair ZX-81. A Saudi Arabian company has produced an add-on appropriately called Arab RAM, which plugs into the back of the computer. It generates an Arabic character set, and text is displayed on the screen from left to right. Arab RAM also gives the Basic a full set of Arabic keywords.

Keyboard overlays and a supplementary manual written in Arabic are also provided.

The computer can still be used for programming in the English language when the user choses to.

Further details from Autoram, PO Box 147, Jeddah, Saudi Arabia. Telephone: Saudi Arabia (010 966) 660 4212.

Dragon/ Tandy converter

IF DRAGON CRUNCHER does what is claimed for it the number of good programs available to Dragon owners has been vastly increased at a stroke. Dragon Cruncher converts Tandy Color Computer programs to run on the Dragon. It also works the other way, which will interest Tandy Co-Co owners.

No programming knowledge is required to use Dragon Cruncher. At the moment it can only handle Basic programs. The price if £7.95, including post and packing.

Contact Elkan Electronics, Freepost, 11 Bury New Road, Prestwich, Manchester M26 6LZ. Telephone 061-798 7613.

Lisa ledgers

A COMBINED ledger system with automatic posting to sales, purchase and nominal ledgers is now available for the Apple Lisa. Sunaccount costs £1,250. Financial reports from the package can be further manipulated by Lisacalc and Lisawrite.

Contact Systems Union Ltd, 34 Delancey Street, London NW1 7NH. Telephone: 01-485 2594.

Down the sewer

PORTABLE COMPUTERS don't get soggy, which gives them an advantage over pencil and paper down a sewer. Two water authorities, Thames and Southern, are using the Husky battery-powered portable to record defects found during sewer inspection. Specialised software for the task was written for them by Structural Dynamics of Southampton.

The Husky is ideal for the purpose as it is waterproof and designed to operate in harsh environments. A new version is available to meet the safety requirements of industries where inflammable or explosive atmospheres are likely to be encountered.

For details contact DVW Microelectronics, PO Box 135, 345 Foleshill Road, Coventry CV6 5RW. Telephone: (0203) 668181.

16-bit Cardbox-Plus

CARDBOX-PLUS is one of the best selling record-keeping programs for eight-bit CP/M machines. It can now be obtained for the Sirius, Wang and IBM PCs. Cardbox-Plus is simple to use because it emulates a card index, with individual records represented by a screenful of information. Record size is limited to 2,340 characters in the 16-bit version.

Cardbox-Plus costs £300. A multi-user version with record-level locking is also now available for MP/M and Turbodos systems. Details from Business Simulations Ltd, Scriventon House, Speldhurst, Tunbridge Wells, Kent TN3 0TU. Telephone: Langton (0892) 3105.

Software Index

YET ANOTHER computer magazine will be on the news-stands from December. *Software Index* takes the form of a directory of available software for eight popular home micros including the BBC, Commodore 64 and Spectrum.

It is a remote cousin of *Practical Computing* as it is published by IPC Magazines, a rival arm of the giant Reed publishing empire. *Software Index* will be published quarterly and costs £1.50.

Intelligent disassembler

MDIS is an intelligent disassembler for Z-80 and 8080 CP/M machines. It lets you take apart machine-code programs for examination or modification.

MDIS goes beyond simple disassemblers and provides automatic labelling in addition to Z-80 or 8080 mnemonics. Data areas are reported in defined-byte form with an ASCII printout alongside.

MDIS output can be to screen, printer or disc, and it can be edited for reassembly by a variety of assemblers including Microsoft's common M-80 assembler.

MDIS costs £50 and is available in a variety of CP/M disc formats from Henry's, 404-406 Edgware Road, London W2 1ED. Telephone: 01-402 6822.

Stocking fillers

MOST OF the following programs should be available from High Street shops but a contact phone number or address of the publisher is provided.

● In **Lone Raider** for the Atari you enter and destroy an alien nuclear power station. It is cassette based and costs £14.99. Published by Atari. Telephone: Slough 33344.

● **Franklin's Tomb** is one of the best Adventure games. Already running on the Dragon and Oric micros, it is now also available for the BBC machine. It costs £9.95. Published by Salamander Software. Telephone: Brighton (0273) 771942.

● **The Forest** simulates the terrain seen by a runner competing in an orienteering event. The scene changes as you run through the landscape. The program, which runs on the 48K Spectrum, comes with a four-colour map prepared to orienteering conventions and a 32-page book of instructions. It costs £9.95. Contact Phipps Associates, 172 Kingston Road, Ewell, Surrey KT19 0SD. Telephone: 01-393 0283

● The latest program for home use is quite seriously called **What's to Eat**. It is a database of meals, with the computer displaying lists of ingredients and producing a shopping list. It runs on the BBC Model B and costs £9.95, or £12.95 on disc. Contact Shumwari Associates, 12 Marlin Court, Marlow, Buckinghamshire SL7 2AJ. Telephone: (062 84) 5751.

● Domesticated people may also be interested in **Cut Your Heating Bills**, a program for the 48K Spectrum. It aims to help you compare savings from double glazing, wall, floor or roof insulation, changing fuel or altering your thermostat settings. It costs £7.95 including post and packing from Brane Software, Myrtle Grove, Brane, Sancreed, Penzance, Cornwall TR20 8RE. Telephone: (073) 672 562.

It's our service!

Whether your applications involve simple financial procedures or complicated R & D Graphics (or a myriad of techniques in between) KGB have the system for you.

With the right software packages to go with it. And all at sensible competitive prices.

But we go further still. We can help with finance and leasing. We provide sound system training. And comprehensive maintenance.

So send for our literature. Have a look at the KGB service – and find out how you can win Game, Set and Match!

Micros for the Business, Commercial and Technical user - Stand Alone and Multi-user Systems.

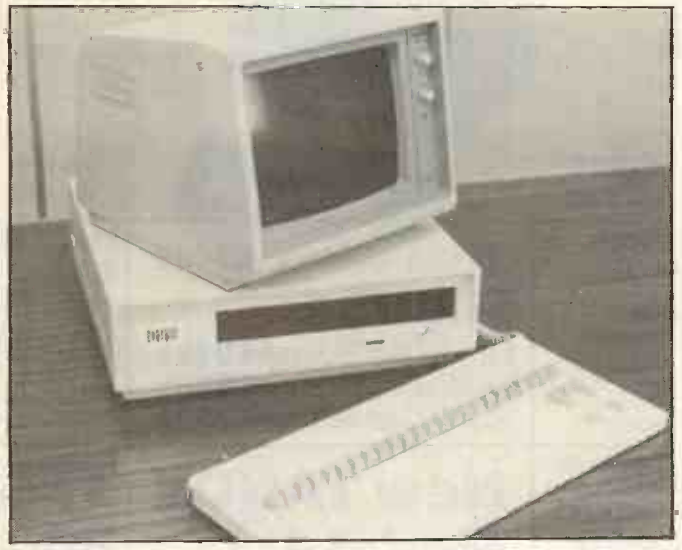
KGB MICROS LIMITED

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

106 St Leonards Road Windsor Berkshire SL4 3DD
Tel: Windsor 50111 Telex: 23152 MONREF G (Ref 8542)

● Circle No. 106

Octopus



AFTER WORKING methodically from M-1 to M-4, LSI has broken with tradition by giving the M-5 a name: Octopus. It is styled differently from the M-4, in being a three-piece desk-top micro. Internally, like the M-4 it offers an 8088 plus a Z-80 for both eight-bit and 16-bit processing with most popular operating systems. The construction is, however, radically different.

The neat main board has a single expansion slot near the back. Other boards can be piggybacked on to it to provide an extra five RS-232C ports, more RAM, an Arcnet-style network connection, etc. In the future, extra processors might be added. Each additional board has both an input socket and an output socket, so they simply slot one on top of another, building up a bus without the need for a card cage. The style is rather like the Memotech accessories for the ZX-81.

The result is a desk-top micro which can be sold at a competitive price against the IBM PC and Sirius 1, but which can also handle, without modification, two more terminals running under M/PM-II. With the extra boards, another four or five terminals could be added, or several small systems networked together. For extra storage, 8in. floppy and hard-disc drives can also be added. The result is a minicomputer-like system like, for example, the ICL PC. Did I hear anyone say "future proof"?

The Octopus offers a choice of keyboards, including LSI's word-processing keyboard with ample function keys, and an IBM PC-type keyboard from Keytronic. There is a choice of monochrome or colour monitors, as the standard machine includes colour circuitry. It also has a built-in PAL UHF output, so if you lug the machine home you can plug it into your TV.

Octopus prices start at £1,530 + VAT for a single-drive system with keyboard but without monitor. A twin-floppy system with a screen and a complete integrated business package called Axis costs £2,090 plus VAT. The Octosoft software package brings word processing, mailmerge, spreadsheet and database; it costs £295 extra.

Octopus is manufactured by LSI, which is part of CPU computers, a company quoted on the Unlisted Securities Market. In the year to June 1983, this 10-year-old company showed turnover doubled from £9.6million to £19.2million. LSI sales were £3.5million.

Contact LSI Computers, Copse Road, St Johns, Woking, Surrey GU21 1SX. Telephone: (04862) 23411.

MOS Supermicro

THE MOS SUPERMICRO is a new British business computer designed and produced by MOS International of Winchester. It uses a Z-80A running at 4MHz, has 64K of RAM, and a good range of interfaces including a Mosnet port for networking. Apparently the Supermicro has been on sale in Australia, Africa and Europe for the last year. Now the British are to be offered the chance to buy it from TKT Computers.

Contact TKT Computers, Rood End Road, Oldbury, Warley, West Midlands.

Lucas LX

MANY READERS of this magazine will remember building their first Nascom from a kit. Since the takeover by Lucas, however, the Nascom 3 has been taken firmly into the office/small business area of the market.

Now Lucas Microcomputers has launched the new LX micro running CP/M 2.2 or, optionally, NasSys and NasDos. The LX has a Z-80A running at 4MHz, 64K of RAM, an 8K Basic in ROM and graphics resolution of 784 by 256 pixels. Up to 4,193 shades are available to colour graphics. The LX can drive both colour and monochrome monitors at the same time, and a UHF output is included to drive a TV, though a 12in. moniotr is supplied as standard. Prices are from £1,795 plus VAT.

Contact Lucas Microcomputers, Lucas Logic Ltd, Welton Road, Wedgnock Industrial Estate, Warwick CV34 5PZ. Telephone: (0926) 497733 and 400004.

Ferranti's Advance

THE ADVANCE 86, a £400 IBM PC-compatible small micro, caused a stir when it was previewed in our October issue. The Advance uses Ferranti ULAs, and now a deal has been signed with Ferranti to produce the micro at its Derker Street factory in Oldham.

Contact Ferranti Computer Systems, Bird Hall Lane, Cheadle Heath, Stockport. Telephone: 061-428 0771. Advance can be contacted direct at 01-609 0061.

Philips Portable

THE WELL KNOWN Dutch multinational has leapt into the transportable computer market with the new P-2000C, which is based on the standard P-2000 office model.

It features a Z-80A, 64K of RAM, 32K of separate video RAM, a 9in. screen and two 5.25in. floppy discs with up to 640K of storage each. The screen resolution is excellent at 512 by 512 pixels. Some unnamed software, including a word-processing package and a spreadsheet, will be bundled with the machine.

This trade information comes from Austria but hardy souls might try Philips in the U.K.

Telephone: (0206) 575115. Or contact Philips Austria, MAG Personal Computers, Trieestestrasse 64, A-1100 Vienna, Austria. Telephone: 43-222-64 55 21/584..

Wang

WANG HAS introduced the Local Interconnect option which enables Wang PCs to be networked, or used as a work station in an OIS — Office Information System — VS, IIS/VS or other Wang system based on a mini or 32-bit super-minicomputer.

New software for the Wang

(continued on page 21)

LONDON COMPUTER CENTRE

NEC ADVANCED PERSONAL COMPUTER

16 bit 8086 128K Ram
2.4Mb Disk Storage
CP/M86 – MS DOS
Green Screen **£1985**
Colour Display **£2595**

LCC SPECIAL BUNDLE.

NEC APC –	R.R.P. £1985
NEC Dot Matrix Printer	R.R.P. £ 395
Benchmark WP Software	R.R.P. £ 311
Cables	R.R.P. £ 30
	£2721
you pay	£1985
you save	£ 736

EPSON QX 10 192K RAM £1735
Up gradable to 256K multi fronts zoom graphics

apricot 256K from **£1495**

SIRIUS 1

1.2 Mb Disk Storage **£2195**
2.4 Mb Disk Storage **£2695**
10. Mb Disk Storage **£3995**

Hard Disk for IBM PC, Sirius, QX10 NEC

10 Mb **£1545**
15 Mb **£1695**
20 Mb **£1995**
20 Mb Tape Streamer **£1495**

SUPERBRAIN 2

Dedicated Wordstar Keypad **from £1865**

New TANDY Model 4

CP/M 3.0* Optional extra
64K-128K RAM
from £1299

TELE-VIDEO 806/816

the Multi User Computer System

LAP PORTABLES

EPSON HX20
Portable with built-in printer
from £402

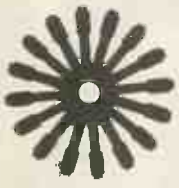
TANDY 100
Portable with built-in 4 Programmes: Word Processor, address book, scheduler, and communications. Large 40 x 8 char. line display
£433

NEC PC 8201 16K RAM EXPANDABLE to 96K

Lap Portable with 8 built in programmes, Word Processor, Investment Portfolio, Loan Evaluator, Appointment/Schedule, Bar Code Reader, Calculator, Tank & Snake Game, Music Generator.
Large 40 x 8 LCD Display
Built-in Serial, Parallel & Bar Code Reader Ports. **£475**

9" SCREEN ZORBA

Portable
full 80 x 24 display
800K disc storage
£1595



FLOWRITER RP 1600 60 CPS

Fast and reliable
8K buffer
£1600

SENDATA 800 SERIES ACOUSTIC COUPLER

£220
* Compact, lightweight, portable
* 10 hours operation from the rechargable batteries
* 300 BPS answer/originate
* Handset sensor on/off switch
* New crystal controlled circuitry
* B.T. Approved.

New JUKI 6100 Daisywheel 18 CPS

Bi directional
Adler daisywheels
Diablo 630 protocols **£399**

3 in One TOSHIBA P1350

24 Needles - high speed drafts 190 CPS Letter Perfect Printing 100 CPS Addressable Pin Graphics **£1130** Options: Tractor **£87:** Sheet feeder **£520**

EPSON FX80/100 160 CPS

TEC F10 40 CPS

Diablo 620 compatible
Japanese reliability
£1350

3 TRAY AUTO SHEET FEEDER

For originals, copies and envelopes.
£695

SINGLE SHEET FEEDER £375

New SHINWA CP 80 MATRIX PRINTER

80 CPS Friction and Tractor inc. interface cable and paper **£250**

SUITABLE FOR MOST DAISY PRINTERS

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.

43 Grafton Way, London W1P 5LA (Opposite Maples)
Opening Hours: 10-7 Mon-Fri. 12-4 Sat.
01-387 4455 (4 lines) Telephone Answering Service After Office Hours Telex: 8953742

● Circle No. 160

CHOOSING A HOME MICRO

WARNING

Choosing a home micro can be a daunting task to the newcomer, and with an ever increasing number of micros emerging on the market, even up-grading, say, from a ZX81 can be a risky and expensive exercise if the wrong decision is made. It is important to look at the real facts and specifications, and check exactly what you get for your money before choosing your micro-computer system.

THE PITFALLS

"DON'T LET THE ADD ONS ADD UP"

A number of large companies are offering packages that seem to be good value and low cost.
These offers usually have a hidden sting inasmuch as the essential accessories such as connection leads, peripherals and software often carry very high cost premiums.
e.g. software for low cost hardware usually costs between £29 and £49 for a ROM cartridge!!

CHECK THE QUALITY OF THE PRODUCT.

Raw materials are now an area where corners can be cut, and shoddy workmanship during 'building' can effect the 'up-time' of your unit.
Areas to watch out for are unreliable edge connectors, corrosion and poor quality P.C.B.s. Low quality components and bad design will seriously effect the reliability of the end product, and can lead to false economy.

DON'T BUY A GAMES MACHINE

Unless you want just games and nothing else! With a games computer you are limited.
Some computers, however, have the advantage of both games facility plus the whole world of computing to explore, as your interest and skills develop. A real computer system will allow you to expand your knowledge of the Hi-Technology world, and help earn its keep with its added uses in the field of education, communication and home business use.

SOFTWARE

Make sure the system you choose has a growing library of support software, to enable you to realize the full potential of your machine.

KEY POINTS TO LOOK FOR

● High Resolution Colour

In general most home computers have a poor graphics resolution (or detail). Check on the vertical and horizontal resolution in graphic mode and multiply the two numbers together. If the result is less than 35,000, then the graphics can hardly be considered high resolution.
Without high resolution graphics displays such as those used in games tend to be "Chunky" in appearance.

● High Quality Sound

Some computers claim to provide a sound channel when in reality all that can be found inside the computer is a small buzzer controlled by electronic pulses. At the very least a sound facility should provide more than one channel and a raise channel as well (for gun shot effects in games for example). The best systems also provide envelope control of the sound channels to produce very sophisticated effects; very important for generating music. Also look for the ability to connect to external amplifiers.

● Keyboard

For accurate entry of programs and data into a computer it is important that the keyboard has a good tactile feel in operation. Coupled with acoustic feedback the user is fully aware when the computer has accepted his/her actions. Also of importance in a keyboard is layout. A standard computer keyboard layout will familiarise the user with the vast majority of computers used in the world of business and professional applications; very important if the purpose of purchasing a computer is educational.

● RAM

One of the most important features of a computer is the amount of RAM, or memory, included. In general the more powerful and exciting a computer program is the more RAM it requires. But take care, all computers are advertised quoting the total RAM used in the system. Computers use up a great deal of their own RAM for storing essential data and particularly in supporting the graphics display and the CPU.
If it is less than 32K think again, is it enough?

● Computer Language

It is too dificult to program a computer in its own binary language so high level languages are used, the most popular being BASIC. However, there are a number of BASICs, some being very different from the rest.
A de facto standard in the computer industry is Microsoft BASIC.
Learn this one and you will be able to program in the majority of computer BASICs; such an important point if a home computer is to be used to educate your children to face the technology of the future.

● Expansion

As your interest and knowledge of computing grows, you will need a computer system that will grow with you: able to accommodate Printers, Disk-drives, Joysticks, Communications Modem, and Colour Monitor, as well as produce HI-FI sound effects.

Choosing the right system carefully will save you from throwing your money away. Check full specification, plus peripherals and software prices, before you buy. Preferably choose a Real computer system that can expand to meet your needs.

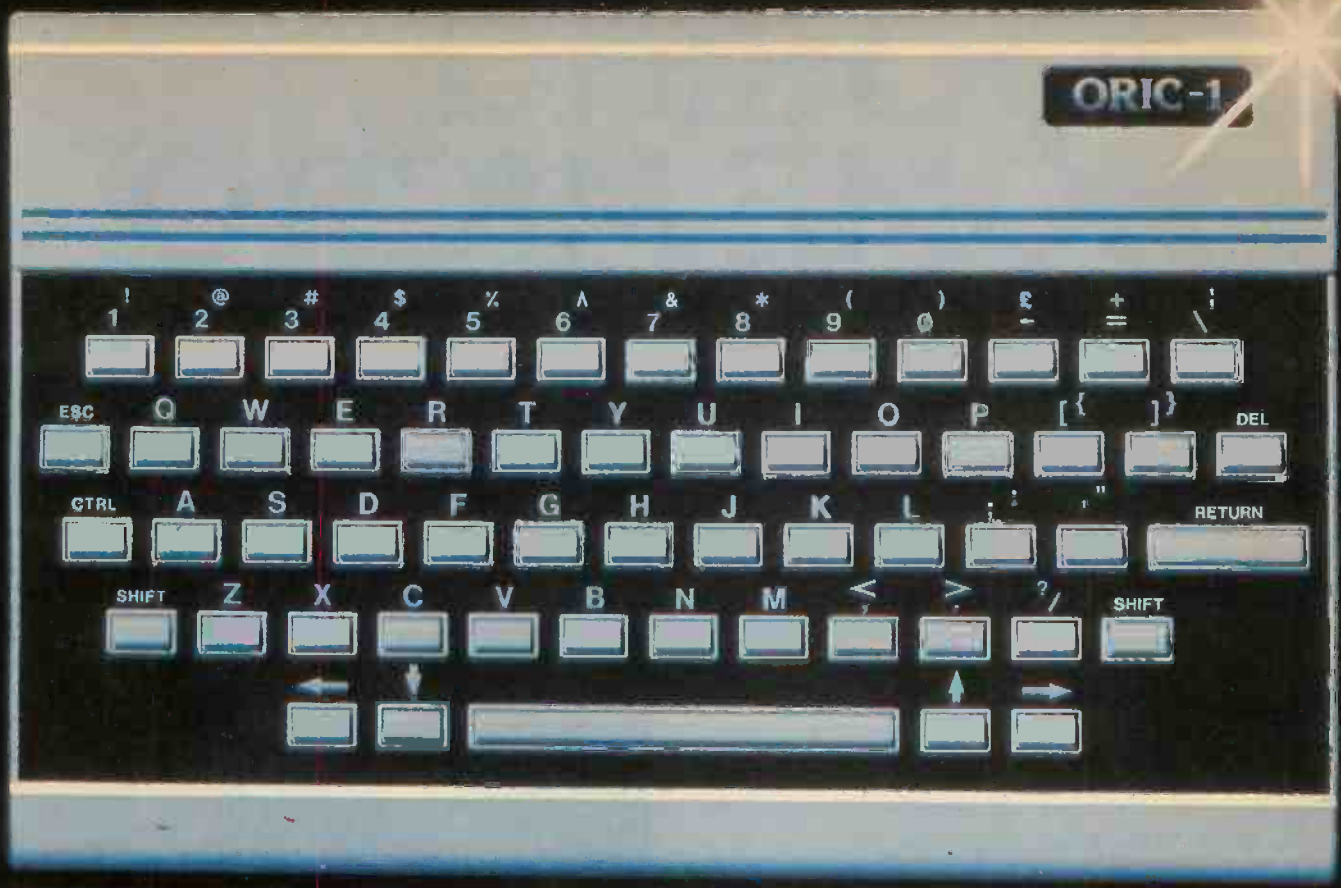
● Software

The computer you choose should have a growing selection of utility software to make the most of its capability.
Remember, computing is here to stay. You can't learn to compute on a toy, or a device which does not behave like a real computer.
In short, look out for a computer which offers all the points above, and you will be sure of getting the best value for money.

To find out which company offers you the right choice, with:-

- Good value, high specification, quality micros.
- A quality, 4 colour, plain paper printer/plotter.
- Communications Modem.
- Micro Disk Drives.
- Comprehensive and growing range of software

TURNOVER... →



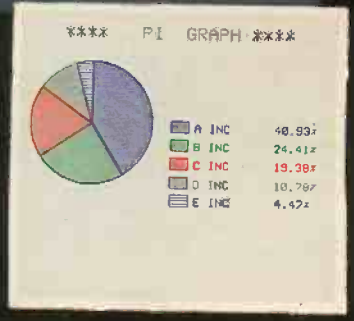
The Growing System

ORIC 3" MICRO FLOPPY DISK DRIVE

Coming soon the incredible new 3" Oric Micro Drives. Small size, Compact, High precision disks with storage capabilities from 100K Bytes to in excess of 1 Megabyte unformatted. With their own built-in power supply, these easy to use units will add big system capability to your home micro.

ORIC MCP 40 COLOUR PRINTER/PLOTTER

The Oric Colour Printer is quality engineered to provide 4 colour hard copy on plain paper, with superb graphics and text capability, printing either 40 columns or 80 columns. It prints in red, green, black and blue, onto a 4½" width standard paper roll. With a print speed of 12 characters a second, the MCP 40 comes with its own power supply and all necessary leads to connect straight into your Oric or to any standard Centronics interface.



This superb printer represents excellent value at just **£169.95 including VAT.**

ORIC PRODUCTS INTERNATIONAL LTD. COWORTH PARK, LONDON ROAD, ASCOT, BERKS.

The right choice for real computing

ORIC-1

Before making your final choice, check any other home micro in the same price bracket, against the incredible specification of the ORIC-1.

Quality of build and materials		Real computer keyboard layout and moving keys	
Superb styling / Full colour display		High Resolution colour graphics 240 x 200 pixels	
Choice of 16K or 48K RAM		Real computer language programming – Basic / Forth	
Latest design technology and circuitry		Teletext/Viewdata compatible graphics (28 rows x 40 characters)	
Real sound – 8 octaves plus Hi-Fi output		Cassette Port & R.G.B. output.	
Centronics printer interface		Fully supported and growing software library	
Colour printer / Disk Drives		A fully expandable system for home, education & small business use	
Communications Modem		Full range of peripherals to support your system...	

ORIC-1 Setting todays standard in Quality and Price.

ORIC-1 48K £139.95 inc.VAT **ORIC-1 16K £99.95 inc.VAT**

All ORIC computers purchased before 31st December 1983 come with a £40 voucher off the M.R.P. of the MCP 40 Colour Printer.

MCP 40 COLOUR PRINTER £169.95.
OFFER PRICE £129.95

TANSOFT ORIC Software

NEWS FLASH
LATEST RELEASE
THE HOBBIT

The fast growing success of ORIC-1 means that an incredible number of software titles are becoming available for your Oric. With many well known titles from independent software houses, plus exclusive ORIC SOFTWARE from TANSOFT, you can now drive your Oric towards its full potential.
Below is a small selection from Tansoft's range, all of which offer superb value.

BUSINESS
ORIC BASE, ORIC CALC, AUTHOR.

MACHINE LANGUAGES
FORTH, ORIC MON.

COMPUTER GAMES
ZODIAC, HOUSE OF DEATH, ORIC MUNCH, SUPER BREAKOUT, ULTIMA ZONE, DEFENCE FORCE.

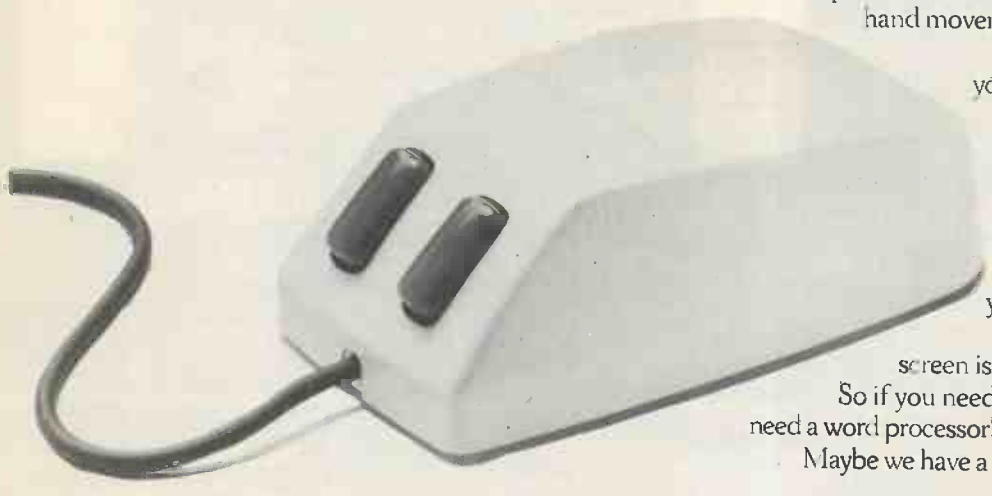
TOURING LANGUAGES
GERMAN, SPANISH, ITALIAN, FRENCH.

GENERAL INTEREST
ORIC CHESS, MULTIGAMES 1, MULTIGAMES 2, ORIC CAD, THE NOWOTNIK PUZZLE.

TANSOFT ORIC SOFTWARE available from your ORIC supplier and all good software dealers. For full list of further information contact:-

TANSOFT LIMITED – 3 CLUB MEWS, ELY, CAMBS CB7 4NW TEL (0353) 227 1/2/3/4

mouse[1] (mows) *n.* (*pl.* **mice**). Unique hand-operated device to facilitate fast operation of WORD, Microsoft's sophisticated word processing software package, starting with the IBM PC.



In producing WORD, we have redefined word-processing software for the foreseeable future.

No longer is it necessary to have a word processor if you want to do word processing.

All you need is an IBM PC and a Microsoft WORD software package.

And away you go.

Instantly your IBM is transformed from a mere microcomputer into a word processor with as many functions as you will ever need.

For a start, it's fast.

(This is where the mouse comes in.)

It pushes whole sentences around with natural hand movements.

And it's sure. Even if you're not.

With special undo facility, multiple windowing and context sensitive help.

Typefaces can be varied too.

Bold, italic, underlined, you name it.

And what you see on the screen is what you get on paper.

So if you need word processing but don't need a word processor's price, give us a call.

Maybe we have a little something to talk about.

WORD

Please send me further information on Microsoft Word.

Name_____

Position_____

Company_____

Address_____

Tel_____

MICROSOFT®

Right: First time.

Microsoft, Piper House, Hatch Lane, Windsor, Berks SL4 2QT. Tel (07535) 59951.

PRA12/3W1

● Circle No. 109

(continued from page 15)

PC includes Notebook, a simple database system which searches unstructured text, and a UCSD-p run-time support system. Word-processing files from the PC can now be transferred to the Wangwriter and other Wang office systems equipment.

The price of the Wang Professional Computer has been cut. The cheapest entry-level system with a single drive and no monitor costs £1,835 plus VAT. A full system with two 360K drives and a VDU costs £2,675 plus VAT. The Local Interconnect option costs £285, and Notebook costs £145 — all prices plus VAT.

Contact Wang (U.K.) Ltd, Wang House, 661 London Road, Isleworth, Middlesex TW7 4EH. Telephone: 01-560 4151.

Signet 3

KENNETH BAKER, Minister for Information Technology, recently opened the new Shelton Instruments factory in North London. The government's British Technology Group is one of its financial backers. On view for the first time was the Signet 3, an expandable multi-user small-business system, which was to be officially unveiled at Compec.

Contact Shelton Instruments, 74-77 White Lion Street, London N1 9PJ. Telephone: 01-278 6272.

Spectrum joystick

DOWNSWAY is now offering a joystick which plugs directly into the Spectrum and which can be programmed to suit any keyboard-operated game. You press the key on the keyboard while moving the joystick in the desired direction, which is then remembered until you reprogram it or turn off the computer. The joystick costs £22.95.

Contact Downsway Electronics (U.K.) Ltd, Depot Road, Epsom, Surrey KT17 4RJ. Telephone: Epsom (03727) 27222.

The Workslate

CONVERGENT TECHNOLOGIES, which brought you the powerful Burroughs B-20 micro, has just announced a portable for the executive. The workslate has the familiar tools such as a calculator, calendar and address book, and it also has a built-in spreadsheet.

Unlike the Tandy/NEC/Olivetti lap computers — but like the Epson HX-20 — it has a built-in microcassette recorder. The LCD display is, however, bigger than all these at 46 characters by 16 lines. Overall dimensions are about the same at 11.25in. by 8.5in. but it only weighs 3lb. Like Sony with the Typecorder, CT has taken the line that real executives do not type, they dictate. Thus the keyboard is not typewriter-like and the microcassette records speech as well as programs and data.

The Workslate comes with an AC adaptor, modular phone-jack cable, soft case and instruction tapes. A printer is an optional accessory.

The Workslate has initially been launched at $895 via the American Express Christmas Catalogue. After that market has been filled it should be available through U.S. stores, then reach the UK some time in 1984.

Contact Convergent Technologies, 38/40 Sycamore Road, Amersham, Buckinghamshire HP6 5DR. Telephone: (02403) 28515.

U-Net for the BBC

ACCORDING TO U-Microcomputers, Acorn cannot deliver Econet that compares with U-Net because it needs a second 6502, something that is in short supply. U-Microcomputers says, however, that it can now deliver U-Net for the BBC Micro, allowing up to 32 micros to share up to six disc drives and one or two printers.

U-Net is a star network that has established itself on the Apple II, and been on field trial on the BBC Micro since this summer. Once you have acquired U-Net, a BBC Micro satellite kit costs £50 plus VAT.

Contact U-Microcomputers, Winstanley Industrial Estate, Long Lane, Warrington, Cheshire. Telephone: (0925) 54117.

Phoenix Stratos

THE PHOENIX STRATOS business computer runs CP/M and is said to be faster than many computers costing considerably more. Its main selling points, however, are that it packs twin 8in. floppy-disc drives offering 2.5Mbyte of storage and it costs under £2,000. If you want to know more then you have to get in touch with Phoenix direct.

Contact Phoenix Systems, Second Floor, Buckingham House, 42 Princess Street, Manchester. Telephone: 061-236 1172.

In brief

- **Olivetti** had the misfortune to pick the wrong processor, the Zilog Z-8000, for its personal micro. Olivetti has already produced an 8086 card for the M-20 to offer MS-DOS capability. Now it is signing a deal with Corona Data Systems, the manufacturer of an IBM PC work-alike. Olivetti will make the machine in Europe.
- **The Zeus 3X** is a 32-user micro with one Z-80A and one Intel 8088 for each user. It is being sold by Millbank Computers of Twickenham. Telephone: 01-891 4691.
- **Almarc Data Systems** has added the Motorola 68000 running Unix to the range of processors in its Spirit micro. A 10Mbyte system costs £4,000 plus VAT. Telephone: Nottingham (0602) 52657.
- **Cifer's Model 2887** has a Z-80, a 5Mbyte or 10Mbyte hard disc, runs CP/M Plus and costs £3,395 or £3,995. For £995 you can add a 68000 to run Unix. Telephone: Melksham (0225) 706361.
- **Imp** has announced a range of support products for its powerful 68000-based IMP-68. They include 1Mbyte memory cards and interfaces to a range of discs and tape streamers. Imp also has Unix software including Uniplex word processing, Mince, Superfile and a CP/M emulator. Telephone: Consett (0207) 503481.
- **Plessey Microsystems** has developed a bubble-memory system, the PBS-90M, with 4Mbyte to 24Mbyte capacity. It is intended to replace disc systems in military applications. Telephone: Towcester (0327) 50312.
- **Mom Systems** of Aberdeen has launched a configurable communications package to link micros to micros, minis or mainframes in asynchronous or bisynchronous modes. Mom says it has been field tested in the North Sea. Telephone: Aberdeen (0224) 571825.
- **Grundy's** Newbrain micro may continue after all. It seems that the Dutch distributor Tradecom International wants to take it over.

G. W. COMPUTERS LTD LONDON'S WEST END NATIONWIDE OVERNITE SERVICE MORE PRODUCT RANGES BETTER SERVICE PROBABLY THE WIDEST SELECTION OF NETWORKS... MICROS...AND PRINTERS ON DISPLAY NATIONWIDE

*****THE NEW DBMS III (series III of the world's first 'task-robot-programs')*****

*****FEATURES*****

1400 character record sizes
mathematical scratchpad
record relational indexes
translateable to any language
User-defineable reporting
field protection/classification
either-or, same as, greater, smaller
sorts 'alpha or numeric' any window
12 online file architectures
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
range match, not match, integer match
sort speed 500 records per 20 seconds
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
13 interrogation question types
short filling output/audit trails
Word-star & Mbasic compatible

DBMS III.7 NEW SWITCH MODE FACILITY ENABLES YOU TO CROSS UP TO 12 DIFFERENT FILES (32000 RECORDS PER FILE) PRE-SELECTING ANY OF UP TO 20 FIELDS PER RECORD/FILE FOR DISPLAY/PRINT OUTPUT (240 FIELDS) IN ALL. ONE MASSIVE ENQUIRY CAN PASS THROUGH 384,000 RECORDS

You might have two files whose records are directly related to each other, so that the first file (say containing names and addresses) refers to the second file (say financial and other information relating to the same record numbers in the first file) directly. Then you can simply select that in file 1 you are interested in just the name and telephone numbers, whereas in file 2, you are interested in the income, trading period and number of branches, information. Your enquiry can then pass through both files highlighting that information only. Actually there doesn't need to be a strict correlation between the same record numbers in different files, and you can also on just one JUMP command go to any record in any of the 32000 records in any of the twelve files and carry on cross-referencing from there onwards.

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

Simply design your file, give its fields your words, setup your report mask, and then enter your records. Switch to 'automatic drive' and formulated any task you wish to 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"; "analysis"; "patient history analysis"; "research-analysis"; "budgetting-analysis"; "vehicle-location control"; "librarian analysis"; "plus more?"

Not only does this program surpass most of its kind that you might buy elsewhere, but if you buy the hardware from us, then you get it FREE . . . DBMS II (WITHOUT MACROS) AND DBMS III ARE FULLY IMPLEMENTED UNDER CPM-86 (tm) AND MS-DOS (tm) I.E.: SIRIUS/VICTOR/IBM DBMS II IS £395.00 (or £250.00 by mail order ex. training) . . . DBMS III is £575.000 (or £295.00 by mail order ex. training).

MICRO-COMPUTERS

INTERTEC	-Superbrain 64K RAM/320K disks	1895.00
	-Superbrain 64K RAM/700K disks	2295.00
	-Compustar 64K RAM/320K disks	2195.00
	-Compustar 64K RAM/700K disks	2595.00
NORTHSTAR	-Advantage 64K RAM/700K disks	£2195.00
(exc DOS)	-Advantage 64K RAM/5.3M disks	£3095.00
TELEVIDEO	-802 64K RAM/700K disks	2395.00
	-802H 64K RAM/7.3M disks	3950.00
	-806 64K RAM/10M disks	5195.00
	-816 256K/750K disks	*£3350.00
ACT	-Sirius 1 256K/1.2M disks	*£2195.00
	-Sirius 2 256K/2.4M disks	*£2695.00
	-Sirius 3 256K/10MEG disks	*£3995.00
VICTOR	-9000 256K/1.2M disks	*£2195.00
IBM	-PC 64K RAM/640K disks	£2595.00
	-PC I 320K/640K disks	£3195.00
IBM	XT (TEN MEGABYTE)	£4480/00
IBM	XF (FIVE MEGABYTE)	£3650.00
ALTOS	ACS800-2 64K RAM/1M disks	2195.00
	ACS800-10 208K/10.5Meg disks	5695.00
NEC	APC 128K RAM/2M disks	call.00
CORVUS	Concept 16 bit pc	call.00
SANYO	G80 64K RAM/320K disks	1195.00

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

WE STOCK MOST OF THE BEST KNOWN SOFTWARE ALSO MOST OF THE BEST KNOWN BRANDS OF PRINTERS & PERIPHERALS FROM 300.00 TO 2700.00 (OKI/EPSON/DRE/NEC/QUME/ANADEX/RICOH)

PRINTERS

OKI	-Microline 80	295.00
	-Microline 82A	395.00
	-Microline 83	695.00
	-Microline 84	895.00
EPSON	-MX80/FT-3	425.00
	-MX100/FT-3	575.00
ANADEX	-DP 9000	895.00
	-DP 9501	1045.00
	-DP 9501 (A)	1145.00
QUME	-9/45 R/O	1995.00
	-9/55 R/O	2195.00
	-9/35 R/O	1495.00
NEC	-3510 R/O	1495.00
	-7710 R/O	2195.00
	-5520 KSR	2250.00
DRE	-8820	1295.00
	-8830	1695.00
TEXAS	-810	995.00
	-825	995.00
DIABLO	-630	1995.00
RICOH	-RP1600	1695.00
OLYMPIA	-ESW 103 14 CPS	975.00

SOFTWARE

G.W.L.	-BUS V8.00 (Accounts)	275.00
	-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
	-FORMS/TEXT/CALC-DBMS IV	*£575.00
	-Sales Ledger	*£95.00
	-Purchase Ledger	*£95.00
	-Nominal Ledger	*£95.00
	-Stock Control	*£95.00
	-Address-Mailer	*£95.00
	-QASort/QNSort (500 Recs/14secs)	*£95.00
MICROSOFT	-Mbasic 80	*195.00
	-Fortran 80	295.00
	-Cobol 80	395.00
	-Basic Compiler	*225.00
	-MU lisp/mu star	125.00
MICROPRO	-Word-star	*£295.00
	-Mail-merge	*£95.00
	-Spellstar	125.00
	-W-star/M-merge/Sp-Star	425.00
BYROM	-BStam (communications)	100.00
	-BStms (tele-comms)	100.00
DIGITAL	-CBasic	75.00
	-Concurrent CPM/86	*375.00
	-CBasic86	*175.00
	-Pascal MT	225.00
LIFEBOAT	-T/Maker	155.00
M'FOCUS	-CIS Cobol	420.00
	-Forms II	100.00
SORCIM	-Super Calc	195.00
PEACHTREE	Magic Wand	190.00
	-Magic Calc	175.00
VARIOUS	-including tele-comms etc	call.00

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

G.W. COMPUTERS LTD — Tel: 01-636 8210
POPULAR BRANDS OF EQUIPMENT WE SELL
MICROS: Sirius/Victor/I.B.M./DEC
Epson/North-star/Sanyo/Superbrain
Compustar/Altos/Apple-Lisa/Televideo
PRINTERS: Nec/Qume/Diablo/Oki/Epson
Olympia/Ricoh/Texas/Dre/Anadex
OTHERS: Corvus/Compustar
Hard disks networks and multiplexors
Spoolers/Modems/Buffers
most of the best known brands of software

SYSTEM DEAL (our speciality) SAVES YOU 1500.00+

Buy any computer, any printer and 150.00 value diskettes add £85.00 for cables and testing.
add 10% for return to base warranty for 1 year (optional)
add £110.00 for delivery & installation (optional)
Training optional extra £120.00
and get completely *****FREE*****

cpm handbook	50 basic exercises	2000 sheets paper
DBMS III.7	magic wand w/proc	magic calc
mbasic 80	diagnostics	msort/dsort
recover	autoload	instant basic
library boxs	disk/games	DT/AS/NS sorts

Total Value £1525.00
Based on 8 bit hardware, 16 bit software varies

Here's a typical example of a complete system deal

1-Sirius 128k ram/1.2 megabyte disks	2195.00
2-Oki microline 80 printer	295.00
3-Cables & testing	85.00
4-Diskettes	150.00
5-price differential on magic/wand for word-star	100.00
software described above ***** FREE *****	2825.00

We specialise in 'STANDARD MICRO-PRINTER SYSTEMS' as well as 'NETWORK SYSTEMS BASED ON A SHARED HARD DISK'.
The range of computer products (mostly ex stock) includes the most popular brands of micro-computers, printers, modems, buffers, spoolers and software.

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 144 Meg hard disk	7950.00
N'STAR	-16 Bit u/grade	395.00
	-18 Meg hard disk	2995.00
RODIME	-6 Meg hard disk	1495.00
	-12 Meg hard disk	1950.00
GENIE	-5MG fixed/5MG removeable disk	3295.00
QUADRAM	-64K print spooler/copier	295.00
BIZCOMP	-RS232/Auto-modem 1200 baud	450.00
AST	-port expanders (4 tmnls to 1 prtr)	395.00
GIX	-port expander (switcher)	95.00

NOTE. Corvus drives with multiplexor may network sirius.. Superbrain.. Concept.. PET.. Victor.. IBM..

SOFTWARE COMMENT!!!
INTEGRATED SOFTWARE IS PROPERLY REPRESENTED, when the degree of integration reflects the ability to refer to as many different files, as well as employ as many different functions, under as many different modes as possible in one program only. This principle not being observed, will confer upon your purchases the attribute of their being expensive as an aggregate even though individually they are cheap. "DBMS III.7" and "THE KEY" are comparably worthy of such a label.

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 'knowpacks'
We do not operate a reader's reply card service.
Terms: C.W.O. or C.O.D. Prices exclude V.A.T. but include all non-credit discounts available.
No dealers. The above lists are not exhaustive.
Please call at our showroom only by prior appointment. Unless expressly agreed, all warranties are commercial 90 days return to base for parts and labour. Annual warranties and maintenance facilities available nationwide through closely related third parties.

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

AN IMPORTANT ANNOUNCEMENT FOR POTENTIAL SYSTEM BUYERS

Any serious buyer knows that although the HARDWARE and SOFTWARE are both inter-dependant, the choice of software is CRITICAL to the consequence of having useless piece of hardware nor not.
With this in mind our standard system deal gives you the software free with a system purchase. However, if you want more!

NOW we have a piece of software that is a challenge to the highest state of the art on micro-computers today. It's the first of its kind world-wide. It is called THE KEY, and it will unlock the power of your micro to the limits of your imagination. It is very expensive however, because it is the first to embody many features of other programs, in one single program that has over-lapping functions. It costs 995.00 Stg., and is available with a system purchase.

it features, the entire list of functions already covered by our program called DBMS III.7a to be seen elsewhere in our advertisement. PLUS. + + + + + + + +
Paint any form including upwards from 100 (depending upon size of ram in hardware) data fields on the screen. Screen width up to 250 columns. Page lengths 100 lines.

The form might be a letter where data fields on the screen. Screen width up to 250 columns. Page lengths 100 liens.

The form might be a letter where data fields are name-addresses. Search files and accept any fields on teh database into any fields on the letter. The form might be a spreadsheet, where searches call records (in columnated style) from the database and perform calculations, the difference here is that unlike other 'calc' programs giving you 254 lines per spreadsheet, THE KEY gives you 32000 lines if your database has that many records.

The standard attributes of any field, allow you to SEARCH OTHER FILES for fields to accept into any field on the current form, plus allowance to POST OTHER FILES any fields from the current form into any fields on that file. RELATE TO AS MANY OTHER FILES, as the number of data fields you have on the master form. Make data fields CALCULATE AGAINST FORMULAE, and other data fields. VALIDATE DATA INPUTS criticially character by character; numerically, alphabetically and date-wise.

NO MANUAL NEEDED, all help menues accessible by hitting 'esc' at any point in the three major modes of activity (create, data entry, data query).

You can set up dozens of individual files that eventually are inter-connected through one master form; like an invoice, order, personnel-file, stock control, mail-shot. The master form may at every juncture of a data field, go outside the current form to supplementary forms for data retrieval, or post-filing.
Come along the computing road with us. We're out in front so you'll get the best there is at the price. On IBM and SIRIUS.

The first robot-concurrent-forms-database-text-processor-spreadsheet-no-manual-all-in-one-program.

G. W. COMPUTERS LTD — Tel: 01-631 4818

Contains the highest state of the art software available today

FORMS/TEXT/CALC/DBMS IV ALL IN ONE PROGRAM — "KEY" — at £995

When you budget for a complete system of software you eventually end up with a host of packages like, Sales, Purchases, Nominal, Data, Text, Calc, Mailshot, Invoice, Order, Workflow, Personnel, and so on.
The list is endless and the outlay several thousands of pounds.

Features. Design a form as wide as a window of 250 characters, long as needed. Cursor movements are 'left, right, up, down, delete left delete right, tab right-left-up-down' Paint your form as you like directly on the screen.

Text..... Write a letter as you see it on the screen, edit it then simply enter ^P to print.

Calc..... Set into the form, your data fields, "£££££" and specific file-related activities, formulae and validation checks.
Enter values and see the spreadsheet calculate itself.

Database. Search files for data to be inserted to fields specified.
All the features of DBMS III, explained elsewhere in our ad.

Here's an example of an invoice you might design for your stationery .....
You could design your own spreadsheet, order form, statement, or any other kind of form that is required to fit your existing stationery.

INVOICE <0>£££££££££	
To £<1>£££££££££ £<2>£££££££££ £<3>£££££££££ £<4>£££££££ £<5>£££££££	From: G.W. Ltd 55 Bedford Court Mans. Bedford Avenue London W.C.1. Tel: 01-636 8210

Date <6>£.£	Tax point <7>£.£	Agent <8>£

Quantity	Description	Cost	Tax	Total
<9>£	<10>£££££££	<11>£	<12>£	<13>£
<14>£	<15>£££££££	<16>£	<17>£	<18>£
	and so on...			
	Total...<19>£		Tax...<20>£	

<??> items <1> to <5> internal command to request name input, and then search an address file for details.
<??> items <6> to <7> request date input and validate.
<??> item <8> request agent number and validate range.
<??> <9> request quantity, validate range.
<??> <10> request description, search file, accept, and calculate fields <11>, <12>, <13>, if finished invoice then calculate fields <19> and <20>

Now comes the more valuable facility, you can provide the 'FORM' with file-related instructions, not only to request a 'console' input for a file search against names, and stock, but after the invoice is finished the fields you have selected may be passed to related files.

EG: Send fields <0>, <1>, <6>, <7>, <11>, <12>, <13>, <19>, <20> to a sales ledger.
Then send fields <9>, <10>, <11>, to product analysis file.
Then send fields <0>, <1>, <7>, <19>, <20> to V.A.T. file
Then send fields <10>, <11>, <12>, <13> to Nominal ledger.

Available at present only on SIRUS/IBM PC.

● Circle No. 110

Who on earth would pay three times as much for an accounting program that's only half as good?

There's no room for a comedy of errors when it comes to choosing the right accounting program.

The wrong decision will produce a very sad clown indeed.

You can, if you really wish, pay £1,000 or more for a sprawling, highly complicated, 4–7 disk monster with a manual you can't lift without a course of weight training, or understand without a brain transplant. Alternatively, for just £375, you can discover the unique simplicity of SAGE.

SAGE produces the only accounting program which is truly integrated and uses only one program and one data diskette.

● Sales and Purchase Ledgers, ● Nominal Ledger, ● Cash Book, ● Journal Entries, ● Trial Balance, ● VAT Return, ● Monthly and Annual Accounts, ● Age Analyses, ● Statements and Audit Trail – every accounting function you need in one compact and comprehensive package. The SAGE program is also widely used for Incomplete Records Accounting (without requiring modification). It can therefore be used by practising accountants for both functions. Its efficiency is built on simplicity–and its simplicity accounts for the price.

The SAGE accounting program is easy-to-learn and easy-to-use, with a short, clear and simple manual.

It's fully automatic – which means no shuffling through the program to find the section you need.

It's complete and self-contained – no expensive modules to buy every time you need an extra function.

It's suitable for use on CP/M or MS–DOS machines and has so far been implemented on Osborne, Superbrain, Epson QX–10, Sirius, Victor 9000, IBM PC, BBC/Torch Z80 and ITT with others in the pipeline.

What's more, the SAGE accounting program has been successfully tested in hundreds of installations and is the only system of its type – is as effective in a one-man business as in a multi million pound corporation.

Check it out and we'll turn the smile the right way up.

Return the coupon and we will send you more information and the name of your nearest dealer.

☐ Please send me your 8 page explanatory brochure.

☐ Please arrange for me to have a demonstration.

*I do not yet own a computer/have a _____ computer. *Delete as appropriate

Name _____

Position _____

Company _____

Address _____

_____

_____

Tel: _____

British Software for British Business

SAGE SYSTEMS LTD., Hawick Crescent Industrial Estate, Newcastle upon Tyne, NE6 1AS. Tel: 0632 761669 Telex: 53623 SAGESL G

PC3

Our innovation accounts for our price!

● Circle No. 111

sinclair special 5

Inside... New Interface 2 and ROM cartridges! New Software!

TAKING NEW SOFTWARE IN NEW DIRECTIONS

You'll see that this issue of Sinclair Special devotes considerable space to software. Why, when we've so much to say about hardware and peripherals? Simply because at Sinclair we believe in supporting first-class hardware with first-class software.

This month sees the start of a new commitment to education in our catalogue, both for adults and children.

In the field of micro theory, we've programs like Beyond BASIC and Make-a-Chip, which take you from the creation of simple ZX® assembler subsets to simulated circuit design projects.

There's Musicmaster, to teach you music terminology, note values and composition.

And if you're keen to beat your Spectrum at chess (which can be hard), you'll certainly want to try Chess Tutor 1, the first program in a complete chess masterclass.

Coming soon...

In the pipeline are many new releases, some of which break completely new ground. LOGO and micro-PROLOG for instance. They're fifth generation languages which will take you and your Spectrum closer than ever before to the creation and application of artificial intelligence.

A formal agreement between Sinclair and Macmillan Education has been announced, the first results of which will be published this autumn. These consist of five programs in a complete early reading course plus the first four of a series of programs based on Macmillan's top selling Science Horizons Scheme. All programs are designed for use in schools or the home.

And with Blackboard software, we're publishing six more home education programs for primary school children. Covering alphabet, spelling and punctuation, each of these programs is a true gem, unlike any other education software, and fascinating to run. Even for adults!

I believe that these new titles represent a major advance in educational software for the home.

New ROM software too!

You may well have heard news of ZX Interface 2® and ROM cartridge programs. You'll find full details of the Interface and its software on the facing page (and there's an order form on the back page too!). These offer an instant games playing facility at unbeatable prices, and expand the possibilities of using your Spectrum in yet another direction.

Alison Maguire

Alison Maguire
Applications Software Manager

SOFTWARE UPDATE

The latest cassette software for ZX® Computers

Chess Tutor 1

For 48K RAM Spectrum. **£9.95.**

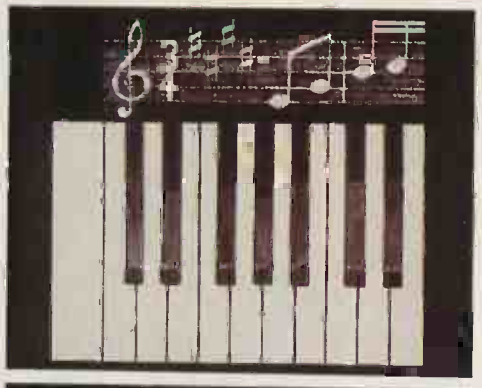
Chess Tutor is a new way of learning all about chess – using your ZX Spectrum.®

It starts from the beginning by teaching you about the chess pieces and the way they move – including castling, en passant, promotion, check, checkmate, stalemate and perpetual check.

Then it teaches you the basic tactics – pins, forks, double attacks and skewers.

There are over 120 exercises and over 200 questions for you to answer – with demonstrations and hints from your ZX Spectrum when you want them.

You can choose which parts of the course you want – and even experienced players may be surprised at what they can learn from Chess Tutor.



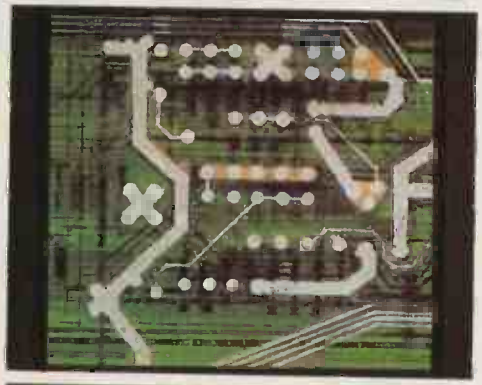
Musicmaster

For 48K RAM Spectrum. **£9.95.**

Musicmaster turns your ZX Spectrum into a musical instrument which will not only play tunes, but will also demonstrate key signatures, durations of notes, and scales.

You can write your own tunes – in any key – play them over and over again, save them on tape, modify them.

You can either write your music on a stave, or place a simple overlay on your Spectrum for a 17-note keyboard.



Make-a-Chip

For 48K RAM Spectrum. **£9.95.**

Make-a-Chip teaches you the basic elements of circuit design, shows you how they fit together, and then lets you design and test your own circuits.

When you have designed a circuit, you can give it inputs and outputs and your ZX Spectrum will check it for you. Then it will run it, or tell you what's wrong so that you can modify it.

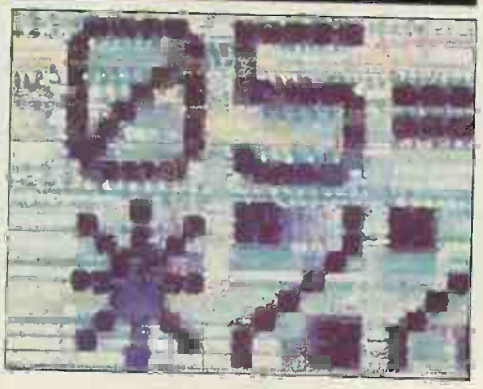
Make-a-Chip is a fascinating way of finding out how computer logic works.

Print Utilities

For 16K and 48K RAM Spectrum. **£9.95.**

Increase the printing and display facilities of your ZX Spectrum with the Print Utilities program.

Print Utilities enables you to enhance your programs by generating characters of eight different sizes which you can place anywhere on your screen.



Beyond BASIC

For 48K RAM Spectrum. **£9.95.**

Takes the agony out of assembler. Takes the mystery out of machine code.

Beyond BASIC gives you a deeper insight into the workings of your ZX Spectrum. It explains what happens inside your micro when you run a program, and it teaches you simple Z80 machine code programming.

A major feature of Beyond BASIC is that it enables you to write your own Z80 assembler programs – then you can actually see on your screen how they affect the ZX Spectrum memory and registers.

ZX INTERFACE 2®

The New ROM Cartridge/Joystick Interface

Loads programs instantly!
Takes two joysticks!
Just plug-in and play!

The ZX Interface 2 is the latest new peripheral for the ZX Spectrum® system. It enables you to use new ZX® ROM cartridge software: plug-in programs that load instantly. It allows you to use two standard joysticks, without the need for separate, special interfaces.

To use new ZX ROM cartridge programs, just connect Interface 2 to the rear of your Spectrum or Interface 1 and plug in the cartridge of your choice. The program is then loaded, ready to run!

You can use any joystick that has a 9-way D plug. Use one or two of them for extra fun with ZX ROM cartridge or Sinclair cassette programs – or with dozens of other Spectrum-compatible programs!

SEE BACK PAGE FOR ZX INTERFACE 2 AND ROM CARTRIDGE ORDER FORM!

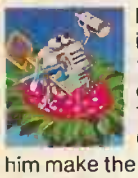
...AND BRAND NEW ROM CARTRIDGE SOFTWARE!

There's already plenty of choice of ZX ROM cartridge programs for your Spectrum. Some are old favourites, in an exciting new form. Others are new.

And now, thanks to ROM cartridge technology, you can run them *all* on a 16K RAM Spectrum, even if they were originally written only for 48K machines!

Every ROM cartridge program loads fast and faultlessly. No wires, no waiting, no worries about loading errors! All of them are affordably priced too, at £14.95.

New! PSSST



Robbie the Robot sits in his garden. Help him fetch compost to cultivate his prize Thyrgodian Megga Chrysanthodil. Help him make the right choice of pesticide, to ward off devilish insects. Stop the insects breeding to overwhelming numbers before Robbie's plant has bloomed. PSSST is horticulture with a horrendous twist!

One and two player option, with a host of features including sound effects.

Chess

This sophisticated program does everything you'd expect at board game level, and much more besides.

The high-resolution chessboard and pieces are arranged in a row and column system, so it's easy to key in your moves.

At any stage of the game you can request the computer to suggest a move, reverse roles or change the level of skill.

Full-colour high-resolution graphics.

Backgammon

Everything you need to play the famous and deceptively simple board game. Board, stones, rolling dice and doubling dice are shown in full colour and high resolution. Choose from four levels of skill to suit experts and beginners alike – full rules are included.

Planetoids

Dodge and swerve using your thrust button, turn on a planetoid... fire! But beware – the alien ship moves fast to destroy you with cluster bombs. And when it comes to the crunch, use your hyperspace button!

Full-colour high-resolution graphics with sound.

Space Raiders

Your skill is all that's stopping successive waves of aliens from destroying Earth. Use your gun base to attack. Shelter behind buildings... move out and blast the passing alien soaceship!

Full-colour high-resolution graphics with sound.

Hungry Horace

Horace is forever being chased around the park by guards.

He steals their lunch, eats pathway flowers and creates chaos in the park by ringing the alarm!

You'll have to be quick to keep Horace out of trouble!

Full-colour high-resolution graphics with sound.

New! Tranz Am

Set in a future time ruled by cars and trophies, in a land where petrol replaces gold, and status is possession of the 8 Great Cups of Ultimate.

Driving your Super Blown Red Racer, use your skill to outwit and crash the Deadly Black Turbos. Use your instruments to locate and collect the trophies – before you overheat or run out of fuel.

A program with outstanding multi-directional movement, graphic features, and a playing area equivalent to more than 600 times actual screen area.

Horace and the Spiders

Guide Horace on the hazardous journey to the cobwebbed house full of poisonous spiders.

Safely in the house, you must move along cobwebs, choose a spot... and jump on it! The spiders will be in a frenzy – scuttling to repair their precious web.

And when a spider is spinning a new section, you're safe to attack and destroy it!

Kill all the spiders, and a new web appears... with even more spiders to catch.

Full-colour high-resolution graphics.

New! Cookie

You're Charlie the Chef, who keeps his ingredients locked in the larder. But if the ingredients escape, they bring the inedible Nasties with them!

You must daze the escaping ingredients with flour bombs, and knock them into the mixing bowl. Stop them getting into the dustbin, at all costs! And beware of Nasties that get into the mixing bowl!

Cookie is fast-moving panic in the pantry, with a cast of real characters. A program to make you smile – and sweat!

New! Jet Pac

As Chief Test Pilot of the Acme Interstellar Transport Company, your task is to deliver and assemble spaceship kits. On your way round the galaxy, you're free to collect precious stones and gold.

The catch? Rocket fuel is precious and scarce. And the aliens don't take kindly to the theft of their valuables. You'll need your wits and your lasers!

With a host of features, including multi-directional movement, explosions, sound effects and one and two player option.

ZX MICRODRIVE

NOW ON RELEASE

The ZX Microdrive® System – as you'd expect from Sinclair – is unique to the world of computing. It's a compact, expandable add-on system which provides high-speed access to massive data storage. With just one Microdrive alone (and Interface 1), you'll have at least 85K bytes of storage, the ability to LOAD and SAVE in mere seconds, the beginnings of a local area network of up to 64 Spectrums, *and* a built-in RS232 interface! The cost? Less than £50 for each Microdrive.

How to get ZX Microdrive

Spectrum owners who bought direct from us, by mail order, have been sent full details. Order forms are being mailed in strict rotation, so if you haven't yet received your order form please bear with us. We're making good progress in meeting the huge demand.

If you didn't buy your Spectrum by mail order, don't worry. Send us the form from the bottom of this page. We'll add your name to the mailing list, and send you details by return.

Each Microdrive costs £49.95. Interface 1 costs £49.95, but just £29.95 if purchased with a ZX Microdrive. Extra ZX Microdrive cartridges: £4.95.

How to order

Simply fill in the relevant sections on the order form below. Note that there is no postage or packing to pay on some purchases. Orders may be sent FREEPOST (no stamp needed). Credit card holders may order by phone, calling 01-200 0200, 24 hours a day. 14-day money-back option, of course. Please allow 28 days for delivery.

®ZX, ZX Spectrum, ZX Interface and ZX Microdrive are all registered trade marks of Sinclair Research Ltd.

sinclair®

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

To: Sinclair Research Ltd, FREEPOST, Camberley, Surrey, GU15 3BR.

ORDER FORM

Section A: Hardware

Qty	Item	Code	Item Price £	Total £
	ZX Interface 2	8501	19.95	
	ZX Spectrum – 48K	3000	129.95	
	ZX Spectrum – 16K	3002	99.95	
	Postage and packing: orders under £90	0028	2.95	
	orders over £90	0029	4.95	
			TOTAL £	

Section B: Software

	ROM CARTRIDGE PROGRAMS		
G12/R	Planetoids	5302	14.95
G9/R	Space Raiders	5300	14.95
G13/R	Hungry Horace	5303	14.95
G24/R	Horace and the Spiders	5305	14.95
G28/R	PSSST	5307	14.95
G30/R	Cookie	5309	14.95
G29/R	Tranz Am	5308	14.95
G27/R	Jet Pac	5306	14.95
G22/R	Backgammon	5304	14.95
G10/R	Chess	5301	14.95

	CASSETTE PROGRAMS for ZX Spectrum		
E9/S	Chess Tutor 1	4308	9.95
E7/S	Musicmaster	4306	9.95
E8/S	Beyond BASIC	4307	9.95
E6/S	Make-a-Chip	4305	9.95
L5/S	Print Utilities	4404	9.95
		TOTAL £	

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

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

*Delete/complete as applicable.

Signature

Mr/Mrs/Miss

Address

PRC912

(Please print)

ZX Microdrive information request

Please add my name to the Microdrive Mailing List, *and* send me a colour brochure with full specifications of ZX Microdrive/Interface 1 ☐ *(tick here)*. You can use the above form to send us your name and address.

● Circle No. 112

FT conference

Jack Schofield was among those attending this exclusive personal computer event.

IN MID-OCTOBER the Intercontinental Hotel, London, was packed with the cream of the British computer industry for a two-day conference organised by the *Financial Times*. The theme was The Professional Personal Computer: Markets and Strategies. The message that came across was that the micro market is booming, and there is money to be made from both hardware and software — especially if you are IBM.

Speakers on the first day included Floyd Kvamme of Apple Computer Inc., Cyril Yansouni of Hewlett-Packard and Alex McIntosh of IBM U.K. Noticeable by his absence was the personable Adam Osborne, who was due to speak on "Where the Professional Computer is going". It would have been interesting to hear where the Osborne 1 is going.

Jean Yates, President of Yates Ventures and well known Unix watcher, gave an interesting talk on "The Likely Winners and Losers". The winners will apparently be IBM, Apple and any one of the three others, take your pick. In a humorous aside, Ms Yates declined to name losers on the grounds that some of them were her clients.

Imitation IBMs

However she did point out the difficulties faced by the massed ranks of IBM imitators. Most are buying sub-assemblies from the same or similar sources, and could therefore be squeezed on price. They are following IBM standards, so they could be in trouble if IBM changes the standards. No one could achieve 100 percent compatibility with IBM, leading to potential problems attracting software writers. The dealers and distributors are overcrowded with products, and some must lose the fight for shelf space. Finally, there is a lack of mini and mainframe products in the line-up to provide an upgrade path.

Dr Alex McIntosh, speaking for IBM, gave nothing away. However, he did drop a few hints about IBM's possible entrance into the small micro market. Showing a *Newsweek* graph of the booming market he said: "Seriously, if a sector of your industry was showing such runaway growth as this, would you sit back and ignore it? Of course not, and neither could we." Later he added: "IBM has been in every area of computing since the earliest vacuum tube monsters . . . In this light, it's unthinkable that a major industry trend like personal computing would not eventually involve IBM." So why not home computing?

For me, however, the highlight of the day was the presentation by Daniel Fylstra, Chairman of the Board and Chief Executive Officers of Visicorp. His unstated theme was the background to the integrated software product VisiOn, which is a Lisa-like suite promised for the IBM PC. He showed how the requirements for the suite arose from the microcomputer's transition from an individual item into an all-purpose office work station.

Day 2 started with a new chairman, Ian McNaught-Davies, and a talk from Ted Stein of the $6.5 billion insurance company Connecticut Mutual. It was willing to face a fact about microcomputerisation that most large companies are not: that "by the time an organisation makes a proper business decision, cost justified and all that, the technology is obsolete".

One of their number saw an Apple on TV and they decided to replace their 1972-vintage network with micros. That was in July 1981, and they called it "the Apple solution". When the equipment was shipped in June 1982 they had, by that time, fixed on the IBM PC. They bought 1,000 of them. They also made themselves into a computer store and sold a further 450 PCs, plus peripherals and software, to their independent sales outlets.

The afternoon session was opened by Brian Androlia of ACT, who gave the background to the launch of the Apricot micro. Key decisions were that the machine should be designed to match an existing software base — so the Apricot was made compatible with the Sirius — and that it should appeal to the replacement market. He reckoned that most Apples and Pets had already been written off in the company books, so a smart new machine should appeal to these users, as well as to new users.

With the minimum worthwhile aim of producing 3,000 machines a month, Androlia said it cost £11 million to launch the Apricot. "You have to buy the best," he said. And, he pointed out, the entry cost was getting higher every month.

The one thing which gave everyone pause was Androlia's comment that "rarely does a successful computer manufacturer produce a good follow-on product. I can't think of one." ACT, however, is already working on a follow-up to the Apricot.

The next talk was from Susumu Aizawa of Epson, Japan. He described recent developments there, leaving us with the impression that the Japanese have LCDs, printers, floppy-disc drives and portable micros pretty much sewn up. What next? The "fifth-generation" micro. It will have "enormous artificial intelligence and a huge database, and its ultra high-speed CPU will operate under critically important new software." He added: "At that time, perhaps, the Japanese will be able to shed their reputation for imitation."

The final speaker was Dr Horsnell of Philips, and he poured a welcome dose of cold water on some of the more gung-ho thinking that, over two days, had begun to take hold. He pointed out that the EEC budgeted £8 billion to pay subsidies to farmers via the Common Agricultural Policy. Worse still, the budget had just been overspent by some £240 million. Meanwhile, the government had only managed to come up with £100 million for our own Estrial fifth-generation research.

Small is best

In the final forum discussion, Ian McNaught-Davies demurred. He considered that all the good software has come from small, under-financed entrepreneurial organisations working in backrooms. CP/M, MS-DOS, and VisiCalc are famous examples. "Mac" went so far as to say that if large software teams wanted to increase their productivity by 40 percent this could be done by shooting 20 percent of their members. My own impression is that, by and large, he is right.

In the micro business — both hardware and software — agile, small companies outperform large ones most of the time. In fact the whole micro market has been created by hobbyists and home enthusiasts, and it is only recently that the large corporations have sought to cash in. However, notwithstanding the success of Apple, it is true that the small companies often fail to capitalise on their developments — due to a shortage of capital.

Everyone agreed that the British banks were hopeless when it came to backing ideas with money, and that a ready supply of venture capital was what kept the American micro boom going. That in turn accounted for their 80 percent share of the world market. Dr Horsnell may well be right too, but pouring government money into schemes has generally been ineffective.

Still, if this *Financial Times* conference encourages British capitalists to take a few more risks backing innovative micro companies it will have helped.

Whether the delegates got full value for their £500 conference fee is another matter. Separate talks did not relate to one another, and there was not enough hard information. Still, plenty more was doubtless exchanged in the bar afterwards.

Ratones robot

John Billingsley supervised the 1983 Euromouse finals in Madrid. Here he reports the results.

HAVE YOU EVER tried to explain to a Spaniard who speaks no English that you want to make a metal template to guide the drilling of 1,088 precise holes in a three-metre square of chipboard? That's easy, compared with getting him to buy emulsion paint rather than wood paint for the running surface. Next time I go to Spain I'll make sure I've learnt the Spanish for more than Micromouse — *los ratones robot*.

Superlite I and II were the first finalist mice on the scene in the Telecommunication department of Madrid Technical University. Next to arrive were the Finland team from Tampere with 3½ mice. The aptly named Lego eventually failed to qualify, largely because it fell apart into a heap of bricks every time it ran. Massive Microsaurus came to defend its title, while Manu and Telu were based on a nimble tricycle, but shared only one set of mechanical parts. We agreed that both could compete, but could only win a single prize.

The boys from Mador School, Bangor-on-Dee turned up, thanks to the Welsh Development Agency. Fullyautomatix II had improved greatly since Earls Court, but to live up to its name needed some debugging. Yes, they had seen the Ilford boys on the plane. No, they had no idea where they were staying. Madrid has a lot of hotels.

The laboratory adjoining the maze became a hive of industry as tests took place on a skeleton 80-wall maze. The walls, each containing two nails, had been laboriously carried in my suitcase. I still wonder what Airport security made of the X-ray!

Mid-afternoon on Tuesday the British hopes arrived: Knownaim, Thumper, T4, T3 and T1 — plus the remaining maze walls. Some astute detective-work had tracked down Clement Chambers and the troupe he was sponsoring from Ilford County High School. Orac brought the total of mice to 13. Five would have to be eliminated before Thursday's final.

The qualifying maze complete, trials began in earnest. One after another mice reached the centre in times which shrank from an initial five minutes to an alarming 15 seconds. A redesign of the finals maze was necessary so that the timing would not require an accuracy of hundredths of a second. Microsaurus, Knownaim, Telu and T4 all looked evenly matched, and the contest was set to be a close one.

An audience of 400 crammed into the lecture theatre next day. The judges were Jan Wilmink, the Euromicro Chairman,

Manu/Telu carried off Euromicro's $1,000 and the Brass Cheese.

Mouse history

In 1979 when planning started, the organisers of Euromicro '80 felt that the conference would benefit from some light relief. The IEEE magazine *Spectrum* was starting to print reports of a Micromouse contest in the United States. How could we organise a similar contest here?

The next issue of *Spectrum* described all the problems they had encountered with a corner-target maze, when high-speed wall followers started to out-perform the more intelligent mice. It was decided that the walls and passage-width dimensions should comply with the American contest but that other features, such as the sandpaper floor, should be abanonded. In particular it was decided to place the target at the centre of a square maze, designed on a 16 by 16 grid.

After the initial publicity enquiries flooded in, but as the day for the trial contest at Portsmouth Polytechnic approached mice started to fall by the wayside. In July 1980, the first British trials were held with just five mice. Plessey's Fred and Marconi's Meryl were far from complete — Fred could only spin in circles and Meryl relied on a lot of cheating "fly-by-wire".

The boys from Worthing Sixth Form College had their wires crossed and Algernon could not travel in a straight line. The two other mice had been constructed as final-year projects in Portsmouth Polytechnic and the only one to show real promise was Free-Wheelin Franklin which could at least navigate a straight passage and a couple of corners before becoming bewildered. The more erratically the mice performed, the more the audience enjoyed the proceedings. BBC South screened a delightfully amusing report of the contest.

The European Finals at Euromicro 80 were quite a different matter. Mice arrived from all over Europe: Midnight Sun from Finland, Lami from Switzerland, Superlite from Germany and Yamahico II from Japan. Fred now boasted a grey fur cover, a mousely leer and a singing voice like Les Dawson. Meryl was at last on autopilot and Ancomical, a new mouse from ICL, appeared in a beautiful brown furry shape which must have been envied by small children across the country when the mice appeared on *Blue Peter*.

There was an enormous of variety of technology, including a mouse built from a plastic toy car. Despite being sawn down, its three-point turns could barely get it around the corners. One mouse was built very simply from aluminium: with primitive mechanical sensors which clattered along the tops of the walls and with a

T4 and Dibley: refused to turn left.

Mr Tashiro of the Japanese Micromouse Association and also of Namco, maker of Pacman, Mario Urea of the Madrid branch of IEEE, and Professor Mariagiovanna Sami of Milan Polytechnic.

Neither school team had really qualified, but both were allowed to run for five minutes to compete for the novice trophy. Despite three changes of processor and a valiant attempt at debugging, the Welsh team could only persuade Fullyautomatix to run a short way before it crashed — again and again. Orac, however, managed at least half a corner before it abandoned maze-solving for Flamenco dancing. Clearly Orac achieved the better performance, and was awarded the novice trophy. Professor Sami said that she was especially pleased because "the little boys looked so sweet in their white CRL shirts."

T3 was the next to run, and more by luck than judgement found the centre in a time of 1 minute 13 seconds on its first run. It went on to find two other routes, but neither was faster. Superlite I had problems from the start, while Thumper babbled its way around the maze, finding a succession of routes to the centre. On its fourth run, Thumper beat T3's time by just one second, in 1 minute 12 seconds.

Now for the Finnish mouse Telu. On its first run it found the centre in 41 seconds. Six runs later, each under a minute, it achieved 31.6 seconds, which three further runs could not better. Superlite II now arrived, but met the same fate as its brother. It is especially sad that Superlite was unable to show off its cunning recognition strategy. Once it has learned the maze, it can be put down anywhere at random in any orientation, and it will find its bearings and run to the centre.

Superlite's early retirement caught Alan Dibley by surprise. T4's power supply had been interrupted, and the program had to be reloaded. Now T4 steadfastly refused to turn left, and so retired. Now it was all up to David Woodfield's Knownaim. In secret practice, Knownaim had beaten 14 seconds on the qualifying maze. Now it shot forwards along the first straight, turned the first corner — and stuck. It did it again, and then again — and all British hopes seemed lost.

Manu now arrived on the maze, bearing more than a slight resemblance to Telu. Its performance, too, was identical; for each run its time was within one second of its *alter ego*. This provoked a question which set the judges conferring: if Telu could run again as Manu, with only a change of processor board, could not Knownaim run with a change of ROM? It seemed only fair to give it five minutes, especially as Microsaurus was undergoing last-minute surgery. Knownaim reached the centre in exactly one minute — but was timed out before it could do better. Now Microsaurus was brought forth, rescued from blindness in the nick of time. But despite its promise in practice, one minute dead was the best of its four times.

So Manu/Telu carried off the $1,000 first prize, donated by Euromicro. Microsaurus won a 48K Spectrum donated by Investronica, while Knownaim ousted Thumper from third place to win £150 donated by Citema. David Woodfield was especially happy to win his mounted piece of brass cheese, one of the three winner's trophies.

The finals maze was redesigned to spread out the contestants.

jerky stepper-motor movement, the mouse was far from pretentious. This, however, was Nick Smith's Stirling Mouse, the first European champion and the first mouse to reach the centre of the maze and know that it had got there.

Following an Easter workshop meeting organised by ICL Amateur Computer Club, mice improved in leaps and bounds. At Wembley in 1981 Thumper and Thezeus appeared. Thezeus established the practice of building a mouse around a small personal computer — with the keyboard sawn off to keep it within the size limit — while Thumper combined ingenuity with craftsmanship.

In the light of experience the rules of the contest had been changed slightly to allow each mouse 15 minutes to perform. The mouse was allowed to make as many runs as it could within the time limit. To benefit mice with ingenuity and maze-learning ability, only the best time was taken into account. Thumper achieved a time of 47 seconds, Stirling Mouse 1 minute 37 seconds and Thezeus 2 minutes 27 seconds. At the 1981 European Finals, held in Paris at the Palais de le Decouverte, Thumper defeated 14 opponents to establish itself as the new European champion.

Among the competitors at the Earls Court Computer Fair for the 1982 British finals were Thezeus, Son of Thezeus and T3, all out of Alan Dibley's stable. Phil Yeardley brought Brainy Bricks, a mouse constructed from Lego. It had first appeared at the 1980 final and David Buckley brought Major Tom to join several novice mice. The two new Thezeii beat Thumper into third place — but all three times were less than one minute.

The 1982 European Finals were held at Tampere in Finland, where one of the hazards facing the contestants — and organisers — was an evening sauna, complete with the proverbial jump into a freezing lake. Eight mice battled hard for the title, snatched by a mere two seconds from T4 by the home team's Microsaurus from Tampere University of Technology in a 40-second sprint.

The contest is going from strength to strength with an increasing representation of school entries. Copenhagen is the venue for next year's European finals in August, following British finals to be held at the Computer Fair. Next year's Champion will embark on an expenses-paid trip to Japan to take part in the Japanese 1985 Mouse event. With other events planned next year for Austria and Madrid, it threatens to be a busy year.

For a set of the rules and details of contests to come, please write to John Billingsley, Department of Electrical and Electronic Engineering, Portsmouth Polytechnic, Anglesea Road, Portsmouth PO1 3DJ.

Just because you need it in a flash, don't expose yourself!

You've a deadline to meet, the right CP/M Software package is needed, the right decision has to be made; which format, which product, when can it be delivered, at what price?

You need good advice, and just as important, you need to talk to someone who has a large enough range to be able to offer honest advice. Someone who can then deliver on time, someone whose catalogue is fast becoming the byword of the software industry.

So don't expose yourself, talk to Software Limited. Choice, advice and delivery, all aimed at meeting your deadline.

Software Limited... Because there's more to choose from, we're the only choice to make.

01-833 1173/6

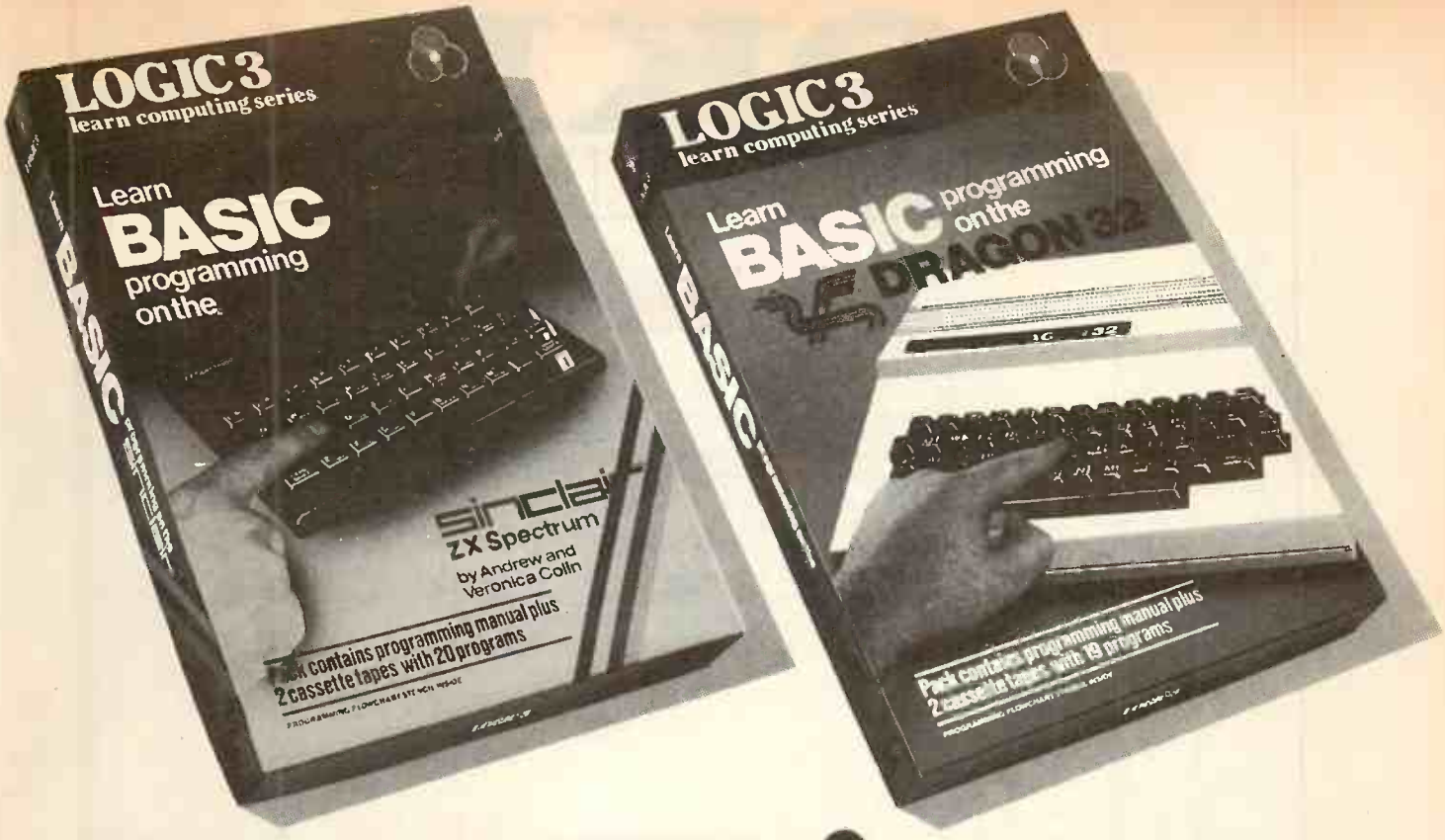
Software Limited
No. 2 Alice Owen Technology Centre
251 Goswell Road, London EC1

CP/M is a trademark of Digital Research

Software Limited

Attractive quantity & dealer discounts available

• Circle No. 113



THERE'S NO PRESENT LIKE THE FUTURE.

THE WORLD'S FINEST PROGRAMMING TUTORIAL FOR ONLY £12.95.

Thousands who own, or would like to own home computers have yet to experience the feeling of discovery that comes when you write your own programs. Yet learning programming can be easy.

'Learn Basic' from Logic 3 is the ultimate development of the method first devised at Strathclyde University – a straightforward, easily understood tutorial written by Professor Andrew Colin and Veronica Colin, authors of Britain's best-selling tutorial package.

Using the method tested by university students and used successfully by over 200,000 home computer users, 'Learn Basic' runs on your own computer and explains everything in clear non-American English without jargon or computertalk. In a matter of hours, you will be writing programs that work.

Essentially, 'Learn Basic' and the rest of the 'Learn Computing' Series that will follow soon are designed for people who want to keep abreast of the computer age. For people who realise that understanding computers is the key to future success, at school, at work and as a parent.

Make your future, and your family's future, richer this Christmas.

Get 'Learn Basic' by Logic 3 – two tapes and a full-size manual for Spectrum or Dragon (others soon) at just £12.95.

At that price, it's a gift.

Buy the Logic 3 'Learn Computing' Series at computer shops and major retail stores all over Britain. In case of difficulty, write to Logic 3 in Windsor.

TO: Logic 3 Ltd, Mountbatten House, Victoria Street, Windsor SL4 1HE.

If you would like to know more about using and programming a computer in your home, send this coupon for your free copy of our 16-page explanatory booklet "100 things you wanted to know about computers."

It will help you cut through the jungle of computer jargon, and give you news about software developments – even games. ☐

Or send for our software catalogue (tick either or both). ☐

Name_____

Address_____

_____

_____

I have already/intend to get a_____ microcomputer
(delete as inapplicable)

LOGIC 3
– THE KEY TO THE WORLD OF TOMORROW.

● Circle No. 107

OKI
MICROLINE

Microline 82A and 83A

High quality and performance as well as an attractive price are key features of these printers. Built on a moulded aluminium plate and driven by 2 motors.

These printers can work almost without limitation, as the printhead's design allows for over 200 million characters to be printed. The short line logic seeking printing speed is rated at 120 cps. The carriage width allows for the printing of 80 characteres (model 82A) and 136 characters (model 83A).

Character sets for several languages and graphics printing are standard features of these printers as well as the processing of various paper types.

The interfaces provided allow for parallel or serial data transfer – buffered or unbuffered – from most popular desktop computers and widely-used PCs.

MICROLINE – more than 150. 000 printers in Europe in use.

OKI OKI ELECTRIC EUROPE GmbH
Emanuel-Leutze-Str. 8 · D-4000 Düsseldorf 11
Telefon 02 11/59 20 31 · Telex 8 587 218

U.K. X-Data Ltd.
F-705/751 Deal Avenue
Trading Estate, Slough
Berkshire SL1 4SH
Tel.: 0044-753-72331
Tlx.: 051-847728

COUPON

Please send me/us more information to:

☐ MICROLINE 82 A
☐ MICROLINE 83 A
☐ The whole MICROLINE program

PC12

Name:

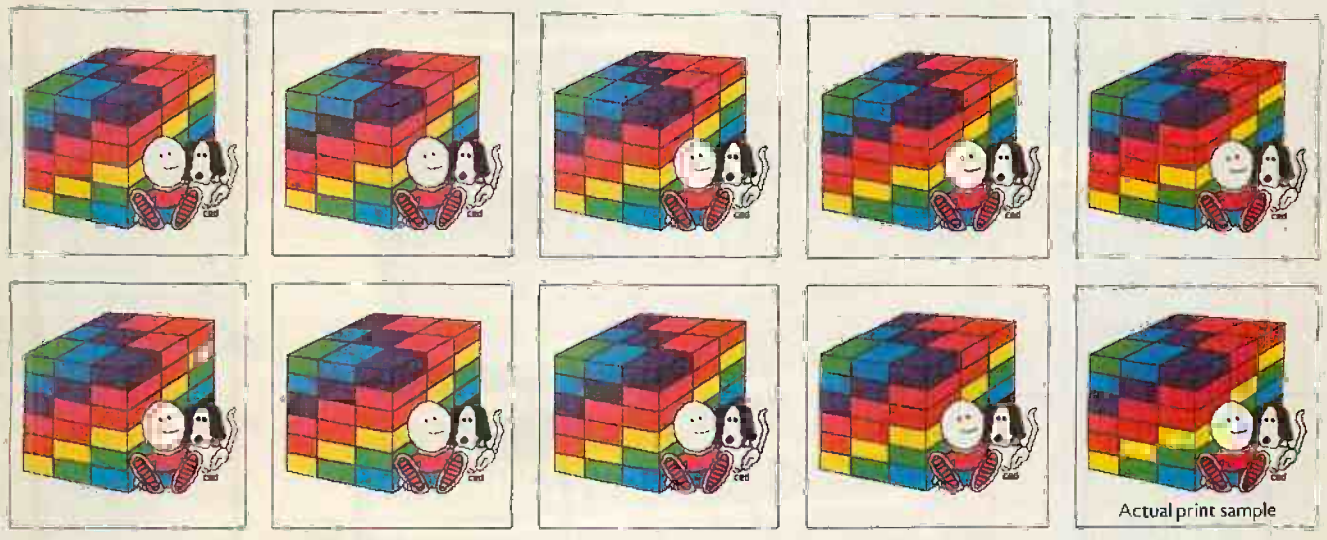
Street:

City:

Phone:

● Circle No. 114

Put some colour into your printing without going into the red



The new PRISM impact matrix printers let you put colour into your printed output, at a cost you can afford. Both the PRISM 80-column and the PRISM-132 column make most single colour printers look pale by comparison.

PRISM printers.
They brighten up your day.

- ☐ Added versatility: the four basic colours (black, cyan, magenta and yellow) can also be mixed precisely to give up to 144 different shades.
- ☐ Correspondence quality at 110 cps.
- ☐ High quality draft printing at 200 cps.
- ☐ 84 x 84 dpi high resolution graphics capability.
- ☐ Staggered 9-wire print head – ideal for precision word processing applications.
- ☐ Bi-directional printing to maximise throughput.
- ☐ Proven reliability.
- ☐ Selectable automatic justification and character sizes.
- ☐ Optional manual and automatic sheet feeding.

- ☐ Compatable interfaces to most micros including Apple, IBM and Sirius.

Dealer Enquiries Welcomed.

CAE GROUP

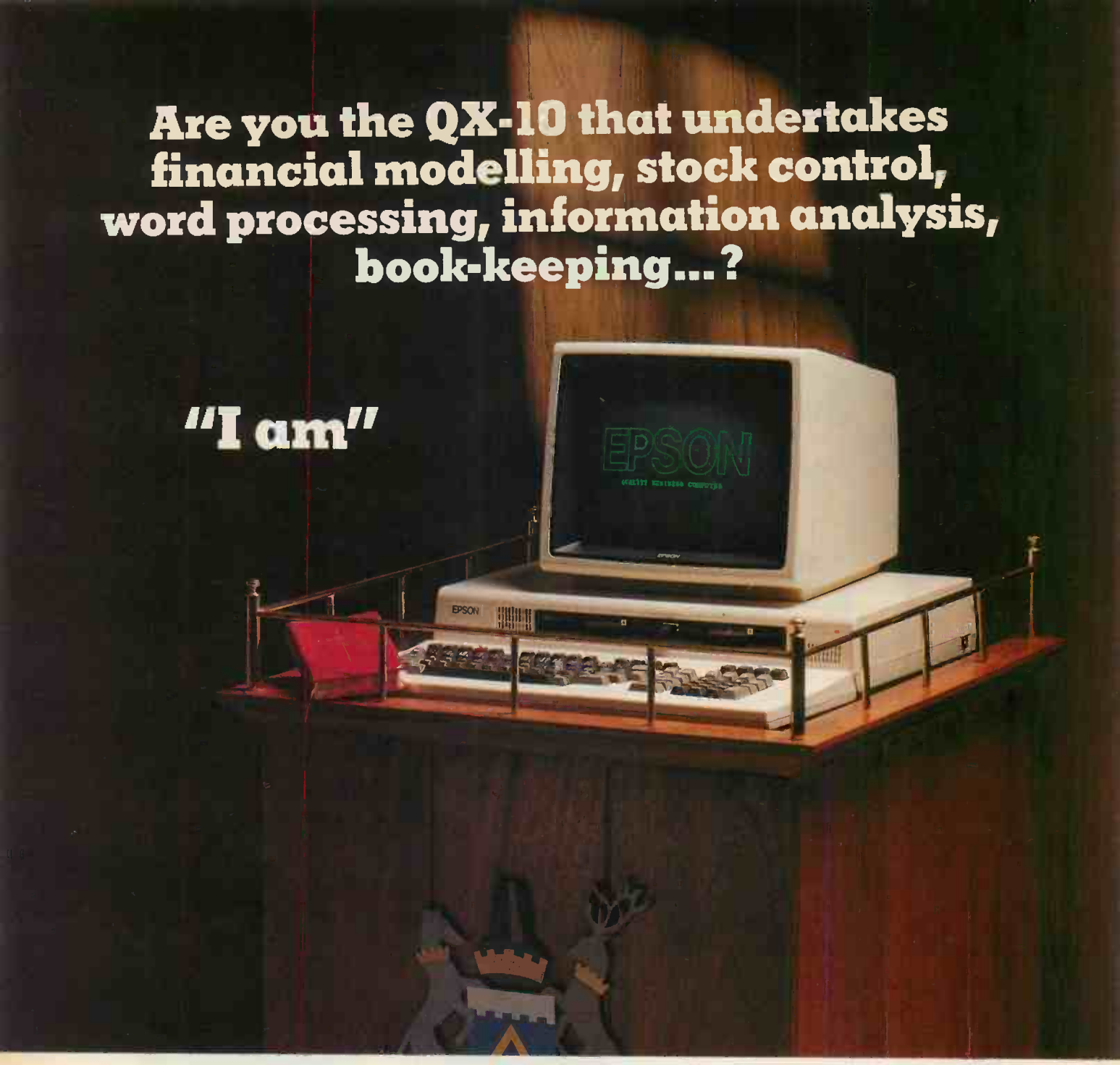
Teleprinter Equipment Ltd.
Akeman Street, Tring, Herts. HP23 6AJ. Telephone: Tring (0442 82) 4011/5551
International Telephone: +44 44282 4011/5551. Telex: 82362
Regional Sales and Service: Manchester (061-626) 3371.

Associated Companies GADC/CAE/ME
CAE Group. UK distributors for computer peripherals from General Electric, Geveke, GNT, Integral Data Systems, Navtel, NEC, Mitsui, Qume, Silver Reed, Spectron Northern Telecom, Teleray, Teletype and Texas Instruments.

● Circle No. 333

Are you the QX-10 that undertakes financial modelling, stock control, word processing, information analysis, book-keeping...?

"I am"



With over 20 years of experience in producing high quality printers, Epson have now perfected a fully integrated desktop computer. All the evidence has gone to prove that the QX-10 is capable of performing all the tasks you will ever require of it, quickly and efficiently.

Installation of the QX-10 can be carried out with the minimum of interruption, and with its easily understandable keyboard, it is simplicity itself to operate.

Having such a diverse range of software packages available such as database from Pearl and office productivity and accountancy from Peachtree with C P/M and multifont BASIC as standard, the QX-10 can supply all the answers whatever your business.

Just look at what's on offer: a big memory – 192k upgradable to 256k RAM and all the graphics you'll ever need – and high resolution graphics at that.

The ability to communicate easily with other machines, including our own HX-20 and the advantage of using our fine range of printers, make the QX-10 a totally versatile system at a price you'll find impossible to equal – £1735 plus VAT.

If you're looking at micros, look at the QX-10.

The system with all the answers.

EPSON

Extraordinary product. Exceptional quality.

Epson (UK) Limited, Freepost, Wembley, Middlesex HA9 6BR.
Sales Enquiries: Freefone EPSON.
General Enquiries: 01-902 8892.
Telex: 8814169.

☐ I would like a demonstration of the QX-10.
☐ Please ask my Epson dealer to contact me.

Name _____
Position _____
Company _____
Address _____
_____
Tel: _____

PC/12/10

● Circle No. 116

Battle of programs

David Levy reports on the 1983 European microcomputer chess championship.

EACH YEAR SINCE 1978 there has been a chess competition held within the PCW show. The mixture of Europe's best amateur chess programs with some of the most prominent commercially available chess computers provides an excellent proving ground — a kind of annual state-of-the-art contest. The 1983 European Microcomputer Chess Championships took place in London from September 28 to October 2 at the Barbican.

The bare results of the tournament do not reveal all the excitement, frustration and tensions that were felt by most of the contestants. Watching your chess program take part in a tournament is a most nerve-racking experience. It is enormously frustrating to have to sit back and watch, knowing that your program has what should be an easy win, and see it fritter away its advantage into a draw or even a loss.

If parapsychology really works I would love to know the medium used to transmit the information. I would build an add-on for certain chess computers and beam my thought processes at them. Perhaps it will happen one day, but by then most chess programs will probably be much stronger than I am, so I will not be able to help them.

But back to the tournament. The overall winner of the event was from the amateur category. Programmers Mike Johnson and Dave Wilson brought back the super-fast hardware which had won last year's tournament. It is built around a 16-bit Advance Micro Devices bit-slice processor, working in conjunction with a 64-bit ALU, and provides approximately 80 times as much computing power as a 4MHz Z-80A.

With such an enormous start on all the other competitors it was hardly surprising that Advance 3.0 won the tournament. Yet it still had some bad moments. Advance lost its game against the Constellation, and was in losing positions in other games. But when its opponent fails to find the most accurate continuation to clinch the same Advance is very resilient and normally weathers the storm to come out on top.

If it reaches the end-game without having a totally lost position, Advance can be almost certain to outplay anything running on a conventional microprocessor. It can search the game tree much more deeply and employs special transposition tables to speed up the tree search still further. Johnson and Wilson deserved to win the tournament because theirs was clearly the strongest entry, but I cannot help feeling that hardware such as this is not entirely in the spirit of microcomputer chess tournaments. They were banned from the World Microcomputer Championships in Hungary.

The European Commercial Championship was won by Chess 2001, a magnetic sensor-board chess computer manufactured by Newcrest Technology in Hong Kong. The program in this product is a version of Cyrus 2.5, written by Richard Lang at Intelligent Software Ltd. Although it was clearly the best of the commercially available entries, Chess 2001 was not quite in the same league as Advance 3.0. When Advance had a totally lost position during the last round I had vague hopes that Chess 2001 might share first place in the tournament — but Advance eventually won its "lost" position.

One of the most interesting moments of the tournament came in 2001's last-round encounter with Caesar, when we saw what I believe is the first ever example in computer chess of *Zugzwang*. This German word describes a position in which one side is compelled to lose something, usually some material, because and only because it is its turn to move. In other words, the opponent does not threaten to win the material, but the side whose turn it is to move must make a move which throws itself on the sword. It is extremely rare for *Zugzwang* to occur in a game between human players, and this particular example will go down in the annals of computer chess.

1 — Advance 3.0, private: 7½
2 — Chess 2001, commercial: 6½
3 — Constellation, commercial: 6
4 — Cyrus 2.5, home; equal with White Knight II, home: 5½
6 — Cyrus IS Chess, home; equal with Caesar, private; and Colossus, private: 5
9 — Mephisto Experimental, commercial; equal with Spectrum Chess II, home: 4½
11 — Merlin X, private: 4
12 — Dragon Cyrus, home: 2
13 — Albatross, private: 1½
14 — Chessnut 2, private: ½

Final placings, with category and number of wins out of nine games.

In third place was another commercial entry, the new Novag Constellation. This machine was unfortunate enough to be thrashed by all three of the strongest versions of Cyrus: Chess 2001, Cyrus 2.5 running on a Sirius, and Cyrus IS Chess on a Sinclair Spectrum. Since it was the only program to defeat Advance 3.0 it fully deserved its high placing.

There was a tie for the European Home Computer Championship between Intelligent Software's Cyrus 2.5, another incarnation of Richard Lang, and BBC Software's White Knight II written by Martin Bryant. Both programs showed that it is now becoming possible to buy chess programs for some home computers that will be almost as strong as or stronger than many of the leading commercially available chess computers.

I expect the strongest dedicated chess machines to keep their edge for the next few years, partly because chess-computer manufacturers are taking advantage of the faster versions of the eight-bit microprocessors, and partly because of the inevitability of the switch to 16-bit processors in dedicated chess machines. At the same time I would expect most home computer owners in 1985 to be able to buy a £10 chess program that is more than strong enough for their needs.

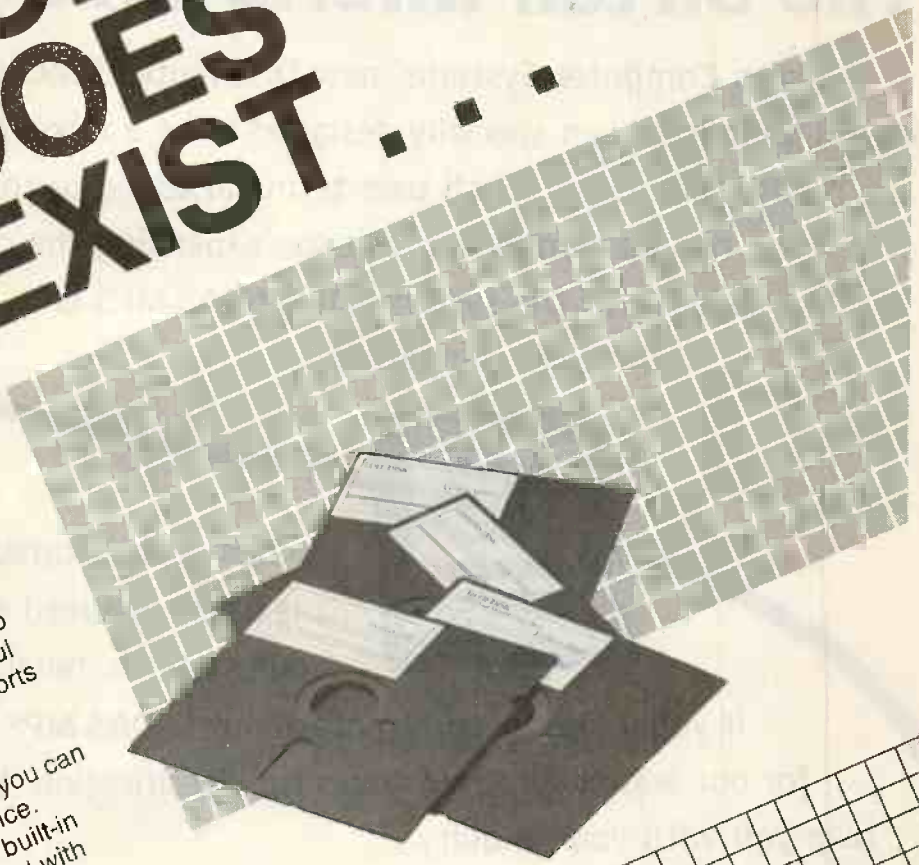
Of the other competitors in the tournament I would like to single out Caesar, which has made a great deal of progress since it last competed. This program is very much a spare-time hobby — its programmer is a pharmacist — and shows just how much can be achieved by an amateur chess programmer who goes about things in the right way. I have to say that — he took my advice back in 1979.

What can one conclude about the state of the art in microcomputer chess from the games and results of the tournament? First, despite the relative success of Caesar, it is clear that the professional chess programmers are at an enormous advantage. Although Advance was an amateur entry — that is, it did not run on a home computer and was not programmed in a commercial environment — Mike Johnson has been writing chess programs for a living since the beginning of 1979. Richard Lang, Constellation's author, Dave Kittinger, and Martin Bryant are professionally involved in chess programming.

If, as I suspect, the commercial incentives remain for another couple of years, I would still expect to see the professionals walking away with the prizes in 1984 and 1985. By then there will be so many amateur chess programmers all over the world that it will be quite possible for the big breakthrough to come from, say, a garage behind a small house in a small California town.

Perfect Calc™
PERFECT WRITER™
Perfect Writer
Perfect Writer/Speller®
Perfect Writer
Perfect Speller
Perfect Filer
Perfect Filer
Perfect Filer®
Perfect Calc

PERFECT SOFTWARE DOES EXIST . . .



Perfect Writer™
The revolutionary word processing program with split-screen editing. Features ninety-one (91) built-in page and document design formats. Multiple mailings management, automatic footnotes and index cross-referencing.

Perfect Speller™
The in-context spelling checker with a 50,000 word dictionary, including additional words unique to your subject.

Perfect Filer™
The versatile records management tool for mailing lists, labels, invoices, cheques, forms, and reports—fully integrated with Perfect Writer™. Easy to use, with two mailing list programs provided. So powerful you can perform up to five simultaneous sorts on up to 65,000 records.

Perfect Calc™
The most powerful spread-sheet program you can buy—up to seven worksheets on-line at once. User-generated functions, split screen, 17 built-in financial modeling programs. Fully integrated with Perfect Writer.™

Perfect Software, Inc.™

To order or find out more, contact:

Pete & Pam Computers
Telephone: 0706 227011
Telex: 635740 PETPAM G

Transam Microsystems Limited
Telephone: 01-405 5240/2113
Telex: 24224 (Ref. 1422)

Tamsys Limited
Telephone: Windsor 56747
Telex: 849462 TELFAC G

Software Limited
Telephone: 01 387 8832
388 9927

Telex: 21879

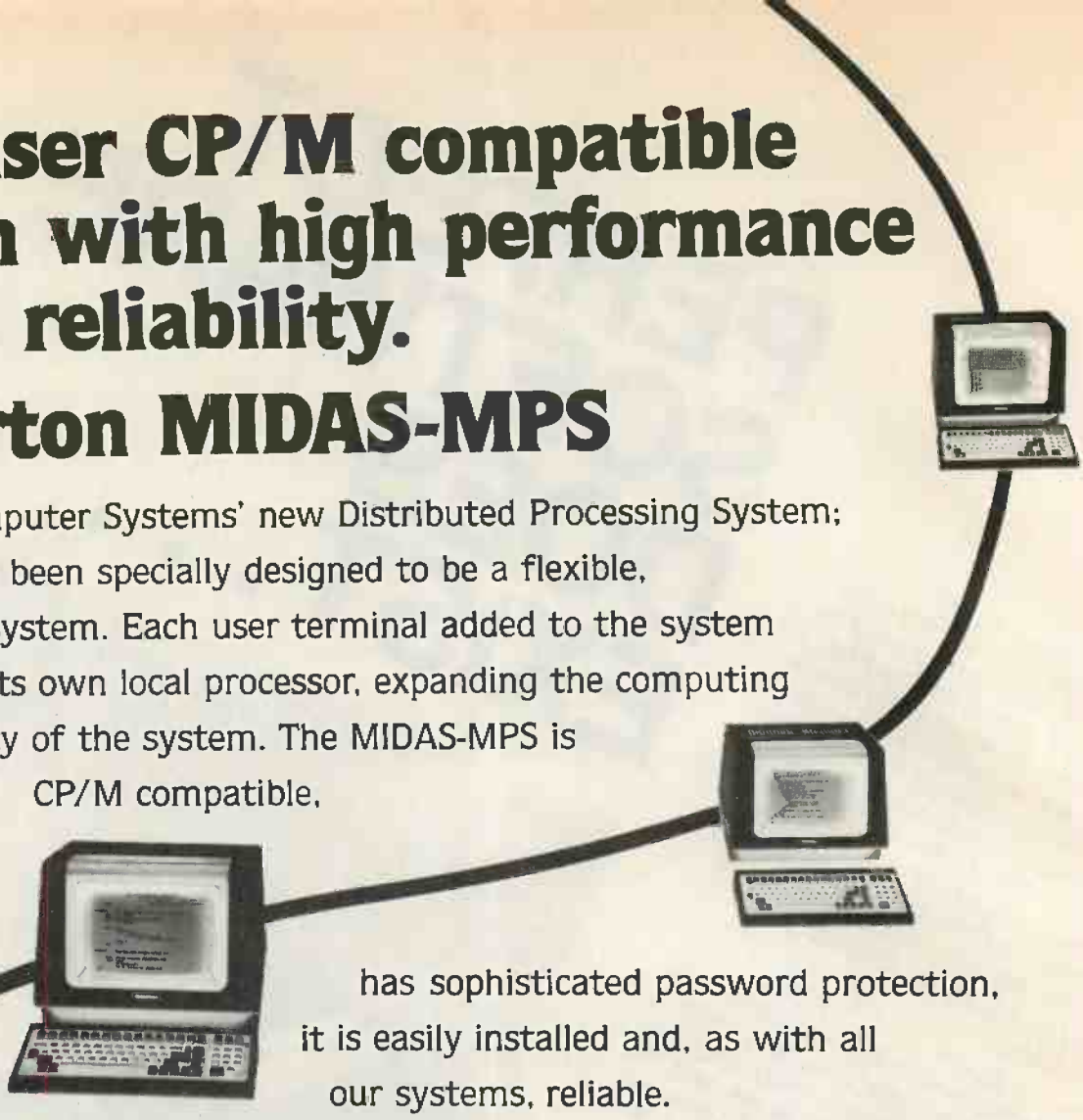
Interam Computer Systems Ltd.
Telephone: 01 622 9373
Telex: 925859

Ferrari Software Ltd.
Telephone 01 751 5791
Telex 8953736 Compex G

● Circle No. 117

A multi-user CP/M compatible system with high performance and reliability.

The Sirton MIDAS-MPS

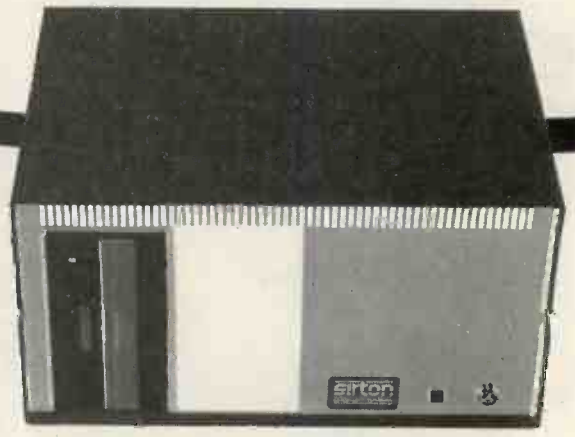


Sirton Computer Systems' new Distributed Processing System; MIDAS-MPS, has been specially designed to be a flexible, multi-user system. Each user terminal added to the system has its own local processor, expanding the computing capacity of the system. The MIDAS-MPS is CP/M compatible, has sophisticated password protection, it is easily installed and, as with all our systems, reliable.

If you'd like to learn more about MIDAS-MPS why not write or 'phone for our leaflet which includes full specification. We'd be pleased to help you with your enquiry.

Features:

- ★ CP/M Compatible
- ★ Multiple Directories with Hierarchical Access
- ★ Easily Expandable
- ★ High Throughput
- ★ High Speed Communication
- ★ Individual Processors at each Terminal
- ★ Easily Installed
- ★ Reliable
- ★ User Friendly



sirton computer systems

Sirton Computer Systems

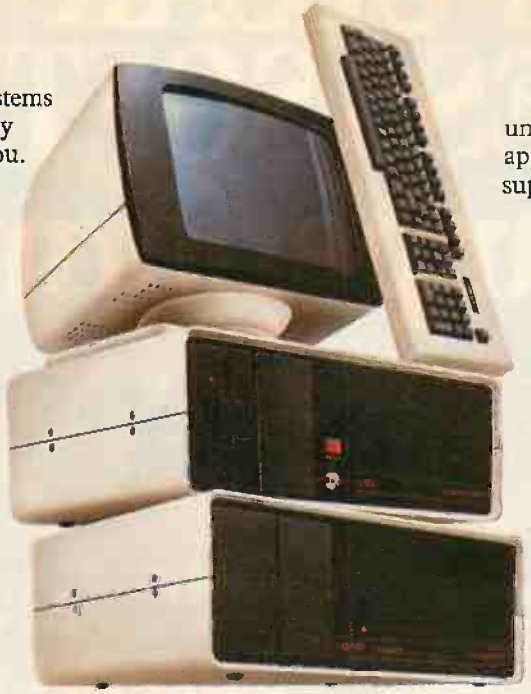
Unit 14, 29 Willow Lane, Mitcham, Surrey, CR4 4NA. Telephone: 01-640 6931/2/3

• Circle No. 118

If the number of computer systems on the market leaves you totally bewildered, we don't blame you.

And that's not your only problem. If you are not very careful, the system you buy today could well be obsolete tomorrow. That's how fast computer technology is progressing.

But take heart. There is one computer system that won't become obsolete. Because it is modular in concept it can be expanded both inside and outside to accommodate extra capacity and new advances—as well as being able to increase in size and capability to keep pace with your own growth or changing requirements.



You have a choice from a virtually unlimited range of CP/M compatible application software. Plus the support of total dealer back-up.

And, most important, you won't find that you've bought a system that suddenly doesn't meet your needs. The Communicator offers the facility to enhance and upgrade existing models to take account of new applications.

Comart have also met the stringent CCTA requirements. Which means we are A1.
In short, Comart Communicator systems can keep pace with both progress and innovation.

So don't get bogged down with obsolete equipment. Contact your Comart dealer for a demonstration now.

The Comart Communicator. One computer system that won't sink into obsolescence.

What's more, it's British.

At any one of the addresses listed below you can see the remarkable flexibility of a Comart Communicator system for yourself.

In under three years, it has become a complete family of compatible, fully expandable microcomputer systems, covering 20 models and including single user, multi-user and multi-processing systems.

To become technical for a moment, there's a choice of 8 or 16 bit processors, up to 1 megabyte of RAM and a wide range of floppy and hard disk storage capacities and add on modules.

COMART COMMUNICATOR SPECIFICATIONS

	CP100 Series Systems	CP1000 Series Systems
Microprocessors:	8 Bit Z80A (1 to 6)	16 Bit 8086
Memory	64K-512K bytes	256K-1M byte
Storage:	390K or 780K byte diskettes 5M or 20M byte hard disks	390K or 780K byte diskettes 5M or 20M byte hard disks
Operating Systems:	CP/M, MP/M II & CP/NET, multi-processor 1 to 5 users	CP/M86, MP/M86, MS-DOS, 1 to 8 users

Features common to both CP100 & CP1000 Series Systems

Keyboard/Display: 105 Key, detached 14" green screen, swivel/tilt.
Expansion: Internal – S100 cards, mainframe communications & protocols.
Expansion: External – stackable modules inc. cartridge tape & 8" floppy & hard disks

CP/M, MP/M II, CP/M 86, MP/M 86 & CP/Net are trademarks of Digital Research Inc. Z80A is a trademark of Zilog Corp. MS-DOS is a trademark of Microsoft Corp. Comart and the Comart logo are trademarks of Comart Ltd.

comart

Comart Limited, Little End Road, Eaton Socon, St. Neots, Huntingdon, Cambridgeshire PE19 3JG.
Tel: (0480) 215005. Telex: 32514 Comart G

Member of the Comart Group of Companies

COMART COMMUNICATOR UK DEALERS

ABERDEEN
MOM Offshore
Tel: 0224 22520

AYLESBURY
J.K. Wakeford Associates
Tel: 0296 27473

BEDFORD
Remdex-Bradley
Tel: 0234 68581

BEDS (AMPTHILL)
M.E. Marketing
Tel: 0525 404262

BELFAST
Cardiac Services Co
Tel: 0232 625566

BIRMINGHAM
The Byte Shop
Tel: 021-622 7149

CAMBRIDGE
Cambridge Computer Store
Tel: 0223 65334

CAMBS (ST NEOTS)
Wellcom
Tel: 0480 217217

CHANNEL ISLES
Bell Data Systems
Tel: 0481 23671

COLCHESTER
Eurotec Consultants
Tel: 0206 72538

DONCASTER
Spot Computers
Tel: 0302 25159

DUBLIN (EIRE)
Lendac Data Systems
Tel: 0001 710226

EDINBURGH
Holdene Microsystems
Tel: 031-557 4060

GLASGOW
The Byte Shop
Tel: 041-221 8202

GLENROTHES
Computer Services Scotland
Tel: 0592 773710

LEEDS
Holdene
Tel: 0532 459459

LONDON (BRIXTON)
Jarogate
Tel: 01-671 6321

LONDON (COVENT GARDEN)
Digitus
Tel: 01-379 6968

LONDON (EC4)
Zygal Dynamics
Tel: 01-248 4883

LONDON (NW1)
The Byte Shop
Tel: 01-387 0505

LOUGHBOROUGH
Data One
Tel: 0509 37281

MANCHESTER
The Byte Shop
Tel: 061-236 4737

MANCHESTER
NSC Computers
Tel: 061-832 2269

NORWICH
Eastern Bus. & Accounting Systems Tel: 0603 27460

NOTTINGHAM
The Byte Shop
Tel: 0602 40576

OXON (BICESTER)
Zygal Dynamics
Tel: 08692 3361

READING
M.E. Electronics
Tel: 0734 667663

SOUTHAMPTON
The Byte Shop
Tel: 0703 334711

STAINES
Newbury Data Recording
Tel: 0784 61141

SWINDON
Great Western Computing
Tel: 0793 485517

WATFORD
Lux Computer Services
Tel: 0923 47367

WILMSLOW
Holdene
Tel: 0625 529486

WINDSOR
Romtec
Tel: 075-35 51550

WORTHING
Ace Computing Services
Tel: 0903 35411

● Circle No. 119

PULSAR BUSINESS SOFTWARE The star performer for apricot

The Pulsar range of business software will turn Apricot into a powerful management tool.

Software engineers working hand-in-hand with the Apricot development team have enhanced the range of accounting, word-processing and modelling packages to maximise Apricot's exciting fourth generation features.

Already 10,000 users of Sirius and IBM PCs have given Pulsar their seal of approval.

STAR PERFORMER

PULSAR takes the mystique out of computing without sacrificing performance. From the design of the software through to the documentation, the accent is on friendliness and ease of use, making it an effective business partner in a matter of hours.

And by harnessing the new fourth generation features of Apricot – like the unique MicroScreen™ – Pulsar has become the friendliest business software around.

Pulsar is true 16-bit software developed by ACT at a cost of over £1 million for today's business computers. Pulsar owes nothing to early 8-bit software, being developed from powerful programs written by ACT's engineers for its own bureau mainframe computers. It draws on over 18 years experience in creating packaged business software.

DESIGNED TO PLAY A LEADING ROLE

The Pulsar range has been designed to meet all the management information needs of business users. Consisting of some 15 integrated packages, the range includes commercial accounting functions, office systems for word processing and electronic mail, and management tools for planning and modelling. The integration between packages is powerful and flexible.

Shared information means files don't have to be duplicated and data does not have to be re-entered.

AND IN SUPPORT

ACT's investment in Pulsar goes beyond the software to encompass full training facilities for users and 'hot-line' support for your dealers to make sure you get the best service possible.

In addition to a nationwide network of over 500 independent dealers ACT has hand-picked 60 Pulsar Software Centres who specialise in Pulsar and can give immediate on-the-spot advice and action.

A STAR-STUDDED CAST

The Pulsar Range for Apricot:

Sales Ledger	£195	dBase II	£395
Purchase Ledger	£195	MicroModeller™	£595
Nominal Ledger	£195	SuperCalc 2™	£175
Payroll	£195	SuperCalc 3™	£295
Stock Control	£195	Multiplan™	£195
Invoicing	£195	Wordstar™	£295
Data Analysis	£195	MailMerge™	£95
Informer Database	£295	SuperWriter™	£295

Please send me details of Pulsar Business Software for Apricot

Name

Position

Company

Address

Telephone

● Circle No. 120

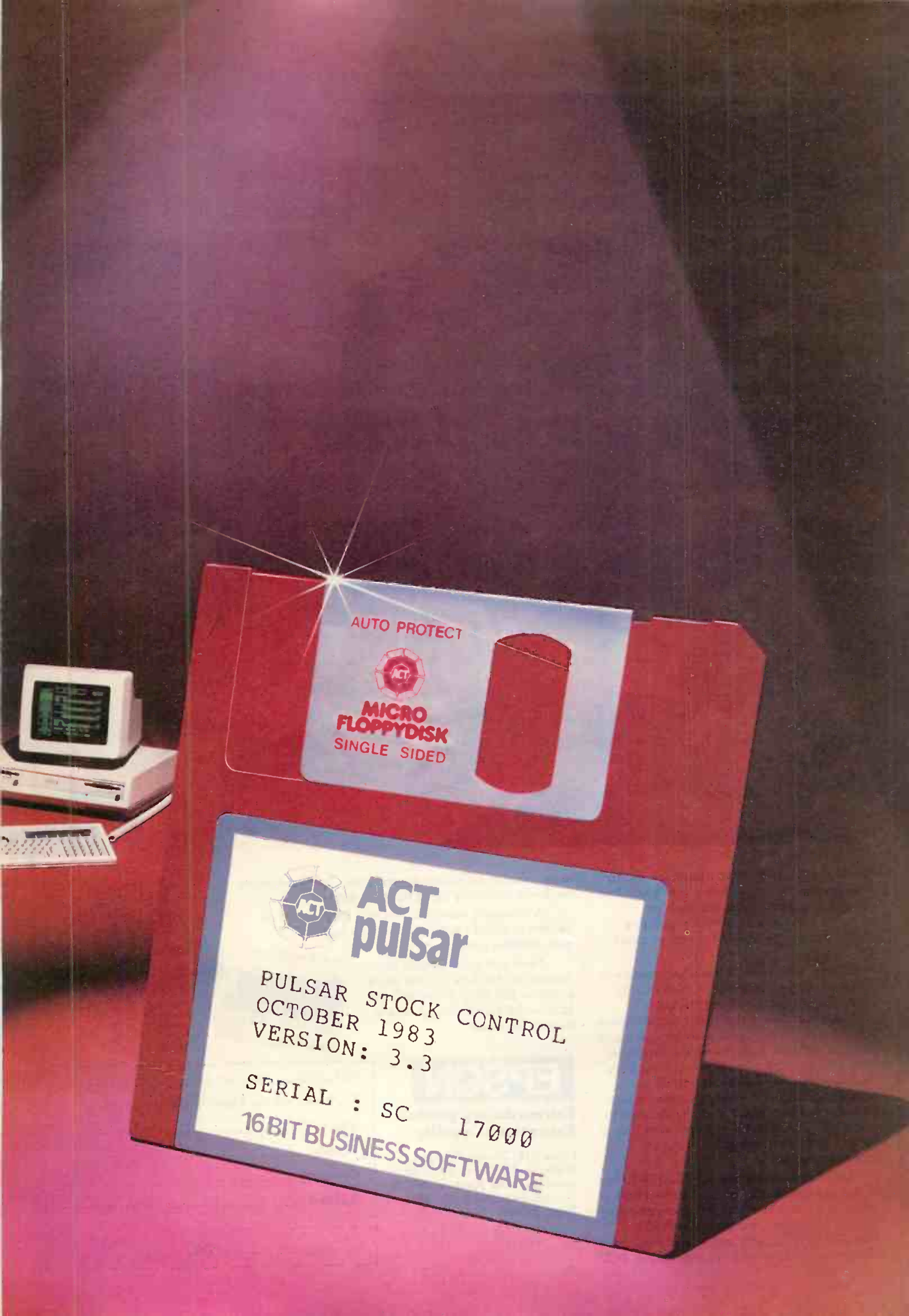
For more information on Pulsar the Star Performer for Apricot clip the coupon and return to

ACT (Pulsar) Ltd

Freepost Birmingham B16 1BR

or call 021-455 7000

™ indicates registered trade mark. Ownership details on request. All prices exclude VAT.


AUTO PROTECT
MICRO
FLOPPYDISK
SINGLE SIDED
ACT
pulsar
PULSAR STOCK CONTROL
OCTOBER 1983
VERSION: 3.3
SERIAL : SC 17000
16 BIT BUSINESS SOFTWARE

The HX-20. For business on the move.

In today's fast moving business world, your information has to move with you. Over the past few years there has been an increasing demand for a totally portable computer with the ability to meet so many challenges.

Epson, with over 20 years experience in designing and manufacturing high quality printers, have produced the HX-20, a precision machine with its own rechargeable power supply that can be used for just about any task within todays discerning business; from data capture to word processing, from card indexing to sales order entry. Communicating with other machines is no problem and the HX-20 is easily coupled to one of our fine printers. You can even link in another computer system by using an acoustic coupler.

Don't be fooled by its size, the HX-20 has all the software back-up you'd expect from a much larger machine and incorporates many "bigger computer" features – 16k RAM expandable to 32k with serial interfaces, a full size typewriter keyboard, it's own built in LCD screen and a dot matrix microprinter. A microcassette facility is available as an optional extra.

A complete computer that will either stand on its own or could be the obvious extension to your existing system.

More and more people are finding out just how big the small compact HX-20 is. Why don't you find out for yourself – you owe it to your business.

EPSON

Extraordinary product. Exceptional quality.

Epson (UK) Limited, Freepost, Wembley, Middlesex HA9 6BR.
Sales Enquiries: Freefone EPSON.
General Enquiries: 01-902 8892.
Telex: 8814169.

☐ Please send me full details of the HX-20.
☐ Please ask my Epson dealer to contact me.

Name _____

Position _____

Company _____

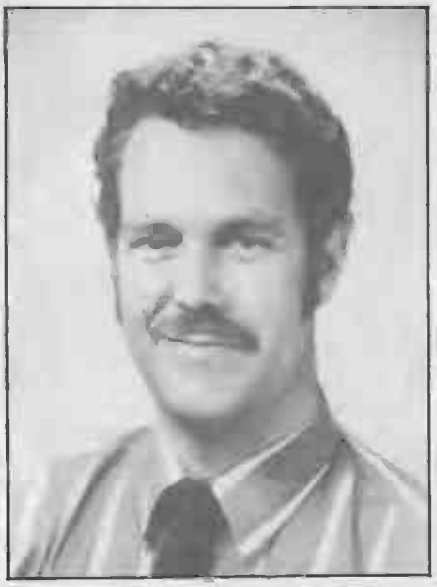
Address _____

_____

_____ Tel: _____

PC 12/20

Thrilled to 32 bits



by Ray Coles

THE FIRST MICROPROCESSORS to perform like real computers rather than like calculators arrived in the mid-1970s, and are still very much with us. Prise the lid off a Spectrum, Oric or Vic-20 and inside you will find a first-generation eight-bit processor such as the Z-80 or the 6502 still going strong, despite the walking stick.

Eight-bit processors are now in the mature phase of their life, which means that they are available by the truck load at very reasonable prices. They have long since stopped drawing gasps of admiration from would-be system designers, who now have their fickle eyes riveted on the sexier 16-bit devices like the Intel 8086, the Zilog Z-8000 and the Motorola 68000.

There are already many up-market personal computers available, such as the IBM PC and the ACT Sirius, which use the newer 16-bit technology. In both these cases the chip is an Intel 8088 which has a 16-bit processor on the inside behaving like an eight-bit device on the outside to reduce memory costs. Also becoming available are systems based on true 16-bit processors such as the Apple Lisa, which uses the Motorola 68000 device.

Unlike the Intel 8086, the Motorola device was designed from the outset to have an internal 32-bit register set and architecture while retaining a 16-bit memory interface to reduce packaging problems and to enable it to compete with the lower-cost Intel and Zilog designs. With the promise of 256K RAM chips just around the corner, however, the time has come for the 68000 to emerge from its chrysalis and assume the full glory of its 32-bit inheritance. 1984 is going to be the year of the 32-bit processor, and systems designers are already going goggle-eyed at the prospect of all the goodies shortly to be unveiled by the chip manufacturers.

It will, of course, be some time before Sinclair Research comes up with a 32-bit home micro with a cardboard Winchester and a 2Mbyte add-on RAM pack. But we can expect other manufacturers to have higher-priced systems available from 1985 onwards. What amazing systems they will be! They will offer more power than a Vax minicomputer in a desk-top package costing a fraction of the current Vax price, and with graphics and software which will make your mouth water.

Four manufacturers have already announced their 32-bit plans. Next year is going to see a tussle for market leadership in this prestige area, with some interesting changes compared with the previous contests for eight- and 16-bit leadership. In the past Intel has always been first in the field. Zilog and Motorola generally followed shortly afterwards with technically superior devices, one of which has gone on to be at least as successful as the early-bird Intel.

In the 32-bit stakes, however, the order has been reversed. A rank outsider, National Semiconductor, has already announced the launch of its 32032 device. Motorola and Zilog are to follow close behind in early 1984, with Intel rather surprisingly bringing up the rear with a late-84 launch for its iAPX386. It is true that Intel already has a 32-bit processor, the iAPX432, but this low-profile device is not likely to be a direct competitor in the mass market. One cannot help wondering whether Intel knows something that the others don't.

National will be first thanks to a late launch for its 16032 16-bit design which was, like the Motorola 68000, designed to have a 32-bit internal architecture. With a 16Mbyte address range, built-in memory management and floating-point co-processor, and an elegant and powerful instruction set, the 32032 is a mighty beast indeed.

The latest silicon processing techniques have been used to squeeze the 100,000-plus transistors required on to a small die which fits inside a 60-pin package. Software writers will flip at the prospect of being able to use any data type or addressing mode with any of the basic instructions. Early reports suggest that the 32032 can run high-level compiled languages such as Fortran at the same speed as an equivalent machine-code program.

Early in the new year we will witness the launch of the Motorola 68020, a souped-up full-width 68000 with lots of new instructions and an amazing 256Mbyte address range. The 68020 will use CMOS technology to reduce power consumption to just 1.8 watts while running from a 16MHz clock and achieving 1.5 million instructions per second.

Another innovation will be an on-chip instruction cache which will speed up program execution by reducing the time spent in accessing slower system memory. Since most program code runs in a sequential fashion, the fast cache memory can speed things up by being filled a block at a time. In most situations a cache hit-rate of greater than 90 percent can be expected.

Zilog is due to launch the Z-80000 later in the year, but has already released full details of the nought-bound monster following in the footsteps of the Z-8, Z-80, Z-800 and Z-8000 already with us. Like the National and Motorola devices the Z-80000 prides itself on having instruction-set compatibility with its 16-bit predecessor.

As usual, Zilog has gone for speed, with clock rates up to 25MHz promised and a throughput of up to 5,000,000 instructions per second. Unlike Motorola, Zilog has incorporated cache memory for both data and instructions, and 16 cache blocks each 16 words deep are available on the chip. Also on the chip is a built-in memory-management unit which provides for virtual-memory operation and sophisticated protection mechanisms.

Finally we will be offered the long-awaited iAPX386 from Intel. It was first announced over two years ago but is unlikely to see the light of day until late 1984. The 386 will double the throughput of Intel's current top-of-the-line 16-bit processor, the iAPX286, and will use a closely related architecture which can be traced back to the 8086.

The architecture of the 8086 has always seemed rather messy to me, and it is difficult to see how Intel can hope to compete with the offerings of the other three manufacturers which will be first — as well as best — this time round. Yet the Intel bandwagon has a big following which wants more than just sexy chips, and no one has yet been able to challenge Intel in the software and hardware support offered to designers.

So there it is, the 32-bit era is about to dawn. But don't put your trusty eight-bit crate out to grass just yet. It will be quite some time before we see the first 32-bit personal computer advertised — even in this magazine!

Discover the Microcomputer Age

Come along to The Northern Computer Fair and discover for yourself the excitement of the microcomputer age. All you need to know about personal computers, home computers and microcomputer systems for business will be on display at Belle Vue, Manchester from November 24-26. All your questions will be answered at the North's premier personal computer exhibition.

Enthusiasts can see the latest software and hardware technology in action, and for those new to the world of computers this show is a great introduction. Being sponsored by Practical Computing and Your Computer, the leading microcomputing magazines, you can be sure of value for money at £3 a ticket for Adults and £2 for Children under 16.

£1 off

THE Northern Computer Fair

Personal computers
Home computing
Small business systems

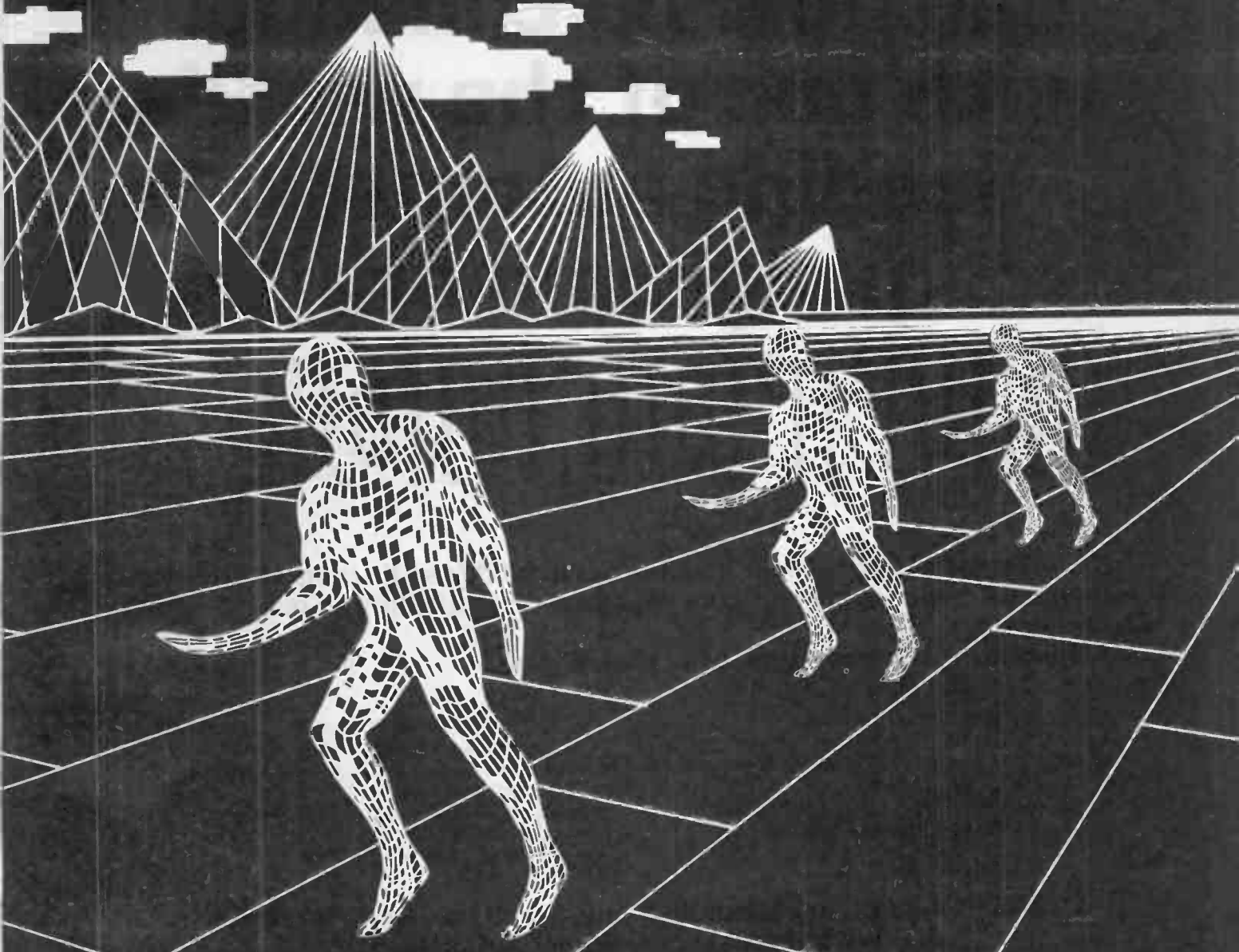
This voucher entitles the bearer to a one pound reduction on the purchase of one adult or child full price ticket. This cannot be used with any other offer.

Belle Vue Manchester
November 24-26, 1983

Travelling to the show is also easy as the organisers have arranged special reduced-price tickets with British Rail which include the cost of admission. For further information ring British Rail Enquiry Bureau on 061-832-8353 before November 11.

The Northern Computer Fair is open between 10.00 am and 6.00 pm every day so come along and bring the microcomputer age alive for you.

For special party rates and further information contact:
The Exhibition Manager, The Northern Computer Fair,
Reed Exhibitions, Surrey House,
1 Throwley Way, Sutton,
Surrey SM1 4QQ



THE **Northern Computer Fair**

Personal computers
Home computing
Small business systems

Sponsored by:

Practical Computing and YOUR COMPUTER

Belle Vue
Manchester
November
24-26, 1983

ASHTON·TATE ■ dBase II*

The worlds leading micro database package can now be enhanced with one of the worlds leading automatic programmers

STEMMOS AUTOCODE 1

If you're not a programmer it writes powerful dBase II* programs for you.
If you are a programmer it cuts your time dramatically and gives you bug free codes first time.
A 15 minute demonstration will convince you.

- Automatic Menus and SubMenus
- Automatic Data Entry screens
- Automatic Data Entry Routines
- Automatic Edit/Validation
- String, Numeric, Date and calculated fields
- Automatic Multiple Reports Selection on part fields
- Automatic Programs in dBase* code with interactive screens
- Documentation of the generated system produced automatically
- No prior knowledge of dBase II* is needed
- Installed on more than 50 microcomputers
- Available on MS-DOS, CP/M 86 and CP/M 80

Call Stemmos or any of our distributors and dealers to arrange your demonstration at your nearest Autocode centre

DISTRIBUTORS
TRADESOFT LTD
London SW11 01 622 9373

XITAN SYSTEMS LTD
Southampton 0703 38740
SOFTWARE LTD
London EC1 01 833 1173/6
FERRARI SOFTWARE
Feltham 01 751 5791

PETE AND PAM COMPUTERS
Rossendale 0706 212321/227011
ENCOTEL SYSTEMS LTD
Croydon 01 686 9687/680 6070

STEMMOS LTD
Stemmos Ltd
199 Uxbridge Road, London W12
Tel: 01-740 9444 Telex 893003 Stemmos G.

***dBASE II is a registered trademark of Ashton-Tate Ltd.**

● Circle No. 123

The right software for your application from COMPUTECH

apple
Authorised Dealer
Service Centre
System Consultancy

COMPUTECH FINANCIAL ACCOUNTING PACKAGES

Payroll	£375
Invoicing and Stock Recording	£295
Sales, Purchases and General Ledgers	each £295

Also costing and group consolidation

COMPUTECH UTILITIES DISK
for reliable error checking copying, diskette scan, interpret and patch, etc £20
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 £45

COMPUTECH GRAPHICS DISK
for printing Apple pictures and graphs on Epson and Microline (free with printers purchased from Computech) £30

COMPUTECH TERMINAL UTILITIES
Apple to Apple and Apple to mainframe from £130

COMPUTECH hardware...just plug it in and go!

switches and jumpers provide hardware options without soldering

DIPLOMAT VIDEO DIGITISER
store a frame from video camera in a fiftieth of a second, process and print — for Apple II £195
for APPLE //e, including 64K Extended 80 Column Card £345
DIPLOMAT PARALLEL Interface £80
DIPLOMAT SERIAL COMMUNICATIONS Interface £85
DIPLOMAT RAM 16 Memory Expansion £95
DIPLOMAT CLOCK/CALENDAR £80
LOWER CASE Character Generator with Applewriter 1.1. enhancements £50
MICROMUX Data Exchange (Max 16 Ports) from £850
MATRIX PRINTERS, Microline and Epson with graphics and up to 200 cps from £222
MICROLINE Optional Character Generator £15
DAISY WHEEL PRINTERS, Olympia, Qume, Ricoh from £798

Prices exclude VAT, Carriage and Packing

COMPEC '83
15-18 NOV
OLYMPIA
STAND 718
NATIONAL HALL

For full details phone for data sheets and a FREE demonstration

COMPUTECH SYSTEMS

168 Finchley Road, London NW3 6HP. Tel: 01-794 0202

The Apple logo is a trade mark of Apple Computer Inc. VisiCalc is a trade mark of VisiCorp

● Circle No. 124

NO LIMIT

Now, a home computer with virtually no limit to its possibilities. The astonishing new Sharp MZ700. A machine with a dazzling array of talents.

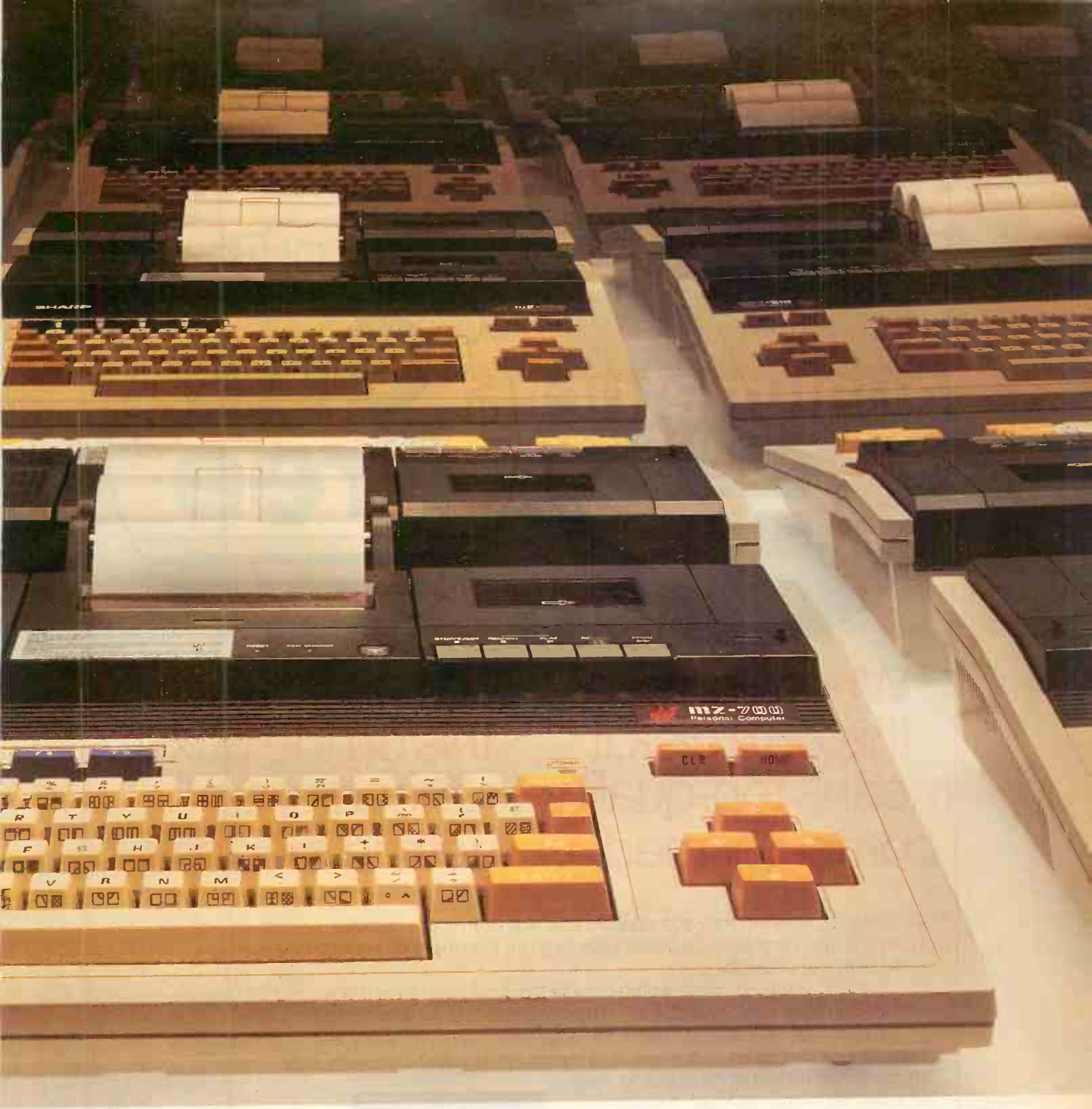
First, it's a 'clean' machine. So you are not limited to any one computer language. You have the flexibility to run and write programs in BASIC, FORTRAN, MACHINE CODE, PASCAL, ASSEMBLER and many others. And the MZ700's 512 predefined characters mean you can build up detailed pictures on the screen, without spending time specifying and designing special characters for games and special effects.

Second, it has a memory of 64K. So as your technique improves and develops, you are able to move forward to more and more advanced programming.

All of which makes this the perfect home computer for parents, as well as children.

The MZ700 gives you access to a wide choice of new software, from only £3·95 per cassette. An additional plotter/printer, costing £129·95, can produce high resolution graphics in 4 colours. A data cassette recorder is an extra at £39·95. Both add-ons fit snugly into this easy to carry compact system with no trailing wires. And you get ten exciting games, free on purchase, including Super Puckman, Circus Star, Snake v. Snake, and Man-Hunt.

The brilliant new MZ700.
The no-limit computer. £249·95. From Sharp. Where great ideas come to life.



CPU:	Z80A	1
ROM:	Monitor 4K byte ROM	1
	Character generator 4K byte ROM	1
RAM:	64K byte D-RAM	8
	4K byte V-RAM	2
1/O bus:	Expansion 1/O bus	1
	Additional printer 1/O bus	1
	Cassette READ/WRITE terminals	2
	Joystick terminals	2

RGB MONITOR/VIDEO MONITOR/RF OUTPUTS

COMPATIBLE WITH SHARP MZ 700 SERIES

Look for this logo on software denoting Sharp Compatible Software.

To: Sharp Electronics (UK) Ltd,
Home Computer Division,
Sharp House, Thorp Road, Newton Heath,
Manchester M10 9BE. Tel: 061-205 2333

Please send me details of the Sharp MZ700.

Name _____

Address _____

_____

PC2

The world of
SHARP
where great ideas come to life.

● Circle No. 125

The sign of a good disk.

qualimetric®

Ten for the price of nine.
One Free

When you see this on a disk, it means top-quality computer media.

When you see this on the box, it means you're getting it for less.

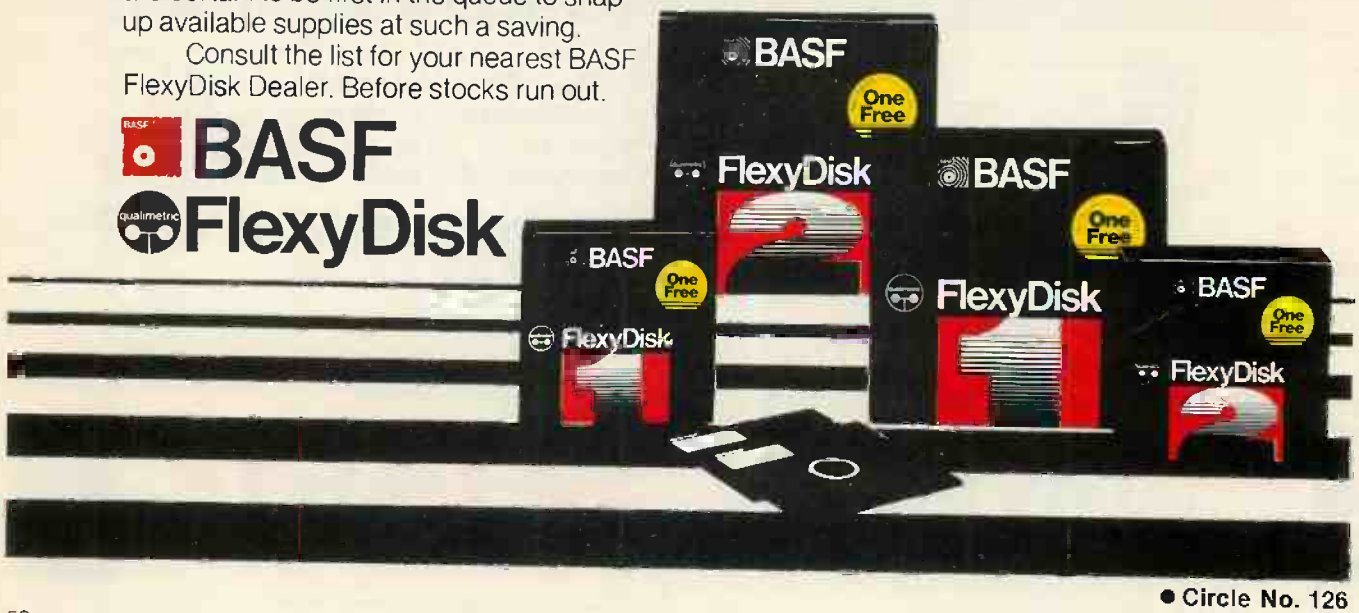
With so much money and valuable data tied up in your computer, small business system or word processor, it doesn't pay to go for low prices on your computer media at the expense of quality.

Except when you can buy ultra-reliable top quality and save money into the bargain – with BASF FlexyDisks, available as '10 for the price of 9' for a limited period only.

Existing BASF FlexyDisk users swear by their quality, reliability and long-life data protection, summed up by the new Qualimetric symbol. And that's why they are certain to be first in the queue to snap up available supplies at such a saving.

Consult the list for your nearest BASF FlexyDisk Dealer. Before stocks run out.

BASF
qualimetric FlexyDisk



● Circle No. 126

LONDON AND HOME COUNTIES:

Data Efficiency Limited
Maxted Road, Maylands Avenue
Hemel Hempstead, Herts HP2 7LE
0442 60155

Data Media Services
Unit 9
Ashford Industrial Estate
Shield Road
Ashford, Middlesex TW15 1AV
07842 47341

AWS Computer Supplies
57 Surbiton Road, Kingston, Surrey
01-541 1188

Computer Accessories Ltd
10 Barley Mow Passage
Chiswick, London W4 4PH
01-994 6477

Computaform
4 Merivale Road, Harrow, Middlesex
01-423 5005

Data Processing Accessories
Unit 66, Bearbrook Industrial Estate
Rabans Lane, Aylesbury, Bucks
0296 24411

Essex Data Product
17 Guithavon Street, Witham, Essex
0376 518629

Northamber
3 Dawes Court, Esher, Surrey
0372 68311

Pete and Pam Computers
103 Blegborough Road, London SW16
01-769 1022

Mediafile
86/96 Garratt Lane, London SW18
01-870 7986

MIDLANDS:

CCS Media
277a Woodborough Road
Nottingham NG3 4ST
0602 620979

Frank Groome Group of Companies
Nottingham 0602 301633
Brigg 0652 54966
Coventry 0203 613417
Leeds 0532 771181
Leicester 0533 556479
Lincoln 0522 36984

Geest Computer Services
Carr Road Industrial Estate
Peterborough, 0733 51231

Stratton St Margaret
Swindon, 0793 827727

GBH Data Services
Dumfries Chambers
91 St Mary Street, Cardiff CF1 1JY
0222 25653

Landscape Computer Services
East Field House
Woodhall Spa, Lincolnshire
0526 53560

Regent Paper
657 Melton Road, Thurmaston
Leicester LE4 8EG
0533 695952

Stryder Publishing
PO Box 167, Sutton
Norwich NR12 9RS
0692 82011

Trade Data (Trade Enquiries Only)
49 Illiffe Avenue, Oadby, Leicester
0533 712378

NORTH WEST:

Pete and Pam Computers
New Hall Hey Road, Rawtenstall
Rossendale, Lancashire
0706 212321

Broker Forms
214 Manchester Road, Warrington
0925 34440

National Micro Centres:
Wilmslow 0625 530891
Stockport 061 480 0539

YORKSHIRE

Tandberg
Elland Road, Leeds
0532 774844

SYSTEM
12 Collegiate Crescent
Sheffield, S10 2BA
0742 682321

NORTH EAST:

DP Supplies
St Andrews House, Westfield Terrace
Gateshead, Tyne & Wear
0632 785068

SCOTLAND:

Excel Data
Clydebank Business Park
Clydebank, Glasgow G81 1JA
041 952 7878

Tait Components
973 Sauchiehall Street, Glasgow
041 339 9959

Tullis Neill
Peggy's Mill, Mayfield
Dalkeith EH22 4AD
031 663 6691

STEMMOS
the dBASE™ II experts

STEMMOS are one of Britain's leading software houses and specialists in dBase II

STEMMOS offer a helpline for dBase II users

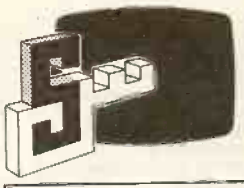
STEMMOS wrote **Autocode I**,™ the only intelligent program generator for dBase II

STEMMOS hold monthly seminars in the heart of London on dBase II

– An opportunity for anyone from engineer to businessman to write their own microcomputer program.
– And for the programmer the chance to write programs in a fraction of the time.

Seminars:

7, 8, 9, Nov. 5, 6, 7, Dec. 10, 11, Jan.



STEMMOS
The Key to successful software

Please send me more information on:
dBase II ☐
Autocode I ☐
dBase II User seminars ☐

Name:
Company:
Address:

STEMMOS LTD
199 Uxbridge Road,
London W12.

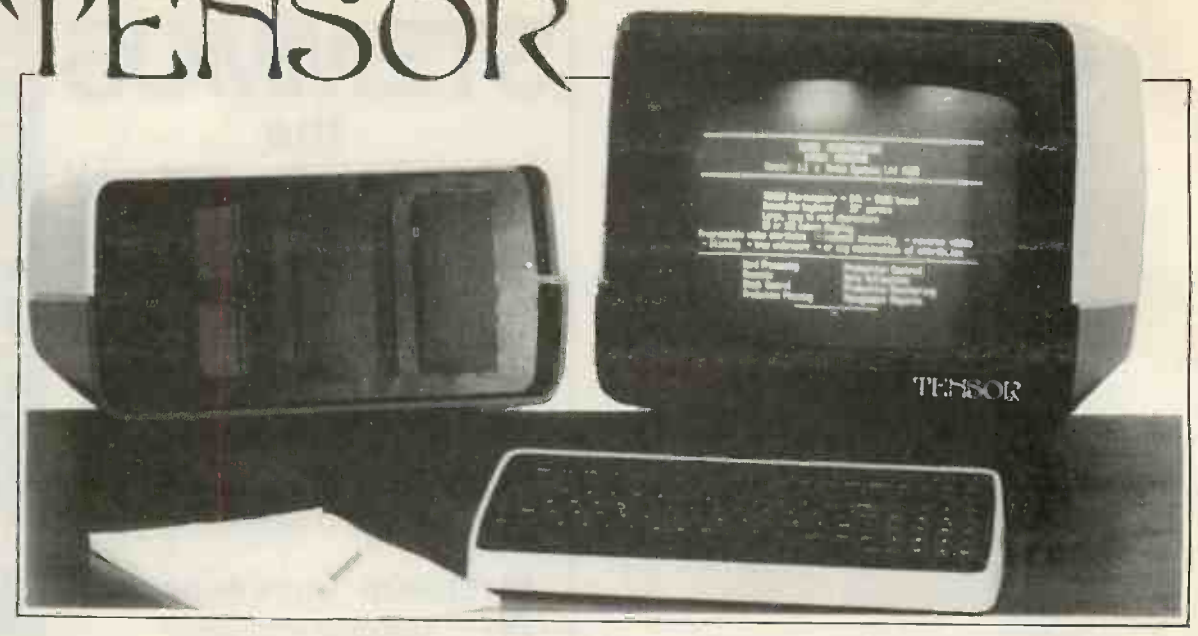
Tel: 01-740 9444 Telex: 893003 STEMOS G

dBase II™ Ashton Tate Autocode I™ Stemmos Ltd.

STEMMOS dBASE II dBASE II dBASE II dBASE II STEMMOS

● Circle No. 127

TENSOR



TENSOR Computers have been helping to run British industry for years! Unlike other microcomputers, the TENSOR is a complete range of hardware and software products; from fibre optic Local Area Networks or Programmable Process Controllers, to COBOL based business packages and industrial software for factories.

T4000	Dual 5.25 floppy disk module (2x400k)
T4001	Single 5.25 floppy disk module (400k)
T4003	Dual 8" floppy disk module (500k)
T4004	Single 8" floppy disk module (250k)
T4012	5 MB hard disk unit
T4013	10 MB hard disk unit
T4014	20 MB hard disk unit
T4015	40 MB hard disk unit
T4016	80 MB hard disk unit
T4020	Mini winchester controller
T4030	Cartridge tape backup unit
T4050	Micro cassette unit
T6000	64k S100 computer Z80 based
T6001	64k S100 computer 8086 based
T8021	Local Area Network controller
T8000	S100 Z80 processor card
T8001	S100 process control I/O board
T8002	S100 64k memory card
T8003	S100 CRT and video controller
T8005	S100 industrial keyboard encoder
T8009	S100 6 slot motherboard
T8013	S100 proximity switch detector
T8022	S100 serial comms board
T8029	S100 floppy and hard disk controller
T8031	S100 80 way I/O board
T8037	S100 8086 processor board
T8038	S100 16 bit 128k memory board
T8039	S100 16 bit floppy and hard disk controller
T8041	S100 Ethernet controller
T8054	S100 11 slot motherboard
T8055	S100 timer/interupt board
T8071	S100 Z80 64k computer+I/O
T1000	Stainless steel data collection node
T9101	Data collection terminal
T9900	Data logging terminal
T9103	Time and attendance terminal
T9002	Bar code reading computer
T9102	Z80 based programmable controller
T9000	2732/2764 EPROM burner
T8100	Fibre optic transiever
T8106	10 way fibre optic controller
T8070	Z80 single board industrial controller
T8072	Industrial data logger with cassette
T8063	8 way TRIAC controller
T8025	4 digit thumbled LED display unit
T8027	Solenoid Operated Valve controller
SP1120	Multibus speech computer
PR2000	Unlimited text-to-speech computer
P500	Nominal ledger package (COBOL)
P501	Sales Ledger package (COBOL)
P502	Purchase ledger package (COBOL)
P504	Fixed assets package (COBOL)
P505	Project management package (COBOL)
P506	Payroll, SSP and personnel package (COBOL)
P100	Computerised manufacturing package (COBOL)
P102	Finished goods stock control package (COBOL)
P105	Shop floor documentation package (COBOL)

All of the above products are designed, built and maintained by Modus Systems Ltd. Modus would like to install a TENSOR computer in your business or factory. Call us today, maybe we can help you!

MODUS SYSTEMS LIMITED

Park Drive, Baldock, Herts, SG7 6EW
Telephone Hitchin (0462) 894848(4 lines)
Telex 825058 Modus G

Government Registered Micro Computer Consultants MAPCON No 508

A member of the British Microcomputer Manufacturers Group.

• Circle No. 196

MICROCOMPUTER PRICE BREAKTHROUGH!

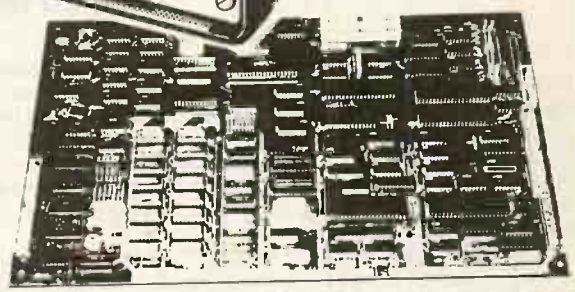
TWIN-DRIVE COMPUTER SYSTEM

FROM ONLY

£799

The MX Series are beautifully housed in a low profile brown/ beige metal case.

Now MICRONIX smashes the price barrier of Professional Systems — 100% British designed and built. No frills, no gimmicks, no forced purchase of unwanted software at hidden cost! Our low, low system cost gives you freedom to choose and buy software to suit your requirement and still save money! Four models to choose from and a massive 21 Mbyte Hard disk Subsystem is also available. Based on the versatile MICRONIX 80HD Single Board Micro all models have • Z80A MHz CPU • 64k (expandable to 128k) RAM • 24 x 80 VDU • Floppy Disk Controller • SASI Hard Disk Interface • Real Time Clock/Calendar with battery back-up • Two RS232c Ports • Two Parallel I/O • Buffered BUS • ASCII Parallel Keyboard Port • Composite Video • CP/M compatible Operating System. Just add a terminal or video monitor and a keyboard (optionally available) and you are in business!



The heart of the system — MICRONIX 80HD Single Board Micro — also available separately

LOOK AT THESE PRICES!

MODEL MX400:
400K TWIN 5¼" SYSTEM.....only £799
MODEL MX800:
800K TWIN 5¼" SYSTEM.....only £899
MODEL MX1600:
1600K TWIN 5¼" SYSTEM.....only £999
MODEL MX2400:
2400K TWIN 5¼" SYSTEM....only £1,199

KEYBOARD: 102 Key Low Profile ASCII Keyboard only £125
(£5 carriage)
HARD DISK: Mass Storage Hard Disk Sub-systems complete with Software and ready to plug into any MX System above:
Model MX115HD 11.5 Mbyte Hard Disk only £1,250
Model MX216HD 21.6 Mbyte Hard Disk only £1,399
All prices are exclusive of carriage (£15 per System) and VAT.

micronix computers Ltd

Suite 2, 26 Charing Cross Road, London WC2. Tel. 01-240 0213/0217. Telex 295173 VILORD G

• Circle No. 220

The Computer Trade Show '84

"Where the professionals meet"

Wembley Conference Centre March 13–15
Open 09.30–17.00 daily

If you want to talk to buyers then 'The Computer Trade Show '84' is the certain way of reaching an audience of the highest quality. Only bona fide trade visitors are admitted to the show and at the last exhibition 3,653 trade buyers came to 'The Computer Trade Show'. Such people are serious business buyers, with 41 per cent of 1983 visitors involved in computer/WP systems distribution and 25 per cent looking for OEM equipment for systems integration.

This impressive audience attends 'The Computer Trade Show' because of the guaranteed quality of the show. Held near the centre of London at the modern Wembley Conference Centre with its sophisticated businesslike atmosphere, it is staged by the country's largest exhibition organiser, Reed Exhibitions. Sponsors of the show are 'Computer Weekly', 'Systems International', 'Software', 'Practical Computing' and 'Micro Business'.

A prestigious conference programme held in conjunction with the show is certain to attract wide media coverage and professional visitors of a high calibre. With important industry issues discussed in depth, the conference will be the talking point of the year in the trade. For further information contact Christine Jones. Tel. 01-643 8040.

Reed Exhibitions has organised an impressive promotional programme for 'The Computer Trade Show '84' with direct mailings to selected visitors to the COMPEC series of exhibitions and to the entire circulation of the sponsoring magazines. Editorial previews of the exhibition in the sponsoring journals will ensure that interest in the show is at its height in the crucial period just prior to 'The Computer Trade Show '84'.

With this kind of backing it is no wonder that an important number of computer companies, like *Digital Equipment Company, Perkin Elmer, Kode, Norsk Data, General Automation, Rediffusion, Geveke, Newbury Data and Multicomputer,* have already booked stand and space at the show. So if you want to be sure of meeting thousands of business buyers with bulk purchase at the forefront of their minds you must reserve your stand space at 'The Computer Trade Show '84' by clipping the coupon below, or better still phone Gillian Johnson on 01-661 3125 NOW!

I am interested in exhibiting at 'The Computer Trade Show '84'. Please send further information ☐
I am interested in visiting. Please send me a visitor registration leaflet ☐

Name _____

Position _____

Company _____

Address _____

_____

_____ Telephone No. _____

Return coupon to:
Gillian Johnson, Exhibition Sales Department, Electrical/Electronic Press, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

● Circle No. 129

A PERFORMANCE AND PRICE BREAKTHROUGH IN APPLE][® & //e HARD DISC STORAGE

High Performance AID hard disc systems of 5-20 megabyte capacities, specifically designed for use with the Apple, are now available running under DOS, CP/M & Pascal. The units cold boot and throughput speeds are really impressive. If you want to leave others standing, try our fast DOS option!

The range features the 5+5 and 10+10 drives which enable you to configure half the drive as primary and half as secondary storage for ease of archiving.

The systems have been designed around the concepts of data reliability and convenience of operation.

They are simply the most competitive hard discs on the market. So why pay more for less.

interface INTEC technology

INTEC, 41A-45, Knight's Hill, West Norwood, London, SE27 01-761 5999 Tlx: 8813271 GECOMS G

AID

LOW PRICE

5 Mb	£990
10 Mb	£1270
20 Mb	£1490

All prices ex-VAT.
Apple is the registered trade mark of Apple Inc.

DEALER ENQUIRIES WELCOME

● Circle No. 130

Meet the fa

Minstrel + TurboDOS

the marriage of reliability and versatility

Minstrel

The Minstrel is an exciting new British micro-computer and offers Winchester-based systems at fantastically low prices. The range extends from single-floppy single-user CP/M systems right up to a 68000-based model and includes an 8086-based range.

The Minstrel is compatible with the North Star Horizon and offers a superior alternative at a much better price.

There is a network of Minstrel dealers in the UK and Europe. Contact us for the name of your local dealer. Dealer enquiries invited.

S100 bus

The amazing versatility of the Minstrel is due to the bus used: the S100 bus. This bus system is not only future-proof – the future is created on the S100 bus. Every major micro-computer development appears first on the S100 bus. Now over 150 manufacturers make S100 products and their combined range approaches 1000 boards.

HMSystems
Hotel MicroSystems Limited

69 Loudoun Road, London NW8 0DQ

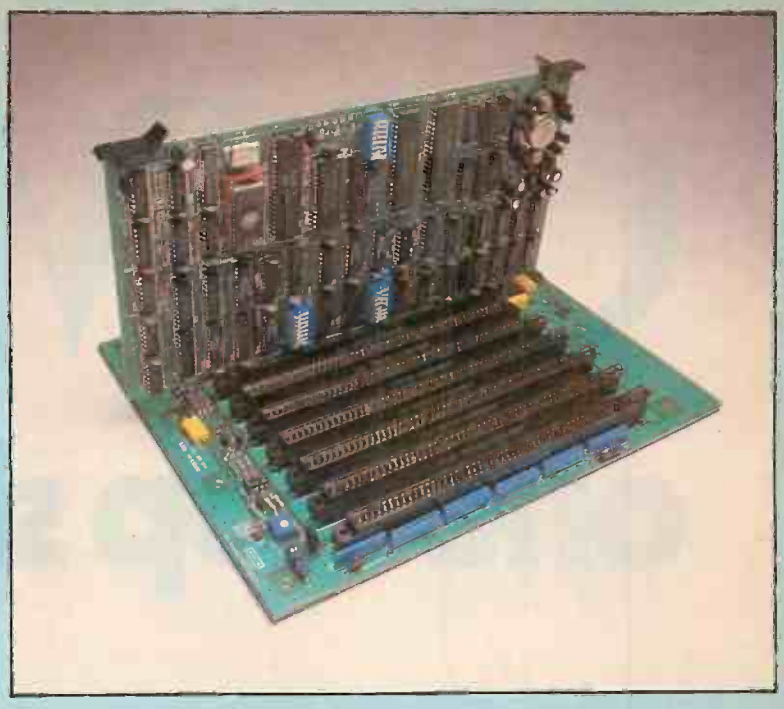
national	01 328 8737
international	+441 328 8737
telex	266828

mily

One machine – eight computers

Yes! Inside the Minstrel micro-computer illustrated there are actually 8 Z80A single-board computers. One is dedicated to each user of the system resulting in astonishing performance. A ninth processor controls central disk storage and printers.

TurboDOS provides sophisticated spooling for multiple printers, supports 1000Mb disk drives and 128Mb files, and employs powerful disk buffering techniques.



TurboDOS®

CP/M COMPATIBLE MULTI-USER OPERATING SYSTEM

TurboDOS is a popular high-performance multi-processor operating system. Each user has their own slave processor board (illustrated above). TurboDOS systems have been shown to out-perform mini-computers in the DEC PDP11/34 class at a fraction of the hardware cost.

TurboDOS is compatible with CP/M, the industry standard operating system, which means you have access to a vast range of off-the-shelf software.

The next development to TurboDOS on the Minstrel allows you to connect systems together via a Local Area Network.

ASTONISHING PRICES!

Minstrel with two 400Kb floppy drives £1790.
With 1 400Kb drive and 5Mb Winchester £2615.

A sample 2-user TurboDOS system including:

Minstrel
1 800Kb floppy
1 5Mb Winchester
2 slave processor cards
2 KDS7362 VDU's (illus)
1 Epson printer

ONLY
£5420

A sample 5-user TurboDOS system including:

Minstrel
1 800Kb floppy
1 20Mb Winchester
5 slave processor cards
5 KDS7362 VDUs (illus)
1 Epson printer
1 OKI 84 printer

ONLY
£9850

TurboDOS is a registered Trade Mark of Software 2000, Inc.

• Circle No. 131

QUME peripherals

one stop shopping

Get it together from one manufacturer

The QumeTrak 142; high data reliability, trigimballed head, low cost, half height 5¼ in. floppy disk drive . . .

The new QVT range; ergonomically designed emulating video terminals . . .

The Sprint 11 Plus; legendary print quality, operator-exchangeable interface, daisywheel printers . . .

The recipe for quality peripherals from Qume blends the QumeTrak 142 floppy disk drive and the QVT range of video terminals with the Sprint 11 Plus printers to satisfy all the needs of the discerning system builder who demands quality, capacity, reliability and aesthetic ergonomic design . . . all from one shop . . . QUME.

Ask your nearest Authorised Distributor for further details or 'phone or write Steve Hammond at Qume (UK).

Qume®

Qume (UK) Limited,
Bridgewater Close, Reading, Berkshire RG3 1JT.
Tel: Reading (0734) 584646. Telex: 849706

A British Company of ITT

QUME

Distributor Network UK and Ireland

P = Printers. V = Video Terminals.
M = Disk Drives.

PV Access Data Communications Ltd
Unit 17 Eskdale Road
Uxbridge Industrial Estate
Uxbridge, Middlesex UB8 2RT.
Tel: 0895 59781

PV Alphatech Computer Systems Ltd
Marlow Road, Bourne End
Buckinghamshire SL8 5SP. Tel: 06285 28237

PV Bytech Ltd
Unit 57 Suttons Industrial Park
London Road, Earley
Reading, Berkshire RG6 1AZ. Tel: 0734 61031

PV Daisy Terminals Ltd
Bridge Road
Haywards Heath, West Sussex RH16 1UA.
Tel: 0444 457546

PV Datac Ltd
Tudor Road, Altrincham
Cheshire WA14 5TN. Tel: 061 941 2361

M Euro Electronics Ltd
Twyman House, 31 Camden Road
London NW1 1YE. Tel: 01-267 5416

P Facit Data Products
Maidstone Road
Rochester, Kent ME1 3QN. Tel: 0634 401721

V Northamber Ltd
Sandown Industrial Estate
Mill Road, Esher, Surrey KT10 9QA
Tel: 0372 68311

PV ISG Data Sales Ltd
Unit 5 Wellington Industrial Estate
Basingstoke Road, Spencers Wood
Reading, Berkshire RG7 1AW.
Tel: 0734 884666

V B.T.S. Technology Ltd. (Unit 12)
St. Pancras Commercial Centre
63 Pratt Street, London NW1 0BY.
Tel: 01-267 7541

PV Teleprinter Equipment Ltd
Akeman Street
Tring, Hertfordshire HP23 6AJ.
Tel: 044282 4011

Printwheels and Ribbons

ISA Ltd (Master Distributor)
80-84 Thornton Road
Bradford, Yorks.
Tel: 0274 306787 & 01-992 3401

Facit Data Products
Maidstone Road
Rochester, Kent. Tel: 0634 401721

Kores Nordic (GB) Ltd
West Road, Templefields
Harlow, Essex. Tel: 0279 20411

Willis Computer Supplies Ltd
P.O. Box 10, South Mill Road
Bishop's Stortford, Herts CN23 3DN.
Tel: 0279 506491

Stylographic Services Ltd
40 Watling Street, Radlett
Herts WD7 7NN. Tel: 09276 4585

Desco Carbon & Ribbon Supplies Ltd
70 Clober Road, Milngavie
Glasgow G62 7SS. Tel: 041 956 1134

Willis Computer Supplies (Ireland) Ltd
15 Windsor Terrace, Dun Laoghaire
Co. Dublin, Ireland. Tel: 0001 801470

Qume®

Qume (UK) Limited,
Bridgewater Close, Reading, Berkshire RG3 1JT.
Tel: Reading (0734) 584646. Telex: 849706

A British Company of ITT

CAMEL PRODUCTS

PROMER-81 * DREAM-81 * POWER SOURCES * MONITOR STANDS * PRINTER STANDS

BLOPROM-81 * ROM-81 * MEMIC-81 * PIO-81 * PIO-SP * MEMIC-81 * CRAMIC-81

BLOPROM-81

A uniquely sophisticated EPROM PROGRAMMER

In use at various labs incl. Sinclair Research

Eprom programmer for the 2516, 27XX single supply families. yes, even the 27128 from Intel. Check, Read, Program + Verify all or part of Eprom.

So immensely user friendly you'll hardly need the manual. Designed for the beginner but includes a single key entry route for the professional. Supplied as firmware, the m/c driver routine alone is worth more than the price of BLOPROM-81. No Personality Cards or other additions, just a ZX81. Several inbuilt safety features. On-board Vpp generation. 28pin ZIF socket. Cabled connector and extender plug. ABS case.

Note: Can provide up to 36 inputs or 40 outputs as an I/O **£79.95**

NEW IN CMOS **MEMIC L.2**

A 4KB 2532/2732 replacement in fast (200nSec) CMOS RAM with Lithium battery backup. 12" cabled connector. For any system with a 24 pin Eprom socket **£35.95**

MEMIC 81.2 for the ZX81

Faster than a Floppy. Easier than an EPROM. A 4K CMOS memory and Lithium battery unit. Saves programmes up to 10 years without external power. Plug it into the ZX81 and flick a switch and your program is ready for retrieval. A simple PRINT USR . . . entry loads your program into RAM. Resides in 8-12K but can be moved to 12-16K. Comprehensive notes + example **£29.95**

CRAMIC-81-2

Banish the Whir, Click and Try again of ZX81 Systems.

16K CMOS RAM and Lithium battery in cabled ABS case, with expansion adaptor.

Powers off the ZX81 when running. Resides in 16-32K. Can be used like an ordinary 16K but can also retain program up to 10 years. Ingenious hardware/software allows swopping of RAMs from program. **£79.95**

PIO-SP

An 8 + 8 line parallel Input/Output card which lests the Spectrum communicate with external systems. Rugged TTL chips used. Connections on 8 pin sockets. Mating connectors supplied. **£18.50**

PIO-81A

As PIO-SP but for the ZX81 **£14.95**

DREAM-81

A 64k with extras.

Full 64K Rampack with link options to disable 0-8-16K. Plus a 28 pin EPROM socket for 2716/2732/2764 and even the latest 27128 from Intel. Fast/slow Eprom option. professionally built and tested. In an ABS case with an LED indicator. **£69.95**

PROMER-81

At last! A low cost reliable programmer for 2516/32, 2716/32 EPROMS. This is the solution to using EPROMs instead of tape. Requires 4 × PP3 batteries for a regulated 25 volts. Remarkably prices at **£19.95**

ROM-81

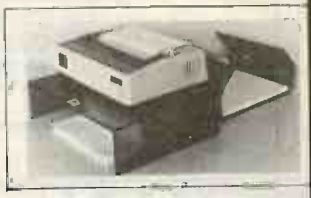
Provides two 24 pin sockets for up to 8K of EPROM memory in the 8-16K area. Eproms are permanent memory which require programmers (see above) to write to them. Can use 2516/32 or 2716/32 **£19.95**

PRINTER/MONITOR ACCESSORIES

MSB Monitor Stand for BBC micro. Sits over the Beeb 17" × 12" × 3.75" P + P £3.50 **£19.95**

PSS Standard printer stands for OKI, Epson etc. 15" × 12" × 4.5" P + P £3.50 **£16.95**

PSL Large model 17" × 14.5" × 3.75" P + P £3.50 **£19.95**



PSC-3 for Epson MX-100 etc. 21" × 14" × 3.75". P + P £3.50 **£22.95**

CUSTOM PRINTER STANDS for larger printers **P.O.A.**

POT Printer Output Tray for 11" fanfold paper P + P £3.50 **£16.95**

UK, VAT extra. No VAT on exports P + P UK, Free Europe + 5% — Overseas + 10%
UK & Worldwide dealerships available.

Cambridge Microelectronics Ltd, One Milton Rd, Cambridge, CB4 1UY *Tel (0223) 314 814*

● Circle No. 133

● Circle No. 132

FOR SALE

EX-RENTAL
RAIR MICROS

WE HAVE A NUMBER OF EX-RENTAL MACHINES AVAILABLE FOR SALE WITH ON-SITE MAINTENANCE AVAILABLE.

PRICES FROM:

3/20A 64K	£750
8MB HARD DISK	£600
3/30A 64K	£1750
3/30S 64K	£2250
3/50 256K	£3000

CONTACT:

JULIE HEWITT ON:- (01)-897 3071

ADPinnsite

HEATHROW HOUSE
BATH RD,
CRANFORD
HOUNSLOW
MIDDLESEX TW5 9QP

● Circle No. 134

A+G COMPUTERWARE

XMAS SPECIALS

ALL THE BEST FROM A+G
Only while stocks Last! A Christmas Gift!
Smith Corona TPI Daisywheel Printer
Serial or Parallel £280! YES! ONLY £280!

BASF DISKS

5¼" S.S.S.D. Box of Ten £15 Only.
Guaranteed for a lifetime with no quibble.
Exchange for any that fail to please.
5¼" S.S.S.D. Box of Ten £20!
8" D.S.D.D.Box of Ten £23!
Don't miss this "Once in a lifetime" offer.
All first quality media. No seconds.

SPECIAL OFFER

Shrink Wrap Super Sealer 240 volt machine.
Up to max 16" width. All film available.
Should cost £1000 — Offer price £275

MONITORS

Phoenix 12" Green Screen HiRes £99. Amber £109.

APPLE SOFTWARE

Send for exciting 1984 List — Lower prices.
Lots of New Items — Bargains Galore!

PRINTERS

Juki 6100 Daisywheel £335! XMAS OFFER
Epson RX80FT £280! ONLY

Full Price Lists and Brochures on request.
Just a phone call away.

Govt. & Educ. Orders welcome.
Fast delivery by Interlink — Carriage £8 —Disks £1 per order.
Please add VAT to all totals.

P.O. Box 34, Cheadle, Cheshire, SK8 4PT
Telephone 061-428 2014

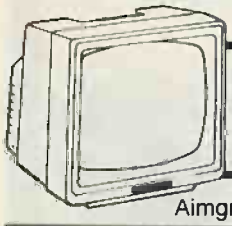
● Circle No. 135

AIMGRAM: FOR UNBEATABLE PRICES

CHOOSE FROM THE WIDEST RANGE OF LOW COST PERIPHERALS – ALL EX-STOCK

For printers; monitors; Apple interfaces; ribbons; diskettes and a host of micro accessories.

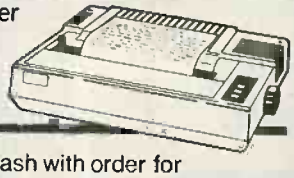
If you want peripherals fast and at the lowest prices around, ring Aimgram first.



Kaga green monitor
FROM ONLY
£87
(Exc VAT & carriage)

One look at these two examples from our range will show you what we mean!

Epson RX80 printer
FROM ONLY
£239
(Exc VAT & carriage)



Please send cash with order for immediate delivery, or ask for our complete price list.

Aimgram Ltd, 31 Roman Gardens, Kings Langley, Herts WD4 8LG

OTHER EXAMPLES FROM OUR RANGE

EPSON PRINTER PRODUCTS	
Epson FX80 Dot Matrix (160 cps) Printer	£359.00
Epson MX100 Type 3 Dot Matrix (100 cps) Printer	£399.00
Epson FX100 Dot Matrix (160 cps) Printer	£479.00
Epson RX80FT Dot Matrix (100 cps) Printer	£269.00
KAGA MONITORS AND ACCESSORIES	
Kaga 12" Amber Monitor (Hi-Res)	£95.00
Kaga Medium Res 12" RGB Colour Monitor	£189.00
Kaga High Res 12" RGB Colour Monitor	£228.00
Kaga Super High Res 12" RGB Colour Monitor	£319.00
STROBE PLOTTER	
Complete System inc. BBCPlot Software	£349.00
Complete System: inc. Interface for Apple II/IIe and 'AppPlot' Software	£379.00

All prices exclude VAT and carriage

PHONE 09277 68211
FOR LOWEST PRICES AROUND

STOP PRESS!
Dysan floppies from around £20 (box of 10)

● Circle No. 136

'Get it right at Laskys...

Games, business, education, word processing, accounting... The amazing potential of micro computers is virtually limitless, so you need the right advice in order to find exactly the right machine for you. At Laskys we have a specialist micro department called Micropoint, where we can help you to analyse your requirements and experiment with everything from the simplest to the most sophisticated equipment.

A choice of easy ways to pay, free 2 year guarantee, a commitment to exchange products if you are not completely happy and, of course, a nationwide after sales service. You can't buy micro anywhere better than Laskys – who else offers you so much?

Micropoint at Laskys

ATARI 400

£129.90

Home computer with 16K memory. Spill proof keyboard. Superb graphics. Colour and sound, includes Basic program kit.

FREE ATARI 410 CASSETTE PROGRAM RECORDER FOR LOADING AND STORING PROGRAMS. USUAL PRICE £49.90

APPLE IIe PROFESSIONAL HOME COMPUTER PACK

PLUS VOUCHERS WORTH OVER £100 FOR PROGRAMS & ACCESSORIES.

£998

A sophisticated micro with amazing scope for home and office.

64K memory, disk drive, RF modulator enabling you to use your existing TV as monitor, includes Owners Pack.

LYNX 96K

Compact powerful 96K home unit at a budget price. Colour, sound and graphics. Compatible with most cassette players. £298

Lynx Parallel Printer Interface £49.90
Lynx Serial Printer Interface £3.90

Recommended Epson printers for Lynx
Epson FX80 £498
Epson MX100/3 £539
Epson RX80 £349

EASY WAYS TO PAY
ASK IN STORE FOR DETAILS

All credit offers subject to acceptance by Lasky's Credit Brokers. Ask for written details. Prices correct at time of going to press, but may be subject to variation. All offers subject to availability. Prices include 15% VAT. Except portable equipment one year. Computer peripherals, programs one year (Commercial use on computer & VDU one year. Peripherals programs 6 months.)

LASKYS
The Home Entertainment Specialists

ALL MAJOR CREDIT CARDS ACCEPTED

XMAS & NEW YEAR OPENING HOURS
(Mon 5th Dec – Mon 9th Jan)
ALL STORES
9am – 7pm (Mon-Fri)
9am – 6pm (Sat)
Sat 24th Dec closes 4pm
Open Mon 2nd Jan
QUEENSWAY & GOLDERS GREEN
OPEN EVERY SUNDAY
11 am-7pm

LONDON & HOME COUNTIES
42 Tottenham Court Road W1
257 Tottenham Court Road W1
7-9 Queensway W2
open Sunday 11 am - 7pm
471-473 Oxford Street W1
Golders Green Road NW11
BEXLEYHEATH 15-16 The Broadway
BROMLEY 22 Market Square
COLCHESTER 12 Trinity Square
CROYDON 77-81 North End
ENFIELD 46-48 Palace Gardens
KINGSTON Eden Street
LUTON 192 Arndale Centre
READING Friar Street
RICHMOND Hill Street
ROMFORD South Street
SLOUGH Queensmere Centre
WATFORD Charter Place
SOUTHERN ENGLAND
BRIGHTON 151-2 Western Road
BRISTOL 16-20 Penn Street
CHATHAM 8 The Pentagon
GLOUCESTER 25 Eastgate Street
MAIDSTONE 79-81 Week Street
SOUTHEND 205-206 Church'd West
MIDLANDS AND NORTH
BIRMINGHAM 19-21 Corporation St
CHESTER 7 The Forum
LEEDS 28-34 Albion Street
LEICESTER 45 Market Place South
LIVERPOOL 33 Dale Street
157 St John's Precinct
MANCHESTER
12-14 St Mary's Gate
NEWCASTLE UPON-TYNE
6 Northumberland St
NORTHAMPTON 78 Abington Street
NOTTINGHAM 1-4 Smithy Row
OXFORD 16 Westgate
PETERBOROUGH Queensgate Centre
PRESTON Guildhall Arcade
SHEFFIELD 58 Leopold Street
WOLVERHAMPTON 2 Wulfrun Square
YORK 10a Coney Street
SCOTLAND
EDINBURGH 4-6 St James Centre
GLASGOW 66-70 Buchanan Street
WALES CARDIFF 122 Queen Street

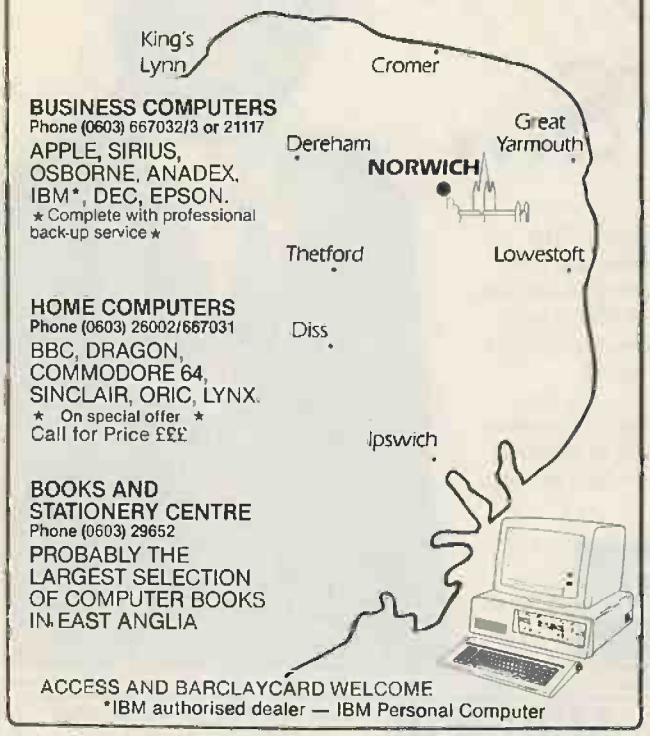
Watch out for new Laskys Stores opening soon in Ealing, Southampton, Brent Cross, Cambridge and Exeter.

● Circle No. 137

Anglia Computer Centre

88 ST BENEDICTS STREET NORWICH NR2 4AB
TELEX 975201 ACOMP G

SPECIALISTS IN BUSINESS COMPUTERS



BUSINESS COMPUTERS
Phone (0603) 667032/3 or 21117
APPLE, SIRIUS, OSBORNE, ANADEX, IBM*, DEC, EPSON.
★ Complete with professional back-up service ★

HOME COMPUTERS
Phone (0603) 26002/667031
BBC, DRAGON, COMMODORE 64, SINCLAIR, ORIC, LYNX.
★ On special offer ★
Call for Price £££

BOOKS AND STATIONERY CENTRE
Phone (0603) 29652
PROBABLY THE LARGEST SELECTION OF COMPUTER BOOKS IN EAST ANGLIA

ACCESS AND BARCLAYCARD WELCOME
*IBM authorised dealer — IBM Personal Computer

● Circle No. 138

STOCK TAKING SALE

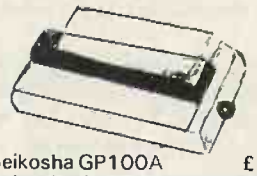
ACT Sirius 1 — olivetti Praxis 35

only £385

* Daisywheel Electronic Typewriter Printer
* Centronics Interface
* Correction Ribbon
* Choice of Typefaces

128K RAM. 1.2 Mb CP/M & MS DOS operating systems. only £1850
Other printers at unbeatable prices

+ two free cassettes £139

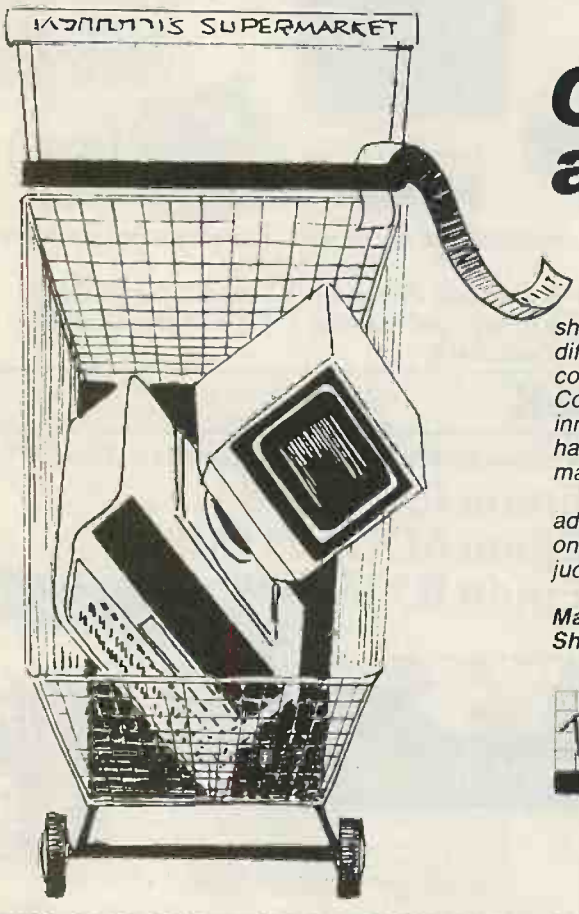


Seikosha GP100A	£170
Seikosha GP250X	£220
Epson RX80	£260
Epson FX80	£360

Add VAT but Delivery is Free

ASCO BUSINESSES
43 Windmill Way, Reigate, Sy RH2 0JB Tel: (07372) 48055

● Circle No. 139



Cash and carried away?

Some people are trying to promote self-service computer shopping. It would be a mistake to get carried away, there's a difference between frozen peas and peripherals! In selecting a computer to perform the functions you need, The Leeds Computer Centre can help you. They are responsible for innovations approved by the major computer manufacturers and have developed their own computer systems sold on overseas markets.

The Leeds Computer Centre is ideally qualified to offer you advice and consultations. Along with this, they can show you not only the newest on the computer scene but what in their judgement represents the best quality and value.

Main dealers for:-
Sharp, Epson, Gemini, Quantum, Nascom & Dragon

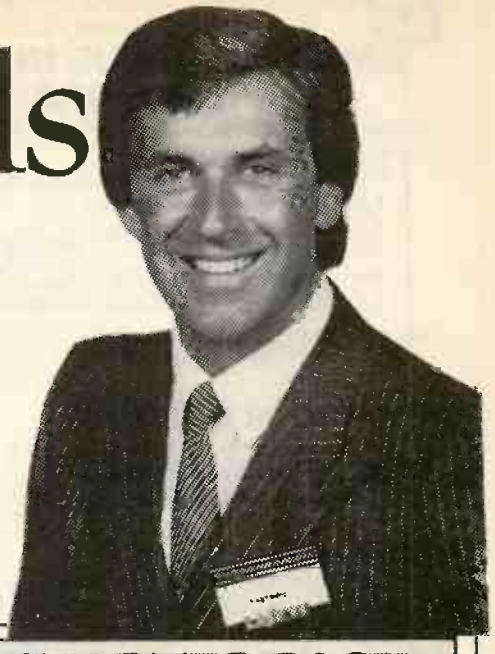
The LEEDS COMPUTER CENTRE

BITS : P.C.S COMPUTER PRODUCTS LTD

55 Wade Lane, Merrion Centre, Leeds LS2 8NJ Tel (0532) 458877

● Circle No. 140

...nobody sells micros better.'



Micropoint
at Laskys

ATARI 600XL

£159.90

New Home Computer with 16K memory. Full size keyboard plus help key (for additional information and menu screen) superb graphics, colour and sound. Compatible with all Atari home computer Software.

VIC 20 STARTER PACK

£139.90

Includes VIC 20 5K computer, C2N cassette recorder for loading & storing programs, & cassette software which includes Introduction to Basic Part 1, Blitz, Hoppit, Race & Type-a-Tune!

COMMODORE 64K

A home computer with a full size keyboard. Powerful 64K memory, sprite graphics, colour and sound.

£229

ORIC 48K

A home computer with 48K memory, ergonomic keyboard, colour/sound graphics.

Oric MCP40 Printer £169.90.

£139.90

DISK DRIVE 1541 £229

WITH FREE EASY SCRIPT WORD PROCESSING AND GAMES SOFTWARE. (USUAL PRICE £75.)

LASKYS SOFTWARE SELECTION

DISCOVER OUR MASSIVE RANGE OF SOFTWARE IN STORE! ALL THE LATEST TOP TITLES FOR ALL THE POPULAR FORMAT MACHINES

EASY WAYS TO PAY
ASK IN STORE FOR DETAILS

*All credit offers subject to acceptance by Laskys Credit Brokers. A.a.a. for written details. Prices correct at time of going to press, but may be subject to variation. All offers subject to availability. Prices include 15% VAT. **Except portable equipment one year. Computer peripherals, programs one year. (Commercial use on computers, VDU one year. Peripherals, programs 6 months.)*

LASKYS
The Home Entertainment Specialists

ALL MAJOR CREDIT CARDS ACCEPTED

XMAS & NEW YEAR OPENING HOURS
(Mon 5th Dec – Mon 9th Jan)
ALL STORES
9am – 7pm (Mon-Fri)
9am – 6pm (Sat)
Sat 24th Dec closes 4pm
Open Mon 2nd Jan
QUEENSWAY & GOLDERS GREEN
OPEN EVERY SUNDAY
11 am-7pm

LONDON & HOME COUNTIES
42 Tottenham Court Road W1
257 Tottenham Court Road W1
7-9 Queensway, W2
open Sunday 11am-7pm
471-473 Oxford Street W1
Golders Green Road NW11
BEXLEYHEATH 15/16 The Broadway
BROMLEY 22 Market Square
COLCHESTER 12 Trinity Square
CROYDON 77 81 North End
ENFIELD 46-48 Palace Gardens
KINGSTON Eden Street
LUTON 192 Arndale Centre
READING Friar Street
RICHMOND Hill Street
ROMFORD South Street
SLOUGH Queensmere Centre
WATFORD Charter Place
SOUTHERN ENGLAND
BRIGHTON 151-2 Western Road
BRISTOL 16-20 Penn Street
CHATHAM 9 The Pentagon
GLOUCESTER 25 Eastgate Street
MAIDSTONE 79-81 Week Street
SOUTHEND 205-206 Churchill West
MIDLANDS AND NORTH
BIRMINGHAM 19-21 Corporation St
CHESTER 7 The Forum
LEEDS 28-34 Albion Street
LEICESTER 45 Market Place South
LIVERPOOL 33 Dale Street
157 St. John's Precinct
MANCHESTER
12-14 St Mary's Gate
NEWCASTLE UPON-TYNE
6 Northumberland St
NORTHAMPTON 78 Abington Street
NOTTINGHAM 1-4 Smithy Row
OXFORD 16 Westgate
PETERBOROUGH Queensgate Centre
PRESTON Guildhall Arcade
SHEFFIELD 58 Leopold Street
WOLVERHAMPTON 2 Wulfrun Square
YORK 10a Coney Street
SCOTLAND
EDINBURGH 4-6 St James Centre
GLASGOW 66-70 Buchanan Street
WALES CARDIFF 122 Queen Street

Watch out for new Laskys Stores opening soon in Ealing, Southampton, Brent Cross, Cambridge and Exeter.

• Circle No. 141

CHILTERN ELECTRONICS
THE MONITOR SPECIALISTS

AMAZING VALUE IN VIDEO MONITORS

Professional quality equipment by AGC Corp ideal for your micro

Look at these features:

* Superb resolution for graphics, 80 col., etc.
* Bandwidth 10hz - 22Mhz
* Green Screen P31 phosphor
* Antiglare tube
* Attractively styled case
* Composite video, Mains operation

DEALER ENQUIRES WELCOME

Available in 9" Model HM911 . . . . £85
12" Model HM123 . . . . £89
Add £5 carr. & VAT

RGB COLOUR MONITORS

Superb quality at unbeatable low prices
By Electrohome, Canada
13" Standard Resolution Model 1301/1 . . . £209
13" High Resolution Model 1301/2 . . . £299
Microvitec Club
14" Standard Resolution Model 1431 . . . £244
14" High Resolution Model 1441 . . . £450
Add £8 carr & VAT

FANTASTIC KEYBORD BARGAIN!!

Scoop purchase allows us to offer a 49 key QWERTY layout, ASCII encoded keyboard. Fully cased, used but guaranteed working. Full logic diagrams and information supplied.

ONLY £15

Add carriage £1.85 and VAT
Educational discounts. ACCESS welcome. Same day despatch.
Call Gary Kent on 02407 71234

HIGH STREET, CHALFONT ST GILES, BUCKS HP8 4QH Telex 262284

● Circle No. 142

OUR DUST COVERS LOOK OLD VERY QUICKLY

But given the choice between your computer equipment, which cost hundreds or thousands of pounds, and our DUST COVERS which only cost a few pounds, we know which you would prefer to look old first.

Manufactured from ANTI-STATIC and FLAME RETARDANT PVC, specially made for Crown Dust Covers to cover computer equipment.

Each cover will pay for itself many times over, reducing use of expensive cleaning materials and substantially increasing the trade-in value when you up-grade the system. Dust build up on sensitive internal components can also cause break down and expensive repair bills.

DUST COVERS AVAILABLE FOR ALL MAKES AND MODELS
For further details write or phone us.

Crown Dust Covers
11 RAILWAY TERRACE
KINGS LANGLEY
HERTFORDSHIRE WD4 8JB
Tel: Kings Langley
(09277) 65979
Make Ideal Christmas Presents for the Home User

● Circle No. 143

LONDON COMPUTER CENTRE

8/16 bit SOFTWARE
The comprehensive range includes

WORDSTAR £235
SUPERCALC II/III £190

WORD PROCESSING	£
Spellbinder	290
Peach Pack*	332
Spellstar	134
Maillist	50
Grammatik	85
FINANCIAL PLANNING	
Plannercalc	85
Supercalc I	130
Multiplan	170
Lotus 1-2-3	357
D BASE CORNER	
FastBase	150
Autocode	195
Quickcode	205
Dgraph	190
Friday	185
Infostar	266
UTILITIES	
Sid £60, ZSid £76, Mac £133	

D BASE II £349
SPELLING CHECKER £80

LANGUAGES	£
MBasic	215
MBasic Compiler	235
C Compiler	330
Fortran 80/86	325
Cis Cobol/Forms2	399/105
Pascal MT+	240
Pascal MT+*SSP	350
ACCOUNTING	
Pegasus from	250
Peachtree from	325
Tabs from	199
Exact	500
Pulsar	395
COMMUNICATIONS	
Bstam	130
Crosstalk	135
Moveit 80/86	90/105

*Incl. PeachSpell/Maillist
Please telephone for the LCC Software Catalogue

FORMATS: Superbrain, Televideo, Sirius, Sanyo, Osborne Northstar, 8" SD, DEC, Epson QX-10, IBM *ICL, H-P, XEROX, ALTOS.*
All prices are exclusive of VAT

New! The fast and easy way to generate your own dBase 11 Applications programs – use fastBase. £150.

* only fastBase allows 7 index files per data base, all others allow 1 index file
* only fastBase allows report generation on 3 files others 1 file
* fastBase Structures Command files with indentations allowing maximum speed in execution
* fastBase uses a series of on-screen prompts and Help Menus to lead you through the process of generating *your own* dBase 11 Command files.

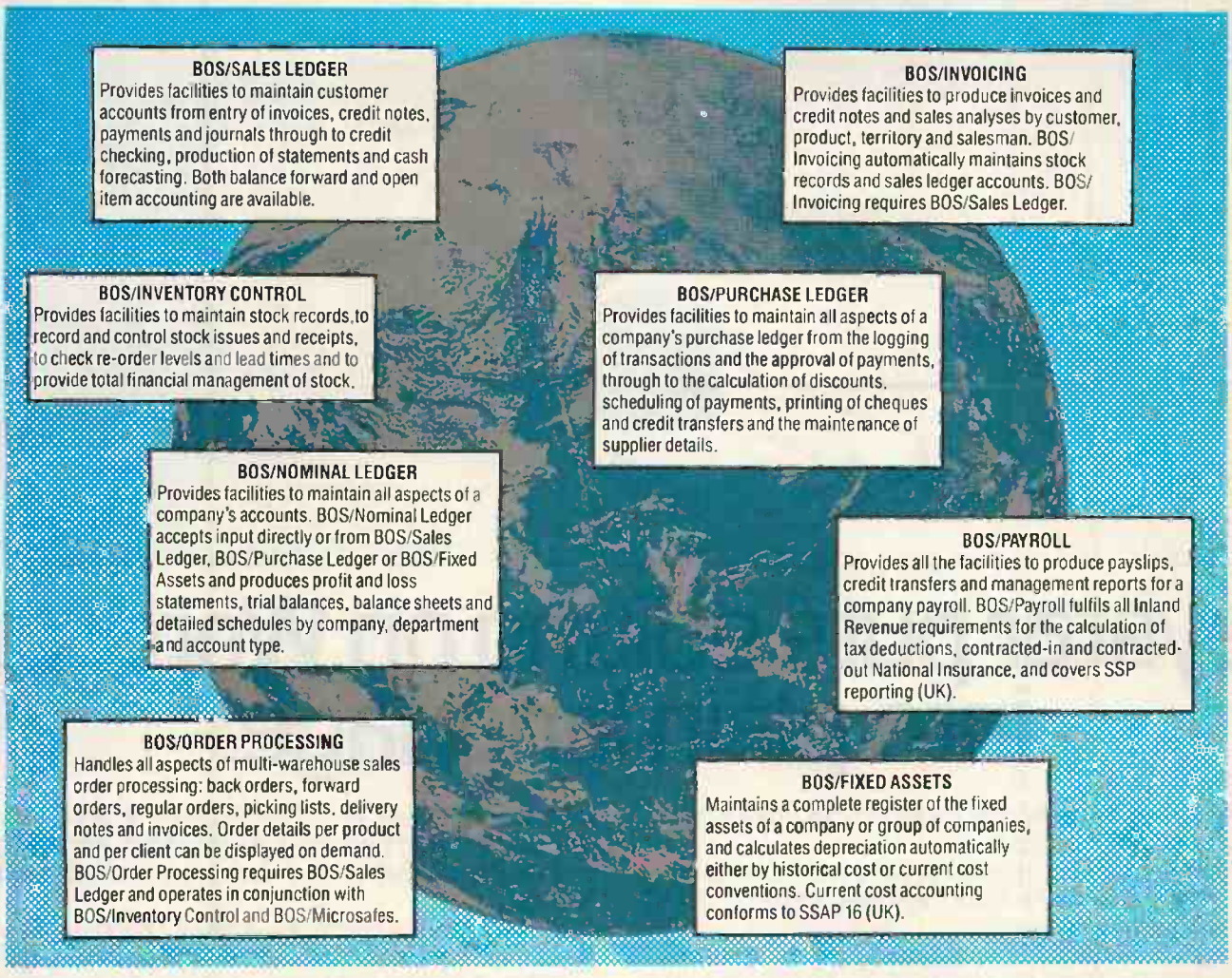
Demonstrations on all software daily – call in or order by mail.

43 Grafton Way, London W1P 5LA (Opposite Maples)
Opening Hours: 10-7 Mon-Fri. 12-4 Sat.
01-387 4455 (4 lines) Telephone Answering Service After Office Hours
Telex: 8953742

● Circle No. 144

BOS SOFTWARE

SERVING THE BUSINESS WORLD



BOS Software's extensive experience in international software satisfies the needs of our clients, not only in the UK, but throughout the world.

Choose **BOS Business and Office Software** and you will be buying not only the most comprehensive quality range of software available for the micro market, but also **BOS Software's** five years of international experience.

BOS Software is supplied in the UK by MPSL.

For further details of **BOS Software** complete this coupon, clip to your business card or letterhead and return to **MPSL.**

MPSL, 87-89 Saffron Hill,
London EC1N 8QU, England.
Telephone: 01-831 8811 Telex: 22763

BOS
BUSINESS OPERATING SOFTWARE

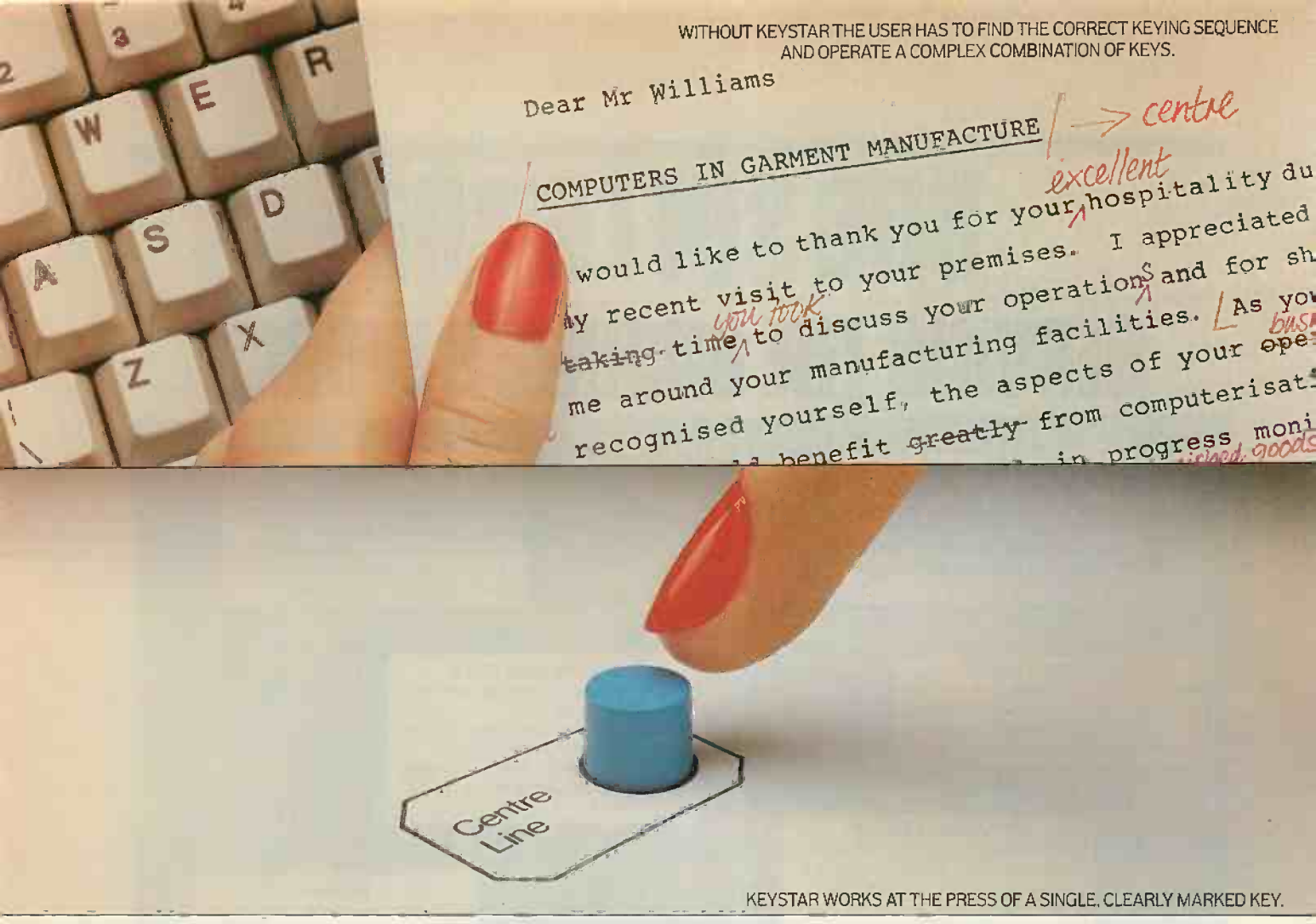
Name

Company

Type of Computer

PC 12/83

● Circle No. 145



Keystar™ puts editing on Wordstar™ into plain language.

Is your secretary the only person in your office who can talk to your word processor?

Wordstar is by far the most popular word processing program available. But, like all such systems, it takes time and practice to learn its language.

Keystar now puts the whole office on speaking terms with Wordstar. Good news for those of us who have to work late on that vital report. And for the temp who started yesterday. (We like to think that it will also add a whole new dimension to your secretary's relationship with Wordstar.)

Keystar makes Wordstar immediately accessible by providing fifty-six of its editing commands as colour-coded buttons, each labelled in plain English.

Press the appropriate Keystar button; Wordstar performs as commanded. And since there is no need to display help menus, there is fifty per cent more room on the screen for your documents.

Make Wordstar work for you! Contact your nearest Keystar dealer or order direct by completing and returning the order coupon.

For the technically minded, Keystar connects easily to your microcomputer via an RS232C/V24 serial port. This port can be shared with other devices and on some systems, for example, Cromemco and Altos the device would naturally be the V.D.U.

On integral systems, e.g. Apple II, Osborne, RML380Z, Superbrain, Act Sirius/Victor 9000, IBM PC, the device could be a printer, a plotter or a modem and special instructions are provided to direct Wordstar to recognise the presence of Keystar on such systems.

To: WMI PRODUCTS, INTEGRATED MICRO APPLICATIONS LTD., 21 LANSDOWNE CRESCENT, EDINBURGH EH12 5EH

Please send me _____ Keystar units at £231.75 per unit (price includes VAT, carriage and insurance).

I will be connecting Keystar to a _____ microcomputer.

I enclose a cheque/postal order for £ _____ made payable to 'WMI Products.'

Please debit my Access Card No _____ for £ _____

Visa Card No _____ for £ _____

Signature _____

Name _____

Address _____

Tel. No _____

Dealer enquiries welcome. Telephone 031-225 3141 ask for Jim Wheatley.

Please allow 28 days for delivery. VAT No. 270769925.

Integrated Micro Applications Ltd reserve the right not to accept any order. Any acceptance will be subject to Integrated Micro Applications' terms and conditions.

Wordstar is a registered trademark of Micropro Corporation International.

● Circle No. 146

Plan 2000 network

ZYNAR, already well known for networking Apples, has launched Plan 2000 to network IBM PCs, as long as at least one of them is the XT. This hard-disc model provides 10Mbyte of storage to be shared by all the PCs on the network. The system is based on the well proven Arcnet system pioneered by Datapoint and also used by the new LSI Octopus, as well as Tandy, Wang and Zenith. The Plan 2000 development has, however, been done in the U.K., partially funded by a grant from the Department of Industry under the MAP project-support scheme.

The Plan 2000 starter system includes a card each for two PCs, plus the coaxial cable to link them together, and this costs £1,475. Further PCs can then be added at a cost of £475 each, up to a maximum total of 255 work stations.

Before this level is reached, however, the system will have been upgraded to the Plan 4000, with a 137Mbyte hard disc as a file server. Plan 4000 has been on sale since January, and supports Apples too.

The network allows PCs to swap files or data, send electronic mail, and share system resources such as hard discs, printers, telex and modem links.

Contact Zynar Ltd, 122/3 High Street, Uxbridge, Middlesex UB8 1JT. Telephone: Uxbridge (0895) 59831.

PC Flashes

● **Landsoft** has upgraded its popular payroll package for the Commodore to Payroll 3 for the IBM PC. Telephone: 01-878 7044/7.

● **Pete & Pam** is now importing Type Faces, a program from the Alpha Software Corporation of Burlington, Mass, which provides 15 type styles on the Apple II and IBM PC. The program supports Epson MX and IDS printers and costs £99 plus VAT. Telephone: Rossendale (0706) 227011.

● **Simon Computers Ltd** sells add-on cards for the Apple II and Sirius 1. Now Simon has a RAM expansion board with an asynchronous serial port for the IBM PC. Prices are from £180 for 64K to £305 for 256K, plus VAT in each case. Telephone: 01-680 4646.

● **Aptec,** Appropriate Technology Ltd, has enhanced and expanded its bilingual Arabic/English software. Arabstar 2 is Aptec's enhanced word-processing package. Arabforms for forms generation and a relational database called Arabdbase, have been added. Telephone: 01-328 7272.

Big Blue's profits up 25 percent

IBM MADE $1.3 billion profit on turnover of $9.4 billion during the third quarter of 1983, ending 30 September, according to chairman John Opel. This was mainly due to soaring hardware sales of $5.29 billion, up 40 percent on the same period last year. IBM's rental earnings, however, were down by nearly 20 percent. Massive sales of the PC in America must also have been a factor. These figures translate into £867 million profit on £3,527 million sales in real money.

Graphics card

THE STANDARD IBM PC comes with a monochrome card and printer, which can be a little tricky if you want to run a program using colour graphics. Reflex Ltd has the answer in the form of the Hercules graphics card. It replaces the mono card and allows colour graphics to be displayed — in mono, of course — on the standard monochrome screen. Thus it becomes possible to use the facilities of programs like Lotus 123 and Supercalc-3 without splashing out on a colour monitor. The mono Hercules costs £395.

Contact Reflex Ltd, Wellington Industrial Estate, Basingstoke Road, Spencers Wood, Reading RG7 1AW. Telephone: Reading (0734) 884611.

Making a connection

IN 1981 a company called The Legal Connection merged with Fountain Management Services to form The Professional Connection. Fountain had Trial — Time Recording and Integrated Accounting for Lawyers — to run on IBM minis, and the new company started distributing software for the IBM Displaywriter too. Now it has added an IBM PC connection.

The Professional Connection claims exclusive distribution rights for Dataease, an IBM PC database which is part of the "-ease" series from Software Solutions Inc. Dataease requires 128K of RAM and costs £450.

Another Professional Connection package is the word processor Palantir, from Designer Software. It is easy to use, includes mailing facilities and costs £240.

Also in the catalogue are the Easy series from Information Unlimited; the Chang Laboratories range of Docuplan, Memoplan, Microplan, Graphplan, Dataplan and Fileplan, plus the usual Peachtree and Visi ranges.

Hardware available includes a mouse plus the Big D disc drive. The 8in. drive is designed to run alongside the IBM PC's 5.25in. floppy, so you can transfer files to the smaller format. That could be useful if you have an IBM Displaywriter, 4300, System 38 or 34 or 23 or similar, but with a price of £1,495 it is not a toy.

The Personal Computer Connection, part of The Professional Connection, is at the Old Manor House, Wickham Road, Fareham, Hampshire PO16 7AR. Telephone: Fareham (0329) 230870 or 239025.

IBM Robots

IBM (UK) has announced two high-precision robotic systems that can be programmed using the PC. Each has a servo-controlled, jointed arm. Programing is done in the AML/Entry Version 2 programming language. The robots cost £21,559 and £27,399 and are built in Tokyo by Sankyo Seiki.

MICROSOFT WORD

Even without a mouse, this package has plenty to teach the others; with one, Chris Bidmead found it was like a month of birthdays.

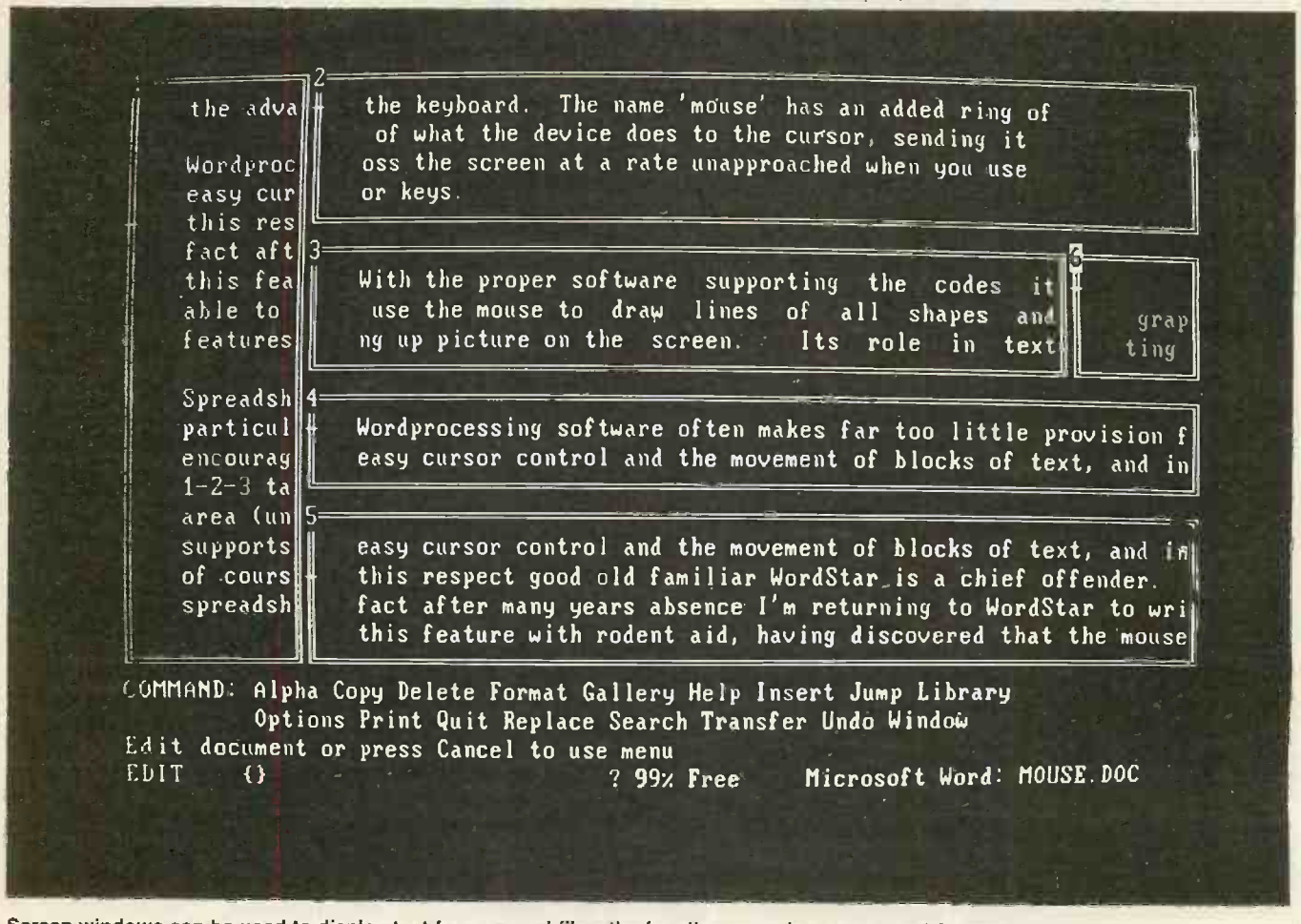
WORDSTAR, Memorite, Wangwriter, Perfect Writer, Peachtext, Spellbinder and similar extensions to journalistic fingertips have been pretty thoroughly digested in this office over the years, so excitement over a new word-processing package is rare. But I am euphoric about Word — also rather clumsily known as Multi-Tool Word — the latest fruit of the current 16-bit burst of creativity by Bill Gates and his team at the Microsoft Corporation of Belleveue, Washington.

Here is a deep-down, thoroughly designed package. It has a smooth and presentable user interface that will not frighten away beginners, but concealing an array of dazzling functions that can be unfolded one by one in the user's own time, like a month of birthdays. Word looks like being the writing aid that we writers, journalists, typists, managers and all have been waiting for ever since micros became affordable.

You will find some criticisms in the eulogy that follows, criticisms expressed as disappointments. Take them as a compliment to the package. It is so good it deserves to be better. And bear in mind that what I looked at was the Beta test version of the software.

Word is superficially a WYSIWYG word-processing system — what you see is what you get. It is a school of thought exemplified — though far from perfectly — in good old reliable WordStar. In WYSIWYG word processors the display on the screen shows more or less how you can expect to see the text when it is printed out. This is certainly true of Word. But internally Microsoft's new offering incorporates many of the features of a diametrically different approach known as Emacs.

One of the driving ideas behind the Emacs word-processing system, originally developed at the MIT artificial-intelligence lab, is that what appears on the screen is important only in respect of its content. Formatting is a function of printing, and should not bother the head of the programmer or creative writer using the package. His or her primary concern is to get around the text quickly, access and edit several texts at the same time, and generally treat the screen as if it were an electronic desk top on which papers can be shuffled. Later, when the time comes to produce hard copy, format codes embedded in the text will make calls on a library of ready-made formatting instructions, guiding the layout with no further human intervention.



Screen windows can be used to display text from several files; the four-line menu is a permenant feature.

The Emacs philosophy has many advantages for the experienced user, but is hard to sell to newcomers, who find the "glass typewriter" aspects of WYSIWYG software more instantly reassuring. But in going the WordStar route they sacrifice:

- The facility to alter the entire file format quickly and simply by changing the style instruction at the head of the text.
- The ability to move around the text, and move the text around, in logical increments of character, word, sentence, paragraph, rather than the physical increments of row, column and screen.
- The opportunity to work on more than one file at the same time.

Emacs offers all this and more. Now Word has it too — libraries of format styles, multiple buffers, the lot — but bundled cleverly into the lower reaches of the software where the complexity will not interfere with the beginner's sense of control over the package.

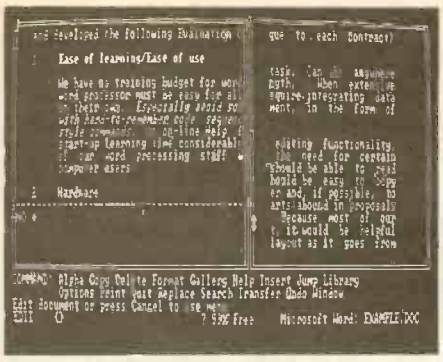
When you first bring up Word a bordered window appears, occupying most of the screen but leaving four lines at the bottom for the menu. The window is empty except for a cursor positioned in the top left-hand corner. The cursor appears to have a hollowed-out diamond in the centre, but in fact the diamond is the end-of-text marker, a separate symbol overlaid at the moment by the cursor.

You type in the text as you would on a typewriter. Automatic word wrap takes care of line endings, and you only need hit Return when you get to the end of the paragraph. Elementary correction works as you might expect, with the Backspace key wiping out text as the cursor moves to the left. When the screen fills, a very fast scroll clears it and puts the last few lines at the top.

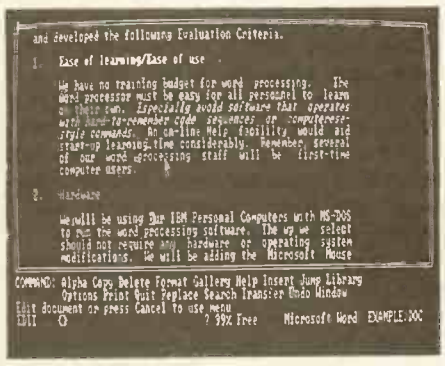
Simple editing is almost as easy, using the cursor keys supplemented by the Page Up and Page Down keys to go back to mistakes. WordStar and Word both sensibly forbid the cursor to stray outside the area of text but, in a welcome departure from WordStar's cursor handling, the Word cursor travels intelligently up and down, tucking in towards the left margin to follow short lines, but remembering its original column when line length permits.

By default the editor is in insert mode, so text to be replaced has to be deleted first, using the standard Delete key. If inserted characters increase the length of any line beyond the margins readjustment of the paragraph takes place automatically. You do not have to tidy edited paragraphs manually, as in WordStar.

Up to this point the system behaves like a super-typewriter, and there is nothing to alarm the moderately experienced typist. If you have already used word processors like WordStar moving, deleting and copying blocks of text should raise no difficulties either as it is actually simpler. Instead of visible block markers, Word appears to stretch the cursor to highlight the area of text you are selecting. Delineating a logical



Horizontal bars show where windows fall.



The mouse adds an extra cursor.

unit of text — a word, a sentence or a paragaph — is even simpler as an IBM function key is set aside for each function.

Unlike WordStar, Word does not lose deleted text. Instead it is sent to a special buffer area called Scrap, from which it can be recalled simply by hitting the Insert key. This elegant idea imported from Emacs means that there is no essential difference between deleting and shifting text around.

The same concept is extended naturally to create a glossary function. Instead of the default deletion to Scrap you can slice away sections of text and store them in named buffers for instant recall later. So instead of having to type

Yours disgustedly,
Major Philip J. Ffolks-Appleby (rtrd),
The Old Granary,
Wittering-cum-Lowdly,
Nr Tunbridge Wells,
Kent

at the end of all my letters to *The Times* I can squirrel the lot away in a buffer called Bye, where it lurks for instant recall. The glossary system lets me create a whole set of such abbreviations and file them for later use.

Experiment with all this awhile, and you will be able to write, edit and print simple documents. Progress is fast because you can try out new functions without any fear of doing permanent damage to your text, thanks to the Undo command that reverses the last action you took. But at this stage you will barely have scratched the surface of what Word can do. The awesome power of the package starts to unfold when you investigate how it handles formatting.

In standard Emacs a format instruction like

@begin(quotation)

makes no change to the screen layout, but is read by the formatting routine run immediately prior to printing. It will be understood as a command to switch in the appropriate left and right margins and observe other format conditions like line spacing, all of which add up to what is called the "environment". This particular environment would be switched off again by the instruction

@end(quotation)

In Word, instead of being bracketed between @begin and @end statements, environment codes are stored invisibly at the end of every paragraph and every division. A division is a section of the text established by the user, perhaps to demarcate chapters of a book or separate a preface from the main body of an article.

The environments are defined by the user in a separate part of the software called the gallery, accessed by way of the main menu. The gallery can be used to establish a number of environments. Each one is given one- or two-character codes so that the gallery can store freeze-dried formats just as the glossary stores canned instant text.

In Edit mode you enter the code by holding down Alt while hitting the appropriate character keys. The code may or may not appear in the left-hand margin of the text window, depending on your choice, but either way the screen changes instantly to reflect the way the text will print out.

The environments and their definition codes can be stored in a style library, grouped according to context. People who spend their time writing articles, reports, memos and letters tend to develop an individual way of laying out each job. Word allows you to have style files called, for example, Article, Report, Memo, Letter, and attach the appropriate one to the file you are working on. This way the person generating memos need only to think about the layout once in a lifetime, not every time one is typed.

The next logical step in the exploration of Word is to start splitting the screen up into windows. A window is simply a bordered section of the screen in which text is handled independently from the other windows, and you can have up to eight of them. The most easily graspable application is when a special window — normally, but not necessarily, at the bottom of the screen — is reserved for collecting footnotes. You might also use the idea to look at two parts of a text simultaneously, for example when moving a paragraph from the end to the beginning of a long document.

You can take the window idea further by attaching different text files to different windows. Grasshopper minds can edit several separate documents at the same time. More orderly authors can move text between documents or use one window to scribble notes on while developing the argument in full on another.

All this works well enough using the basic IBM hardware. The review was run

(continued on next page)

MICROSOFT WORD

(continued from previous page)

on an IBM XT, but the hard disc makes no spectacular difference to performance because Word keeps all its text in memory. Few people work with text files longer than a couple of dozen pages, but if you have an urge to create really large documents, enhancing the IBM to 256K will give you all the space you need to handle over 40,000 words.

A significant difference to Word comes when you plug in the high-resolution graphics board. With the appropriate monitor this will give you colour, and Word is equippped to use this feature to help differentiate between the windows. I find colour monitors excruciatingly eye-aching to work with for any length of time, but the real advantage of high-resolution graphics is that it will enable Word to show italics, underline, double underline characters and the rest of the character enhancements exactly as they will appear in print. On the normal IBM mono screen all enhanced text apart from bold print, which appears highlighted on the screen, is simply displayed in the underlined form. One small bug in this section leaves underlined sections of the text semi-highlighted when the cursor passes over them.

Of course the add-on that really zips up Word's performance is Microsoft's new mouse, which is hardly surprising as the two were conceived together. I have avoided mentioning it so far to make clear that Word is a perfectly viable proposition on its own, but rodent control certainly adds a new dimension.

Unlike some mice, which take over the existing cursor, Microsoft's adds a second, smaller cursor to the screen. It can still be used to give the text cursor a kind of seven league boots to stride over miles of prose with the flick of a wrist, but it has the added advantage of being able to stroll all over the screen, and outside the text window on to the menu. By rolling the mouse cursor across to the appropriate word on the menu and clicking one of the two buttons, any of the listed functions can be summoned without recourse to the keyboard.

The borderlines that box in the windows are also sensitive to a tickle from the mouse. Placing the mouse cursor a certain distance along the left-hand vertical or the lower horizontal of the frame and pressing a button make the text in the window scrolls vertically or horizontally to an extent proportional to the distance. Press the other button and it scrolls the same distance in the opposite direction. The mouse can also summon the text cursor from one window to another, and directly split and recombine windows. Without the mouse window management has to be organised through the menu and is a little cumbersome.

Thanks to the clarity of WYSIWYG, printing out text prepared by Word holds no terrors. The only area of doubt — which will delight WordStar devotees — is that Word is unable to display page breaks dynamically. If you want to know where they will appear you have to run a Repaginate routine, which for a long file means a few minutes of thumb-twiddling while internal goblins go through the text inserting arrows into the margin in the appropriate places. Subsequent changes to the text will invalidate the arrows, requiring a rerun of the routine.

In some badly implemented word processors that work like this you might have to go around this loop several times, setting forced page breaks and seeing the subsequent knock-on effect before you judge the text fit to print. The problem is a lot less likely to arise in Word, where conditional page breaks are implemented far better than WordStar simply by letting you assign the Keep characteristic to paragraphs. Keep paragraphs never break: a new page will be started if the whole paragraph will not fit. It should not be necessary to call on Keep too often, because as a default MTW will automatically avoid creating "widows" — the printers' name for solitary lines split off from their paragraph by a page break.

My biggest disappointment, I suppose, is the fixed menu that permanently takes up the bottom four lines of the screen. Its presence emphasises the family likeness to Multiplan, which is nice for Microsoft's marketing department. Certainly the menu mechanism is going to come in handy when you first approach the package, and experienced users driving mice require it to click the functions into life. But nobody needs it all the time, and there is no reason why it should not be vanished away until summoned, leaving more room on the screen for text.

The multiple file-handing also falls short of excellence. Although you can have several different documents open at any time, each one has to be associated with a window, and of course every window you create makes futher inroads into screen space. This is further complicated by the fact that you cannot create a new window as an object in itself. Instead it has to be cloned from an existing window, carrying over one of its dimensions and all its existing text. Cleaning out the text, attaching a new file and possibly reshaping the window then form additional operations.

This is a pity. In the philosophy of Emacs the business of attaching new files and switching between them is designed to be extremely simple. In Word, if you want to switch around between documents you have the following choices:

A—Make equal-sized windows for each document.

B—Enlarge the window for each document as you work on it, then shrink it again.

C—Keep one large window, then pull the documents in and out of it as you work on them.

If you are just juggling two documents, approach A might be a possible solution. But remember the irremovable menu section is already taking up the lowest four lines of your screen, and each window you create has to give up two rows and two columns to the border. For more than three documents, solution A just is not feasible because the windows will be very pokey.

Suggestion B seems a sensible way of going about things, except that changing the window shape is less than instant for non-mouse users. But unless you really do need to read both texts simultaneously — which in practice is seldom the case — it is a poor substitute for method C.

Solution C is the approach familiar to users of an Emacs development by Mark of the Unicorn for CP/M machines called The Final Word. In it you do not attach files to windows taking up screen space but to buffers, invisible and dynamically changeable segments of the virtual memory. That sounds like a mouthful, I know, and the value of a window is that it is something concrete and easily graspable, which is probably why Microsoft uses the concept.

But buffers are nothing more than invisible windows that you can bring into view at the touch of a button. Once you are used to the economy of screen space implicit in this way of doing things it is not easy to take the mandatory fragmentation that accompanies Microsoft's handling of multiple files. You might assume that Word can be pursuaded to emulate approach C by making the secondary windows very small and then somehow swapping files between windows, but alas the software will not let you.

Nearly all the word processors I have looked at give a character count to keep track of the verbiage being generated — which is useful for journalists in particular. Not so Word. The bottom line of the didsplay shows the percentage of available memory that is being taken up , and and a discreet horizontal bar travels up and down the left-hand side of each window to indicate the position of the cursors relative to the whole file. But there is no built-in word or character count.

Conclusions

● Microsoft's Word is a logically clear, many-talented new word processor that adds considerable lustre to the IBM PC.

● Even without the graphics board and the mouse, Word has a lot to teach existing word-processing packages. With them it is a revelation.

● At £275 it looks like value for money. You can also buy it bundled in with the mouse for £340, which is a real bargain. But if you go for the mouse, cost in the IBM graphics board at a further £216; it is not essential but you will be hard put to resist having the full kit.

● Contact Microsoft at Bulbourne House, Gossoms End, Berkhemsted, Hertfordshire HP4 3LP. Telephone: (07535) 59951.

● Circle No. 147

TRS-80™ Colour Computers

Up To £80 Christmas Savings!

They're Ideal For Entertainment, Education And Home Use!

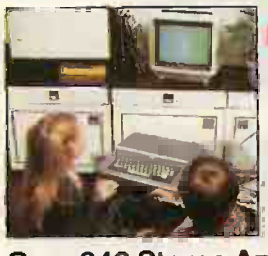
TRS-80 Standard Colour Computer With Built-In 16K Memory. The TRS-80 Colour Computer makes computing fun for the entire family! Just pop in a Program Pak for entertainment, educational or personal uses. Or, with the easy-to-use manual, learn to write your own programs in Colour BASIC. It comes with 16K of internal memory (expandable up to 32K), eight colours and a built-in RS-232 interface for easy communications ability. You can easily add a printer or joysticks, and it comes with a comprehensive instruction manual.
26-3004 ..... **£179.95**

Save Even More On The TRS-80 Colour Computer With Extended BASIC. Advanced programming is more affordable than ever! With Extended BASIC, it's easy to draw highly-detailed shapes using simple, one-line commands. Produce impressive designs, charts, even animation. It's loaded with the dynamic features a serious programmer needs too, like PEEK, POKE and USR commands, multi-character variable names (two significant), string arrays up to 255 characters, full featured editing, tracing and nine digit accuracy. Includes tutorial manuals or both Standard and Extended Colour BASIC.
26-3002 ..... ~~£299.95~~ **Save £80.00 £219.95**
TRS-80 Colour Computer With 32K Extended BASIC.
26-3003 ..... ~~£379.95~~ **Save £80.00 £299.95**

Colour Computer Upgrade Kits Add More Memory and Better Graphics

32K RAM Upgrade Kit. 26-3017* **£79.95**
Extended Colour BASIC ROM Upgrade Kit 26-3018* **£59.95**
Colour Computer Joysticks. 26-3008 ..... **Pair £9.95**

Specifications:
Microprocessor: 6809E 8-bit processor. **Clock Speed:** 0.894 MHz. **Keyboard:** 53 keys, including up, down, right and left arrows, BREAK and CLEAR. **Video Display:** 16 lines of 32 upper case characters. Colour graphics capabilities range from 32 x 64 (8 colours) to 192 x 256 (1 colour and background colour) with 3 intermediate formats. Higher resolutions in the same range are available through machine language, Extended BASIC or Program Paks. Output connects to any standard UHF TV set and includes video and sound. **Memory:** 16K internal dynamic RAM. Expandable to 32K. Colour BASIC is in 8K ROM, 16K ROM with Extended BASIC. **Input/Output:** 1500-baud cassette (recorder optional). Connectors for two 2-dimensional joysticks (optional). RS-232C serial I/O port. **Interrupt Timer:** Accessible from Extended BASIC or machine language only. **Power:** 240VAC, 50 Hz, 50W. *Installation required, Not Included



Tandy®

The Biggest Name In Little Computers

Over 340 Stores And Dealerships Nationwide

This compute to be desig

Only one person could design precisely the right computer for your business.

You.

But unless your name is Clive Sinclair, you'll probably need help from someone with a little more experience.

Like LSI computers. (That's us.)

We've had seven years' experience of developing micros and software exclusively for business. (You won't find us in primary schools or amusement arcades.)

The result of which is the most flexible system ever offered – Octopus.

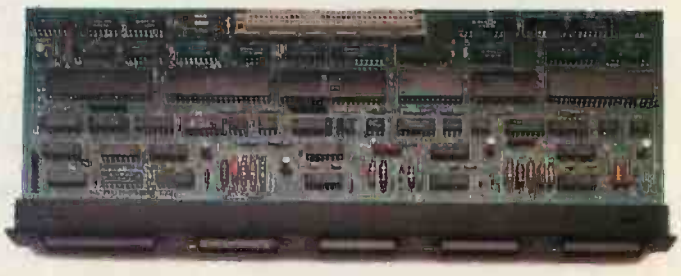
Computer design starts here, here or here.

Around fifteen hundred pounds will buy you an Octopus system at its simplest.

The central computer with a fully programmable keyboard and one disc drive. With the optional carrying case, you can take it home, to business meetings, to your hotel; anywhere a TV screen is available.

"A couple of thousand pounds will buy a fully-fledged business computer system, including two disc drives and a high resolution monitor. And, quite free, over a thousand pounds worth of software: a package called 'Axis.'

It's capable of controlling stock, invoicing and keeping your sales, purchase and nominal ledger, and would almost certainly be the first software package you'd have to buy.



For an appreciably greater investment the ultimate Octopus starter kit offers the extra speed and capacity of a Winchester disc drive, integrated with the central computer.

Keep your options open.

This is where your designing comes in. (And the back of the box is where it goes in.)

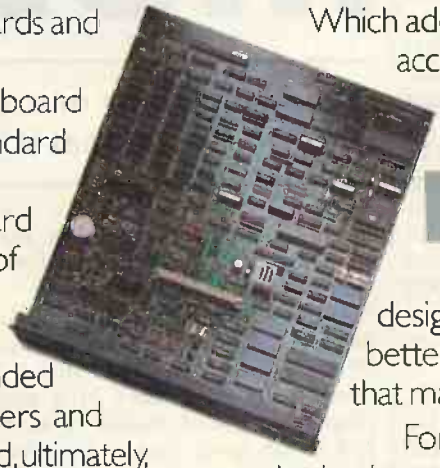
er is designed
ned by you.

We've left room for four option boards and are offering, already, a choice of seven.

For example, a telecommunications board facilitates all kinds of links through the standard Telecom network.

A graphics board conjures up all kinds of shapes and sizes.

Others offer colour display, expanded RAM, links for printers and other peripherals and, ultimately, the ability to connect up an entire Octopus network.



And because you'll be able to get up-dated option boards, the Octopus system means you can keep your options open for the foreseeable future.

Better by a Zilog.

With all this inbuilt flexibility, we had to be doubly sure about the abilities of the central processor.

So we included two of them.

Namely the Intel 8088-2 and the Zilog Z80B.

In plain English (well, plainish), this means Octopus can operate both the tried and tested 8-bit programs and the new, faster 16-bit ones; even, if necessary, switching between the two.

It can also speak five languages or more and work on any of five operating systems.

Which adds up to the fact that Octopus will accept virtually all of the business micro software that's currently on the market.

Hard-nosed software.

Not that we let that stop us from designing our own. And designing it better, with the kind of thoughtful detail that makes for real convenience.

For instance, we provide a mat to lay over the keyboard when its function keys are re-programmed. So you won't have to re-train staff to use a keyboard that says one thing and means another. Or re-train them whenever you up-date or expand the program.

An advantage, we might add, which you could only enjoy with a computer system that doesn't become obsolete or outgrown.

No matter what size of business you've got designs on.

Please send me details of the Octopus computer system.

Name_____

Position_____

Company_____

Address_____

_____ Postcode_____

Telephone_____

LSI OCTOPUS

The growing business computer.

To LSI Computers, Copse Rd., St. Johns, Woking, Surrey GU21 1FX Tel: 04862 23411.

PC 2 / 83

● Circle No. 148

HEWLETT PACKARD MODEL 16

Dream machine or expensive nightmare? Ian Stobie found that it depends who you are.

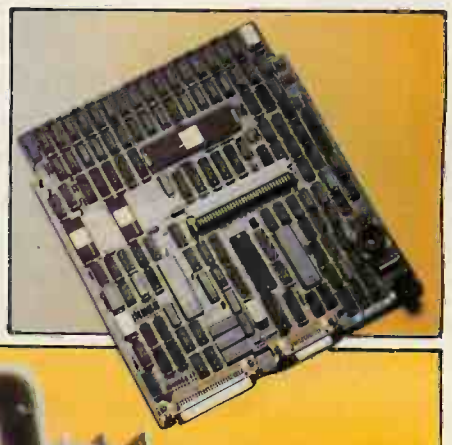
THE FIRST THING to strike you about the Series 200 Model 16 is that it is very compact. Hewlett-Packard has fitted about the same processing power as the Apple Lisa into a square foot or so of desk space, if you don't count the keyboard.

The system's very powerful Motorola 68000 16-bit processor and half a megabyte of memory are packaged in with the 9in. screen in a single unit no bigger than an IBM PC monitor. It sits atop or alongside the dual disc-drive box, which uses Sony 3.5in. drives and is also very compact. The keyboard continues the theme, being just large enough to accommodate a standard-size QWERTY key layout.

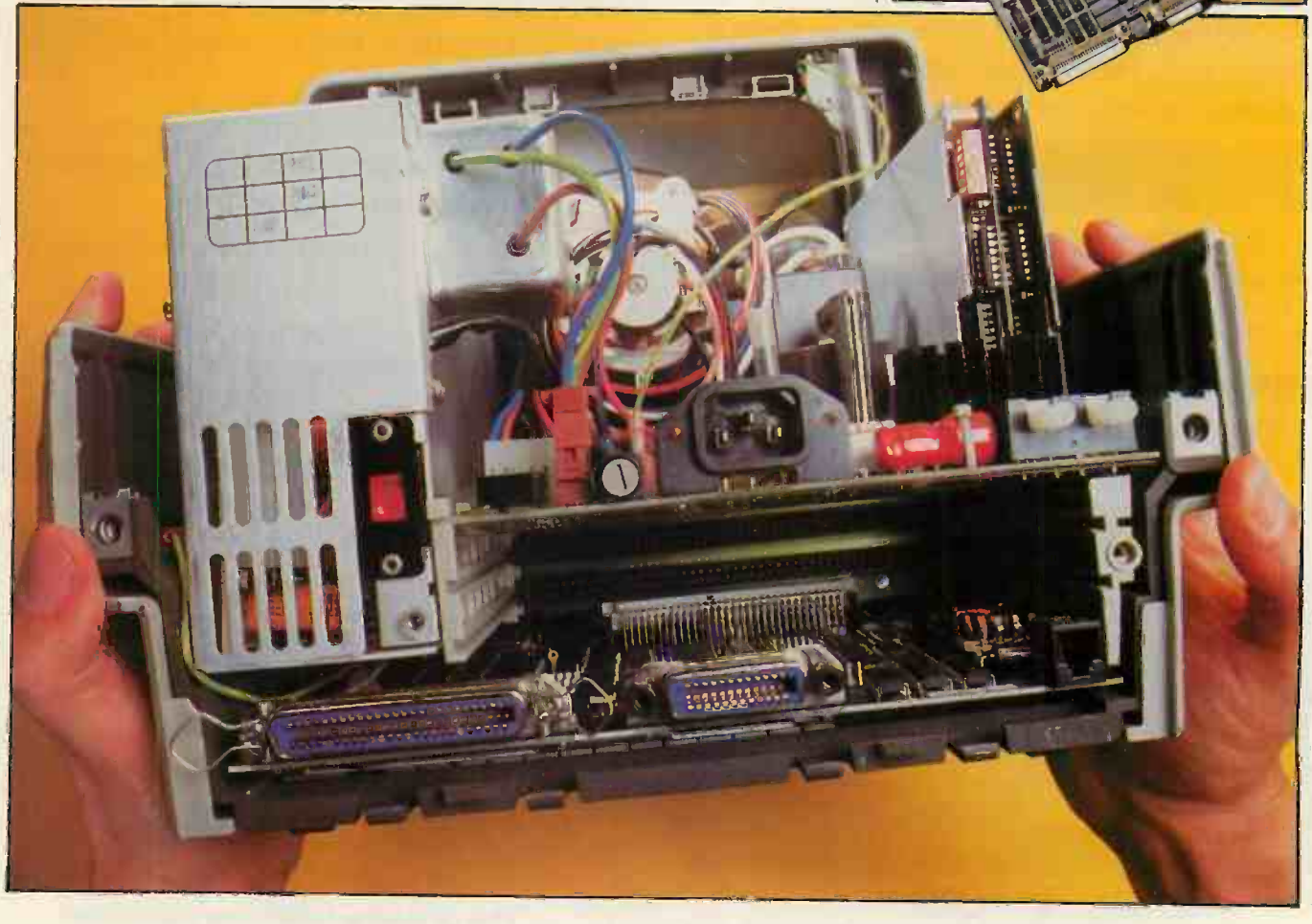
Although Hewlett-Packard is well known for its own processor chips, the Model 16 is the fourth machine it has designed around the Motorola 68000 chip. The Model 16 is the latest and least expensive model in the 200 Series. In the configuration we had to review, with 512K of RAM and twin 270K micro-floppy drives the price is £4,758. We also tried out the 82905B printer, price £604, which is an Epson MX-80 with an HP badge and interface on it, and used the excellent £832 7470A two-pen plotter. The graphs for *Practical Computing*'s October cover, were produced on this system.

Unlike the Lisa, which is intended mainly for first-timers in an ordinary office, the Model 16 is aimed at a more technically sophisticated kind of user, who is probably working in a scientific or technical environment. This accounts for the enormous differences between the two machines even though they are both built around the same 68000 processor.

The typical Model 16 user is likely to program the machine as well as or instead of using packages. The Model 16 is therefore intended more as a powerful programming work station to sit on the desk or lab bench than as a conventional piece of office equipment.



The 68000 processor and 0.5Mbyte of RAM are housed inside the CRT casing.



Taking a closer look at the Model 16 reveals signs of this intended role. The various components of the system are connected together in a neat way with cables that terminate in a standard connecting block. Each block has a plug on one side and a socket on the other, so you can push another block into the back of it, letting you piggyback several cables into the one HPIB socket on the back of the main unit.

The initials HPIB stand for Hewlett-Packard Interface Bus, the HP implementation of the IEEE-488 standard interface originally designed for programmable instrumentation. A large range of specialised instruments can be connected to the Model 16 through it. The only problem I found with this connection method is that with discs, plotter and printer all piggybacked together the back of the main unit began to be pushed away from the wall.

The keyboard also has a tell-tale sign of the special bias of the system, in the rotary control knob positioned to the left above the keys. In some of the general-purpose applications we tried you can turn this knob to move the cursor — around a spreadsheet, for instance or through a word-processing document. The knob's origins go back to HP's Shadow terminal from which the Model 16 casing is descended, where it provided a convenient analogue control for instruments attached to the HPIB. The knob can still be used in this way, and it is supported by appropriate Basic statements.

The typical user may well want a plotter with such a system. The two-pen 7470A plotter is one of HP's smaller models. It can plot on to ordinary A4 paper or, with different pens, on to overhead projector slides. All plotters are fascinating to watch, and the 7470A especially so. The pen is held by an arm which moves from side to side; at the same time the paper is moved backwards and forwards by two rollers. The rollers grip the paper very tightly, leaving a small furrow along two sides of the paper. The system seems to achieve very accurate positioning.

The 7470A can work with two colours at a time under program control: the arm moves across and grabs the appropriate pen when so instructed by the software driving it. For more colours you need to change pens manually.

One particularly elegant feature of the Model 16's Basic, which is typical of the whole HP approach, is that the same set of plotting and drawing commands work on a wide range of different output devices. With our set-up we could display the same graphics image on the screen, on the plotter or on the matrix printer simply by including a line of code to specify the device type.

Software for the system all came on the neat Sony micro-floppies. The Model 16's drives combine HP electronics with Sony Corporation drive mechanisms. The most obvious advantage is compactness, of both drives and storage media. Each drive has a formatted capacity of 270K, or about the same as HP's 5.25in. drives. They are single sided, but double-sided drives are under development. HP can already provide one-plus-one units combining a 3.5in. micro-floppy with 4.6 or 9.6Mbyte hard discs.

The standard operating system is HP's own, and it takes a while to get familiar with it. However, the Model 16 is likely to appeal to the more experienced user, so it should give them few problems. Although powerful it does have some irritating features, particularly the long device names which you have to type in repeatedly.

The graphics presentation package, which has been translated from one HP machine to another over the years, now seems somewhat long in the tooth. It is adequate for presenting graphs in a predetermined format but you cannot replot the same data as a different type of graph — changing from pie to bar chart, for instance.

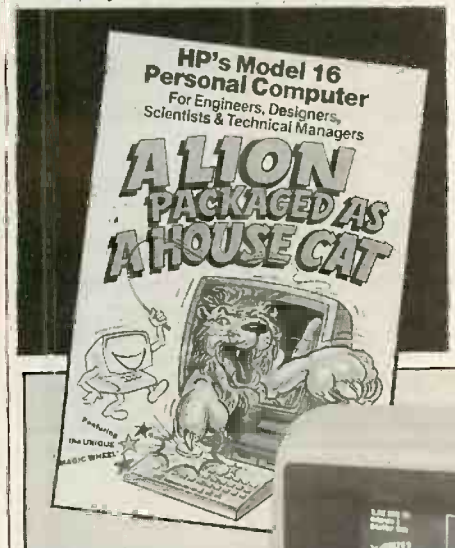
By contrast, MBA from Context Management Systems does allow this, but is much more difficult to use. MBA — which also runs on the IBM PC — is a large integrated piece of software based around a spreadsheet of up to 90,000 cells. Cells can contain up to 8,000 characters of text so short documents can be stored. It has involved searching, sorting and retrieval commands like a database. It comes on three discs and takes up a lot of memory. My initial impression is that it is rather complex, requiring a large investment of time to learn to use.

With this type of programming-oriented machine the obvious thing to load up first is Basic. HP Basic is also available on ROM — for an extra £990 — for users who do not want to load from disc. This would also free an appreciable amount of memory as HP Basic is very comprehensive and takes up 277K. Pascal, Fortan and a Hewlett-Packard version of APL, called HPL, are among the other languages available for the Model 16 system.

With Basic loaded, available memory on our 512K system was 240,576 bytes. You are told the available memory without asking for it every time you List, which is very sensible.

The first thing to get used to when using HP Basic is the heavily formatted screen. Only two lines of the 25-line by 80-character display show the lines you

(continued on next page)



Left: the new HP image. Below: the HP Series 200 Model 16 system.

HEWLETT PACKARD MODEL 16

(continued from previous page)
have most recently typed in. The bulk of the screen is taken up with an 18-line output area, with other areas set aside for program prompts, function-key definitions and various indicators.

You can type in lines in the normal way, one at a time with line numbers, or use the editor. The editor is preferable, as program lines do not disappear as you type them in. In fact, you can scroll through a listing to any position using the rotary control knob. You change direction from up-down to left-right by hitting the Shift key. An indicator on the screen shows the current direction.

Having typed in a program, your next surprise is the speed at which it runs. HP Basic is in fact semi-compiled, in that each time you type in a line a symbol table is updated so that labels and variables can be resolved to memory addresses very quickly when the program is actually running.

In a fully compiled Basic — CBasic, for instance — you first have to write the source code with a text editor, then compile it to an intermediate file, then finally run it. Despite its speed, HP Basic is as suited to spontaneous programming as any purely interpreted Basic.

The Model 16 has another trick up its sleeve. While running a program you can list it — in fact you can execute any command that does not require input while a program is running, as the Model 16 is a multi-tasking system. Variables can be inspected and changed, a disc directory obtained, a listing printed, while all the time some massive computation is chugging away.

HP Basic goes well beyond the usual microcomputer Basic in several respects. Apart from providing very good editing and debugging facilities, it allows structured programming and has a number of powerful and unusual commands. The editor allows indenting of program lines and has a Find and Replace facility, which is useful for changing variable names. Lines can optionally have labels as well as line

Specification

CPU: Motorola 68000 running at 8MHZ
RAM: 512K expandable to 768K internally, with further 4.6Mbyte expansion available through external expansion unit
Size: Main unit placed on top of disc unit, and ignoring keyboard, measures 370mm. high by 325mm. wide by 330mm. deep
Display: 9in. diagonal 25-line by 80-character CRT with 300-by-400 dot high-resolution graphics capacity; characters are made up of seven-by-eight matrix within 10-by-12 cell
Keyboard: Detached QWERTY keyboard with five function keys and rotary control knob; knob can be used to position cursor or to generate program interrupts; other keyboard options available with numeric keypad
Interfaces: HPIB and RS-232C; HPIB is IEEE-488 and can communicate with up to 14 devices using piggyback connection system; wide range of optional interfaces available
Discs: Twin 3.5in. micro-floppy drive unit, formatted capacity 270K per drive; uses Sony discs; disc options include 4.6Mbyte and 9.6Mbyte Winchesters
System software: HP Basic 2.0 Pro-Basic language system with integral OS; optional languages include Pascal and HPL, HP's version of APL; Fortran available from third-party supplier; optional operating systems include Digital Research's CP/M-68K and Unix
Application software: HP-supplied packages include VisiCalc, Graphics Presentation, Forecasting, Statistics Library 1, 2 and 3, Numerical Analysis, AC Circuit Analysis, Waveform Analysis
Manufacturer: U.S.-based Hewlett-Packard at its West German plant
U.K. prices: £3,773 for 512K system comprising 9816 main unit, keyboard, and Basic 2.0 on disc; disc drives priced separately at £985 for 9121D dual 3.5in. micro-floppy unit
U.K. distributor: Hewlett-Packard Ltd, Personal Technical Computers, Eskdale Road, Winnersh, Wokingham, Berkshire RG11 5DZ. Telephone: Crowthorne (0344) 773100

The 68000 CPU

Misleading advertising claims are confusing the whole issue of processor performance. The Model 16, with its Motorola 68000 CPU, was designed from the outset to be a programmer's machine running a high-performance Basic, and the choice of chip was important.

The Motorola chip has a 16-bit wide data bus for CPU-to-memory transfers. In other words, it grabs data in 16-bit wide chunks which, other things being equal, is twice as fast as grabbing data in eight-bit chunks. This aspect of a processor's operation is considered to be of fundamental importance and is why the 68000 is called a 16-bit chip. Other popular 16-bit chips are the Zilog Z-8000 and the Intel 8086; the Intel 8088 as used in the IBM PC and ACT Sirius, by contrast, only has an eight-bit wide data bus.

The Motorola 68000 used in the Model 16 can directly address more memory than the other common 16-bit chips. Its 24-bit wide address bus means it can directly address 16Mbyte. By comparison the Zilog Z-8000's 23-bit wide address bus gives it an 8Mbyte address space, while the 20-bit wide address bus on the Intel 8086 and 8088 limits their address space to a single megabyte. This is still superior to the 64K permitted by the 16-bit address bus of the earlier generation Z-80 and 6502 processors, but the more program segments or data available to the user without bank switching or disc accessing the better.

On the HP Model 16 all this address space has been used to provide both a large amount of user RAM and to memory map peripherals, a technique which allows fast and convenient I/O. The main board of the Model 16 has 256K of RAM on it, and two expansion slots allow expansion inside the case up to 768K; our review system had one expansion board fitted. An external expansion box can be used to add more memory, up to another 4.6Mbyte.

Where the Motorola 68000 really scores over the rival processors is that internal arithmetic and logical operations are carried out 32 bits at a time in 32-bit wide registers. This is what makes exceptionally fast and accurate calculations possible. By comparison, the Zilog Z-8000, Intel 8086 and Intel 8088 have 16-bit internal registers. If the Intel 8088, with its limited eight-bit wide data bus, can be advertised as a 16-bit processor — presumably on the strength of the 16-bit width of its internal registers — then you could equally plausibly hype the Motorola 68000 as a 32 bit chip.

In the technically sophisticated market HP is aiming the Model 16 at, claims matter less than performance. HP appears to have chosen the best chip for the job. Running our standard Benchmark tests on the Model 16 we found it the fastest machine we have yet tested. This is so in spite of the high numeric precision — 15 significants digits — of the Basic's default-variable type.

numbers, and you can obtain a full cross-reference table of the labels and variable names you have used.

Debugging aids include tracing, the setting of break points, and single stepping. You can cause the program to run one line at a time by pressing a special Step key on the keyboard. The line being executed is displayed on the screen.

HP Basic permits very long strings of up to 32K characters. They are particularly useful when reading information into a string from a device attached to the HPIB. Substrings are delineated in the ANSI way:

"PRACTICAL" [5,7]

specifies the substring TIC. A full set of graphics commands support both the screen and other HP output devices. In Graphics mode the Model 16's screen can display 300-by-400 dot graphics.

An uncommon but useful command found in HP Basic is Select-Case, which works with all variable types. For example:

```
10 SELECT S$
20 CASE "0" to "9"
30 GOSUB Valid
40 CASE "E"
50 GOSUB End
60 CASE ELSE
70 GOSUB Ignore
80 END SELECT
```

Arrays can have up to six dimensions. You can set a subscript range for each dimension anywhere between 32K and −32K. Twenty commands are provided to allow external events to interrupt normal program flow and force a branch to a named subroutine. HP Basic is documented in a set of four manuals. They are not included in the cost of the system but are thorough and include indexes.

All in all HP Basic seems very complete. For more specialised applications HP provides an extension package which contains another 170 Basic statements, mainly matrix manipulation and external device handling.

Marketing push

Hewlett-Packard is the world's seventh-biggest manufacturer of computers, selling $2.2 billion dollars worth of computing kit in 1982. It is structured into 44 fairly autonomous divisions, 22 of which produce computers in some form, the others mainly instruments. The company's growth has been achieved with very little borrowing. This financial rectitude has historically been coupled with an unwillingness to shout very loud about the company's expensive but generally technically excellent products.

HP is now trying to reorganise itself into a more marketing-oriented company. While the restrained technical approach was alright for its traditional instrumentation and technical-computing business, HP does not want to lose out on the computer boom. The company still remembers that Apple was founded in 1977 by a defector from HP: Steve Wozniak was an HP engineer.

The plan is to move from number 7 to number 3, behind IBM and DEC, by 1986, and one of the first manifestations of the new HP is the promotion of the Model 16. A brash and bold leaflet has landed through many of the nation's letterboxes. According to an HP handout: "direct mail thrust is expected to exceed 200,000 individual shots — close to the U.K.'s entire universe for Electronic Engineers, Scientists and Technical Professionals."

The Model 16 leaflet aims to impress the nation's technical elite with a rather disreputable-looking cartoon lion, which appears to be trying to sell them the computer. The Lion describes the rotary control knob as a "super personal magic wheel". The accompaying personalised letter quotes *Byte* magazine as describing the Model 16 as "a lion packaged as a house cat". What it fails to note is that the *Byte* article in question, published in June 1983, was written by John Monahan, an employee of Hewlett-Packard's Desktop Computer Division. So it is just one HP publicist quoting another.

I'm probably not alone in preferring the old HP style. The real way for HP to win wider markets is by dropping its prices.

Micro-floppy discs

Although at first sight not a very spectacular development, the 3.5in. micro-floppy discs are very convenient in practice. They mark a large step forward from conventional floppy discs.

The small discs are tougher for three reasons. First, the recording film is mounted inside a rigid plastic case. Second, a metal shutter covers the gap where the read/write heads need to get close to the recording surface. On the HP drives the shutter is automatically opened when the disc is inserted, and closed again when the disc is removed, so the recording medium itself is always protected from finger marks and dust. Finally, the micro-floppy has a solid metal centre. Conventional floppy discs are gripped and rotated through the centre hole, the edge of which is subject to a good deal of wear.

HP says it is already shipping more 3.5in. micro-floppy drives than 5.25in. and 8in. drives combined. It expects to deliver six times as many in this first year of availability. Apart from the greater compactness and convenience to the customer, the failure rate of the drives themselves is said to be only one-quarter of that experienced with HP's 5.25in. drives Users benefit, and HP does too as it saves money under guarantee provisions.

Benchmarks

The HP Series 200 Model 16 is the fastest machine we have tested. The table shows the time in seconds to run eight standard Benchmark routines. They test out various typical tasks, each routine repeating an appropriate set of Basic statements 1,000 times. We were using the HP Basic 2.0 language system supplied on disc with the Model 16.

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
HP Series 200 Model 16 – 68000 CPU	0.2	0.6	1.4	1.6	1.7	2.8	4.3	15	3.4
Orion – 8086 CPU	0.6	2.1	4.8	4.9	5.8	10.5	16.7	13	7.3
Olivetti M-20—Z-8000 CPU	1.1	4.0	8.0	8.4	9.2	17.1	26.5	12	10.8
IBM PC – 8088 CPU	1.2	4.8	11.7	12.2	13.4	23.3	37.4	30	16.9

Conclusions

● The HP model 16 is extremely compact and also extremely powerful. It is primarily intended for users who require great precision and speed or the ability to connect their system up to instrumentation.

● To use the Model 16 solely for general office work would be expensive overkill. A machine with less processing performance but a larger base of general software would be more appropriate.

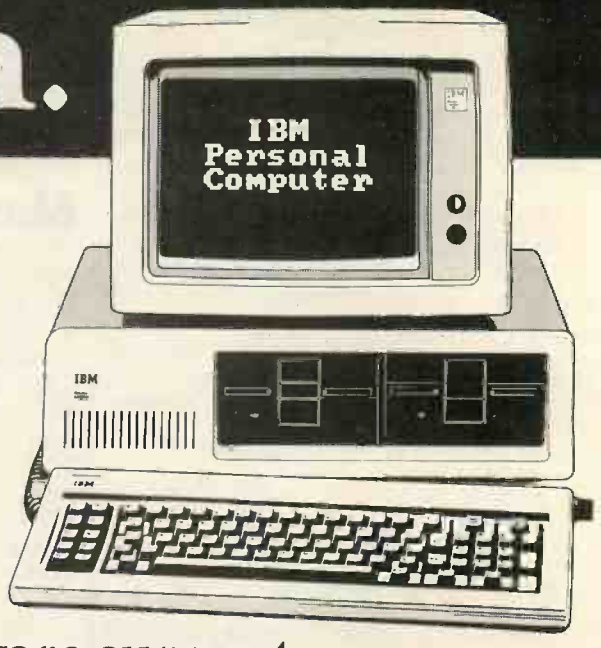
● The availability of general office software for the Model 16 is of importance because it allows the machine to be more fully employed when placed in a technical environment, doing routine tasks as well as those demanding high performance.

● The 3.5in. micro-floppy discs are a great success. They are convenient to use and handle, and will probably rapidly be adopted by other manufacturers in place of conventional 5.25in. floppies.

● HP Basic is very impressive. Fortunately the Model 16 has lots of memory as it is also very big — 277K! Asmemory costs fall and the processors capable of using it become more widespread perhaps the Basics offered on other machines will start reaching similar standards.

● For the user/programmer, especially one working in a technical environment, the Model 16 must be dream machine of the year.

Microware and IBM — an unbeatable combination.



We promise to:

- Analyse and identify your requirements.
- Advise on your system needs.
- Supply and install your equipment.
- Provide the widest range of software support.
- Offer comprehensive maintenance contracts.
- Take pride in our unparalleled after sales service.

MEMORY EXPANSION

1. Memory expansion from 64-512K
2. Memory expansion with extended features:
   - Printer port
   - R232
   - Games control
   - Battery clock/calendar
   - Expansion up to 512K
3. Memory expansion for electronic disk (RAM) providing capacity of up to *2 Mb*

MULTI-TASKING

- Multi-tasking software is now available for PC DOS – up to 9 tasks can be run
- Concurrent CPM

WINCHESTER DRIVES

1. PC Pair
   Hard disk storage
   - 3.9" Winchester drives
   - Single board DTC controller plugs directly on to PC Bus
   - No additional power required
   - Fixed or removable second drive
2. Our range of 5¼" external Winchesters provides up to *80 Mb* of storage
   - Easy back up facility

NETWORKING

PC net

- Local area network and shared resource
- Independent of disk type ie XT, corvus etc
- Independent hard disk system
- Remote PC
- IBM PC DOS 1.1, 2.0
- Disk and file sharing
- Low cost, easy to use
- Simple to set up
- Up to 16 PC's per file sharer

SOFTWARE

Pegasus - Business application systems

- Sales Ledger
- Purchase Ledger
- Nominal Ledger
- Invoicing
- Payroll
- Stock Control
- Order Entry
- D Base II Applications

Our complete list of software is too long to publish, but the widest range is available from stock including:
Wordstar, Mailmerge, Supercalc, D Base II, Fortran 80, Easyfiler, Easywriter, Visicalc

TRAINING

We offer training to our IBM PC customers:
1. Computer aided training, which, after initial set-up, your PC guides you through the software
2. On site personal training by our experienced professional instructors

MONITORS

We recommend from our range the following:

- The new IBM colour monitor
- LUXOR – high res. colour
- AMDEK – the only IBM compatible amber screen monochrome available
- HANTAREX – 14" high res. colour

SERVICE

We offer a number of service options including:
1. Warranty/non-Warranty repairs
2. Extended Warranty contracts
3. Quick response service contracts covering both parts and labour

PURCHASE TERMS

1. Rental agreements
2. Leasing contracts
3. Approved credit purchase
4. Credit cards

IBM PC in a briefcase!!
Colby portable – using the IBM Board
Guaranteed 100% IBM compatible. Ask for details.

Microware

Microware (London) Ltd.
Showroom at: 637 Holloway Road, London N19 5SS.
Phone 01-272 6237/6398 or Telex 297598.

IBM Authorised Dealer

IBM Personal Computer

• Circle No. 149

Revolutionize the way you think about computers.

The new OM8064

The 8064 packs all the power you will ever need. Sleek and trim, yet fully expandable with eight slot expansion unit.
The newly designed compact keyboard is a piece of art in itself. The OM8064 features ultrasensitive key and single key programming commands, you will get much more including a powerful 64K dynamic RAM up to 14K of ROM, 24 line x 40 character text display with high resolution graphics a 6502 and Z80 microprocessor.

Dealer Enquiries welcome

TASHKL COMPUTER SYSTEMS LTD
24 LOGAN ROAD, WEMBLEY, MIDDLESEX HA9 8PX
TEL No. 01-904 4467. TELEX No. 296708

CP/M is a registered trade mark of Digital Research Inc.

£1080 PLUS VAT

THE PRICE OF THE COMPLETE SYSTEM COMPRISING OF:

OM8064 MICROCOMPUTER WITH
- ✻ STANDARD 64K RAM
- ✻ 8 SLOT EXPANSION UNIT & COVER
- ✻ STANDARD 2K ROM FOR CP/M®
- ✻ MAXIMUM 14K ROM FOR BASIC
- ✻ STANDARD 6502 CPU AFG CARD
- ✻ STANDARD Z-80 CARD
- ✻ STANDARD CENTRONIC I/F CARD & I/F CABLE
- ✻ STANDARD 80 COLUMN CARD
- ✻ STANDARD FLOPPY DISK DRIVE CONTROLLER
- ✻ TWO 5¼in SSSD SLIMLINE DISK DRIVES & I/F CABLES EACH 163 KBYTE
- ✻ 12in GREEN MONITOR & CABLE
- ✻ JOYSTICK ADAPTOR CABLE
- ✻ TV ADAPTOR
- ✻ TAPE RECORDER CABLES

● Circle No. 150

The problem with buying a home computer, as you may already have discovered, is there's often very little software to go with it. Or all that is available is games, games and more games.

There's no such problem, however, with the Commodore 64. It has a more extensive range of serious software than any other home computer.

It also has an unusually large (in fact elephantine) 64K memory, as well as every peripheral you're ever likely to need.

Put simply, this means the computer has the capacity to run more interesting, entertaining and complex programs.

You can teach yourself just about any subject you care to mention, even computer programming.

And for the office there are programs like word processing, financial planning, information storage and stock control.

Finally, when you're mentally exhausted, you can even entertain yourself – yes, with games.

When all's said and done, however, we do have to admit that in one respect the Commodore 64 isn't up with the competition. It costs around £229, much less than any comparable machine.

And that's a fact we hope you'll never ever forget.

When you have an enormous memory there's no end to the things you can do.

Please send me further information on: the 64 computer ☐ 64 software ☐ disk drive ☐ cassette unit ☐ printers ☐ monitor ☐

Name (Mr. Mrs. Miss)

Address

Send to: The Commodore Information Centre, 675 Ajax Avenue, Slough, Berkshire SL1 4BG. Or telephone (0753) 79292.

commodore

6S PCO 1283

● Circle No. 151

ATARI 800XL

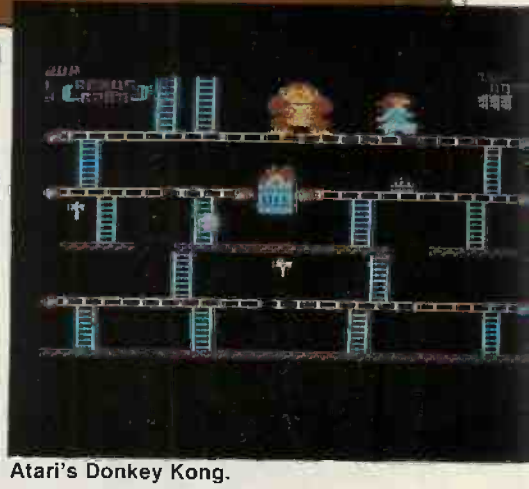
Jack Schofield, already a fan of the old 800, discovers it had some faults after all. But the new 800XL . . .

Computer War: Thorn-EMI's best yet.

THE BEST THING about the new Atari 800XL is that it is pretty much the same as the old 800. Atari, like Apple with the IIe, has such a large user base world-wide, and so much software, that it was essential to retain compatibility.

Thus it was possible to write much of this review on the review machine, using Atariwriter and an 810 disc drive. I was also able to try some new games, including Astro-Chase, Super-Cobra and Chess from Parker Brothers, Caverns of Mars on ROM and Donkey Kong from Atari, plus the excellent Computer War — Thorn-EMI's best effort yet.

I also tested a number of older programs. When loading autoboot discs like Zaxxon



Atari's Donkey Kong.

and VisiCalc, you just hold down the Option key when switching on to switch out the Basic ROM and free the available RAM. With autoboot tapes using Basic, you still hold down Start as before.

There must be some software that uses illegal entry points in the operating-system ROM, or something of that kind, which will run on the woo but not on the 800XL. I could only find one — a pre-release EPROM version of Astro-Chase from Parker Brothers. All available peripherals worked with the 800XL.

The new machine offers several improvements over the 800 which it replaces. The most obvious one is the 64K of RAM instead of 48K. Of course, this does not provide any more RAM free to Basic: there is still about 37.5K, the same as the Commodore 64, because that is all the 6502 CPU can handle once it has taken care of Basic and the operating system. It was disappointing to find that no extra RAM is available to machine-code programs such as VisiCalc.

There are many other changes to both the machine and the system. Appearance is greatly improved. The case is much smaller — less than half the size — and has attractive two-tone styling and brushed silver function keys.

The 800XL has more potential for expansion. A new edge connector expansion bus has been provided on the back to take an eight-slot system box called The Expander. It will hold Apple-style expansion cards to offer such options as a 128K RAM-disc, hard disc, flat-screen TV interface, IBM PC emulator, IEEE-448 interface and a few other fancy gadgets. Some of them have been available to fit inside the 800 in a memory slot, but this meant removing one or two of the 16K RAM cards and substituting a 32K or 48K card with the option card.

For self testing a new Help key brings up a self test of the RAM, keyboard, four sound channels and graphics. Such diagnostic routines are normally found only on far more expensive micros.

Two new debugged ROM chips replace the old operating-system card and cartridge-load Basic. One 16K chip includes the old 10K operating sysem and the new self-test routines. An 8K ROM on the single board now holds the Basic. The Basic has been further — and apparently completely — debugged.

More graphics

The 800XL has new capabilities in text and graphics. There are four new graphics modes using the existing Antic and GTIA custom graphics chips. They are actually existing Antic modes which were previously very troublesome to access from Basic. There is now an international character set in addition to the standard set, the double-width set and the double-width/double-height set. The international characters include accents, umlauts, and a £ sign CHR$(8), all in both normal and inverse forms. The extra characters are accessed by Poking 204 decimal into location 756 — which is less than delightful but is necessary to retain compatibility with existing software. It is still possible to redefine the character set.

The new line of four micros brings with it a new range of peripherals in the same two-tone black-and-grey style. They include the 1050 double-density 5.25in. disc drive with DOS-3, the 1010 dedicated cassette recorder, Super Joysticks, Trak Ball, a touch-tablet and three new printers.

With DOS-3 the 1050 offers only a rather poor 127K of storage, which is not quite up to Apple standards. Compatibility with the 810 has been preserved, however. The 1010 recorder, like the other new add-ons, has two serial ports so it no longer has to be at the end of the peripheral daisy-chain. The £70 touch-tablet is brilliant, and so is the light-pen.

The 1025 printer is an 80-column dot-matrix model; the 1020 four-colour printer/plotter resembles the Tandy/Oric/Sharp models. Like the others, the letter-quality 1027 printer plugs straight into the 800XL. It may only do 20 characters per second, but the print quality is outstanding, and it costs only £299.

Atari's 80-column CP/M add-on has already been demonstrated running on an Atari 800. As it hangs on the serial bus it works with any Atari, including the existing 400 and new 800XL. The only CP/M programs available on Atari disc were WordStar and Multiplan. However, there are plans to add all the most popular programs including dBase II, Peachpak software, Pascal/MT+ and Sorcim's Super* series.

Of course, Atari CP/M add-ons have been available — mainly in the U.S. — for some time. They include the Critical Connection, ATR-8000 and Micro Mainframe. The ATR-8000 already offers an 8088 board with 256K of RAM and either CP/M-86 or MS-DOS for IBM PC compatibility, while the Micro Mainframe is able to read and write most disc formats. However, having an Atari-backed system will do wonders for hardware interchangeability and software availability.

There are already over 50 programs in Atari's main line of programs, plus over 150 in the cheaper APX line-up, and the rate at which programs are being introduced has increased. New issues scheduled include a superb Logo, 10 games including Pole Position, Robotron, Joust, Jungle Hunt and Ms Pacman, plus more serious software such as Family Finances and Timewise. The original VisiCalc has been relaunched with the new machines.

Internally the 800XL shows the same kind of advances as the Commodore 64. The seven separate pieces of a 48K 800 with Basic have been reduced to a single clean board. There are still five big integrated circuits, of course: Antic, GTIA, PIA, Pokey and the 6502 itself. However, a small IC has taken over the timing from a mass of capacitors and resistors. Memory is greatly simplified to a single row of eight 64K chips. Finally, the PAL monitor circuitry has been cleaned up and improved. The result is that the 800XL is cleaner and neater than the 800. It should prove even more reliable, and of course be much cheaper to manufacture. There may be other differences I missed. No documentation was supplied with the review machine.

Not much has been sacrificed from the 800, except the huge, solid aluminium interior casing. It has been replaced by tin sheeting folded over the main board to prevent RF interference. You could stand a monitor on the old 800 but you couldn't do it with the new one.

Another thing to go is the small loudspeaker inside the case. Now all the beeps, synthesised sounds and key clicks are output through to the TV set, or via the

(continued on next page)

Basic mode	Antic Mode	Cols × Rows	Colours × shades	RAM required
0	2	40×24	2	992
1	6	20×24	5	672
2	7	20×12	5	420
3	8	40×24	4	432
4	9	80×48	2	696
5	A	80×48	4	1,176
6	B	160×96	2	2,184
7	D	160×96	4	4,200
8	F	320×192	2	8,138
9	F	80×192	1×16	8,138
10	F	80×192	9×5	8,138
11	F	80×192	16×1	8,138
12	4	40×24	5	1,152
13	5	40×12	5	660
14	C	160×192	2	4,296
15	E	160×192	4	8,138

Modes 12 to 15 are new to the XL line.

Mode 9 offers 16 shades of one colour, where mode 11 offers 16 colours but all the same intesity. Mode 10 offers nine colours and five intensities. Different modes can be mixed on the screen at the same time.

ATARI 800XL

(continued from previous page)

composite video DIN port to a hi-fi outfit.

There is only one cartridge slot, instead of two. Very few cartridges were made for the right-hand slot, but if you own, say, the Eastern House Monkey Wrench toolkit you will not be able to use it with the 800XL. The 800XL is no longer turned off automatically when inserting or removing cartridges, but doing this with the power on seems to do no harm.

There are only two joystick ports, instead of four. This may bother people with the Thorn-EMI Soccer and Ice Hockey cartridges — which were playable by four players — but not many others. People like me, who have converted two of the joystick ports into one eight-bit parallel port, will have to find a different way of driving an Epson MX-80 or similar parallel printer. In other respects, the 800XL seem to match the 800, as reviewed in the July 1982 issue of *Practical Computing*, pages 74 to 78.

The 800 keyboard was quite good, but the XL one is superb and suitable for fast touch-typing. The matt finish and the clarity of the labelling are improvements. In addition, Atari has corrected the solitary placing error of its previous models: the key which gives inverse video has been moved to beyond the right Shift key. It no longer carries the Atari logo, but graphically declares its function.

In all there are 57 typewriter keys plus five function keys including Help and Reset. The Shift keys are huge. A Caps key toggles between upper and lower case. A Control key allows the set of 29 graphics characters to be entered directly, though they are not marked on the keyboard. The Control key also allows four-way cursor movement through the full-screen editor.

As Atari Basic dates back to 1979 it is by now quite a well known dialect. It offers rather better support for the hardware than Commodore Basic, and while it is poor compared to BBC Basic it is only half the size. It has no structured commands, but you can Goto a variable name to emulate the BBC's procedures.

The advantages of Atari Basic are that it provides syntax checking on line entry and superb editing facilities. It also provides long, meaningful variable names, and some useful error trapping. It offers long strings rather than string arrays, which some think of as a bug but I think is a feature.

There is no single-key keyword entry, but there is a quick alternative: abbreviations can be used instead. For example, you can enter GR. for Graphics, SE. for Setcolor, DR. for Drawto, F. for For and N. for Next, etc. Basic is tokenised and so expands them when you list the program.

The few bugs in the original Basic seem to have been dealt with. After long editing sessions the Basic never hangs up. A naked input no longer causes a lock up, and the unary minus, −0, works correctly. Dimensioning a string larger than memory now produces an error message. If there are other bugs in the Basic, I couldn't find them.

The 800XL runs the standard Benchmarks a tiny bit quicker than the 800. However, Atari Basic is still slow, and far too slow for action games unless you are a clever programmer. There are quicker Basics such as Basic A+, Basic XL and Microsoft Basic for the Atari, three compiled Basics, plus numerous other languages, including Pilot, several assemblers and macro-assemblers, five Forths, Pascal, Datasoft's Lisp, OSS's Tiny C, etc. If you don't like Atari Basic, you don't have to lump it.

A fast new games language called Action! is on the way from Optimized Systems Software, the original author of Atari Basic. It comes on a 24K ROM cartridge with the compiler paged in 8K. It is said to have features from assembler, Pascal and C, and the U.S. price is $100, or $65 discount. Sounds wonderful; not here yet.

The 800XL is already a great games machine, but can it offer more? It is suitable as a home machine thanks to the smattering of family programs and Atari's excellent computerised card index, Home Filing Manager. With the easy-to-use Atariwriter word processor on a ROM cartridge, and a cheap letter-quality printer, it is eminently suitable for word processing at home.

From the educational point of view there are some good programs but most of these are American in origin. Atari (U.K.) is starting to tackle this by converting American to English, but the BBC Micro, the cheaper Electron and even cheaper Spectrum all look better bets from this point of view because they are widely used in schools.

Apart from VisiCalc and some database programs, U.K. business software remains thin. There are the Chipsoft accounting and ledger packages, which require discs and/or Microsoft Basic, and a few others, but the Commodore 64 already has more business software. With the CP/M and IBM options it will of course become a viable option, but then Commodore and Acorn are both promising CP/M too.

One area where Atari will score is in support. It has over 70 local service centres where a machine can be taken for repair. There is also an excellent user hotline which will answer queries promptly over the phone. Atari publishes a glossy magazine *I/O* which is free to users. And there are already around 100 user groups.

In an industry where many new machines leave the user isolated, with no software or peripherals, struggling to debug crass errors in the basic machine, the 800XL represents an attractive alternative.

Specification

CPU: 6502C running at 1.79MHz
Specialised ICs: GTIA graphics display; Pokey sound generator and control of ports; Antic screen and I/O
ROM: 16K operating system and diagnostics; 8K Basic
RAM: 64K; 37.5K free to Basic
Keyboard: 57 typewriter keys with auto-repeat plus five function keys including Help key
Display: 16 modes, from 40 characters by 24 lines of text to 320 by 192 pixels graphics; up to 16 shades of up to 16 colours
Sound: four channels, sound synthesiser with distortion control, up to 3.5 octave range with 255 notes from Basic; about eight octaves via Pokes; sound or music from dedicated cassette recorder can be incorporated in programs; key click and all other sound output via TV.
Ports: ROM cartridge slot, 8-16K; two joystick ports; PAL TV output; composite video/sound output port; serial bus; processor bus for expansion connection
Special features: player-missile graphics, equivalent to Commodore's sprites; upper/lower-case character set with 29 block-graphics characters; International character set; double-width and double-height characters
Power: separate transformer; on/off switch on back of console
Dimensions: 374 × 220 × 57mm, approx.

Conclusions

● The Atari 800XL is a well designed, thoroughly debugged, well supported home/games micro with an outstanding specification at a reasonable price. It knocks machines like the Lynx and the Electron into a cocked hat.

● The 800XL already has peripherals available, including discs, and masses of software, making it usable right from the start.

● With either the Expander box or 80-column CP/M upgrade, which has a Z-80 running at 4MHz, it could grow into a business machine — but, like the BBC Model B and Commodore 64, only for a very small business. The wide availability of Atari servicing and the user hot-line are advantages.

● So far Atari does not seem to have achieved the kind of market share in the U.K. which as a $2 billion corporation it enjoys in the rest of the world. The XL range could change that. The hardware and software are there, but it still needs the marketing.

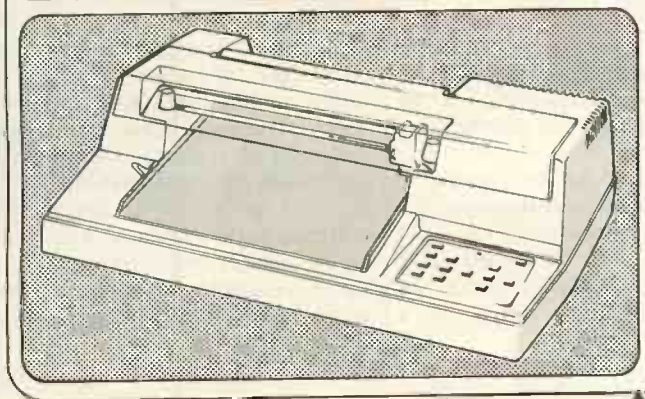
● The 800XL costs £249.99 and is distributed by Atari International (U.K.) Ltd, Atari House, Railway Terrace, Slough, Berkshire, Telephone: Slough (0753) 33344.

watch out for data warrior

Data Warrior are proud to announce the launch of their new product range which includes the highly acclaimed Hewlett-Packard 7470A Plotter. The only one with "Sweet-Lips" technology.

HEWLETT-PACKARD

7470A PLOTTER



Despite the myriad imitations, the 7470A Plotter is the **only** one with "Sweet-Lips" technology. It's interesting to see other plotters producing what appears to be a similar output to the 7470A, but if accuracy in dimensions is important to you, then you'll find that few if any can match the Hewlett-Packard expertise. The HP 7470A can plot 1000 points in a 1-inch line! With that degree of resolution coupled with the capability to run almost all popular micros, **and** the back-up and experience of one of the world's largest manufacturers, you can't afford to sell lesser machines.

There are many other products available in our extensive range and these include Warrior 10 System for IBM; Sirius; Apple and S100 BUS; Digitek Expansion Cards for Apples; Phoenix Monitors; Centronics Printers; Sapphire Mars – CP/M Financial Modeller and a wide range of BASF Floppy discs.

We have an extremely competitive pricing structure which includes dealer's stocking finance and end user leasing. What's more we can offer very fast deliveries (48 hours in most cases) and a comprehensive and highly geared organisation. Data Warrior will soon be a force to be reckoned with. Watch out for Data Warrior.

data warrior

This advertisement shows only a small part of our range. For complete details please complete the coupon or telephone:

Name _____ Position _____

Company _____

Address _____

Data Warrior, Adelaide House, 9 Adelaide Street, St Albans, Herts AL3 5BE.
Telephone: St Albans (0727) 37327.

OLIVETTI M-10

Ian Stobie visited Olivetti's U.K. headquarters to get the feel of its new Japanese-built lap portable.

OLIVETTI'S M-10 battery-powered portable computer is strikingly similar to the Tandy 100. This is not surprising as both machines are made in Japan for their respective famous-name suppliers by the same company, Kyocera.

We reviewed the Tandy machine, in a generally favourable way, in the August issue of *Practical Computing*. But there are enough differences between the two versions in specification and the way they are being sold to warrant taking a look at the machine as it appears in its Olivetti colours.

Olivetti says the M-10 will be available in November, while Tandy's Model 100 is on sale in Tandy stores now. Both systems cost around £500 for the unexpanded machines with 8K RAM. A system with the full 32K of RAM costs £730 from Tandy; Olivetti's price is likely to be similar.

These prices are also roughly comparable with the similar-sized Epson HX-20 portable. The HX-20 is actually slightly less expensive at £402 for the 16K model, but it has a much smaller four-line by 20-character display. On the other hand it comes complete with a built-in 24-column dot-matrix printer and has an optional £75 micro-cassette drive which fits neatly on the machine.

To complicate the choice still further NEC is about to launch another version of the Kyocera machine in the U.K., this time with internal RAM expandable to 64K and with optional 32K battery-backed RAM cartridges for program or data storage. The NEC machine will cost £475 for the 16K version, £828 for the 64K version, with the battery-backed RAM cartridges costing £195.

The display is the most striking feature of the Olivetti system as large LCD arrays are still quite unusual. Taking up most of the top surface of the machine, it measures about 195mm. by 50mm. It can show eight lines of 40 characters, or 64-by-240 dot graphics. Graphic characters can be generated from the keyboard and the Basic has point-plotting and line-drawing commands. The whole display panel can be propped up at about a 30 degree angle. Combined with adjustments of the LCD itself the overall result is a very clear display, which personally I prefer to looking at the glowing screen of a conventional CRT.

The keyboard is one of the most attractive features of the Tandy machine, and the Olivetti keyboard feels equally good. The U.K. version has two more keys than the Tandy and resembles the IBM PC keyboard a little, with the Backslash key between the Z and the left Shift.

In use the M-10 appears to behave identically to the Tandy model, although there are apparently a few minor differences in the 32K Microsoft ROM which contains the Basic, operating system and built-in application software. When you switch on a menu appears, showing a directory of all the programs and files currently in the system, and the date, time and amount of free memory. To select and run a program you simply position the cursor over the file name and press the Return key.

A simple word-processing program

called Text lets you prepare text or program files. It has rather limited formatting abilities but does have useful features like Search and Replace, Block Move and Block Copy.

The Basic interpreter offers 14-digit numeric precision without being too slow, which is a considerable achievement for a CMOS machine. The M-10 hardware is well supported, with Basic commands for the graphics and sound, and function keys. The Olivetti manual is clear and comprehensive, although I think someone new to programming would have to buy a book to supplement the rather skimpy tutorial section on Basic.

The Telcom program is for transferring files through the RS-232C interface. It allows you to change various parameters like the baud rate, parity and number of stop bits, and then send or receive named files. I was not able to try this during my visit. It is supposedly easy to connect machines up and transfer files, providing the two machines you are using have the standard RS-232C interface, but I have found that in practice it often turns out that something thwarts you. Olivetti is offering three different RS-232C cables, so one of them should work.

The M-10 will be distributed in the U.K. through Olivetti's existing 350 dealers. Many of them will be bundling the M-10 up with software for specific vertical markets and looking to sell to larger customers in fleet quantities. To reach the individual buyer more effectively Olivetti is also negotiating arrangements to sell through some of the major independent High Street retail chains.

Olivetti plans to have a battery-powered acoustic-coupling modem available at the same time as the machine for around £200. Also battery-powered is Olivetti's PL-10 four-pen plotter, similar to the Oric and Tandy plotters and costing around £150. It has four small ball-point pens mounted on a carousel mechanism which allows it to produce colour graphics or up to 80 characters of text across 115mm, paper rolls.

The other vital peripheral the Olivetti needs is a cassette recorder, for storing programs or data. Although Olivetti says any cassette recorder should work from the cassette interface it will be recommending a specific brand.

Specification

CPU: OKI 80C85, an eight-bit CMOS code-compatible look-alike to the Intel 8085, running at 2.4MHz
ROM: 32K ROM containing Microsoft-written software; free slot for additional 32K ROM
RAM: 8K expandable to 32K; battery backed.
Size: 300 × 210 × 50mm.
Weight: 1.7kg.
Power supply: Four AA batteries or equivalent lasting a claimed 20 hours in continuous use; internal NiCad back-up batteries are fitted as standard; AC adaptor optional
Display: tiltable eight-line by 40-character liquid-crystal display with contrast adjustment; 64 by 240 dot addressable graphics.
Keyboard: full-size QWERTY layout with full-travel keys; eight programmable function keys, eight other special keys; numeric keypad simulated with Numeric key
Interfaces: parallel printer interface; RS-232C serial; tape cassette; bar-code reader
Software: Standard ROM contains Microsoft Basic, Text mini word processor, simple address list and appointments scheduler and communications software
Manufacturer: Kyocera, Japan for Italian-based Olivetti
U.K. distributor: British Olivetti Ltd, Olivetti House, PO Box 89, 86-88 Upper Richmond Road, London SW15 2UR. Telephone 01-785 6666; scheduled for distribution in November at around £500 including VAT for 8K version.

Expansion ROM and RAM sockets, bus connector and batteries are in the base.

One of the advantages the Epson HX-20 enjoys over the Tandy Model 100 is the volume of independent software available. It is helped by having a reliable method of program distribution, in the Epson-supplied micro-cassette, but there is nothing to stop standard cassette tape software being supplied for the Olivetti M-10. The machine also has space for another 32K ROM, which may well attract system houses developing customised hardware, as no cassette and no loading are necessary.

It is too early to say whether a large body of cassette-based software aimed at the individual user will develop for the M10. Olivetti says some software houses are working on such packages and that a Calc is on its way. The real question is whether between them NEC, Tandy and Olivetti can sell enough machines, as software writers can probably cover all three systems with little extra effort.

Conclusions

● The M-10 is virtually the same machine as the Tandy 100. Principle differences from the Tandy are the more IBM-like keyboard layout and the fact that the display panel pops up.

● The M-10's large eight-line by 40-character LCD display is clear in normal light conditions and the keyboard is excellent.

● Undoubtedly highly portable, the M-10 is well suited for commercial applications requiring text entry or data capture away from the mains power supply. It is also suitable as a personal machine for writing and using quick programs while on the move.

● Olivetti's matching battery-powered acoustic coupler and printer will be important to the success of the M-10, allowing it to be expanded into a powerful communicating computing system.

● The M-10 is also very similar to the NEC PC-8201, which is also about to be launched in the U.K. The NEC has the potential for greater memory expansion than either the Olivetti or Tandy machines, which may be an advantage in some applications.

● The strength of Olivetti's distribution network and its marketing resources give the M-10 a good chance of emerging the best seller out of these three similar machines.

● The similarly priced Epson HX-20 is probably a more suitable machine, with its micro-cassette drive installed, for applications requiring the collection of large amounts of data in the field. The Epson also has a larger existing independent software base.

● All of these portable machines are inferior to similarly priced home computers in terms of processing speed and display facilities. They are only worth considering if true portability is important to your application.

Find your perfect

partner with Icarus

The Columbia 16BIT Personal Computer

Columbia
your perfect partner
ICARUS
Computer Systems Ltd

When you're choosing a computer, love at first sight can lead to a brief and disappointing flirtation, when what you wanted was a lasting and meaningful relationship.

That's where the unique Icarus computer dating service can help!

Just fill in this simple questionnaire and see if Icarus can help you in your search for a perfect partner.

1. What do you consider to be the essential qualities of a 16 BIT microcomputer?

Easy-on-the eye amber screen ☐

Floppy and Winchester disc configurations ☐

Two RS-232 serial ports & one parallel printer port ☐

13A plug ☐

2. What interests and activities will you be sharing with your computer?

- Accounting ☐
- Word Processing ☐
- Financial analysis and projection ☐
- Stock control ☐
- Full colour graphics ☐
- Games ☐

3. Which of the following characteristics do you consider important in a 16 BIT micro?

- Choice of CP/M 86 and MSDOS operating systems ☐
- Expandability up to 896K RAM ☐
- Plenty of IBM PC compatible expansion slots ☐
- FREE software to the value of £750 ☐
- Good looks ☐

4. What special features do you look for in a serious relationship?

- Access to hundreds of 16 BIT 'off the shelf' software packages including all those designed for the IBM PC ☐
- Access to 8 BIT CP/M software via optional Z80 expansion card ☐
- Wide range of enhancements, such as additional serial ports, 8087 arithmetic co-processor for high speed maths functions and IEEE bus controller ☐
- Close proximity of servicing and technical advice ☐
- Good family connections ☐

Thank you for your trouble. Here's some great news – there *is* a computer that's just right for you. The Columbia 16 BIT PC. It's your perfect partner.

For more intimate details, write in complete confidence.

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

● **Circle No. 153**

OUR CONTRIBUTION TO THE APPLE SCENE

CARDS

RAMCARDS

– with free software.

U-RAM16+ equivalent to Apple language card includes DOS mover. **£65.00**

SPECIAL BARGAIN **U-RAM32**+ versatile 32K card (includes DOS mover, VVE and VRD). **£50.00**

U-RAM64+e and **U-RAM128**+e big value, big memory cards including free DOS mover, disc emulation (VRD) and Visicalc expand software. (VVE).
64K **£180.00**
128K **£275.00**

NEW **VVE80 11e** Visicalc expand software for the 11e 80 column board and our U-RAM64 or U-RAM 128. **£30.00**

INTERFACES

NEW **U-PRINT 16**+e serial centronics, buffer and graphics printer interface. **£129.00**

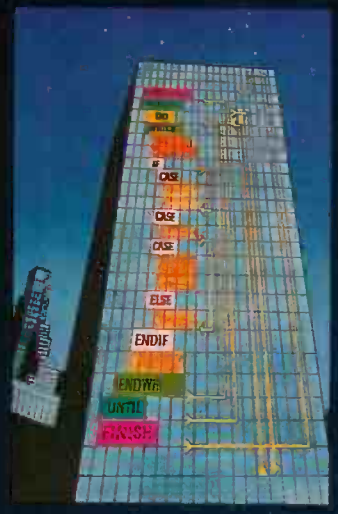
NEW **U-PRINT 64**+e version with 64K buffer. **£229.00**

U-PRINTCAB Centronics cable for U-PRINT. **£15.00**

U-S232+e /// serial interface. **£75.00**

U-PORT+e /// 8 serial interface on one card. **£195.00**

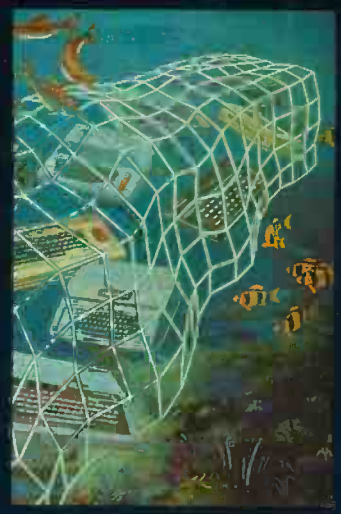
NEW **U-A/D**+e /// 8/16 channel, 12 bit A/D, software controlled gain, 32 digital I/O channel and timer! **£375.00**



STRUCTURED BASIC+e

The package that adds structured BASIC commands to Applesoft.
It allows structured programming without the complexities and fussiness of PASCAL. **£90.00**

"the only package I've seen this year I'd buy for my own collection"
Personal Computer News. Jun 83



U-NET+e

The most sophisticated, powerful and easy to use network system for the Apple II+ or IIe. Up to 29 users share up to six disc drives, one or two printers and a clock. Distance from host to satellite 100m with longer distances possible via modems. Detailed information on request.

Prices exclude VAT and delivery.
12 months warranty with all items.

CARDS

Interfaces continued –

U-DT+e /// digital I/O and timer card. **£105.00**

NEW **U-CENT**+e /// Centronics interface. **£69.00**

NEW **U-4DISC**+e disc controller (4 drives). **£85.00**

ENHANCEMENTS

U-Z80+e processor card for CP/M. **£95.00**

SPECIAL BARGAIN **U-TIM**+e precise timer. **£45.00**

U-TERM+ 80 col. display. **£150.00**

U-M68000+e 32 bit 68000 processor card. **£469.00**

NEW **U-TALK**+e speech synthesis. **£85.00**

AIDS

U-EXT+e /// slot extender. **£9.50**

U-PROT+e /// prototype card. **£12.00**

U-NSCRUMP+e /// software protection card. **POA**

MOTHERBOARD

The **U-COM2** is a fully compatible 8 slot, 64K RAM motherboard selling in increasing quantities to OEM's and System builders.
Big quantity discounts!
Details on request.

U-MICROCOMPUTERS

U-Microcomputers Ltd
Winstanley Industrial Estate,
Long Lane, Warrington,
Cheshire WA2 8PR
Telephone 0925 54117
Telex 629279 UMICRO G

USA Subsidiary –
U-Microcomputers Inc.,
300 Broad Street, Stamford,
Connecticut 06901, USA.
Telephone 203 359 4236
Telex 965999 O&S STD

KEY
\+ compatible with II+
e compatible with IIe
/// Apple /// version available with SOS driver. Price on request

U-NET is a trade mark of U-Microcomputers Ltd.
Apple is a trade mark of Apple Computer Inc

ORDER FROM YOUR DEALER NOW!

The 64K question

The Commodore 64 is hailed as one of the best home micros for word processing — but which package to buy? Barbara Conway offers some advice

WHEN COMMODORE introduced its new 64K computer a large part of the sales pitch was that here, at last, was the perfect dual-purpose machine for home and business. Like most such claims it was a little over-enthusiastic. The machine itself turned out to be more of a curious hybrid, with plenty of memory and features for home use but some major drawbacks as far as the serious business user was concerned, including the very limited Basic and the 40-column screen.

Yet the 64 has some admirable qualifications for use as a word processor. The ample memory allows long documents or chapters to be included in each file. And the superb Commodore screen editor tends to spoil regular users for other micros. With built-in advantages like these, the 64 was an obvious candidate for WP programs and, after a delay of several months following its launch, it got them.

I have looked at most of the packages currently on the market for the 64 — and more are imminent. Prices range from £40 to over £80, so the buyer can afford to be choosy and, perhaps predictably, it turns out that price is an unreliable guide to quality.

Paperclip 64

The opening screen is clear and inviting and the program does nothing to disappoint — quite the contrary. Paperclip 64 is one of the easiest of the professional word processors to use, with a sensible manual and plenty of aids for the accident-prone.

The package consists of a disc, a 112-page manual and a dongle which slots into the first joystick port. There are a wide variety of options for printer files, including my own version of the Epson MX-80, plus a do-it-yourself guide to setting up a printer if you do not own one of the many models provided for. I did have a little trouble loading the right variation for my printer. So perhaps the instructions need to be a little clearer on that point. If one idiot can become fuddled then so can others.

All in all there is very little to complain of in Paperclip 64. All the standard functions are there and several fancy additions to the normal minimum. Although it does not format as you type, the format instructions are fairly effortless. You can switch whole paragraphs, lines or phrases with a few keystrokes, and highlight word by word if you need to.

Another pleasing facility, particularly for those writing technical documents, is the ability to give special identification keys to phrases which are likely to crop up frequently. All you then need to do is press the relevant key, and your phrase, complex latin name or whatever is printed for you. Considerable effort has been spent on ensuring that all functions are accessed easily, including disc operations.

Another feature which will appeal to professional users is the numeric mode. It allows you to perform simple arithmetical operations with the program, and makes life a great deal easier when you prepare your tax returns, or the like. Having struggled with this task on other programs, I found it a pleasure on Paperclip 64. Setting out columns of figures, and even manipulating them in spreadsheet style, is easy although the actual calculations allowed are only addition and subtraction. The limit for any individual total is 38 digits which was enough for me. On the general principle of wanting a mile or two when offered an inch, I did feel that the facility was so useful that I resented being restricted to just two mathematical functions.

Backing up the mailing-list facility is an alphanumeric sorter which can be used for sorting out lists of names and addresses both by surname and, if some surnames are repeated, by a subsidiary field of information such as street name. Of more interest to writers and journalists is the ability to generate an index of sub-headings for each file as a report is written, with the page numbers automatically recorded for easy reference.

When reviewing a series of packages one of the indications of the merits of a program is how heroic you feel when you have made your way through one. In the case of Paperclip I hardly noticed any struggle at all. Bearing in mind the limitations of even a powerful home micro like the Commodore 64, as against the

(continued on next page)

Barbara Conway is a City columnist on the *Daily Telegraph*

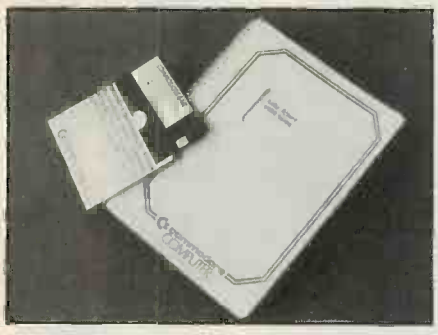
● Circle No. 154

The 64K question

(continued from previous page)
IBMs and their like, this program kids you that your micro is a mini in many respects. Drawbacks include the fact that in-text format instructions swallow valuable memory and the minor grouse about the print files, but these are relatively faint damns in a praiseworthy professional package.

Easy Script

Before going into any detail about Easy Script I have a confession to make. This package, produced by Commodore, was the first to come out for the 64 and also the first I had ever used. Because there was a hefty time lag before anything comparable appeared, I had plenty of time to form a



near-sentimental prejudice in favour of Easy Script.

The program was originally written for the 64 and although the early manual I have refers to a cartridge it is actually on protected disc. The manual itself is a very hefty and well printed affair. It starts from scratch with plenty of pauses in the instructions to check that you have understood the lessons so far. Printer options are comprehensive and the screen colour can be changed, which in this case is just as well since it starts as a pretty depressing grey-and-white combination. The printer-choice menu is straightforward.

One of the beauties of Easy Script is that, although it possesses enough powerful features to stand up well against most of its more recent competitors, it comes very close to being idiot proof. It is one of the few programs where, in my earliest attempts to use it, I was not able to crash any files. It may be possible to do so, but short of accidentally turning off the machine I have yet to find out how.

The text is entered unformatted. The format instructions are fairly easy to learn, but as in so many of these packages they take up valuable text memory. The page can be viewed almost as it will be typed — with the exception of some special printer instructions where you have to guess the final appearance — with one simple output command and printed with another.

Files can be saved to tape or disc and editing in format mode is a single-key operation. Disc directories can be viewed without danger to unsaved text, and files already stored can be appended to those currently in the machine with little problem except memory size.

Text manipulation is catered for well, and for report work there are facilities for both horizontal and vertical tab settings. Using the basic 40-column screen can be awkward for that function, but the screen does scroll horizontally in the video-output mode, which lets you see if you have worked out the tabs properly.

Files can be linked for global printing when required with a simple format instruction. Search and replace can be used, although there is some scope for confusion here, and chunks of text can be shifted around the file. Headings and page numbers are also catered for. The mail-merging facility can cope with most needs and requires little practice to produce a standard letter suitably printed out with different addresses and salutations.

Easy Script also has a matching spelling checker, Easy Spell. Although it lives up to its title for simplicity of use, it soon palls. To use it properly there are so many fiddly disc-switching operations that after a while you just stop bothering. It is not difficult, but it is irritating.

Wordcraft 40

An established star adapted from the Pet Wordcraft 80, this is the package with almost everything — including the biggest price tag of the lot. It is an undeniably excellent program, but with so much high-powered competition around it is hard to justify its cost.

Wordcraft 40 comes on cartridge, making it particularly attractive to those

with either a single disc drive or no discs at all. The manual is in a ring binder but the copy with my package was very badly printed, which detracted substantially from the quality of the contents. As with many of the manuals, it starts from the very beginning, assuming little or no knowledge of the medium. Its first step is to make sure that the equipment is properly connected before powering-up.

An idiot-proofing measure within the program is a flashing screen and error

message when you get a code wrong. Although it is possible to crash text while performing disc operation, the screen does warn you of the risk when it occurs.

When entering text you toggle painlessly

	Horizontal scroll	Auto-format	Lines of text per file	Numeric mode	Search and replace	Global print	Price	Supplier and phone number
Easy Script	Y	*	764		Y	Y	£75	Commodore (0753) 7929
Paperclip	Y	*	829	Y	Y	Y	£86	Kobra Micro Marketing (049) 122512
Quick Brown Fox	Y	Y	800		Y	Y	£60	SPT Electronics (0621) 868484
Script 64		*	‡	Y	Y	Y	£78.25	Impex Designs 01-900 0999
Simply Write			699		Y	Y	£35-£40	Simple Software (0273) 504879
Wordcraft 40	Y	Y	341		Y	Y	£89.95	Audiogenic (0734) 586334
Wordpro 3-Plus/40			329	Y	Y	Y	£80	Wego Computers (0833) 49235
Vizawrite	Y	Y	875		Y	Y	£69	Viza Software (0634) 813780

*final format can be output on video
‡ stores screen by screen up to 99 A4 pages

between typing and editing modes. The screen layout is clear, with format instructions for page width and length in the status line away from the text itself. Text is formatted as you write. Operations such as centring are made unusually simple. One minor point which took some getting used to was the command for a new line at the end of a paragraph. Most 64 programs use the Return key for this, but Wordcraft 40 makes use of one of the function keys instead. Full marks go to Audiogenic for some nice friendly touches in the manual, like the suggestion of taking a break after the first few sections. The computer equipment may not have been overheating but the user, suffering from a surfeit of word processors was quite near to it and appreciated the thought.

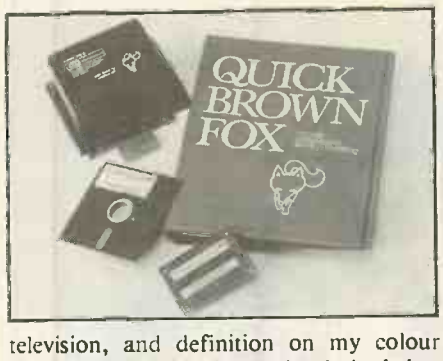
Text manipulation is much the same as that on other full-function packages. The Insert mode is a little idiosyncratic, opening up patches of 61 characters apiece, which close after the text is typed in rather than simply letting you type in however much new text you need and then returning to normal. There are no complications over shifting blocks of text, repeating blocks, search and replace and other similar operations. Naturally at this price, there are full header and footer facilities.

Disc and printer instructions are comprehensive and, in isolation, Wordcraft 40 would be very attractive. But with the likes of Paperclip around, it does not quite justify the price.

Quick Brown Fox

As a reasonably kindly soul, and one who was given a great deal of help and professional courtesy by SPT Electronics, I find myself in a real quandary over this package. There was one thing about the unit I received that I really liked; unfortunately, it wasn't the word processor.

My copy came complete with a large box of tricks which, when inserted into the cartridge port, gave me the one thing that I yearned for on my 64 — an 80-column screen. It will not work on an ordinary



television, and definition on my colour monitor left something to be desired, but on a green monitor the effect was very impressive. The cartridge allowed the word processor to be switched out so that the 80 columns could be used in normal programming.

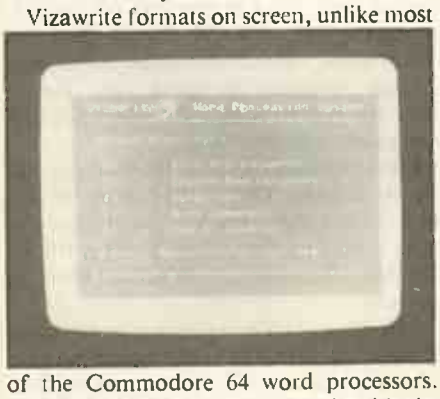
So much for the good news. As far as the word processor itself is concerned, I can only report that I am baffled. It has most of the right features, but someone seems to have decided to make them as fiddly and difficult to use as possible. Even relatively simple editing involves switching in and out of modes which seem designed to irritate. It is not difficult to do, but annoying when you are trying to get a decent flow of words going.

The manual, like the program itself, has all the right ingredients but the result is not a pretty sight. There may be places for its painfully jokey approach but a word-processor manual is not one of them. The actual instructions are reasonable enough, but the effort required to swallow the condescending tone renders them all but useless. I would use the 80-column board with pleasure, but only with the word processor permanently switched out.

Vizawrite

One of the earliest word processors produced for the 64, and very much in the "user friendly" category is also twinned with a spelling checker. It makes a rounded package well matched to the needs of heavy users such as myself.

Vizawrite formats on screen, unlike most



of the Commodore 64 word processors. Most people will probably use it with the 40-column page width for composition and a revised width for actual printing. The program scrolls across the screen automatically if you set for full page width, but I prefer to see large chunks of my text fully available to me as I write. Having only half the page visible makes me nervous. Perhaps it is a hang-up from more years than I care to think about of being a typewriter hack.

Format instructions are clear and are further explained in the admirably laid-out manual. You are allowed a generous amount of text per file. The program disc is heavily protected with no facility for making a back-up copy. Although Viza Software will replace a corrupted disc an y problems with it will mean that further writing depends on the speed of the company's response.

At least one facility on Vizawrite seems to be unique. The program actually admits the existence of other word processors and can merge its own files with sequential files from some of them — such as Commodore's own Easy Script. It is a nice touch and, for the likes of me who have many an Easy Script file, it is very practical.

The display is averagely clean. Like most others, Vizawrite can change screen colours, which is a mildly attractive if hardly decisive facility. It caters without too much trouble for most likely printers. Disc access is straightforward, and disc operations such as reading the directory can be used in the middle of text operations without risk of losing the story so far.

If I had not used Paperclip I probably would not have noticed the fact that calculations and sorting operations are not catered for in Vizawrite. Most other needs are, in straightforward vein, so that complex editing including matters such as switching chunks of text are easy to get the hang of.

It took me some time to get used to the mailing operation, but once I got the hang of it there was no usage problem there at all. Although produced early in the life of the 64, Vizawrite holds up very well against most of its rivals. The spelling-checker option is a plus, particularly since it operates without undue fuss. Vizawrite is good value for money.

Simply Write

This is the cheapest package of the lot, but do not let that mislead you. It is startlingly good value for money. Simply Write comes on disc or tape with a relatively slender but workmanlike manual. Bearing in mind the prices its features are

remarkable. It can get along with any printer, disc handling is straightforward and the maximum text per file is just about double that of the most expensive program in this survey.

Almost all the text-manipulation requirements are there, including shifting blocks of text, page numbering, justification of text and centring. Better still, the commands are easy to memorise

(continued on next page)

The 64K question

(continued from previous page)

and use. Simple Software has even given it a colour-change facility — one of many features showing up the opposition.

It is not the best of the bunch, but a package at this level which offers linked files, mailing-list facilities with an alphabetical file sort, and the ability to view formatted text before printing has to be good value. For many home users, particularly if they want to use a word processor without the added expense of a disc drive, this is an ideal starter package.

Script 64

This is an unusual package in several respects, most notably because it is the only one currently on the market to include an integral spelling checker, a development which others look very likely to follow. Script 64 comes on disc with a well printed ring-binder manual which covers most of what you are likely to want to know, including a wide range of text and print-control functions.

The program is different from most of the others in that instead of performing the usual scrolling-up function when your text reaches the bottom of the screen window, it switches to the next screen. I found it less convenient than the conventional continuous scrolling text.

Printer choice is liberal and disc commands are clear. The program makes the most of the text memory available by not cluttering it up with format commands. They are enclosed in special control maps which can cover either an entire file of up to 40 screens or each individual screen. A special structured-screen format exists to deal with technical documents or charts. There is a numeric mode, once again with calculations limited to addition and subtraction. Keys can be redefined and files linked globally.

The star turn is definitely the spelling checker. You have to create your own dictionary disc, and building up a suitable vocabulary is a little tiresome, but that applies to any such program. If you need this facility — and most home users probably will not — Script 64 is the obvious choice.

Impex designs is also now marketing another package, which I have not had the chance to test, called The Word. Again it is not for the majority of home users, but since it is based on Paperclip run on an 80-column board it sounds a good option for those likely to need a word processor for heavy use. A database is included and the package costs £195. The price puts it way out of the normal range, but if you can make use of the facilities it could turn out to be fair value.

Wordpro 3-Plus/64

When the majority of word processors available for the Commodore 64 cost an average of around £60 then a package which costs £80 had better be something special. Wordpro is good, but for a program in the luxury price bracket it has some surprising deficiencies.

Most obvious of these shortcomings is the file capacity. One of the features of the 64 is the fact that it has 39K available to the user. With a maximum text area per file of 329 lines, Wordpro is well behind most of its rivals.

The other problem is almost inexcusable in a package like this: a disc operation can crash the text in a file. It is something that most other packages have either prevented or at least provided insistent warnings about. The package includes a copy-protected disc and a comprehensive manual which manages to cater for the absolute beginner without being unduly patronising.

However, the text is not formatted as typed, which is par for the course. And although there is no problem in getting it to print out a full page width, the screen will not scroll horizontally across 80 columns to show you exactly what the printer will produce.

The printing output is straightforward but I met a hitch here that may be worth recording. Wordpro accepts different printers but it will only recognise a printer if it is attached to the computer by the serial bus. That left my Epson, using a Centronics ribbon connector, feeling distinctly unloved when I tried to output text. Assuming that your printer is connected acceptably, Wordpro has the facility, matched by Paperclip, to print up to 255 copies of any text without any further complications and separately from the mailing-list operation.

There are no complaints about text manipulation, including erasure, switching, duplication, etc., or about the ease of disc operations — always remembering the real risk of losing text while reading a directory. The main program has 329 lines of text for files, but there is an Extra Text mode for frequently used material and mailings. The ability to key in often-used text is one area in which Wordpro beats Paperclip, since the more expensive package can extend this function to cover several lines against Paperclip's maximum of one line. Wordpro will also let you key in an abbreviation which the program will change to the full word when you include it in the text.

Wordpro matches Paperclip's numeric functions, with the ability to set up columns and perform addition and subtraction with them. But it goes no further than Paperclip in this and, bearing in mind the vast price difference, looks on balance to be the less attractive of the two.

"ONE THING YOU'LL NEVER GROW OUT OF"

When we tell you that the new Spectravideo SV•318 is incredibly expandable, we mean it. If you think that goes without saying, just glance through a few of our competitors' ads. Time and again, you'll read about 'a wide range of expansion modules now in the pipeline', 'coming next year' ... 'in the shops soon'.

The SV•318 has a full supporting system of 14 peripherals, available now. Which means that when you're ready to take the next step, so are we.

For software, too, the SV•318 is second to none: built-in CP/M compatibility gives you immediate access to over 3000 existing programs. And, using Microsoft BASIC as its resident interpreter, it's a home computer that gives you real scope for writing your own programs. Compact good looks and a host of intelligent design features (including a unique built-in Joystick/Cursor Control) may be no more than you'd expect from such a powerful and sophisticated machine.

But the price may well surprise you. At £199 (incl. VAT), the Spectravideo SV•318 is far better value for money than any of its 'disposable' competitors.

SPECTRAVIDEO™

SV•318

PERSONAL COMPUTER

- **Memory** – 32K RAM expandable to an incredible 256K, and 32K ROM expandable to 96K.
- **Expandibility** – Full supporting system of 14 peripherals, including game adapter, 7-slot expander unit, floppy disk drive, data cassette, etc.
- **CP/M Compatibility** – Immediate access to over 3000 existing software programs.
- **Graphics** – 16 colours, and 256 x 192 high resolution graphics.
- **Sound** – 3 sound channels, 8 octaves per channel.
- **71 Key QWERTY Keyboard** – special features include unique built-in Joystick/Cursor Control.

Microsoft BASIC is a trademark of Microsoft Corporation
CPIM is a trademark of Digital Research Inc.

For more information on the expandable SV•318, and the address of your nearest dealer, telephone or write to us at:

Name _____

Address _____

_____

_____ Tel _____

CKSupplies

Unit 5, Norside, Oldmixon Crescent, Weston-super-Mare, Avon BS24 9AX.
Telephone (0934) 418838/516246

PC

● Circle No. 155

SOFTWARE FOR YOUR MICRO

British Broadcasting Corporation

These new software packs are designed to exploit to the full the sophisticated design and great versatility of the British Broadcasting Corporation Microcomputer.

White Knight: Mark Eleven

The amazing chess program that won joint first place in the P.C.W. Microcomputer Chess Championships.
£11.50

Canyon

'The game is fascinating, the graphics are good, the instructions excellent, and the whole thing is a pleasure'
–THE MICRO USER
£10.00

Dr Who: The First Adventure

Wriggling Worms and Terrordactyls are among the hazards facing Dr Who in this exciting graphics game.
£10.00

VU Type

An ingenious program that teaches you to touch-type without the need for a book, using exercises approved by Pitmans.
£16.10

Record Keeper

A very useful program enabling householders and small businessmen to keep track of their lists.
£13.80

Taxcalc

This Which? income tax calculator enables you to check your tax bill for 1982-83.
£17.25

Toolbox

This invaluable set of programming aids includes a REM stripper, cruncher, RAM test and program re-sequencer.
£21.00

Beyond Basic

A book and software pack explaining and demonstrating assembly language programming using the British Broadcasting Corporation Micro's built-in BASIC assembler.
Book £7.25 Software Pack £11.50
Published jointly with National Extension College Trust Ltd.

The Friendly Computer Book

An illustrated, step-by-step guide to computing and BASIC, by Jonathan Inglis.
£4.50

The original software range from the British Broadcasting Corporation is still available:

Early Learning. Fun Games. Games of Strategy.
Home Finance. Painting. Drawing. Music.
The Computer Programme Programs Vol. 1
The Computer Programme Programs Vol. 2
Each £10.00

ON SALE NOW AT
SELECTED BOOKSELLERS AND
MICROCOMPUTER SHOPS

Prices include VAT.

● Circle No. 156

ATA The market leaders!...

ACT Sirius 1 128K 1.2MB S/S DISKS ONLY-£1795

ATA'S philosophy is to ensure that our customers have quality computer hardware and software products at COMPETITIVE prices, together with technical assistance required to efficiently operate their computer system.

Export specialists — ring or telex for details

...with recognised professional support

Sirius Hardware

	£
Sirius 1 128K 1.2mb disk drives	1795.00
Sirius 1 256K 2.4Mb disk drives	2395.00
Sirius 1 256K 1.2mb disk drive & 10Mb internal Winchester	3295.00
128K RAM Boards	264.00
256K RAM Boards	399.00
384 RAM Boards	499.00
512K RAM Boards	575.00

Z80 CP/M 80 System

SSE Z80 CP/M 80 system	395.00

Sirius Software Languages

CBasic 86	179.00
Level 2 Cobol with forms 2	595.00
Microsoft Basic compiler	269.00
Microsoft Pascal compiler	335.00
Microsoft Fortran compiler	335.00

Word Processing

WordStar	269.00
SpellStar	120.00
MailMerge	120.00
Word Mailer	80.00

Databases

dBase II	365.00
Autocode	180.00
DataStar	135.00

Spreadsheet

Multiplan	180.00
CalcStar	80.00

PRICES EXCLUSIVE OF VAT AND CURRENT AT TIME OF PRINTING

System Utilities

	£
Diagnostic package	69.00
CP/M configuration package	119.00
MS DOS programmers toolkit	169.00
Sirius 1 hardware reference manual	45.00
IEEE 488 package	169.00
Graphics toolkit	169.00
Asynchronous communications	169.00
remote batch	285.00
3270 emulator	340.00

I.C.E. Winchester Sub-Systems

5 Megabyte	1395.00
10 Megabyte	1599.00
20 Megabyte	2099.00
40 Megabyte	3399.00

Tape Streamer

Will fit all drives as above and also Apple ProFile 5Mb (Please state which drive when ordering)	£1660.00
Cartridges DC 300A (5Mb & 19Mb)	16.00
DC 600A (20Mb)	25.00

(Size after Formatting. One year's on-site maintenance.)

MULTIPLEXOR AVAILABLE FROM £950.00

Colour Monitors

Luxor high resolution 25Mhz linear & TTL	499.00
Kaga Denshi medium resolution TTL	325.00
Kaga Denshi low resolution	265.00

We also stock the Hantarex RGB monitors, as recommended by Apple in Europe.

Kaypro II

Fresh from the U.S.A.! The best value portable micro from KAYPRO . . . including Software

	£
KAYPRO II 2 x 200K disc drives	1395.00
KAYPRO IV 2 x 400K disc drives	£1695.00
KAYPRO X 1 x 400K disc drive and built in 10MB Winchester	£2875.00

Other software including financial ledgers etc also available.

Hyperion

Hyperion 256 x 2 MSDOC, Basic	2950.00

Printers & Plotters

Epson

Epson RX80 120 CPS	260.00
Epson FX80 160 CPS	350.00
Epson MX100 100 CPS	420.00
Epson RX80FT	295.00
Epson FX100 160cps	525.00

Apple

APPLE Dot Matrix 120 CPS	349.00
APPLE Letter Quality Printer	1199.00

Ricoh

Ricoh 1300 Flowriter	1155.00
Ricoh RP1600 Flowriter	1499.00
Mannesmann Tally MT160L	449.00
Mannesmann Tally MT180L	649.00

Plus full Range of Centronics Printers Available

Plotters

Hewlett Packard HP7470	999.00
Hewlett Packard HP7475(A3) TBA	1399.00
Calcomp 8 PEN (A3)	2999.00

WE ALSO STOCK APPLE IBM AND HEWLETT PACKARD

TERMS AND CONDITIONS
For delivery please add £0-£199 - £5, £200-£1499 - £13, £1500 - 1%.

CHEQUES WITH ORDERS
Please allow 10 days for clearance. PLC's, public sector etc 30 days credit available on official orders, subject to 5% credit charge.

ACCESS VISA

ATA — LONDON 4 Albion Hse, 1 Back Hill, London EC1. 01-833 0044
Telex 25102 CHACOM G
ATA — POTTERS BAR 197, High Street, Potters Bar, Herts EN6 5DA (0707) 57113
ATA — SHEFFIELD 72 Eldon Street, Sheffield, S1 4GT. (0742) 700802
FREEPOST SHEFFIELD S1 1AY

KAYPRO II PORTABLE
2 x 200 K DISK DRIVES
80 Col. 64K RAM
£1395

ATA

• Circle No. 157

Enhancing dBase II

If you judge a product by the number of add-ons produced for it Ashton-Tate's database package must be a winner. Mike Lewis tries some of them out.

ASHTON-TATE'S DBASE II has been on the market for less than three years. Yet a veritable sub-industry has grown up around it. There are firms that will sell you dBase courses, dBase consultancy, books on dBase and, inevitably, a clutch of software products which claim to enhance and improve the original program. Some of these add-on programs will indeed make life easier for the dBase user. But most of them appear to do little that you cannot do for yourself with minimum effort.

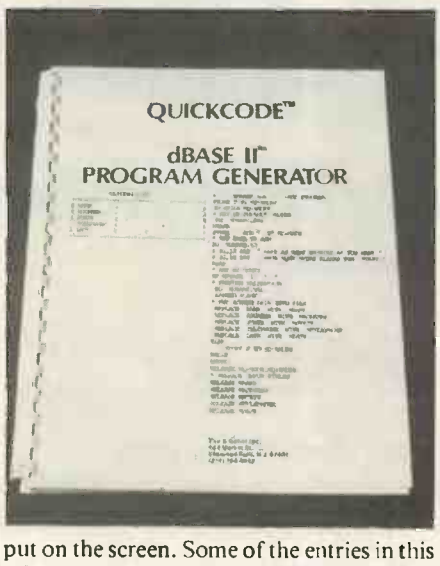
Perhaps the leader in the field is Fox & Geller, an American software house that has recently set up shop in central London. It has three dBase-oriented products: dUtil, which provides a rag-bag of functions for the dBase programmer; dGraph, a graphics program which I have come to like a lot; and its best known product, Quickcode, which is grandly claimed to be a program generator.

Quickcode

Quickcode does indeed generate programs, but they are very limited in what they can do. What you end up with is a simple set of dBase command files that create and maintain a single database. It is adequate for a few simple applications, but the process lacks flexibility and fails to take advantage of the power of dBase II. To use Quickcode, you describe your application in terms of a data-entry form. A simple editor places field captions, instructions and boxes on the screen, exactly as you wish them to appear to the end-user. To specify an input field, you type a semicolon followed by the field name.

There is the usual set of cursor-control and editing keys to help you design the form. In fact, Fox & Geller allows you to assign any keys you like to the various control and editing functions, a practice which more software publishers should follow. You can use these keys to juggle things around on the screen until you are happy with the way they look.

To describe the input fields in more detail you enter Quickcode's field mode. It presents you with a table setting out the characteristics of each field that you have



put on the screen. Some of the entries in this table are filled in by default; others are initially blank.

Using the same control keys, you go through the table filling in the entries, or altering existing ones. In this way you define the lengths of the fields, their types, validation criteria, and other characteristics. You can go back and forth between the data-entry screen and the field table as often as you like, altering things as necessary. You can also save the whole thing to disc for later recall.

When you are satisfied with your screen and the fields, you tell Quickcode to generate the programs, which is completely automatic. It also produces an empty database, and a print file containing an image of the screen for documentation purposes. The generated programs form a menu-driven system for running from within dBase. You can use these programs to add records to the database, and to retrieve and amend existing records using the data-entry screen that you specified in Quickcode. There are also functions for printing reports and for setting up a data file for processing by WordStar and Mailmerge.

The best thing about Quickcode is that it is indeed quick. It took me less than an hour to generate a sample order-processing system, and the actual program generation took under three minutes. The problem is that the generated programs can really only do one thing — maintain a single file. This might be fine for, say, a mailing list. But if that is all you neeed to do you may be better off with a simple filing system such as Micropro's Datastar or Caxton's Cardbox.

Most serious programmers would find Quickcode too limiting for anything other than rough-and-ready applications. You have very little control over operator messages, and none at all over disc usage. I like to put plenty of Help screens in my programs, which you can easily do in dBase, but in Quickcode you would have to amend the generated code. Although it is easy enough to do, it rather defeats the object of a program generator.

Friday

An alternative front-end system to consider is Friday. It is produced by Ashton-Tate, the publisher of dBase itself. Strictly speaking, Friday is not a dBase add-on becaus it functions quite independently of dBase. It is a very useful program in its own right, and provides a simple method of creating and maintaining dBase -type files. It gives you all the functions of Quickcode programs and a great deal more. Friday has many of the features of dBase, except that it is not a language. It is entirely menu-driven, and certainly easier for beginners to use.

dUtil

Fox & Geller's second offering is dUtil, a collection of utility functions for dBase programmers. This program is straightforward to use and reasonably fast, but it does very little that you cannot easily do by other means. The main feature of dUtil is its ability to merge subsidiary command files, which are like subroutines in other languages, into higher-level programs.

The theory is that this saves running time because it cuts down the disc accessing needed to call in the lower-level code. I found that this works well up to a point, although the time savings are quite small. The theory falls down when the main program has to call one of several different

subroutines, according to some conditions. To illustrate, consider the following coding:

```
DO CASE
    CASE CODE = "A"
        DO GETSALES
    CASE CODE = "B"
        DO GETCOSTS

etc. etc.

ENDCASE
```

If you put this through dUtil you would find that all the subsidiary routines had to be loaded with the main program, and each would need to be scanned by dBase. Without dUtil only the routine that was actually used would be loaded. So dUtil would slow the program down in this case, rather than speed it up. A better solution would be to use a macro call. You would rename the subroutines as, say, Geta, Getb, etc., then replace the entire Case statement by a simple Do Get&code. Unfortunately, dUtil cannot handle this construction.

Another problem with dUtil is that it could greatly increase the amount of disc space needed by the programs. It can also cause difficulties with Return statements in subroutines. When these are brought up to the high level, they will cause a branch to the wrong place. At least, the accompanying manual warns you of this problem and gives advice about dealing with it.

Other dUtil functions include: expanding keywords and converting them to capitals, putting indents into a program to emphasise its structure, adding comments to Endifs and Enddos, and outputting a tree diagram for a set of linked command files. I suppose some dBase users would find these moderately useful, but I doubt if many would consider it worth paying £69 for them.

What is dBase II?

The cover of the dBase II manual bears the title *Assembly-Language Relational Database Management System*. Don't let this put you off — nothing could be further from the truth. dBase has nothing to do with assembly language. True, the program was itself written in assembler. But then, so was WordStar, CP/M and most Basic interpreters. So what? You certainly will not need to know assembler to use dBase.

Then there is the bit about relational databases. If you define a database as a method of storing data independently from the programs that use it, then dBase more or less fits the bill. But there is a lot more to relational databases than this — see "What exactly is a database?", *Practical Computing*, May 1983. dBase is a long way from being a true database package but then so are most of the products that rely on this overworked description.

In fact, dBase II — the II is part of the name but is usually omitted; there was never a dBase I — is a high-level programming language that is especially useful for applications involving filing, searching, indexing and retrieval. To give you an idea of its power consider the following dBase program:

```
USE ACCOUNTS
REPLACE ALL YEAR:TOT WITH YEAR:TOT + MNTH:TOT, MNTH:TOT WITH 0 FOR
  TYPE >2 .AND. ACTIVE = "YES"
```

Yes, this really is a complete program. It opens a file, reads each record in turn, tests for certain conditions, updates two of the fields in the record, rewrites the updated record, tests for end of file, closes the file, and returns control to the calling program. Not bad for two program lines. dBase programs tend to be so short that many users manage without them altogether. They simply type the commands as and when they need them.

But like all languages, dBase has its weaknesses. In particular, it is completely useless for any type of table handling or subscripting. Its string manipulation is minimal, and it has no floating-point arithmetic.

It is in file handling that dBase really shines. It has high-level commands for indexing, searching, sorting and joining — comparing two files and extracting a common subset. And the programmer never has to worry about the structure of a file, all references being by field name.

Add to this the dBase commands for screen handling and report writing, and you begin to realise why this is such a popular tool. Few users would claim that it is ideal. It still has bugs and it can be infuriatingly slow. There are also many look-alike packages on the market, some of them quite good. But as a method of producing ready-to-use systems as quickly as possible, dBase II is hard to beat.

dGraph

By contrast Fox & Geller's third product, dGraph, although not cheap, is worth every penny of its £200 purchase price. My initial reaction to this graph-drawing utility was that it would be too limited for most users. But dGraph has hidden depths, and once I started using it I began to realise its power.

On the surface, dGraph is a simple program that will draw four different types of diagram: bar charts or histograms; line charts, such as a time series; pie charts; and a sort of rectangular pie chart called a piebar figure. The main limitation is that the diagrams are fixed in size at roughly half an A4 sheet.

To use dGraph at its simplest level you type in an array of figures — up to four columns and 52 rows — then tell the program to start drawing. dGraph will use default settings to produce a take-it-or-leave-it diagram, but the fun begins when you start specifying your own settings. You can choose the type of shading, the symbols to use as markers, reverse — white on black — printing, and various headings, titles and legends. You can zoom on to a small part of the graph; you can merge text with graphics; and you can plot averages and cumulative values on the same axes as the basic data.

So what has all this to do with dBase? If you tell dGraph to get its data from a dBase file it will access the file structure and let you use the fields and records to define the graph. You can perform arithmetic on the fields, select records, and much more. It is very powerful, but also very easy to use. My only complaint is that the manual makes the process look more complicated than it is.

But dGraph is in no way tied to dBase and you can use it as a stand-alone program. It incorporates a rather crude text editor for keyboard entry of data, or you can pass data to it in the form of a file. It makes it easy to link it to prgrams in other languages.

From the system developer's point of view, dGraph has some useful features. You can separate the process of defining the graph from the actual drawing, so the end-user can call up a pre-defined graph simply by typing a CP/M command line such as

```
DGRAPH SALES CHART
```

You can use the dBase Quit command to

(continued on next page)

(continued from previous page)

link dGraph with a dBase menu, allowing the user to select a graphics option without being aware that a separate program is in use.

One snag with dGraph is that you need a printer with bit-mapped graphics. The program supports a range of popular matrix printers, but there is also an option for writing a bit image of the graph to disc. A competent programmer could easily write a program for printing this file to any suitable hardware, including a bit-mapped screen or, at a pinch, a plotter.

dBPlus

While dGraph will find a ready market among non-dBase users, Humansoft's dBPlus package is firmly aimed at the dBase fraternity. It has three functions, each of which neatly exploits a weakness in dBase itself. Firstly, there is a program for sorting dBase files. Humansoft claims this to be up to 15 times faster than the Sort command within dBase. I did not carry out any exact timings, but sorting in dBase is so slow that I can readily believe it. The strength of the dBPlus version is that you can sort on as many fields as you like in a single pass. In dBase you can only sort on one field at a time.

Even so, this feature is nothing to get excited about. I suspect that most dBase uses avoid sorting at all costs, preferring indexes instead. This is not only faster than sorting, it is much more flexible. In dBase, you can combine fields, sub-fields and constants in almost any way to produce indexes. And you can arrange for an index to be updated automatically as records are added and deleted.

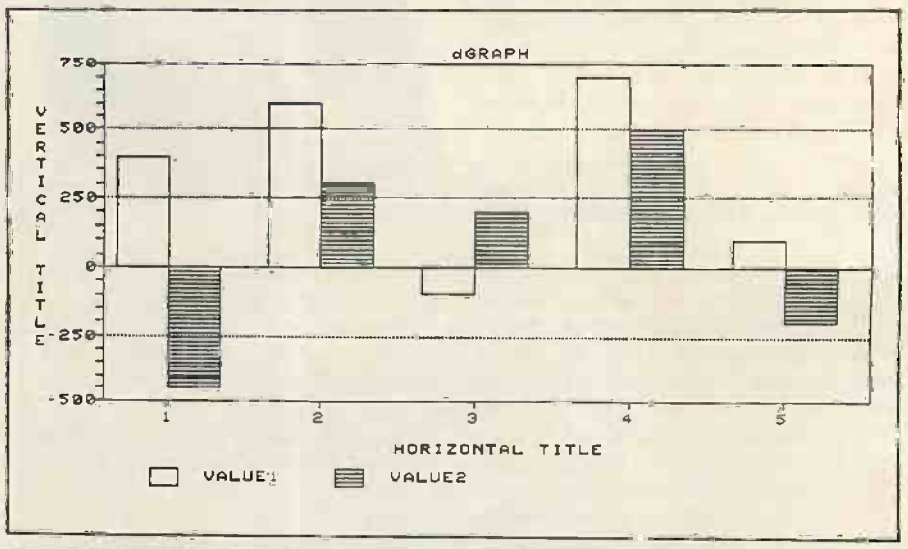
The second dBPlus function is used to compress a dBase file, with the aim of saving disc space for back-up and archive copies. It takes advantage of the fact that dBase uses a full byte to record each character, digit, flag, sign and decimal point in its files. DBPlus uses a much more efficient method. I did not achieve the savings of 70 percent that Humansoft claims, but I can imagine that such savings are possible in the most favourable circumstances.

The snag is that you can only use the packed version of the file for archives and security. dBase cannot itself access this copy, and you have to reverse the process in order to process the file an any way. Fortunately, it takes no longer than normal file copying.

The third dBPlus function is called Transform. It is a menu-driven version of dBase's Modify Structure command. It does not appear to do anything that you cannot do in the dBase verson, but it is certainly simpler to use.

Runtime

Finally, Ashton-Tate has a product that will be warmly welcomed by software houses who wish to sell dBase packages off the shelf. Up to now, such firms have had



Books about dBase

When you buy dBase II, you get a 188-page A4 typeset manual. It is reasonably well written, carefully organised, and full of examples. True, the typography is a little peculiar — the most recent edition has funny little diamonds instead of quote marks. But most people manage to understand much of the text, which, by the standards of our industry, can only be described as excellent.

Still, there are a lot of writers about who think that they can do better. No doubt some of them can, so you can expect to see books about dBase appearing in your local bookshop or computer retailer from now on. One such writer is Adam Green. Mr Green is the head of an American firm called Softwarebanc, a consultancy that specialises in dBase applications. He is the author of *dBase II User's Guide*, published by Prentice-Hall at £24.65.

Of this book's 150-odd pages, some 45 are devoted to a sample set of programs all clearly explained and nicely commented. They show Mr Green to be a system designer and programmer of the old school — one who plans his application carefully before putting his fingers on the keyboard. If you are new to programming you would do well to study these samples. The programs are for keeping track of donations to a college, but they will serve as a model for many other applications. They also neatly illustrate many dBase techniques.

Alas, Mr Green's undoubted skill as a programmer does not spill over into his writing; the book itself is not well written. I suspect that someone who finds dBase hard to understand will be even more confused after reading this volume. An experienced dBase user will learn nothing from it either.

But the worst thing about this book is the appalling typography. It has been printed on a daisywheel typewriter, with absolutely no thought to its appearance. The page layout is sloppy to say the least, and typing errors abound. Using word processors to create camera-ready copy in this way is becoming quite common, and there is no excuse for not making a good job of it. Take a look at some of Digital Research's recent manuals to see how well it can be done. The surprising thing is that a firm with the prestige of Prentice-Hall should agree to let the book out in this condition. And to charge nearly £25 for it is nothing short of an insult.

A much better bet is *Everyman's Database Primer* by Robert Byers, published by Ashton-Tate at £12. Although not a small book at 300 typeset pages, it is very easy to read. Mr Byers has a good writing style, and you will zip through it.

Although he sets out to describe the theory of databases, the author uses dBase II for all his concrete examples and illustrations, which is not surprising when you consider who the publishers are. I would not be surprised if an intelligent newcomer to computers was able to learn to use dBase from this book alone.

I would go further and say that this book provides a very useful introduction to computers in general. It will take the reader from the basic idea of organising data through to some fairly advanced programming concepts, and all at a very easy pace. I recommend it.

two big problems. First there was the question of cost. To use a package a user had to buy dBase as well, and this greatly increased the cost of the application. Then there was the fact that the developer had no way of protecting his source code.

Ashton-Tate's Runtime package overcomes both these problems. It consists of two programs: dBCode, which crunches a batch of command files in such a way that they cannot be read by a human; and dBRun, which executes the crunched programs. To the end-user, the application looks exactly the same as if it was being run under dBase proper. The difference is that the user no longer has access to the dBase command line. He can only run the programs that he has purchased. And because dBRun can be licensed at a much lower price than the full dBase package, off-the-shelf systems work out much cheaper to buy.

dBase II is now firmly established as the leading database-management language, and there is likely to be a big increase in the number of ready-made packages in dBase. Another growth area will be in application packages that have no connection with database management, but that nevertheless includes an interface with dBase files. Ashton-Tate's Financial Planner is a good example. It is a modelling language, with a Read command that can access dBase data. And I know of at least one payroll that permits the user to pick up details of bonuses and overtime from dBase.

Conclusions

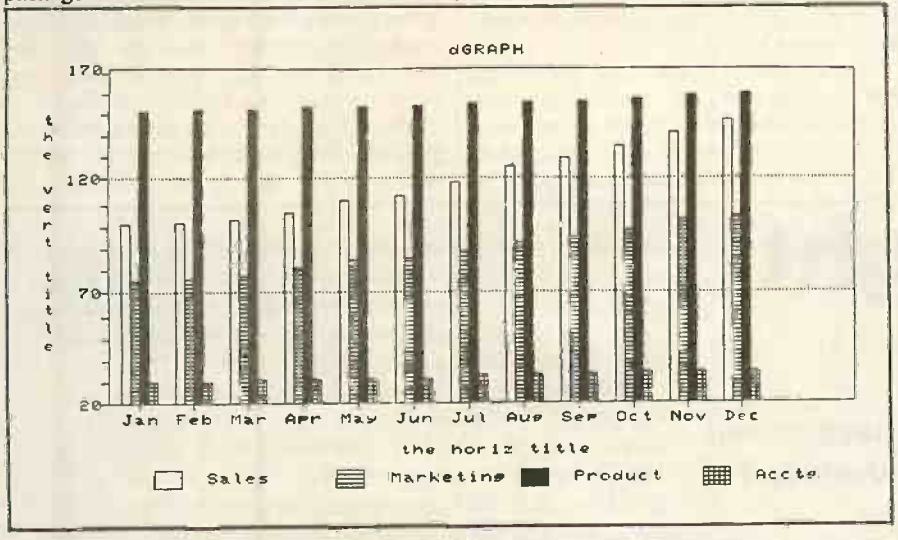
● With dBase II gaining a dominant position in the database market, the growth of add-on programs, compatible languages and off-the-shelf applications has been inevitable. If a software product can be advertised as dBase-compatible, it has a head start.

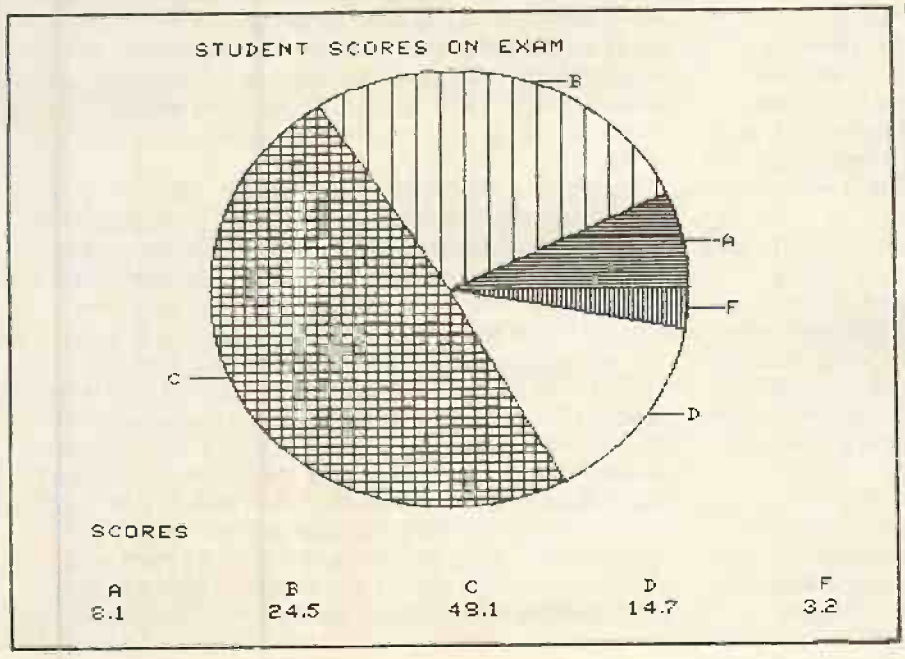
● Some of the add-on progams are useful and powerful systems in their own right. A good example is dGraph, which is likely to find a niche in the growing graphics market even among non-dBase users.

● Others are less useful. A typical reaction to dUtil or dBPlus might be: "Great program. So what?" These products do precisely what they set out to do, but provide little or nothing that cannot be achieved with a text editor or with dBase itself.

● If your database needs are extremely simple, a dBase program generator such as Quickcode might be worth looking at. But you would probably be better off with a single-file handler or with Friday, a sort of menu-driven version of dBase.

● The dBase Runtime package will be good news for vendors of application packages. It is likely to lead to more off-the-shelf products being written in dBase.





dBase products

Product: Quickcode
Description: A dBase program generator. You define an application in terms of a data-entry screen. Quickcode generates a menu-driven set of dBase programs that use this screen format for adding data to a file and performing basic file maintenance.
Publisher: Fox & Geller, 17 Wigmore Street, London W1, Telephone: 01-580 5816
Price: £200

Product: Friday
Description: A file-manipulation system aimed at first-time micro users. It has many of the features of dBase, and its file are dBase compatible. But it is completely independent of the dBase language and no programming knowledge is required.
Publisher: Ashton-Tate, Cofferidge Close, Stony Stratford. Telephone; (0908) 568866
Price: £190

Product: dUtil
Description: Various utility functions for dBase programmers.
Publisher: Fox & Geller
Price: £69

Product: dGraph
Description: A program for drawing histograms, true graphs, pie charts and piebar diagrams. It can be linked with dBase, used on its own, or interfaced with other programming languages.
Price: £200

Product: dBPlus
Description: Programs for sorting and compressing dBase files, and for altering file structures.
Publisher: Humansoft. There appears to be no official U.K. distibutor, but the package is usually obtainable through dealers.
Price: About £100

Product: Runtime
Description: A product which makes it possible for software publishers to market their dBase programs without having to sell dBase itself.
Publisher: Ashton-Tate
Price: Special licensing arrangements are available for software houses, etc.

Birthday surprise

We present the winner — and the best of the rest — from our anniversary competition.

FOR PRACTICAL COMPUTING'S fifth birthday this year we set a competition, with Commodore (U.K.) kindly donating £500-worth of prizes of the winner's choice. Having looked back at the developments in computing over the previous five years we asked what the computer of 1988 will be like? More specifically, we invited you to submit a short report of the sort we often publish as a preview — a brief review of a machine that is new and that we have not had the chance to subject to the extensive hands-on testing required by a proper review.

There were more entries than expected — nearly 90 — and they showed a wide variety of approaches. Some people tackled the assignment seriously, with predictably dull results. Others paid less scrupulous attention to the actual year of their new micro's launch, but explored areas in which micros might possibly develop. Yet others poked fun at the whole enterprise. The most po-faced of these described a new micro called Mabel.

It was remarkable, not to say depressing, that a great many of the visionary new micros contained obvious flaws which were carefully pointed out in the reports. Does this mean the manufacturers are going to continue to make cock-ups just like they do today? Obviously.

In case anyone is interested, the consensus is that the micro of the future will look rather like a small briefcase. When you open it up, the keyboard will be on the bottom and a full-size flat screen inside the lid. Brian Williams calls it the knee/desk PC, which is shorter than the Premier Executive Portable Work Station.

One of the many nice variations on this micro is the Deja Vu, on which A M Warburton reports. The most futuristic part of this new Commodore is that it contains graphics commands such as Arc, Dot, Draw and Colour. Notwithstanding the attractive drawings submitted the name is just too true for this type of micro. The Gavilan is expected to be with us "real soon now", and that already wraps up the 1988 hardware in a brief-case sized box.

It was good to see a sense of humour evident in many entries. J E Chesney took the logical step from today's infatuation with mouse operation and christened his micro The Cheese — well, its official title is the eQual. The point about this micro is that it has graph-driven software. Everyone is familiar with the boring system whereby production increases and you plot the resulting graph. Far better to move the graph up and watch production increase.

The eQual also has a personal software package that generates horoscopes, and if micros really are to become part of

The Thought Processor

Trevor Hatchett previews a flexible and elegant blend of hardware power and programming sophistication.

What marks this new computer apart from all of its competitors is its ability to communicate with mere humans with the same high efficiency with which it communicates with other computers and peripheral devices. For the novelty of the Thought Processor, as it is called, lies not merely in its massive memory, but rather in the uncannily intelligent manner in which it is used.

It has a vast chunk of RAM — inaccessible to the user — that is entirely for its own benefit, and which is completely under its own control. It uses this memory to store what it experiences and has a separate processor to constantly refer to and modify this increasing bank of data. As a result, after a few hours of use, you begin to feel that it is almost able to read your mind. And maybe that isn't far from the truth. For it certainly is a very intelligent machine.

However, let us first take a quick look at the appearance of the system. The rather bland, timeless appearance belies the thought and cleverness that has been put into the system. What your own system looks like depends very much upon you, for the Thought Processor comprises a set of interconnecting modular units, each of which has a specific function. You simply plug together the combination of parts that you need. They clip together solidly, and come apart readily, if need be, in a most satisfying manner.

The range of peripherals is comprehensive and well integrated. There are units to enable it to talk to most other types of computer, receive all kinds of broadcast and transmitted communications, and scan text and graphics. But the huge memory and the extensive use of powerful intelligent software make it most impressive when communicating with human beings. It accepts input via the keyboards — typewriter, musical or graphic — or through the marvellous touch-sensitive high-resolution flat colour screen, or using the optical-character readers, or voice-recognition, or simply by the executive mouse.

I found this almost too much to take, particularly while verbally word processing, as I was mildly rebuked for my grammatical inaccuracies by my own disembodied voice. I eventually opted for one of the more relaxing default voices. I did have some fun creating a duet with my computerised self using the music keyboard as well.

It will also learn to read what you write, eventually. You have to be neat and clear, and it takes some time to absorb your style of writing, but once it has mastered your idiosyncracies, it doesn't make as many mistakes as you might expect. Using this feature is a chastening experience — I had almost forgotten what it was like to write more than a few sentences in longhand.

However, it does read printed matter far more readily, picking up new typefaces in a matter of seconds rather than minutes. It retains the facility, should you wish, to

everyday life that has to be a logical development. If the software also generated page 3 girls then the eQual could replace the *Sun*. One last question: why is it called the eQual? Because no one would buy it if it was called the Superior.

James Bryant and Dave Kress of Analog Devices submitted a report on the Commodore Playmate complete with flat screen colour display and Smalltalk: all eminently sensible. However, they also suggest the machine will have a BT-approved modem. This is just too futuristic for 1988. Sorry, we have to draw the line somewhere.

But given that in 1988 everything electronic will be interconnected with everything else, R J Collins has a fascinating way of increasing programming power. His Googol-flop machine is based on the knowledge that with millions of micros around, CPU time far exceeds user time — just the reverse of the mainframe days. Thus the CPU only needs the facility to lock into any number of other inactive units inside a predetermined neighbourhood to increase its power by parallel processing.

If a program took an hour to run, the CPU would simply borrow 500 free units round the country and finish the job in a few seconds. Mr Collins notes: "The rather novel design philosophy has some interesting applications — as sales increase, so does the power of any given system. This means that if you buy the first system now, by 1997 it will be 10,000 times more powerful."

Another novel approach to hardware was taken by Malcolm Phillips, S Hayward and others. Considering what Honeywell has already achieved with its integrated helmet and display sighting system, IHADSS, for military pilots, couldn't the computer of the future use similar technology? In other words, the micro could be worn like a helmet. Mr Hayward's Capo I computer solves the problem of kids sitting passively in front of the computer all day. They can wear it out instead.

Malcolm Phillips suggests a more distributed type of machine. The hardware sits over the shoulders like a Bone Phone stereo. The RAM is knitted into your jumper, while the screen image is created inside the lenses of a pair of spectacles.

However, it must not go unrecorded that, according to Alan Burns, 1988 is the year when Russia enters the £100 micro market. "The whole outfit is in a very solid leatherette-covered steel case .... The first impression is that one is looking at a very old-fashioned typewriter, owned by a mad wire-maker." Sounds as though Mr Burns owns an early-model Russian camera. Nevertheless, the Apparatchik works well and will give years of service.

In general, most of the hardware developments for 1988 look logical; 256K or 1Mbyte RAM chips as standard, built-in hard micro-floppies offering megabytes of storage, built-in printers and large flat display screens. All this technology is on the horizon; it just needs to be made smaller and a lot cheaper to become the stuff of everyday life.

But it is software that offers the more exciting developments. Current projects such as integrated operating systems, megabytes of Lisa-like software offering user-friendly operation, plus the millions of pounds/dollars/yen being thrown at the twin problems of expert systems and artificial intelligence must surely produce some dramatic improvements in these areas.

While Smalltalk is a very popular programming language in 1988, other new languages have been invented. RCade, mentioned by A W Cowley, is obviously a must for games writers.

R A Humphries notes that other popular languages are Fifth and Limp, along with the software packages Mega Cardbox and The Very Last One. His micro, incidentally, is the Multimate from the Sinclair subsidiary ICL — hence called Sinicle — and Mr Humphries notes that its main rivals in the market are the Oak Meson and the ITV Coronation. He may jest, but truth is often stranger than fiction. Forth would have been called Fourth if six-letter file names had been allowed, so Fifth

(continued on next page)

reproduce on the silent high-resolution colour printer a more than reasonable facsimile of the acquired type style, with all the usual graphic manipulations available from the software resident within the printer.

But where I suspect the designers have scored an enormous direct hit with consumers is having created a machine that has the ability to run software, not only from all of the various forerunners from its own manufacturer, but also from almost any of the recently popular micros. This ability has already earned it the nickname The Sponge, but it does mean that you can use nearly all the software that is currently available.

There is obviously no need for you to completely get rid of your own old system. Just transfer what you want into the Thought Processor and you can retain the benefit of all the time and hard work you already put in. No programs are lost, there is no data to re-enter: the Thought Processor takes it all in its stride.

It is a remarkable machine to work with. If you are writing, composing, drawing or programming, it imperceptibly anticipates, corrects and guides you in a most constructive way, because over time, it detects and remembers the way that you tend to think. Consequently you can work very quickly and accurately.

To prevent you getting into too much of a rut, the designers have also provided a kind of random free-association mode that can help you brainstorm your way out of trouble or predictability. In all it is a machine I should want to work with for the foreseeable future, even at the current rate of progress. But who knows what might be dreamed up next? Even five years ago, something like the Thought Processor would have been thought impossible.

Mabel

Personal computing takes a quantum leap with this revolutionary system, previewed by Roger Peacock.

Five years ago, the Apple Lisa system made a genuine attempt to open another route with its emphasis on interaction with the machine on a more practical and "real" level. Its approach did not divert other makers from their quest for miniaturisation, but it did prompt two young designers from Cambridge — home of de Bono's lateral thinking — to start work on Mabel.

They firstly renounced virtually every single design parameter passed down intact from the earliest Pets and Tandys, and started from scratch to build a truly "user-friendly" system. At its official press launch on Friday, I saw journalists visibly trembling with excitement at the greatest breakthrough in personal computing since the chip itself.

The first striking thing about Mabel is its physical appearance — a large, slate-grey metallic cabinet standing about three feet high on the floor and covering a rectangular area of six feet by three feet. No screen, keyboards or disc slots were in evidence, and the only clue to the use of this monolith was the tunnel area in the centre of one long side where the user places his or her legs comfortably to operate the equipment.

The demonstration began, and eyes began to widen as the really radical nature of Mabel's approach became apparent. The flat top surface of the console turned out

(continued on next page)

(continued from previous page)

is logical. There is already a language called Extended WSFN — "which stands for nothing".

But who, in 1988, is going to sit around writing programs? D J Hague has a good idea: the people who do it now. Hence the most important feature of his Cerebus 32 micro, from the CBM/Sinclair consortium, is the Mimic mode, in which it will imitate most of the computers of the early 1980s. Mr Hague points out that this satisfies the growing market in pioneer hardware: "... with many clubs devoted to the specialised aspects of microcomputing, where aficionados speak machine language and think in hexadecimal. Only five years ago, remember, these mysteries were already redundant knowledge, mastered for no other reason than the glow of achievement, plus a remote chance of making some money."

Mr Hague also notes that "with the Mime key down, Select Commodore 64 pressed, the screen powered up with the near-forgotten border and

64K RAM SYSTEM
38911 BASIC BYTES FREE,

followed by a refusal to accept programs from an old disc I still had around." Ah, those were the days.

With so many fascinating — and diverse — entries it was difficult to choose a winner. In the end the Editor awarded the prize to Trevor Hatchett of Stockport, Cheshire, for picking up the key points on the computer horizon. He gives us at least a glimpse of what could be in the future, while his ideas are solidly based in developments taking place today. Small consolation prizes have been sent to K B Cusson of Epson, Surrey for the Boxatrix, and Roger Peacock of Thetford, Norfolk for making us laugh with his account of Mabel.

We must do this again some time. Probably in 1988.

(continued from previous page)

to be the central operational area, to handle in a flexible manner most of the input and output, centred on a movable 12 in. by 8 in. plain white work area. Input involves a revolutionary cordless light-pen type implement designated the Program Entry Module. When the user places the Module against the white work area, it physically deposits layers of graphite which echo the input exactly. There are no fixed pixel positions so the system is capable of virtually infinite resolution. Multicolour graphics are simply a case of changing modules.

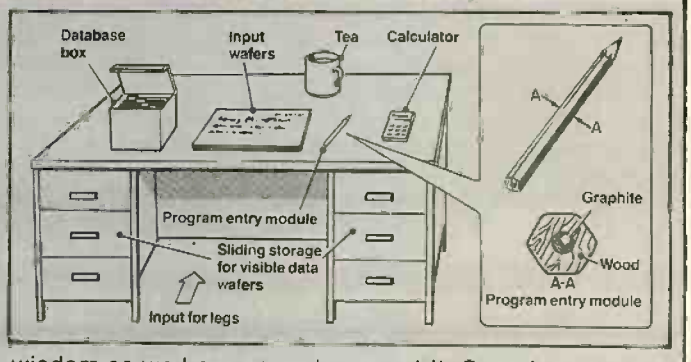
So much for graphic input, but how on earth have the designers coped with alphanumeric entry without resorting to more conventional hardware? The answer is refreshingly simple: the revolutionary principle of Direct Handwriting Recognition. While most microdesigners have been struggling for years with speech recognition, Mabel takes the alternative but totally effective route of allowing the user simply to write away on the white work area with the module. Every stroke, cross and dot is faithfully reproduced in the dark graphite with no hardware barrier between the user and the text.

Before the dumbstruck audience had time to draw breath, the demonstration proceeded from data entry to data storage. Surely this totally unconventional computer would have to fall back on more traditional facilities for the permanent retention of data? Not a bit of it.

The designers ran quickly over the well known shortcomings of magnetic storage: vulnerability — degradation, rough handling, etc. — and explained that one of the chief micro aversions still restricting computer acceptance was that an inability to see magnetic information leads to an inability to believe in its complete integrity. The answer for Mabel is probably the simplest yet most devastating of all — visible storage.

The journalists held their breath when this was demonstrated. The designers simply peeled off a 12in. by 8in. wafer from the white work area and held it aloft, showing the previously entered text and graphics still intact for all to see. Then in one deft movement a large cassette-like box slid from the console to the operator's right and in went the visible storage wafer, intact, visible and entirely non-volatile. Head-crashes, disc errors and power cuts were not going to affect that data, and the most suspicious non-computer cynic would have total faith in data in his or her own handwriting.

At this stage in the demonstration it had dawned upon everyone that Mabel is not merely another new computer but a complete overthrow of ever tenet of conventional



wisdom as we have come to accept it. Questions such as "Will it run CP/M?" Suddenly became a complete irrelevance, and larger issues such as Mabel's repercussions on the information revolution began to come to mind.

The designers have not been content to leave any area of the machine unchanged in their quest for friendlier operation. For example they have taken the Lisa screen calculator and given it real substance in the form of a remote numeric-pad-like mini-console which detaches from another storage cassette in the main console and on which a complete range of scientific and floating-point number crunching can readily be effected. A demonstration of a paperclip-type database was also given with another instance of total practicality, this time in the shape of a box-like container housing dozens of visible storage units, now on thicker wafers, which could be grouped using small metallic clips to give ready access to sorted files.

Software for the new system was briefly touched upon, but it appears that virtually every item of alphanumeric text ever published in English will form Mabel's software base and, by utilising the visible-storage principle, access to that base is immediate. The price of the actual system at around £100 brought gasps of sheer disbelief from the assembled gathering.

Predictions and forecasting in the micro world of 1988 is normally an area best avoided, but from what I have seen of this revolutionary new system I will go out on a limb and state that Mabel will change our lives. It could well be that within the next five years every schoolchild in the country from infant to student will have his or her very own Mini-Mabel at which to sit and at which all teaching will be conducted.

It is also now a real possibility that every town and local authority will start central town database facilities using the new visible storage, whereby any citizen can go along with a ticket and borrow visible files for consumption at home sitting at Mabel.

The Mabel recolution has only just begun!

ATA The market leaders!...

apple NEW! HOME COMPUTER PACK

Apple IIe Computer Disc Drive with Controller, T.V. Modulator, Apple Books, Software Vochers + FREE Apple Sports Bag

ONLY £849

ATA'S philosophy is to ensure that our customers have quality computer hardware and software products at COMPETITIVE prices, together with technical assistance required to efficiently operate their computer system.

Export specialists — ring or telex for details

...with recognised professional support

Apple Hardware

	£
Apple IIe	
Apple IIe 64K	645.00
Disk drive with controller	270.00
Disk drive	200.00
III Monitor including stand	220.00
Apple IIe minotir	125.00
Phoenix hi-res green 12" monitor	99.00
Phoenix hi-res amber 12" monitor	105.00
Apple III	
Apple III 256K including Monitor III, Disk drive & SOS	1980.00
Additional 5.25" disk drive	270.00
Profile 5mb Winchester	1299.00

Accessories

80 column card	65.00
80 column card 64K extended	145.00
Numeric keypad (//e)	85.00
Numeric keypad (II +)	75.00
T.V. modulator with sound	12.00
Videx Videoterm 80 column card	195.00
Videx Soft Switch (40/80 column)	20.00
Videx Keyboard Enhancer	87.00
Videx Inverse ROM and character sets	18.00
Microsoft Softcard (Z80 CP/M)	199.00
Microsoft Softcard Apple III (Z80 CP/M)	265.00
Accelerator card (3.6 mHz 6502C & 64K)	289.00
Joystick (//e)	29.00
Joystick (II +)	22.00
System Saver fan & voltage reg.	59.00
Dust cover for Apple II	6.50
Dust cover for Apple II 2 × DD & 12" minitor	9.00
Dust cover for Apple III & Monitor III	11.99

Colour Monitors

Luxor high resolution 25Mhz linear & TTL	499.00
Kaga Denshi medium resolution TTL	325.00
Kaga Denshi low resolution	265.00

We also stock the Hantarex RGB monitors, as recommended by Apple in Europe.

PRICES EXCLUSIVE OF VAT AND CURRENT AT TIME OF PRINTING

Interfaces

	£
Apple RS232 Super Serial card	99.00
Apple IFEE 488 card	205.00
Apple parallel interface with cable	99.00
Apple III parallel interface with cable	130.00
CCS 7710-01 RS232 serial interface	109.00
Grappler + parallel graphics interface	105.00
PACT 8 bit A/D converter	115.00
Keyzone 12 bit A/D converter	138.00
PACT 12 channel D/A converter	125.00
RGB card TTL/analog output (programmable)	99.00
RGB card TTL output	85.00

Digitek Accessories & Interfaces

64K RAM	199.00
128K RAM	299.00
PrintMaster parallel printer interfaces available for Anadex, Epson, Centronics, Citoh, NEC & TEC	75.00
Super PrintMaster III interface available for all printers as above and also for the Apple Dot Matrix printer	100.00
RS232 high speed serial interface	80.00
Z80 with manuals	149.00
Screenmaster 80 inc. soft switch inverse video, 3 scroll speeds & altern. chr. sets	185.00
Eurocolour card with modulator (II +)	95.00
UHF Modulator with "clean signal"	39.00

Robocom Bit Stik C.A.D. Graphics System

Robocom Bit Stik 1.1 system	230.00
Robocom Bit Stik 1000 upgrade software	190.00
Robocom Bit Stik 1000 system package	415.00
Plotter driver for A4 and A3 plotters	90.00

Kaypro II

	£
FRESH FROM THE U.S.A.! The best value Portable Micro from Kaypro . . . Including Software	
KAYPRO II 2 × 200K disc drives	1395.00
KAYPRO IV 2 × 400K disc drives	1695.00
KAYPRO X 1 × 400K disc drive and built in 10MB Winchester	2875.00

Other Software including financial ledgers etc also available.

Hyperion

Hyperion 256 × 2 MSDOS, BASIC	£2395.00

Printers & Plotters

Epson

Epson RX80 120 CPS	260.00
Epson FX80 160CPS	350.00
Epson MX100 100CPS	420.00

Apple

Apple Dot Matrix 120 CPS	349.00
Apple Letter Quality Printer	1199.00

Ricoh

Ricoh 1300 Flow Writer	1150.00
Ricoh RP1600 Flow Writer	1499.00
Mannesmann Tally MT160L	449.00
Mannesmann Tally MT180L	649.00

Plus full range of Centronics Printers Available.

Plotters

Hewlett Packard HP7470	999.00
Hewlett Packard HP7475(A3) TBA	1399.00
Calcomp 8 PEN (A3)	2999.00

WE ALSO STOCK APPLE IBM AND HEWLETT PACKARD

TERMS AND CONDITIONS
For delivery please add £0-£199 - £5, £200-£1499 - £13, £1500 - 1%.

CHEQUES WITH ORDERS
Please allow 10 days for clearance. PLC's, public sector etc 30 days credit available on official orders, subject to 5% credit charge.

Apple IIe
BUSINESS PACK WITH DISC DRIVE AND 12" MONITOR
£999

ATA — LONDON 4 Albion Hse, 1 Back Hill, London EC1. 01-833 0044
Telex 25102 CHACOM G
ATA — POTTERS BAR 197, High Street, Potters Bar, Herts EN6 5DA (0707) 57113
ATA — SHEFFIELD 72 Eldon Street, Sheffield, S1 4GT. (0742) 700802
FREEPOST SHEFFIELD S1 1AY

ATA

● Circle No. 158

The sting in a micro's tail

Criminals are as eager as anyone to exploit the opportunities of information technology. Martin Edwards explains how they do it and how to stop them.

COMPUTER FRAUD is a major growth industry. The recent world-wide increase in crooked or near-crooked misuse of new technology has been spectacular. Yet for some reason this activity does not seem to attract the stigma that is attached to other kinds of crime. In the past few months, the mass media have been quick to recognise and to capitalise upon the trend.

The BBC TV serial *The Consultant* showed us a cunning bank-fraud scheme under investigation by a villainous anti-hero who happened to be an expert computer-security consultant. Having identified the *modus operandi* he neatly exploited it for his own benefit. Hollywood gave the subject a fresh and highly topical twist in the massively successful movie *War Games*. The film charts the progress of a teenage hacker from accessing into the school computer in order to improve his grades to tapping into the top-secret U.S. military computer that continuously plays war games. When the precocious youth becomes directly engaged in a deadly game of gobal thermonuclear war the results make riveting watching.

The Pentagon reckons that *War Games* could never happen in everyday life. Let us hope so. But the plot is not as distant from reality as one might think at first. Remarkable incidents of a comparable if less dramatic nature have already occurred.

It is not so long since a 15-year-old Westminster schoolboy cracked the security system of a London computer time-sharing service. Last year a group of teenagers from Manhattan worked their way into the Pepsi-Cola computer network, and wreaked havoc with the giant company's deliveries in Canada.

The upsurge of computer fraud stems from the rapid increse in opportunities for abuse of new technology. The computer plays such an important part in modern life that it would be surprising if it were not sometimes the context or means of the crime. It is the sheer scale of the problem that is beginning to cause so much concern.

A leading expert on computer security, Michael Comer, said in his book *Corporate Fraud*, which sets out many examples of computer crimes: "One good thing about computers is that they cannot steal, drive delivery trucks or climb ladders". All the same, the reasons why computer fraud is big business are easily explained.

The power and complexity of many computer functions make it possible to achieve massive gains from minute and virtually undiscoverable manipulations of programs. Colin Tapper, an eminent lawyer specialising in computer problems, has said: "The situation is one in which the opportunities are endless, the rewards unbounded, the techniques easy and the danger of detection minimal".

Computer fraud has been described by cynical American investigators as "equal-opportunity employment". The majority of computer frauds involve employees of the victim company, although some of the villains are business contacts or outsiders. Access to sensitive computer information can put a poorly paid employee in a position to take enough money to ruin his company.

Even if the would-be computer crook does not have any business training he need not despair, he can enjoy a vocational course in computers as part of the rehabilitation programme in any one of a number of U.S. penal institutions. No doubt this policy will soon be duplicated in English prisons.

There is absolutely no reason why computer fraud should be confined to major institutions or larger companies, nor is it. Small businesses with limited financial resources and consequently less elaborate security procedures are very much at risk. A small business computer may cost only a couple of thousand pounds or so and be capable of functioning in an ordinary office, run from the mains power circuit and operated by a clerk. A decade or so ago, a computer of comparable power might have cost hundreds of thousands of pounds and required special environmental conditions and an expert staff to run it. Not surprisingly, more and more firms are investing in hardware and programs to reduce administration and staff overheads, to increase productivity and to improve access to critical business information.

But there are risks in the brave new world. The investment will be counter-productive if new systems create new openings for vandals and other criminals. In the search for improved efficiency, many computer systems eliminate the separation of functions that once acted as a major check on crime.

Martin Edwards is a solicitor practising in Liverpool.

Such statistics as exist are alarming. According to a recent report from the Guaranteee Society, a subsidiary of the insurance company General Accident, new technology is helping dishonest employees to steal more than £2 million a day from their companies. Some estimates put losses world-wide from computer abuses in excess of £1,500 million a year.

Computer frauds come in a very wide variety of forms. In the United States, computer fraud has for a number of years been perceived as the dark side of technological progress. The Americans have developed a picturesque and rather idiosyncratic vocabulary of their own to describe the methods of computer vandals and criminals. The new jargon is loosely used at times, but by its sheer colour it conveys a striking image of the techniques that are now being employed.

The kind of unauthorised access graphically depicted in *War Games* may be considered as a variant of the well established phenomenon of piggybacking. The expression was originally devised to cover one type of computer abuse in the world of commerce. When someone using a distant terminal accesses the central processor, a line of communication is established. If the line is not properly closed down or terminated the next user to come on line may find that he is accessing files which are not his own.

The consequences of piggybacking can be highly embarrassing. In one case, two engineers based in Los Angeles accidentally used a password which was one digit different from the one allocated to them. The number happened to belong to the president of the computer bureau by whom they were employed. As a result, much to their surprise and gratification, they obtained direct access to highly confidential clients and financial data. The engineers went on to use the unlimited amount of computer time which the password made available to them in order to exploit the secret information.

Potentially even more damaging, is the

PICTURE COURTESY OF UNITED ARTISTS CORPORATION

Piggybacking stories abound — the film *War Games* takes them further.

use of so-called logic bombs to sabotage the system. On a number of ocassions disgruntled employees have programmed the company computer to perform a damaging function. The logic bomb may be triggered some time after the employee has left the company, perhaps introducing deliberate errors into the program or wiping clear valuable files.

Input data is particularly susceptible to the activities of the computer crook. The available studies show a preponderance of data diddling in the reporter cases. Although techniques vary with the circumstances of the case, the essence of data diddling is usually the creation of a false credit coupled with the concealment of a consequential debit, usually in an account where controls are not as tight as they should be.

Sometimes the object of manipulation is to hold back cash receipts, or the target area may be purchases. An example of the latter was the case involving an accounts clerk employed by a U.K. catering service. In collaboration with an accomplice who owned a grocery business he submited a series of false account numbers and invoices for undelivered food to the company's computer system. So successful were this pair that the sting continued for eight years, netting in excess of £50,000 before they were detected and convicted.

A villain with a more original cast of mind happened to be a senior executive in a U.S. company which distributed telephone equipment. The company's branches had dial-up facilities into the computer system at head office. The executive would place orders for the delivery of equipment to one of his company's remote warehouses, using his own telephone terminal and masquerading as a branch of the company. This gave the appearance of an internal stock movement that did not involve rendering a bill to an outside customer. The ingenious thief would then pose as a company driver, pick up the goods in a disguised van and sell them off. Again, he was eventually detected, but after serving a brief prison sentence it is reported that he made use of his experiences by setting up a computer-security consultancy!

Unauthorised alteration of computer programs is another widely recognised means of fraud. Program patches, known as "trap doors", allow an unauthorised user to exploit weaknesses in the design, logic or electronic circuitry of a system to defeat its security procedures. Information can then be drained off without leaving any trace of what has happened. When using an operating system with manufacturer-supplied software it is often impossible to guarantee that it contains no trap doors.

Among the other possibilities are superzapping, using a specially written program to bypass security controls so as to amend or reveal information contained within the system. In the Trojan Horse type of fraud parallel instructions are added, so that the computer carries out unauthorised functions while the program continues to perform in the expected manner.

Round-down frauds illustrate the way in which unauthorised patches can operate to the benefit of a thief, by diverting odd amounts such as fractions of a penny or a cent into an account in which he has an interest. In one case, a computer programmer at a bank in Hamburg, West Germany, embezzled almost 500,000 Deutschmarks from a large number of accounts. The unauthorised patch inserted into a transaction the query; "Is there an odd amount in the entry?" If the answer was No, the entry was processed correctly. If the answer was Yes, the odd amount would be deducted from the entry. The round balance was posted in the normal way to the proper account, while the odd amounts were transferred to the thief's account.

The Americans have nicknamed this highly effective slicing procedure as "salami" fraud. The individual sums deducted are so trivial that it is unlikely that their absence will be noticed. If the worst happens — from the criminal's point of view — and he is caught, the bank may in any event be reluctant to prosecute because of the adverse publicity which the case might attract.

Another potentially lucrative category of fraud involves the alteration of master-file data. The problem here is summarised by Michael Comer: "While many computer frauds are restricted to people within the computer centre, manipulation of master files is possible by many people within an organisation . . . To ensure that business practices stay flexible, master files have to be easy to amend. But this ease of amendment also means ease of fraudulent manipulation, either on data input forms or through program alternations."

A further attraction is that master-file information tends not to be subject to control to the same extent as transaction data. Thus it may be possible either to create a fictitious master file or to manipulate data on general files, for example by removing an overdraft limit or credit limit from the master file of a favoured customer.

An analyst employed by a British chemical company noticed that one of his employer's subsidiaries was not being allowed the standard discount for intra-group purchases to which it was entitled, but was being charged the full amount. In collusion with a buyer, he created a company of his own, which he set up in his employer's accounting system as a subsidiary. Supplies to the real subsidiary were made through the crooked subsidiary, which retained the discount. The thieves are reported to have made a profit of almost £200,000 in two years.

Clearly, one of the major problems is detecting when computer fraud has actually occurred. The case studies show that all too often a crime is only discovered by chance. The means used to perpetrate the crime may remain a mystery. Some businesses may be reluctant to report computer crimes because to do so may damage their credibility. United States law demands that computer crimes be reported, but this is not the case in Britain.

Nevertheless, it is no longer possible to hope that the problem will just go away. Businesses are arming themselves with a whole range of defences against computer fraud. They include more efficient personnel security procedures; improved controls on access to the system, whether direct or by remote terminal; eliminating weaknesses in system design; and spot check and routine security review procedures. The piggybackers, data diddlers and superzappers of this world are no latter-day Robin Hood. Their activities are selfish and destroy confidence in computers and commerce. Businesses suffer as a result and jobs are lost. Computer fraud is an evil of our time. ■

BBC shapes up

With John Leach's pair of Basic utilities you compose complex graphic objects on the screen, and move them at will within your own games programs.

A WHOLE CLASS of commands are available in BBC Basic to control output to the screen. They are prefixed by the characters "VDU" and replaced the screen Pokes used on other computers.

It is still possible to Poke to the BBC secreen using the ? command. But to do so you need to know the correct memory location and there is no guarantee that code of this type can be transferred unchanged to later upgrades of the system.

The VDU23 command can be used to establish user-defined characters, either within a program or as a direct command. It does not write directly to the screen memory, but to an area reserved for user-defined characters. Any characters defined in this way remain in memory until the computer is switched off. They will survive a Break interrupt, and even the loading and running of a new program.

The VDU23 command is followed by eight bytes representing the eight rows of an eight-by-eight pixel which makes up the character. The first byte is the top row. Each of the byte's eight bits corresponds to a specific pixel. A 1 turns on a pixel; 0 leaves a blank. The most significant bit represents the left-most dot. The VDU23 command accepts bytes as decimal or hexadecimal numbers. Thus 32 or &20 have the same effect, as they represent the same number in decimal and hexadecimal notation.

This is all very well, but it requires some mental agility to convert a spacecraft or even a simple triangle into the necessary set of decimal or hexadecimal numbers. The program I have written will do it all for you from a character you draw on the screen using the cursor controls.

Some interesting, undocumented features were used in the program. A few were discovered by examining the listings on the BBC's own demonstration tape, and others were picked up from scattered user group publications.

The *FX 4, 1 command allows the cursor keys to act as input keys without moving the cursor directly. As well as the cursor arrow keys, the Copy and Delete keys are used in the same way. The codes transmitted by pressing these keys can be used within a program.

An undocumented equivalent of the Peek command is used here to read memory for previously defined characters. The syntax on the BBC machine is:

I = ? MEMORY LOCATION

equivalent to Peek, and

?MEMORY LOCATION = I

equivalent to Poke.

In BBC Basic there lurks a trap for the unwary in the use of procedures. It is possible to enter a program and start running it and find that all is well for a while, until suddenly the dreaded No Room message appears and the program bombs out. This happens because a Procedure call creates a temporary demand for extra memory, and the more nesting of calls there is, the worse the situation becomes. It can be quite puzzling when, after exiting the program, you Print Himem and Lomem and find that you have 200 to 300 bytes free.

So when you enter the listed program be careful how you type it in. The initial version worked well until a deliberate error was entered. A call to ProcErr resulted, and this led to the display of the No Room message. Removing three spaces from the listing allowed sufficient space for the ProcErr call to be handled. The program is teetering on the edge of allowable memory, at least for the Model A, which is why there are no Rems, so do not put in extra spaces to make it look tidy. The program is documented in figure 1.

Save the program on tape, and then run it. It is useful to define

*KEY0 "RUN|M"

You will see an eight-by-eight square of yellow lines on a black background at the bottom of the screen. The screen background is white.

You are asked to enter the defined character's number, which must be betwen 224 and 255. When you press Return, the square fills up with the character previously defined by that number. It is displayed as red squares between the yellow grid lines. If you are running the program on a black-and-white television, the red squares do not show up well, so change the program to

Listing 1. Character generator.

```
  880REM *** Character Definition ***
  890
  900 DIM CHBYTE(7)
  910MODE5:@%=3:VDU28,0,11,39,0:COLOUR 1
:COLOUR 131: CLS:VDU24,192,0,128,0,192,2
,128,2:CLEARLINE$=STRING$(20," ")
  920VDU4:VDU30:FOR I%=0 TO 7:PRINT TAB(
0,I%);CLEARLINE$:NEXT I%:PROCPANEL
  930INPUT TAB(0,3)"Enter number >"NCHAR

  940IF NCHAR=0 THEN MODE6:GOTO 1060
  950 IF NCHAR<224 OR NCHAR > 255 THEN P
ROCERR:GOTO920
  960 FOR VT%=1TO 8:J%=1:K%=?(&0C00+(NCH
AR-224)*8+8-VT%):FOR HT%=8 TO 1 STEP-1:I
F(J%ANDK%)>0 THEN PROCBLOB(1,HT%,VT%)
  970J%=J%*2:NEXT HT%:NEXT VT%
  980 PROCMOVE:PRINT TAB(0,3)CLEARLINE$;
TAB(0,5);CLEARLINE$
  990 @%=1:FORI%=0TO7:CHBYTE(I%)=0:K%=12
8:FORJ%=0TO7:P%=POINT(224+J%*64,160+I%*6
4):IFP%=1THEN CHBYTE(I%)=CHBYTE(I%)+K%
 1000 K%=K%/2:NEXT J%:PRINT TAB(12,27-2*
I%);"&";
 1010 IF CHBYTE(I%)<16 THEN PRINT"0";
 1020 PRINT ~CHBYTE(I%):NEXTI%:@%=3
 1030 VDU23,NCHAR,CHBYTE(7),CHBYTE(6),CH
BYTE(5),CHBYTE(4),CHBYTE(3),CHBYTE(2),CH
BYTE(1),CHBYTE(0)
 1040 PRINT TAB(0,3)NCHAR;" = ";CHR$(NCH
AR);"   O.K. ";:INPUT Y$:IF Y$="" THEN M
ODE6:GOTO1060
 1050 IF LEFT$(Y$,1)<>"Y" THEN PRINT TAB
(0,5);"Continue entry":GOTO 980 ELSE GOT
O 920
 1060 PRINT:PRINT:FOR I%=0 TO 7:FOR J%=2
24 TO 248 STEP 8:PRINT I%+J%;" = ";CHR$(
I%+J%);"   ";:NEXT J%:PRINT:NEXT I%:END
 1070 DEF PROCPANEL:CLG:GCOL0,2:MOVE 192
,128:FOR I=192 TO 704 STEP 64:MOVE I,128
:DRAW I,640:NEXT I:FOR I=128 TO 640 STEP
 64:MOVE 192,I:DRAW 704,I:NEXT I
 1080 FOR I=13 TO 27 STEP 2:PRINTTAB(12,
I);"    ":NEXTI:ENDPROC
 1090 DEF PROCERR:PRINT TAB(0,6)"Error (
224 to 255)":T=TIME:REPEAT UNTIL TIME=T+
300:ENDPROC
 1100DEF PROCMOVE :REM MOVE CURSOR
```

define GCol 0,2 or GCol 0,3 instead of GCol 0,1.

When switched on, the operating system defines alternate sets of eight full and eight empty squares. You are now in the editing mode, and the point to be edited is shown by a small red cursor square, if the point is black, or a black square if the point is red.

You move the editing point around with the cursor arrow keys and enter a defined point by pressing Copy. If you try to move out of the square a Beep will wake you up. You can obliterate any point by pressing Delete. If you want to start over again press C, which clears the display, or F, which completely fills it with red. When you are satisfied, press Return.

Pressing Return does two things. First, the hexadecimal representation of the pattern is listed to the right of the square display so that you can copy it down for use in VDU23 commands in your own programs. Then the defined character is printed, and you are asked if it is OK. If you reply Yes you are asked for another number; if No you continue entry with the cursor controls. Before the character is Printed it must have already been entered into reserved memory.

One further command is available when you are in editing mode. If you enter N a message appears asking for a new number. When this is entered the character is assigned to that number, rather than the number you started with — provided it is within the range 224 to 255, of course. This facility can be used to build up a series of similar pixels without entering each from scratch. It could be particularly useful for producing animated figures.

A Return without a new number exits from the program, after listing the character set from 244 to 255, including those you have previously defined. If you want to make any further additions or changes, just run the program again.

Listing 2. Multi-character blocks.

```
100   PRINT TAB(X,Y): REM Start the block off at some point
110   FOR I%=1 TO 10: REM Or whatever
120   VDU 9,32,10,8,32,11,          Print 2 blanks at left
          N1,N2,N3,N4,              Print top row of pixels
          10,8,8,8,8,               Move down and backspace 4 left
          N5,N6,N7,N8,              Print bottom row of pixels
          8,8,8,8,8,11              Cursor back to top left
130   X=INKEY(DELAY): REM Slow down the movement
140   NEXT I%: VDU 30: REM Home cursor
```

At a later stage you can display the defined characters with

PRINT CHR$(N)

where N is the character number. Alternatively you can simply put VDU N1,N2,N3 . . . where N1,N2,N3 . . . is a series of defined characters. This is an economical way of displaying a block, and if you insert 8, 9, 10 or 11 in the series, to shift the cursor around you can display a complete block of defined characters in one command.

The example in program 2 shows how a block of four horizontal by two vertical previously defined characters can be moved very quickly across the screen. The listing is set out with comments on several lines for clarity, but in your program write them as one long string of numbers or variables separated by commas. As it is all in one VDU command the action is very fast, and may have to be slowed down, by line 130, for example. It is equally simple to move blocks in any direction on the screen.

Figure 1. Character generator lines.

Line 910 — Sets numeric Print width with @%. Defines graphics screen area with VDU24, and text area with VDU28.

Line 920 — VDU4 separates text and graphics cursors. VDU30 homes the cursor to the top left of the screen.

Line 960 — Discovers what the previously defined character is by Peeking the screen with the ? command, ofsetting &0C00, the beginning of the defined character area.

Line 990 — Illustrates the use of the Point command within the editable square to set up the ChByte array. This technique avoids the need to have a separate eight-by-eight array to hold the information.

Line 1020 — Uses the ~ Print syntax for printing numbers in hexadecimal; not documented. Inserts an extra 0 to align display if number is less than &10.

Line 1030 — Uses VDU23 to set the character from the ChByte array.

Line 1060 — Prints out the complete set of defined characters.

Line 1120 — Uses *FX 4,1 to disable cursor arrow keys.

Line 1160 — Picks up numeric value of keyboard arrow key and branches accordingly.

Line 1210 — *FX 15,0 flushes out the type-ahead keyboard buffer.

Line 1250 — Uses the Copy key.

Line 1260 — Uses the Delete key.

Line 1280 — After detecting an F in editing mode, fills the square with red, then back to the default of black.

Line 1340 — Tests the point of the editable square with the Point command; returns the current colour.

Line 1360 — Draws the small square cursor.

Line 1380 — Fills the editing point with a red or black square.

```
 1110*FX 15,0
 1120 *FX 4,1
 1130 H=1:V=1:PROCSPOT(1,H,V)
 1140A$=GET$:C%=ASC(A$)
 1150 IF C%<136 OR C%>139 GOTO1240
 1160 ON C%-135 GOTO 1170,1180,1190,1200
 1170IF H=1 GOTO 1210 ELSE PROCSPOT(0,H,
V):H=H-1:GOTO1230
 1180IF H=8 GOTO 1210 ELSE PROCSPOT(0,H,
V):H=H+1:GOTO1230
 1190IF V=1 GOTO 1210 ELSE PROCSPOT(0,H,
V):V=V-1:GOTO1230
 1200IF V=8 GOTO 1210 ELSE PROCSPOT(0,H,
V):V=V+1:GOTO1230
 1210 *FX 15,0
 1220 VDU7:GOTO1140
 1230 PROCSPOT(1,H,V):GOTO1140
 1240 IF C%=13 GOTO 1310
 1250 IF C%=135 THEN PROCBLOB(1,H,V):GOT
O1140
 1260 IF C%=127 THEN PROCBLOB(0,H,V):PRO
CSPOT(1,H,V):GOTO 1140
 1270 IF A$="C" THEN PROCPANEL:GOTO 1130
 1280 IF A$="F" THEN GCOL0,129:PROCPANEL
:GCOL0,128:GOTO 1140
 1290 IF A$="N" THEN PRINT TAB(0,5);CLEA
RLINE$;TAB(0,5):INPUT "New number >"NTES
T: IF NTEST<224 OR NTEST >255 THEN PROCE
RR:GOTO1140 ELSE NCHAR=NTEST:ENDPROC
 1300 GOTO 1140
 1310 *FX 4,0
 1320 ENDPROC
 1330 DEF PROCSPOT(C,H,V)
 1340 H%=(H-1)*64:V%=(V-1)*64:P%=POINT(2
24+H%,160+V%):IFP%=1 AND C=0 THEN C=1:GO
TO1360
 1350 IF P%=1 AND C=1 THEN C=0
 1360 GCOL 0,C:MOVE 208+H%,144+V%:DRAW24
0+H%,144+V%:DRAW240+H%,176+V%:DRAW208+H%
,176+V%:DRAW208+H%,144+V%:ENDPROC
 1370 DEF PROCBLOB(C%,H,V):H%=(H-1)*64:V
%=(V-1)*64:GCOL 0,C%
 1380 MOVE 200+H%,132+V%:DRAW254+H%,132+
V%:DRAW254+H%,188+V%:PLOT85,200+H%,132+V
%:DRAW200+H%,188+V%:DRAW254+H%,188+V%:PL
OT85,200+H%,132+V%: ENDPROC
```

Steps & Adders

Start here with SUPERBRAIN

3 You need to store greater quantities of data with faster access times so Winchester Disc Storage facility now required. If you started with a W6, move forward 4 places. Otherwise . . .

2 Each SUPERBRAIN comes with CP/M operating system, BASIC programming language, twin Z-80 microprocessors and an RS-232 communications port.

1 Choose your SUPERBRAIN. Twin floppy disc, hard disc (W6) or multi-user (COMPUSTAR) models available. If you don't need a W6 or multi-user straight away, don't worry – you can always upgrade later on.

4 Either upgrade your SUPERBRAIN by replacing one floppy drive giving a Winchester plus floppy configuration . . .

5 OR . . .

6 Add on a 5¼" Winchester in a separate box. Whichever way you do it, Icarus Winchesters give 5, 10 or 30 MB of disc storage – enough to accommodate up to 200 separate items of information about each of 300 individual customers' sales prospects or up to 60,000 stock control records.

7 Your company moves to another part of the country to take advantage of regional development grant. SUPERBRAIN servicing well supported by Icarus nationwide dealer network.

8 Data interchange facility required so external 8" floppy disc drive added giving ability to transfer data to and from a mainframe computer.

MULTI-USERS CAN START HERE

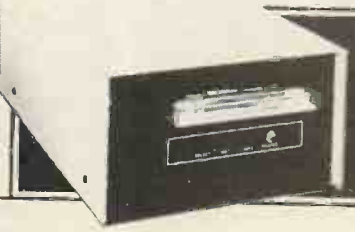
10 Your financial director decides to use SUPERBRAIN for "What if . . ." budgetary calculations. Icarus supplies specialised software.

9 Enhance performance of SUPERBRAIN by addition of GRAPHICS BOARD and supporting software.

You can now read and create your own IBM 8" format floppy discs.

11 Fit all your existing SUPERBRAINS with ICARUS multi-user chaining adaptor to take advantage of COMPUSTAR facility.

12 A COMPUSTAR system enables you to establish a multi-user network of SUPERBRAINS, with each SUPERBRAIN connected into a central data store giving 10, 96, or 144 MB of storage.



13 Leave nothing to chance. Add a 13 MB CARTRIDGE TAPE BACK-UP UNIT to give file-by-file back up for your SUPERBRAIN hard disc.

14 SUPERBRAIN: the game with no end. Our development continues as your business prospers . . .

You don't need to throw a 6 to start. To find out more about SUPERBRAIN microcomputers and add-ons from Icarus, circle the reader reply number below or phone for full details.

INTERTEC DATA SYSTEMS

SUPERBRAIN

ICARUS

Computer Systems Ltd.

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

The Icarus SUPERBRAIN dealer network includes:

LONDON

CALIBRE BUSINESS SYSTEMS, 87 Long Lane, West Smithfield, LONDON EC1A 9ET. Tel: 01-606 1738.

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

HOME COUNTIES

COMPUTING CONSULTANCY, Lyngen, Oldhill Wood, Studham, DUNSTABLE, Beds LU6 2NF. Tel: (0582) 872463

STRATEGY BUSINESS SERVICES, Station House, UCKFIELD, East Sussex. Tel: (0825) 4143

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

TRANSFLO INSTRUMENTS LTD, Loose Road, MAIDSTONE, Kent ME15 7BY. Tel: (0622) 683888

SOUTH & SOUTH WEST

MICRO-XZEC LTD, Walton House, Richmond Hill, BOURNEMOUTH, Dorset. Tel: (0202) 21220

EAST

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

CULLOVILLE LTD, Thornfield, Woodhill Rd, Sandon, CHELMSFORD Essex. Tel: 0245 413919

MIDLANDS

BASIC BUSINESS SYSTEMS LTD, Network House, 20 Ludlow Hill Rd, WEST BRIDGEFORD, Nottingham. Tel: (0602) 232265

MICROAGE LTD, 53 Acton Rd, LONG EATON, Nottingham NG10 1FR. Tel: (0607) 664264

VIGO SOFTWARE SERVICES, Malt Shovel Cottage, Vigo, Bercot, BROMSGROVE, Worcs. Tel: 021-445 1445

WALES

BORDER COMPUTING & PROGRAMMING, Dog Kennel Lane, BUCKNELL, Salop. Tel: (05474) 368

MICROCARE COMPUTING LTD, 18 Baneswell Rd, NEWPORT, Gwent. Tel: (0633) 50482

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 7PN. Tel: (0724) 849696

NASTAR COMPUTER SERVICES LTD, Ashton Lodge, Abercrombie St, CHESTERFIELD S41. Tel: (0246) 207048

SORTFIELD LTD, E Floor, Milburn House, Dean Street, NEWCASTLE-UPON-TYNE. Tel: (0632) 359593

XENON COMPUTER SYSTEMS, 18 Old Rectory Gardens, Cheadle, STOCKPORT, Cheshire. Tel: 061-428 9508

SCOTLAND

ESCO COMPUTING FACILITIES, 321 Blythwood Court, Anderston Cross, GLASGOW G21. Tel: 041-221 0310/2536

TURNKEY COMPUTER TECHNOLOGY LTD, 10 Somerset Place, GLASGOW. Tel: 041-332 7101

● Circle No. 159

Basic truth

The true/false logic implicit in Basic provides a powerful alternative to If-Then. Philip Musk puts it to use in an Apple arcade game — in one line of Basic.

ALL COMPUTERS are capable of assessing whether a statement is true or not, as such a facility is essential for any decisions to be made. Most Basic programmers would use the If-Then type of statement, but there is a second method for performing functions if a condition is met.

A computer has three logical operators which can be used for comparing numerical and even string values. These operators are < , > and = . If you type

PRINT 1 = 1

then the computer responds with 1 because the statement is true. Some computers generate −1 to indicate that a statement is true.

If you now type

PRINT 1 = 2

then the computer returns 0 because this is a false statement. The operators < and > are used in exactly the same manner. Any combination of two of the operators, such as < =, is also possible.

The logical operators can only perform a mathematical function if the condition is met or otherwise, whereas an If-Then type statement can perform any function. This is obviously a drawback, but the logical operators offer one ability which is not possible with the conventional kind of decision statement.

On most computers, when an If condition is met, then all the functions on that line after the Then are performed. If the condition is false, then all the functions following the Then are ignored. With logical operators, the rest of the line is processed whether the condition is true or false. This small difference can vastly increase the power of one line of Basic.

The one-line program Three Blobs for the Apple II+ makes use of logical operators. It could be described as a fast-moving action game with on-screen scoring, a high score and sound effects. You are represented by a V on the top line of the screen. Using paddle 0 as a steering wheel, you dodge clusters of stars which scroll up the screen towards you. For every line the screen scrolls up you are awarded one point. Your total score is displayed in the top-left corner of the screen.

If the V hits a star or goes off the top line

to the left then you are deemed dead and the game ends. You cannot crash into the score displayed on the screen. After a crash, a beep sounds and your score is shown alongside the highest score attained. Pressing any character-producing key restarts the game.

Only four variables are used:

A$ — arbitrary character typed by user to restart game
B — position of the V relative to 1044, the middle of the top screen line
C — your score
D — the high score

When you type Run all variables are set to zero, and the string to null. The first section of the program puts the cursor at the beginning of the first screen line. The next then prints your score there. The program then draws the V in the centre of the top screen line. The variable B is decremented if the paddle is turned to the left, or incremented if the paddle is turned to the right. Your score is then increased by 1. The cursor is then moved to the beginning of the 22nd line down the screen and three asterisks drawn at a random position on that line. The Call causes the execution of the standard routine for scrolling the screen up one line.

These three sections appear to be a long and slow method for printing the stars on the screen and then scrolling them. The stars could be printed on to the bottom line and the screen allowed to scroll naturally. However, when the stars were put on to the far right of that line the screen scrolled up twice, allowing the V to fly through some stars. The same thing happened on the 23rd line, even with the preferred method.

The next part of the program is a conditional jump. It checks to see if the place where the V was before the screen scrolled is now blank. If it is the loop described so far is repeated. If the place checked is not a space, code 160, then a crash is concluded, and the rest of the line is executed.

The next part of the program adds (C-D) to D if C is larger than D. It increases the high score to your own score if your score is higher than the previous high score. A beep is then sounded, code 7, and your score and the high score are printed. The keyboard buffer is then cleared to remove all unwanted key presses. The command GetA waits for a key to be pressed. The horizontal position of the V is then reset to zero, and so is your score. The screen is then cleared by the Home, and the game is restarted.

When the program is typed in, no spaces should be included otherwise the end of the line will be ignored. Take care to type correctly, because if you list the program to edit it the Apple includes spaces and it becomes too long. Once the program is in memory it can be run. For the first game you might crash into the program listing, which is still on the screen, but this will not happen again as the screen is cleared after each game.

The highest score to date on the paddle is about 2,500, but the control can be a little difficult to master. The paddle buttons can be used for left and right instead of the paddles themselves. To alter the program, replace

(PDL(0)<55)+(PDL(0)>200)

with

PEEK (49249)>127+(PEEK(49250)>127)

The game is now played with paddle 0 on the left and paddle 1 on the right.

A logical operator is not only useful in one-line programs. An operator takes longer to process than one If-Then statement but less time than two so you may be able to write faster programs if you replace two or more if statements by a logical operator. ■

Three Blobs.

```
10 VTAB1:PRINT C:POKE 1044+B,150:B=B-(PDL(0)<55)+(PDL(0)>200):C=C+1:
   VTAB22:PRINT TAB(RND(1)*38+1)"***":CALL 64624:ON(PEEK(1044+B)=160)GOTO10:
   D=D+(C-D)*(C>D):PRINT CHR$(7)"SCORE:"C,"HIGH:"D:POKE 49168,0:GET A$:
   B=0:C=0:HOME:GOTO10
```

LONGMAN SOFTWARE

-THE KEY TO EARLY LEARNING

Games for the BBC B and Sinclair ZX Spectrum

Programming and graphics by Micromega

Already available

Simple adding & subtracting 4-6yrs £7.95
ZX Spectrum 16k/48k

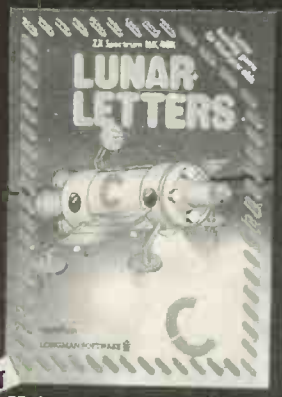
Number recognition 4-8yrs £7.95
ZX Spectrum 16k/48k

Introduction to the alphabet & word recognition 4-6yrs £7.95
ZX Spectrum 16k/48k

When we launched our early learning software you were delighted. As last programs were available from Britain's top educational publisher that let you use your home computer to help your children learn important basic skills. Now we've added eight exciting new games that cover an even wider range. Early-learning is easy as children join in the fun with the Robot Runner, Sum Scruncher, Micro Chimp and lots more colour graphics.

NEW

Letter learning 4-6yrs £7.95
ZX Spectrum 16k/48k



Maths Practice 6yrs+ £7.95
ZX Spectrum 16k/48k

Tables Practice 6yrs+ £7.95
ZX Spectrum 16k/48k

Spelling game 6yrs+ £7.95
ZX Spectrum 16k/48k

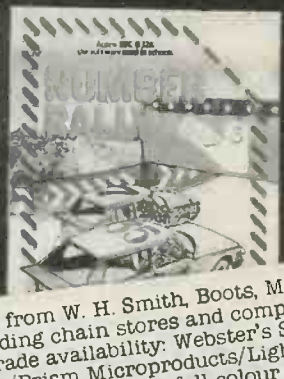
NEW

Help with adding & subtracting 5-7yrs £9.95 BBC B

Help with adding & subtracting 7-8yrs £9.95 BBC B

A game to develop problem-solving skills 4-8yrs £9.95 BBC B

Practice in number skills 4-8yrs £9.95 BBC B



Available from W. H. Smith, Boots, Menzies, other leading chain stores and computer shops. Trade availability: Webster's Software Directory/Prism Microproducts/Lightning. In case of difficulty, or for a full colour catalogue, write to **Division GS22 (Software) Longman Group Ltd Burnt Mill Harlow Essex CM20 2JE**

LONGMAN SOFTWARE

Out to play

Computer games can have serious content — and anyway, what's wrong with having fun? Jack Schofield introduces this month's special feature.

BECAUSE we are serious people and this is a serious magazine we have a tendency to look down on games. We shouldn't. There are no Brownie Points for having a micro that is bad for games: any micro that is bad for games must be bad for other things too. Too slow, eh? No colour option? No fine scrolling or high-resolution graphics? Too bad.

Today's big-selling attention-grabbing software uses colour and sound, draws graphs, offers fine scrolling on multiple windows, and joystick or mouse operation. WordStar, Lotus 123, Microsoft's Multi-Tool Word, Supercalc-3, Context MBA: the old Teletype terminal approach is doomed.

People have been playing games with computers ever since they were invented. One of the most famous mainframe games is Adventure, or Colossal Caves, which was originally developed by William Crowther and Don Woods. But Adventures only require a simple text display, such as can be provided by a teleprinter or Teletype terminal. The boom in games is based on other, more powerful facilities, such as colour graphics and sound effects.

Spoilt for choice

These attractions are many and various, because computer games today cover a wide field, from the completely mindless to the usefully educational. Modern games include Adventure, fantasy and strategy games, educational games, business games, simulations, space and arcade games, as well as computer versions of traditional sports and pastimes.

The best known strategy games are war games, and are also — more tediously — played with game boards, armies and dice as well as on computers. Chris Crawford's Eastern Front is the classic of this genre, though there are now many examples.

Space games started originally with versions of Star Trek, derived from the cult TV series. The apotheosis is Star Raiders, a three-dimensional real-time all-action implementation.

Space games really took off when they arrived in the pubs, clubs and arcades in the form of Taito's Space Invaders. Others followed: Asteroids, Missile Command, Scramble, Defender, Galaxians, Zaxxon . . . microcomputer versions have exhausted most of the possible variations. Fast action, brilliant colour and explosive sound are the important elements.

Once the arcade machines had become established, other types of games started to appear. The first big hit among them was a maze game, Pacman. Like Space Invaders itself it originated in Japan. The next major development was jumping games such as Donkey Kong, Jungle Hunt, etc. Other games, such as Tron, have been based on films. Again, micro versions have generally followed to exploit ideas from the arcade originals.

Many computer games are simply transpositions of established games. Chess is the most obvious example, but other writers have put backgammon, solitaire, bridge, snooker, darts and even dominoes on to the micro.

Flight simulators

It is but a small jump from these to simulations, which need not actually be games. Driving and flight simulations are common. The fun of playing them need not be amassing points or blasting aliens, but simply the enjoyment of mastering a difficult skill. Compare the instrument panel of a Cessna light aircraft with that of the Microsoft Flight Simulator and you will see how accurately the simulation can be done.

Business games are also a form of simulation. The program parallels the running of a business, which might be — in American examples — a lemonade stand, or the economy of a whole country. Whatever the product, these games generally involve setting production levels, paying the workmen, buying advertising and negotiating loans with the bank. The program may also throw in random disasters like strikes and wet winters, to see how well you cope.

In real life, economists and politicians regularly play this kind of game — except they call it the Treasury model of the economy. Each faction feeds in its policies and trade assumptions, and the model comes back with the results — usually inflation and higher unemployment.

Educational games also run the gamut from the pre-school level — learning the alphabet — to arcade-style action. Drill has a bad name in these progressive times, but nonetheless it is something a computer can handle very efficiently.

American games

Some modern American educational games really do offer arcade-style action. Type Attack is one example. Letters rain down on your position and you have to press the appropriate letters on the keyboard to destroy them. Even if games don't teach anything, they have one very important function: they make microcomputers friendly and accessible.

Right from their earliest days, when most people were afraid of computers, micros have been dismissed as toys. The original Apple was dismissed out of hand by most of the major computer companies, because it had colour and sound and attracted lots of games. Those major companies stood by as Apple became a billion-dollar corporation.

Of course the companies who want to sell to the business user tend to play down the games aspect of computing. One reason is that they are afraid to have their micros compared to machines like the BBC Micro and Commodore 64, which are not only vastly cheaper, but in some respects more powerful.

But this anti-games attitude is mistaken, as is shown by the example of IBM. The IBM PC already sets the standard in the small business/executive work-station category of micros, and is set to become the most successful micro in history. Nevertheless it is not dressed up as a "professional", but is plainly a personal computer. Games and education programs make the IBM PC an all-round applications machine, and that accounts for its wide appeal. The fact that it is a powerful business machine is too obvious to need stating.

The point is that a computer is simply an applications machine, like a telephone, a camera or a TV set. If you tried to sell someone a telephone that only took business calls, or a TV that would only receive information programs, but had an automatic cut-out for *Coronation Street*, people would think you were crackers. They'd be right. Nevertheless people do the same thing pretending games don't exist when, if the truth be told, they permeate all microcomputing.

Work or play?

Children really do enjoy messing about with computers. Lorraine Boyce explains how they could be learning at the same time.

DISTINCTIONS BETWEEN work that which I must do, and play, that which I enjoy doing, become ever more blurred. Since many school leavers are unlikely to find a job immediately after leaving school, educational objectives have to change. Fifth-year courses increasingly include an element of education for leisure designed to keep unemployed teenagers off the streets, and to reduce the potential mischief of idle hands.

One recent government initiative extends the provision of Information Technology Education Centres, ITECs. Based on the famous Notting Dale centre, there are now over 100 dotted throughout the country. Unemployed school leavers are given workshop facilities and instruction in micro-technology and electronics. The spin-off is that they become employable in an area where demand for competent personnel at present exceeds supply.

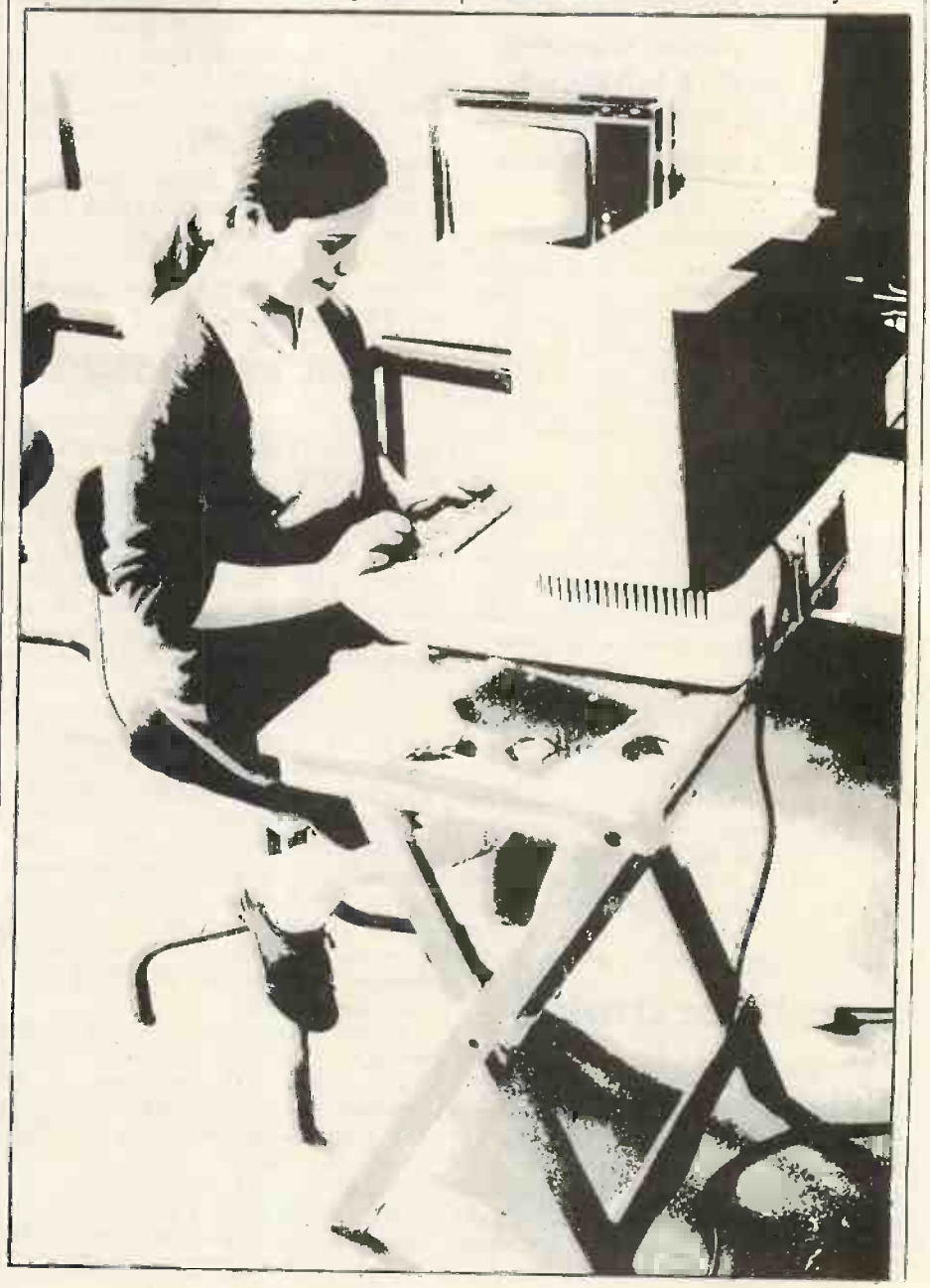
Young people initially attend the ITECs for the best possible reason: they want to. Even in overcrowded, badly equipped inner-city schools fascination with new technology is not stifled. Video arcades and High Street micro dealers sell the idea that it is essential to get closer to the changes prompted by the microchip. Some young people even shoplift home computers in order to teach themselves to program. With motivation such as this who can judge what is work and what is play?

If the premise that work and play are becoming indistinguishable is accepted, then any piece of software can be regarded as a game. Apart from commercial installations, few of us load a program a second time which we do not enjoy using. A whole population must be educated to computer literacy, as rapidly and painlessly as possible.

The door is wide open for professional micro programmers to assist attempts by educationalists and parents to channel the young's enormous enthusiasm for games and technology into valid learning experiences. So much the better if these can be seen to enhance the constituents of the traditional curriculum found in schools. Teachers may complain about the lack of first-rate educational software, but there are still some useful samples around. Several established micro dealers have responded to the interest and are stocking educational games.

Tentative enquiries for educational games in branches of W H Smith produced a positive, informed response. Prominent among the selection of software available were three Spectrum programs released by Longman. They were written for the government's Microelectronics Education Programme, MEP, and were part of the software support for the Department of Trade and Industry's half-price hardware for schools package. Parents have always gone to some lengths to acquire the same textbooks as their children use at school. Spectrum owners may now do the same with primary-school cassettes such as ABC Liftoff and Hot Dog Spotter, which reinforces estimation of number. Other Spectrum games include Widgit's trio: one on the alphabet and two assisting with the concept of sets, the foundation of much infant-school level mathematics. Sets also feature in Get Set, one of the Griffin range also available from W H Smith.

The Griffin programs are written by practising teachers; Get Set by the Sinclair prize winning Fisher-Marriott duo, who learned the hard way to make error messages less attractive than the reward for a correct response. Their spelling game included monstrous purple space invaders to carry away unwanted letters and dump them in a large wastepaper basket. The children loved them. This salutory lesson



has yet to be heeded by the ingenious designer of Scisoft's Jungle Maths, demonstrated before an interested throng in Tottenham Court Road's Spectrum Centre.

The reward for a correct calculation is the movement of a tiny figure through the pixels of a strip of jungle at the top of the screen. Try a wrong answer and the display changes. Palm trees and a larger figure appear; falling coconuts bombard the figure until its limbs fall off. Onlookers agreed that this was far more fun and carried on getting the sums wrong. The Pit yawned in front of us and the figure fell to land with a splat at the bottom. Even the tattooed skinhead whose exploration of Psion's Flight Simulator had been interrupted by the experiment felt that lack of skill was being reinforced.

Flight simulators occupy their own niche. It is probably libellous to repeat the persistent rumour that at least one eastern European airline uses the Psion Spectrum version to train its pilots. But these games do seem to have opened up a new area of realistic simulations. Those wondering how they compare with the real thing should tune to Central Television's *Magic Micro Mission* in November. One edition of this six-part *Tiswas*-inspired series shows a flight simulator used by a real air-traffic controller talking down a real airline captain.

Also anonymous is the Oxford Street software emporium which stocked but refused to load or even describe the Texas Instruments educational games. The range undoubtedly has some most attractive graphics and TI Logo, with its magical sprites, is based on Seymour Papert's research at Massachusetts Institute of Technology. Those alarmed that young people are becoming voluntary Basic hacks can take hope in the strong movement of primary teachers towards use of Logo as the only programming language for children. Would that the CSE and O-level examination boards could look at it that way too.

Far too many are prettified versions of drill-and-practice programs designed to teach and test spellings and number bonds. Here it is arguable that the patient and uncritical micro is a better mentor than a hard-pressed teacher or worried parent. However, the capabilities of the computer lend themselves to far more imaginative and worthwhile educational games. Some of the best are appearing in non-

(continued on next page)

Educational software

catalogued by Theodora Wood

ATARI

Game	Type	Memory (K)	Supplier	Age	Price
Conversational French	LP	16	AT	10+	£40
Conversational German	LP	16	AT	10+	£40
Conversational Italian	LP	16	AT	10+	£40
Conversational Spanish	LP	16	AT	10+	£40
Cubbyholes	Q	16	AT	5-12	TBA
European Countries & Capitals	Q	16	AT	10+	£15
Hickory Dickory	LP	16	AT	5-11	£11.50
Invitation to Programming 1-3	PR	8	AT	10+	£20-£23
Mathematic-tac-toe	Q	16	AT	8-16	£11.50
My First Alphabet	LP	32	AT	2+	£30
Number Blast	RD	16	AT	6-16	£11.50
Quizmaster (disc)	Q	32	AT	8+	£16
Scram	SIM	16	AT	12+	£20
Speed Reading	LP	16	SL	15+	TBA
The Music Tutor	MU	40	AT	6+	TBA
Three R Math System	RD	48	AT	5-13	TBA
Tricky Tutorials 1-11	PR	16	MA	12+	£21
U.S. States & Capitals	Q	16	AT	10+	£15
Vdeo Math Flash Cards	RD	8	AT	6-10	£11.50

BBC MICRO

Game	Type	Memory (K)	Supplier	Age	Price
Additional Fun	RD	32	SH	4-7	£14.95
Algebra 2	LP	32	SM	13+	£7.95
Algebraic Manipulation	LP	16/32	AC	15-18	£9.95
Animal Vegetable Mineral	IN	16/32	BE	7-13	£5.69
Biology	LP	32	SI	14-16	£12.50
Business Games	SIM	16/32	AC	12-18	£9.95
Chemical Analysis	LP	32	AC	15-18	£13.80
Chemical Simulations	LP	32	AC	15-18	£13.80
Chemical Structures	LP	32	AC	15-18	£13.80
Educational Games	Q	16/32	GA	5+	£5.95
First Steps In Algebra	LP	32	SM	10+	£7.95
Happy Numbers	RD	32	BE	4-6	£8.95
Introduction to Trigonometry	LP	32	SM	16-18	£7.95
Jars	RD/LO	32	AC	7-13	£11.90
Launching Logic	LO	32	SH	5-8	£14.95
Learning Maths Package	RD	16/32	GA	9-12	£7
Lift Off with Numbers	RD	32	SH	3-6	£14.95
Mental Arithmetic	RD	32	SM	8-14	£6.95
Missing Signs	RD	16/32	AC	5-10	£11.90
Mr T Tells the Time	RD	32	GH	3-7	£12.95
Mr T's Money Box	RD	32	GH	3-7	£12.95
Mr T's Alphabet Games	RD/Q	32	GH	3-6	£12.95
Mr T's Measuring Games	RD/Q	32	GH	3-6	£12.95
Mr T's Number Games	RD/Q	32	GH	3-6	£12.95
Mr T's Shape Games	Q	32	GH	3+	£12.95
Music Tutor	MU	16/32	GA	8+	£10.95
Number Balance	RD	16/32	AC	5+	£9.95
Peeko Computer	LO/PR	16/32	AC	5+	£9.95
Sets & Operators	LO	32	SH	7-12	£14.95
Sentencing Sequencing	RD	32	AC	7-9	£11.90
Theorem of Pythagoras	LP	32	SM	10+	£7.95
Timeman One	RD	32	BE	4-9	£8.95
Tree of Knowledge	IN	32	AC	4+	£9.95
Town Test	Q	32	SI	4+	£6.50
Turtle Graphics	LO/PR	32	AC	9+	£16.85

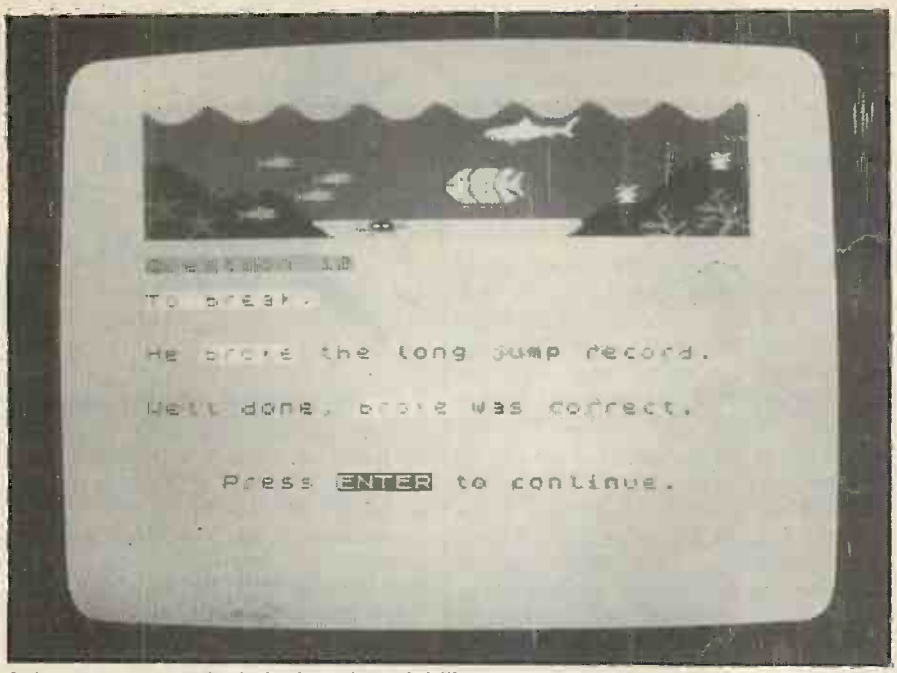
COMMODORE PET

Game	Type	Memory (K)	Supplier	Age	Price
Animation	PR	16/32	SU	8+	£15
Broadwater Economics	SIM	16	WL	14+	£28.75
English Skills	RD	16/32	PE	9-13	£10
Flight Simulator	SIM	32	SU	9+	£20
Font	PR	16/32	SU	10+	£8
Kings + Queens	Q	32	SU	8+	£6
Languages	Q	16/32	PE	9-16	£10
Mathematical Games 1&2	Q	16/32	PE	8-14	£10ea.
Multiple Choice	Q	16/32	PE	6-9	£10
Northern Hangman	Q	16/32	PE	9-13	£10
Numeracy Skills	RD	16/32	PE	4-8	£10
Physics 1-5	LP	16/32	PE	14+	£10ea.
Southern Hangman	Q	16/32	PE	14+	£10

COMMODORE 64

Game	Type	Memory (K)	Supplier	Age	Price
Gortek, The Microchips & 12 Educational Programs	PR	64	PE	10-13	£12.95
Gortek, the Kryptobytes & 12 Educational Programs	PR	64	PE	10-13	£12.95

(table continued on next page)



Calpac's programs include the rule-and-drill type.

(continued from previous page)

commercial areas, but Applied Systems Knowledge, ASK, has some good games available over the counter for the BBC and Vic-20. The series includes a version of Kim's game as well as the identikit Facemaker.

Inner London Education Authority has set up a unit which steadfastly withstands all approaches to commercialise its excellent maths programs. Secondary Maths Individual Learning, Smile has some of the best and soundest educational software available. It includes simple number guessing and attractive maze games. Nim prompts much discussion but is rarely beaten, and involves searching for lost animals, which motivates work on the use of co-ordinates. Unfortunately this highly desirable 380-Z software is normally available only to ILEA teachers.

When Northamptonshire teachers realised how little software would initially be available for their DoTI 480-Z machines, they set to and wrote some straightforward but useful material. The

(table continued from previous page)

VIC-20

Game	Type	Memory (K)	Supplier	Age	Price
Biology O-level	LP	20	PE	14+	£9.99
Physics O-level	LP	20	PE	14+	£9.99

DRAGON 32

Game	Type	Memory (K)	Supplier	Age	Price
Artist	PR	32	AB	5+	£5
First Letters and Words	RD	32	AB	4-6	£6.50
Flight Simulator	SIM	32	PSS	9+	£7.95
Infant Pack	RD	32	SD	3-6	£3.95
Junior Pack	RD	32	SD	6-9	£3.95
Maths Level 1	RD	32	CH	4-6	£19.95
Maths Tutor	RD	32	AB	3-10	£5
Music Tutor	MU	32	AB	5+	£12.95
O-level Physics	LP	32	AB	14+	£6.50
Popstar	SIM	32	SW	9+	£5.25
Puzzler	LO	32	SD	8+	£6.95
Quiz Pack	Q	32	SD	6+	£3.95
Time Traveller	SIM	32	WL	9-13	£9.95

SINCLAIR SPECTRUM

Programs marked with an asterisk* are also available for the ZX-81

Game	Type	Memory (K)	Supplier	Age	Price
ABC Lift-Off	RD	16/48	LO	4-8	£7.95
Adding & Subtracting	RD	16/48	WI	3-6	£5.25
Alphabet	RD	16/48	WI	3-6	£5.25
Animated Arithmetic*	RC	16/48	LC	3-8	£6.50
Ballooning	SIM	48	HE	8-12	£9.95
Calpac FL1*	RD	16/48	CA	5-8	£9.50
Calpac FL2*	RD	16/48	CA	7-10	£9.50
Calpac FL3*	RD	16/48	CA	9-12	£9.50
Calpac O-level Chemistry*	C	16/48	CA	9-12	£9.50
Car Journey	SIM	48	HE	8-12	£9.95
Countabout	RD	16/48	LO	4-8	£7.95
Counting	RD	16/48	WI	3-6	£5.25
Educational Quiz*	Q	16	RO	6+	£4.95
English Literature	Q	16/48	SC	9+	£6.95
Firework Music*	MU	16/48	SO	4+	£5
First Numbers	RD	16/48	CO	3-6	£5.95
Flight Simulation	SIM	48	SC	9+	£7.95
French Vocabulary Test	RD	16/48	SC	9+	£4.95
Geography 1	Q	16/48	SC	9+	£6.95
German Vocabulary Test	RD	48	TU	11+	£4.95
Hidden Letters	Q	16/48	PO	5+	£5.95
History 1	Q	16/48	SC	7+	£6.95
Hot Dog Spotter	RD	16/48	LO	4-8	£7.95
Intermediate Maths 1&2*	RD	16/48	RO	9-13	£4.95
Inventions 1	Q	16/48	SC	7+	£6.95
Language Development*	RD	16/48	DR	7-13	£7.90
Maths 1-5*	LP	16/48	SN	11+	£7.95
Micro-Maths*	LP	16/48	LC	14+	£24.50
Money	RD	16/48	PO	3-10	£5.95
Music Maker	MU	48	BL	5+	£5.75
O-level French Revision*	LP	16/48	RO	14+	£4.95
O-level German Revision*	LP	16/48	RO	14+	£4.95
Shapesorter	RD	16/48	WI	3-8	£5.25
Short Vowel Sounds	RD	48	SR	3-8	£7
Snail Logo	LO/PR	48	CP	9+	£9.95
Special Agent	SIM	48	HE	8-12	£8.95
Tables	RD	16/48	CO	7-11	£5.95
Telling the Time	RD	16/48	PO	3-9	£5.95
Telling the Time	RD	16/48	CO	3-9	£5.95
The Night Sky*	A	16	BR	6+	£8.90
The Four Rules of Number*	RD	16/48	DR	6-13	£11.70
Tuner*	MU	16/48	SO	5+	£5

Program type

IN: Information retrieval categorisation
Only a limited number of these programs exist for children. They familiarise the user with filing techniques to set up data banks and information-retrieval systems of their own choice.

LO: Logic learning
Maze programs found in games listings are the oldest form. Adventure programs explore this area in an imaginative way but few have been produced specifically for children. Programs specifically for children are available to encourage logical thought, and introduce younger children to the concepts of sorting according to shape/colour/size. More advanced versions exist to explore this area further.

LP: Learning package
Learning packages are valuable aids for the secondary-school child onwards, and can teach a variety of subjects. Like Rule and Drill, they teach by example and test, and could be particularly useful in revision for examinations.

MU: Music
Programs of this sort use the computer's sound and graphics

inevitable Hangman is there but so are helpful programs on sets and Venn diagrams, a computerised Battleships, three-dimensional Noughts and Crosses and an infant word processor. Full marks for initiative to the Northamptonshire pioneers.

Board games, the family entertainment of our Victorian predecessors, readily lend themselves to today's technology. No longer do we need to search down sofas for missing pieces, and any tendency to cheat is automatically checked. The chess simulations on the market are a boon to the lone enthusiast and are now joined by Griffin's Reversi — also called Othello — TI's Yahtzee, and Psion's Scrabble. Unlike the majority of games played against the micro, Psion's scrabble gives the player a slight advantage. If a word which the computer does not recognise is entered it will be challenged. However, the player can then affirm that the word exists and the micro will accept it, although it is unable to add it to its vocabulary for next time. Cheating is possible but the ethics of someone prepared to cheat a computer at Scrabble are beyond comment. Less easy to fix is the Mensa intelligence test available for the Spectrum.

Right from the beginning computing has been regarded by most of its exponents as play. Mainframe boffins cheerfully and absorbedly spend most of their waking hours at the keyboard. Lights burn all night in university computer centres — not all the students inside are using or writing Adventure games either. Unwilling school children are ejected from after-hours computer clubs by teachers who forget to eat lunch because they are as hooked as their pupils. Tots on TV giggle as they press keys to animate floor turtles. Even Hunt the Thimble has been computerised by Ginn.

People enjoy computers. It is hard to draw a line where the games stop and the education begins. Recent revised opinion even holds that much-criticised video games have an educational spin-off in terms of enhanced concentration and the strengthening of weak or damaged limbs.

Software for schools is now a thriving cottage industry, a response to teachers' insistent demand for good educational software. The position improves all the time and many established publishers are entering the market. Assessment of the educational aspects of software is simple. Just ask yourself "Did I learn anything and was it fun?" If the answer to both is yes, then you could probably say it was an educational game.

capability to introduce recognition of tone, use of a keyboard and musical notation.

PR: Programming skills
There are a number of programs available to teach programming to older children and adults. For the age range 9 to 16, these skills are either taught in a simplified game/test format or introduce versions of Logo. This teaches programming skills by allowing the child to use simple commands to move and draw with a turtle on the screen or on the floor. They encourage a familiarity with logic, programming routines and geometric functions. Problem-solving skills learned in this way can be applied in other areas.

Q: Quiz
Quiz programs operate in various fields of education and are either quizzes set by the program and/or can be used interactively by the child/adult setting the questions and levels of difficulty. Also included in this category are educational games.

RD: Rule and drill
Rule-and-drill programs use the computer's capability of graphics, sound and animation to teach basic skills from pre-school to secondary age. The format is generally to present examples and then test. Following on from more familiar methods of teaching these skills, they can make rote learning more interesting and fun if used for short periods of time. The programs listed for the younger children can introduce them to the computer and its keyboard.

SIM: Simulation
Many programs have been produced for older children and adults, but few for the under-10s. Children make decisions based on information presented either graphically or as text. They can introduce a child to the vocabulary and concepts and the consequences of decisions taken.

Programs listed here are available on cassette, and sometimes on disc too.

Suppliers

AB: Abacus Software, 21 Union Street, Ramsbottom, Bury, Lancashire.

AC: Acornsoft, 4a Market Hill, Cambridge CB2 3NJ.

AT: Atari International (U.K.), Atari House, Railway Terrace, Slough, Berkshire SL2 5BZ

BE: Bourne Educational Software, Dept AU 6, Bedfield Lane, Headbourne Worthy, Winchester, Hampshire. SO23 7SQ.

BL: Bellflower Software, 6 Rosewood Avenue, Greenford, Middlesex.

BR: Bridge Software, Dept SU, 36 Fernwood, Marpit Bridge, Stockport, Cheshire SK6 5BE.

CA: Calpac Computer Software, 108 Hermitage Woods Crescent, St John's, Woking, Surrey GU21 1UF.

CH: Cheshire Cat, Ampalsoft Computer Services Ltd, Knutsford, Cheshire.

CO: Collins Educational, (W.H. Smith & Son), Glasgow G4 0NB.

CP: CP Software, Dept YC 8, 17 Orchard Lane, Prestwood, Buckinghamshire HP16 0NN.

DR: CES, 94 Airedale Avenue, London W4.

GH: Good Housekeeping, Ebury Software, 72 Broadwick Street, London W1V 2BP.

HE: Heinemann Computers in Education, 22 Bedford Square, London WC1B 3HH.

LC: LCL, 26 Avondale Avenue, Staines, Middlesex.

LO: Longman Group Ltd, Longman House, Burnt Mill, Harlow, Essex CM20 2JE

MA: Maplin Electronic Supplies, PO Box 3, Rayleigh, Essex SS6 8LR.

PE: Commodore Dealers; or Commodore Information Centre, 675 Ajax Avenue, Slough, Berkshire SL1 4BG.

PO: Poppy Programs, Richmond House, Ingleton, Carnforth, Lancashire LA6 3AN.

PS: PSS, 452 Stony Stanton Road, Coventry CV6 5DG.

RO: Rose Cassettes, 148 Widney Lane, Solihull, West Midlands B91 3LH.

SC: Sinclair Research, Camberley, Surrey GU15 3BR.

SD: Shards Software, 189 Eton Road, Ilford, Essex IG1 2UQ.

SH: Shiva Publishing Ltd, 4 Church Lane, Nantwich, Cheshire CW5 5RQ.

SI: Silverlind, 156 Newson Road, Burton-on-Trent, Staffordshire DE15 0TR.

SL: Silica Shop, 1-4 The Mews, Hatherley Road, Sidcup, Kent DA14 4DX.

SM: Small School Software, 1-2 King Street, Ludlow, Shropshire.

SN: Simon Software, Dept YC, Newend, Redditch B96 6NE.

SO: Software Cottage, 19 Westfield Drive, Loughborough, Leicestershire LE11 3QJ.

SR: Sherston Software, 1 Noble Street, Sherston, Malmesbury, Wiltshire SN16 0NC.

SU: Supersoft, Dept C7, 1st Floor, 13-14 Canning Road, Wealdstone, Harrow HA3 7SJ.

SW: Swansoft Software, Dept YC, 8 St Aiden Drive, Killay, Swansea.

TU: Tutorial Software, PO Box 43, Enquiry Office, 22-29 Mill Street, Newport, Gwent NP1 3XZ.

WI: Widget Software, 48 Durham Road, London N2 9DT.

WL: John Wiley & Sons, Baffins Lane, Chichester, Sussex PO19 1UD.

Towards mastery

Neville Maude looks at the best chess programs and pits two BBC tapes against the opposition.

COMPUTER CHESS has progressed remarkably over the past decade, to the extent that a chess computer recently drew a game with world champion Anatoly Karpov — though admittedly it was during one of his simultaneous displays. When David Levy made his famous bet in 1968, that no computer program produced in the following 10 years would be able to beat him, the wager was a good proposition for the human player. Making a similar bet today would be a different matter.

The best programs and the specialised hardware developments go into the dedicated chess machines which are, of course, single-purpose instruments. However, not everyone wishes to invest in one, especially if they have their own micro. It seems much more logical to utilise the power of the computer and have the display on a TV set or monitor.

Producing the display is not the simple task it may appear at first sight. One problem with early computers was designing black and white pieces that were equally visible on both black and white squares. The general availability of colour has helped here, but some programmers are still having difficulties. A good screen display can swallow a great deal of RAM, while remembering the moves for subsequent replay or listing can take a lot of the remainder. Often too little RAM is left for the actual playing of the game.

The problem is that chess is very demanding of both memory and processor. Even if only a few moves are considered on each side, the number of possible variations can be very large indeed. To search through all the possibilities by brute force quickly becomes impossible, so the program must evaluate each position it finds as best it can. This leads to the horizon effect: the ability to see one more move ahead may produce a crushing victory for the machine, but it does not have the power, or the time, to search the next level. It cannot see over the horizon.

Human players play differently from machines, in that they are able to pre-visualise a position they would like to be in. They can then work backwards, to see how the favourable position can be arrived at. In other words, instead of simply trying to make the best of a given position, they evolve a plan. The vast majority of possible moves do not need to be analysed at all by the player.

Chess computers have evolved rapidly over the last few years, not just because of increased processing power but also thanks to the skill of the software writers. A good account of this progress is given in David Levy's book *Computer Gamesmanship*, published by Century Publishing earlier this year.

The first popular chess programs for micros were Sargon, written by Kathe and Dan Spracklen, and the ROM carrridge programs for the Atari and TI-99/4 computers. In its time the Atari was something of a pace-setter for the industry, though it lacks sophistication by modern standards. Its game is played on a rectangluar board, and the graphics could certainly be improved on today. It also suffers from the common complaint of becoming too slow at the higher levels.

Sargon, developed in 1977, was published in book form, and appeared on cassette for the popular Pet micro — at a fairly high price. Sargon II, for Z-80 based computers, was an improvement and a version which ran on the Jupiter Wavement III achieved remarkable success at the American Chess Masters tournament in Washington. Sargon II appeared on many popular micros including the Apple II and the Atari, and has most recently come out on the Vic-20.

Much of the success of the Sargon II can be ascribed to the algorithm which analyses the values of exchanges at the terminal nodes — the bottom of the tree in a root-and-branch search. Recently a new program, Boss, has been announced, which is claimed to beat Sargon II and probably does. However, even more recently, Sargon III has been announced, though so far it is only implemented for the Apple IIe and IBM PC.

Another new U.S. program is Chess 7.0 from Odesta, for the Apple II and Atari micros. It was written by Larry Atkin, who was one of the co-authors of the Northwestern University program, Chess 4.7, which won almost everything in the 1970s and was, at the end of the decade, World Computer Chess Champion three years in a row. Which of these three is better I really do not know.

Among dedicated computers, Sargon 2.5 has been superseded by Morphy, which has better opening strategy and avoids the Sargon weakness of castling into danger.

Game	Runs on	Supplier
Chess	Atari	Atari
Chess	Atari, IBM PC	Parker Brothers
Chess	BBC	Computer Concepts
Chess	BBC	Program Power
Chess	BBC, Electron	Acornsoft
Chess	BBC, Vic-20	Bug-Byte
Chess	Spectrum	Mikro-Gen
Chess	ZX-81 16K	Psion/Sinclair
Chess 1.4	ZX-81	Abersoft
Chess 7.0	Apple, Atari, TRS-80	Odesta
Chess II	Spectrum 48K	Artic
Chess, The Turk	Spectrum	Oxford Computer Pubs.
Chess ZX-81	ZX-81	Artic
Cyrus Chess	Dragon	Dragon Data
Cyrus IS	Spectrum	Intelligent Software
Grandmaster Chess	Commodore 64, Vic-20	Audiogenic
Master Chess	Spectrum	Mikro-Gen
Masterchess	Spectrum 48K	Psion
Sargon II	Apple, Atari, Vic-20	Heyden
Sargon III	Apple, IBM PC	Heyden
Superchess	Spectrum 48K	CP Software
Superchess II	Spectrum 48K	CP Software
The Chess Player	Spectrum 48K	Quicksilva
Video Chess	TI-99/4a	Texas Instruments
Voice Chess	Spectrum 48K	Artic
White Knight	BBC	BBC Publications
ZX Chess	ZX-81	Mikro-Gen
ZX Chess I	ZX-81	Artic
ZX Chess II	Spectrum 48K	Artic

Morphy can be expanded at both ends by specialised programs to play more varied openings in greater depth and to improve end-game play.

For up-to-date standings, see the report by David Levy on page 37 of this issue on the most recent European computer chess championship. It is natural to expect that the improvements evident here will eventually work their way through into the standard chess programs for micros.

Whereas previously most of the developments were taking place in the U.S., David Levy's company Intelligent Software is now making significant strides in the U.K. It is noteworthy that the latest ROM cartridge chess program for the Atari computers, to be launched shortly by Parker Brothers, is based on the Cyrus program. A slightly later version, Cyrus II, has just been launched on cassette for the Spectrum and is said bo be very strong.

Main criteria

Yet another new U.K. program is Grandmaster Chess from Audiogenic, available on cassette for both the Vic-20 and Commodore 64. It claims to be one of the world's stongest programs for home computers, but is too new to have established a track record. Ideally, of course, every program would be rated for strength on one of the standard scales. While this is often a selling point of dedicated chess machines, it is rare among computer games.

The main criteria to be considered when choosing a chess program are the strength and speed of the game — which are interrelated aspects — and the facilities available, such as the ability to modify the board. The provision of a Hint facility, to suggest a possible next move, and the quality of the graphics are probably secondary though clearly individuals may have different priorities. To some players the ability to take back a mistaken move — though this is not allowed in tournament chess — may be important.

The ability to play on automatic, as it were, is offered by a number of programs, including Grand Master, Cyrus II and the Parker version of Cyrus. The last two will also replay the game you have just finished. Disc-based programs like Sargon III and Odesta's Chess 7.0 can offer a selection of historical master games: Chess 7.0 has 30 and Sargon III no less than 107.

The overriding consideration must always be that the program must play well enough to provide the human player with a real challenge at a reasonable rate of play. There is no real amusement to be had from repeatedly crushing a weak program.

The latest generation of chess programs to become widely and readily available is for the BBC Micro with 32K, and these can be taken as exemplifying the current state of the art. Bug-Byte and Computer Concepts provide two examples while the latest release is the very strong White Knight II from BBC Software.

The Bug-Byte cassette is, of course, in machine code and loads in only two minutes by the command

*RUN "CHESS".

As with most serious modern programs it moves by standard algebraic commands, understands castling and *en passant*, recognises a stalemate, plays black, white or both, and does not permit illegal moves. This is about the minimum that is acceptable today. Advertisements for the game claim it can be set to 1,000 levels, which sounds impressive, but it is the range of strengths that matters, not the number of minute subdivisions into which that range can be divided. Nevertheless the control over game strength is of interest.

It is set by inputting a number from 0 to 9.99. The number before the decimal point sets the number of moves ahead the computer will search; the number after the point is the number of moves that will be considered at each node. While this gives a good range, play becomes impossibly slow at the higher levels.

For a first trial, I set the maximum strength and opened E2-E4. There are only 20 possible first moves and about six to eight common ones, but after four hours I was still waiting for a reply. Moving down to level 7 gave a time of about five to 10 minutes per move. Then I let it play Mephisto — one of the best dedicated machines available at the moment — at its level 4, which takes about 45 seconds per move. Mephisto polished it off in 30 moves, with the issue never being in doubt.

On the lower levels, the Bug-Byte chess invariably replies to E2-E4 by bringing out its knight, B8-C6, and after the reply D2-D4 brings out the other knight . . . which is, of course, chased away by E4-E5, and white has a very easy game. The weakness of this cassette is that it has no opening book, so the computer can easily be placed in a poor position before the middle-game starts. All chess programs are strongest in the middle-game and are weaker at end-game play. You should step up the level towards the end if you want a more worthy opponent.

Another BBC cassette from Computer Concepts is described as version 2.32B. It is also in machine language but loads with

CHAIN "CHESS"

which in practice boils down to the universal BBC loading CH." ". Loading is again quick, at three minutes.

In this version the player can control the computer strength to an unprecedented degree. You can set the number of moves ahead which the computer explores from one to eight. This is a brute-force search. The next option concerns captures only, and the menu terms it Care; it runs from 0 to 9.

Next comes Sub-level, which determines the number of moves considered at each level, and can be set from 0 to 9. This equates with the setting after the decimal point in the Bug-Byte program. Finally there is a setting called, for no apparent reason, Speed. It is similar to the Sub-level setting, but the number of moves depends on merit, rather than being fixed in advance.

Mercifully, Computer Concepts has refrained from claiming that its program can be set to 8,000 different levels. On level 1 the Sub-level and Speed settings have no effect unless the Care setting is 2 or greater. When Care is greater than 2, a random choice is made between moves of equal merit, which makes for greater variety in games.

Extra features

A typical choice of settings could be 3,2,8,3 at which moves take five to 10 minutes, or longer according to the complexity of the position. Again, however, Mephisto on its 45 second setting beat it without difficulty, despite the great time advantage given the Computer Concepts program.

Other features of this cassette are that it uses the assignable function keys of the BBC Micro to change levels, sides, etc. while Ctrl-H offers a Hint facility. Unfortunately the hints are not very good, as they correspond to the move the computer would make on level 1 with a Care setting of 0.

Chess programs for micros still have plenty of room for improvement, especially in the provision of reasonably good opening books. Another major advance would be programs that continued thinking in their opponent's time, like human players and the best dedicated machines. A better alpha-beta pruning tree would not come amiss, either. I would like to see the provision of time clocks so that the computer can be required to play under tournament conditions, with the possibility of coming under time pressure. Other ideas are the ability to select a particular opening line, and provision of a Hint facility of good quality.

However, the main requirement is still the ability to play at a level of, say, BCF or UCSF 1,400 at a tournament speed of 40 moves in two hours or, preferably, 30 moves in one hour. If computer chess shows the same improvement over the next decade as it did during the last, this will come. Grandmasters must look to their laurels: by 1990 we may have a computer as world champion.

Taking off

It may not be the real thing — but it's safer and cheaper. Ian Beattie-Edwards outlines the complexities of flight simulation.

JUST ABOUT every computer magazine and Sunday supplement carries advertisements for the Psion flight simulator for the Spectrum, as well as the Hewson Consultants Night Flight, both of which are always in the list of top-selling "games". But do not be misled. They are not just games, which I suspect is why they have sold so well, as they are simulating rather well the flight characteristics of a light aeroplane.

There are a multitude of similar programs designed to run on most home computers — with the notable exceptions, at the time of writing, of the Vic-20 and Commodore 64. But since the prospective simulator buyer will almost certainly already have bought a computer, so in practice most people have little real choice.

The exceptions are Apple owners. At present there are five simulations or flight trainers for the Apple. This relative plenty is a result of the machine's good graphics and its market penetration in the U.S., where the flying fraternity is well supported by software writers. It is confirmed by the glut of flight-planning and similar programs — some good, some bad.

The prospective buyer of any home-computer simulation must remember that he or she is trying to compare the micro with, at worst, two or three minis driving a multi-million pound simulator like the Redifon. And that is sufficiently sophisticated to be taken as the real thing by even the most experienced pilot. Many flying clubs have the next best thing, an Instrument trainer, and will be pleased to show you the simulator and a real aeroplane. You may even get a trial lesson: you never know, you might prefer the real thing.

There are several variations on the theme of simulation so do not be confused by the slight variation in phraseology. There is a world of difference between an instrument trainer, a visual flight trainer or a cockpit procedural trainer. To a learner pilot a visual flight trainer would be the most help, but unfortunately it also the most expensive and difficult to design and build.

The trainee pilot relies on all the visual clues, such as wing tips in relation to the horizon, the attitude of the aircraft by referencing a mark on the windscreen, or a distance from the cowling to the actual horizon. The pilot can also gain clues to the aircraft's speed from the rate that the view changes. There is also "seat of the pants" information like the wind rushing past the aircraft, and even the angle that the aircraft crabs in to wind. All these must be available visually, and valid for all phases of flight.

The instrument trainee is a much more experienced pilot who must now fly the aircraft only with reference to the instruments provided in the cockpit. A modern cockpit has several instruments, but only a limited number are essential to safe flight. The remainder are provided to make life easier, and in some cases almost make the pilot redundant.

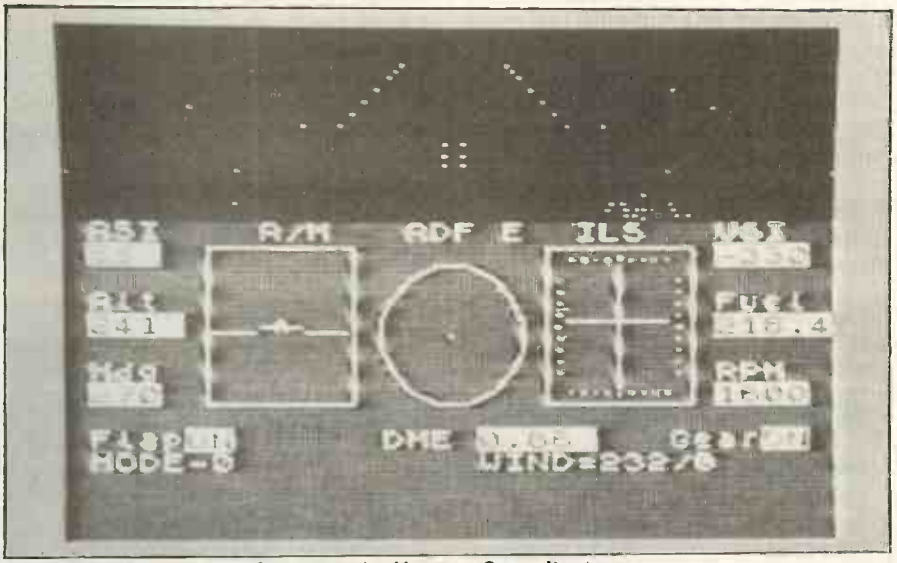
For example, there is a basic layout called the T, which was developed by the military in the early days of flying to help pilots make a regular scan of the primary flight instruments. These essential instruments are the giro compass, artificial horizon, turn and slip, climb and descent, air-speed indicator and possibly an engine rpm counter. The pilot must then scan the remainder of the instruments, including the navigation instruments, at a less frequent rate to ensure a safe flight.

The final type is the cockpit procedural trainer, designed to assist experienced pilots to convert more quickly and cheaply to a new type of aircraft. The idea is that the pilot learns the position of switches, selectors and indicators and the inter-relation between them. There is no attempt to mimic the aircraft's performance. The pilot then goes on to the simulator which might just be an instrument simulator or, more likely, a fully visual simulator. Most modern instrument and visual simulators have sound, vision and motion to provide realism. Only smell is missing.

Ian Beattie-Edwards is a director of Beattie-Edwards Aviation Ltd of Crawley, Sussex, supplier of flight simulators.

A real-life cockpit — the Airbus Industrie A310.

Rediffusion's Boeing 737 flight simulator.



Nightflite for the Sinclair Spectrum, by Hewson Consultants.

Simulator	Supplier	Runs on	Type
737 Flight simulator	Salamander	BBC B	V/I
747 Landing simulator	Atari APX	Atari	limited V/I
747, Airbus, Concorde	Molimerx	Tandy; 747 for the BBC B	
Air-Sim-1*	Mind Systems	Apple II	VI
Cleared for landing*	Programmers Software/BEA	Apple II	V/I
Dawn Patrol		Apple II	combat simulation
Dragonfly	Hewson	Dragon 32	
Flight Simulation*	Psion	Spectrum 48K	V/I
Flight Simulator	Microsoft	IBM PC	V/I
Fly One	Kuma	Sharp MZ-80A	
Heathrow ATC*	Hewson	Spectrum	air-traffic control
Jumbo		Tandy, Genie, BBC B	
Jumbo Jet Pilot	Thorn EMI	Atari	V/I
Nightflite	Hewson	Spectrum	V/I
Pilot		Sinclair ZX-81 16K	limited V/I
Space Shuttle	Microdeal	Dragon 32	Space Shuttle V/I
Spitfire Ace	Microprose/BEA	Atari 32K	combat simulation
Spitfire Simulator	Mind Systems/ BEA	Apple II	combat simulation
TR80-FS1, A2-FS1	Sub-Logic	Tandy, Apple II	

*recommended.
BEA: Beattie-Edwards Aviation Ltd
V/I: visual/instrument

Clearly a home computer cannot compete with the quality of simulation provided by the industry. But there is a new piece of kit, called Minisim, currently available in America and soon to be distributed in the U.K. Minisim is a dedicated comuter with rudder pedals and a control wheel, throttle, etc. which plugs into your TV or monitor. It correctly simulates the instrument flying required by the Federal Aviation Authority in America, and does so well enough to allow a reduction in mandatory training. The National Physical Laboratory is also investigating an economic visual instrument simulator that, when produced, should satisfy the medium-level training market — if the price is right.

But back to reality. For most people, the only way they will ever fly a large or even a small aircraft is to fly a simulator. While none of the products on the market compares with the specification offered by the big machines or the real thing, most micros have several programs available. Those in the table marked with an asterisk are particularly recommended, but I have not tried all the packages listed.

There are no cockpit procedural trainers on the home-computer market, as it is probably felt that it is not interesting enough to the general public. However, there are firms that specialise in producing computer simulations for training in supertankers, oil rigs and similar problematical areas, so there is hope for a similar trainer for pilots.

When assessing a visual simulator make sure the view from the cockpit moves in relation to the control movements; it must bank and climb. And whatever the simulator is designed to do, if it is simulating an aeroplane then you must have joystick control; keys for left, right, up and down movement are not acceptable for a realistic simulation.

The refresh rate for the screen and the joystick read must be fast enough to ensure jump-free displays. Finally, the mathematical model used to simulate the aircraft must work in all axes, and the aircraft must be able to loop and stall correctly. As far as an instrument trainer is concerned, its main function is to ensure the scan rate is sufficient to ensure that the actions carried out by the pilot are the correct responses to the problem in hand.

Play for profit

Learn how to run a company without going broke or landing up in jail.

BUSINESS GAMES are now one of the most interesting areas of computing, with numerous amusing games for home micros and, at the other extreme, serious mainframe games that attract top-flight institutional entries.

Business games did not start with computing. Perhaps the first really popular example of a business game was Monopoly, for which there was a craze in the States in the 1930s, during the great economic depression. Monopoly is, in fact, a property-management game, with its panoply of rents, mortgages, and house and hotel building. A substantial game with a number of participants will often have a separate banker to dole out the Monopoly money.

Of course Monopoly remains popular today, and there are a number of versions for microcomputers including Monopoly, Space Monopoly and Do Not Pass Go. A Monopoly program listing for Commodore computers was published in the December 1982 issue of *Practical Computing*.

There are distinct advantages to using a micro as the banker. It can take over the tedious chore of apportioning rents and, usually, will provide an electronic banking service. In this respect, at least, Monopoly gains from computerisation in a way that bears a resemblance to real life.

At the other extreme, consider something like the Treasury model of the U.K. economy. This is an enormously elaborate computer model which is programmed to mimic the real behaviour of the economy as exactly as possible. Insofar as there are "rules" — the laws of economics — these are but dimly understood and thus appear to be frequently broken.

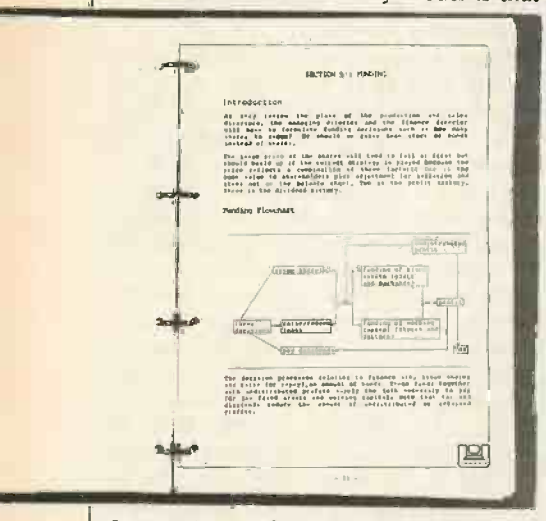
The idea of the Treasury model is that the government should be able to feed something into the system, such as an increase in VAT, and see the effect. If the real economy fails to follow the model then it is the model that is wrong. The complexities of the problem were covered in an article by John Hudson, The U.K. Budget on a Micro, in the July 1983 issue of *Practical Computing*.

Whether they are done seriously or for amusement, it is computers that make such simulations possible, by providing the calculating power to work out all the very complex implications of financial actions. They are far too arduous and time consuming to be done manually, but without them the simulation ends up being trivial.

One reason why the Treasury model, or any model, of a whole economy is of doubtful use is that the real economy is not a closed system. Actions by other countries, over which the government has no control, may have far-reaching consequences. Thus, in a small way, when sterling crashes for political reasons, shopkeepers on the South Coast benefit from a flood of cross-channel shoppers.

The performance of an individual company can be modelled more accurately, though even here a reasonably constant national background must be assumed. This is the basis for a number of management games where the aim is to maximise one particular aspect of its performance — either profits, production or employment. This is the approach taken in the National Management Game, sponsored by the Institute of Chartered Accountants in England and Wales, the *Financial Times* and ICL, in association with the CBI and the Institute of Directors. This year's finalists are teams from M&G, Rediffusion Radio Systems, and Watney Combe Reid.

Another example is Corplan — short for Corporate Planning — which is available for a number of micros from



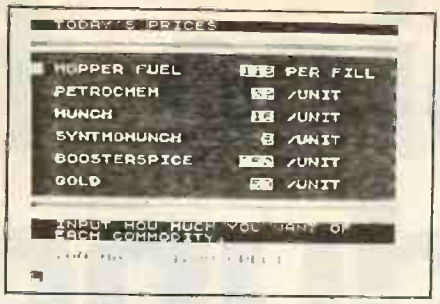
Corplan has a substantial ring-bound manual, as suits a serious learning game.

Game	Machine	Publisher
Acquire	Apple II, TRS-80, Pet	Avalon Hill
Airline	Atari, TRS-80, Tandy CoCo	Adventure International
Airline	ZX-81, Spectrum	Cases Computer Software
Auto Chef	ZX-81, Spectrum	Cases Computer Software
Boardroom	Spectrum 48K, ZX-81 16K	Wessexsoft
Cartels & Cuthroats	Apple II	Startech
Champions	BBC, Dragon, Spectrum, ZX-81	Peaksoft
Comanex*	CP/M	Sapphire Systems
Company Director*	TRS-80	Molimerx
Conflict A	ZX-81, Spectrum	Martech Games
Corn Cropper	ZX-81, Spectrum	Cases Computer Software
Corplan*	Apple II, Nascom, Pet BBC, Spectrum, TRS-80	Understanding Ltd
Dallas	ZX-81, Spectrum	Cases Computer Software
Dictator	Spectrum 48K	dk'Tronics
Do Not Pass Go	Spectrum	Work Force
Domination	Atari	Atari APX
Energy Czar	Atari	Atari
Everest Ascent	Spectrum 48K	Richard Shepherd
Flexi-Game*	BBC B	Ulster Mgmt Centre
Football Manager	Spectrum 48K	Addictive Games
Galactic Empire	Atari	Adventure International
Great Britain Ltd	Spectrum 48K	Simon Hessell
Kingdom	Atari	Atari
Millionaire	Apple II, Atari, IBM PC	Blue Chip Software
Miner	Newbrain	Computasolve
Monopoly	ZX-81	MPT
Ocean Trader	ZX-81	Quicksilva
Print Shop	ZX-81, Spectrum	Cases Computer Software
Ship of the Line	Spectrum	Richard Shepherd
Space Monopoly	Dragon	Microdeal
Space Trader	Dragon	Abacus
Taipan	Spectrum	Jaysoft

*serious games

Business simulation

In Dictator you have to pay for a secret police report to see how you are doing.



Quicksilva's Trader on the Spectrum contains little actual trading activity.

Understanding Ltd. Corplan provides an introduction to corporate planning through its simulation of an imaginary company making corples. The company is run by three people: a production director, a sales director and a finance director.

Corplan is a very detailed management game, to the extent of using double-entry book keeping. It was originally developed on a DEC 10 and a mainframe at the University of Birmingham, before being shifted to the Tandy TRS-80 micro because mainframes were simply not transportable. Radio Shack in the United States has done a considerable amount of work extending and Americanising the original package, and it forms the basis of its push into universities and colleges.

Corplan's co-author Martin Mitchell says the game is based on around 100 economic equations and is quite usable up to the level of Masters degree in Business Administration. It is already used as a training aid by a number of major companies including Carreras Rothmans, and is the basis of a national competition run by the Institute of Cost and Management Accountants in conjunction with Tandy (U.K.). The aim of the game is to maximise profits; go wrong and you go bust.

Comanex, from Sapphire Systems, is a similar game, specially written for micros. It is currently available on CP/M-86 for the IBM PC and requires 80K to run, but a version is being produced for the Research Machines 380-Z for the schools market.

Like Corplan, Comanex is designed to give players insight into the running of a typical manufacturing company, and to illustrate how the company's accounts reflect their operations, and how the various accounts fit together. Comanex also has a couple of extra points. First, the skill level can be set by the administrator. Second, random events are built in to simulate some of the risks, uncertainties and surprises of real-life company operations.

Sapphire says its game is used and approved by leading manageent consultants, and that a major professional institution is going to use it as the basis for a national schools-management competition, yet to be announced.

The Ulster Management Centre's business simulation is called Flexi-Game and runs on the BBC Model B. Factors involved include price, quality, sales promotion, advertising, trends and seasonal variations, stock control, investment and cash flow. It is one of the few serious business games to use graphics, which should make it suitable for use in schools.

However, it would be dangerous to be patronising. Most of the national business game competitions seem to be won by teams of schoolboys, while teams from the major banks go bust, and those from the major political parties finish near the bottom of the league.

There are numerous other programs where the accent is on the game rather than the business. The Dictator from dk'Tronics, allows you to run a banana republic on a 48K Spectrum. You have to balance the interests of the various factions such as the army, the peasants, the landowners, the guerillas and the secret police. Your aim is to salt away as much cash as you can in your Swiss bank account, then make a dash for it in your helicoptor before the inevitable revolution leads to your assassination. This game also throws in random events to spoil your plans. You can be invaded by nearby Leftoto or find banana prices drop by 98 percent.

Atari's Kingdom allows you — more seriously — to run a small agricultural community. Items of concern include the number of people starved, number of immigrants, the quantity of land owned, the bushels per acre harvested and the bushels eaten by rats. Your aim is to keep the maximum number of people alive, in which case you are popular and get elected for another term of office.

If you have grander aspirations there is Simon Hessel's Great Britain Ltd, for the 48K Spectrum, which makes you prime minister. This time your aim is to stay in power for as long as possible — just like real life — so you soon learn to expand the health service and build new schools just before an election. However, it must be said that the program, while amusing, is not a serious economic model.

Cases Computer Simulations, run by M R Lloyd-Jones MBCS, MBIM, also has a good range of business games for both the ZX-81 and Spectrum. In Print Shop, for example, you have to juggle the number of staff and machines, paper stock, job-cost estimates and production schedules to try to make a profit. The number of orders is randomised to make life difficult.

If you are looking for a business game to buy, remember that not everything with "Trader" in the title is a real business game. The Trader Trilogy from Quicksilva, for the Spectrum, has some amusing graphics but the amount of buying and selling involved is extremely limited. A good business game must be cyclical, whether the business is run weekly or monthly, or there is no chance to apply the lessons learned. Also the random factors must not have too great an effect on the final result. It may be funny to be wiped out by an unforseen disaster, but business games are not meant to be all that funny.

What they can do, at their best, is introduce people — both children and adults — to business concepts that they might not otherwise meet, and to do it in an entertaining way. This is not to say that everyone has to agree with the way business is done. But it is certainly a good idea to know about it.

Suppliers

Atari International (U.K.) Inc., Atari House, Railway Terrace, Slough, Berkshire SL2 5BZ.

Cases Computer Simulations, 14 Langton Way, London SE3.

dk'Tronics, 23 Sussex Road, Gorleston, Great Yarmouth, Norfolk.

MPT, 42 Raedwald Drive, Bury St. Edmunds, Suffolk.

Peaksoft, 7 Hawthorn Crescent, Burton on Trent, Staffordshire.

Sapphire Systems, 1-3 Park Avenue, Ilford, Essex IG1 4LU.

Simon W Hessel, 15 Lytham Court, Cardwell Crescent, Sunninghill, Berkshire.

The National Management Game, Institute of Chartered Accountants, PO Box 433, Chartered Accountants Hall, Moorgate Place, London WC2.

Ulster Management Centre, Manor House, Rathlin Island, County Antrim.

Understanding Ltd, The Production Village, 100 Cricklewood Lane, London NW2 2DS.

Work Force, 140 Wilsden Avenue, Luton, Bedfordshire.

A voice from the dungeon

Drawing on his experience running Essex University's Mud, Richard Bartle speculates on the possibilities of multi-user games.

ONE of the most intriguing prospects envisaged by games players is a multi-player version of Adventure. You would not only be pitted against fiends provided by the game designer but could also be thwarted by another player, who might well appear out of the blue and mug you for all your treasure!

Although proper multi-player Adventure-type games are probably a fair way off for micros, programmers have already taken advantage of the resources available on the larger, time-sharing mainframes to make the first experiments along these lines. Multi-User Dungeon is the first and, so far as I know, the only large-scale up-and-running multi-player Adventure. It is written fro the DEC System 10 mainframe — which happens to be the same make of machine as the one on which the original Adventure took its first few steps.

Mud originated at Essex University, where its kernel was written in 1979 by a then undergraduate, Roy Trubshaw. Even in its infant form, the game easily overtook Adventure in popularity among the students. When Trubshaw left in 1980 I took over control of the program and expanded it to its present-day form.

Mud runs on the university's DEC System 10, which has a KL-10 processor running under Tops-10 monitor version 7. Communication between players is by shared data using a writable, sharable segment of physical memory. It runs in around 64K 36-bit words, much of which is the shared data, and uses another 40K in random-access disc files for non-changing information such as text. For speed it is written in BCPL.

When he wrote Mud, Trubshaw aimed to produce a multi-player game with a modifiable database. The modifiable database was required to allow changes to be made quickly and easily, without having to recompile the Mud program itself — which is similar to the state of not changing your Basic interpreter in order to modify your Basic program. It was considered undesirable that the program might otherwise have hardwired within itself a line to, say, check if the bear were following you, as is the case in Adventure. What if the database designer wanted a world without a bear, but with some other animal instead, or a world with a bear which was not quite so friendly?

Mud's database is written in a language called Multi-User Dungeon Definition Language, MUDDL. It has undergone many enhancements from which it has emerged with a quirk or two, but is definitely a success. It only takes about two minutes to add a new room, the connections to other rooms, the associated objects and the things you can do to them. It is all done with a normal editor, and the resulting program is compiled by DBase, the database loader, which sets up all the internal representations so that Mud itself can come along, eat, and interpret.

The program structure allows great flexibility and permits Muds to be chained together so that leaving a room from a certain direction might put you imperceptibly into an adjacent room which is actually in another Mud, running with an entirely different world. The only penalties are not being able to talk across such Muds or take things over with you. Such facilities would require shared data, a luxury unavailable between programs. Of course, within the same world, communication is very heavy.

A Mud can be likened to an interpreter trundling over a program, which happens in this case to be a description of an environment. Players run one of the interpreters and play in its world, but that Mud may run another version loaded with different data in order to give the impression that the world it represents is larger than what it can actually hold.

Modifiable databases permit applications for programs in many non-game worlds. The two clasic non-Adventure examples are taxi drivers "on the knowledge" and biology students travelling through the human body: "You are now heading up the superior vena cava. On your right you can see . . ." Other applications are not too difficult to imagine — say, finding your way in advance across the London Underground, or following current along electrical circuits.

Home computers are unlikely to use this facility, at least for the next few years. Storing instructions implicitly as a program, that is procedurally, is more compact than storing the same information explicitly as data and then interpreting it. So until larger memories become commonplace it will always be more economic to hardwire a program. Why program in MUDDL when Basic is halfway to being as good and you probably have a Basic interpreter already? Besides, what software manufacturer is going to release games interpreters which run a language so simple a child can write Adventures if this means they will not sell so many of their own games as a result?

Another reason we will not be seeing home computers with multi-player Adventures in the near future is that their implementation is likely to involve one micro running a series of slaves, rather than a network or ring of independent machines.

Game	Runs on	Publisher	Comments
Adventures 1-12	Apple, Atari, Tandy	Adventure International	Scott Adams series
Castle Wolfenstein	Apple, Atari	Muse	lastest rave
Colossal Adventure	Atari, BBC, Commodore 64, Lynx, Nascom, Oric Spectrum	Level 9	mainframe classic
Temple of Apshai	Apple, Atari, Commodore 64, IBM PC, Vic-20	Epyx	
The Hobbit	Spectrum 48K, Orlc, Commodore 64, BBC	Melbourne House	has graphics
The Wizard & the Princess	Apple, Atari, Vic-20	Sierra On-Line/Melbourne	has graphics
Zork I, II, III	Apple, Atari, Commodore 64, IBM PC, Tandy, DEC, CP/M	Infocom	classics

GAMES

This will make switching to another world — another program — a bad idea, whichever representation for it you choose. If one person wants to leave for another world then everyone else has to go as well. Different sections of a world are awkward on a small machine anyway. It would be a definite damper on any game to have something like "You are now leaving this module: please insert disc Mud 001 and press Return" printed out at you in mid-Adventure.

All those crafty technicalities do not really impress the players. What attracts them is something which sounds exciting, like the multi-player aspect. The first thing most new players do on meeting another player is attempt to kill them. More advanced players will maybe follow you, wait until you are half dead killing the wolf or something, then steal your pickings and run away. It comes of watching too much *Tom and Jerry* on TV, so the sociologists tell us.

Having sated their blood lust, the next thing people do is try to explore. In this respect Mud is much the same as a normal Adventure, although the descriptions tend to be better because of the extra space available to keep them on our industrial-size disc packs. Some aspects do differ, however: for example, you may have to ask for help in order to lift up a heavy portcullis.

At this stage of the game players tend to chat to other players and seek help, directions, advice, or ask if they have seen Fenwyn and has he still got the sword? They may join together in small groups, lest they are set upon by one of the nasties which roam the land, in which case they can gang up on it and do it a bit of no good. The party will also be useful to carry the treasures they find, until they figure out that some of the pack animals, such as the ox, will help them take more weight with them, too. Only one member of the group need carry a light source. Eventually, having amassed some goodies, they will want points for their modest haul.

A problem here is how to give players points for treasure without letting other players pick up the treasure and do the same thing. Normally, in single-player games, points are scored for dropping things somewhere, but in a multi-player game you have the problem that someone else might come along and try to pick it up. It is intensely annoying to be told that the objects lying there in front of you are regrettably unavailable. If you make it disappear when dropped in the place, you need a feasible explanation for its disappearance — and not just "magic". You cannot just have it disappear every time someone picks it up instead, or make them eat it, because often the treasure has other uses: the axe kills people and chops down trees and doors, as well as being treasure.

The solution is to make the treasure disappear when dropped in certain selected places. It is made plain that you will not be able to pick things up from there by their very nature. You can score points for your own treasure; no one else need see it, and you only have yourself to blame if you did not realise it was going to disappear. In Mud you have to cart treasure to a swamp, so it is pretty obvious that if you were to drop it you would not get it back.

Having doused your brand so that you do not blow yourself up setting light to the marsh gases you walk in, say "Drop treasure" or whatever, and score the points. The treasure disappears, then you realise in horror that you wanted to keep the statuette of the lion because it leads you through the graveyard maze. The swamp, incidentally, doubles as an ingenious maze itself, which cannot be mapped by the conventional method of dropping objects, as they just sink. The only non-sinking items are players, so you need co-operation to find the route through to the dry bit in the middle where the crown is hidden.

There are other ways to get points apart from dropping things in the swamp, but they involve destruction of the object in question, as in drinking the potion or killing the dryad. The only exception is kicking the beggar, which earns you a single point every time you are prepared to type out the necessary long command. Killing him, incidentally, would get you about 50 points, assuming you won. Some of the

(continued on page 129)

No 1 source for software

SOFT OPTION SOFTWARE CENTRE

When you're thinking software, think Soft Option first. Chances are we'll have the right product, in the right format, on the shelf in quantity.

We despatch fast from stock. We also offer a dealer pricing system to suit individual needs with cumulative discounts available.

Finally, we *know* about software—we can give you technical support when it's needed.

So make Soft Option your first call. We'll soon become your first choice.

CP/M 80 CP/M 86 MS-DOS

and IBM PC Software

SOURCES INCLUDE:

We hold stocks of most software manufacturers including:

MICROPRO
MICROSOFT
DIGITAL RESEARCH
SORCIM
IUS
ASHTON TATE

MACHINE FORMATS INCLUDE:

Software can be made available in 8 BIT or 16 BIT formats to suit most micro-computers currently on the market including:

Superbrain
North Star Horizon
North Star Advantage
Columbia PC • IBM PC
Televideo • Apple
CP/M 8" • Rair • Sirius

PROGRAMS INCLUDE:

Our complete list of software is too long to publish and changes by the hour but here are a few examples to whet your appetite.

WORDSTAR	MICROPRO's comprehensive word processing system.
PL/I-80	DIGITAL's PL/I Compiler.
BASIC-80	MICROSOFT's popular and powerful basic Interpreter. There is a Compiler too.
FORTRAN-80	Fortran Compiler to ANSI X3.9 1966 except COMPLETE data.
SUPERCALC	SORCIM's spread sheet and modelling system.
EASYFILER	Data Recording System for the IBM PC from IUS.
dBASE II	Relational Database Management from Ashton Tate.

RING THE SOFTLINE Grantham (0476) 860171

All products are supplied complete with full originator's documentation.
Please send large s.a.e. for full details.
TRADE ENQUIRIES WELCOME.

BARCLAYCARD VISA

Soft option

SOFTWARE CENTRE

The Soft Option (UK) Ltd. Home Farm House Colsterworth Grantham Lincolnshire NG33 5HZ Tel: Grantham (0476) 860171

● Circle No. 161

(continued from page 127)

tasks are surprisingly complex: for example, finding the rope to fix to the gunpowder to put in the cannon, finding the metal ball to load the cannon and lighting the rope to discharge the cannon at a sturdy door.

Safe places to hide treasure are in short supply too. Only a certain number of objects may be carried, depending on your dexterity and only up to a certain weight, depending on your strength. Although bags and pack animals will to some extent alleviate this problem, they often prevent you going where you want. The ox will not jump off the cliff with you even if you have got the umbrella, and even if it is open. There is no guarantee that leaving an object in one place will mean that it will still be there when you return. It is a case of finders keepers, and your beautiful gold-bound book may be being used to feed the goat by then. The solution is to employ a guard or put it somewhere such as a locked room where no one else can reach it — but then your keys may be stolen from you.

For those who like the idea of posterity, messages and advice for future players can be left behind. The main debating forum is the captain's logbook on a wrecked ship out to sea. Comments ranging from "Pascal rules OK" to "Dragons kill 99 percent of known mortals" have been left for the benefit and edifiction of future generations of Adventurers.

Most exploring is done by logging the game in a file and looking at it later. It is a handy device, but not of much practical use on any micro version, primarily because the game can be printed out on the printer as you play. Also useless unless you are in a timesharing environment is the Bug feature — well it bugs me — which allows players to complain about any aspect of the program which they think is wrong. I have just completed a map of where all the terminals in Essex University are, so that in the future it may append to a message "You have been killed by Nic" the note "who is sitting two rows behind you to your left . . ."

One feature which enhances Muds — though it is a complete waste of time in single-user dungeons — is being able to sleep to recuperate your lost stamina, say after a hard slog at a zombie. You get back a point every 10 seconds or so, but of course if some vindictive type chances upon you while you slumber, you cannot expect to be playing for much longer.

Originally Mud had a Debug mode to check out new sections of the database. It is tedious to have to get the coracle to brave the shark to reach the island in order to find the acorn to give to the squirrels when you eventually get back. Now called Wizard mode, Debug mode has evolved into a sort of on-going end-game which continues to fascinate even master players who have been in 4,000 games or so. It is Wizard mode which makes Mud something more than just a tarted-up single-user game.

Flying around and glowing in the dark while in Debug mode are quite useful features, and after a while other perks were inserted with only a little extra work. Being able to look in rooms without going there, kill people with a single blow, pick up objects from any room without having to fly there first, find the location of objects without having to search for them — all these were a cinch to put in for debugging, and made life comfortable for the program maintainers.

The change came with the Snoop command. It allows someone in Debug mode to see what is on the screen of some other player, without that other player knowing. Suddenly, a command became available to the elite which was not actually any use for debugging. After I first implemented the facility, I spent the next three hours just sitting watching the other players stumbling around asking each other stupid questions and eventually managing to cook up an intelligent solution to all the traps I had laid on for them. It was a revelation.

So was born Wizard mode. It came at a useful time, too: as with most Adventure-type games, once you have all the points it is a case of "So what now?" In the pre-programmed, non-random games such as the original Adventure and the superb Zork there is an end-game which you may enter once you have earned most or all of the points. The end-games soften the blow because they are specially constructed climaxes, and a new section comes as a welcome surprise if you know the rest of the place like the back of your hand. But then, that's it. You have finished. You go out and buy a new disc with a new game, and start off from scratch.

In Mud, the concept of a level was borrowed from the real-world game Dungeons and Dragons, from which Adventure took the original fantasy role-playing idea. D&D still beats computer versions hands-down because people are better dungeon masters than computers —

and you cannot threaten a computer when things do not go your way. A player in Mud starts off as a novice, and when anyone meets them in the flesh or types Who, to see who is playing, they are told that, say, Polly is here. After 300 points, Polly goes up a level and becomes Polly the Warrior. Strength, dexterity and stamina go up by 10 too. After 600 points it would be Polly the Heroine and after 1,2000 Polly the Champion. As the points double successively Polly becomes the Super-heroine, followed by Enchantress, Sorceress, Necromancess, Legend and finally, at 76,800 points, Witch. At this stage, strength, etc. are at the maximum of 100, although that does not really matter since wizards can change any of their attributes when they like.

As you reach higher levels of experience you accrue abilities and magical talents. For example, at Enchanter level the deadly magic wand — a sort of medieval laser — can be used to dot off most of the denizens of the land without so much as a by your leave. The ability to cast certain spells appears if you are in possession of the relevant magical item. Such magic lets you see what other players are doing, summon people to where you are so that you can attack them, find out where items are, and so on. In short, they are the least dangerous of the Wizard mode commands. On reaching that final level, the Wizard mode password is revealed, and for you the game has entered a new dimension.

All the time you have been playing you were being pestered by wizards who kept appearing with crashes of thunder, and disappearing in puffs of smoke. If you were stuck they have miraculously known, and you have suddenly found yourself in possession of just the item you needed to get you out but which you dropped in the fiery pit by accident. You have been whisked from the centre of the maze to somewhere you actually recognised, and reluctantly put back if it turned out you were not lost in the first place. You have attacked the pompous, know-it-all, god-like so-and-so's and been ground into the floor first hit; insulted them and found things typed on your screen you did not type. But now you have made it to wizard yourself you can teach them . . .

The first thing you notice is that the prompt has changed from a boring old * to an impressive magic wand - - - *. Next you

(continued on next page)

(continued from previous page)

observe that you are told the names of all the objects you come across, so you can see what is lurking hidden in a room even if mortals cannot. You can switch the rain on and trap someone underground when it floods the river. Hmm, useful.

Then all of a sudden you get a message: "Cynthia has started to play Mud having played 0 times before". Aha! "Get flower from garden. Go start. Give flower to Cynthia. Hiya, Cinth!" From maniacal, paranoid, kill-it-if-it-moves legend you have transformed into kindly, benevolent, tolerant, omnipotent wizard.

You will soon pick up some of the other nifty Wizard mode commands, such as an attach/detach feature which lets you play two or more characters at once and swap between them. One moment you are a wizard, the next a simple novice asking dozy questions to egg players on so that you can give them a bit of what for when they set about you with an axe. Oh, that feeling of veiled power!

Adventure-like games can be improved drastically by better descriptions, graphics of some quality and by the increased experience of the games designers themselves. Having the odd multi-user game on resource-sharing micros will enliven many an evening, but the real fun only comes when the players do not necessarily know each other and are of varying degrees of experience.

The database must be large enough not to bore players by making them get most of their points in several nigh-identical sessions. In Mud, if you get all the treasure you can make wizard in four games. Having several other players in at the same time makes this harder, but you get more points for each individual item and for winning fights.

What I would like to see — and it's a long, long way off — is some local or national network with good graphics, sound effects and a well designed set of worlds of varying degrees of difficulty. In this true meritocracy, you will forever be encountering new situations, new difficulties, new solutions, and above all new people. Everyone starts off on an equal footing in this artificial world.

It is doubtful whether multi-userness is going to be more than just a novelty among the better-off home-computer enthusiasts for a good while yet. Setting up a network over telephone or cable TV lines would have to be big enough business to attract more than just the hobbyist, too. So perhaps we will eventually see a decline in the popularity of the micro Adventure and an increase in a more continuously running campaign. Still, who wants to play in a game full of primary schoolkids going around locking you in small rooms just for laughs? Mind you, they wouldn't if there was a wizard watching . . . we'll have to wait and see. PC

EXTEND YOUR BASIC WITH THESE NEW COMMANDS

INDEX

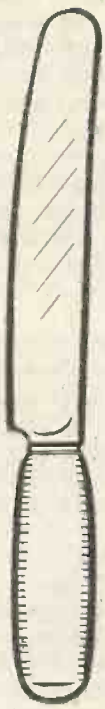
* File records by name
* Fast retrieval by key
* Fast sequential retrieval
* Balance Tree files
* Cross reference keys

SORT

* Fast sorting
* Comma delimited files
* Fixed length files
* Sorts INDEX files
* Compatible with Wordstar

SCREEN CONTROL

* On line screen design
* Automatic data validation
* Screen editing features
* Adaptable for any VDU
* Memory mapping



as BASIC as the knife and fork

USE OUR TOOLS FOR NEATER, QUICKER CODE –

All of these tools have been specifically designed for use with Microsoft BASIC (interpretive or compiled) but can be linked for other languages. They will run on any CP/M machine with 8080 or Z80 processor. They are all written in machine code for maximum efficiency and full **source code listings** are given in the manuals, with full instructions on how to implement and install them.

PRICES

INDEX Manual	£9.95
SORT Manual	£13.50
SCREEN Manual	£9.95

Diskettes £50 each, excluding VAT. Standard format, IBM single sided single density 8". Other formats can be supplied – enquire for full list.

PHIPPS ASSOCIATES

Dept E FREEPOST EM463 (No stamp)
172 Kingston Road, Ewell, Surrey KT19 0BR
Telephone 01-393 0283. 24 Hour answering.

Prices include postage but for air mail delivery in Europe add 90p (outside Europe add £2.20) per item.
Access and Visa welcome

VISA

● Circle No. 224

Software So Powerful You'd Buy A Computer To Use It

One Personal Pearl can do all this . . . .

ACCOUNTING

Asset Record
Accounts Management
Bookeeping System
Business Accounting
Business Check Register and Budget
Client Accounting
Construction Accounting
Delivery Service Automation
Depreciation Calculations and Reports
Executive Accounting
Fixed Asset Accounting
Fixed Asset Depreciation
Fund Accounting
Multi-Journal Accounting
Nominal Ledger

AGRICULTURE

Adjusted Weaning Weights
Cattle Feeding Management
Corn Harvest Losses
Cow-Calf Profitability
Crop Yields
Farm Management
Feeder Pig Production
Field Population
Field Size
Generation Annotated Pedigree
Herd Management Performance
Job Cost (Crop Cost)
Least Cost Fertilizer Application
Net Energy for Feedlot Cattle
Sheep Production Management
Soil Erosion
Soybean Harvest Losses
Swine Production

BUSINESS MANAGEMENT

Budget Planning
Business Productivity
Business Planner
Creative Financing
Filing System
Financial Planning
Project Cost Control
Project Planning and Budgeting
Estate Agents
Report System
Retail Purchasing and Pricing
Salary Planner
Sales Analysis

CAPITAL PROJECTS

Project Management
Project Planning
Project Scheduling
Project Tracking

DISTRIBUTION

Beer Distribution Management
Inventory, Order Entry, Invoicing
Oil Jobber Management
Order Entry and Inventory Control
Retail Management
Wholesale Distribution

EDUCATION

Catalogue Cards
Comparative Buying
Income Meets Expenses
Interactive Tutorials
Job Readiness-Assessment
Living Things
Money Management Assessment
Questions & Answers In Biology
Questions & Answers In History

FINANCE, INVESTMENT & PORTFOLIO ANALYSIS

Quotecharter
Quoteprocessor
Stock Portfolio
Stock Tracker

HOME MANAGEMENT

Address File
Auto Records
Checkbook Balancing
Checking Account Management
Diet Analysis
Financial Analyzer
Grocery List
Home Finance
Home Inventory File
Magazine File
Mortgage Analysis
Personal Accounting
Personal Expense Record
Personal Finance Manager

INCOME TAX

Individual Tax Management
Individual Tax Planning

INVENTORY CONTROL

Business Inventory
Inventory Accounting
Inventory Control
Inventory Management
Materials Tracking
Order Entry/Inventory Control
Point-of-Sale Retail System
Property Manager of Moveable Equipment
Rental Business
Retail Inventory
Stock Control

JOB & CONTRACT COST ACCOUNT

Contract Billing
Contractor Job Cost
Cost Accounting
Equipment Costing
Job Cost Accounting
Project Cost Accounting for Architects
Project Cost Accounting for Engineers

MAILING LIST & LABEL PROCESSING

Address Book Mailing List
Commercial Mailing
Name & Address Management
School Mailing
Small Business Mailing & Filing

MARKETING SALES ANALYSIS

Office and Agent Productivity
Proposal Developer
Sales Analysis
Sales Management Program
Sales Project Management
Sales Tracker

ORDER ENTRY ACCOUNTS RECEIVABLE

Accounts Receivable
Cash Receipts
Company Sales
Invoicing
Membership Billing
Multi-Property Accounts Receivable
Order Entry
Order Tracking
Purchase Order
Sales Invoicing
Sales Ledger

PERSONNEL MANAGEMENT

Personnel Management
Personnel Data Recorder
Personnel Record

PROFESSIONAL OFFICE SYSTEMS

Insurance Broker
Client Billing System
Dental Accounting and Billing
Dental Office Management
Legal Billing & Timekeeping
Legal Time Accounting
Medical Office Management
Patient Accounting
Patient Billing & Accounts Receivable
Patient Scheduler
Professional Time and Billing

PURCHASING/SALES ACCOUNTING

Sales Ledger
Bought Ledger Accounts Payable
Cash Disbursements Posting
Check Writer
Company Purchases
Contractor Accounts Payable
Purchase Ledger

PROPERTY

Flat Management
Commercial Property Management Listing
Office/Apartment Management
Property Management
Rental Management
Tenant Processing

TIME MANAGEMENT AND SCHEDULING

Agenda Files
Appointment Calendar
Personal Datebook
Staff Appointments
Time Management

WORD PROCESSING

Business Form Design
Form Letter
Index Cards

. . . and more

MPI

MICROCOMPUTER PRODUCTS INTERNATIONAL LIMITED

THE HOME OF MICROCOMPUTER SOFTWARE

Room PP1,
Central House,
Cambridge Road,
Barking,
Essex IG11 8NT.

Tel: 01-591 6511
Telex: 892395

• Circle No. 163

MicroSight

Use your BBC Model B as an image analyser with :-

MicroSight I

Available on BBC, Apple, Commodore, Research Machine, Sirius, etc, Includes Camera cables, interface, software and documentation.

£495.00 + VAT

MicroScale.

Image processing software to calculate area and perimeter of objects within a specified window also to dimension features. Disk and printer dumps of binary and grey scale data.

£295.00 + VAT

MicroEye Vision Interface.

256 x 256 pixel resolution with 255 grey levels per pixel comes complete with software and documentation. Can be used for video tape digitising Satallite picture analysis etc. Available for BBC, Apple, Commodore, Research Machine, Sirius etc.

£295.00 + VAT

DIGITHURST

Digithurst Ltd.
Leaden Hill, Orwell, Royston,
Herts SG8 5QH
Tel: (0223) 208926

● Circle No. 164

EVERYDAY ELECTRONICS and computer PROJECTS

DECEMBER ISSUE 90p

NOW ON SALE

TWIN CASSETTE INTERFACE FOR THE TRS-80

This add-on I/O Port enables the basic TRS-80 Model I Level II Microcomputer to be simultaneously linked with two cassette decks which until now was only possible with the expensive Expansion Interface. Both decks can be used for Saving, Loading and bi-directional file-handling operations.

ENVIRONMENTAL DATA RECORDER FOR THE ZX SPECTRUM

Stores data received from sensors in digital form in CMOS RAM for subsequent read-out via a computer. Particularly valuable where quantities being measured change slowly or readings are required over a long time period. Portable and weatherproof, ideal for field work. May be used with other computers with minor modification.

● Circle No. 165

Disky®

AAA Grade diskettes
Top Quality Media - at the right price from the number one supplier.

HAL's huge stocks mean immediate availability of the right diskette whatever your system. Write or phone for your free Disky compatibility list.

Or, to place your order, dial direct on any one of our six telephone sales lines.

★ NO FUSS
★ NO WAITING
★ TOTAL SERVICE FROM A TEAM THAT UNDERSTANDS DISKETTES AND COMPUTERS.

Sales hot line number

0252 517171

Exclusive U.K. Agent

HAL Computers Ltd.,
Invincible Road,
Farnborough,
Hants.
GU14 7QU

HAL COMPUTERS LIMITED

● Circle No. 166

Games choice

Jack Schofield picks the micro games which stand up best to the test of time.

ONCE UPON A TIME it was possible for someone to have heard of all the microcomputer games available, and to have played most of them. Now few people know more than a tiny proportion. Just keeping track of the publishers would be a full-time job. Computer games programs are now as emphemeral as paperback novels.

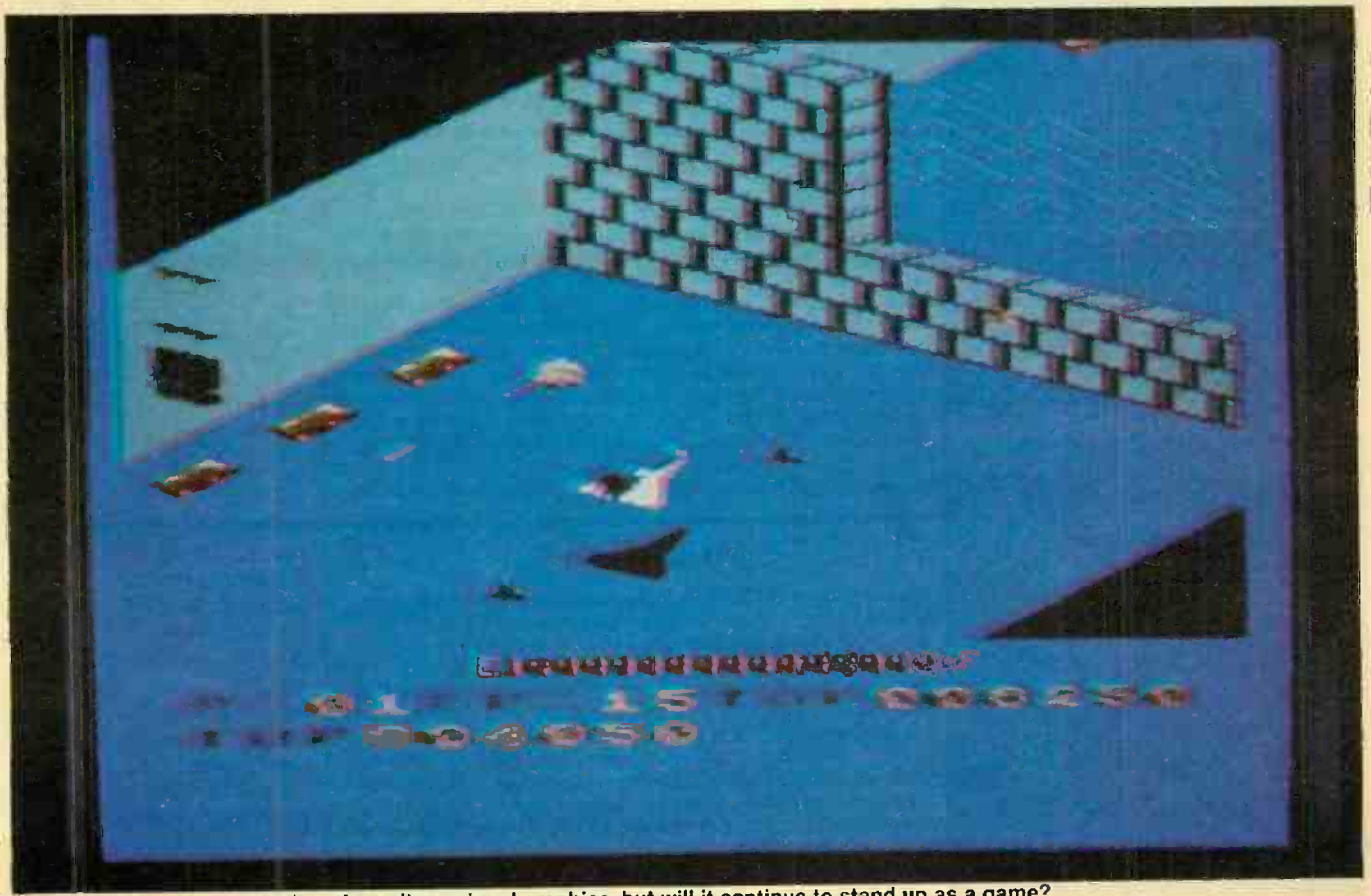
Under the circumstances, choosing a Top 10 is extremely foolhardy, not to say arrogant. What I can plead in mitigation is that, as a reviewer, I have had the chance to try more games on more different machines than most people could stomach. To further balance the selection, I have chosen a wide range of games that I know are all among the best of their type, if not the best.

I have deliberately not picked my latest favourites such as Thorn-EMI's Computer War. Games which are exciting now may in time lose their attraction, especially if the main appeal is the sound and graphics. That happened to me with Preppie.

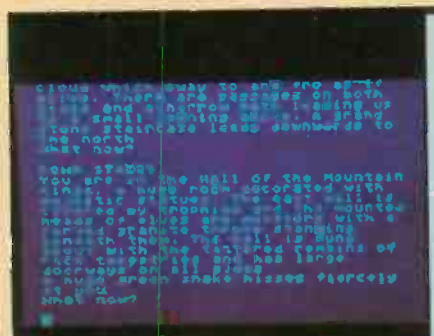
Some of the Top 10 have been around for years, and I'm confident they will stand the test of time. But I have not just picked my own favourites, or Atari's Centipede would be among them, with Zaxxon by Datasoft, to name but two. All the games chosen satisfy other people too.

If there isn't room for all my favourite games, almost by definition there isn't room for yours. Fans of such gems as Ultimate's Jet-Pac, Broderbund's Choplifter, Atari's Pacman or Acornsoft's Snapper, Atari's Donkey Kong or Program Power's Killer Gorilla, dk'Tronics' Dictator or Addictive's Football Manager will look for them in vain. Please do not write in and complain until you've tried all those in my selection. If you get the chance to try them, I think you will like them.

The Top 10 selection is overleaf. Also worth checking out are:
Choplifter, Zaxxon, Zork I/II/II, Miner 2049er and Bandits for the Apple II and Atari.
Computer War, Donkey Kong, Missile Command, Qix for the Atari.
Hover Bovver, Attack of the Mutant Camels for the Commodore 64.
Donkey King for the Dragon 32.
Jet-Pac, Manic Miner, Zzoom, Jumping Jack for the Sinclair Spectrum.
Zaxxon for the Tandy Color Computer.
Parsec, River Rescue for the TI-99/4a.



Zaxxon has wonderful scrolling three-dimensional graphics, but will it continue to stand up as a game?

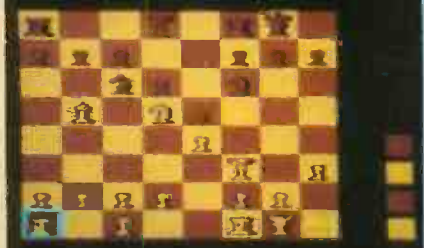


COLOSSAL ADVENTURE £10

Adventure, written on a mainframe by Crowther and Wood, has been crammed on to a micro, on tape, by Level 9 Computing. A whole new ending has been added, with 70 new locations. It has all been squeezed into 32K by using data-compaction techniques, but the game still takes up to 10 minutes to load from tape. Then your quest takes you exploring the dangerous Colossal Caverns — if you can find them. You must collect all the treasures, get past the giant green snake, defeat the dragon and outwit the bridge troll. And if you do all this without getting killed maybe you will become a Grandmaster. Buy it immediately.
Format: Cassette for Atari, BBC Micro, Commodore 64, Lynx, Nascom, Research Machines, Spectrum.

For. Poetic, moving and tough as hell. Text only but with correct spelling. Save game feature.

Against. Tedious tape loading. Disc version not available.



CYRUS IS CHESS £10-£35

Chess programs nowadays play quite well, but the quest is still on for a machine that plays a more human — a more imaginative — game. Also, it helps to have extra facilities. The Cyrus IS chess program, written by Intelligent Software for the Spectrum, plays extremely well and won the second European Microcomputer championships in 1981. It lets you save and replay games, set different levels and change during play, print out the moves and/or the board, take back moves and set up problem positions. You can also choose the colour of the black pieces.
Format: Cassette for Spectrum from Sinclair and as Cyrus Chess for Dragon; on ROM for Atari; and disc for IBM PC from Parker Brothers.

For. Plays well. Many functions.

Against. Graphics of Spectrum version less attractive.

DEFENDER £30

In Williams' great arcade game you manoeuvre a needle-fighter above a rudimentary landscape, defending humanoids against green landers. Ideally you destroy all the landers first, but listen for humanoid cries. Check radar, zoom round, kill lander, catch humanoid and return him to the ground. You also have to shoot bombers, pods, swarmers and baiters. A lost humanoid becomes a kamikaze-like mutant. Atari's licensed Defender is a brilliant version with three levels of play. The only limitation is that a joystick does not give the starfighter feel of the original controls. Acornsoft's Planetoids is a passable unlicensed version playable, after a fashion, from the keyboard.
Format: ROM for Atari; Planetoids on cassette for BBC.

For. Fast, gripping space game. Good sound effects and highly manoeuvrable fighter.

Against. Too easy after first 60,000 points. Atari ROM only counts 99 attack waves.

EASTERN FRONT £22-£30

War games have a reputation for being fiddly and tedious to play. Chris Crawford changed all that in Eastern Front by making the computer do all the work. Playing it needs no board, no dice and no counters — just a joystick. Eastern Front simulates the German Barbarossa campaign of 1941-42, where the human plays the attackers and the computer the Russian defenders. The computer always wins though it is possible to take Moscow, which is more than Hitler managed. The graphics are amazing. The game map covers about 10 screens with single-pixel scrolling in all directions. It takes three hours to play. Avalon Hill also has Chris Crawford's quicker game, Legionnaire.
Format: ROM, tape and disc for Atari only; 16K for cassette.

For. Easy to play. Good game. Good historical simulation. Amazing graphics.

Against. Takes three hours to play. No Save Game feature.

FLIGHT SIMULATOR £42

Few outside the U.S. knew flight simulators like Airsim-1 and Cleared for Landing, for the Apple, so Microsoft's Flight Simulator, developed from one of them, came as a revelation. It has a full-feature instrument panel, right down to the magneto, which closely follows a Cessna light plane. Full allowance is made for wind and clouds, and if you fly around for long enough it gets dark. Meanwhile, the view out of the cockpit window — optionally front, left, right or down — shows a moving three-dimensional landscape. It is well-nigh perfect for frustrated flyers or learners. There is also a World War 1 flying-ace mode, where you can fight German biplanes. It is very, very difficult.
Format: Disc for the IBM PC with colour-graphics card.

For. Accurate, detailed simulation. Good but slow three-dimensional graphics.

Against. Expensive equipment needed to run it. Check disc runs with your set-up before purchasing.

GRIDRUNNER £5-£8

Imagine Centipede crossed with *Tron* and you get some idea of the flavour of this international hit by Jeff Minter of Llamasoft. Where Centipede is a novelty game Gridrunner is a technoflash effort suitable for the most battle-hardened veteran of the intergalactic space war. Your blaster runs on the lower portion of a grid down which stream the Gridsearch runners while you try to blast them. Meanwhile XY Zappers on the edge of the grid shoot at you from the side and underneath. There are great sound effects on the Atari and Commodore versions. It is possibly the fastest game in the Universe, but if you beat it try the even more vicious Matrix.
Format: Cassette for Atari, Commodore 64 and Vic-20 by Llamasoft; for Dragon and Spectrum by Salamander.

For. Ultra-fast brain-damaging action.

Against. No disc versions. Seen on ROM only in America.

SCRABBLE £16-£25

This is a computer version of the popular word game from J W Spear and Sons — a remarkable piece of programming which packs a vocabularly of around 10,000 words as well as the program routines into a 48K Spectrum. In the original Apple version the dictionary is held on the reverse of the program disc. The graphics of the two programs are quite different, and the Spectrum version has a particularly nice tile-shuffling routine. The computer will play from one to four parts, and at one to four skill levels. Average response time is under two minutes. At the highest level it plays a very good game, scoring on average from 350 to 450 points.
Format: Cassette for 48K Spectrum; disc for 48K Apple; Commodore 64 and BBC Model B versions to come.

For. Plays a good game to official rules. Quite fast. Good graphics. Save Game Feature.

Against: Challenges some well known words and plays its own obscure ones.

STAR RAIDERS £30

The cult TV series Star Trek fathered a series of slow, complex computer games. Star Raiders is a high-speed arcade version of the same idea, and probably the best computer game of all time. You have to destroy all the Klingons, preferably without losing any of your own Starbases. Then you get a rating. If you do it quickly enough, without taking any hits or stopping for repairs, you get a high rating. The game has four main screens: fore and aft views from the Enterprise windows, galactic chart, and long-range scan. Switching is instant. The best feature is the three-dimensional view of the action. If you have only played Star Raiders at Novice level, you haven't played it.
Format: Atari ROM only. No rivals in the game galaxy.

For. Brilliantly fast, complex, challenging space game.

Against. Atari only. Needs three hands or Le Stick joystick.

THE HOBBIT £15

Melbourne House's famous graphics adventure is based on Tolkien's book of the same name, which is supplied with the game. It's called a graphics adventure because it includes about 30 still pictures of locations which are drawn when you get to them. This leaves room for only 80 locations in all, compared with Colossal Adventure's 270. Still, The Hobbit has other qualities, including a 500-word vocabulary and the ability to understand quite complex sentences. The game has a real-time element: you can't sit around thinking because time passes. The adventure follows the book quite closely with you as Bilbo.
Format: Cassette for Oric, Spectrum, Commodore 64 and BBC Micro.

For. Attractive graphics. Large vocabulary. Time element. Many features, including text printout and Save Game.

Against. Slow to load. Some bad grammar and spelling.

WAY OUT £26

Maze games were an early feature of computer gaming, but there has never been a maze game like this one by Paul Edelstein. It constructs three-dimensional mazes on the screen, and you can go careering through them at high speed using a joystick. There is a flash each time you bounce off a wall. Meanwhile the maze through which you pass is drawn at the bottom of the screen — as long as you have your compass. This can be stolen by the whirling cleptangle, so you have to chase that to get it back. Way Out offers 26 extremely realistic mazes, all with the same graphics, and keeps a record of the best score for the shortest way out of each maze. A two-player Mark II version is on the way.
Format: Disc for Apple and Atari from Sirius Software.

For. Real-perspective high-speed moving graphics. Good sound effects.

Against. Maze restricted in size on screen. Maze plan rather hard to see.

THE SORD M68
BRIDGES THE GAP BETWEEN 8 & 16-BIT MACHINES

Keep your 8-bit software and move across to 16-bit performance

If you're about to outgrow your 8-bit micro system but, naturally, can't bring yourself to throw away that huge investment you've made in 8-bit software, focus on the new Sord M68.

It features two separate central processing units in one powerful machine. There's the reliable and respected Z80 8-bit CPU, partnered by the remarkable new 10MHz 68000 16-bit CPU.

The incredibly low-cost M68 will maintain your 8-bit software investment and give you 16-bit performance. It is the 'bridge' everyone has been looking for – and SORD have found.

The M68 is PIPS compatible. PIPS is Sord's simple no-program computer language for business.

Specification Highlights	7.5mb Winchester 20mb Winchester	Z80A 8-bit CPU 68000 16-bit CPU 10 MHz
Software	BASIC, FORTRAN, C, COBOL, PIPS CP/M 68k, CP/M-80, MS-DOS, USCD P-SYSTEM Word processing, SORD graphics language. S-NET Local Area Network from £1,300	
Display	12in. green monitor. 12in. colour – 16 colour graphics with a palette function of 4913 colours. 2000 characters (80 x 25). 640 x 400 dot resolution. 512 character set	
I/O	Serial ports – RS-232C. Parallel ports – 1 (centronics compatible). GP-IB – 1 port (IEEE-488). On-line terminal – IBM 3270 mainframe emulation	

SORD
THE JAPANESE EDGE

For further details or the address of your nearest SORD dealer, please phone 01-930 4214.

M68 Mk41 – £2995 + VAT, includes 64K 8-bit RAM/256k 16-bit RAM, 2 x 1mb 5¼in. floppy disk, 12in. green CRT, PIPS III and C/Basic.
M68 Mk5 – £3845 + VAT, as above but 2 x 1mb 8in. floppy disk.

TOKYO, NEW YORK AND NOW LONDON 01-930 4214

• Circle No. 167

Cosmic circle

by John Hooper

The image on the screen flickered, the colours chasing up through the visible spectrum and back again, and then steadied.

"You see?" the Operator exclaimed, "I told you we're getting close to System failure." The silence was punctured by the faint crump of exploding shells, and the display showed fountains of debris rising from the battlefield as salvo after salvo landed across the Roman trenches.

"We've never had this problem before. How often has it happened?" queried the Observer.

"Well" the Operator began, "it hasn't been too bad on an absolute scale — say, three or four times in the last 10 watches — but the check I ran shows the effect is increasing both in rate and intensity. I'd say we've less than half a watch before a malfunction serious enough to beat all the error traps and cause a full scale crash."

The Observer pulled a long face. "Half a million years of system time, but only eight hours for real! I don't see how we can possible get the replacement up and running in time and link the two for transfer. Are you getting the same problem with other slots?"

Swinging round to the main panel the Operator signed in a new co-ordinate set. "See for yourself!" he replied, waving towards the display. "I've left the tracer on so we can get instantaneous confirmation of any disparities. It slows things up a bit, but at this level the locals will never notice."

The viewer showed an empty plain, straggly bushes and wiry grass. The sound of wind and rain swirled out over the watchers. The Observer read off the tracer P/T-M output. "Salisbury Plain, England; 910573.7; matching to better than 10^{-10} percent! Seems OK. Jump it forward, say 100 System years."

The scene flashed bright, then faded to much the same place and time as before. The tracer readout, glowing gently green above the display, opined that reality and predicted reality again matched to better than 12 decimal places.

"And again. And again". Still no change. "Now give it, oh, a thousand years". Before the flash had died away the tracer chimed softly, and its message flared into orange.

Matching no better than 10^{-2} percent.
Error growing.

"But I don't see anything wrong," complained the Observer.

"It's there, just on the edge of the image." As the Operator swung the display across an aiming graticule materialised in the field and locked on to the target "Close up, and run check 5", ordered the Operator.

The scene hurtled out of view around the edges, and the cross-hairs centred firmly on a circular arrangement of standing stones. The Tracer bonged softly, and noted in red that the match was now no better than 10^{-1}. Its rather synthetic voice said sweetly that the predicted reality was most definitely not capable of producing this artefact, adding that the stones were foreign to the site and the local technology insufficient to erect them, let alone get them there in the first place. It suggested a probably UMOS error, and fell silent.

"Oh, wonderful!" sneered the Observer. "Now tell us something we don't know." He signed for Control, and reported the matter, ending "And next time we re-equip they'll put in MP/C over my dead body! I am fed up to here with their rotten Universal Memory Operating System. Universal Cock-up System would be more like it!"

The indignant squawk in reply was missed by the Operator, who had switched to a command channel and was carrying out a full deep scan of the relevant memory store. The reality image had been replaced by an enlarged view of the store's main index.

"Look," the Operator exclaimed "this seems to be the problem!" He heightened a trail of disturbances running through the Index. "It's corrupted the pointers to this whole P/T sector. No wonder the matching was off; the data is effectively jumbled up like someone had given it a random shuffle! We're lucky we didn't get Stone Age mixed with Atomic Age!"

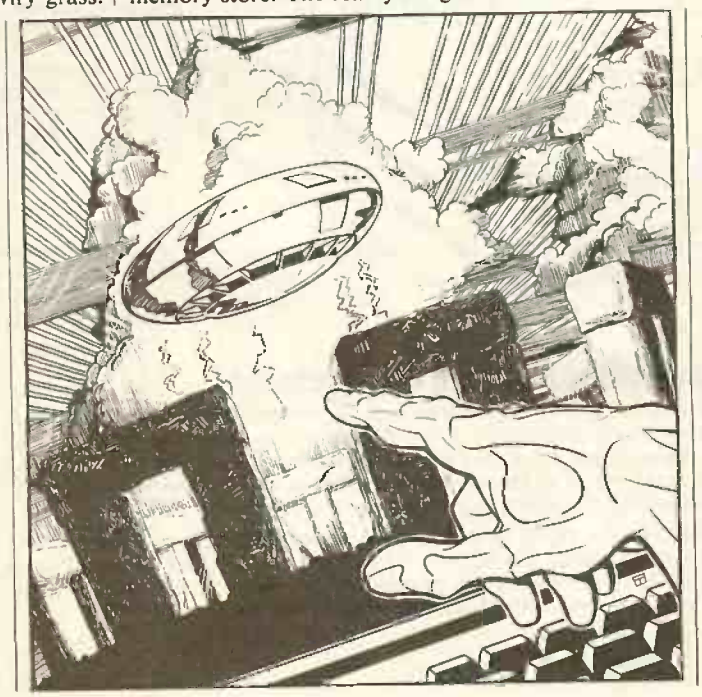
The Observer grimaced. "Look's like a soft error to me," he said.

"But the size of it!" retorted the Operator. "Most SE's I've seen have been spectacular but short, and the monitor program's repair section can design round them, but this — this extends through almost half the index. That's over a billion years system time!" His awed voice became plaintive.

We'll never rescue this one!" The Observer had been listening to Control. "They say that at present rate their Monitor Program/Cosmos simulator predicts a zero match — disaster — in less than 5,000 years system time, and that the divergence will be uncorrectable within 2,000 years, which is about two minutes real time. They regret that the back-up file has been mislaid, and anyway things look too far gone for Transfer. They suggest we scratch, and start again."

The Operator sighed. "How many times will that be?!

I've lost count," the Observer smiled wryly, "but it's given us so much trouble I'm beginning to wonder if we'll ever get the bugs out of this Cosmos." He turned to the Operator: "OK, take it away!"



The Operator manually unlocked and removed a protective cover, revealing the Reset key. He glanced at the image, currently showing a silvery-white craft of some sort lifting off with no visible means of support from the stone circle, now clearly a landing cradle. The tracer flashed an angry crimson

Matching no longer meaningful
Divergence critical at over 10 major points, and increasing.
Recommend Abort Cosmos.

He turned to the Observer, who nodded and depressed the key. The image cleared, and the viewer showed nothing but a centrally located hard point of light. The tracer P/T-M output, now in soft green, said, complacently,

Cosmic Centre; 0.0000000
Match perfect.
RUN

A FLOPPY FOR YOUR MICRO

SHARP **BBC** TRS 80

250K £142 500K £182 1000K £252

- TWELVE MONTHS GUARANTEE AVAILABLE AS ONE OR TWO DRIVE SYBSYSTEMS
- BACKED BY SERVICE COMPANY TO THE TRADE
- DRIVE REPAIRS FROM £25

SPECIFICATION		NAKED	BOXED WITH PSV
250K	40 TRACK SS	£142	£182
500K	40 TRACK DS	£182	£222
1000K	80 TRACK DS	£252	£300

PRICES DO NOT INCLUDE VAT

MATRIX

(COMPUTER ENGINEERING) LTD

0225 742586

● Circle No. 168

TOP SAVINGS

PRINTERS – Also Available Seikosha, Oki, Star, Qume, Olivetti, TEC, Mannessman Tally.

		£
Epson	RX80	229
	RX80 F/T	256
	FX80 F/T	335
	FX100 F/T	430
Diablo	630 (RO)	1699
Smith Corona	TP1	299
Juki	6100	350
Ricoh	RP1300S	945
	RP1600S	1165
Brother	HR15	419

COMPUTERS

		£
Commodore	8096	735
	64	165
	1541	165
Epson	HX20	375
	QX10	1600
Spectrum	48	109

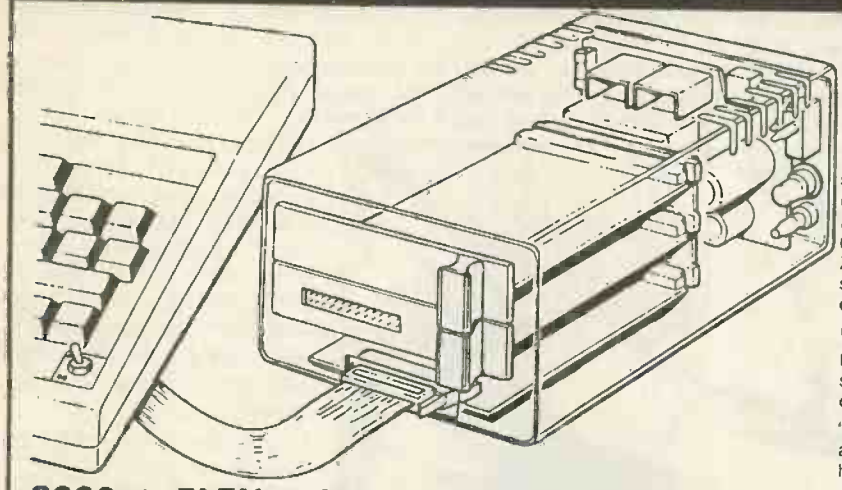
Prices exclude VAT. Next day insured delivery £10.
Monday to Friday 9.00 – 6.00.
Phone for stock availability and out of hours collection arrangements.

MAYFAIR MICROS

5th FLOOR 65 DUKE STREET LONDON W1 Telephone 629 2487

● Circle No. 169

CUBEFLEX 6809 2nd processor for the BBC micro



CUBEFLEX for education and software development

CUBEFLEX is supplied with a number of useful machine code handling facilities, and FLEX itself comes complete with a text editor and machine code assembler for 6809.

However, the real strength of FLEX is the enormous range of other software to run under its operating system.

Cross assemblers and macro facilities exist which allow the CUBEFLEX to develop object code for all the 68 range from 6801 to 68000, all the 80 range, and the Z80. The CUBE ROMULATOR can be added to the spare slot in the CUBEFLEX, and so emulate the developed software in a target system.

COMPILERS

PL/9 is a high level compiling language whose structure resembles BBC BASIC. However, when compiled into machine code it runs four times as fast.

"C", Pascal and 6809 extended BASIC are all also available, and allow the user to employ the language of his choice.

6809 + FLEX – the ultimate in 8-bit systems

The BBC microcomputer is already so good, how can it be improved? FLEX is the only truly machine independent operating system for 8-bit processors. Even CP/M (for Z80) is machine specific to a significant degree. But take any standard 5 1/4" FLEX diskette and it will load on CUBEFLEX. All variations of double or single sides, 40 or 80 tracks (if 80 track drives are fitted), and even double density (if an appropriate disk interface is fitted on the BBC) are automatically catered for.

CUBEFLEX connects to the BBC via the TUBE, and uses the standard BBC disk interface and disk drives. All BBC facilities are unimpaired by the addition of CUBEFLEX, and can be called up or returned to at any time. The FLEX configuration parameters are held in EPROM, and the unconfigured FLEX diskette is read in and initiallised upon entry of the start-up command.

CUBEFLEX 6809 2nd Processor unit **£299**
Unconfigured FLEX diskette + manual **£130**

Send for our free 150 page catalogue.

All prices exclude VAT. Trade enquiries welcome.

Control Universal Ltd
Anderson's Court
Newnham Road,
Cambridge CB3 9EZ.
Tel 0223 358757

● Circle No. 170

ASHTON·TATE ■ dBASE II

The world's leading micro database package can now be enhanced with 3 new products

Fox & Geller, the world's largest suppliers of dBASE II add-ons, are now established in the UK to supply and support

QUICKCODE™

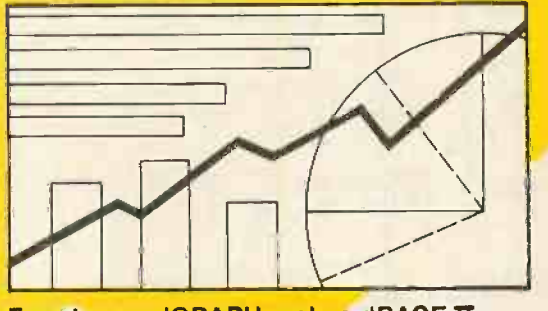
The dBASE II program generator. QUICKCODE writes concise programs to set up and maintain any type of database. You still have all the power of dBASE II and there is no programming required. Draw your data entry form on the screen and you're in business – it's that simple. The most powerful program generator available. And the easiest to use. **QUICKCODE makes dBASE II easy.**

dUTIL™

The dBASE II utility program. dUTIL automatically combines your dBASE II command files, saving disk access time and speeding up your programs. dUTIL makes your listings more readable by automatically indenting and aligning command sequences. Makes debugging that much faster. dUTIL also cuts out repetitive programming. Simply type your instruction sequence into a standard text file – then INCLUDE it in as many dBASE II command files as you wish. **dUTIL makes dBASE II faster**

dGRAPH™

The dBASE II graphics system. Now you can bring your dBASE II database to life! Produce pie charts and bar or line graphs in minutes and with ease. Advanced features make dGRAPH as powerful as it is easy. Features like autoGRAPH which will automatically load dBASE II data, compute scales, draw grid lines and label charts. Then there's automatic shading and overlay graphs. And more.



Easy to use dGRAPH makes dBASE II better to look at

Dealers – contact your Fox & Geller distributor for more details:

Encotel	01-680 6040	Soft Option	(0476) 860171
Ferrari	01-751 5791	Tamsys	(Windsor) 56747
Midlectron	(077382) 6811	Tradesoft	01-627 1800
Pete & Pam	01-769 1022	Xitan	(0703) 334711
Softsel	01-844 2040	Software Ltd	01-833 1173

FOX&GELLER

Fox & Geller (UK) Ltd
17 Wigmore Street
London W1.
Tel: 01-580 5816

QUICKCODE, dGRAPH, dUTIL and autoGRAPH are trademarks of Fox & Geller
dBASE II is a trademark of Ashton-Tate.

● Circle No. 174

A HIGH PERFORM
MULTI-USE

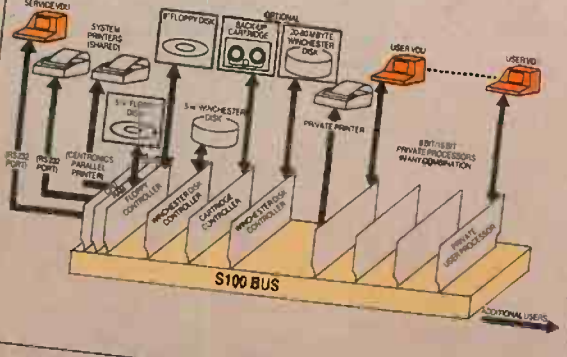
GRASP THE FACTS AND SAVE UP TO 50%

Pay much less for much more computing power per user

	BROMCOM SuperStar	IBM System 34	DEC PDP11/34	ICL System 25	Olivetti System M40	Burroughs B95
		Conventional Mini-Computers				
Class	Super-Micro (Multi-Processor)					
Processing Power	Up to 16 8 bit (Z80A) or 16 bit (iAPX 186)					
Memory Per User	8 bit up to 128Kbyte 16 bit up to 1Mbyte					
Disc Storage & Backup	From 10Mbyte up to 160Mbyte +40Mbyte tape					
Expandability	Up to 16 users more with networks. Up to 512Mbyte storage					
Lowest Entry Cost	£2450 (including VDU)					
Cost of 2 User 10Mbyte System 2 off VDUs	£5975 (8 bit) £6975 (16 bit) (including VDU)					
Incremental Cost for Each Additional User	£995 (8 bit) £1495 (16 bit) (including VDU)					
Hardware Compatibility	World Standard S100					
Software Compatibility	World Standard CP/M & MS-DOS					

Systems Architecture

Each user has its own processing power each with 16 bit and up to 1Mbyte Memory or 8 bit and up to 128Kbyte.



Available Software

BROMCOM Standard Range	BROMCOM Specialised Packages	Text & Database	Languages
Sales Ledger Purchase Ledger Nominal Ledger Stock Control Order Processing Job Costing Payroll (with SSP)	Property Management Energy Management Membership M'gement Betting Office Chain Insurance Brokers Wholesale/Retail Automatic Invoicing Planned Maintenance Garment Trade	WordStar SpellStar Mailmerge DataStar ReportStar Spellbinder SuperCalc dBaseII Rescue Microplan	BASIC COBOL FORTRAN PASCAL C PL/I APL

BROMCOM Bespoke Programming – Can be carried out by BROMCOM or a growing number of OEMs and Dealers in all areas.

All CP/M and MS-DOS software will run without any modification at all.

SuperStar is a trademark of Bromley Computer Consultancy Ltd.
CP/M is a trademark of Digital Research.
MS-DOS is a trademark of MICROSOFT.

• Circle No. 175

BRITISH MULTI-USER SYSTEM

ANCE, GENUINE, R SYSTEM.

Some installations are a little more difficult than others!

Such as the one at Banham Patent Locks, Limited, in London.

BROMCOM® supplied hardware and software that would have taken a respectable-sized minicomputer from, say, DEC or IBM or Olivetti at twice the price for hardware, three times the price for software and four times as long to implement.

The Hardware – BROMCOM SuperStar™ – is handling six terminals (expandable to 16) and three printers with 20Mbyte disk storage and tape backup. The operators work round the clock, so the speed and reliability demanded of the system are high.

Operators can simultaneously enter Invoices, Payments, etc, while other functions such as word processing and database operations (over 15000 entries!) are in constant use by other terminals.

- POWERFUL – HIGH PERFORMANCE – FLEXIBLE
- VERY COST-EFFECTIVE WITH LOW ENTRY PRICE
- FULLY MODULAR AND EASY LOW-COST EXPANSION
- WORLD-STANDARD S100 HARDWARE AND OPERATING SYSTEM – CP/M OR MS-DOS
- FULL MULTI-USER CAPABILITY WITH RECORD/FILE LOCKING AND PRINTER SPOOLING
- FIELD-PROVED OVER TWO YEARS WITH A LONG LIST OF SATISFIED CLIENTS
- STYLISH NEW DESIGNS FOR 1984 AND BEYOND
- MODEL 10 CATERS FOR UP TO 6 USERS, MODEL 20 UP TO 16 USERS

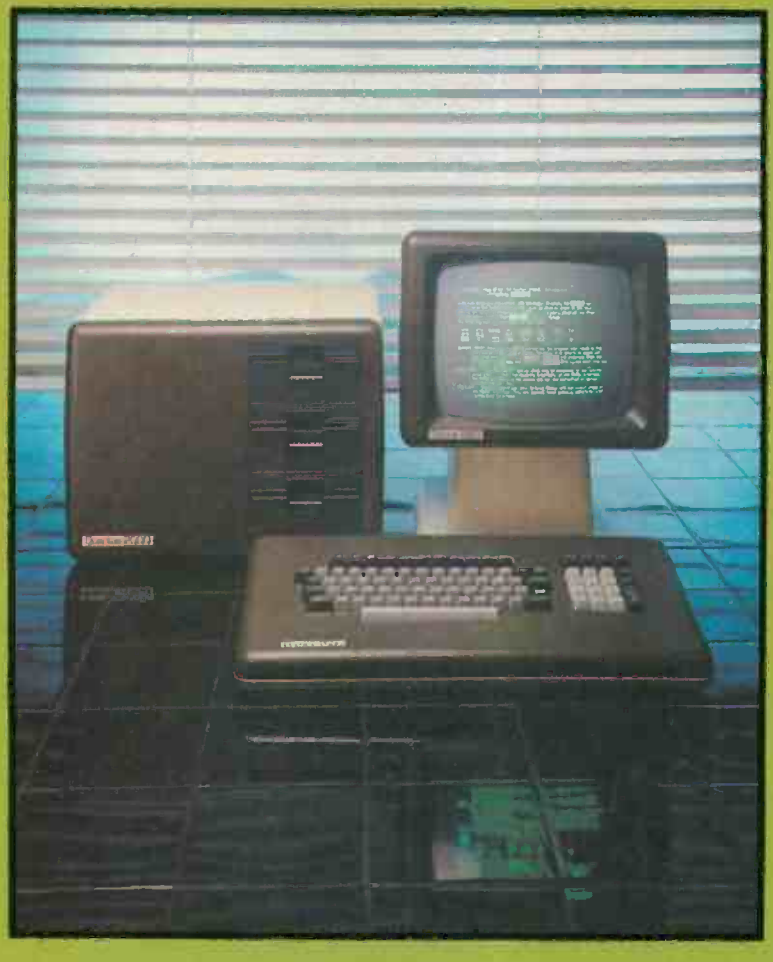
SuperStar

OUTPERFORMING MINICOMPUTERS WITH MICROCOMPUTER ADVANTAGES.

BROMCOM

Bromley Computer Consultancy Ltd
417-421 Bromley Road, Bromley, Kent, BR1 4PJ.
Telephone: 01-697 8933 Telex: 896691

Quantumise your options!



Quantum 2000 NETWORK

- ★ The Network will support over 30 terminals
- ★ 11.8 Megabytes Hard Disk Storage
- ★ Global drive with common read only files
- ★ Password protected, read/write files
- ★ Common read/write files with file locking
- ★ Message facility
- ★ Shared or local printer
- ★ Terminals can support local floppies
- ★ Fully intelligent terminals with dual processors & 64K System RAM

Limited number of Dealerships available in the U.K.

QUANTUM COMPUTER SYSTEMS LIMITED. THE LEEDS COMPUTER CENTRE
55, WADE LANE, MERRION CENTRE, LEEDS LS2 8NJ
Telephone (0532) 458877

A MULTIBOARD COMPUTER

● Circle No. 176

>OPEN FILE

PRACTICAL COMPUTING DECEMBER 1983

Open File monitors

Apple ..... John Harris
Atari ..... Jack Schofield
BBC .....Nicholas McCutcheon
Commodore ..... Mike Todd
Dragon ..... Ian Stobie
Epson HX-20 ..... John Wellsman
IBM PC .....Jack Schofield
Newbrain ..... David Watt
Tandy ..... John Wellsman
Research Machines ..... Ian Stobie
Sharp ..... John Hooper
Sinclair ..... John Wellsman

Open File is the part of the magazine written by the readers of *Practical Computing*. All aspects of microcomputing are covered, from games to serious business software and utilities. Fully-debugged programs can be submitted for any micro, and for standard CP/M machines such as the Osborne and Superbrain. Programs can be in machine code or any language, including Forth and Pascal.

Submissions should include a brief description which explains what your program does, and how it does it. If possible it should be typed, with lines double-spaced. We need a printed program listing. Hand-written listings cannot be accepted. A tape or disc of the program helps if it is in a standard format.

When printing listings, please remember to use a new ribbon or double-intensity printing — faint listings reproduce badly. Use plain paper only, and try to list the program across either a 35-character or a 70-character width. Also, make sure all special graphics or inverse-video characters are either listed correctly or else include Rem statements to explain them fully.

Each program listing, tape or disc must have your name and address on it, or we cannot promise its safe return. A stamped addressed envelope is appreciated.

If you write in with a comment, correction or enquiry please remember to state the machine and the program title.

We pay at least £10 for any programs used, or £35 per page and pro rata for part pages.

>SINCLAIR

146 USER-DEFINED PROBLEMS
Crispin Read's character generator and editor overcomes some of the problems of user-defined graphics on the Spectrum.

>COMMODORE

153 SCREEN ROUTINES
Save a copy of the Pet screen to disc, and then read it back again with L V Turner's handy routines.

154 WRITING LETTERS
A Pet word processor capable of handling up to 2K characters.

155 CRASH PROOF INPUT
Accidental null inputs can cause Pet Basic programs to crash — unless you have installed Doug Maloney's simple fix.

>RESEARCH MACHINES

161 RML TYPEWRITER
A simple-to-use text editor for the 380-Z plus Epson MX-80F/T, from Whitehaven Grammar School.

162 BANNER
Two programs to print up to 80 times normal height.

>BBC

171 MODE 7 PICTURES
A utility to allow full-colour graphics and text to be entered on the mode 7 screen.

172 SEA BATTLE
A quick-reaction arcade game by Chris Carr.

174 DISC DUMP
Direct access to 128-byte blocks provides some useful information for programmers with disc-based systems.

>APPLE

175 HANGMAN
The instructive and popular game translated to the Apple screen by Graham Wilson.

>EPSON HX-20

179 ALARM CLOCK
In the gaps between programming your portable can still be working for you.

179 PRINT USING
Unravelling the difficulties of combining this command with Tabs.

179 MEMORY STRUCTURE
How the HX-20 divides up its RAM ...

179 CODED PROGRAMS
... and how it finds programs once they are there.

>TANDY

181 SYSTEM TAPE COPIER
A copying utility which declares the start and end addresses of the program.

181 MIXING TEXT AND NUMBERS
Tabulate text as well as numerical data with a modification to the Print Using command.

>END OF FILE

183 ORIC OTHELLO
The classic game translated for the 48K Oric by Gary Nugent.

Send your contribution to:

Open File, Practical Computing,
Quadrant House, The Quadrant,
Sutton, Surrey SM2 5AS

User-defined problems

ONE OF THE PROBLEMS with user-defined graphics on the Spectrum is that they are rather difficult to define, writes Crispen Read of Henlow, Bedfordshire. The other is that there are not enough of them. The character generator and editor overcomes both these problems.

Normally a Spectrum has 21 graphics characters which can be defined by Poking into the address given by USR "A". This program allows you to redefine the other 96 ASCII characters in the Spectrum by copying the character set in ROM, starting at address 156616, into the RAM starting at address 31831. The character-set pointer, Chars, is then made to point at the character set in RAM, and because it is in RAM the character set can be changed.

To define a character you select option 5 of the menu. The screen then displays a set of on-screen instructions around a large square. A four-cell cursor can be moved around the screen by using the arrow keys on the keyboard; there is no need to press Shift. When the cursor is turned on it leaves a trail on the screen; when it is turned off it rubs out anything it passes over and can therefore be used to move the cursor around the square without leaving a trail, or for deleting a small mistake.

When you have finished composing your masterpiece it can be entered into the character set using option 1. The program then asks you which character you wish to change. When you have typed the character and pressed Enter, the program will take the bit pattern off the screen. To do so it performs a binary-to-decimal-conversion using the ATTR function to read the blocks in the square.

The decimal value is then Poked into RAM in the normal way — see line 5850. This address is found using the expression:

31575 + (8 * CODE C$) + COUNTER 2

where C$ is the string variable holding the character to be changed, 31575 is the start address of the RAM character set, and Counter 2 is the counter for the memory location of the bit pattern, which starts at zero and goes up to 7.

While using the graphics editor it is also possible to enlarge a character in the set on to the square. This is particularly useful for making small alterations to a character in the set or taking a detailed look at the bit patterns of the characters. If you make a mess of drawing a character you can clear the square by pressing 4. To return to the menu press 3. A reminder of which button does what is displayed on the screen.

To replace one character with another from the keyboard use option 4. The program then asks you to enter two characters. The first will be replaced by the second, a message will be briefly flashed on the screen and the program will return them to the menu. This can be useful for doing things like replacing the * with an x or changing (to [.

The program can save character sets, which can be loaded again with or without the program. To save a character set use menu option 2. The program will ask you for a file name, which must be between one and ten characters in length. You will need to take note of the file name, as you will need it when reloading, using option 1.

To load a character set without the program type:

LOAD"filename" CODE 31831,1016

Once the set is loaded type:

POKE 23606,87:POKE 23607,123

Make these Pokes a one-line instruction, and check them before pressing Enter.

The program is well labelled with Rems, which may be left out if you wish.

```
  10 REM ************************
  20 REM *                      *
  30 REM * CHARACTER GENERATER  *
  40 REM *      AND   EDITOR    *
  50 REM *                      *
  60 REM * © 1983 Crispin Read  *
  70 REM *                      *
  90 REM ************************
 100 REM IF CHARACTER SET IS NOT
 110 REM IN RAM THEN COPY IT
 120 REM INTO RAM
 130 IF PEEK 23606+256*PEEK 2360
7<>31575 THEN GO SUB 3000
 140 REM           MENU
 150 CLS
 160 PRINT "PRESS..."
 170 PRINT '''" 1)TO LOAD A CHARA
CTER SET FROM TAPE"
 180 PRINT '" 2)TO SAVE A CHARC
TER SET TO    TAPE"
 190 PRINT '" 3)TO MAKE THE RAM
 CHARACTER SET THE SAME AS THE R
OM"
 200 PRINT '" 4)TO EXCHANGE ONE
 CHARACTER    WITH ANOTHER FROM
THE KEYBOARD"
 210 PRINT '" 5)TO USE THE GRAP
HICS EDITOR"
 220 PRINT '" 6)TO STOP"
 230 LET I$=INKEY$
 240 REM IF NO KEY OR A KEY
 250 REM OTHER THAN 1-6 IS
 260 REM PRESSED THEN INPUT
 270 REM KEY AGAIN
 280 IF I$="" THEN GO TO 230
 290 IF CODE I$<49 OR CODE I$>54
 THEN GO TO 230
 300 IF I$="6" THEN STOP
 310 GO SUB 1000*VAL I$
 320 GO TO 150
 995 REM ************************
1000 REM  SET LOADING ROUTINE
1005 REM ************************
1010 CLS
1020 PRINT INVERSE 1; BRIGHT 1;"
   READY TO LOAD CHARACTER SET
"
1030 PRINT '''"What is the casse
tte copy of the character set ca
lled? (10 char-acters Max.)"
1040 INPUT LINE N$
1050 IF N$="" OR LEN N$>10 THEN
PRINT '''"INVALID FILE NAME..TRY
 AGAIN": GO TO 1030
1060 CLS
1070 PRINT INVERSE 1;"LOADING ";
N$;" FROM TAPE"
1075 PRINT ''' FLASH 1; BRIGHT
1;"PRESS PLAY ON TAPE RECORDER"
1080 LOAD N$CODE 31831,1016
1090 BEEP 1,0
1095 CLS
1100 PRINT INVERSE 1; BRIGHT 1;
FLASH 1;AT 0,5;"CHARACTER SET LO
ADED"
1110 PAUSE 100
1120 RETURN
1995 REM ********************
2000 REM  SET SAVING ROUTINE
2005 REM ********************
2010 CLS
2020 PRINT INVERSE 1; BRIGHT 1;"
   READY TO SAVE CHARACTER SET  "
2030 PRINT '''"What do you want
to call the    cassette copy of
the character  set? (10 characte
rs Max.)"
2040 INPUT LINE N$
2050 IF N$="" OR LEN N$>10 THEN
PRINT '''"INVALID FILE NAME..TRY
AGAIN": GO TO 2030
2060 SAVE N$CODE 31831,1016
2070 CLS
2080 BEEP 1,0
2090 PRINT INVERSE 1; BRIGHT 1;
FLASH 1;"CHARACTER SET SAVED"
2100 PAUSE 100
2110 RETURN
2995 REM ********************
3000 REM ROM TO RAM CHARACTER
3010 REM       SET MOVE
3015 REM ********************
3020 CLS : PRINT INVERSE 1;"    M
OVING CHARACTER SET NOW     "
3030 REM MOVE RAMTOP DOWN TO
```

(listing continued on page 148)

YOU HAVEN'T SEEN ANYTHING LIKE THIS ON A COLOUR MONITOR BEFORE.

An RGB monitor from JVC offering a resolution of 370x470 pixels for less than £150?

We guarantee you won't see another bargain like that in this or any other micro mag – or in any other supplier's showroom.

For we've managed to acquire the sole distribution rights to these superb machines and we are able to offer them at an unbeatable price.

There are two models available: medium resolution (370x470 pixels) at £149.95; and high resolution (580x470 pixels) at £229.95. (Both excluding VAT.)

The units have a 14" screen and are suitable for the BBC Micro, Lynx, Oric, Apple, and most other leading micros.

They are robustly constructed in a handsome cream casing. And come with a full year's guarantee.

Delivery is good: your monitor should arrive by courier service within ten days of our receiving your order.

You can order by filling in the coupon below and posting to: Opus Supplies Ltd., 158 Camberwell Road, London SE5 0EE. Or by telephoning 01-701 8668 quoting your credit card number. Or, of course, you can buy in person at our showroom between 9am-6pm Monday-Friday, 9am-1.30pm Saturday.

MODEL REFERENCE	1302-1 Medium Resolution	1302-2 High Resolution
RESOLUTION	370 x 470 Pixels	580 x 470 Pixels
C.R.T.	14"	14"
SUPPLY	220/240v. 50/60Hz.	220/240v. 50/60Hz.
E.H.T.	Minimum 19.5kv Maximum 22.5kv	Minimum 19.5kv Maximum 22.5kv
VIDEO BAND WIDTH	6MHz.	10MHz.
DISPLAY	80 characters by 25 lines	80 characters by 25 lines
SLOT PITCH	0.63mm	0.41mm
INPUT: VIDEO	R.G.B. Analogue/ TTL Input	R.G.B. Analogue/ TTL Input
SYNC	Separate Sync on R.G.B. Positive or Negative	Separate Sync on R.G.B. Positive or Negative
EXTERNAL CONTROLS	On/off switch and brightness control	On/off switch and brightness control

To Opus Supplies Ltd., 158 Camberwell Road, London SE5 0EE.

Please send me____ Medium Resolution Colour Monitor(s) at £149.95 each (ex. VAT).

____ High Resolution Colour Monitor(s) at £229.95 each (ex. VAT).

____ Connection lead(s) at £6.00 each.

I understand carriage per monitor will cost an extra £7.00.

(N.B. A Medium Resolution Monitor including VAT, lead, and carriage costs £187.39. A High Resolution Monitor including VAT, lead, and carriage costs £279.39.)

I enclose a cheque for £____ Or please debit my credit card account with the amount of £____ My Access/Barclaycard (please tick) no. is____

Please state the make of your computer____

Name____

Address____

Telephone:____

Opus.
Opus Supplies Ltd.

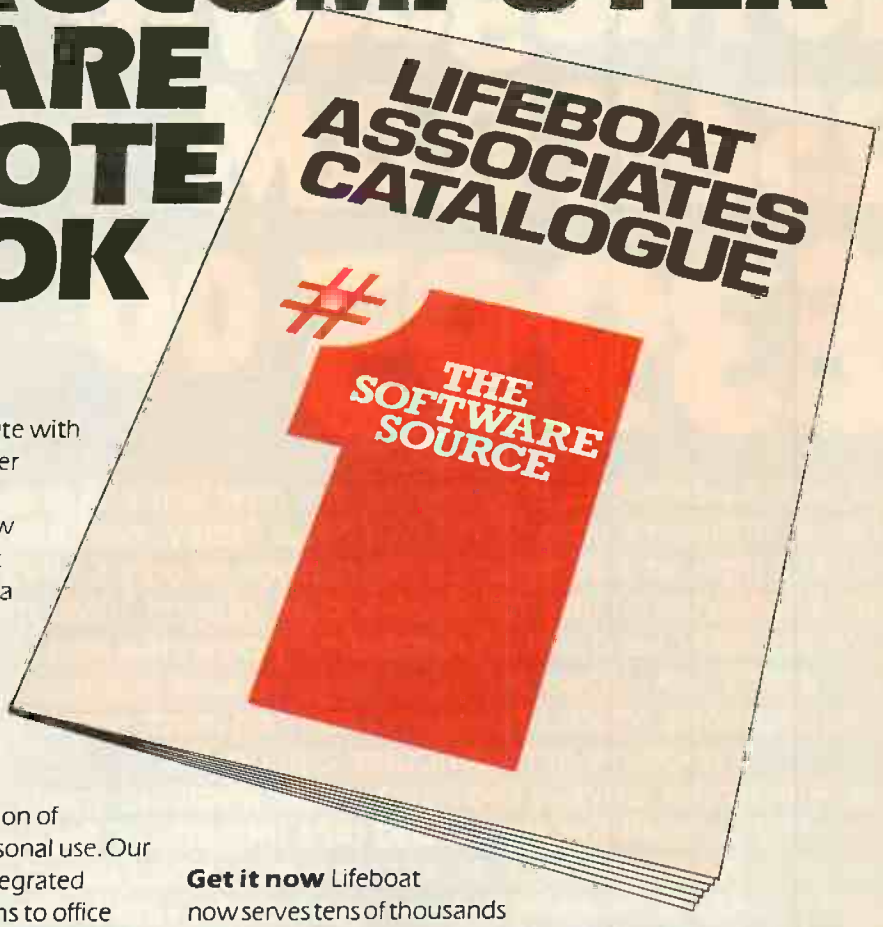
PC2

● Circle No. 177

(listing continued from page 146)

```
3040 REM BELLOW THE RAM
3050 REM CHARACTER SET
3060 POKE 23730,87
3070 POKE 23731,123
3080 LET COUNTER 1=0
3090 LET ROM ADDRESS=15360
3100 FOR A=ROM ADDRESS+256 TO RO
M ADDRESS+1024
3110 POKE 31831+COUNTER 1,PEEK A
3120 LET COUNTER 1=COUNTER 1+1
3130 NEXT A
3140 REM TELL THE COMPUTER WHERE
3150 REM TO LOOK FOR THE RAM
3160 REM BASED CHARACTER SET
3170 POKE 23606,87
3180 POKE 23607,INT 123
3190 RETURN
3995 REM ************************
4000 REM    CHARACTER EXCHANGE
4005 REM ************************
4010 CLS : INPUT "ENTER CHARACTE
R TO CHANGE";C$
4020 INPUT "ENTER NEW CHARACTER"
;R$
4030 FOR A=0 TO 7
4040 POKE 31575+(8*CODE C$)+A,PE
EK (31575+8*CODE R$+A)
4050 NEXT A
4060 CLS : PRINT INVERSE 1; BRIG
HT 1;"      CHARACTER REPLACED
"
4070 BEEP 1,0: PAUSE 100
4080 RETURN
4995 REM ************************
5000 REM    GRAPHICS EDITER
5005 REM ************************
5010 CLS
5020 REM DRAW THE ON SCREEN
5030 REM INSTRUCTIONS AND THE
5040 REM EDITING GRID
5050 PRINT AT 1,0;"PRESS..."
5060 PRINT AT 3,0;" 1-TO ENTER";
AT 4,0;"CHARACTER INTO";AT 5,0;"
SET"
5070 PRINT AT 6,0;" 2-TO VIEW";A
T 7,0;"CHARACTER FROM";AT 8,0;"S
ET"
5080 PRINT AT 9,0;" 3-TO EXIT";
5090 PRINT AT 10,0;" 4-TO CLEAR"
;AT 11,0;"GRID"
5100 PRINT AT 19,0;"TO MOVE CURS
OR";AT 20,0;"USE ARROW KEYS. TO
TURN CURSOR  ON AND OFF PRESS ""
0"" AND ""9"""
5110 PLOT 119,152
5120 DRAW 129,0
5130 DRAW 0,-129
5140 DRAW -129,0
5150 DRAW 0,129
5160 REM  DEFINE  VARIABLES
5170 LET X=15: LET X1=X
5180 LET Y=3: LET Y1=Y
5190 LET MARKER=0
5210 REM ENTER INSTRUCTION
5220 LET I$=INKEY$
5230 REM IF NOTHING OR AN
5240 REM UNKNOWN COMMAND IS
5250 REM ENTED THEN TRY AGAIN
5260 IF I$="" THEN GO TO 5220
5270 IF CODE I$<48 OR CODE I$>57
 THEN GO TO 5220
5280 GO SUB 5320+(300*VAL I$)
5290 GO SUB 8500
5300 GO TO 5220
5315 REM ************************
5320 REM      TURN CURSOR ON
5325 REM ************************
5330 LET MARKER=1
5340 RETURN
5570 REM ************************
5580 REM  TAKE CHARACTER FROM
5590 REM    GRID AND ENTER IT
5600 REM         INTO SET
5610 REM ************************
5620 INPUT "TYPE CHARACTER TO CH
ANGE ";C$
5630 REM IF CHARACTER CODE IS
5640 REM OK THEN REDIFINE IT
5650 REM IF NOT SAY SO AND
5660 REM RETURN TO MENU
5670 IF CODE C$>32 AND CODE C$<1
28 THEN GO TO 5710
5680 CLS : PRINT INVERSE 1; BRIG
HT 1;"THAT CHARACTER CAN'T BE CH
ANGED"
5690 BEEP 1,0
5700 GO TO 140
5710 REM FILL CURSOR POSITION
5720 REM WITH APPROPRATE BLOCK
5730 IF MARKER=1 THEN PRINT AT Y
,X; INK 2;"▀▀";AT Y+1,X; INK 2;"
▀▀": GO TO 5750
5740 PRINT AT Y,X;"  ";AT Y+1,X;
"  "
5750 REM READ BIT PATTERN FROM
5760 REM SCREEN
5770 LET COUNTER 2=0
5780 FOR L=3 TO 18 STEP 2
5790 LET POWER=7
5800 LET TOTAL=0
5810 FOR C=15 TO 30 STEP 2
5820 IF ATTR (L,C)=58 THEN LET T
OTAL=TOTAL+2↑POWER
5830 LET POWER=POWER-1
5840 NEXT C
5850 POKE 31575+(8*CODE C$)+COUN
TER 2,TOTAL
5860 LET COUNTER 2=COUNTER 2+1
5870 NEXT L
5880 RETURN
5910 REM ************************
5920 REM    CHARACTER ENLARGER
5925 REM ************************
5930 LET LINES=1
5940 LET COLUMNS=13
5950 INPUT "ENTER CHARACTER TO V
IEW ";V$
5960 FOR A=0 TO 7
5970 LET DECIMAL=PEEK (31575+8*C
ODE V$+A)
5980 LET LINES=LINES+2
5990 LET COLUMNS=13
6000 FOR B=7 TO 0 STEP -1
6005 LET COLUMNS=COLUMNS+2
6010 LET BIT=2↑B
6020 IF DECIMAL>=BIT THEN PRINT
AT LINES,COLUMNS; INK 2;"▀▀";AT
LINES+1,COLUMNS; INK 2;"▀▀": LET
 DECIMAL=DECIMAL-BIT: NEXT B: NE
XT A: RETURN
6030 PRINT AT LINES,COLUMNS;"  "
;AT LINES+1,COLUMNS;"  "
6040 NEXT B
6050 NEXT A
6060 RETURN
6210 REM ************************
6220 REM  EXIT GRAPHICS EDITOR
6225 REM ************************
6230 GO TO 140
6510 REM ************************
6520 REM      CLEAR SCREEN
6525 REM ************************
6530 GO TO 5000
6810 REM ************************
6820 REM      CURSOR LEFT
6825 REM ************************
6830 LET X=X-2
6840 RETURN
7110 REM ************************
7120 REM      CURSOR DOWN
7125 REM ************************
7130 LET Y=Y+2
7140 RETURN
7410 REM ************************
7420 REM        CURSOR UP
7425 REM ************************
7430 LET Y=Y-2
7440 RETURN
7710 REM ************************
7720 REM      CURSOR RIGHT
7725 REM ************************
7730 LET X=X+2
7740 RETURN
8010 REM ************************
8020 REM     TURN CURSOR OFF
8025 REM ************************
8030 LET MARKER=0
8040 RETURN
8490 REM ************************
8500 REM      CURSOR PRINT
8505 REM ************************
8510 REM CHEAK X AND Y CHORDS
8520 REM ARE WITHIN GRID
8530 IF X<15 OR X>30 THEN LET X=
X1
8540 IF Y<3 OR Y>17 THEN LET Y=Y
1
8550 REM IS CURSOR ON/OFF
8560 IF MARKER=1 THEN PRINT AT Y
1,X1; INK 2;"▀▀";AT Y1+1,X1;"▀▀"
: LET I=2: GO TO 8580
8570 PRINT AT Y1,X1;"  ";AT Y1+1
,X1;"  ": LET I=5
8580 PRINT AT Y,X; INK I; FLASH
1;"▄▄";AT Y+1,X; INK I; FLASH 1;
"▄▄"
8590 LET X1=X
8600 LET Y1=Y
8610 RETURN
```

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.

#1 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 (LBSOFT 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 Hinterbergstrasse 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 Telex 250303 (PUBLIC X PARIS)

● Circle No. 178

THE ACT SIRIUS SX
10 Megabyte
256K RAM
£3995·00

Built with a commitment to quality, the new Sirius SX is the latest addition to the 16-bit ACT Sirius family. And it's available now, at a complete system price of only £3,995. With 256Kbytes of internal RAM and an integral 10Mbyte Winchester hard disk, it is extremely powerful and extremely fast – ideal for those large volume business applications which previously required much more expensive minicomputer equipment.

The Winchester drive is the heart of the machine, greatly improving on both the speed and data integrity of floppy-based systems. Average access time is reduced to just 134 milliseconds while the average transfer rate is an astonishing 104,000 characters per second.

Like all the Sirius range, the Sirius SX is backed by the strength and resources of ACT. The Pulsar range of true 16-bit application software for accounting, planning and word-processing; over 1,000 hardware/software add-on products; ACT Training Centres open to all; nationwide field service; a full range of printers and consumables. And the most complete and professional dealer network in the United Kingdom.

Sirius prices start at just £2,195 for a dual floppy drive system with 1.2Mbytes and £2,695 for the double-sided floppy drive version offering 2.4Mbytes.

ACT SIRIUS SX : THE FACTS

WINCHESTER SUBSYSTEM

10.6Mbyte (formatted) 5¼" integral Winchester drive
Twin platters
134msec. average access time
Intelligent disk controller
DMA interface to system memory
Multiple operating systems
User configurable

GENERAL SPECIFICATIONS

256Kbytes RAM
Intel 8088 16-bit processor unit
1.2Mbyte double-sided floppy disk drive for back-up
800x400 pixel, high resolution graphics
Multiple operating systems
Parallel/IEEE 488 port
2xRS232 aysnchronous/ synchronous ports
Internal user port

For more information on the new ACT Sirius SX, clip the coupon and return to:

ACT (UK) Limited

FREEPOST
Birmingham B63 1BR

or call: 021-501-2284

Please send me further details of the new Sirius SX

Name _____

Position _____

Company _____

Address _____

_____

_____

_____

Tel: _____

● Circle No. 179

PC/12/83

(THE KEY * TO SUCCESSFUL SOFTWARE SALES)

Earls Court,
London.
June 5-7, 1984

software '84
EXHIBITION AND CONFERENCE

Certainly the major software event of 1984 will be **Software '84,** to be held for the first time in Central London. **Software '84** will be totally dedicated to professional software sales and will be held from June 5-7, 1984 at Earls Court in the centre of London, the Nation's biggest commercial market place.

Such a show could only come from a company that understands the computer market. Reed Exhibitions, the country's largest exhibition organisers, will be staging **Software '84** with all the skill the company has already brought to the highly successful Compec shows.

Computer Weekly, Software and the National Computing Centre (NCC) will be sponsoring both the exhibition and the prestigious conference, running at the same time, guaranteeing a high level of interest in both events. The event has the full support of the Computer Services Association (CSA) and The Institute of Data Processing Management (IDPM) and are co-sponsored by 'Systems International', 'Practical Computing', 'Micro Business' and 'Computer Talk'.

Inevitably, top quality business visitors will be drawn to such a show, with DP professionals, dealers, OEM's and serious business and professional end-users all visiting the exhibition with nothing but software purchase at the forefront of their minds.

With that kind of captive audience you can't afford not to be a part of this important event. So turn the key to the booming software market and make **Software '84** the key to successful software sales. The first step is to fill in the coupon below:

Return to: The Exhibition Manager, **Software '84,** Reed Exhibitions, Surrey House, 1 Throwley Way, Sutton, Surrey SM1 4QQ

I am interested in exhibiting at **'Software '84'.** Please send me full details. ☐

I am interested in visiting **'Software '84'.** Please send me a visitor registration form. ☐

I am interested in attending **'Software '84'** Conference. Please send details. ☐

Name _____ Position _____

Company _____

Address _____

_____

Telephone No. _____ Telex _____

software '84
EXHIBITION AND CONFERENCE

by Mike Todd

Screen routines

IT IS A FAIRLY simple task to save a copy of the screen to disc and then read it back again as required. L V Turner of Colchester has provided two simple routines to do it.

The screen occupies memory locations 32768 to 33767, and the first program simply fools the Pet into thinking that its current Basic program occupies the same memory space as these locations — lines 30 and 35 — and then performs the Save routine.

After the Save is complete, these pointers must be restored to what they were. The program does this in lines 50 and 55. The Pokes to 40 and 41 reset the start of the Basic program, which on the Pet is constant, but the pointer to the end of the program is different for different programs, and so must be reset to its original value. This is done by first preserving the values in memory locations 1 and 2 and Poking them back afterwards.

Loading the screen back again is also very simple, as shown in the second listing. Unfortunately a Load command issued from within a program assumes that a new program has just been loaded. It also starts the new program running from the beginning, although all variables are preserved to allow programs to be chained together.

Arrangements therefore need to be made to allow the Load command to be executed only once, otherwise every time the screen is loaded, the program will restart and the screen will be loaded, and the program will restart, and so on.

The first time through the program, all variables will be reset to zero and so X=0 and the screen will be loaded. By resetting X to 1 before performing the Load, X will still be 1 when the program is restarted, and the simple test in line 20 will prevent the screen being loaded again.

To use this routine anywhere other than at the begining of a program could be tricky, but it is certainly not impossible with a little imagination.

Unfortunately, the cassette routines on the Pet do not allow memory locations beyond 32767 to be saved, so it is not possible to use this technique with cassettes.

Mr Turner has also provided an unusual way of manipulating the contents of the screen. The machine-code program set up by the Basic loader will transfer each line of the screen into an array.

Line 20 sets up the screen and preserves a suitable work area at the upper limit of memory. The values given are for a 16K, Basic 2 Pet. Lines 2000 to 3020 perform the machine-code loading function, and once this section had been executed, the command Sys 15194 will transfer lines 0 to 24 into the array starting at SC$(0) and ending at SC$(24). In the transfer, all characters are converted from their screen values to their ASCII values, and all reverse-field characters are retuned to normal.

The program could be modified for larger or smaller Pets. Unfortunately, Basic 4 operates its strings in rather a different way to Basic 2 so this routine is unlikely to be easily modified for Basic 4 Pets.

Save screen.

```
10 REM ****************************
11 REM *                          *
12 REM *   SAVE SCREEN TO DISK    *
13 REM *                          *
14 REM ****************************

20 POKE1,PEEK(42):POKE(2),PEEK(43)
30 POKE40,0  :POKE41,128
35 POKE42,232:POKE43,131

40 SAVE"0:SCREEN",8

50 POKE40,0       :POKE41,4
55 POKE42,PEEK(1):POKE43,PEEK(2)
```

Load screen.

```
10 REM ****************************
11 REM *                          *
12 REM *  LOAD SCREEN FROM DISK   *
13 REM *                          *
14 REM ****************************

20 IF X THEN 40
30 X=1:LOAD"0:SCREEN",8

40 REM CONTINUE WITH PROGRAM
```

Screen to array: Basic loader.

```
10 REM ****************************
11 REM *                          *
12 REM *  COPY SCREEN INTO SC$    *
13 REM *                          *
14 REM ****************************

20 POKE59468,14:POKE52,80:POKE53,59:CLR
30 DIM SC$(24)

2000 S=15194
2010 FORI=S TO S+152
2020 READ A
2030 POKE I,A:C=C+A
2040 NEXT
2050 READ A
2060 IF A<>C THEN PRINT"CHECKSUM ERROR"

3000 DATA 169,128,141,106,59,169,60,141
3001 DATA 120,59,160,4,162,0,189,0,132
3002 DATA 41,127,201,64,144,3,24,105,64
3003 DATA 105,64
3004 DATA 157,0,64,232,208,236,238,106
3005 DATA 59,238,120,59,136,208,225
3006 DATA 165,44,133,84,165,45,133,85
3007 DATA 160,0,177,84,201,83,208,7
3008 DATA 200,177,84,201,195,240,26,160
3009 DATA 2,177,84,133,86,200,177,84
3010 DATA 133,87,24,165,84,101,86
3011 DATA 133,84,165,85,101,87,133,85
3012 DATA 144,215,24,165,84,105,7,133
3013 DATA 84,165,85,105,0,133,85,169
3014 DATA 40,133,86,169,60,133,88,169
3015 DATA 0,133,87,168,165,86,145,84
3016 DATA 200,165,87,145,84,200,165,88
3017 DATA 145,84,200,192,75,240,13,24
3018 DATA 165,87,101,86,133,87,165,88
3019 DATA 105,0,133,88,144,222,96
3020 DATA 17836
```

Screen to array: disassembled version.

```
3B5A A9 80      LDA #$80
3B5C 8D 6A 3B   STA $3B6A
3B5F A9 3C      LDA #$3C
3B61 8D 78 3B   STA $3B78
3B64 A0 04      LDY #$04
3B66 A2 00      LDX #$00
3B68 BD 00 84   LDA $8400,X
3B6B 29 7F      AND #$7F
3B6D C9 40      CMP #$40
```

(continued on next page)

(continued from previous page)

```
3B6F 90 03      BCC $3B74
3B71 18         CLC
3B72 69 40      ADC #$40
3B74 69 40      ADC #$40
3B76 9D 00 40   STA $4000,X
3B79 E8         INX
3B7A D0 EC      BNE $3B68
3B7C EE 6A 3B   INC $3B6A
3B7F EE 78 3B   INC $3B78
3B82 88         DEY
3B83 D0 E1      BNE $3B66
3B85 A5 2C      LDA $2C
3B87 85 54      STA $54
3B89 A5 2D      LDA $2D
3B8B 85 55      STA $55
3B8D A0 00      LDY #$00
3B8F B1 54      LDA ($54),Y
3B91 C9 53      CMP #$53
3B93 D0 07      BNE $3B9C
3B95 C8         INY
3B96 B1 54      LDA ($54),Y
3B98 C9 C3      CMP #$C3
3B9A F0 1A      BEQ $3BB6
3B9C A0 02      LDY #$02
3B9E B1 54      LDA ($54),Y
3BA0 85 56      STA $56
3BA2 C8         INY
3BA3 B1 54      LDA ($54),Y
3BA5 85 57      STA $57
3BA7 18         CLC
3BA8 A5 54      LDA $54
3BAA 65 56      ADC $56
3BAC 85 54      STA $54
3BAE A5 55      LDA $55
3BB0 65 57      ADC $57
3BB2 85 55      STA $55
3BB4 90 D7      BCC $3B8D
3BB6 18         CLC
3BB7 A5 54      LDA $54
3BB9 69 07      ADC #$07
3BBB 85 54      STA $54
3BBD A5 55      LDA $55
3BBF 69 00      ADC #$00
3BC1 85 55      STA $55
3BC3 A9 28      LDA #$28
3BC5 85 56      STA $56
3BC7 A9 3C      LDA #$3C
3BC9 85 58      STA $58
3BCB A9 00      LDA #$00
3BCD 85 57      STA $57
3BCF A8         TAY
3BD0 A5 56      LDA $56
3BD2 91 54      STA ($54),Y
3BD4 C8         INY
3BD5 A5 57      LDA $57
3BD7 91 54      STA ($54),Y
3BD9 C8         INY
3BDA A5 58      LDA $58
3BDC 91 54      STA ($54),Y
3BDE C8         INY
3BDF C0 4B      CPY #$4B
3BE1 F0 0D      BEQ $3BF0
3BE3 18         CLC
3BE4 A5 57      LDA $57
3BE6 65 56      ADC $56
3BE8 85 57      STA $57
3BEA A5 58      LDA $58
3BEC 69 00      ADC #$00
3BEE 85 58      STA $58
3BF0 90 DE      BCC $3BD0
3BF2 60         RTS
```

Writing letters

If you have a Pet and an Epson MX-80 printer, but not the luxury of a word-processor package, then the Letter Writer program from A Peake of Swansea may be just what you are looking for. It can cope with text up to 2K characters long, though it does not include provision for saving to tape or disc.

The program holds the text in a reserved

(continued on page 156)

Writing letters.

```
10 REM LETTER WRITER. A PEAKE. 4/83.
11 REM ADDRESS IN LINES 112-116.

100 L =10 : REM LEFT MARGIN.
102 R =70 : REM RIGHT MARGIN.
106 PA= 5 : REM PARAGRAPH INDENT.

110 DATA 5: REM LINES IN OWN ADDRESS.
112 DATA "70 Higher Lane","Mumbles
114 DATA "Swansea","SA3 4PD"
116 DATA "(0792) 69885

119 REM FOR 8/16K PETS POKE 53,24/56 & M=6145/14337. 32K PET GIVE
    N.
120 IF PEEK(53)<>120 THEN POKE 53,120:RUN:RESERVES 2K OF MEMORY S
    TARTING AT M
130 M=30721:IF PEEK(M)=170 THEN POKE M,0:POKE M+2046,0:REM SWITCH
    ON VALUE
140 DIM P$(45):REM ALLOWS 45 LINES OF TEXT, OR USE P$(1.2*2048/(R
    -L))
145 N=M:POKE 59468,14: REM LOWER CASE
150 PRINT"[CLR]","Letter Writer",,,"==============[CD][CD]
160 PRINT,"1) Write a letter.[CD]
165 PRINT,"2) Continue with letter.[CD]
170 PRINT,"3) Check if letter in memory.[CD]
175 PRINT,"4) Send a letter to printer.[CD]
180 PRINT,"5) Finish.[CD][CD]
200 PRINT"[REV]Which number please? ";
210 GET A$:IF A$="" THEN 210
220 A=(ASC(A$)AND127)-48: REM ALLOW SHIFTED FIGURES
230 IF A<1 OR A>5 THEN 210
240 PRINT A:PRINT:M=N
250 ON A GOTO 1000, 270, 280,3000
260 END
270 F=2:GOSUB 500:GOTO 2000
280 GOSUB 500:PRINT:PRINT:GOTO 160

499 REM PRINT FROM MEMORY TO SCREEN
500 PRINT "[CLR]"
510 PRINT "[HOM]":M=N:C=0
520 A=PEEK(M):IF A>0 THEN PRINT CHR$(A);:M=M+1:C=-(C+1)*(A<>13):G
    OTO 520
530 IF F=1 THEN POKE M-1,0:F=2:GOTO 510: JUMP TO PREVIOUS PARAGRA
    PH
540 IF F=2 THEN F=0:M=M-C:REM EXIT WITH CURRENT M & C
550 RETURN

599 REM PICK UP 1 LINE OF 'C' CHARACTERS & SKIP LEADING SPACE
600 P$="":C=R-L+PA*(P$(P)>""):IF PEEK(M)=32 THEN M=M+1
610 FOR A=M TO M+C:B=PEEK(A):P$=P$+CHR$(B)
620 IF B=0 OR B=13 THEN M=A+1:B=0:RETURN
630 NEXT:M=A:RETURN

699 REMOVES PART WORD AT END OF LINE
700 C=LEN(P$)
710 FOR A=C TO 1 STEP -1:IF MID$(P$,A,1)<>" " THEN NEXT
720 IF A=0 THEN P$=LEFT$(P$,C-1)+"-":M=M-1:RETURN: NO SPACES SO I
    NSERT HYPHEN
730 P$=LEFT$(P$,A):M=M-C+A
740 RETURN
797 REM"convert PET codes in p$ to EPSON codes in k$
798 REM PET CAPITALS ARE 128 ABOVE LOWER CASE
799 REM MX80 CAPITALS ARE 32 BELOW LOWER CASE
800 K$="":FOR C=1 TO LEN(P$):A=ASC(MID$(P$,C,1)):B=A AND 127
810 IF B>63 THEN B=B-32*(A=B)
820 K$=K$+CHR$(B):NEXT
830 RETURN

999 REM NOW EXTRACT DATA FROM USER
1000 PRINT"Please type the 'TO' address -[CD]
1010 PRINT"Type 'none' if you don't want one,
```

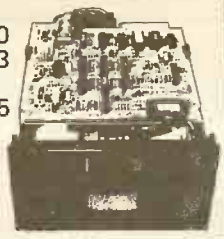
(listing continued on page 156)

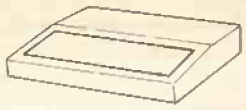
The £ sign should be entered as #. Cursor controls are shown in square brackets: for example, [CL] means cursor left.

TOSHIBA
½ Height Drives
5¼" Drives
ND 04D 48 TPI £210
ND 06D 96 TPI £233
8" Drives
ND 40D 48 TPI £425

SHUGART
5¼" SA 400 £191
8" SA 800 £460
Shugart prices subject to availability.

DISC DRIVES





METAL BBC CASE

Identical to your present plastic case, but allows you to stand your drives and monitor on the top of your micro. ONLY £39.50

T.V.CAMERA

2/3" Miniature T.V. Mains operated 1V pp Composite out
ONLY £150.00

Suitable Lens 16mm, ONLY £23. Many others available from stock.

Sale

PRINTERS SALE

MANY DEMO MODELS AVAILABLE AT STUPID PRICES ALL CARRY FULL WARRANTY.
PHONE FOR DETAILS.

MONITORS

COLOUR MONITOR
Metal Cased RGB/PAL Including Sound!
ONLY £ 232.34 incl.

COME IN FOR A DEMO AND SEE FOR YOURSELF HOW GOOD IT IS!

PLASTIC CASE GREEN SCREEN MONITORS 24 MHz..... £ 92.96

METAL CASED HIGH RESOLUTION ANTI – GLARE SCREEN
Model 125 Amber..... £ 99.00
Model 125 Green ..... £ 98.00

METAL CASED HIGH RESOLUTION STANDARD GLARE SCREEN
Model 128 Amber ..... £ 88.00
Model 128 Green ..... £ 87.00

THESE PRICES INCLUDE VAT AND CARRIAGE – COLLECT AND SAVE £7

SPECIAL OFFER!! SPECIAL OFFER!!
Brand new 12" 90% Non Glare and panelled tube with TTL Driver for 12 Volt operation. Special clearance offer £ 81.75
(The tube alone is worth £62 of the £81)

CROFTON PLEDGE
GO TO YOUR LOCAL COMPUTER DEALER AND ASK HIM FOR A 'CROFTON MONITOR' AT THE ABOVE PRICES. IF HE HASN'T GOT ONE IN STOCK, AND HE WON'T ORDER ONE FOR YOU, WE WILL SUPPLY YOU DIRECT AND REDUCE THE ADVERTISED PRICE BY £10
You will have to give us the Name, Address and Tel. No. of the Dealer who you spoke to in order to qualify.

PRINTERS

EPSOM

RX80T	£307
FX80	£479
MX100FT-3	£518

OK1 - MICRO LINE

M80 P	£241
M82 A	£347
M92 P	£491

IDS - MICROPRISM
Prints like a daisy at a matrix price £414

SEIKOSHA 7 COLOUR
EP 700A £448

QUME

9/45 RO FFP	£1,870
9/55 RO FFP	£2,325

LUCAS LOGIC

Lucas 80	£263
RS232 INT	£56.92

THESE ARE ONLY A FEW OF WHAT WE ARE ABLE TO OFFER. IF YOU WANT ANOTHER PRINTER OR INTERFACE GIVE US A CALL. WE GUARANTEE TO SHIP ORDERS WITHIN 24HRS, OR WE WILL PAY CARRIAGE.

ALL THESE PRICES INCLUDE VAT & CARRIAGE.

Computer Desks
Solid professional tubular frame with drawer.
£25 + carriage £7

ZX81 Keyboard
£29.95

USED EQUIPMENT

Computer Power Supplies
+5V @ approx. 3.5 Amp
+12V @ approx 1.0 Amp
–12V @ approx 1.0 Amp
Voltage can be changed £14
5" Axial Fans £5
Computer Boards... Many useful IC's
£2 each or two for £3.50

BRAND NEW
Tandy Inline Modulators £8

I WOULD LIKE TO PURCHASE THE FOLLOWING ITEMS...
..... £.....
..... £.....
..... £.....
..... £.....

I ENCLOSE A CHEQUE/P.O. FOR £..... PAYABLE TO CROFTON ELECTRONICS OR DEBIT MY
ACCESS CARD NUMBER.....
NAME.....
ADDRESS.....
.....
TELEPHONE NO. .....

CROFTON PLEDGE
I HAVE BEEN TO MY LOCAL DEALER WHO'S NAME IS:
.....
ADDRESS.....
.....
.....
TEL.....
HE COULD NOT SUPPLY A CROFTON MONITOR & I AM THEREFORE CLAIMING MY £10 DISCOUNT ON YOUR ADVERTISED PRICE.

SEND TO: CROFTON ELECTRONICS
35 Grosvenor Road, Twickenham, Middlesex

CROFTON ELECTRONICS

35 Grosvenor Rd., Twickenham, Middx.
Tel. 01-1923/1513 Telex 295093

● Circle No. 181

ALL ABOVE PRICES INCLUDE VAT. CARRIAGE IS ALSO INCLUDED EXCEPT WHERE SHOWN SEPARATELY.

(continued from page 154)

area of memory, rather than in string variables. This area is protected in lines 120 and 130, and the values given are for a 32K Pet — other values for 16K and 8K Pets are given in line 119.

Your own address should be inserted in the Data statements in lines 112 to 116, with the first Data statement in line 110 giving the number of lines in the address.

The Print command at the start of line 2010 is actually the program's own cursor. It is obtained by Shift-&, which gives the chequer-board characters. In lines 1220 and 3210 the maximum length of the address lines is assumed to be 15.

Because text is held in protected memory it is not lost if the program aborts for any reason. Simply run the program again, select option 1, re-enter the headings. When the program says "continue with your letter" — see line 1330 — press the Del key and the text will reappear.

Although designed for use with an MX-80 printer, there is no reason why the program should not work with the MX-100 or the FX-80 printers. It should also run satisfactorily on a Commodore 64.

Crash-proof input

The Pet's annoying habit of aborting a program after the Return key is pressed in response to an input prompt has caused many headaches for programmers and users alike. Many solutions to the problem have been published over the years, from specially written input routines to using the keyboard as an input file. However, Doug Maloney of Cleveland has reminded me of one of the simplest fixes known. It is simply:

```
10 POKE 14, 1

20 INPUT " ; " ; A$

30 PRINT

40 POKE 14, 0
```

Line 10 simply tells the Pet that input is coming from an external device. No question mark prompt is therefore required, and null input is to be ignored. Line 20 performs a normal input with a colon as prompt.

Line 30 forces the cursor to return to the next line as the Return at the end of the input is not echoed back to the screen as it would normally be. Thus, the cursor ends up exactly where it was when the Return key was pressed. Finally, line 40 returns everything to normal.

The prompt in the Input command is important as it prevents a null input being accepted. In that case A$ would be set to a null string. But if that is in fact what is required the prompt could be omitted; the program will still not abort if Return is pressed with no input. Only a string variable should be used. A numeric variable would result in an error being generated; a numeric response is simply obtained using the Val function. μ

(listing continued from page 154)

```
1020 PRINT"and also after the last line.[CD]
1030 PRINT"Press RETURN at the end of each line.[CD]
1040 PRINT"Address:-":OPEN1,0:A=1:REM IMPROVES PET'S DODGY INPUT
     ROUTINE
1050 PRINT"Line";A;"is ? ";:INPUT£1,A$:PRINT
1060 IF A$<>"none" THEN AD$(A)=A$:A=A+1:GOTO 1050
1070 CLOSE1:AD$(0)=STR$(A-1):IF A=1 THEN 1200
1080 PRINT:FOR B=1 TO A-1:PRINT,AD$(B):NEXT
1090 PRINT:PRINT"[REV]Is this correct (y or n)? ";
1100 GET A$:IF A$="" OR (A$<>"y" AND A$<>"n") THEN 1100
1110 PRINT A$:PRINT:IF A$="n" THEN 1000
1200 PRINT"[CD]Type the date,('none' if not wanted),   followed b
     y RETURN? ";
1210 OPEN1,0:INPUT£1,A$:PRINT:CLOSE1
1220 PRINT:IF LEN(A$)<16 THEN 1250
1230 PRINT "[REV]";A$;"[OFF] is too long -
1240 PRINT"Would you shorten it please?":GOTO 1210
1250 DT$="":IF A$<>"none" THEN DT$=A$
1300 PRINT"The 'Greeting' (Dear Sir / Your Grace / Mrs Smith) ? "
     ;
1310 OPEN1,0:INPUT£1,TL$:PRINT:CLOSE1
1320 PRINT"[CD]Now continue with your letter, using
1330 PRINT"RETURN only at the end of a paragraph.[CD]"

1999 REM GET A CHARACTER AND CHECK IT
2000 IF M+C>N+2045 THEN 2100:REM CHECK ROOM
2010 PRINT"^&[CL]";:REM PRINT OWN CURSOR OF SHIFTED &
2020 GET A$:IF A$="" THEN 2020
2030 PRINT" [CL]";:A=ASC(A$):B=A AND 127: REMOVE CURSOR & UNSHIFT
      A$
2040 IF B<32 OR B>95 OR B=34 THEN 2060
2050 A=B-128*(A>192):PRINT CHR$(A);:POKE M+C,A:C=C+1:GOTO 2000
2060 IF B=13 THEN PRINT:POKE M+C,B:POKE M+C+1,0:GOTO 160
2070 IF B=20 AND C=0 THEN F=1:GOSUB 500:GOTO 2000: ALLOWS DELETE
     KEY
2080 IF B=20 THEN PRINT CHR$(B);:POKE M+C,0:C=C-1:POKE M+C,0
2090 GOTO 2000

2100 PRINT:PRINT"There is no more room left. I advise
2110 PRINT"option '4' below, followed by '1'.[CD]
2120 GOTO 160

2999 REM PUTS BODY OF LETTER INTO ARRAY P$(P) FOR FASTER COPIES
3000 M=N:P=0:P$(0)=CHR$(9):PRINT,"[CD][CD]Please Wait.
3010 GOSUB 600 : REM PICKUP 1 LINE
3020 IF B>0 AND PEEK(M)<>32 THEN GOSUB 700: REMOVE PART WORD
3030 GOSUB 800 : REM AND CONVERT FOR PRINTER
3040 P$(P)=P$(P)+K$:P=P+1:P$(P)=""
3050 IF B=13 THEN P$(P)=CHR$(9): REM PARAGRAPH INDENT (2ND TAB)
3060 IF B>0 THEN 3010
3070 W=P-1: REMEMBER NUMBER OF LINES

3099 REM FIRE UP PRINTER
3100 PRINT"[CLR]","PLEASE CHECK -[CD][CD]
3110 PRINT"1)  The Printer is ON,[CD]
3120 PRINT"2)  the READY light is ON
3130 PRINT"     (press 'ON LINE' button if not),[CD]
3140 PRINT"3)  there is paper in the machine.[CD][CD][CD]
3150 PRINT"     Press SPACE BAR when ready.
3159 REM PET ABORTS IF PRINTER NOT READY, SO- WAIT FOR SPACE
3160 WAIT 59410,4,4:POKE 158,0 : REM THEN CLEAR KEY BUFFER

3200 E$=CHR$(27):A$=CHR$(9)+CHR$(9)+CHR$(9):OPEN4,4
3210 PRINT£4,E$;"d";CHR$(L);CHR$(L+PA);CHR$(R-15);CHR$(0):REM SET
      TABS
3220 PRINT£4,E$;"0";E$;"e":REM LINE SPACING & EMPHASISED ADDRESS
3230 RESTORE:READ P:FOR D=1 TO P:READ P$:GOSUB 800:REM YOUR ADDRE
     SS
3240 PRINT£4,A$;K$:NEXT:PRINT£4,E$;"f":REM CANCELS E$;"e"
3250 IF DT$>"" THEN P$=DT$:GOSUB 800:PRINT£4,A$;K$:REM DATE
3260 P=VAL(AD$(0)):IF P=0 THEN 3300
3270 FOR D=1 TO P:P$=AD$(D):GOSUB 800:REM HIS/HER ADDRESS
3280 PRINT£4,CHR$(9);K$:NEXT
3300 PRINT£4,E$;"2":REM LINE SPACING
3310 P$=TL$:GOSUB 800:PRINT£4,CHR$(9);K$
3319 REM ALL THIS FOR THE SAKE OF THE NEXT LINE!
3320 FOR P=0 TO W:PRINT£4,CHR$(9);P$(P):NEXT
3330 PRINT£4,CHR$(7):CLOSE4:PRINT

3400 PRINT"[CD][CD][REV]Do you want another copy (y or n)?
3410 GET A$:IF A$="" OR (A$<>"y" AND A$<>"n") THEN 3410
3420 IF A$="y" THEN 3100
3430 GOTO 150
```

The printer you've all been waiting for.

Epson have done it again! Realising a genuine need in the market place for a printer that not only has the same advanced features as its sister, the well tested RX-80, but also has the ability to accept both single sheet and fanfold paper; we bring you the RX-80 F/T.

This latest addition to our range of fine printers gives you dot addressable graphics, standard Centronics compatible interface with a range of interfaces to suit most machines and a fast 100 characters per second print speed.

By incorporating both friction and tractor feed, (which allows for variable paper width) Epson have produced a completely versatile printer at a thoroughly realistic price. Just another example of how we at Epson are not only identifying customer needs, but acting to serve them staying one step ahead of the field with our quality range of printers and computers.

Don't wait any longer...find out about the RX-80 F/T today.

EPSON

Extraordinary product.
Exceptional quality.

Epson (UK) Limited, Freepost, Wembley, Middlesex HA9 6BR.
Sales Enquiries: Freefone EPSON.
General Enquiries: 01-902 8892.
Telex: 8814169.

☐ I would like a demonstration of the RX-80 F/T.
☐ Please send me details of my local stockist.

Name _____

Position _____

Company _____

Address _____

_____

Telephone _____

PC12/P

● Circle No. 182

Be Spoilt

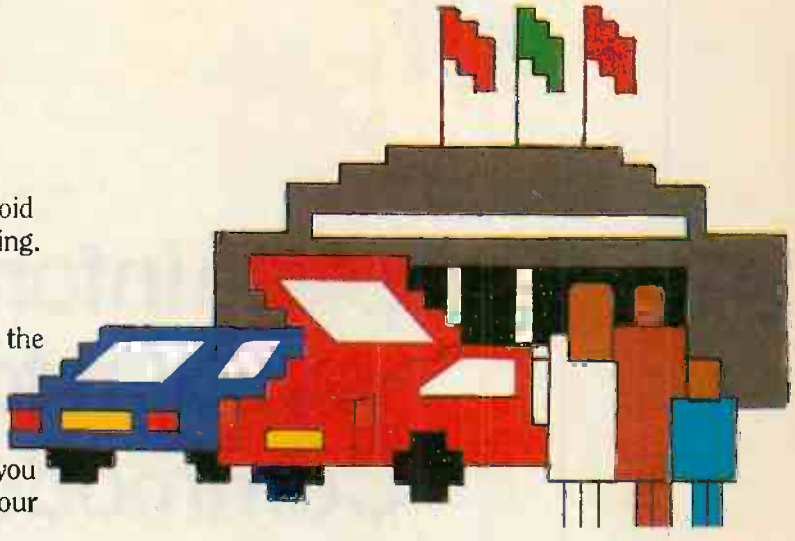
Your Computer Christmas Fair

50p OFF

This voucher entitles the bearer to – a 50p reduction on the purchase of one adult or child full price ticket. This cannot be used with any other offer.

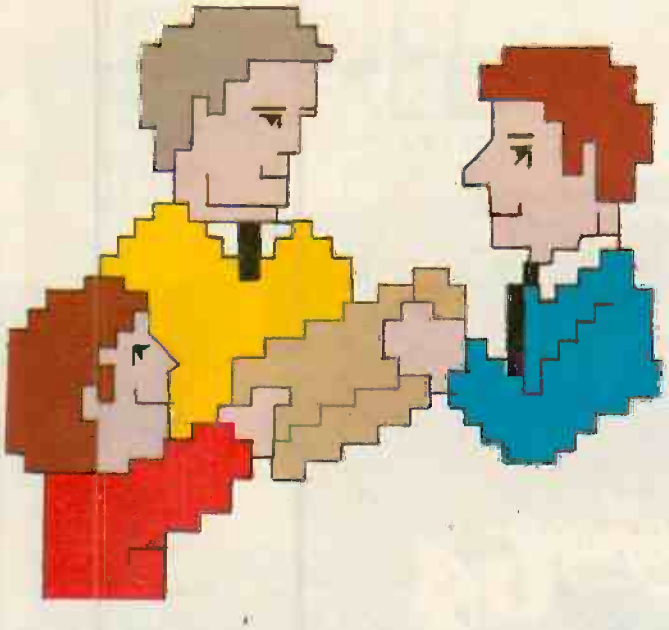
December 15-18, 1983 Wembley Conference Centre

For Choice...



Why not be spoilt for choice this Christmas and avoid all the usual rush, hassle and frustration of present buying. By visiting the first Your Computer Christmas Fair (December 15-18) you can be sure of seeing a truly vast range of microcomputer products, all under one roof at the Wembley Conference Centre, the most modern and comfortable exhibition venue in the country.

Whether you're interested in choosing a micro for home management, child education or games playing, you can see everything demonstrated at the show, with all your questions answered by expert sales staff from the manufacturers, dealers and software houses. Huge amounts of software and hardware, add-ons like joysticks and printers, plus a special Sinclair Village, will be at the show, so you can purchase the system you really want.



Large product stocks held on site mean no one will be disappointed and, because most exhibitors will accept major credit cards, you can try and buy in comfort, at the show.

As Wembley Conference Centre has parking for a staggering 5,000 cars you will be able to take away all the purchases you make on the day. The Conference Centre, with its excellent and economical catering facilities, is the ideal pre Christmas treat for the whole family, away from the high street crush.

Opening times are from 10 am to 6 pm every day except Friday – Special late night 8 pm closing. Because the exhibition remains open until 6 pm on the last Sunday before Christmas you can be assured of buying all your micro goodies.

There's never been a better way to shop for micro computer presents. So wrap up your Christmas gift worries at the Your Computer Christmas Fair.

Sponsored by

YOUR COMPUTER

Organised by
Reed Exhibitions
Surrey House
1 Throwley Way Sutton
Surrey SM1 4QQ
Tel: 01 643-8040

Admission Price
£2·50 Adults
£1·50 Children

Wembley Conference Centre
December 15-18, 1983

commodore

Superbase 64

The Complete information Control system for the Commodore 64

Available from Commodore Dealers and selected major retail outlets

Precision Software

Precision Software Limited
Park House, 6 Park Terrace,
Worcester Park, Surrey, KT4 7JZ.
Telephone: 01-330 7166
Telex: 8955021. PRECIS G

● Circle No. 183

RML typewriter

THE PROGRAM Type was designed by Ron Bulmer of Whitehaven Grammar School to enable a Research Machines 380-Z linked to an Epson MX-80 F/T Mk III printer to be used as an electronic typewriter. Many schools in Britain now possess a Research Machines 380-Z, one of the first computers recommended by the Department of Education and Science. It has some impressive features, notably its disc drives, the ability to run CP/M and its high-resolution graphics. It also has quite an advanced Basic, and the potential to run other high-level languages.

At Whitehaven Grammar School, we decided to link it to an Epson MX-80 FT Mk III printer. This printer has some excellent facilities: we were impressed by its ability to produce emphasised or double-struck characters in both normal and double-width mode. Even more interesting was its condensed mode, which produced a typeface which compares favourably in elegance and legiblility with many "letter-quality" printers.

The condensed mode seemed ideally suitable for general-purpose text for such routine school purposes as student records, exam papers, form lists and the like. It also offered possibilities, since it reproduced clearly on a Xerox or an offset copier, for the production of a school magazine or news sheet. The emphasised mode seemed perfect for titles and headings.

Ideally, of course, a commercial word processor would be used. Packages such as WordStar are breathtakingly comprehensive in the facilities that they offer, but they do have some drawbacks. As well as the expense of the software itself they need a fair amount of operator experience for proper use, and since they are written in machine code, they cannot easily be modified for a specific job.

I wrote Type as an inexpensive and easy-to-use alternative to a full-blown word processor. Type had to make use of the Epson printer's facilities and meet the following criteria:

- user-friendliness, to make it easy for non-experts to run,
- standard text in condensed characters,
- a choice of line widths from 10 to 110 characters, with 100 as standard line width,
- automatic line feed at a word space,
- both normal and expanded characters in double-printed form for titles and headings, and
- automatic centering of titles and headings.

Line justification is not included; I regard computer justification as an abomination. All the specifications are met by Type, and inexperienced operators have used the program after only a few minutes explanation.

If you put Type on the same disc as CP/M and Basic, then after booting the system, typing

Basic Type

will load and run the program. It first asks whether you require the standard line length of 100 characters, or some other length. The standard 100 characters was chosen as being most suitable for the ubiquitous A4 sheet. About 75 to 80 characters is suitable for A5.

You are then ready to type in your text. Most of the keyboard keys function in the normal way, and those keys such as Shift, Caps Lock and Delt perform normally. A standard-length line occupies about 2½ screen lines, and deleting is possible over the wrap-around of lines on screen. The Return key is only used to terminate short lines, such as end-of-paragraph lines. Normal-length lines are terminated automatically. This, of course, is what makes even the simplest word processor so much nicer to use than an ordinary typewriter. There are no opening quotes on the 380-Z keyboard so the reversed vertical line key, shifted, at the top right-hand side of the keyboard, is used instead. It may look a trifle strange on screen, but it prints quite well.

As each line is completed, it is automatically transferred to the printer and printed out. Typing Return at the beginning of a line prints a blank line. When you have finished your text, pressing Esc takes you back into Basic.

A change of type is signalled to the printer by a coded prefix to the line. The codes used are the two punctuation characters: and! for normal and expanded bold characters respectively, and the character > to centre the line. For example:

!TITLE

prints "TITLE" in expanded characters

:HEADING

prints "HEADING" in bold characters

!>TITLE

prints "TITLE" in expanded characters, centred

:>HEADING

prints "HEADING" in bold characters, centred

>SUBHEADING

prints "SUBHEADING" in condensed characters, centred. There are fewer characters per printed line with normal or expanded characters, so the program limits input on lines prefixed by : or ! to the bold-letter equivalent of 100 condensed characters.

(continued on next page)

Type.

```
10 REM "TYPE" PROGRAM (C) RON BULMER 6.1.83
20 REM Produces narrow type output from an Epson MX80 F/T3 printer using the R.M.380Z computer
30 CLEAR 1000:PRINTER 3:PUT 31          :REM allocate string space; parallel feed; clear screen
40 CR$=CHR$(13):D$=CHR$(127):E$=CHR$(27):D2$=CHR$(8)+" "+CHR$(8):C5$=CHR$(15):C8$=CHR$(18)
50 ?:?:?TAB(11)"Check printer ON":?
60 ?"   Standard (100) line Length? (Y/N)";
70 G$=GET$(£0):?G$:IF G$="Y"OR G$="y"THEN LL=100:GOTO 100  :REM LL=line length
80 ?:?TAB(8)"Line length required"CR$;TAB(7);:INPUT"(between 10 and 110)";LL
90 ?:?:IF LL>110 OR LL<10 THEN 80       :REM reject input outside line length limits
100 ?:?TAB(12)"Ready for text":?:?
110 LPRINT C5$;                         :REM set printer for narrow characters
120 L1=0:A$=""                          :REM L1=flag for bold heading line, initially set at 0
130 G$=GET$(£0):IF G$=E$ THEN 370       :REM E$ (ESC key) exits from program
140 IF G$=D$ AND A$=""THEN 120          :REM idiot-proofs the DELT key (D$)
150 IF G$=CR$ THEN 240                  :REM CR$ (RETURN key) ends line & sends it to printer
160 IF G$=D$ THEN G$=D2$:A$=LEFT$(A$,LEN(A$)-1):IF A$=""THEN L1=0
170 IF A$="!"THEN L1=LL*0.285+1.5       :REM L1 sets maximum length of heading line
180 IF A$=":"THEN L1=LL*0.575+1.5       :REM     "    "       "       "    "
190 L=LEN(A$):IF L>LL-4 AND G$=" "OR L>LL-4 AND G$=" "THEN 240  :REM ends line after char. no.LL-4
200 IF L>L1 AND L1>0 THEN 130           :REM limits line length to L1 on bold headings
210 PRINT G$;:IF G$=";"THEN G$=CHR$(96) :REM substitutes for leading inverted comma
220 IF G$<>D2$ THEN A$=A$+G$            :REM avoids adding DELT char. to line in memory
230 GOTO 130
240 IF L<>40 OR L<>80 THEN ?            :REM avoids blank line on screen after lines of 40 or 80
250 IF LEFT$(A$,1)="!"THEN 320          :REM selects typeface of heading
260 IF LEFT$(A$,1)=":"THEN 300          :REM    "       "    "    "
270 IF LEFT$(A$,1)=">"THEN 290          :REM flags centred heading
280 LPRINT A$;CR$:GOTO 120              :REM prints ordinary lines
290 LPRINT SPC((LL+1-L)/2);MID$(A$,2);CR$:GOTO 120  :REM prints centred ordinary lines
300 IF MID$(A$,2,1)=">"THEN C=1:LPRINT SPC((LL-(L-2)*1.74)/2+.5);
310 LPRINT C8$;:GOTO 340                :REM last 2 lines deal with bold centred headings
320 IF MID$(A$,2,1)=">"THEN C=1:LPRINT SPC((LL-(L-2)*3.48)/2+.5);
330 LPRINT C8$;CHR$(14);                :REM last 2 lines deal with expanded centred headings
340 LPRINT E$;"E";:IF C=1 THEN LPRINT MID$(A$,3);:C=0:GOTO 360  :REM ESC"E" sets bold type
350 LPRINT MID$(A$,2);                  :REM this omits the prefix code
360 LPRINT CR$:LPRINT E$;"F";:GOTO 110  :REM ESC"F" switches off bold type
370 ?:LPRINT C8$;:END                   :REM switches off narrow characters on printer
```

(continued from previous page)

The program will work just as well with Rem statements omitted. The Clear statement in line 30 allocates string space in memory. This program does not use much memory — only enough for a single line of text, in fact — so a smaller figure than that given would suffice. Printer 3 indicates the type of printer interface; in our case it is a Centronics-type parallel feed.

Line 40 gives some of the regularly used commands more compact names. For example, CR$ is Carriage Return, D$ is the standard Delete, and E$ is the Escape code. D2$ is an alternative form of Delete, with the advantage of allowing "round-the-corner" deletion of screen lines — something that the 380-Z Basic editor lacks. C5$ and C8$ open and close the printer's Narrow Type mode.

Variable L1 in line 120 is the title-line flag. It is initially set at 0, but reset to the appropriate line length whenever : or ! are input as a line prefix. The resetting is done at lines 170 and 180. A$ is the input line of text, initially a null string.

Line 160 changes the standard Delete to D2$, allowing screen wrap-around deletion. Line 240 ensures that unnecessary Carriage Returns after a line of exactly 40 or exactly 80 characters are avoided.

Banner

BANNER is a short and simple program for the RML 380-Z written by Mark Callaway of Alnwick, Northumberland. It uses the advanced features of Basic SG2 to print banners on a printer. The program magnifies each letter in your message to 80 characters high and dumps it on the printer. To improve the look of the output, Banner strips the blank columns off the sides of each letter and separates each letter with a fixed number of spaces.

Many programs for printing magnified characters need hundreds of binary numbers to specify the shape of each character. Most micros have this data in the character-generator ROM but it is often placed inaccessibly on the VDU board. Research Machines. Basic SG2 has a command which prints magnified characters on the high-resolution graphics board. By examining these characters you can find the elusive codes defining the shape of each character. Once you have done this, printing is simple.

Owners of micros such as the BBC, which do not have separate graphics and text boards, can simply print letters on the screen and use the Point command to discover the shape of the characters.

Card is a more sophisticated program which works on the same principle as Banner. It lets you write a six-line message on the screen and dumps it on an 80-column printer. Like Banner, the program proportionally spaces the output: Card does this by drawing each letter on the screen and measuring the gap between it and the previous letter. The computer then blanks the letter and redraws it packed against the previous letter. The program then dumps the message on your printer by examining the high-resolution graphics board.

Banner.

```
10 REM Banner Printer by Mark Callaway
20 REM C 30/12/82
25 REM For RML 380Z with Hi-Res, BASICSG2 and a printer.
26 REM
30 INPUT"What is you message ";M$
40 INPUT"Width of letters ";W
50 INPUT"Gap between letters ";G
60 INPUT"Do you want me to print with a particular character (Y/N) ";R$
70 IFLEFT$(R$,1)="N"ORLEFT$(R$,1)="n"THENR$="n":GOTO90
80 INPUT"Which character shall I use ";C$
90 CALL"RESOLUTION",0,2            :REM enable Hi-Res graphics
100 CALL"CHARSIZE",20,20           :REM magnify characters 20 times
110 FORX=1 TO LEN(M$)
120   T$=MID$(M$,X,1)
130   CALL"STPLOT",0,0,VARADR(T$),2 :REM print T$ magnified 20 times
140   IFR$="n"THENC$=T$            :REM C$ is the character which goes on the printer
150   FORS=0TO7                    :REM S scans through the 8 columns which make up each character
160     IFT$=" "THEN190
170     FORZ=0TO7:CALL"RDOUT",5+S*20,5+Z*20,VARADR(I):IFI=2THEN190
180     NEXTZ:GOTO250              :REM checks to see if this column of the character is blank
190     FORU=1TOW                  :REM This loop sets the width of the printed letters
200       FORT=0TO7                :REM T scans up the columns which make up each character
210         CALL"RDOUT",5+(S*20),5+(T*20),VARADR(I)  :REM I is set to the intensity of pixel S,T
220         IFI=2THENFORV=1TO10:LPRINTC$;:NEXT ELSE LPRINT"          ";
230       NEXTT:LPRINT: REM LPRINT prints on the printer
240     NEXTU
250   NEXTS
260   CALL"STPLOT",0,0,VARADR(T$),0 :REM blank the magnified character
270   FORY=1TOG:LPRINT:NEXTY       :REM print gap between letters
280 NEXTX
```

Card.

```
10 REM Card by Mark Callaway
20 REM C 2 January 1983
30 REM Prints a 6 line message on a printer
40 REM Requires RML 380Z with Hi-Res and BASICSG2
50 REM
60 REM Instructions - type your message slowly and give the computer
70 REM time to pack the letters together.
80 REM Press return at the end of each line.
90 REM When you try to skip onto the seventh line,
100 REM the computer will ask you if you want your message printed.
110 REM
120 REM If your printer doesn't force a return/linefeed every 80
130 REM characters, add '575 LPRINT'.
140 I=0
150 GRAPH
160 TEXT
170 PRINT"Press '!' to escape"
180 CALL"RESOLUTION",0,2
190 CALL"PLOT",288,0,2:CALL"LINE",288,192
200 CALL"CHARSIZE",4,4
210 XC=0:YC=160
220 A$=GET$(20000)
230 IFASC(A$)=13THEN500
240 IFA$="!"THEN530
250 CALL"STPLOT",XC,YC,VARADR(A$),3
260 REMfindfirst non-blank column
270 OX=XC
280 IFA$=" "THEN330
290 FORS=0TO7
300 CALL"RDOUT",XC,YC+S*4,VARADR(I)
310 IFI<>0THEN330
320 NEXT:XC=XC+4:GOTO290
330 IN=XC-OX
340 REM IN = NUMBER OF BLANK COLUMNS
350 REM FIND NO OF BLANK COLUMNS AT END OF
    PREVIOUS CHARACTER
360 X=OX
370 IFOX=0THEN420
380 FORS=0TO7
390 CALL"RDOUT",X,YC+S*4,VARADR(I)
400 IFI<>0THEN420
410 NEXT:X=X-4:GOTO380
420 BACK=OX-X
430 REM BACK=NO BLANK COLUMNS AT END OF PREVIOUS CHAR
440 IFA$=" "THENCALL"FILL",OX-BA+4,YC,OX-BA+28,YC+28,1
450 CALL"STPLOT",OX,YC,VARADR(A$),0
460 CALL"STPLOT",OX-IN-BA+8,YC,VARADR(A$),3
470 XC=XC-IN-BACK
480 XC=XC+32
490 IFXC<288THEN220
500 YC=YC-32:XC=0
510 IFYC>=0THEN220
520 REM PRINT
530 INPUT"Shall I print this ";R$
540 IFLEFT$(R$,1)="n"ORLEFT$(R$,1)="N"THENRUN
550 INPUT"Which character shall I print with ";C$
555 REM Walters WM 2000 owners try 550 C$=CHR$(166)
560 FORY=0TO48
570 FORX=0TO79
580 CALL"RDOUT",X*4,192-Y*4,VARADR(I)
590 IFI=3THENLPRINTC$; ELSE LPRINT" ";
600 NEXT
605 IFY/8=INT(Y/8)THENLPRINT
610 NEXT
620 TEXT
```

- **Britain's No 1 range of products**
- **Check our UK dealer network for your nearest outlet**
- **After sales service from our own factory and engineers**

It's our aim to provide satisfaction at the sign of the Big 'M'. By providing local distributors, best prices and service, we offer you the most. If you don't see it in our ad ask your local distributor, or write to our Head Office for full list.

All prices include VAT
All prices correct at time of going to press, but subject to change

All products normally in stock but to prevent a wasted journey phone your local dealer first before calling.

● Circle No. 185

BBC HARDWARE

Electron
Son of the BBC
at selected
retailers
NOW

A full colour 32K ROM computer with text and graphics modes up to 640 x 256 graphics and 80 column text screen, extended Microsoft basic, built in assembler 1 MHZ and tube interface, sideways ROM, RS 423, A/D converter.

BBC Model B £399

ALSO AVAILABLE

BBC Model B + Econet
BBC Model B + Disk Interface
BBC Model B + Disk Interface + Econet

DATA BASE RETRIEVAL AND INFORMATION PACKAGE

BBC and Disk Interface Disk Drive, Green Monitor, Dot Matrix printer, Data Base program complete with all cables, manuals and formatting disk.

£1075

This month's SPECIAL FEATURE

RGB STD/RES £247.25

RGB Colour, standard resolution. As used by Acorn Computers. This is a top quality monitor, also comes in high resolution.

RGB Colour HIGH/RES £632.50

SANYO GREEN

One of the best value monitors on the market – ideal for the first time user

£95.52

PHOENIX ORANGE

£95.52

Another top quality monitor – good, lightweight, hard plastic casing, easily portable, for use everywhere

● Circle No. 186

Disk Drives

100K disk drive	**£201.25**
200K single disk drive	**£241.50**
400K single disk drive	**£396.75**
800K dual disk drive	**£711.85**

Software

UK's No. 1 range of software. Check availability with your local dealer

SINCLAIR SOFTWARE – SEND FOR LIST

Printers

SEIKOSHA GP100	**£214.99**
SEIKOSHA GP250	**£276.00**
EPSON RX80	**£339.25**
EPSON FX80 160 cps	**£454.25**
OLIVETTI SPARKJET PRINTER	**£419.75**
SMITH CORONA D/W/HEEL	**£459.00**
TEC STARWRITER 40 cps	**£1265.00**
JUKI 6100 D/W/HEEL	**£458.85**
STAR MCP40 COLOUR PRINTER	**£171.35**
STAR DP510	**£275.00**

COMMODORE

CASSETTE UNIT	**£44.95**
DISK DRIVE 1541	**£229.00**
PRINTER 1515	**£230.00**
JOYSTICK 1311	**£7.50**
PADDLES 1312	**£13.50**

NEW

CONCHESS

This remarkable chess game comes in 3 different finishes. Warning . . . try it once and you're sure to buy it.
Models available:

ESCORTER	**£179.99**
AMBASSADOR	**£229.99**
MONARCH	**£179.99**

LYNX

LYNX 96K	**£299.00**
JOYSTICK INTERFACE	**£13.95**
SERIAL INTERFACE	**£3.99**
CENTRONICS INTERFACE	**£49.95**

Workstation

Designed to take computer, disk drive, printer and paper. Robustly built for school, business or home use.

700mm **£118.00**
1100mm **£138.00.**

£5 GIFT VOUCHERS

Want to buy a present but don't know exactly what to get?

Big 'M' Gift Vouchers are the answer, in £5, £10 and £20 denominations. Available at your local Big 'M' dealer – check out list for your local store.

NEW

MASTER CLASS VIDEO

Finding it hard to come to terms with user manuals. Master Class videos will take you step by step and make first time computing much more enjoyable. Hire or buy for a very low cost.

TORCH Z80 Disk pack (Including perfect software)	**£839.50**
JUPITER ACE	**£69.95**

Look out for our special Christmas ZX81 pack.

ZX81

1K RAM, world's largest-selling computer, 16K expansion pack, masses of software, basic language, many expansions including keyboard/memory/printer, high resolution graphics.

£39.95

16K RAM	**£29.95**
ZX PRINTERS (NO PSU)	**£39.95**

SINCLAIR SOFTWARE – SEND FOR LIST

RETAILERS WANTED

Think you're good enough to become a Big 'M' distributor? Full back up given. Write for details and application forms to

Steve Macfarlane
Micro Management
16 Princes St, Ipswich
Tel: (0473) 219461

SINCLAIR

SPECTRUM

16K and 48K, basic, colour, text and graphics, vast range of software including education, printer, built-in speaker. You can build a very good system at a very good price.

ZX SPECTRUM 48K **£129.95**

ZX SPECTRUM 16K **£99.95**

COMMODORE

COMMODORE 64

-64K RAM,

colour, sophisticated ROM/RAM user, full business applications, disk drives available, sound, UHF/composite video, proven basic language, exceptional value, high resolution graphics, many "add-ons" available, printers.

£229.00

ORIC

48K, colour, high resolution graphics 240 × 200, text 28 + 40, pre-programmed sound, user-defined keyboard/graphics, non touch-sensitive keyboard, microsoft type basic with powerful extensions, RGB/UHF, standard cassette interface, parallel printer output, several periferals available, printers available modems and PRESTEL (coming).

ORIC-1 48K **£139.95**

LYNX

LYNX 48

48K standard, expandable to 192K, colour, 57 key typewriter keyboard, CP/M compatible, serial port, high resolution graphics 265 × 248, digital/analogue sound converter, RGB/UHF composite video, RS232/parallel, cassette.

£224.99

DRAGON

DRAGON 32

32K RAM, colour, extended basic, sound 5 octaves 255 tones, vast software range, typewriter keyboard, standard cassette drive, high resolution graphics, 256 × 192, text 16 + 32, looks like a British worldbeater.

£174.99

MEMOTECH MTX SERIES

Powerful fast Z80 computers with 16K video RAM *plus* 32K or 64K user RAM (500 or 512) – both expandable to 512K.

*Intergral joystick ports (2) – cassette port (2400 bd) – centronics interface – TV + sound – composite video monitor – hi-fi – cartridge port – expansion bus.

*ROM contains ASSEMBLER/DISASSEMBLER, PROGRAM MONITOR, NODDY & extended BASIC with commands for 32 SPIRITES; 4 CH SOUND; 40 × 24 TEXT or 32 ×24 TEXT with 256 × 192 PIXELS each in COLOURS; 8 virtual screens.

MTX 500: **£275**

MTX 512: **£315**

Up to £1000 instant credit available through selected Big 'M' dealers. Ask for details. Financed by Lombard Tricity (APR).

AGENTS

Aberdeen
Microcomms
372-374 George St.
0224 633385

Abergele
Abergele Computer Centre
8 Water St. 0745 826234

Altrincham
M Copeland Ltd
37 Stanford New Rd.
061 928 0087

Ballymoney
Everyman Computers
Charlotte St. 02656 62116

Bedford
The Software Centre
52a Bromham Rd. 0234 44733

Bishop's Stortford
3 Church St. 0279 506801

Bridgend
Automation Services
31 Wernlys Rd. Penyfai 0656 720959

Bristol
Brensall Computers Ltd
24 Park Row. 0272 294188

Brixham
Computer Systems (Torbay)
Pump St. 08045 6565

Bromley
Datastore
6 Chatterton Rd 01 460 8991

Chelmford
Essex Computer Centre
Moulsham St. 0245 358702

Clacton-on-Sea
Clacton Computer Centre
Pier Avenue 0255 422644

Colchester
Capricorn Computer Centre
32 North Hill
0206 68471

Croydon
Universal Micro Peripherals
233 London Road, W Croydon
01 683 0060

Derby
First Byte Computers
10 Main Centre
London Rd. 0332 365280

Dover
Dover International Computer Centre
18-19 The Charlton Arcade
High St. 0304 212433

Co Durham
Knowledge Computer Centre
15 North Burns
Chester-le-Street
0385 888144

Gloucester
The Model Shop
79 Northgate St. 0452 410693

Guildford
The Model Shop
23 Swan Lane 0483 39115

Hastings
The Computer Centre
37 Robertson St. 0424 439190

Haverfordwest
The Computer Centre (BIS)
22 Market Courtyard Shops
Haverfordwest. Dyfed
0437 68228

Heckmondwike
Thoughts and Crosses
37 Market St.
Heckmondwike, W Yorks
0924 402337

Hemel Hempstead
Faxminster
25 Market Square 0442 55044

Horsham
Microstore
13b West St.
0403 52297

Hull
Computer Centre (Humberside)
26 Anlaby Rd. 0482 26297

Ipswich
Micro Management
32 Princes St. 0473 59181

Ipswich
Brainwave Micro's
Crown St. 0473 50965

London
Computers of Wigmore St.
87 Wigmore St., W1 01 486 0373

London
The Advanced Technology Centre
207 Eltham High St.
London SE9 01 859 7696

Norwich
Richard Pank
Anglia Square
0603 27963

Norwich
Byteronics
40 Cowgate

Nottingham
Computer Market
27 Goose Gate
0602 586454

Plymouth
The Model Shop
11 Old Town St. 0752 21851

Preston
4MAT Computing
67 Friar Gate
0772 561952

Scunthorpe
Ashby Computer Centre
298 Ashby High St.
0274 871756

Sheffield
Just Micro
22 Carver St. 0742 752732

Shetland
Tomorrows World
Esplanade. 0595 2145

Southend-on-Sea
Estuary Software
261 Victoria Ave. 0702 43568

Stoke on Trent
Town Computer Store
30 Town Rd., Hanley
0782 287540

Stroud
The Model Shop
22 High St. 04536 5920

Surbiton
Computasolve
8 Central Parade, St Marks Hill
01 390 5135

Welling
Bureau Computer Services Ltd
52 – 54 Bellegrove Rd.
01 301 2677

SPECIAL OPPORTUNITY

£1 OFF

PURCHASES OVER £20

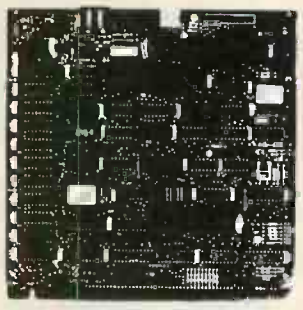
Use this coupon to get even better value at your local Big 'M' dealer. Check our list for your nearest dealer.

This coupon can be used at any official Micro Management dealer. The bearer is entitled to a £3 reduction on purchases over £75. Only one coupon per person can be redeemed. Valid until January 30th 1984. Micro Management 16 Princes Street, Ipswich, Suffolk.

Micro Management Head Office: 16 Princes Street Ipswich Suffolk Tel: 0473 219461

● Circle No. 187

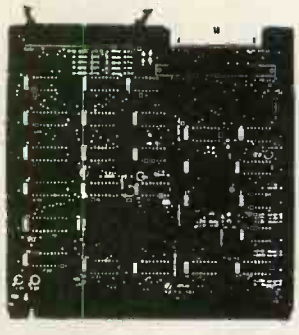
MicroValue 80-BUS MULTIBOARDS



GM813—CPU/64K RAM Board

* 4MHz Z80A C.P.U.
* 64K Dynamic RAM
* RS232 Interface
* Two 8-Bit I/O Ports
* Cassette Interface
* Extended & Page Addressing Modes
* CP/M Compatible Monitor

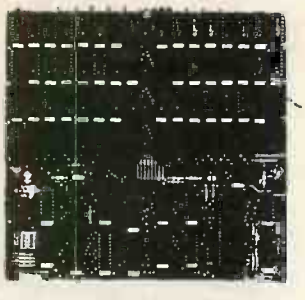
£225



GM829—Disk Controller Board

* Up To 4 Mixed 5.25 & 8" Drives
* SASI Hard Disk Interface
* Single & Double Density Operation
* Single & Double Sided Drive Support
* Supports 48 and 96 TPI Drives

£145

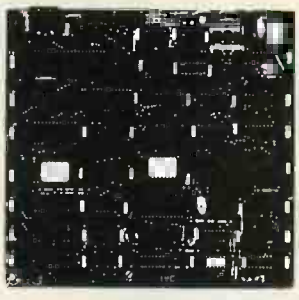


GM833—RAM-DISK Board

* Virtual Disk Operation
* 512K Dynamic RAM
* Port Mapped For Easy Interface Software
* Over 10 Times Faster Than a Floppy Disk

£450

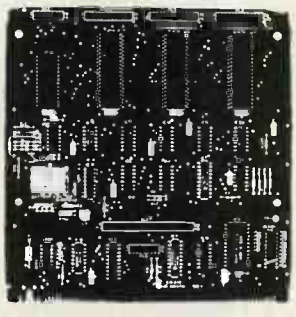
Please note: This board cannot be used as a conventional RAM board



GM812—Video Controller Board

* 80 Characters x 25 Line Display Format
* On-board Z80A Microprocessor
* Buffered Keyboard Input
* Programmable Character Generator
* 160x75 Pixel Graphics
* Light Pen Input

£125



GM816—Multi I/O Board

* 6 I/O Ports
* 4 Counter/Timer Channels
* On-Board Real Time Clock
* Battery Backup
* Further Expansion Capability

£125

PLUTO—Colour Graphics Board

* On-Board 16 Bit Microprocessor
* 640x576 Bit Mapped Display
* 192K Of Dual Ported RAM
* Comprehensive On-Board Software

£399

CLIMAX—Colour Graphics Board

* 256x256 Pixel Display
* 16 Colours
* Ultra-fast Vector & Character Generation
* Light Pen Input
* UHF or RGB Outputs

UHF Version **£199**

UHF & RGB Version **£220**

GM811—CPU Board

* 4MHz Z80A CPU
* 4 'Bytewide' Memory Sockets
* 2x8-Bit Input/Output Ports
* 8 Bit Input Port
* RS232 Serial Interface
* Cassette Recorder Interface

£125

GM803—EPROM/ROM Board

* Up to 40K of Firmware
* 2708 or 2716 EPROMS
* Page Mode Operations

£65

GM802—64K RAM Board

* 64K Dynamic RAM
* 4MHz Operation
* RAM Disable Function
* Page Mode Operation

£125

MP826—Static RAM Board

* 32K Static RAM
* Battery Backup
* Page Mode Operation

£185

EV814—IEEE488 (GPIB) Controller

* Cost Effective Controller
* Comprehensive Software Supplied
* Full Implementation
* Easy To Use

£140

GM827—87 Key Keyboard

* User Definable Function Keys
* Numeric Keypad
* Cursor Control Keys

£85

GM839—Prototyping Board

* Fibreglass P.C.B.
* 80-BUS Signal Identification
* High Density IC Capability

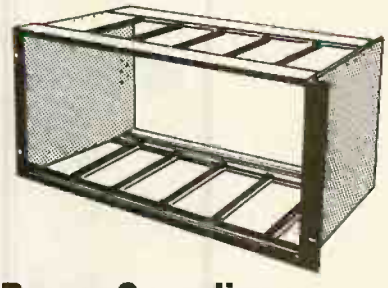
£12.50

MULTIBOARD COMPUTERS

Gemini Microcomputers

All the boards and components in the 80-BUS range are fully compatible and offer a very flexible and cost effective solution to your computer needs. For further information about the 80-BUS range contact your nearest MICROVALUE dealer.

MicroValue · MicroValue



Power Supplies, Mother Boards & Frames

* GM807 3A Power Supply	£40.00
* GM817 6A Switch Mode P.S.U.	£75.00
* GM843 10A Switch Mode P.S.U.	£95.00
* GM656 3 Slot Motherboard	£5.00
* GM654 5 Slot Motherboard	£6.00
* GM655 8 Slot Motherboard	£10.00
* MP840 14 Slot Motherboard	£47.00
* GM662 5 Board Frame	£50.00
* GM610 19" Frame	£37.50

Gemini Galaxy 2

"I would place the Galaxy at the top of my list" (Computing Today, April 1983)

* Twin Z80A Processors
* CP/M 2.2 Operating System
* 80x25 Video Display
* 64K Dynamic Ram
* Light Pen Interface
* Up to 1.6Mhz Disk Capacity
* Serial RS232 Interface
* Parallel Interface
* Numeric Keypad
* Definable Function Keys
* Cassette Interface
* 12" Monitor Included

from £1495

Quantum System 2000

Computerise Without Compromise

* 80-BUS Construction
* Serial & Parallel Interface
* Stylish Design
* Up To 2.4Mhz Disk Capacity
* Up To Three 5.25" Drives
* Fully Expandable
* Twin Z80A Processors
* CP/M Operating System
* 64K Dynamic Ram
* Definable Function Keys

Two-Drive Quantum £1910

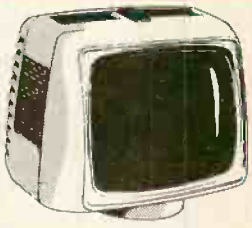
Gemini Multinet

The Gemini Multinet enables as many people as possible to have access to their own microcomputer with mass storage and printer facilities for the lowest possible cost. This is achieved by providing a central 'fileserver' fitted with a Winchester hard disk unit and printer interfaces, in conjunction with a method of interconnecting up to thirty-one workstations to the fileserver. The fileserver and each station are fitted with the Gemini GM836 network interface board. A Micropolis 800K floppy disk drive is incorporated in the fileserver providing backup for the hard disk.

GM910 Galaxy 4 Multinet 5.4 M/byte fileserver	£2600
GM912 Galaxy 4 Multinet 10.8 M/byte fileserver	£2850
GM909 Galaxy 4 Multinet workstation	£650

Both fileservers and workstations are supplied complete with VDU's; the operating software is supplied with the fileserver.

Phoenix P12 Monitor



A high quality 12" data display monitor, ideal for Gemini systems. The P12 is available in both green and amber phosphor versions and has a resolution of 20Mhz. **£95**

BUY FROM THE COMPUTER PROFESSIONALS

MICROVALUE DEALERS:

AMERSHAM, BUCKS
Amersham Computer Centre,
18 Woodside Road,
Tel: (02403) 22307

BRISTOL
Target Electronics Ltd., 16 Cherry Lane.
Tel: (0272) 421196

EGHAM, SURREY
Electrovalue Ltd.,
28 St. Judes Road, Englefield Green.
Tel: (07843) 3603

LEEDS
Leeds Computer Centre,
55 Wade Lane, Merrion Centre.
Tel: (0532) 458877

LONDON W2
Henry's Radio, 404 Edgware Road.
Tel: 01-402 6822

LONDON SW11
OFF Records,
Computer House, 58 Battersea Rise,
Clapham Junction.
Tel: 01-223 7730

MANCHESTER M19
EV Computing, 700 Burnage Lane.
Tel: 061-431 4866

NOTTINGHAM
Computerama, (Skytronics Ltd.)
357 Derby Road.
Tel: (0602) 781742

Telephone orders welcome

MicroValue

REAL value — from the Professionals

● Circle No. 188

A picture is worth a thousand words

Complete your computer system with the Beaver Plotter, from dealers at around £400. The Beaver Plotter gives the best value for money today. By using the latest linear motor technology, the Beaver Plotter brings you quality and performance comparable to units priced nearer £1,000.
Our advanced technology means more than just low cost. A dramatic reduction in moving parts provides you with excellent accuracy and reliability.

To find out more send for details now.

Tell me about the BEAVER

.....

.....

.....

I have an immediate need ☐
Send me information only ☐

Linear Graphics
A new line in computer hardware

LINEAR GRAPHICS LIMITED

34A Brook Road, Rayleigh Weir Industrial Estate, SS6 7XN.
Tel: (0268) 741322
Telex: 995701

● **Circle No. 189**

Mode 7 pictures

A LETTER from G Parris of Yeovil which starts "To produce pictures using Print and VDU statements in mode 7 is difficult and time consuming" must be a model of understatement. The accompanying program is a utility allowing full-colour graphics and text entry to a screen in mode 7.

The program is made no less daunting by the inclusion of an entire rhythm section sound track. What part sound effects have to play in a utility program I do not know, though I suspect that they are meant to indicate what control level the program is operating under at any moment.

After a quarter of an hour jotting down all the keyboard options on several scraps of paper, everything made a little more sense. There are 10 different screens which can be manipulated in memory, called, modified, saved, tanked on to disc or tape, and pulled back again.

Nothing valid on a mode 7 screen is missing from the options, and given the need to set up mixed text and graphics elements this must be the easiest way going. The stored screens can be called from user programs, bringing the option of pictures or picture backgrounds closer to home-designed games.

```
LIST
  10  REM*****************************
*
  20  REM      MODE 7 PICTURES      *****
*
  30  REM  FOR 0.1 AND 1.2 ROMS    *****
*
  40  REM       DISC OR TAPE        *****
*
  50  REM       BY G. PARRIS        *****
*
  60  REM         MAY 1983          *****
*
  70  REM*****************************
*
  80  MODE7:FORY=4TO5:VDU31,2,Y,134,14
1:PRINT"Would you like DISC or TAPE":NE
XT:FORY=7TO8:VDU31,0,Y,134,141:PRINT"st
orage of pictures (";CHR$129;"D";CHR$13
4;"or";CHR$129;"T";CHR$134;"):-";:NEXT
  90  *FX15,1
 100  TD$=GET$:IF TD$="T" THEN *T.
 110  IF TD$="D" THEN *DISC
 120  IF TD$<>"D" AND TD$<>"T" THEN GO
TO90
 130  FORY=10TO11:VDU31,3,Y,131,141:PR
INT"IS ";CHR$129;TD$;CHR$131;" CORRECT?
 (Y or N)";:NEXT
 140  *FX15,1
 150  A$=GET$:IF A$<>"Y" THEN RUN
 160
 170  ONERROR PROCstore(&6800,&7C00)
 180  *FX4,1
 190  SHAPE=255:C=151:CG=151:CT=135:V=
-15
 200  PROCindex
 210
 220  REPEAT:REM MENUS
 230  A$=INKEY$(0)
 240  IF A$="1" THEN PROCmainmenu:PROC
index
 250  IF A$="2" THEN PROCgraphicsmenu:
PROCindex
 260  IF A$="3" THEN PROCtextmenu:PROC
index
 270  IF A$="5" THEN UNTIL A$="5":GOTO
 2000
 280  UNTIL A$="4"
 290  CLS
 300  PROCstore(&7C00,&6800)
 310
 320  REM MAIN LOOP
 330  A=INKEY(40):REM PAUSE
 340  PROCcursor
 350  IF POS=39 THEN GOTO 330
 360  IF INKEY(-101) THEN PROCnewbackg
round:REM KEY B
 370  IF INKEY(-84) THEN PROCgraphic:R
EM KEY G
 380  IF INKEY(-36) THEN PROCtext:REM
KEY T
 390  IF INKEY(-52) THEN VDU159:REM KE
Y R
 400  IF INKEY(-71) THEN VDU152:REM KE
Y K
 410  IF INKEY(-35) THEN VDU154:REM KE
Y E
 420  IF INKEY(-54) THEN VDU153:REM KE
Y U
 430  IF INKEY(-98) THEN VDU12:REM KEY
 Z
 440  IF INKEY(-85) THEN VDU158:REM KE
Y H
 450  IF INKEY(-68) THEN VDU136:REM KE
Y F
 460  IF INKEY(-83) THEN VDU137:REM KE
Y C
 470  IF INKEY(-102) THEN PROCmemloads
ave:REM KEY M
 480  IF INKEY(-82) THEN PROCsave:REM
KEY S
 490  SOUND1,V,220,2:GOTO330
 500
 510  DEFPROCgraphic
 520  VDUC
 530  REPEAT
 540  *FX15,1
 550  A=GET:IF A>&30 AND A<&38 THEN SO
UND1,V,80,3:C=A+&60:CT=A+&50
 560  PROCnewshape
 570  IF CG<>C THEN VDU8,C,SHAPE,8:GOT
O590
 580  VDU SHAPE
 590  CG=C:*FX15,1
 600  UNTIL INKEY(-74) OR POS=39:REM R
ETURN OR SCREEN EDGE
 610  ENDPROC
 620
 630  DEFPROCcursor:REM USE CURSOR KEY
S
 640  IF INKEY(-58) AND VPOS>0 THEN VD
U11:ENDPROC
 650  IF INKEY(-42) AND VPOS<24 THEN V
DU10:ENDPROC
 660  IF INKEY(-26) AND POS>0 THEN VDU
8:ENDPROC
 670  IF INKEY(-122) AND POS<39 THEN V
DU9:ENDPROC
 680  ENDPROC
 690
 700  DEF PROCnewbackground
 710  A=GET:IF A<&30 OR A>&37 THEN END
PROC
 720  IF VPOS=24 THEN ENDPROC
 730  IF A=&30 THEN VDU156,156,10,8,8:
ENDPROC
 740  VDUA+&50,157,10,8,8:ENDPROC
 750
 760  DEF PROCnewshape
 770  REPEAT
 780  IF INKEY(-58) THEN SHAPE=SHAPE+1
 ELSE IF INKEY(-42) SHAPE=SHAPE-1:REM C
URSOR UP & DOWN KEYS
 790  IF SHAPE=159 SHAPE=255
 800  IF SHAPE=256 SHAPE=160
 810  IF SHAPE=192 SHAPE=224
 820  IF SHAPE=223 SHAPE=191
 830  IF CG=C THEN VDU SHAPE,8:GOTO850
 840  VDU 8,C,SHAPE,8:*FX15,1
 850  A=INKEY(20):SOUND0,V,100,1:UNTIL
 A=&87:REM COPY KEY
 860  ENDPROC
 870
 880  DEFPROCstore(X%,L%)
 890  FORI%=0 TO &400 STEP 4:I%!X%=I%!
L%:NEXT:ENDPROC
 900
 910  DEFPROCmemloadsave
 920  SOUND1,V,200,3:*FX15,1
 930  REPEAT:A$=GET$:IF A$="I" THEN PR
OCmsave
 940  IF A$="O" THEN PROCmload
 950  UNTIL A$=CHR$&0D:REM RETURN
 960  ENDPROC
 970
 980  DEFPROCmsave
 990  SOUND1,V,30,4:*FX15,1
1000  REPEAT:A$=GET$:UNTIL A$>="0" AND
 A$<="9"
1010  P=VAL(A$):PROCstore(&4000+(&400*
P),&7C00):SOUND1,V,50,4:ENDPROC
1020
1030  DEFPROCmload
1040  SOUND1,V,20,4:*FX15,1
1050  REPEAT:A$=GET$:UNTIL A$>="0" AND
 A$<="9"
1060  P=VAL(A$):PROCstore(&7C00,&4000+
(&400*P)):SOUND1,V,45,4:ENDPROC
1070
1080  DEFPROCtext
1090  VDU9:*FX15,1
1100  REPEAT:D$=GET$:UNTIL D$="D" OR D
$=" "
1110  IF D$="D" THEN SOUND1,V,160,4:PR
OCdoubleheight:ENDPROC
1120  SOUND1,V,100,4:*FX15,1
1130  A=GET:IF A>&30 AND A<&38 THEN SO
UND1,V,80,3:C=A+&60:CT=A+&50 ELSE IF A<
>&20 THEN GOTO 1130
1140  IF A>&20 THEN VDUCT
1150  REPEAT:*FX15,1
1160  F$=GET$:PRINTF$;:UNTIL INKEY(-97
) OR POS=39:REM TAB OR SCREEN EDGE
1170  ENDPROC
1180
1190  DEFPROCdoubleheight
1200  VDU141,10,8,141,11:*FX15,1
1210  A=GET:IF A>&30 AND A<&38 THEN SO
UND1,V,80,3:C=A+&60:CT=A+&50 ELSE IF A<
>&20 THEN GOTO 1210
1220  IF A=&20 THEN VDU10 ELSE VDUCT,1
0,8
1230  *FX15,1
1240  A=GET:IF A>&30 AND A<&38 THEN SO
UND1,V,80,3:C=A+&60:CT=A+&50 ELSE IF A<
>&20 THEN GOTO 1240
1250  IF A=&20 THEN VDU11 ELSE VDUCT,1
1
1260  REPEAT:*FX15,1
1270  F$=GET$:PRINTF$;:VDU10,8:PRINTF$
;:VDU11
1280  UNTIL INKEY(-97) OR POS=39:ENDPR
OC:REM TAB OR SCREEN EDGE
1290
1300  DEFPROCindex
1310  D=141:H=130
1320  CLS:VDU31,5,2,H+1,D:PRINT"@@ MOD
E7 PICTURE INDEX @@":VDU31,5,3,H+1,D:PR
INT"@@ MODE7 PICTURE INDEX @@"
1330 VDU31,6,4,H+3:PRINTSTRING$(25,"_"
)
1340  VDU31,0,6,H+4:PRINT"Would you li
ke:-"
1350  FORY=9 TO 10:VDU31,6,Y,H,D:PRINT
"< 1 >  MAIN MENU":NEXT
1360  FORY=11 TO 12:VDU31,6,Y,H,D:PRIN
T"< 2 >  GRAPHICS MENU":NEXT
1370  FORY=13 TO 14:VDU31,6,Y,H,D:PRIN
T"< 3 >  TEXT MENU":NEXT
1380  FORY=15 TO 16:VDU31,6,Y,H,D:PRIN
T"< 4 >  COMPOSE PICTURE":NEXT
1390  FORY=17 TO 18:VDU31,6,Y,H,D:PRIN
T"< 5 >  EXIT PROGRAM":NEXT
1400  FORY=21 TO 22:VDU31,6,Y,H+5,D:PR
INT"ENTER A NUMBER 1 TO 5":NEXT:ENDPROC
1410
1420  DEFPROCmainmenu
1430  H=131:CLS:FORX=0 TO 2 :VDU31,11,
X,H:PRINT"**************":NEXT
1440  VDU31,11,1,H,42,H+4:PRINT"MAIN
MENU";:VDUH,42
1450  VDU31,0,4,H:PRINT"< Z >  Clear S
creen"
1460  VDU31,0,5,H:PRINT"< B >  Plus  <
1 TO 7 & 0 >"
1470  VDU31,14,6,H:PRINT"Sets Backgrou
nd Colour"
1480  VDU31,4,8,H+3:PRINT">>>>>> SCREE
N TO MEMORY <<<<<<"
1490  VDU31,0,10,H:PRINT"< M >  Goes t
o Save Mode"
1500  VDU31,1,11,H:PRINT"< I >  Input
        < O >  Output"
1510  VDU31,0,12,H:PRINT"KEYS NO.  < 1
 TO 0 >  Pictures 1 TO 10"
1520  VDU31,3,13,H:PRINT"< I >  &  < O
```

(continued on next page)

(continued from previous page)

```
 >   Used to Repeat"
 1530  VDU31,3,13,H,60,H-2:PRINT"RETURN
";:VDUH:PRINT">  Back to Main Program"
 1540  VDU31,3,15,H+3:PRINT">>>>>> MEMO
RY TO CASSETTE <<<<<<"
 1550  VDU31,0,17,H:PRINT"< S >  and th
en "
 1560  VDU31,4,18,H:PRINT" KEYS  NO. <
1 TO 0 >"
 1570  VDU31,14,19,H:PRINT"Saves Pictur
es 1 TO 10"
 1580  VDU31,5,21,H+4:PRINT"PRESS";:VDU
H-2:PRINT" RETURN ";:VDUH+4:PRINT" FOR
 INDEX ";:REPEAT:A=GET:UNTIL A=&0D
 1590  ENDPROC
 1600
 1610  DEFPROCgraphicsmenu
 1620  H=130:CLS:FORX=0 TO 2:VDU31,10,X
,H:PRINT"£££££££££££££££":NEXT
 1630  VDU31,10,1,H,35,H+5:PRINT"GRAPHI
CS  MENU";:VDUH,35
 1640  VDU31,6,4,H:PRINT"Available in";
:VDUH+1:PRINT"Main Program:-"
 1650  VDU31,1,6,H:PRINT"< E >  Expande
d   < U >  Unexpanded"
 1660  VDU31,1,7,H:PRINT"< H >  Hold
    < R >  Release"
 1670  VDU31,11,8,H:PRINT"< K >    Conc
eal"
 1680  VDU31,0,10,H+2,157,H+3:PRINT" <
> < > < > < > * < > < > < > < > < >"
 1690  VDU31,3,12,H:PRINT"Press  < G >
for Graphics Mode"
 1700  VDU31,5,14,H:PRINT"< 1 TO 7 >  G
raphics Colour"
 1710  VDU31,1,16,H:PRINT"Cursor Keys"
 1720  VDU31,4,17,H:PRINT"< UP >  &  <
DOWN >  Change Shape"
 1730  VDU31,5,19,H:PRINT"< COPY >  Rep
eats the Shape"
 1740  VDU31,1,21,H,60,H-1:PRINT"RETURN
";CHR$H;CHR$62;" Then  <";:VDUH-1:PRINT
"COPY";CHR$H;CHR$62
 1750  VDU31,12,22,H:PRINT"Goes back to
";CHR$(H+1);"Main Program"
 1760  VDU31,6,24,H+5:PRINT"PRESS ";CHR
$(H-1);"RETURN";CHR$(H+5);" FOR  INDEX
";:REPEAT:A=GET:UNTIL A=&0D
 1770  ENDPROC
 1780
 1790  DEFPROCtextmenu
 1800  H=134:J=151:CLS:FORX=0 TO 2:VDU3
1,11,X,H:PRINTSTRING$(14,"+"):NEXT
 1810  VDU31,11,1,H,43,H+1:PRINT"TEXT
MENU";CHR$H"+"
 1820  VDU31,4,4,H:PRINT"Available in";
CHR$131;"Main Program:-"
 1830  VDU31,1,6,H:PRINT"< F >  Start
   < C >  Stop Flashing"
 1840  VDU31,0,8,H-1,157,H-3:PRINTSTRIN
G$(17," =")
 1850  VDU31,5,10,H:PRINT"Press  < T >
for Text Mode";
 1860  VDU31,18,11,J,255
 1870  VDU31,9,12,J:PRINTCHR$183;STRING
$(17,CHR$163);CHR$235
 1880  VDU31,2,13,H:PRINT"< D >  Double
  ";:VDUJ,62,H:PRINT"< SPC.BAR > Single
"
 1890  VDU31,18,14,J,62
 1900  VDU31,0,15,H:PRINT"<1 TO 7> Top
Col.";:VDUJ,62,H:PRINT" <1 TO 7>"
 1910  VDU31,0,16,H:PRINT"<1 TO 7> Bot.
Col.";:VDUJ,62,H:PRINTSPC11"Colour"
 1920  VDU31,18,17,J,62
 1930  VDU31,5,18,H:PRINT"Type Text   "
;:VDUJ,62,H:PRINT"   Type Text"
 1940  VDU31,18,19,J,62
 1950  VDU31,0,20,H:PRINT"<";CHR$(H-5)"
TAB";CHR$H">  Back to ";:VDUJ,62,H:PRIN
T"<";CHR$(H-5)"TAB";CHR$H">  Back to"
 1960  VDU31,3,21,H-3:PRINT"Main Progra
m  ";:VDUJ,62,H-3:PRINT"   Main Program
"
 1970  VDU31,6,23,H+1:PRINT"PRESS ";:VD
UH-5:PRINT"RETURN ";:VDUH+1:PRINT"FOR
INDEX ";:REPEAT:A=GET:UNTIL A=&0D
 1980  ENDPROC
 1990
 2000  MODE7:FORY=4TO5:VDU31,4,Y,134,14
1:PRINT"YOU ARE OUT OF THE PROGRAM":NEX
T:*FX4,0
 2010  END
 2020
 2030  DEFPROCsave
 2040  PROCstore(&6800,&7C00):CLS
 2050  SA$=GET$
 2060  IF SA$="1" THEN *SAVE"PIC.1" 440
0 47FF
 2070  IF SA$="2" THEN *SAVE"PIC.2" 480
0 4BFF
 2080  IF SA$="3" THEN *SAVE"PIC.3" 4C0
0 4FFF
 2090  IF SA$="4" THEN *SAVE"PIC.4" 500
0 53FF
 2100  IF SA$="5" THEN *SAVE"PIC.5" 540
0 57FF
 2110  IF SA$="6" THEN *SAVE"PIC.6" 580
0 5BFF
 2120  IF SA$="7" THEN *SAVE"PIC.7" 5C0
0 5FFF
 2130  IF SA$="8" THEN *SAVE"PIC.8" 600
0  67FF
 2140  IF SA$="9" THEN *SAVE"PIC.9" 640
0 67FF
 2150  IF SA$="10" THEN *SAVE"PIC.10" 4
000 43FF
 2160  PROCstore(&7C00,&6800)
 2170  ENDPROC
>
```

Sea Battle

If you can't sit back and tap the force, you will last 10 seconds in this game by Chris Carr of Evesham, which is based on a once-popular arcade game. I find it disconcerting that sheer effort should be so unavailing, but the ability to react without thinking has always been recognised in some circles as a talent worth cultivating. I am sure that Athos and friends would have cottoned on to Sea-Battle in an instant and run up scores beyond the dreams of sedents. For myself, I didn't notice the existence of a score facility until I went back to Mr Carr's letter.

The submarines, frigate, aeroplanes and helicopters are well executed if phrenetic. The controls are standard left- and right-hand A, Z, . and /, for missile, depth-charge, left and right. There are two speed options, neither of which were much help though I did see a difference, and suitable

(continued on page 174)

```
   10 REM*** SEA-BATTLE ***
   20 REM*** Copyright  ***
   30 REM*** C.Carr 82  ***
   40 H%=0
   50 ONERRORRUN
   60 MODE1
   70 REM*** TITLES ***
   80 CLS
   90 PRINT'''TAB(10)"*** SEA-BATTLE *
**"
  100 PRINT''"     Your task is to dest
roy the waves"'"of attacking submarines
,fighter "'"aircraft and helicopters,us
ing the"'"following controls:"
  110 PRINT''SPC8". --- Steer left"''SP
C8"/ --- Steer right"''SPC8"A --- Fire
a missile"''SPC8"Z --- Drop a depth cha
rge"
  120 PRINT''SPC5"Level ? (0-Hard,1-Eas
y)":A$=GET$
  130 L%=VALA$:IFL%=1THENW%=200 ELSE W%
=0:IFL%<>1THENL%=0
  140 PRINT''"   *** Hit any key to co
ntinue ***"
  150 A$=GET$:CLS
  160 REM*** PROG START ***
  170 PROCDEFINE
  180 FORJ=0TO39:PRINTTAB(J,16)CHR$230;
NEXT
  190 PRINTTAB(0,0)"**SEA-BATTLE**   Sc
ore=0    Hi-Score=";H%
  200 COLOUR3:PRINTTAB(SPH%,16)SHIP$
  210 COLOUR2:PRINTTAB(SBH%,SBV%)SUB$
  220 PRINTTAB(PLH%,PLV%)PLANE$
  230 COLOUR1:PRINTTAB(HEH%,HEV%)HE$
  240 FORJ%=0TOW%:NEXT
  250 SOUND1,2,130,1
  260 SBH%=SBH%+1:PLH%=PLH%-1:HEH%=HEH%
+1
  270 IFSBH%>=34THENPRINTTAB(SBH%,SBV%)
"    ":SBH%=0:SBV%=RND(5)*2+18
  280 IFHEH%>=36THENPRINTTAB(HEH%,HEV%)
"    ":HEH%=0:REPEAT:HEV%=RND(6)*2+1:UNT
ILHEV%<>PLV%
  290 IFPLH%<=0THENPRINTTAB(PLH%,PLV%)"
    ":PLH%=35:REPEAT:PLV%=RND(6)*2+1:U
NTILHEV%<>PLV%
  300 IFPF%=0 AND (ABS(PLH%-SPH%)<4 OR
RND(1)>.95)THENPF%=1:PBH%=PLH%:PBV%=PLV
%+1
  310 IFHF%=0 AND (ABS(SPH%-HEH%+3)<2 O
R RND(1)>.95)THENHF%=1:HBH%=HEH%:HBV%=H
EV%+1
  320 IFSF%=0 AND (ABS(SPH%-SBH%+4)<2 O
R RND(1)>.95)THENSF%=1:SBBH%=SBH%:SBBV%
=SBV%-1
  330 IFPF%=1 THENPROCPLANEBOMB
  340 IFHF%=1 THENPROCHEBOMB
  350 IFSF%=1 THENPROCSUBBOMB
  360 IFINKEY(-104)=-1 AND SPH%>0 THEN
SPH%=SPH%-1
  370 IFINKEY(-105)=-1 AND SPH%<34 THEN
SPH%=SPH%+1
  380 IFINKEY(-66)=-1 AND MF%=0 THENMF%
=1:MH%=SPH%+1:MV%=15
  390 IFINKEY(-98)=-1 AND DF%=0 THENDF%
=1:DH%=SPH%+1:DV%=17
  400 IFMF%=1THENPROCMISSILE
  410 IFDF%=1THENPROCDCHARGE
  420 GOTO200
  430 REM*** END ***
  440 COLOUR3
  450 *FX15,0
  460 FORJ%=0TO2000:NEXTJ%:CLS:PRINTTAB
(6,10)"Your ship has been sunk"''SPC6"Y
ou scored ";S%;" points"''SPC6"on level
 ";L%
  470 PRINT''SPC6"Another go ? ":A$=GET
$:IFA$="N"THENPRINTUSR56345
  480 IFS%>H% THEN H%=S%
  490 CLEAR:GOTO70
  500 REM*** SUBROUTINES ***
  510 DEFPROCDEFINE
  520 VDU23,230,0,0,0,0,4,10,50,193
  530 VDU23,231,0,0,0,0,255,255,127,0
  540 VDU23,232,1,15,127,255,255,255,25
5,0
  550 VDU23,233,128,128,192,240,255,255
,255,0
  560 VDU23,234,0,0,0,255,254,252,248,0
  570 SHIP$=CHR$230+CHR$231+CHR$232+CHR
$233+CHR$234+CHR$230
  580 VDU23,235,0,0,0,7,127,255,127,0
  590 VDU23,236,3,3,7,255,255,255,255,0
  600 VDU23,237,240,240,240,255,255,255
,255,0
  610 VDU23,238,0,0,0,240,254,255,254,0
  620 SUB$=" "+CHR$235+CHR$236+CHR$237+
CHR$238+" "
  630 VDU23,239,0,0,0,0,15,255,0,0
  640 VDU23,240,0,0,0,0,0,255,255,127,0
  650 VDU23,241,0,14,30,62,254,255,254,
0
  660 PLANE$=CHR$239+CHR$240+CHR$241+"
"
  670 VDU23,242,1,0,0,0,255,15,0,0,0
  680 VDU23,243,255,16,30,255,255,126,6
0,0
  690 HE$=" "+CHR$242+CHR$243
  700 VDU23,247,198,238,124,124,56,56,5
6,16
  710 VDU23,244,60,60,60,24,60,126,126,
60
  720 VDU23,245,8,28,28,28,62,62,119,99
  730 VDU23,246,129,66,36,0,0,36,66,129
  735 ENVELOPE1,131,1,-1,1,1,1,1,121,-1
2,-6,-4,120,120
  736 ENVELOPE2,129,0,0,0,0,0,0,100,-20
,-1,-4,100,0
  740 SPH%=18:HEH%=0:SBH%=0:PLH%=35
  750 HEV%=RND(6)*2+1
  760 PLV%=RND(6)*2+1:IFPLV%=HEV%THEN76
0
  770 SBV%=RND(5)*2+18
  780 PF%=0:HF%=0:SF%=0:MF%=0:DF%=0
  790 MH%=0:MV%=0:DH%=0:DV%=0
  800 PBH%=0:SBBH%=0:HBH%=0:PBV%=0:SBBV
%=0:HBV%=0
  810 S%=0
  820 ENDPROC
  830 DEFPROCPLANEBOMB
  840 COLOUR3
  850 PRINTTAB(PBH%,PBV%-1)" ":IFPBV%<>
16THEN PRINTTAB(PBH%,PBV%)CHR$244:PBV%=
PBV%+1:ENDPROC
  860 IF?((HIMEM+(PBV%*640)+PBH%*16)+7)
<>204 THENPROCEXPLOSION(PBH%,PBV%):PROC
SINK:GOTO430
  870 PF%=0
  880 ENDPROC
  890 DEFPROCHEBOMB
  900 COLOUR2
```

(listing continued on page 174)

THE BEST WAY TO BUY DISKS

VAT & Post Inclusive

All products fully Guaranteed

You pay the PRICE you SEE

wabash

No 1 Disk — Won the "Industry Seal of Approval"

Prices/Box 10		10	50	100
5¼"				
SS SD 48TPI	M11	16.10	15.20	14.20
SS DD 48TPI	M13	19.00	17.80	16.70
DS DD 48TPI	M14	21.20	19.90	18.70
SS DD 96TPI	M15	24.20	22.80	21.40
DS DD 96TPI	M16	27.50	25.90	24.30
8"				
SS SD 26S	F11	16.10	15.20	14.20
DS DD 26S	F14	27.50	25.90	24.30

Datalife

5yr Warranty from Verbatim.
Best known brand in the World

	10	50	100
MD 525-01	23.70	22.30	20.80
MD 525-01	23.70	22.30	20.80
MD 550-01	33.50	31.50	29.50
MD 577-01	31.20	29.40	27.50
MD 557-01	42.20	39.70	37.20
FD 34-9000	32.60	30.70	28.80
DD 34-4001	39.60	37.20	34.90

Dysan

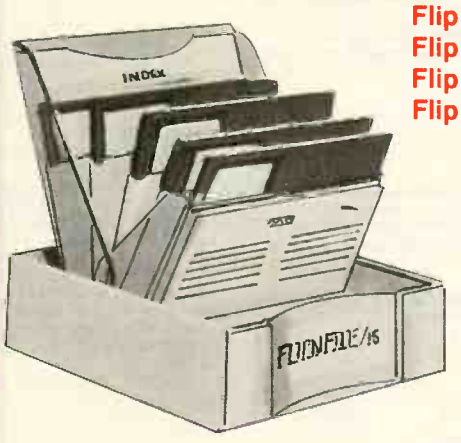
Premium Quality Diskette range

	10	50	100
104/1	29.10	27.40	25.70
104/1D	31.40	29.60	27.70
104/2D	45.50	42.80	40.10
204/1D	43.80	41.30	38.70
204/2D	58.70	55.20	51.80
3740/1	35.90	33.80	31.70
3740/2D	49.90	47.20	44.20

Full range of each brand stock. State sectoring & phone for any disk not seen.

AND STORE THEM!

DISK DIRECT



FLIP 'N' FILE 15

Flip 'N' File 10 £4.99
Flip 'N' File 15 £6.99
Flip 'N' File 25 £26.99
Flip 'N' File 50 £35.40

FLIP 'N' FILE 25
Also available FLIP 'N' FILE 50 for 50 disks

ORDER: THE SIMPLE WAY — Remember! The price you see includes VAT + carriage.
No hidden extras!

- BY MAIL: Clip whole coupon. Enclose cheque or postal order for total of goods required & send to FREEPOST address shown. Your goods will be despatched immediately the payment has been processed.
- BY PHONE: Call us with your Credit card Number (Access or Barclaycard) and your goods will be despatched directly to you.

DISK DIRECT, FREEPOST, WOKING GU22 9BR
TELEPHONE 04862 26626.

NAME _____ Daytime tel. no

ADDRESS _____

ORDER Qty	Part No & Description	Price

● Circle No. 190

(listing continued from page 172)

```
  910 PRINTTAB(HBH%,HBV%-1)" ":IFHBV%<>
16THEN PRINTTAB(HBH%,HBV%)CHR$247:HBV%=
HBV%+1:ENDPROC
  920 IF?((HIMEM+(HBV%*640)+HBH%*16)+7)
<>204 THENPROCEXPLOSION(HBH%,HBV%):PROC
SINK:GOTO430
  930 HF%=0
  940 ENDPROC
  950 DEFPROCSUBBOMB
  960 COLOUR3
  970 PRINTTAB(SBBH%,SBBV%+1)" ":IFSBBV
%<>16THEN PRINTTAB(SBBH%,SBBV%)CHR$245:
SBBV%=SBBV%-1:ENDPROC
  980 IF?((HIMEM+(SBBV%*640)+SBBH%*16)+
7)<>204 THENPROCEXPLOSION(SBBH%,SBBV%):
PROCSINK:GOTO430
  990 SF%=0
 1000 ENDPROC
 1010 DEFPROCMISSILE
 1020 COLOUR3
 1030 PRINTTAB(MH%,MV%+1)" "
 1040 X%=?((HIMEM+(MV%*640)+MH%*16)+5)
 1050 IFX%=0THEN1130
 1060 PROCEXPLOSION(MH%,MV%)
 1070 IFX%=119THEN PF%=0:S%=S%+5:GOTO11
20
 1080 IFX%=51THEN HF%=0:S%=S%+5:GOTO112
0
 1090 IFMV%=PLV% THENPLH%=35:REPEAT:PLV
%=RND(6)*2+1:UNTIL PLV%<>HEV%:GOTO1110
 1100 HEH%=0:REPEAT:HEV%=RND(6)*2+1:UNT
IL PLV%<>HEV%
 1110 S%=S%+10
 1120 MF%=0:PRINTTAB(23,0);S%:ENDPROC
 1130 IFMV%<=1THENMF%=0:PRINTTAB(MH%,MV
%+1)" ":ENDPROC
 1140 PRINTTAB(MH%,MV%)CHR$245
 1150 MV%=MV%-1
 1160 ENDPROC
 1170 DEFPROCDCHARGE
 1180 COLOUR3
 1190 PRINTTAB(DH%,DV%-1)" "
 1200 X%=?((HIMEM+(DV%*640)+DH%*16)+4):
IFX%=0 THEN1240
 1210 PROCEXPLOSION(DH%,DV%):DF%=0
 1220 IFX%=51 THENSF%=0:S%=S%+5:PRINTTA
B(23,0);S%:GOTO1250
 1230 SBH%=0:SBV%=RND(5)*2+18:S%=S%+10:
PRINTTAB(23,0);S%:GOTO1250
 1240 PRINTTAB(DH%,DV%)CHR$244:DV%=DV%+
1
 1250 IFDV%>=31THENDF%=0:PRINTTAB(DH%,D
V%-1)" ":ENDPROC
 1260 ENDPROC
 1270 DEFPROCEXPLOSION(H%,V%)
 1280 COLOUR3
 1290 PRINTTAB(H%,V%)CHR$246
 1300 SOUND0,1,5,1
 1340 PRINTTAB(H%-3,V%)"          "
 1350 ENDPROC
 1360 DEFPROCSINK
 1370 COLOUR3
 1380 FORJ%=0TO39:PRINTTAB(J%,16)CHR$23
0:NEXT
 1390 FORJ%=17TO29
 1400 PRINTTAB(SPH%,J%)MID$(SHIP$,2,4)
 1410 FORK%=1TO400:NEXTK%
 1420 PRINTTAB(SPH%,J%)"          "
 1430 NEXTJ%
 1440 PRINTTAB(SPH%,J%)MID$(SHIP$,2,4)
 1450 FORJ=-15TO0:SOUND0,J,6,1:NEXT
 1460 ENDPROC
```

(continued from page 172)

sound prompts to tune in on. At a more hypothetical level, obliteration of a submarine, aeroplane or helicopter scores 10, of a bomb or missile 5.

Disc dump

Following his memory-dump utility of May, Ian Kerr of Derby has submitted an equivalent function utility for disc management. As with the memory utility, careless use is frequently irreversible and destructive. On the other hand it allows quick answers to unpleasant problems.

The operating instructions are in-built and the utility handles without frustrations or uncertainties. It is not a tool to use for real if you do not know what a track, sector or dictionary is, though with perseverence and a strict avoidance of the Edit facility you might use it as a way of finding out.

Disc dump.

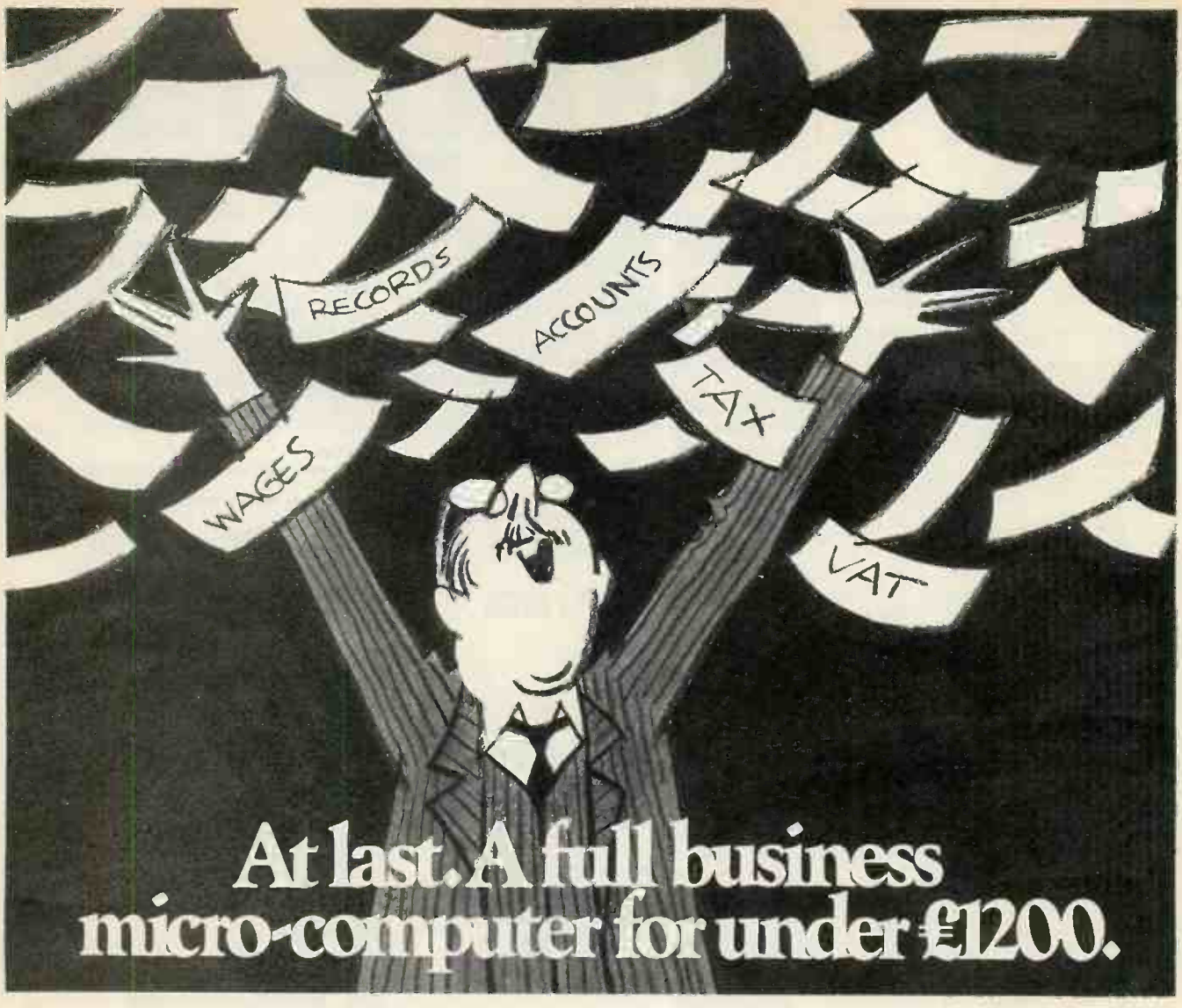
```
   10 REM  *** DDUMP ***
   20 REM  *VERSION 1.3*
   30 ON ERROR GOTO390
   40 *FX4,1
   50 MODE7:DIM I% 15,Dbuf% 256
   60 PRINTTAB(12,5)CHR$141;CHR$134"DDU
MP"
   70 PRINTTAB(12,6)CHR$141;CHR$134"DDU
MP"
   80 PRINTTAB(8,8)"(BEEB Disc Utility)
"
   90 PRINTTAB(3,15)"Input the starting
 location":INPUT"   as <track>,<sector>
 :"TR%,SC%
  100 IF TR%<0 OR TR%>39 OR SC%<0 OR SC
%>9 THEN VDU12,7:GOTO90
  110 VDU12
  120 PRINTTAB(14);CHR$141;"DDUMP";:PRIN
TTAB(14);CHR$141;"DDUMP"
  130 PRINTCHR$132;"ADDR";CHR$131;TAB(1
5);"DATA";CHR$129;TAB(32);"ALPHA"
  140 VDU28,0,24,39,5:REM text area bel
ow Header
  150 M%=Dbuf%:REM point to Disc buffer
  160 PROCdisc_access(TR%,SC%,0):PROCdm
p
  170
  180 REM  =======MAIN PROGRAM=======
  190 REPEAT
  200 K=ASC(GET$):IFK=2 VDU2 ELSE IF K=
3 VDU3
  210 IFK<>139 THEN 260
  220 IF M%=Dbuf% THEN 230 ELSE M%=M%-1
28:PROCdmp:GOTO200
  230 SC%=SC%-1:IF SC%<0 THEN TR%=TR%-1
:SC%=9
  240 IF TR%<0 CLS:PRINTTAB(12,10)"star
t of disc":TR%=0:SC%=0:VDU30:GOTO200
  250 PROCdisc_access(TR%,SC%,0):PROCdm
p
  260 IFK<>138 THEN 310
  270 IF M%=Dbuf%+128 THEN 280 ELSE M%=
M%+128:PROCdmp:GOTO200
  280  SC%=SC%+1:IF SC%>9 THEN TR%=TR%+
1:SC%=0
  290 IF TR%>39 CLS:PRINTTAB(12,10)"end
 of disc":TR%=39:SC%=9:VDU30:GOTO200
  300 PROCdisc_access(TR%,SC%,0):M%=Dbu
f%:PROCdmp
  310 IFK=&4ATHENPROCnewloc:PROCdisc_ac
cess(TR%,SC%,0):PROCdmp
  320 IFK=&45THENPROCmemed:PROCdmp:PROC
write_disc
  330 IFK=&57THEN PROCwrite_disc
  340 IFFLG% GOTO400:REM exit if proble
ms with disc
  350 UNTIL0
  360
  370 REM  ============================
  380 REM  Escape exit routine
  390 IFERR<>17THENREPORT:PRINTERL
  400 VDU28,0,24,39,0:REM full screen t
ext
  410 *FX4,0
  420 VDU31,0,23:REM cursor under data
  430 PRINT"...Bye":END
  440
  450 DEF  PROCnewloc
  460 REM  ==========
  470
  480 PRINTTAB(5,18);
  490 INPUT"Location <tr>,<sct>:"TR%,SC
%
  500 IF TR%<0 OR TR%>39 OR SC%<0 OR SC
%>9 GOTO490
  510 CLS
  520 ENDPROC
  530
  540 DEF  PROCmemed
  550 REM  =========
  560
  570 CLS:PROCdmp:VDU7:PRINTTAB(12,18);
  580 PRINT"EDITING";:MEM%=M%:VDU31,6,0
  590 K$=GET$:K=ASC(K$):IFK=139THENIFVP
OS>0THENVDU11:MEM%=MEM%-8
  600 IFK=138THENIFVPOS<15THENVDU10:MEM
%=MEM%+8
  610 IFK=136THENIFPOS>6THENVDU8,8,8:ME
M%=MEM%-1
  620 IFK=137THENIFPOS<25THENVDU9,9,9:M
EM%=MEM%+1
  630 IF(K<&30)OR(K>&46)OR((K>&39)AND(K
<&41))THEN720
  640 PRINTK$;
  650  N$=GET$:N=ASC(N$):IF(N<&30)OR(N>
&46)OR((N>&39)AND(N<&41))THEN650
  660  PRINTN$;
  670 NV%=EVAL("&"+K$+N$)
  680 ?MEM%=NV%:MEM%=MEM%+1:VDU9
  690 IFPOS>28THENFORI=1TO24:VDU8:NEXT:
VDU10
  700 IFVPOS>15THEN730
  710 GOTO590
  720 IFK<>13THEN590
  730 CLS:ENDPROC
  740
  750 DEF  PROCdmp
  760 REM  =======
  770
  780 Mem%=M%-Dbuf%:REM set offset addr
ess to zero
  790 FORX%=0TO127STEP8
  800 AD%=M%+X%:ad%=(Mem%+X%)
  810 ALFA$="":PRINTCHR$132;~ad%;TAB(5)
;
  820 VDU131:FORNX%=0TO7:HVAL=?(AD%+NX%
):HEX$=CHR$(HVAL)
  830 IF(HEX$<" ")OR(HEX$>"~")THENHEX$=
"."
  840 ALFA$=ALFA$+HEX$:W$=STR$~(HVAL)
  850 IFLEN(W$)<2THENW$="0"+W$
  860 PRINTW$;" ";
  870 NEXT:PRINTCHR$129;ALFA$
  880 NEXT:PRINT
  890 *FX15,1
  900 REM print current disc location i
n Header
  910 IF FLG% ENDPROC:REM don't update
if fault
  920 VDU26:PRINTTAB(28,0)"     ";:VDU8
,8,8,8,8:PRINTTR%;":";SC%
  930 PRINTTAB(28,1)"     ";:VDU8,8,8,8
,8:PRINTTR%;":";SC%
  940 VDU28,0,24,39,5,13:REM restore te
xt area
  950 ENDPROC
  960
  970 DEF  PROCwrite_disc
  980 REM  ==============
  990
 1000  PRINTTAB(3,18)CHR$134"WRITE THIS
 SECTOR TO DISC ??":VDU7:A$=GET$
 1010 IF A$<>"Y"ANDA$<>"y" THEN VDU7,12
:PROCdmp:ENDPROC
 1020   PRINTTAB(3,18)CHR$136;CHR$129"
**  ARE  YOU  SURE???  **":A$=GET$
 1030 IF A$<>"Y"ANDA$<>"y" THEN VDU7,12
:PROCdmp:ENDPROC
 1040 PROCdisc_access(TR%,SC%,1):REM wr
ite sector
 1050 CLS:PRINTTAB(0,15)"  ***  Sector
written to the Disc ***":VDU30
 1060 M%=Dbuf%:PROCdmp
 1070 ENDPROC
 1080
 1090 DEF  PROCdisc_access(track%,secto
r%,action%)
 1100 REM  ================
 1110 OSWORD%=&FFF1:?I%=0:*FX15,1
 1120 I%?1=Dbuf%MOD256
 1130 I%?2=Dbuf%DIV256
 1140 I%?3=0:I%?4=0
 1150 I%?5=3
 1160 IF action%=0 THEN I%?6=&53 ELSE I
%?6=&4B:REM &53 to read,&4B to write
 1170 I%?7=track%:I%?8=sector%
 1180 I%?9=&21:REM ie 256 bytes/sect fo
r 1 sect
 1190 X%=I%MOD256:Y%=I%DIV256:A%=&7F
 1200 CALL OSWORD%:REM read/write a sec
tor
 1210
 1220 REM check for disc access error
 1230 FLG%=I%?&A:IF FLG% THENPRINTTAB(5
,18)CHR$136;CHR$131"Disc error number "
;~FLG%;"..Hit a key":A=GET:CLS
 1240 ENDPROC
```

Hangman

GRAHAM WILSON of Clifton, Bristol offers a version of Hangman which may perhaps prove slightly less controversial than his security procedures, published in February's Apple Pie, correspondence on which is still being received. It has the advantage of not relying on an in-built list of possible words, and so long as you can capture some passer-by for 10 seconds now and then to input a problem you should have nothing to worry about.

Mr Wilson has an elegant coding solution to progressively displaying the gallows. Several readers have commented on the clarity and style of his code which, given the awfulness of Applesoft Basic for readability, is really a considerable compliment.

```
10  REM
15  REM  HANGMAN
20  REM
25  REM  28-3-83
30  REM
35  REM  GRAHAM B. WILSON
40  REM
999  REM
1000  REM  VARIABLES
1001  REM
1005  REM  DF....LEVEL OF DIFFICU
     LTY
1010  REM  I.....COUNTER
1015  REM  IP$...INPUT
1020  REM  L.....LENGTH OF WORD
1025  REM  PT....FAILURE DECREMEN
     T
1030  REM  TR....NUMBER OF TRIALS

1035  REM  WD$...WORD ELEMENTS IN
     PUT
1040  REM  WD$().WORD ELEMENTS
1045  REM  WE$...ELEMENT GUESSED
     WORD
1050  REM  WE$().GUESSED WORD ELE
     MENTS
1055  REM  WR$...SECRET WORD
1060  REM  LF....GOOD TRY FLAG
1099  REM
1100  REM  INITIALIZE
1101  REM
1105  DIM WD$(20),WE$(20)
1999  REM
2000  REM  MAIN PROGRAM
2001  REM
2005  HOME
2010  GOSUB 10000
2015  GOSUB 3000
2020  GOSUB 4000
2025  HOME
2030  GOSUB 10000
2035  GOSUB 5000
2040  GOSUB 5500
2045  GOSUB 6000
2050  GOSUB 7500
2055  FOR I = 1 TO 13: PRINT : NEXT
     I
2060  GOSUB 9000
2065  GOTO 2035
2070  END
2999  REM
3000  REM  INPUT 1: LEVEL OF DIFF
     ICULTY
3001  REM
3010  PRINT "LEVEL OF DIFFICULTY
     :"
3015  PRINT "<1 TO 4>"
3020  INPUT "";DF
3025  IF DF < 1 OR DF > 4 THEN : GOTO
     3000
3030  ON DF GOTO 3035,3045,3055,3
     065
3035 PT = 22
3040  RETURN
3045 PT = 18
3050  RETURN
3055 PT = 14
3060  RETURN
3065 PT = 12
3070  RETURN
3999  REM
4000  REM  INPUT 2: WORD
4001  REM
4002  REM  VARIABLES
4005 L = 1
4010 WR$ = ""
4015  REM  GET WORD
4020  HOME
4025  GOSUB 10000
4030  PRINT "ENTER 0 TO END"
4035  PRINT "WORD : ": GET WD$
4040  IF WD$ = "0" THEN 4070
4045 WD$(L) = WD$
4050 L = L + 1
4055  GOTO 4020
4060  REM  CONSTRUCT WORD WR$ +
4065  REM  INITIALIZE RESULT
4070  FOR I = 1 TO L - 1
4075 WR$ = WR$ + WD$(I)
4080 WE$(I) = "."
4085  NEXT I
4090  REM  CHECK WORD OPTION
4095  HOME
4100  GOSUB 10000
4105  PRINT "CHECK WORD ?"
4110  INPUT "<Y OR N> : ";IP$
4115  IF IP$ = "Y" THEN 4130
4120  RETURN
4125  PRINT
4130  PRINT "PRESS <RETURN> TO CO
     NTINUE"
4135  PRINT "WHEN VICTIM IS NOT L
     OOKING"
4140  INPUT "";IP$
4145  PRINT "WORD : ";WR$
4150  PRINT
4155  PRINT "PRESS <RETURN> TO CO
     NTINUE"
4160  PRINT "PRESS <ANY KEY> TO R
     ESTART"
4165  INPUT "";IP$
4170  IF IP$ = "" THEN : RETURN
4175  REM  SOFT CRASH TO RESTART
4180  POP
4185  GOTO 2000
4999  REM
5000  REM  INPUT 3: TRY
5001  REM
5010  INPUT "GUESS : ";IP$
5015 TR = TR + 1
5020  RETURN
5499  REM
5500  REM  GUESS WORD CHECKER
5501  REM
5505  IF IP$ = WR$ THEN :WE$ = IP
     $: POP : GOSUB 9000
5510  RETURN
5999  REM
6000  REM  GUESS LETTER CHECKER
6001  REM
6005  FOR I = 1 TO L
6010  IF IP$ = WD$(I) THEN WE$(I)
     = IP$:LF = 1: GOTO 6020
6015  IF WD$(I) <  > "£" THEN : GOTO
     6020
6020  NEXT I
6025  RETURN
7499  REM
7500  REM  GUESS WIN CHECKER
7501  REM
7505 WE$ = ""
7510  FOR I = 1 TO L
7515 WE$ = WE$ + WE$(I)
7520  NEXT I
7525  IF WE$ = WR$ THEN : POP : GOSUB
     9000
7530  RETURN
7999  REM
8000  REM  INCREMENT LOSS
8001  REM
8005 PT = PT - 1
8010  IF PT = 1 THEN : POP : GOSUB
     9000
8015  RETURN
8999  REM
9000  REM  DISPLAY
9001  REM
9005  GOSUB 10000
9010  IF WE$ = WR$ THEN 9025: REM
      WINNING WORD
9015  IF PT = 1 THEN 9160: REM  L
     OST LAST GUESS
9020  IF IP$ <  > WR$ THEN 9060: REM
     LOST GUESS GOTO NEXT
9025  REM  WINNER
9030  TEXT : HOME
9035  FLASH : PRINT "CONGRATULATI
     ONS": NORMAL
9040  PRINT : PRINT "WORD : ";WR$

9045  PRINT : PRINT "GUESS :";WE$
9050  PRINT : PRINT "TRIALS : ";T
     R
9055  END
9060  REM  BIDDER
9065  IF LF = 1 THEN :LF = 0: GOTO
     9140
9070  GOSUB 8000
9075  HGR : HCOLOR= 7
9080  REM  ADD NEXT PART TO DRAWI
     NG
9085  REM  ON RELEVANT DIFFICULTY

9090  ON DF GOTO 9095,9105,9115,9
     125
9095  ON PT GOSUB 11005,11010,110
     15,11020,11025,11030,11035,1
     1040,11045,11050,11055,11060
     ,11065,11070,11075,11080,110
     85,11090,11095,11100,11105
9100  GOTO 9140
9105  ON PT GOSUB 11005,11010,110
     20,11025,11035,11040,11050,1
     1055,11065,11070,11075,11080
     ,11085,11090,11095,11100,111
     05
9110  GOTO 9140
9115  ON PT GOSUB 11005,11020,110
     35,11050,11065,11070,11075,1
     1080,11085,11090,11095,11100
     ,11105
9120  GOTO 9140
9125  ON PT GOSUB 11005,11020,110
     35,11050,11065,11070,11075,1
     1080,11085,11090,11105
9130  GOTO 9140
9135  END
9140  PRINT "TRIALS : ";TR
9145  PRINT "WORD   : ";WE$
9150  RETURN
9155  RETURN
9160  REM  LOSER
9165  TEXT : HOME
9170  FLASH
9175  PRINT "COMMISERATIONS"
9180  NORMAL
9185  PRINT : PRINT "YOU'RE DEAD"

9190  PRINT : PRINT "WORD : ";WR$

9195  PRINT : PRINT "YOUR BEST :
     ";WE$
9200  END
9999  REM
10000  REM  SUBR: TITLE
10001  REM
10005  PRINT "HANGMAN"
10010  PRINT "*******"
10015  PRINT
10020  RETURN
10099  REM
11000  REM  DISPLAY SUBRS
11001  REM
11005  HPLOT 167,70 TO 173,70
11010  HPLOT 167,62 TO 167,70
11015  HPLOT 159,54 TO 167,62
11020  HPLOT 151,70 TO 145,70
11025  HPLOT 151,62 TO 151,70
11030  HPLOT 159,54 TO 151,62
11035  HPLOT 167,46 TO 171,46
11040  HPLOT 167,38 TO 167,46
11045  HPLOT 159,30 TO 167,38
11050  HPLOT 151,46 TO 147,46
11055  HPLOT 151,38 TO 151,46
11060  HPLOT 159,30 TO 151,38
11065  HPLOT 159,30 TO 159,54
11070  HPLOT 159,22 TO 163,26 TO
     159,30 TO 155,25 TO 159,22
11075  HPLOT 159,10 TO 159,22
11080  HPLOT 121,26 TO 137,10
11085  HPLOT 121,10 TO 159,10
11090  HPLOT 113,82 TO 121,74
11095  HPLOT 129,82 TO 121,74
11100  HPLOT 121,82 TO 121,10
11105  HPLOT 109,82 TO 133,82
11110  RETURN
```



At last. A full business micro-computer for under £1200.

Because we at NEC make most of the components for our computers, this naturally gives us a price/performance edge over comparable systems.

Which other company could offer a 64K Byte CP/M system like the PC8000, with dual 5¼" disc drives and monochrome monitor, opening the door to a wide range of business software – including integrated accounting, word processing, business planning and graphics – for *just £1,195?*

Whatever the size of your business, the processing power required, or the volume of data you wish to store – up to 20 megabytes on the APC – there is one of NEC's flexible family of personal computers to give you the best price/performance in its class.

PC-8000 Series
Personal Computer. £1,195*

PC-8800 Series
Personal Computer. £1,455*

Advanced
Personal Computer. £1,985*

*PC8000 64K CP/M SYSTEM DUAL 5¼" DISC DRIVES MONOCHROME MONITOR £1,195 EXCL. VAT.
*PC8800 64K EXPANDABLE SYSTEM MONCHROME MONITOR DUAL 5¼" DISC DRIVES £1,455 EXCL. VAT.
*APC H02 128K TRUE 16 BIT MICRO COMPUTER WITH DUAL 1 MEGABYTE 8" DISC DRIVES, [illegible] DISPLAY £[illegible] EXCL. VAT.

To: NEC Business Systems (Europe) Ltd.,
Computer Division, Freepost (no stamp required),
164/166 Drummond St., London NW1 1YP. Tel: (01) 388 6100

BUSINESS_____

NAME_____

ADDRESS_____

PHONE_____

PLEASE TICK: PC8000☐ PC8800☐ APC☐ PC/2/83

NEC
NEC BUSINESS SYSTEMS (EUROPE) LTD.

● Circle No. 191

NEC DEALERS:

Aberdeen Mr B D West
Tyseal Computers Ltd. 0224-647365
Bath Mr D Broadway
Jade Computers 0761 (36397/8 and 32570)
Birmingham Mr A Bell
Tempus Business Systems 021 477 9789
Borehamwood Mr T Benson
Mastermicro Ltd. 01-953 6368
Bridgnorth Mr A S Vincent
Jentech Services Ltd. 07462 61458
Brighton Mr R F Hunter
Brighton Computer Centre 0273 673114
Bristol Mr J Champion
Cashpoint (EPOS) Ltd. 0272 277518
Bristol Mr A E Smith
Axiom 027 588 5632
Cambridge Mr J Hartley
Eicon Research Ltd. 0954 81825
Canterbury Mr C B Raines
Jutea Ltd. 0227 830083
Charmouth Mr A K Hathway
Fenway Controls Ltd. 0297 60223
Colchester Mr M K Titman M.D.
Emprise Electronics Ltd.
(0206) 865926/870353/47242
Coventry Mr K Hudson
Coventry Micro Centre, The (0203) 58942
Dorchester Mr B Savage
Dataman Designs (0305) 68066
Dundee Mr B D West
Tyseal 0382 22613
Eastbourne Mr J Earl
Omega Point of Sale (UK) Ltd. 0323 761799
Eire Mr L Hester
Pye (0001) 98441
Glasgow Mr P Hughes
Albany Data Systems Ltd. 041 226 4757
Glasgow Mr H Johnston
American Computers & Engineers Ltd. 041 248 2427
Grantham Mr R Eyre
ACC Data Systems Ltd. 0476 66611
Guernsey Mr E Ferbrache
Micrologic Systems Ltd. 0481 28789
(from 1st Sep)
Haslemere Mr A Lamont
Crown Management Systems Ltd.
Nr. Haslemere (042879) 3636
Haywards Heath Mr G Theaksten
Southern Computer Warehouses Ltd (04446) 45311
Hemel Hempstead Mr D Stafford
Chiltern Datalink 0442 212714
High Wycombe Mr M A Curley
Hyford Business Machines 0494 446003
Huddersfield Mr G A Vevers
NMR Computers (0484) 682905
Kingswood Mr P D Boylan 0737 83 2738
Zilobyte Systems 01-588 1936
Leeds Mr M Cullen
Hepworth Computer Services 05324 40265
Leicester Mr G A Holt
Computer Store (Leicester) Ltd. 0533 882955
Liverpool Mr T Best
Startec Computers 051 727 7267
London WC1 Mr C Idnani
London Computer Centre Ltd. 01-387 4455
London WC1 Mr K Lockwood
Abbotsford Office Equipment Ltd. 01-837 3980/5478
London WC1/EC1 Mr R Sharpe 01-405 6231
Berrys (Shortwave) Ltd. 01-831 8001/2
London W1 Mr M R Gadd, Miss K Bird
John Lewis Partnership Dept. 827 Radio & TV
Oxford St. London W1A 1EX 01-629 7711
London NW1 Mr M Kraltman
Bonsai Ltd. 01-580 0902
London SW Mr M Lagan
Interam Computer Systems Ltd. 01-622 9373
London EC Mr B Smith
Marchessa Ltd. 01-726 4809
London EC Mr D Warren
MCB (Microwriting Comms Bureau) 01-437 1388
London N1 Mr I Gibson
POS Marketing (UK) Ltd. 01-837 1165
London N1-N22 Mr J A Wynne
Professional Data Services Ltd.
01-445 6655/446 4889
London W2-W10 Mr M Platt
SSCS Ltd. (Selected Software
& Computer Systems Ltd.) 01-351 5622/6
London NW Mr S Virji
Steiger Computers Ltd. 01-961 6000
Loughborough Mr D O'Sullivan
Data One Systems 0509 37281/2
Manchester Mr S Dewsnap
Desktop Computing Ltd. 092 541 5415
Central Milton Keynes Mr S Robotham
John Lewis Partnership 0908 679171
Morpeth Mr R Owen
Computerit Ltd. (0632) 845262
Newport, Isle of Wight Mr A Medley
Cemoc Ltd. 0983 529 555
Northampton Mr P Scott
Basic Computers & Systems Ltd. 0604 710 740
Nottingham Mr V Skitt
Skytronics Ltd. 0602 781742
Oxford Mr M A Curley
Hyford Business Machines 0865 723511-2-3
Petersfield L Robinson, A Macleod
Strongwight Ltd. T/A Community Computers 0730 87567
Plymouth Mr S Taylor
Telfont 0752 550816
Poole Mr A Thompson
Zymotix Ltd. (0202) 679546
Portsmouth Mr P S Palmer
RDS Computers & Business
Services Ltd. 0705 751194
Reading Mr P McRae
Computer 100 0734 591616
Sandy Mr D Gurney
Electron Systems (Sandy) Ltd. 076 781 195
Stafford Mr B Balcanquall
Computerama (0785) 41899
Swaffham Mr T M B Hunt, M.D.
Breckland Business Systems Ltd. (0760) 21637
Taunton Mr J J Williams
CSM Computer Services 0823 76698
Weybridge Ms S Phibbs
IKS Consultancy Ltd. 97 54526
Whitehaven Mr R Turner
H L Elliott Whitehaven: (0946) 3671
Windsor Mr J Gripton
Computer Electronics Ltd.
Windsor: (07535) 62028 and 55669
Worcester Mr R J Rook
Dateort Ltd. 0905 425195
Worthing Mr S C Shannon
Shannon Personnel Ltd. 0903 36247

If you want it tomorrow . . . call us today 01-455 9823

COMPUTER/CALCULATORS

HEWLET PACKARD
HP 41C (Comp/Cal) £126
HP 41C C/R £126
HP 41CV (Comp/Cal) £169.50
HP IL Module £78.00
Printer 82143A £220.95
Printer 82162A £292

SHARP
PC 1500 Pocket Computer £130.00
CE 148 RS232 and Cent I/F £130.00
CE 158 printer/cassette I/F £115.00
CE 151 4K Add on mem £43.00
CE 152 Cassette £36.00
CE 155 8K Add on mem £69.00
MZ-80A 48K Computer £380.00

HP 16C (Hex Con) £81.00
HP 15C (Adv Sci) £81.00
HP 75C (Portable) £600.00
TEXAS
CC40 Portable Computer £155.95
All accessories stocked

MZ-8080AEU Exp Unit £86.00
MZ-80FB Dual Floppy Disc Drives for MZ-80AB complete with I/F card, cables, and
Sharp Disc BASIC & Manual £650.00
MZ-80P4 150 cps Dot Matrix Printer £700.00

WORD PROCESSING PRINTERS

NEC SPINWRITER*
(RS232 or Centronics)
7710 RS232/7730 Centronics.....
Tractors, Sheet Feeders and Paper Guides for NEC, Ex-Stock
Smith Corona*
The most exciting thing to happen to Daisywheel Printers this year.
TP1 .....£375
(RS232 or Centronics — please specify
EL-2000.....
(The TP1/Typewriter Combo-Centronics only)
TEC STARWRITER*
F10—40cps (Serial/Parallel).....
FACIT—4565.....
An enhanced F10—40cps with a 2K buffer.....
Tractor (Bi-Di).....
Sheet Feeder.....
Mechanical Sheet Feed.....
OLYMPIA*
ESW 103 KSR.....
ESW 102(RO).....
TOSHIBA*
The all new high speed:— Word Processing/Draft/Data Processing printer using a — 24 wire printhead to give exceptionally high letter quality output

BROTHER*
HR1 *Highly Recommended* £535
Serial or Centronics — HR15 £420.00
DIABLO 630*
620(RO).....
630(RO).....
630 API—RO.....
630(KSR).....
Tractor (Bi-Di).....
Sheet Feeder.....
FUJI *DAISYWHEEL*
...el Option.....
...r (Bi-Di).....
...t Feeder.....
RUTISHAUSER & BDT*
Sheet Feeders and Tractors for: Qume, Diablo, NEC, Ricoh, TEC Starwriter, Olivetti, etc.
HERMES 612-B
Centronics.....
Tractor.....
RICOH*
Model RP 1300 (S) (4K Buffer) £990.00
Flowriter (8K) PR 1600 .....£1290
Mechanical Sheet Feeder.....

PHONE US FOR BEST DEAL

DOT MATRIX PRINTERS

OKI*
M80A.....£198
M82A.....£295
(120cps Pin, Friction with RS232 & Centronics Parallel I/F)
Tractor.....£55
M83A.....£478
(120cps Friction, removeable Tractor and RS232 and Centronics Parallel as standard)
M84A.....£768
EPSON
Epson RX80 (100cps) £245.00
Epson FX80 (160cps) £350.00
Epson RX80FT £260.00
Epson MX100 Type III £380.00

SEIKOSHA GP-100*
GP-100A.....£210
(RS232 Option).....£63
GP-100 (VIC 20).....£230
GP-250X.....£261

ANADEX*
DP-9001(A).....£1100
DP-9500(L).....£950
DP-9500(A).....£1100
DP-9501.....£1100
DP-9501(A).....1100
DP-9620(A).....£1150
(A) Series are all BUFFERED MODELS

STOP PRESS NOW IN STOCK
NEW APPLE 11E £645
SIRIUS 1128K WITH 1.2Mb S/S DISKS £1790.00
HP PLOTTER 747A RS232 or HP1B £1050.00

EPSON HX20 Briefcase computer. Weighs less than 4 lbs. 16K expandable. 64K Rom. 32K Ram. Full size ascii keyboard. Runs on own power for 50 hours. Complete Serial and RS232 interface. £375.
Accessories & Software for Epson HX20 available from stock.

SOFTWARE

Word Processing APPLE
Applewriter 1.1 .....£55.00
Applewriter 2 .....£85.00
Wordstar £245.00
Applewriter IIe £105.00
Word Processing SIRIUS
Supr Calc £140.00
Multiplan £149.00
Wordstar £269.00
Select £265.00
Mail Merge £85.00

Word Processing IBM
Wordstar £285.00
Easywriter II.....£230.00
Volkwriter.....£149.00
Mailmerge.....£140.00
Easyspeller.....£115.00
Superwriter.....£230.00

Other Software including Microsoft/Comsoft/BOS etc. also in stock

GOODS FULLY GUARANTEED
PRICES EXCLUDING VAT AND P+P.
Company and Government orders accepted by phone.
Barclaycard/Access/Visa accepted by phone.

Tel.: 01-455 9823

EXPORT ORDERS WELCOMED

MOUNTAINDENE
22 Cowper Street London EC2

● Circle No. 192

Please supply me with [ ] more details about Laserbug and your special offers
[ ] a sample copy for £1.00 and an A4 SAE (17p postage)
[ ] 1 UK 12 Month Subscription for £12.00
[ ] 1 UK 6 Month Subscription for £6.00
[ ] 1 Overseas Surface Mail Subscription for £14.00
(air mail rates on application)

Please send the goods to:
NAME ..... ADDRESS .....
.....
I enclose a cheque/PO for £ p made payable to LASERBUG.
Please send the form to LASERBUG Dept. P, 10 Dawley Ride, Colnbrook, Slough, Berks., SL3 0QH

● Circle No. 193

TOP VALUE AND LOWER PRICES AT
LOMAX NEW COMPUTER CENTRE
Exhibition Special (Est 1927)

The BBC Microcomputer System MODEL B ..... £399 (cassette lead £4.50) (cover £4.95)	COMMODORE 64 ..... £199.00
MICROVITEC Colour Monitor £287	SINCLAIR SPECTRUM 48K . £129.95
ACORN AP 100A Printer .... £212.00 LVL Dual Disk Drive 100K ..... £389.00 200K ..... £573.00 Disk Interface (fitted free) ..... £79.95 Speech Interface (fitted free) ..... £55.00 View Word Processor (fitted free) £59.00	TEXAS T199/4A ..... £89.95 SHARP MZ80A ..... £389.00 SORD M5 ..... £149.00
Cassette Recorders from ..... £29.95 Monitors from ..... £79.95 ORIC 48K ..... £128.00 (with £19.95 free software) DRAGON 32 ..... £159.95	PLUS MUCH, MUCH MORE IT PAYS TO LOOK IN BEFORE GOING ANYWHERE ELSE! SOFTWARE AVAILABLE FOR ACORN (BBC) ATARI, DRAGON, BUG-BYTE, RABBIT, COMMODORE, UK. Send S.A.E. for our Computer News Sheet For Insurance & Postal charges ADD £5 for Hardware £1 for Software For MAIL ORDER Phone your ACCESS / VISA on our HOT LINE 061-832 6345 or send cheque P.O. Payable to LOMAX LTD for IMMEDIATE ATTENTION NO EXTRA CHARGE ON CREDIT CARDS

LOMAX (Computer Division)
8 EXCHANGE ST (St Anns Sq) MANCHESTER M2 7HL

● Circle No. 194

Shurland Computers

XMAS OFFERS

Gift wrapped and delivered to your door!

Who do you know who would like an Apple in their Christmas Stocking.

Apple //e Professional Home Computer pack, includes Apple //e, Disk with Controller, TV modulator, Apple Books and additional surprises to 'soften' them up.

apple® IIe **£750.00** plus V.A.T.

IBM Personal Computer

We'll even throw in an Apple sports bag.

Offer closes Friday December 9th.

For a sneak preview of what Christmas has to offer why not visit us at 'Enterprise 83' the regions most powerful business show, Queensway Hall, Dunstable, Beds., November 23/24/25th.

Or telephone our hot line

(0582 450710),

Shurland Computers, Marshall Chambers, Mill Street, Luton, Beds.

BARCLAYCARD ACCESS AMERICAN EXPRESS ACCEPTED

Shurland Computers

● Circle No. 195

by John Wellsman

Calendar alarm clock

```
66 CLS
70 GOSUB120:LOCATE3,1,0:PRINTDY$
80 LOCATE6,2,0:PRINTTIME$
91 I$=INKEY$:IF I$="" GOTO 92 ELSE 1000
92 IF H$<>""THEN 1020
100 GOTO 80
120 '
130 D$=DATE$:D1$=LEFT$(D$,2)
140 MM$="JANFEBMARAPRMAYJNEJLYAUGSEPOCT
NOVDEC"
150 M$=MID$(MM$,(VAL(D1$)-1)*3+1,3)
160 DA$=MID$(D$,4,2)
170 Y$=RIGHT$(D$,2)
180 DD$=STR$(VAL(DA$))+" "+M$+" "+Y$
190 DY$="SUNMONTUEWEDTHUFRISAT"
200 DY$=MID$(DY$,(DAY-1)*3+1,3)
210 DY$=DY$+" "+DD$:RETURN
1000 CLS
1009 PRINT"Time to be set"
1010 LOCATE5,1,0:PRINT"HHMM":LOCATE3,2,
0:INPUTA$
1015 H$=LEFT$(A$,2):M1$=RIGHT$(A$,2):CL
S
1020 IFLEFT$(TIME$,2)=H$ AND MID$(TIME$
,4,2)=M1$ THEN 1030 ELSE 70
1030 CLS: FOR X=1 TO 11
1040 LOCATE 6,2:PRINT"TIME'S UP"
1050 SOUND3+X,7
1055 IF INKEY$<>"" THEN H$="":M1$="":CL
S:GOTO 70
1060 NEXT:GOTO 1030
```

IF YOU TAKE your cue from Epson's advertising and keep an HX-20 by your bedside you may like to have a look at this little alarm-clock program. To set the alarm, press the space bar and enter the time that you want the alarm to go off. To stop the alarm once it has gone off, press the space bar again. Make sure that your Day value is set correctly.

Print Using

Some people have had difficulties with combining Print Using and Tabs. If you program:

```
10 PRINT TAB (10) USING U$;A
```

you will get a syntax error. The solution is to use the following syntax:

```
10 PRINT tab(10)"";:PRINTUSINGU$;A:
```

This holds good for LPrint as well. On page 181 I have described how string and numerical Print Using formats can be combined on Tandy machines. The same technique works equally well on the HX-20.

Memory structure

Some exploring in RAM will show how the program areas are organised. Memset is the starting address for the program area. Before any programs are entered it is divided into five blocks of 14 bytes each, as can easily be seen tying in the following without using any program lines:

```
FOR X=2624 TO
2693:LPRINTX,PEEK(X):NEXT
```

and pressing Enter. You will then see the five blocks of program areas in their unused condition.

The first two addresses of each block contain the number of bytes used by the program in that area. The Epson version of Microsoft Basic has the MSB in the first address and the LSB is the second. In an empty area the MSB is zero and the LSB is 14, indicating that an area containing no program still occupies 14 bytes. You should remember that when you check the memory size of a program with State these 14 bytes are not included in the size of the program.

The next eight addresses of the area block are occupied by the value 32, the ASCII value for a space, followed by two addresses containing zero. The contents of the first 12 addresses of each program area are always the same. The last two addresses of each program area always contain zero, a value equal to the program area. As can be seen if you have used the little routine above, this pattern of 14 bytes is repeated another four times.

Coded programs

To see how the programs themselves are organised, first Login 1, and enter the following program.

```
10 FORX=1TO10
20 PRINTX
30 NEXT
```

Type it in exactly like this without any spaces, then type Stat, which should show a figure of 25 bytes for the program. Any program in number 1 program area will start at 2624. Stat gives 25 bytes for the program, but 14 bytes must be added which Stat does not include, making a total of 39 bytes. The program will therefore end at address 2662.

Now Login 5 so that the program in area 1 is not affected. Enter this program:

```
10 FOR X = 2624 TO 2662
20 LPRINTX,PEEK(X):
30 NEXT
```

and run it. Once again the first two bytes show the size of the program and, as expected, the size or length is given as 39. Then follow the eight 32s and two zeros. Next are two addresses containing the values 10 and 88, the MSB and LSB of the address of the start of the next program line.

The next two addresses contain the MSB and LSB of the line number and it is fairly easy to see that this is 10. The following seven addresses contain the actual program code, and the last address in the line is always a 0. The next address after the zero is 2648, as indicated above, and this address and the next contain the MSB and LSB of the start of the next program line. The next two addresses contain the line number; then follows the code and the line-terminating zero, and so on through the program. It appears to terminate with three zeros, though the first zero is the terminating zero of the last line.

Every line requires at least five bytes of memory: two for the address of the start of the next line, two for the line number and one for the terminating zero. Thus, a 50-line program will need 250 bytes of memory before it is even written. So get as many commands as possible into each line.

The way in which the computer records in memory the program that has been written in Basic is by using what are known as tokens to represent the various commands and functions. Every command and function is translated into and recorded as either one or two ASCII codes. When the function or command requires two ASCII codes, and the first code is always 255.

Looking at your printout, starting at address 2640, the value in this address is 129. This is the code representing For, the first word of your program. The next address is 88, which is ASCII code for X. The next value is 234, the code for =. It is not the ASCII code for the character =, which is 01, but the token code for the function for assignment or equality.

The next code, 4a, is ASCII code for 1; 208 is the token for To, and is followed by the two ASCII codes for one and zero, and finally the zero signifying the end of the line. The next piece of program code starts at address 2652 and is very short, consisting of 162, the token for Print, and 88, the ASCIi code for X.

None of the commands used in the specimen program used the double-coded tokens. If you decide to decode all the functions and commands, remember that when you come across the value 255, it must be taken in conjunction with the following value to give the token. These are mostly the functions like Sin, Cos, Left$, Asc, and so on. There are only two tokens which include the first or opening bracket: "Tab(" and "Spc(".

GO 4th WITH O1 COMPUTERS!

THE APRICOT START UP PACKAGE

FROM
£1495 + VAT
monitor £195 extra

WITH WORDSTAR

The Industry's most successful word processing package with mailmerge.

£295 + VAT

AND PRINTER

TEC FP 1500-25 Daisy Wheel Printer
25 CPs fully Wordstar compatible with optional Sheetfeeder and Tractor.

£595 + VAT

For further information
Call 01-228 2207 Now!

O1 COMPUTERS

Britain's No 1

Southampton House, 192-206 York Road, London SW11 3SA
TELEX: 8954575 CTCLDN

● Circle No. 225

System tape copier

AT ONE of the computer get-togethers that I go to, a friend passed on a security tip for concealing data files. The method could apply to tape or disc, sequential or direct-access files.

The idea is that the first field contains a number or a name. Before the business part of the file is read, the first field is Input and the operator has to enter the matching number or name. The computer compares the two, and the program will not proceed unless they match.

This is, of course, a very simple trick and though it would completely stop the game-player user who only knows how to switch on and Run, any competent programmer could get through it in a moment. It is almost impossible to make an absolutely secure lock for microcomputers. Even the famous dongle can be unscrewed if you really know your stuff.

Mr Anderton of Mawdesley, Lancashire has sent me a useful system tape copier. As well as copying the progam on the computer it will find start and end addresses. When the program is run, you have four options;

Specify the number of bytes to be read, the default is 1,000;
Load from tape;
Record on tape;
Lineprint the bytes.

The first option avoids loading garbage at the end of the program. As it stands, the program can load up to 12,287 bytes. The Load option loads each byte from the start into RAM, starting at 5000hex. The Lineprint option prints bytes from RAM, starting at any specified point. When loading or recording, the stream of bytes can be seen in the top right of the screen.

As you take in and LPrint the first dozen bytes of a system tape, you will find the first starter byte to be 55. The next six bytes are the title in ASCII code. Byte 9 is the LSB of a count of the number of bytes in the program. Byte 10 is the first of the Z-80 machine code.

Right at the end of the machine code are four ending bytes, the last two being the address of the start point of the program, which is jumped to when you press or Enter after system loading. If both have the value zero then the program has not been made to stand alone.

Copier — main program lines.

Line 200 sets printer to a line length to suit and sets default value L, in bytes.
Lines 210 to 240 Poke two small machine-code routines into RAM.
Lines 270 to 300 display the main menu.
Lines 310 intakes your L value.
Lines 400 to 410 load from tape.
Lines 520 and 530 CSave.
Lines 600 to 660 Line Print.

Mixing text and numbers.

```
1  CLS
10 U$="# # # "T$="%       % '9
   SPACES
20 A=RND(200): B$="ODD":
C$="EVEN"
30 IF A/2<>INT(A/2) TEN C$=B$
40 U$=T$+U$
50 PRINT USING U$;C$;A
60 C=C+1: if C>15 THEN END
70 GOTO 10
```

If the tape being copied was recorded on a blank tape, and if you over-estimate its length so as to be sure the program will not stop too soon, then, when the bytes stop coming the program will continue to wait forever for more. Press Break and Run. RAM will have the load, and you can set the number of bytes again and LPrint or record.

Mixing text and numbers

For anyone writing programs that produce reports involving tables of figures, one of the most useful features of Tandy Basic, and of all Microsoft Basics, is the Print Using command. The Apple does not have it, and even the mighty BBC Micro has only a pallid imitation.

Although it is briefly alluded to in the Level II manual, many users do not seem to realise that text can be included in the Print Using string both before and after the signs. For instance, if your are printing percentages then

U$="# # # # %"

will include a % after each value when PrintUsingU$;X is used.

Another little-known feature of this command is that the numeric and text string versions can be linked together as illustrated by the accompanying simple eight-line routine.

It is possible to have a Print Using format combining both text and numeric formats, and using them in one command.

System tape copier.

```
130'THIS PROGRAM LOADS ANY TAPE  BYTE BY
    BYTE STRATING AT A
140'CSHINE  STARTER  INTO RAM STRTING AT
    5000H
150'ANOTHER TAPE CAN  THEN  BE  RECORDED
    FROM RAM.
160'THIS  PROGRAM  MUST BE LOADED AT 500
    BAUDS TO SUITE THE TAPES
170'TO BE COPIED.
180'PUT 20000 IN THE MEMORY PROMPT
200 POKE 16427,76:L=1000
210 DATA205,127,10,217,33,0,80,54,0,17,
    1,80.1.255,47,237,176,217,235
220 DATA33,0,80.205,150,2,205,53,2,50,
    60,60,119,35,27,175,186,32,243,187,
    32,240,205, 248,1,201
230 DATA 205,127,10,235,33,0,80,205,135,
    2,126,205,100,2,50,60,60,35,27,175,186,
    32,243,187,32,240,205,248,1,201
240 FOR I = 2000 TO 20077: READ A: POKE
    I,A:NEXT
270 CLS: PRINT "1 TO SET NO. OF BYTES."
280 PRINT"2  TO  LOAD FROM TAPE.": PRINT
    "3 TO RECORD ON TAPE.": PRINT "4 TO LINE
    PRINT":INPUTI
290 ON I GOTO 310,400,520,600
300 GOTO 280
310 CLS: INPUT"HOW MANY  BYTES (NOT MORE
    THAN 12287)..";L: GOTO 280
400 POKE 16526,35:POKE 16527,78:X=USR(L)
410 CLS:INPUT"****  LOADED ****";I:GOTO
    270
520 POKE 16256,80:POKE  16257,78:  X  =
    USR(L)
530 CLS:INPUT"**** CASS SAVED ****";I:
600 B=0:PRINT"JUST <ENTER> TO LINEPRINT
    FROM BEGINNING"
610 INPUT"OR  SKIP  THE  FIRST  HOW MANY
    BYTES (DECIMAL)...";B
620 FOR  I  =  20480+B  TO  20480+L:
    N=PEEK(I): NM=FIX(N/16): NL=N=NM*16
630 IF NM> 9 THEN NM = NM +7
640 IF NL > 9 THEN NL = NL + 7
650 N$=CHR$(NM+48)+CHR$(NL+48)+" "
660 LPRINT  N$:NEXT:  LPRINT  CHR$(10):
    GOTO 270
```

something even your best friend won't tell you...

Even our best customers can be curiously reluctant when it comes to passing on news of the amazing savings they found at Informex.

So if you've ever wondered where the brightest new bargains in hardware and related peripherals come from, you'll just have to let yourself in on our secret by phoning 01-318 4213 for our latest price list.

INFORMEX

8-12 LEE HIGH ROAD · LONDON SE13 5LQ · ENGLAND

...keep it to yourself

EPSON · BROTHER · IBM · NEC · BASF · ANADEX · TOSHIBA · TEXAS · TEC · STAR · SHINWA · SEIKOSHA · RICOH · ADLER · QUME · OKI · APPLE COMMODORE · JUKI · CORVUS · ACORN · SANYO · FUJITSU · DIABLO · INFORMEX · FORTUNE · DATA PRODUCTS · CONTROL DATA · OLIVETTI · BBC

● Circle No. 197

Oric Othello

OTHELLO IS played on an eight-by-eight board between the computer and its human opponent. Each player has two pieces in the centre of the board at the beginning of the game. Human and computer take turns to place a new piece in one of the vacant squares in such a way as to capture one or more of the opponent's pieces.

Pieces are captured if they lie on a vertical, diagonal or horizontal line terminated at one end by the piece just placed on the board and at the other by another piece belonging to the player. Captured pieces change to the colour of the player who has captured them.

Every move must capture at least one piece. Where no piece can be captured the player misses a turn and the opponent makes another move. The game ends when all 64 squares of the board have been filled, or when neither player can move. The player with most pieces at the end of the game is the winner.

The Othello program has been written by Gary Nugent of Dublin for a 48K Oric. The player plays the computer, and has the option of being black or white. Black always plays first. The computer is a little slow in choosing its moves, but it does provide a challenging game.

The board is displayed and updated after each move has been made. There is no need to press Return after entering each move. To forfeit your move press P. The computer will then make its move, if it is able.

The squares on the board are accessed by a co-ordinate system of input. The columns are lettered from A to H, and the rows numbered from 1 to 8. The row is entered first, followed by the column number. For example: 4C.

Lines 1 to 280 initialise the variables and are only executed at the start of each game. The board is held in the A%( ) and the B%( ) arrays. If the value in the A%( ) array does not match the corresponding value in the B%( ) array then the computer produces a 'Zap' or a 'Shoot' sound, depending on which player is moving. N%( ) holds the eight possible directions of movement from any of the squares on the board.

Lines 300 to 420 form a subroutine which returns a value S of placing a new piece at the square A%(PSN). If F = 1 then the state of the captured pieces is changed.

Lines 500 to 570 display the board and produce the sound effects for captured pieces whose state is being changed. Lines 600 to 670 calculate the best position for the computer to place its piece. If two positions are equally good then one of them is chosen at random.

Lines 700 to 740 display the computer's choice. Lines 800 to 910 accept the human player's move, check that it is valid and display the result. Lines 1000 to 1110 display the result of the game.

```
1 REM ** OTHELLO **
2 PRINT CHR$(17)CHR$(20):CLS:PAPER 0:FOR I=1 TO 5:PRINT:NEXT I
3 DOKE #BC70,535:DOKE #BC98,535
4 PRINT SPC(14)CHR$(27)CHR$(4)"JOTHELLO"CHR$(4)
5 PLOT 11,14,CHR$(3)+CHR$(17)+CHR$(96)+" Gary Nugent "+CHR$(16)
6 PLOT 12,17,CHR$(7)+CHR$(20)+" May  1983  "+CHR$(16)
7 WAIT 300
10 DATA @,28,62,62,62,62,62,28,0
20 DATA \,0,0,0,0,63,0,0,0
30 DATA 11,10,9,1,-1,-9,-10,-11
40 X$="  A B C D E F G H "
50 Y$="  1 2 3 4 5 6 7 8 "
60 Z$="                    "'* 19 spaces *
100 FOR I=1 TO 2:READ CH$
110 FOR J=0 TO 7:READ D:POKE 46080+8*ASC(CH$)+J,D:NEXT J,I
120 LORES 0:INK4
130 FOR I=0 TO 19:PLOT 10,I,23:PLOT 11,I,Z$:NEXT I
140 FOR I=1 TO 18
150 PLOT 10+I,1,ASC(MID$(X$,I,1))+128:PLOT 11,I,ASC(MID$(Y$,I,1))+128
160 NEXT I
170 FOR I=1 TO 9:FOR J=1 TO 15
180 PLOT 10+2*I,2+J,"!":IF INT(J/2)*2<>J THEN PLOT 12+J,2*I,"\"
190 NEXT J,I
200 DIM A%(99),N%(7),B%(99)
210 FOR I=0 TO 7:READ N%(I):NEXT I
220 CMPTR=-1:HUMAN=1
230 A%(44)=CMPTR:A%(45)=HUMAN:A%(54)=HUMAN:A%(55)=CMPTR
240 GOSUB 500:PLOT 8,24,"What do you want:"
250 PLOT 8,25,"Black (B) or White (W) ?":PLOT 11,26,"Black plays first."
260 GET A$:IF A$<>"b" AND A$<>"w" GOTO 260
270 PLOT 8,24,Z$+"      ":PLOT 8,25,Z$+"      ":PLOT 11,26,Z$
280 IF A$="b" THEN 800 ELSE CMPTR=1:HUMAN=-1:GOTO 600
300 S=0
310 IF A%(PSN)<>0 THEN 420
320 FOR I=0 TO 7
330 Q=PSN:L=1:Z=N%(I)
340 Q=Q+Z
350 IF A%(Q)=0 THEN 410
360 IF A%(Q)=T THEN 380
```

(continued on next page)

(continued from previous page)

```
370 L=L+1:GOTO 340
380 S=S+L-1:IF F=0 THEN 410
390 FOR K=1 TO L:AX(PSN+K*NX(I))=T:NEXT K
400 AX(PSN)=T
410 NEXT I
420 RETURN
500 HS=0:CS=0
510 FOR R=1 TO 8:FOR C=1 TO 8
520 X=AX(R+10*C):Y=BX(R+10*C)
525 IF CMPTR=1 AND HUMAN=-1 THEN TEMP=HS:HS=CS:CS=TEMP
530 IF X=-1 THEN PLOT 11+2*C,2*R+1,"O":CS=CS+1:IF X<>Y THEN ZAP
540 IF X=1 THEN PLOT 11+2*C,2*R+1,"@":HS=HS+1:IF X<>Y THEN SHOOT:WAIT 9
542 IF CMPTR=1 AND HUMAN=-1 THEN TEMP=HS:HS=CS:CS=TEMP
545 BX(R+10*C)=X
550 NEXT C,R
553 HS$=RIGHT$(STR$(HS),LEN(STR$(HS))-1)
556 CS$=RIGHT$(STR$(CS),LEN(STR$(CS))-1)
560 PLOT 7,21,CHR$(23)+"You have: "+HS$+", I have: "+CS$+". "+CHR$(16)
570 RETURN
600 M=0:F=0:T=CMPTR:PLOT 14,23,CHR$(12)+"Thinking..."
610 FOR R=1 TO 8:FOR C=1 TO 8
620 PSN=R+10*C:GOSUB 300
630 IF S<M OR S+INT(RND(1)*2)=M THEN 650
640 M=S:X=PSN
650 NEXT C,R
660 IF M=0 THEN 720
670 F=1:PSN=X:GOSUB 300
700 R=INT(X/10):C=X-10*R
710 PLOT 13,23,"I chose: "+CHR$(C+48)+CHR$(R+64)+CHR$(0)
715 FOR I=1 TO 30:PLOT 11+2*R,2*C+1," ":PLOT 11+2*R,2*C+1,"+":NEXT I
720 IF M=0 THEN PLOT 9,23,"I couldn't move.":GOTO 740
730 GOSUB 500
740 IF (A$="p" AND M=0) OR (CS+HS=64) THEN 1000
800 PLOT 7,23,CHR$(2)+"Your move (e.g. 2G):   "+CHR$(0)
810 GET A$:IF A$="p" THEN 900
820 R=ASC(A$)-48:IF R<1 OR R>8 THEN 810
830 PLOT 29,23,A$
840 GET A$:C=ASC(A$)-96:IF C<1 OR C>8 THEN 840
850 PLOT 30,23,ASC(A$)-32
860 PSN=R+10*C
865 T=HUMAN:F=0:GOSUB 300
870 IF S=0 THEN PLOT 12,25,CHR$(18)+CHR$(7)+"ILLEGAL MOVE  "+CHR$(16)
880 IF S=0 THEN WAIT 200:PLOT 12,25,LEFT$(Z$,16):PLOT 29,23,"  ":GOTO 810
885 FOR I=1 TO 30:PLOT 11+2*C,2*R+1," ":PLOT 11+2*C,2*R+1,"+":NEXT I
890 F=1:GOSUB 300
900 GOSUB 500:PLOT 8,23,Z$+"    ":IF CS+HS=64 THEN 1000
910 GOTO 600
1000 CLS:FOR I=1 TO 11:PRINT:NEXT I
1010 A$=CHR$(27)+CHR$(4)
1020 IF CS>HS THEN PRINT SPC(12);A$;"N I WON !!!"CHR$(4)
1030 IF HS>CS THEN PRINT SPC(9);A$;"N CONGRATULATIONS"CHR$(4)
1040 IF HS>CS THEN PRINT:PRINT SPC(11);A$;"N YOU WON !!!"CHR$(4)
1045 IF CS=HS THEN PRINT SPC(10);A$;"N - A DRAW -"CHR$(4)
1050 FOR I=1 TO 20
1060 INK INT(RND(1)*8):PAPER INT(RND(1)*8)
1070 NEXT I
1075 INK 0:PAPER 3
1080 WAIT 200:CLS:PLOT 12,12,"ANOTHER GAME ?"
1090 GET A$:IF A$<>"y" AND A$<>"n" THEN 1090
1100 IF A$="y" THEN CLS:RUN
1110 IF A$="n" THEN PRINT CHR$(20);CHR$(17):END
```

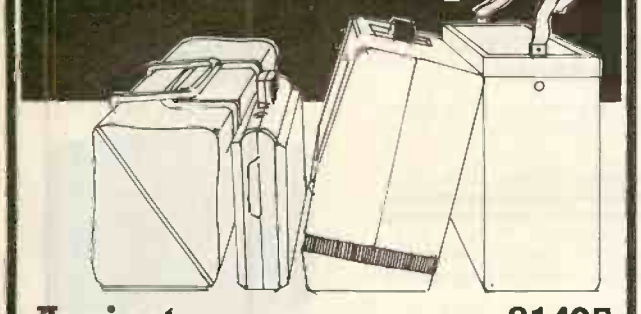
swan packaging

The First Name In Computer Packaging

Ring us on 01-607 9938 for quotations on computer presentation packs and sleeves printed in one to four colours.

● Circle No. 198

Deal with the experts on Portable Comput



Apricot ..... from **£1495**
256K RAM ● Dual 315K drives both upgradable concurrent CP/M and MS-DOS

Philips Portable ..... from **£1390**
64K ● CP/M ● Dual disc drives to 640K

Osborne 01 & **Exec** ..... **£call**

Epson HX20 & **QX10** ... from **£411**

FREE bundled software with every disc based system

On site training, servicing and support.

(0280) 816087 Call for a portable price

Fraser Associates Ltd.
1 Bristle Hill, Buckingham, Bucks
MK18 1EZ (0280) 816087

● Circle No. 199

Kuma

~ a unique pool of expertise

Hardware for OEM's, Research, Experimenters & Micro users

APOLLO 68000

CPU board featuring:—
68000 at 10 MHz.
4K fast static RAM, expandable
16K fast EPROM, expandable
RS232C. Monitor. 24 I/O lines
for **£295.00** *+VAT*

Add-on
EPROM Programmer for 2764 & 27128. Fully supported in software by CPU board **£95.00** *+VAT*

EPSON HX-20

Centronics Printer Interface converts the HX-20 RS232 to Centronics Parallel **£99.50** *+VAT*

Many more HX-20 add-ons available.

MODEMS

300/300 baud Sendedata accoustic coupler (HX-20) **£220** *+VAT*

300/300 baud Sendedata accoustic coupler (RS232C) **£269.50** *+VAT*

1200/75 baud Prism VTX 5000 (Spectrum) **£86.91** *+VAT*

1200/75 baud Prism 1000 (RS232C) **£60.83** *+VAT*

1200/75 Prism 2000 (RS232C) **£73.87** *+VAT*

300/300 baud VDS V21 LP (RS232C) Modem **£249.50** *+VAT*

300/300, 1200/75 baud DFL 2123 Modem (RS232C) **£286.00** *+VAT*

Please phone for requirements.

PRINTER BUFFER

For micro computer systems that are using a printer with a Centronics interface. The effect of a printer buffer is to release the computer keyboard to the operator many minutes earlier than normal during a long print run (up to 64,000 printed characters earlier!) Centrospool
64K Printer Buffer **£189.00** *+VAT*

KUMA Z80

CPU Board Featuring:—
Z80 at 4 MHz, 0, 16, 32 or 48 K RAM. Parallel I/O. MIB I/O board compatible. On board ROM. Can simulate the SHARP MZ-80A, compatible EPROM programmer becoming available

CPU board (no RAM) **£69.95** *+VAT*
16K board **£64.00** *+VAT*
16 line parallel I/O **£24.00** *+VAT*
Monitor ROM **£17.95** *+VAT*

SHARP MZ711

RS232C Serial Interface **£69.52** *+VAT*

Hi-Res Graphics Parallel Centronics Interface . . . and much more to be announce soon.

PRINTER INTERFACES

HX-20 Serial to Centronics **£99.50** *+VAT*
Newbrain Serial to Centronics **£99.50** *+VAT*
Sharp MZ80A without I/O Box to Centronics **£85.00** *+VAT*
Sharp MZ80A without I/O Box to P5/P6 **£85.00** *+VAT*
Sharp MZ80B Centronics **£95.00** *+VAT*
Sharp MZ711 to Centonics to be announced
Epson FX80, MX80, CP80 and RS232C and 2 k buffer **£60.00** *+VAT and many more.*

ELECTRONIC MAIL

Kuma has designed and can supply electronic mail interfaces for **Epson HX-20, Sirus 1, Sharp MZ80A, Sharp MZ711, Spectrum, Commodore 64, & Newbrain.**

Choose from our range of terminal emulations. Comm Software, RS232C interfaces, etc.

Send for our free introductory booklet discussing Telecom Gold, Comet and Prestel, letting us know the computer you wish to use.

TERMINAL EMULATION

The need for terminals (VDU's) often arises for such applications as electronic mail, etc There are many advantages to using a micro instead of a traditional product.

Sharp MZ80A + 80 col + RS232C + Software (includes second RS232C and Centronics port) **£589.50** *+VAT*
Epson HX-20 DM5 software **£39.50** *+VAT*
Newbrain modem adaptor **£69.50** *+VAT*
Newbrain Comm Software **£29.50** *+VAT*
Sharp MZ711 adaptor including software **£69.52 incl. VAT**

PHONE NOW (0628) 71778

Kuma Computers Ltd 11, York Road, Maidenhead, Berks SL6 1SQ
COMET: KUMA
Telex 849462 TELFAC KUMA TELECOM GOLD: KUM 001

Please tick box ☑ for information required, and send coupon to:
Kuma Computers, Ltd. 11 York Road, Maidenhead, Berks SL6 1SQ

Hardware
- ☐ 68000 CPU BOARD
- ☐ Z-80 CPU BOARD
- ☐ HX-20 CENTRONICS I/O
- ☐ MZ-711 MODEM I/O
- ☐ MODEMS

Hardware
- ☐ ELECTRONIC MAIL
- ☐ 64K PRINTER BUFFER
- ☐ SHARP PRINTER I/O
- ☐ TERMINAL EMULATION
- ☐ OTHER KUMA PRODUCTS

NAME .....
ADDRESS .....
POST CODE .....

● Circle No. 200

PROJECT PLANNING

ON YOUR DESKTOP COMPUTER

IBC PROJECT PLANNER GIVES YOU:

Network Analysis	User Defined Reports
Resource Analysis	User Defined Bar Charts
Resource Scheduling	Histograms
Resource Costing	Critical Path Reports
Subnet Library	Special Sort Feature

DEALER ENQUIRIES WELCOME

IBC *Computer Systems Ltd, Belgreen House, Green St, Macclesfield, Cheshire (0625) 616399*

● Circle No. 202

EPROM PROGRAMMERS

NEW **BBC** PET VIC APPLE ACORN

MODEL A 2716, 2516, 2532, 2732, 2732A, 2764, 2564, 25128, 27128 £110.00
MODEL B 2716, 2516, 2532 £ 53.50
MODEL C 2716, 2516, 2732 £ 53.50
PET, VIC, ACORN MODEL A.B. or C. ALL PROGRAMMERS CAN READ/PROGRAMME/VERIFY/COPY
BBC, Apple Model A only.
Full Software Tape supplied for your Computer
PET OWNERS:- Free Programme for making your own Character Sets.

PET SUPERBOARD 40 or 80 COLUMN £ 52.50
- Select up to 8 ROM/Eprom, RAM/ROMS from any available ROM Socket.
- No Wires, Switches or Soldering Required.
- Will except any combination of 2K or 4K ROM/EPROMS, RAM/ROMS.
- Select upto 8 of your own Character Sets

APPLE VIA BOARDS ● The Via Board contains 1 or 2 6522 Via's Single £27.90 Each 6522 Via's contains: 2 × 8 bit Programmable I/O Ports. 1 × 8 Bit Shift Register Double £36.60
- Four Handshaking Lines CA1 CB1, CA2, CB2. Two Programmable Timers.
- Full 5622 Data Sheets supplied

ACORN MONITOR CHIP (2K) £10.50
- 10 Commands to simplify Machine Code Programming
- Full Screen Editor. Repeat Key. Auto Entry Flashing Cursor. Tape Verify
- Slow Scroll, Memory Fill, and many more.

PET IEEE PRINTER BUFFER Available soon
IEEE-Centronics — RS232
- Free Your Pet from Printing
- The Printer Buffer receives all your Printer Data in seconds (5 sheets) Then outputs your Data while you type your next letter.
- 14K printer Buffer.
- Full IEEE to IEEE or IEEE to Centronics output.
- IEEE to RS-232 optional extra. S.A.E. for details

CONNECTORS	CHIPS	
PET IEEE User Port £5.65	2716 EPROM (2K) £4.00	C10 Cassettes (10) £5.00
VIC User Port £5.65	2532 EPROM (4K) £6.50	Eprom Eraser £40.00
VIC Games Port £5.65	2764 EPROM (8K) £8.00	Eprom Eraser Timer £10.00
Acorn Expansion Port £7.00	6116 P.3 (2K) Static RAM £4.50	ALL THESE PRICES INCLUDE VAT AND P&P
PET Cassette Port (Crimp) Orders over 100 £1.00	6522 VIA'S £6.50	

Please Add 15% VAT Plus £2.50 P&P to your orders.
OFFICIAL ORDERS

CIb COMPUTER INTERFACE DESIGNS
4 ALBERT RD. MARGATE. KENT. (0843) 294648

● Circle No. 203

ELBUG — ELBUG — ELBUG — ELBUG — ELBUG — ELBUG — ELBUG — ELBUG — ELBUG — ELBUG

ORBIT FOR THE ACORN ELECTRON

BEEBMAZE

RACER

SPACE CITY

IF YOU HAVE AN ACORN ELECTRON OR ARE THINKING OF BUYING ONE THEN YOU SHOULD JOIN THE ELECTRON USER GROUP.

Members receive 10 copies of the magazine **ELBUG** each year. **ELBUG** is devoted **EXCLUSIVELY** to the **ELECTRON MICRO.** It is packed with news, Reviews, Hints, Tips, Programming ideas, Major articles, plus Regular program features including games and useful utilities.

ELBUG, is produced by **BEEBUG** Publications Ltd., publishers of **BEEBUG**, the magazine of the National User Group for the **BBC** Micro. **BEEBUG now has some 20,000 members, and has achieved a high reputation both in this country and abroad. Acorn and the BBC have both taken out multiple memberships, for example, and our articles are now syndicated in Australia. (For further details of BEEBUG,** see separate advertisement elsewhere in this issue.)

The formula which makes **BEEBUG** an invaluable companion for users of the **BBC** micro will be applied to **ELBUG.**

By subscribing to **ORBIT** you gain all the advantages of a single-micro magazine, with no space wasted on programs and articles for other computers.

Further benefits of membership:

Members' discount scheme with national retailers of software, hardware and books, with savings of up to 25%.

Members' software library with a growing range of titles at special prices for members.

SPECIAL OFFER

SUBSCRIBE NOW, AND GET A FREE INTRODUCTORY CASSETTE CONTAINING 8 TESTED PROGRAMS FOR THE ELECTRON.

1. **SPACE CITY** Defeat the invading Aliens with your laser, and save the city.
2. **3D NOUGHTS AND CROSSES** Pit your wits against the **ELECTRON** on a 4×4×4 board.
3. **RACER** Guide your racing car to victory, avoiding other cars and obstacles on the track.
4. **3D MAZE** In this challenging game, you must escape from the maze — The screen displays a 3D view from inside the maze.
5. **PATCHWORK** A multicoloured display of continuously changing patterns.
6. **KEY SET ROUTINE** A program to set up the user function keys.
7. **MEMORY DISPLAY** An efficiently written utility to diplay the contents of memory (ROM and RAM).
8. **CHARACTER DEFINER** Define individual graphics characters with this useful utility for use in your own programs.

HOW TO JOIN

To subscribe for one year, and get your free cassette, send £9.90 (payable to Orbit) plus a strong stamped addressed envelope (for the cassette) to:

ORBIT, PO BOX 109, High Wycombe, Bucks HP11 2TD

SIX MONTH TRIAL SUBSCRIPTION (5 ISSUES) UK ONLY £5.90 — FREE CASSETTE OFFER STILL STANDS.

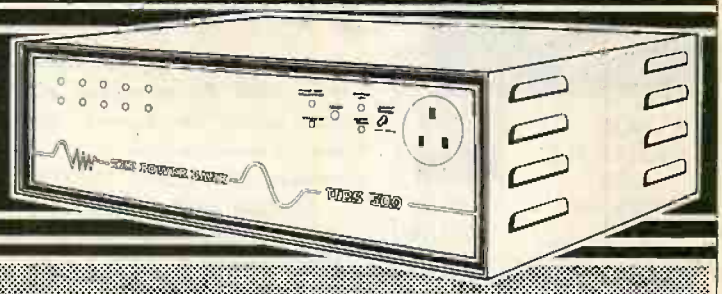
Membership outside UK (one year only): Eire and Europe £16, Middle East £19, America & Africa £21, other countries £23.

Editorial address BEEBUG Publications, PO Box 50, St Albans, Herts, AL1 2AR

● Circle No. 162

uninterruptable power supply

THE POWER BANK 500



THE COMPLETE SOLUTION TO YOUR POWER SUPPLY PROBLEMS.

The power bank 500 **extends our range** — now 120YA, 250VA, 500VA units. Your micro systems — large or small — will continue to operate in the event of a **mains** failure 'NO-BREAK', NO SWITCH-OVER, 'SPIKE & SURGE' **FREE**. Sine wave output derived from self contained battery source.

Applications:- Micro systems/printers/ hard disks/networks/data transmission equipment/telephone systems/installation & recording/in fact any installation which requires a continuous no-break supply.

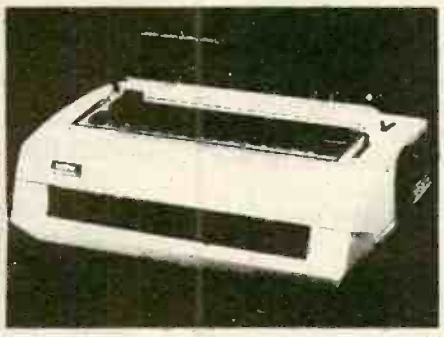
Manufactured by:-

POWER TESTING (SALES) LTD 65a Shenfield Rd, Brentwood, Essex CM158HA Tel 0277 233188 Telex 24224 MONREG 586

● Circle No. 204

THE HR1 THE FINEST PRINTER/TYPEWRITERS MONEY CAN BUY.

Only £695 + VAT



The HR1

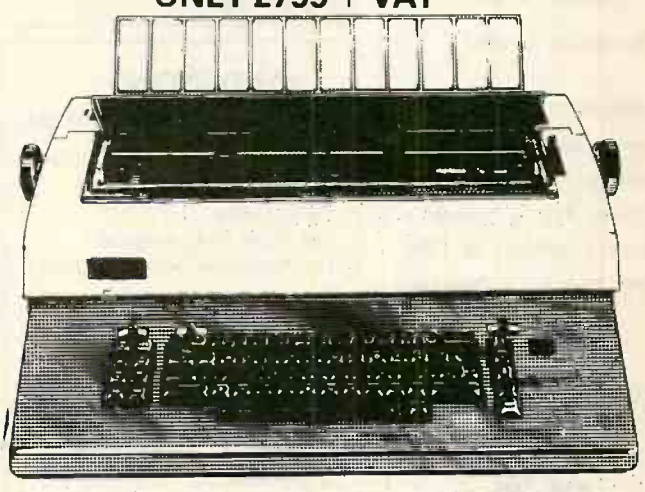
Bi-directional – 17 CPS – some features as below, but without keyboard and lift off facility.

Compatible with

SHARP
OSBORNE
APPLE II
APPLE III
TELEVIDEO
TANDY
BBC
MIMI
TEXAS 30/30
PET
HEWLETT PACKARD
SUPERBRAIN
SIRIUS
XEROX
IBM

In fact most computers

THE CROWN RANIER
ONLY £795 + VAT



CROWN RANIER – The leader of all interfaced daisy wheel printer/typewriters! Here's why:

The unbeatable Crown Ranier is the only heavy duty daisy wheel printer/typewriter which runs on a linear motor – no belts or cables to break, stretch or wear – and uses the IBM ribbon and lift off correctors The reliability has become legend in these days of expensive electronic typewriter breakdowns.

CENTRONIC – IEEE – RS232 INTERFACES – No external boxes – interchangeable daisywheels – variable pitch – three free daisy wheels – automatic whole line correction – easily copes with standard printed forms – 195,000 characters per ribbon (at least twice the average character length) – standard lift off correctors – a printer/typewriter at the flick of a switch.

Perfection as a typewriter (now used by local authorities and multi-nationals), perfection as a printer.

Beware of lightweight, low cost machines – these can never give long term reliable service. THIS MACHINE WILL!! The professional machine.

Ask you local computer or office equipment dealer for further information. EX STOCK DELIVERY.

SOLE UK DISTRIBUTOR. TRADE ENQUIRIES INVITED

CROWN BUSINESS CENTRE

56-58 SOUTH ST., EASTBOURNE, SUSSEX. (0323) 639983.

● Circle No. 206

NOW AVAILABLE FOR **stilts**

EPSON MX100	£4.45
EPSON FX80	£3.95
EPSON MX80	£3.95

When ordering please state printers model

COPY II PLUS

£39.95 + VAT

A set of disk utilities for Apple II or IBM PC combining the most asked for features into one low priced package.

Includes: BIT COPY: SECTOR EDITOR: VERIFY DRIVE SPEED: COPY DISK: DELETE DOS: VERIFY FILES: VERIFY DISK: UNDELETE FILES.

NEW

ADDRAM
by Profit Systems

The best multi function board for your IBM PC. Includes 64K upgradeable to 512K, serial and parallel ports, or 2 serial ports, clock/calendar, Ramdisk and print spooler software

plus . . . .

FREE

TASCMASTER

Multi-tasking PC DOS – allows you to execute up to nine different programs in memory concurrently.

£345 + VAT

FINGER PRINT
FOR EPSON MX PRINTERS

A plug in module that puts 8 special print functions at your fingertips. Tap your printer's panel buttons to instantly select the functions you read!

FINGER PRINT will not interfere with normal printer operation and installs easily without soldering. £44.95 + VAT

SPECIAL OFFER

11 BOXES OF DISKS FOR THE PRICE OF 10 BASF High Quality Qualimetric Disks.

5¼" S/S S/D 110 Disks	*£165*
5¼" D/S D/D 110 Disks	*£275*

The most cost effective way to buy disk media.

RENTAL

Want to rent an Apple?

Or an IBM PC . . . a QX10 . . . a Printer or anything else you can think of? Call either of our offices for a quote – from one machine to fifty, from one day to a thousand years.

BITSTIK GRAPHICS SYSTEM

£249

- Features unique Bitstik 3 axis controller
- Draw directly on the screen in colour
- No computer knowledge needed
- Easy to use microcomputer based drawing and design system
- Powerful "User-Friendly" software
- Low-cost hardware/software package
- Fully expandable, highly versatile
- Hard copy software available for wide range of plotters
- Range of symbols and other graphic material on 'library' disks
- Produce schematics, plans and layouts, business/education graphics

ANNOUNCING . . .

THE APPLE PROFESSIONAL HOME COMPUTER

consists of:-

An Apple IIe
Disk Drive with controller
TV Modulator(colour & sound)

Together with:

An exclusive Apple Sports Bag

Voucher for £25 off Apple II monitor

Voucher for £25 off 1 of the Apple discovery games, or off Apple Logo, or Applewriter IIe or Quickfile IIe.

46% off Micromet 800 service (which includes modem, comms. card, BT Jackplug Installation, Postage, Packaging & Insurance. Total Offer Price £79.95 inc.VAT)

£4 off any software on the Pete & Pam Educational List

£4 off one of three games – Choplifter, Arcade Machine, or Pinball Construction Kit.

£10 off any business software. Available at a very special price to personal callers from participating authorised Apple Dealers.

ASK FOR MORE DETAILS

VersaForm

Business Form Processor

VERSAFORM ALLOWS YOU TO COMPUTERIZE WITHOUT CHANGING A THING.

To automate your business you don't need to change all your familiar business forms. VERSAFORM fills out your present forms very much in the same way you do – only faster. VERSAFORM then stores the information alphabetically and numerically. This means you now have a database that can track your business. VERSAFORM prints the kind of reports that help manage your business–and VERSAFORM automatically checks for errors.

FOR APPLE

VERSAFORM
£239 + VAT
HARD DISK VERSION
£295 + VAT
PASCAL INTERFACE
£149 + VAT

IBM PC VERSION
£295 + VAT

Also by the same publisher.

Q BASE APPLE VERSION
£139 + VAT
IBM PC VERSION
£139 + VAT

PRINTER SHARER

NEW

Would you like to share your printer around several micros? PRINTER SHARER allows the centronics parallel printer to be switched between three computers. Saves all the cable swopping.

(Other printer switch boxes are available – both parallel and serial. Ask for further details).

AN INCOMPARABLE GRAPHIC PLOTTER AT ONLY £495+VAT
Works on all micros with a suitable parallel interface for all your Graph Processing, Chart Processing, Engineering Graphics and Overhead Transparencies.

GOOD NEWS

Sprinter Service

PRINTER PRICES DOWN!

SMITH CORONA TP–1

Daisy Wheel.
120 Words per min.
Serial or parallel units.

WAS £485 + VAT
NOW £349 + VAT

Now you can afford a low cost daisy wheel!

EPSON RX 80T

Dot Matrix.
100 CPS.
Tractor Feed Only.

WAS £299 + VAT
NOW £275 + VAT

EPSON MX 100F/T
100 CPS
WAS £499 + VAT
NOW £475 + VAT

EPSON PRINTERS

RX80F/T
100 CPS, with Graphics
£319 + VAT

FX100F/T
160 CPS, Full carriage width
£569 + VAT

ONE MORE WAY TO GET THE BEST OUT OF YOUR APPLE.

Fast Dos

SPEED UP DISK ACCESS ON DOS 3.3 BY UP TO 20 TIMES! (Depending on the program)

£19.95 + VAT

SPECIAL NOTICE

TABS USERS ON APPLE II.

REDUCE TABS RUN TIME BY UP TO 80% USING THE MS. BOURNER SPEED KIT BASED ON THE ACCELERATOR. WRITE OR PHONE FOR FREE BENCH MARK REPORT.

FURTHER DETAILS.....

MS. BOURNER + PARTNERS
173, Ashford Rd., Bearsted, Maidstone, Kent. 0622 39030

REGISTER OF OEM's

APPLES ARE USED FOR THE MOST AMAZING THINGS

Datalogging, typesetting, process control, precision measurement, animation control, and space flight are just a few of the areas of application in which Apple has starred. Pete & Pam's Lancashire office, with the assistance of Apple UK, are setting up a register of OEM's and their Apple applications. The Lancashire office will then act as a clearing house for information, and will provide advice, support, and a source of supply for OEM's. If you think you might qualify for the program, write to or call our Lancashire office now. You could put yourself on the road to a profitable partnership.

Accelerator II

Over 1400 Accelerator II users are saving valuable time by using the board to speed up the execution of all native Apple II+ programs by up to 3.5 times!

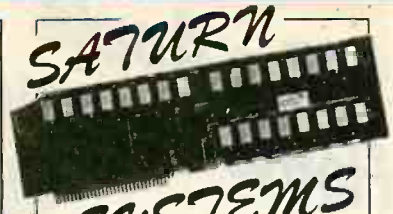
If you value your time, and want to get the most out of your Apple II (and, incidentally, make your Apple II faster than an IBM PC or a SIRIUS!) then buy an ACCELERATOR now. Contact your local dealer or ring us direct. £299 + VAT

Apple IIe version due by Mid January

DO YOU WANT A JOB?

If you think you have a pleasant outgoing personality, and have some experience of the Apple II, IBM PC, or other computers, ring Chris Gillard in our London Office.

He's interested in increasing the number of sales staff to enable us to cope with all the sales telephone calls we receive. We promise staff that they will never be bored!



SATURN SYSTEMS

GOT AN APPLE IIe?
WOULD YOU LIKE MORE MEMORY?

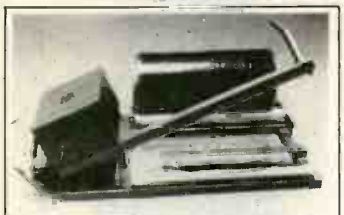
Saturn's NEPTUNE boards are 64K memory and 80 column boards for the IIe, expandable up to 192K. The boards come complete with a software pre-boot disk to allow you to use the additional memory with Visicalc.

PART EXCHANGE DEAL

We'll even offer to part-exchange your Apple 80 column board for £20 or your Apple extended memory 80 column board for £40 to help you move up to 192K on NEPTUNE!

NEPTUNE 64K BOARD
£179 + VAT
Each additional 64K (up to max 192K) — £109 + VAT

Other memory boards from Saturn for Apple II+ and IIe...
SATURN 128K
£299 + VAT
SATURN 32K
£129 + VAT
VC EXPAND SOFTWARE
£39 + VAT
VC EXPAND 80 SOFTWARE
£49 + VAT



SUPER SEALER

The DMS SEALER is a hot-wire sealing system, ideal for use by software publishers, hardware manufacturers etc. The unit consists of a roller platform with bar sealer which, together with film and heat gun provides the facility for producing neat, tidy shrink - wrapped packages. The price of the SUPER SEALER puts a shrink wrapping facility within the reach of even the smallest software house or dealer.

SUPER SEALER
£249 + VAT
ROLL OF FILM TO SUIT
£30 + VAT

THE C.I.A.

Is a list of powerful disk espionage utilities that allow you to investigate, edit, locate, list, trace, rescue, translate, patch, repair, verify, examine, protect, unprotect descrypt and analyse programs or textfiles on normal and protected disks. £35 + VAT

Are you a DEC user?

DOES VT100 MEAN SOMETHING TO YOU?

Would you like a more inexpensive VT52 terminal, with many VT100 features at an inexpensive price?

Zenith's new Z-29 "Smart" compatible terminal features:

12" non-glare green phosphor display, 91 key keyboard.

Set up-on screen, menu driven Set up for most terminal options emulation mode, band rate, parity half/full duplex.

Special graphics with 33 special Symbols.

Excellent value for money — we know, we use them ourselves.

£595 + VAT

THIS MONTHS SPECIALS

Supercalc for ALS Z Card	39.00
Magic Mailer	34.00
Magic Words	34.00
Hellfire Warrior	19.95
Star Warrior	19.95
Upper Reaches of Apshai	9.95
Red Alert	16.95
Duelling Digits	16.95
Labyrinth	16.95
Star Thief	16.95
Head-On	12.95
Fact Fun	12.95
Word Fun	12.95
Macro Screen Editor	12.95
Network	12.95
Windfall	12.95
Phazer Fire	16.95
Neptune	18.95
Lazer Silk	16.95
High Orbit	16.95
Acid-Based Titration	49.00
Ideal Gas Law & Entropy	49.00
Calarimetry Experiments	49.00
Job Cont./Costing in Pascal	49.00
Easymailer 80	69.00
Transforth II	69.00
Wordtrix for IBM PC	16.95
Decision Modeller	399.00
Jaw breaker	16.95
Screenwriter II	79.00
Mouskattack	18.95
Cannonball Blitz	19.95
Lunar Leeper	16.95
Crossfire for IBM PC	16.95

Lisa

The first of Apple's new personal office products systems. If you're into ICONS and are fascinated by what 200 man years of software development can produce then this machine must be for you. See Lisa at either of our offices. Lisa is available for sale, lease or rent — (even for one day!).

AXLON RAMDISK 320

320K BYTES OF RAM MEMORY FUNCTIONS LIKE TWO 35-TRACK, TWO 40-TRACK, OR ONE 80-TRACK FLOPPY DRIVE.

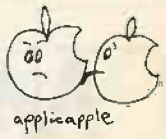
The ultra fast RAMDISK is up to 50 times faster than standard floppy drives, and 10 times faster than hard disk drives. RAMDISK 320 has its own power supply, plus three hour back-up. The drive is fully compatible with DOS 3.3, SOS, CP/M, Apple Pascal 1.1, and PASCAL 4.0. (The driver disks come with each RAMDISK) Comes with plug in slot independant interface card, special designed operating program, plus software for diagnostics, and fast load copy routines. Warrantied for 12 months.

£699 + VAT

● Circle No. 207

WOULD A COUPLE BROUGHT TOGETHER BY A COMPUTER DATING AGENCY LIVE APPLEY EVER AFTER?

Pete & Pam Computers



Mail Order & Distribution:
New Hall Hey Road,
Rossendale, Lancs., BB4 6JG
Phones:
(0706) 212321 & 227011
Telex: 635740 Petpam G

Norwegian Agent:
The Norwegian Software House
Address Okernveien 145
Oslo 5
Telephone 47 2 64 55 77

London Retail:
103-5 Blegborough Road,
London, SW16 6DL
Phone: 01-677 7631
London Office Open Saturdays

Prices do not include VAT please add 15% to your remittance
Postage and Packing FREE

MAKE YOUR SPECTRUM WORK FOR YOU!

ZX Lprint interface enables your Spectrum computer (16 or 48K) to print on any dot matrix or daisywheel printer with 'Centronics' input. Just plug ZX Lprint in and LRINT and LLIST commands will work. Copy command and user defined graphics work on Epson FX and RX, Seikosha 100 & 250, Star DP & STX, CP 80*. No additional software is needed — all of your RAM is free for your programs (e.g. Tasword 2 wordprocessor or our Business Accounts).
*Other high resolution printers can be accommodated using optional 'Copy' software.

ORDER: To EUROELECTRONICS,
26 Clarence Square, Cheltenham, Glos. GL50 2JP Tel: (0242) 852009

From: Name: _____

Address _____

_____

This order is for:

(Quantity) (Quantity)

ZX LPRINT Interface at £34.95 _____

Interconnecting Cable at £10.45 _____ Tasword 2 at £13.90 _____

Please specify make of your printer _____

_____

Cheques PO payable to Please add £1.45 p&p

EUROELECTRONICS please Amount £ _____

● Circle No. 208

The Apple Home Computer Pack

£875 INC VAT

SAVE OVER £500 on current List Price

The Pack contains:

- ☆ Apple //e, 64K
- ☆ Floppy Disk Drive
- ☆ Disk Controller
- ☆ TV Modulator
- ☆ £200-worth of vouchers, etc

all with 12-months guarantee

(Hardware List Value: £1400)

All for £760.87 + VAT = £875

Delivery £15 (within 25 miles of Croydon)

LOW-PRICE PRINTERS & GAMES for Home Pack Buyers

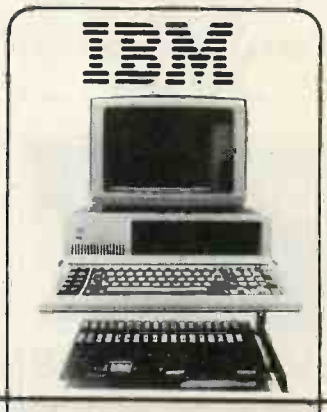
Pre-payment only. Allow 7-14 days for delivery and cheque clearance. Subject to availability.

The Computer Bargain of the Year — from the 'Apple Dealer of the Year' S E REGION

Vega Computers Limited
10 Essex House, George St.
Croydon CR0 1PH
Telephone 01-656 8431
GG

● Circle No. 209

MICRO · RENT ©



MR

01 · 607 8797 · 8

Totally flexible rentals of OSBORNE, APPLE, LISA, IIE, APRICOT, SIRIUS, IBM, COLOMBIA, SAGE, + KAYPRO

KEYBOARD HIRE (LONDON) LTD 176 BARNSBURY ROAD LONDON N1 0ER

● Circle No. 210

The new generation of plotters

for all business & scientific graphics

- A3 paper
- 8 pens
- RS232, IEEE Cx I/faces

£1990

HOUSTON DMP-29

Low cost, high performance intelligent plotting **£865**

- A3/A4 paper
- Interchangeable pens
- RS232 & IEEE I/faces

HOUSTON DMP40

SINTROM GROUP

Sintrom Electronics

PSA PERIPHERAL SUPPLIERS ASSOCIATION

Sintrom Electronics Ltd
Arkwright Road, Reading, Berks RG2 0LS
Tel: Reading (0734) 875464
Telex: 847395

NEW LOW COST A1 PLOTTER NOW AVAILABLE £23

For professional career opportunities contact our Personnel Department

● Circle No. 212

: GO FORTH & * : FASTER DEVELOPMENT – FASTER PROGRAMS

Laboratory Microsystems FORTHs – professional software complete with editors, assemblers, turn-key compilers, system utilities, multi-tasking and extensive documentation.
* * * 68000 FORTH AVAILABLE NOW for CP/M-68K * * *

Z80 CP/M-80, 8" £45, 5"	£60	CP/M-86	£95
IBM PC	£95	Sirius/Victor	£105
PC-FORTH+ 32-bit FORTH	£190	CP/M-86 FORTH+ 32-bit	£190
CP/M-68K	£190	Many other versions	

FLEX and SAGE users – we support you too. Ask for Apples, PETs . . . .

Nautilus Systems Cross-compilers – transport FORTH to different processors, generate secure code, generate ROMmable code, the complete development machine – and very, very fast.
Prices from £230 for your first target.
Target processors include: 8080, 8086/88, Z80, 6800, 6301/6801, 6809, 68000, 1802, Z8, 9900/99000, Z8000, LSI-11

FORTH tapes BBC A/B with editor, assembler, graphics, toolkit	£25
Spectrum 48K with colour and sound	£14.95
Nascom 2 under NAS-SYS 3	£22.50
DIY FORTH kits	
Installation manual – How to do it, model, definitions, editor	£7
Source code listing for one processor – choose from 6502, 6800, 6809, 8080, Z80, 8096/8088, 9900, 1802, 68000, Z8000, VAX, Apple][, LSI-11, Eclipse	£7
FORTH books – range includes:	
'Starting FORTH' by Brodie	£16
'Systems Guide to fig-FORTH' by Ting	£26
JUPITER ACE – now with FREE 16k RAM pack	£78+VAT=£89.70

JMPE

MicroProcessor Engineering Ltd
21 Hanley Road Shirley
Southampton SO1 5AP
Tel: 0703 775482

● Circle No. 211

FROM THE SUBLIME

WHY BE CONTENT WITH SIMPLY A WORD PROCESSING PACKAGE WHEN WE CAN OFFER YOU THE ULTIMATE BUSINESS MICRO SYSTEM

ACT SIRIUS – One of today's most popular 16 Bit Micros. Available in a choice of disc capacities from 1.2MB up to 10MB (Winchesters) to suit your requirements.

SILICON OFFICE – The ulitimate software package combining powerful word processing with spread sheet calculator and full information management.

AND MUCH MORE – We also offer a wide selection of Daisy Wheel and Dot Matrix Printers plus a full range of business software.

COMPARE OUR PRICES – We are confident that we can offer the best service at the keenest prices.

FOR FUTHER DETAILS CONTACT:-

MS Consultants (Cambridge) Ltd.
152 High Street,
Huntingdon PE18 6TF
TEL: 0480 51721

● Circle No. 213

Isn't it time you stopped running your computer at printer speed?

In ten seconds, your computer can output enough print data to keep your printer busy for five minutes, or longer.

Instead of waiting around for the printer, you could install a print buffer, and free your computer for its next task in seconds.

Print buffers take care of the printing — and the waiting. And the more you print, the more time a buffer will save.

Buffers for any combination of micro and printer/plotter. Internal buffers for Epson printers; Apple Computers. 'In-line' buffers for IBM PC, Sirius, Commodore 20/40/80 series, Super Brain, BBC, Tandy, etc.

Data transfer in RS232c serial, Centronics-parallel, IEEE-488 formats. Protocol conversion. RAM sizes from 2K to 256K.

A>Line Computer Systems

1 Church Farm Lane,
Willoughby Waterleys,
Leicestershire LE8 3UD.

Telephone:
Peatling Magna (053 758) 486

Talk to the specialists.
We have the answers.

● Circle No. 214

Top specification. High quality. Reliable. Outstanding value.

£225 + VAT inclusive packaging and delivery.

The Lucas LX80 Printer

An outstanding Dot Matrix printer at an unbeatable price the LX80 is designed to operate with all popular micros.

Brief Specification: 80 characters/line at 80 characters/sec, upper and lower case, alpha numeric characters in normal, italic, bold or compressed type. Tractor and friction feed. Full specification available on request.

Available from Lucas Microcomputers – send cheque with order or telephone for your nearest participating dealer.

Lucas Microcomputers

Lucas Logic Limited
Welton Road, Wedgnock Industrial Estate, Warwick CV34 5PZ
Tel: Warwick (0926) 400004 & 497733

● Circle No. 215

BEEBUG

REGISTERED REFERRAL CENTRE FOR THE BBC PROJECT

BEEBUG FOR THE BBC MICRO

INDEPENDENT NATIONAL USER GROUP FOR THE BBC MICRO

MEMBERSHIP NOW EXCEEDS 20,000

18,000 MEMBERS CAN'T BE WRONG — BEEBUG PROVIDES THE BEST SUPPORT FOR THE BBC MICRO. BEEBUG MAGAZINE — NOW 62 PAGES INCLUDING NEW PRODUCT GUIDE SUPPLEMENT — 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.

October issue: Games — Munch-Man, a Snapper type game with super graphics illusions graphics and sound you won't believe. A versatile :Renumber program for Basic, Fabric Patterns, an invisible Alarm Clock, Disc Sector String Search and a program for drawing 3D Surfaces. Articles on the Teletext mode for beginners, Compilers and Interpreters, using Joysticks, using the Speech Synthesizer and more. Reviews of two Cassette Recorders (Marantz Superscope C190 and Acorn Data Recorder), three Printers (NEC pc-8023B, STAR DP840 and CP-80, and lots of new games software (and we've arranged SPECIAL OFFERS for members). Plus a review of the new Acorn Electron and news of our new magazine for Electron users called ORBIT. Plus all our usual features like Hints and Tips, Postbag, and a new Brainteaser.

November Issue: Program Features: Reversi, a challenging board game, Lunar Escape, an addictive arcade type game, Snarfer, a very useful disc recovery program, Shaper for defining multiple character shapes, Rapids, another short game, Demolition, a sizzling display with matching sound effects. Plus articles on a Clock Display, the Teletext Mode (part 2 of a series), an Introduction to Interrupt Programming, a new Mode 8 and The Beeb in Slow Motion. Plus Extension ROM Board Reviews, Games Reviews, Book Reviews, M-TEC Torch Basic Review. Plus News, Hints and a new Competition.

Magazine programs now available on cassette to members at £3.50 inc. VAT & p+p — see April/May issue for details

BEEBUG NEW OPERATING SYSTEM OFFER
BEEBUG members can now obtain the new 1.2 OPERATING SYSTEM ROM at around HALF PRICE
See BEEBUG Magazine February, March or April for details.
As a result of BEEBUG negotiations with Acorn the ROM now may also be offered by other user groups to their members.

MEMBERS SOFTWARE LIBRARY +
BEEBUGSOFT: BEEBUG SOFTWARE LIBRARY
offers members a growing range of software from £3.50 per cassette.
1. STARFIRE (32k). 2. MOONLANDER (16k). 3D NOUGHTS AND CROSSES (32k). 3. SHAPE MATCH (16k), MINDBENDER (16k). 4. MAGIC EEL (32k). 5. Cylon Attack (32k). 6. Astro-Tracker (32k).
Utilities: 1. Disassembler (16k), Redefine (16k), Mini Text Ed (32k).
Applications: 1. Superplot (32k). 2. Masterfile (3k).
13% discount to members on the excellent wordwise word processing package — this represents a saving of over £5.00.

Send £1.00 & SAE for Sample.
Membership: UK £5.40 for six months, £9.90 for one year
Overseas one year only:
Europe £16.00 Middle East £19.00
Americas & Africa £21.00
Other Countries £22.00

Make cheques to BEEBUG and send to:
BEEBUG Dept 5, 374 PO Box 109
Baker Street, High Wycombe,
Bucks HP11 2TD.
St Albans, Herts, AL1 1AR

● Circle No. 216

SHOCKING NEWS FROM MICRO MIRACLES..!!

GIGANTIC STOCKTAKING CLEARANCE

(for a limited period)

EPSON FX80	~~£400~~	£325
EPSON RX80FT	~~£310~~	£239
EPSON RX80	~~£275~~	£209
EPSON FX100	~~£560~~	£419
STAR	~~£250~~	£199
APPLE IIe	~~£845~~	£589
COMMODORE 64	~~£199~~	£159
BASF DISKETTES 5¼ SS/SD	~~£2.75~~	£1.00
TEXAS TI820	~~£1340~~	£945
TEXAS TI820KSR	~~£1500~~	£1095
RICOH 1600	~~£1625~~	£1190
QUME 5/55	~~£1785~~	£1150

BROTHER HR15	~~£445~~	£355
APPLE III 128K	~~£2418~~	£1495
TEC F10-40	~~£1285~~	£950
APPLE L/Q PRINTER	~~£1350~~	£995
APPLE MATRIX PRINTER	~~£425~~	£345
TEXAS TI810 LQ	~~£1580~~	£1195
NEC 7700	~~£1449~~	£1290
IBM PC		CALL
EPSON QX10		CALL
EPSON HX20		CALL
ANADEX 9501A		CALL
ACT SIRIUS		CALL

DELIVERY NATIONWIDE AT £5 PER ORDER

- Official orders accepted
- Nationwide maintenance contracts arranged
- Prices exclude VAT and delivery

WHY NOT PHONE FOR SOME MORE SHOCKING NEWS

Ask for a full price list. **0962 66191/0962 66783**

OR call at our showroom, next to Winchester BR Station

micro miracles

50A Stockbridge Road, Winchester, Hants
SO22 6RL England

● Circle No. 218

SPRAKEFIELD LIMITED

137 High Street South
Dunstable Beds Tel (0582) 608818

ALL PRICES INCLUDE VAT & CARRIAGE

Prices Down on Software & Printers

5¼" FLOPPY DISK BOXES 10

	1-3	4-7	8+
Verbatim Datalife			
MD525 SSDD	19.78	19.26	18.78
MD550 DSDD	28.12	27.38	26.69
MO 557 SSDD	30.53	29.75	28.98
MD557 DSDD	36.92	35.96	35.05
Dysan 5¼"			
104/1	28.13	27.70	27.29
104/1D	30.43	29.96	29.52
104.2D	43.34	42.68	42.05
204/1D	42.28	41.64	41.02
2042D	56.08	55.23	54.40

SOFTWARE

dBaseII	442.75
Lotus 1-2-3	341.55
Visicalc	183.97
Wordstar	284.63
Mail Merge	143.75
Spell Star	143.75
Perfect Writer	189.75
Perfect Calc	112.21
Perfect Filer	228.08
Basic Compiler	272.55
Pascal Compiler	241.50
C Compiler	345.00

FREE FLOPPY DISK MARKER WITH EVERY BOX (Apple, Commodore, IBM, DEC/CP/M)

5% off YES 5% off these already low prices. Cut out this ad and send it with your order and you can deduct 5% off the price.

MONITORS

Hi Res 12" Monitor
Green 117.46
Amber 124.86

Colour 14" 800 Dot RGB for IBM PC 671.73

PRINTERS

Epson RX80	309.73	Seihosha GP100A	230.00
Epson FX80	462.00	Smith Corona TP1	483.00
Epson MX100	497.00	Ricoh RP1600	1648.33
OKI M80A	251.47	Ricoh RP1300	1311.00
OKI M83A	371.07	Ricoh Flowriter	1748.00

● Circle No. 217

TO THE RIDICULOUS

A COMPLETE WORD PROCESSING SYSTEM FOR JUST £999.50 INC. V.A.T.

Yes it may sound ridiculous but we have shaved our margins to the limit so that we can offer a word processing package that is within the reach of the small business user or the enthusiastic amateur.

SHARP MZ-80A Cassette based micro computer

WDPRO - A Word Processing Software

EPSOM FX-80, 160 CPS Dot Matrix Printer

PLUS 80 Column MX-80A Modification.

PLUS All Interfaces

INCLUDING DELIVERY

DON'T DELAY - Contact us before sanity returns.

MS Consultants (Cambridge) Ltd.
152 High Street,
Huntingdon PE18 6TF
TEL: 0480 51721

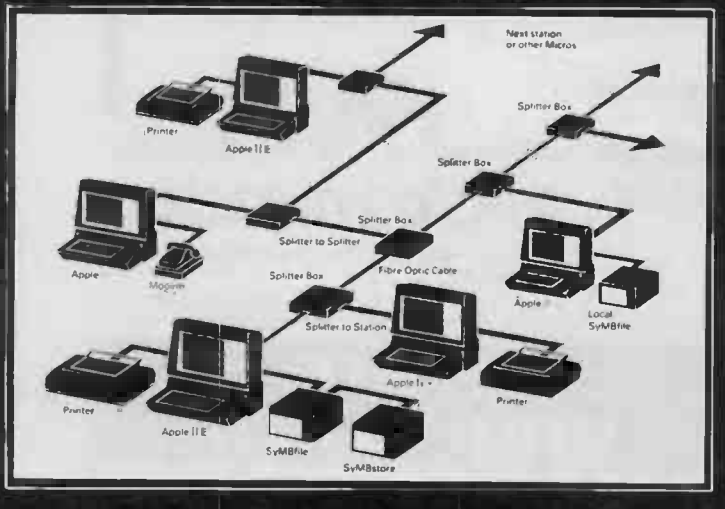
● Circle No. 219

SYMBIOTIC
COMPUTER SYSTEMS LIMITED

SYMBFILE
5¼" WINCHESTER SUB SYSTEM

The SYMBFILE hard disk subsystem is a complete add-on mass storage system for the Apple II, II+, IIE, or III microcomputers and is at present being developed for the SIRIUS, IBM PC and the BBC micro. It is compatible with the majority of hardware products currently available for the Apple, including the 16K Language card and all 80-column cards. SYMBFILES are available in sizes from 5-21 megabytes.

Full DOS, Pascal, and CP/M support allows any standard application software, including database, word processing, and accounting packages to be used.



SYMBNET
LOCAL AREA NETWORK

SYMBNET is a "tree and branch" network system using fibre optic cable to allow several microcomputers to share a common SYMBFILE . SYMBNET is the fastest long range local area network for microcomputers, and can cover a range of 7-9 Kilometres. Fibre optics means that SYMBNET is more cost effective; it uses a high intensity semi-conductor laser to transmit data and cables can be laid along the shortest route, whereas other networking systems use flat ribbon or coaxial cable which are sensitive to electrical noise from fluorescent lights, photocopiers, etc. SYMBNET is compatible with DOS, Pascal, SOS, and CP/M running on any microcomputer supported by the SYMBFILE in concurrent operation.

SYMBPLEXER
NETWORK CONTROLLER

The SYMBPLEXER is a network controller which complements SYMBNET. The SYMBPLEXER is connected directly to the SYMBFILE and performs all read-write operations to and from the hard disk. SYMBPLEXER does away with the need for a central machine thus releasing another terminal to run any application you wish, being a dedicated device the read-write operations are performed very efficiently, the support software allows SYMBPLEXER to designate pass codes for each user and to decide which user may access which applications. If you are currently using SYMBNET , accessing your SYMBFILE via a central machine, the addition of a SYMBPLEXER will in no way change the operational capabilities of the network.

For more details of all SYMBIOTIC products contact

SYMBIOTIC
COMPUTER SYSTEMS LIMITED

DUROMA HOUSE·32 ELMWOOD ROAD·CROYDON·SURREY·CR9 2TX·☎ 01 683 1137 PBX·Telex 893815·DUROMA G·

The SYMBIOTIC GROUP OF COMPANIES
SYMBIOTIC COMPUTER SYSTEMS LTD · SYMBIOTIC EDUCATIONAL SYSTEMS LTD
SYMBIOTIC COMPUTER SYSTEMS INC · SYMBIOTIC COMPUTER SYSTEMS A/S
SYMBIOTIC COMPUTER SYSTEMS (BENELUX)

● Circle No. 128

The fun language

Christoper Roper reviews the first wave of Logo books.

FROM A STANDING START last year, there are now at least six books on programming in Logo and one more is due out by the end of this year. Sadly, they mostly cover the same ground: turtle graphics and a little list processing. The main justification for their almost simultaneous appearance is that every publisher wants a Logo programming book on their list.

The books are appearing now because Logo became widely available on microcomputers only in 1982, beginning with the TI-99/4 and the Apple II. There are now implementations for the Commodore 64, the Research Machines 380-Z, the Atari 400, 600 and 800, the IBM PC and soon for the Sinclair Spectrum.

The idea of Logo as a programming language for children was popularised by Seymour Papert, one of the architects of the language, in his book *Mindstorms: Children, Computers and Powerful Ideas*, which is still available from Harvester Press. It is quite different from the how-to Logo books under review, and should certainly be ready by anyone interested in the language.

The first reason for learning Logo or teaching it to your children is that it is very accessible and teaches the central concepts of computer programming. It provides the best possible entry point to computing for children or adults who are not talented mathematicians or spontaneously enthused by Basic or machine code. Logo is fun.

The second reason, which may attract readers of *Practical Computing*, is that Logo is a sane version of Lisp. It offers list processing with fewer parentheses and without Car, CDR and Lambda. Obviously, Logo on an Apple II cannot be compared to Lisp on a DEC 20, but it is certainly more powerful and more flexible than any of the cut-down Lisps I have seen offered on microcomputers.

Gary Kildall of Digital Research has launched an implementation of Logo for the IBM PC in the belief that Logo could be a useful applications programming language, appealing to the same market as the CP/M with which DR made its first fortune. Over the next two years, we will discover whether Logo is a general-purpose programming language or strictly an educational tool. IBM is launching its own Logo written by LCSI, the company which implemented Apple Logo.

No existing book addresses itself to the wider applications of Logo. They all concentrate on the language in a strictly educational environment, explore its intriguing graphic capabilities, and offer a brief introduction to list processing. Another book which is not strictly about Logo is *Learning and Teaching with Computers*, by Tim O'Shea and John Self. It offers a fairly grim critique of much that has been done with computers in the name of education, and suggests that Logo is one of the few positive avenues of development. O'Shea and Self also look at the question of artificial intelligence in education, and use Logo for publishing sample programs.

One warning — Logo, like Basic, is not a standard language. The first British Logo, implemented at Edinburgh University for the Research Machines 380-Z and 480-Z is quite different from most of the American versions, which derive directly or indirectly from MIT. The books so far published use the American syntax and vocabulary. The Sinclair Spectrum will also follow the American style.

Peter Ross is a lecturer in the Department of Artificial Intelligence at Edinburgh. There are styles and fashions in textbooks, and if you prefer a buttoned-down, economical approach without Californian backslapping then Ross's *Logo Programming* may well be the book for you. Some may find it too demanding and too mathematical, but I like the way he takes the reader a little way into a project and then leaves dozens of possible lines for developing and improving a program. Although he comes from Edinburgh, Ross uses the Terrapin Logo, written for the Apple II in all his examples. It is virtually the same as the version produced for the Commodore 64. Ross also provides appendices facilitating translation into other Logo dialects.

Apple Logo by Harold Abelson comes in two flavours: red for the Terrapin version and blue for the official Apple Logo. Otherwise the two books are identical. At £11.50 it seems disgracefully expensive for a spirally-bound book which must have sold by the tens of thousands in the United States. It is easier for the complete novice than Peter Ross's book, as it spends more time on the simple use of turtle graphics. But Abelson takes the reader through to quite advanced use of lists.

Whether you prefer Ross or Abelson is really a question of style. If I were looking for a textbook to use in school, I think Abelson would do for 11 to 14-year-olds whereas Ross would be better for O-level and A-level students. The Abelson book is much more clearly laid out than Ross's, and has an interesting section on the Dynaturtle, a concept popularised by Abelson and Andy DiSessa at MIT, which is not touched by Ross.

Learning Logo on the Apple II by Anne McDougall, Tony Adams and Pauline Adams is two or three steps down from Abelson and Ross in terms of intellectual rigour, though it covers roughly the same ground. There are more examples, more conventional exercises, and fewer open-ended projects. A teacher who is beginning to use Logo in the classroom — as opposed to a student who is learning Logo — might prefer this book, which is clearly based on the authors' teaching experiences in

(continued on next page)

The fun language

(continued from previous page)

Australia. It can easily be used with either of the Apple Logos as it sets variant procedures side by side.

Learning with Logo by Daniel Watt is one of your all-singing, all-dancing American textbooks, with funny little cartoon figures running about carrying numbers, and masses of bonhomie. Perhaps the educational psychologists have determined that it works, but if you were brought up on read/eat-it-because-it's-good-for-you lines then this one may stick in your craw. It recalled the post-war joke that there were only three things wrong with American soldiers: they were overpaid, overweight and over here. If you substitute "overpriced" for "overpaid" you have Daniel Watt's book.

I probably shouldn't be so nasty about it because it covers the ground quite adequately and is tailored for the American classroom. My worry is that some libraries in this country will feel they must buy all the Logo books, and find themselves spending over £100 before the end of the year.

David Thornburg has written a number of down-market Californian programming guides, and I was prepared for the worst from his *Discovering Apple Logo*. In fact, this book is much better than that and, by concentrating exclusively on graphics, he does break ground not covered by the others. In fact it fits rather neatly as a complement to Peter Ross's guide. Together, they probably make the best package to take a teacher or a student through from the very beginning to a fair standard of competence.

Logo, a Guide to Learning through Programming by Peter Goodyear is due from Ellis Horwood before the end of 1983. To judge only from advance publicity this book, too, will address the problems of the classroom teacher, and will take us through graphics and list processing.

I have found all the books a welcome supplement to the manuals which came with my own Apple Logo discs. However, there is a limit to what can be usefully written down about a language which has been deliberately made simple enough to be used by six-year-olds and whose philosophy demands that you learn by your own mistakes. I think we buy books believing that we will find some magic trick which will turn us into excellent programmers. There is no such magic trick. We just have to learn the language by using it.

Mindstorms: Children, Computers and Powerful Ideas by Seymour Papert. Published by Harvester Press, £8.95. ISBN 0 855 271 639.

Learning and Teaching with Computers by Tim O'Shea and John Self. Published by Harvester Press. ISBN 0 710 806 655.

Logo Programming by Peter Ross. Published by Addison Wesley, £9. ISBN 0 201 146 371.

Apple Logo by Harold Ableson. Published by Byte/McGraw-Hill, £11.50. ISBN 0 070 004 250.

Learning Logo on the Apple II by Anne McDougall, Tony Adams and Pauline Adams. Published by Prentice Hall, £11. ISBN 0 724 807 322.

Discovering Apple Logo by David Thornburg. Published by Addison Wesley, £14.50. ISBN 0 201 077 698.

Logo, A Guide to Learning through Programming by Peter Goodyear. To be published by Ellis Horwood.

Learning with Logo by Daniel Watt. Published by Byte/McGraw-Hill, £16.50. ISBN 0 070 685 703.

MAILING FLOPPY DISKS?

The Swan Disc Pack combines great strength with simplicity of use. Made from rigid white corrugated, it is a self assembly package providing high postal security at economical rates.

Free sample ring us on 01-607 9938

● Circle No. 221

MICRO BEE SOFTWARE

Manufacturing licences for the popular Australian designed Micro Bee computer have recently been granted to many companies throughout the world.

MYTEK Computing is the largest and most respected producer of software for the Micro Bee Computer.

MYTEK Computing invites dealers to sample its large and extensive range of Micro Bee Software.

Micro Bee users are also invited to request to be included on MYTEK Computing's free mailing list. Catalogues are air-mailed regularly to all parts of the world.

MYTEK COMPUTING

1 Kent Street, Bicton, 6157, Perth, Western Australia
Telephone: (09) 330 7336

● Circle No. 337

Add 20K to your BBC micro in five minutes

– ARIES-B20 –

Features

- ★ Adds 20K of useable RAM to your BBC Micro
- ★ Run programs up to 28K long in ANY SCREEN MODE
- ★ Extra memory can be used directly from BASIC I and II, VIEW 1.4, FORTH, LISP, and many other existing programs
- ★ ARIES-B20 is compatible with all correctly written BBC Micro software, on cassette, disc, sideways ROM or cartridge
- ★ Don't be deceived: this product is unique – no other expansion unit has these capabilities
- ★ Complete compatibility – ARIES-B20 uses only documented MOS facilities
- ★ Fitted in 5 minutes using only a screwdriver
- ★ Simply plugs in inside the case
- ★ No soldering or cutting
- ★ (Unlike some add-on products) will cause no damage to your BBC Micro – can be removed at any time
- ★ Incredibly simple to use
- ★ Patent applied for

- ★ Designed in Cambridge by BBC Micro experts
- ★ Top quality manufacture
- ★ Unquestionably the most important add-on ever produced for the BBC Micro
- ★ Top software houses are racing to produce the "super-programs" made possible by the extra capacity

- ★ 1 year guarantee.
- ★ Available mail-order only
- ★ Official purchase orders accepted from bona-fide educational establishments, all other trade cash-with-order

- ★ Price £99.95 including post, packing and VAT
- ★ If not completely satisfied with your purchase, we will refund your money in full providing you return the ARIES-B20 in good condition in its original packaging within 14 days

Machine requirements:

- ★ BBC Micro model B
- ★ MOS 1.2 or later
- ★ Plugs into CPU socket and 1 sideways ROM socket

Also available IEEE-488 interface. Coming soon: Compatible ROM expansion board.

How to Order:

Send cheque or postal order made payable to: Cambridge Computer Consultants Ltd and forward to:
Cambridge Computer Consultants Ltd, FREEPOST, Cambridge CB1 1BR.
Telephone Cambridge 0223- 210677

Please send me (Qty). . . . . ARIES-B20(s) at £99.95 (incl. p.p. & VAT).
I enclose a cheque/postal order made payable to
Cambridge Computer Consultants Ltd for £. . . . . .

Signed . . . . . .

Name (block letters) . . . . . .

Address . . . . . .

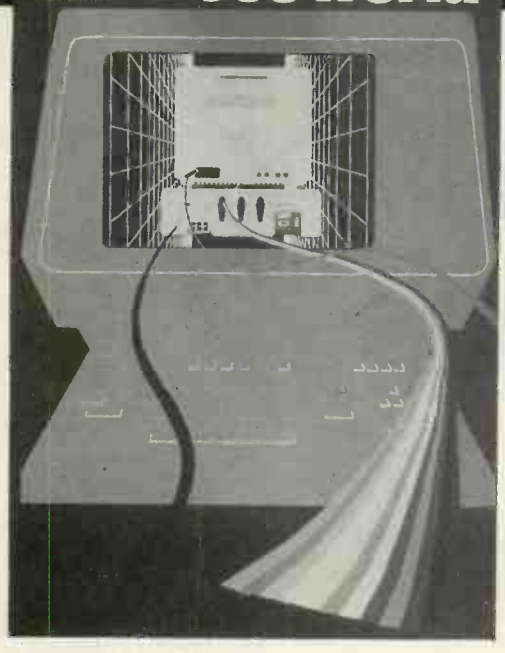
. . . . . Post Code . . . . . .

Cambridge Computer Consultants Ltd, FREEPOST Cambridge CB1 1BR
Telephone Cambridge 0223-210677

● Circle No. 222

The other side of the micro.

ELECTRONICS & Wireless world



Another first from Wireless World.

This month's Wireless World won't be telling you what a micro does, instead we'll tell you how to choose the micro that's most relevant to your technical needs.

This is possibly the most detailed guide to microcomputer facilities yet to be offered in a monthly publication in the UK.

December's Wireless World lists the available micros, their characteristics and facilities for connecting peripherals.

This is a survey for engineers and experimenters, who need to know how individual computers can be used in their work–the emphasis is on the interfacing capabilities of the machines described.

We were the first with the inside stories of television and video, in the December issue we're first again.

Out now.

PUBLISHED BY
ELECTRICAL-ELECTRONIC PRESS

NOTICE TO ADVERTISERS

While microcomputer magazines abound, very few are as well established or as highly regarded as PRACTICAL COMPUTING, now in its sixth year of publication. The magazine concentrates on the serious side of personal computing, providing authoritative reviews of micros (mainly in the £500 — £5,000 price bracket) and the most interesting new software.

Each issue contains a special section devoted to an important area of computing such as languages, databases or printers and plotter. In addition, there are regular features on practical applications, education and an Open File section to which readers contribute their own programs.

But there is no room for complacency in this fast-moving market! In order to keep PRACTICAL COMPUTING as one of the country's leading microcomputer magazines, we have made a number of improvements, with more to follow. These are:-

1. **More editorial pages**
2. **Increased circulation to 61,100 (ABC Jan-Jun 1983)**
3. **Computerised FREE Reader Enquiry Service**
4. **Increased staff levels to provide an even better service to advertisers and readers alike**
5. **Re-designed (from November) to make PRACTICAL COMPUTING more attractive and easier to read**
6. **Recent Reader Survey providing important details on our readership**

However, these improvements have been made against a background of rising costs which have forced us to increase our advertisement rates from the January 1984 issue. All our advertisers with an existing series booking in-house will be given rate protection.

These improvements will ensure that PRACTICAL COMPUTING continues to **lead** and will go on being the best value micro magazine on the market.

To find out more about Britains leading magazine for professional and business users of personal computers contact the Practical Computing advertisement team:

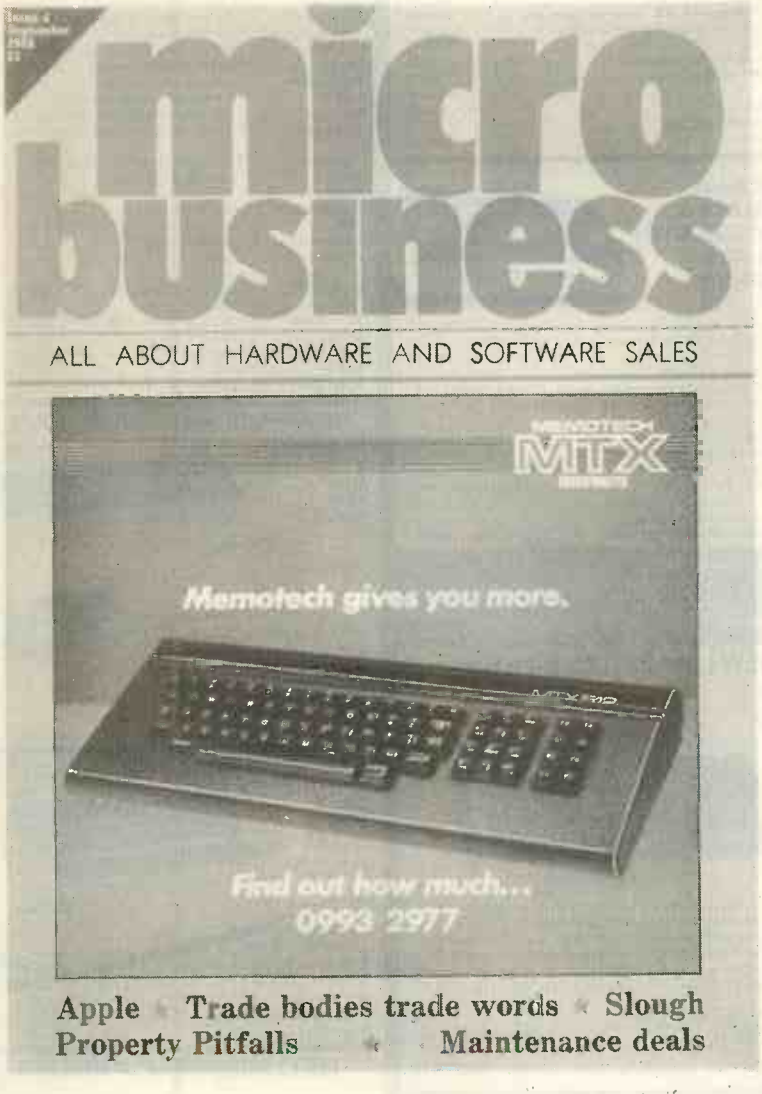
LONDON
Advertisement Manager
Ian Carter 01-661 3021
Quadrant House, The Quadrant,
Sutton, Surrey SM2 5AS

BIRMINGHAM
Advertisement Executive
David Harvett 021-356 4838
Lynton house, Walsall Road,
Birmingham BH2 1BA

MANCHESTER
Advertisement Executive
Geoffrey Aikin 061-872 8861
Grove House, Skerton Road,
Old Trafford, Manchester M16 0WL

NEW YORK
US Advertisement Sales Manager
J Allan Feinman (212) 867 2080
205 East 42nd Street, New York,
New York 10017, USA

Sell through micro retailers and dealers . . .



- **Brings products to the attention of bulk buyers throughout the UK.**
- **6,000 circulation to dealers and retailers.**
- **Free rapid reader enquiry card service.**
- **Backed by the editorial skills of Your Computer and Practical Computing.**
- **Make sure Micro Business is on your advertising schedule.**

For rapid response telephone Ken Walford on 01-661 3139

. . . by returning this coupon

To Ken Walford, MICRO BUSINESS,
Room 317A, Business Press International Ltd,
Quadrant House, The Quadrant, Sutton, Surrey.
Please send me your advertisement brochure, as I am interested in advertising in Micro Business.

Name_____

Job title_____

Company name_____

Company address_____

_____

_____ Post code_____

Telephone number_____

BBC Microcomputer System

OFFICIAL BBC COMPUTER DEALER

This is the best microcomputer currently on the market. 32K RAM, 32K ROM, 8 modes of operation, full colour, full-size keyboard, internal expansions such as disc interface, speech synthesizer, Econet interface – in short, it is a personal computer capable of expanding into a small business system

BBC Microcomputer Model B	£348	VAT	£399.00
BBC Mod B + disk interface	£409	VAT	£469.00
BBC Mod B + Econet interface	£389	VAT	£447.35
BBC Mod B + disk and Econet interfaces	£450	VAT	£517.50
BBC 100K disk drive	£230	VAT	£264.00
BBC dual 800K disk drive	£699	VAT	£803.85
Torch Z80 disk pack including Z80 2nd processor, 64K RAM and CPN operating system + Free Perfect Software	£699	VAT	£803.85
BBC Teletext receiver (Aug)	£196	VAT	£225.40
BBC cassette recorder and lead	£26	VAT	£29.90
Disk interface kit (free fitting)	£86	VAT	£96.60
Mod A to Mod B upgrade kit	£50	VAT	£57.50
Fitting charge for A to B upgrade kit	£20	VAT	£23.00
16K memory upgrade kit	£20	VAT	£23.00
Games paddles	£11	VAT	£12.65
12" Monochrome monitor incl. cable	£89	VAT	£102.35
16" Colour monitor incl. cable	£209	VAT	£240.35
User guide	£10	VAT	£10.00
Econet interface (free fitting)	£60	VAT	£69.00
Speech interface (free fitting)	£47	VAT	£54.05
BBC disk manual + formating disk	£30	VAT	£34.50
Parallel printer cable	£10	VAT	£11.50
BBC word processor (view)	£52	VAT	£59.80
BBC Fourth language cassette	£15	VAT	£17.25
BBC Lisp language cassette	£15	VAT	£17.25

100% BBC COMPATIBLE MITSUBISHI AND TEAC SLIMLINE DISK DRIVES

These drives are supplied ready cased with all the necessary cables, formating program and user disk system guide

There are some useful utilities included, e.g. Epson Screen Dump Program, Memory Dump, Free, Duplicate, Merge and Relocate. Power consumption of these drives is very low (0.2A typ. at + 12V, 0.4V typ. at + 5V per drive). Power is taken from the BBC computer

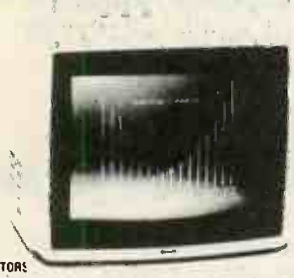
Single drive 100K 40 tracks	£169 + VAT =		£194.35
Dual drive 200K 40 tracks	£329	VAT	£378.35
Single drive 400K 80 tracks	£239 + VAT =		£274.35
Single drive 400K 40 80 tracks switchable	£259	VAT	£297.85
Dual drive 800K 80 tracks	£449	VAT	£516.35
Dual drive 800K 40 80 tracks switchable	£469	VAT	£539.35

COMPLETE WORD PROCESSOR FOR ONLY £1,099 + VAT

This package consists of BBC Microcomputer, View wordprocessor, 400K Slimline disc drive, High resolution 12" Green monitor, Juki 6100 18CPS Daisy Wheel printer and all the necessary cables and documentation. The above package can be supplied with components of your own choice, e.g. 800K disc drive or a different printer. Please phone us for a price for your particular requirement

Special package deal £1,099 + VAT = £1,263.85

PROFESSIONAL MONITORS



GREEN MONITORS

12" Green screen monitors with composite and sync. input. Suitable for most computers

* 18 MHz band width, high resolution	£89	VAT =	£102.35
* 15 MHz band width, normal resolution	£69	VAT =	£79.35

COLOUR MONITORS

* MICROVITEC RGB input 14" monitor supplied with RGB lead for BBC	£209	VAT =	£240.35
* SANYO SCM 14" Normal res. 14", 400 dots, RGB input supplied with RGB lead	£199 + VAT =		£228.85
* SANYO SCM 14M Medium res. 14", 600 dots, RGB input supplied with RGB lead	£299	VAT =	£343.85
* SANYO SCM 14H High res. 14", 800 dots, RGB input supplied with RGB lead	£399 + VAT =		£458.85

EPSON FOR RELIABILITY

EPSON FX80: 80 column, 160 CPS, normal, italic and elite characters, 256 user definable characters, superscript, subscript, 11 x 9 matrix, bi-directional logic seeking, hi-res bit image printing (960 x 8 dots line), friction and tractor feed, 9 international character sets, Centronic parallel interface

FX80 PRICE £349 + VAT = £401.35

EPSON RX80: 80 column, 100 CPS, normal, italic and elite characters, 11 international character sets, hi-res bit image printing, bi-directional logic seeking, 4" to 10" adjustable pin feed, Centronic parallel interface

RX80 PRICE £239 + VAT = £274.84

MX-100 136 column, 100 CPS, friction and tractor feed, up to 15" adjustable carriage, hi-res bit image printing, true descenders, Centronic parallel interface

MX-100 PRICE	£399 + VAT =		£458.85
RS232 interface for all above printers	£55	VAT	£63.25
EPSON RX80FT (friction & tractor)	£269 + VAT =		£309.35
FX100	£479 + VAT =		£550.85
Roll holder for FX80	£12	VAT	£13.80
Ribbon for MX80, FX80, RX80	£8	VAT	£9.20
Ribbon for MX100	£12	VAT	£13.80

SEIKOSHA DOT MATRIX PRINTERS WITH HIGH-RES GRAPHICS

GP-100A 80 column, 50 CPS, dot addressable hi-res graphics, 10" wide, fully adjustable tractor feed, 7 x 5 print matrix, Centronic parallel interface

GP-100A 50CPS PRICE £175 + VAT = £201.25

GP-250X 80 column, 50 CPS, 10" wide, fully adjustable, tractor feed, true descenders, 64 user definable characters, double height and or double width printing, 8 x 5 print matrix, Centronic parallel and RS232 (serial) interfaces both included

GP-250X PRICE £219 + VAT = £251.85

NEW GP-700A 7 COLOUR PRINTER

This latest addition to Seikosha range gives you print in seven colours, 10" wide carriage, friction and tractor feed, 50 CPS print speed, dot addressable high-res graphics, 4 hammer printing mechanism, 10 CPI or 13.3 CPI special Quiet printing mode, Centronic parallel interface

GP-700A SPECIAL INTRODUCTORY PRICE £349 + VAT = £401.35

GUARANTEED LOWEST PRICES

We guarantee that our prices are the lowest on the market. If you can find any item advertised and in stock at less than our price we will match that price

NEW LOW PRICES ON STAR

ONLY £239 + VAT

The most cost effective quality matrix printers to be launched this year. DP510 and DP515 features include friction and tractor feed and roll holders as standard. 100 CPS print speed bi-directional logic seeking 9 x 9 matrix gives true descenders. 2.3K buffer as standard hi-res bit image plus block graphics, sub and super script, italic printing, auto underlining, vertical and horizontal tabulation, left and right margins set, skip over perforation, back space and self test

STAR DP510 10" carriage 80 columns

SPECIAL PRICE £239 + VAT = £274.85

STAR DP515 15" carriage 136 columns

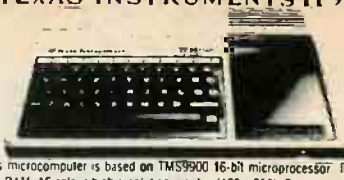
SPECIAL PRICE £359 + VAT = £412.85

RS232 INTERFACE FOR ABOVE £50 + VAT = £57.50

POCKET COMPUTERS AND CALCULATORS

* CASIO PB-100 Basic language pocket computer, 544 program steps, Qwerty keyboard, 12 char display. £34.75 + VAT = £39.95
* CASIO FX-700P, Basic language, scientific functions, 1568 program steps, Qwerty keyboard, 12 char display. £43.44 + VAT = £49.95
* CASIO FX802P Basic language computer, scientific functions, 1568 program steps, built-in mini printer, Qwerty keyboard, rechargeable batteries and charger, 12 char display. £78.22 + VAT = £89.95
* CASIO FA-3 Cassette adaptor for PB100, PB300, FX700. £17.35 + VAT = £19.95
* CASIO FP-12 Printer for BB100 and FX700. £39.09 + VAT = £44.95
* SHARP PC-1211 Basic language computer, scientific functions, 1424 program steps, 24 char display, Qwerty keyboard. £60.83 + VAT = £69.95
* SHARP PC-1251 Basic language computer, 4K RAM, 24K system ROM, 24 char display, Qwerty keyboard, user defined key, numeric pad. £69.52 + VAT = £79.95
* SHARP CE-125 Cassette recorder and mini printer for use with PC-1251, incl. batt charger. £86.91 + VAT = £99.95
* SPECIAL PRICE PC-1251 + CE-125 £146.95 + VAT = £169.00

TEXAS INSTRUMENTS TI 99/4A



This microcomputer is based on TMS9900 16-bit microprocessor. It includes 16K RAM, 16 colour high resolution graphic (192 x 256). The screen display is 32 characters, 24 lines TI-BASIC. Full-size keyboard. For Software there are about 1000 programs to choose from. There are a lot of peripherals available, e.g. Disk Drives, Disk Interface, Speech Synthesizer, Extra RAM. Additional Language (PASCAL, TI-LOGO, ASSEMBLER)

TI HOME COMPUTER HARDWARE

Title	Description	Price inc VAT
TI 99/4A	Complete with UHF modulator and power supply + free cassette lead	£99.95
PERIPHERALS		
Speech Synthesizer	When used with selected modules will reproduce electronic speech	£41.95
Peripheral Expansion System	This unit takes all card peripherals and one internal disk drive	£79.95
Disk Drive – Internal	92K formatted drive, mounts internally in peripheral expansion system	£149.95
Disk Controller Card	Controls up to 3 disk drives, complete with disk manager command module	£109.95
Disk Drive Double Sided	92K formatted capacity per side acts as 2 drives DSK1 & DSK2 total capacity 184K bytes	£219.95
Disk Drive External	Complete with own case, power supply & connecting cables	£259.95
RS232 Expansion Card	Provides 2 serial RS232 ports, and one parallel port for interfacing	£79.95
RAM Expansion Card	Adds 32K bytes extra RAM bringing total capacity to 48K bytes	£79.95
P-Code Card	Includes the UCSD-PASCAL P-code interpreter	£129.95
Matrix Printer	80 column matrix printer printer GP-100A + cable	£219.95
Matrix Printer GP250X	80 column matrix printer with RS232 and Centronic parallel interface	£273.95
Epson RX80 Printer	80 column, 100 CPS matrix printer	£297.85

Please send S.A.E. for software prices

THE AFFORDABLE DAISYWHEEL PRINTER

ONLY £369 + VAT

* 18 CPS – Bi-Directional Logic Seeking
* 10, 12, 15 CPI – Proportional Spacing
* "Drop in" Daisywheel – Triumph Adler Compatible
* Supports all Wordstar features
* Diablo protocols – IBM Selectric ribbon
* 2K Buffer as standard – 100 character Daisywheel

SPECIAL OFFER JUKI 6100 DAISYWHEEL ..... £369 + VAT = £424.35

THE CP80 QUALITY PRINTER

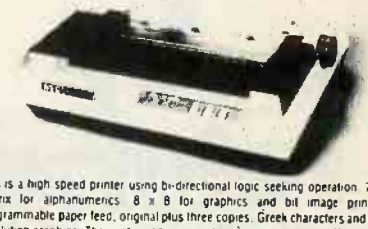
ONLY £239 + VAT

* 80 CPS – Bi-Directional Logic Seeking 80 Column
* Friction and Adjustable Tractor Feed
* Patented Square Needles up to 9 x 13 matrix
* Hi-Res Graphics and Block Grphics

SHINWA CP80 PRINTER ..... £239 + VAT = £274.85

SPARE RIBBON FOR CP80 ..... £5 + VAT = £5.75

NEC 8023BE-C PRINTER



This is a high speed printer using bi-directional logic seeking operation. 7 x 9 matrix for alphanumerics, 8 x 8 for graphics and bit image printing. Programmable paper feed, original plus three copies. Greek characters and high resolution graphics. The print quality is exceptional, and the price is affordable.

Price £299 + VAT = £343.85

* OKI Microline 80 Printer	£199	VAT =	£228.85
* OKI Microline 82A Printer	£329	VAT =	£378.35
* Dragon 32 Computer	£139	VAT =	£159.95

Akhter Instruments Limited

Dept. E.C., EXECUTIVE HOUSE, SOUTH RD., TEMPLEFIELDS, HARLOW, ESSEX CM20 2BZ. UK.

TEL: HARLOW (0279) 443521 OR 412639

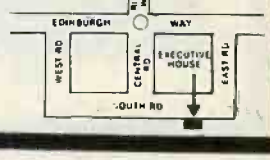
TELEX 995801 REF — A18

ORDERING INFORMATION

All orders which accompany a cheque, cash or postal orders are *CARRIAGE FREE* (UK only). Please make cheques and postal orders payable to "AKHTER INSTRUMENTS". A carriage charge of 3% of invoice total is applicable to BARCLAYCARD and ACCESS orders. We accept official orders from Government and Educational establishments. We accept VAT FREE EXPORT orders, please phone or write to check shipping cost

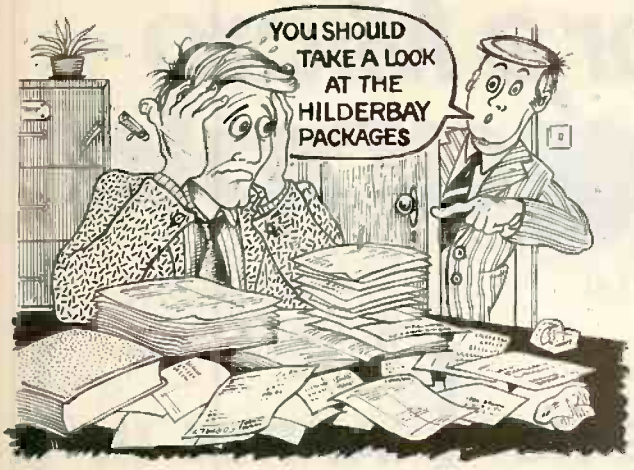
OPENING HOURS: MON-FRI 9am-5.30pm, SAT 10am-2pm.

We welcome callers, no parking problems.



● Circle No. 223

Professional Software for Apple II



Payroll An inexpensive yet accurate, reliable and easily operated program. Designed for the company with tens rather than hundreds or thousands of employees, Hilderbay Payroll offers all the features of packages costing many times more: handles all tax codes, salaries and N.I. contributions, hourly, weekly and monthly payslips, summary of payments etc. Will also work backwards (compute gross pay and deductions from net pay). **£75 + VAT**

Bookkeeper A simple to use bookkeeping program can keep several books independently. Up to 20 analysis headings can be chosen. VAT will be computed where applicable and full analysis can be printed whenever required. "There is nothing else like it on the market. I couldn't do without it". (Windfall Magazine Review, April 1983 p76-77) **£75 + VAT**

Statutory Sick Pay From April 6 all employers must calculate and pay SSP to their sick employees. Rather than keep pages of information and work to 60 pages of the complicated DHSS Guide you can simply operate the Hilderbay SSP system. A free-standing program that will run on Apple II, SSP will work out employee eligibility, linking, all possible exclusions from SSP, tell you the information required and supply all figures required by you and by law. Easily operated by non-computer, non-payroll personnel. "Overall rating very good". (Soft Magazine Review, July 1983 p14-17 & 101) **£75 + VAT**

All our Apple software is offered on 21 day money back approval.

Remember – we at Hilderbay pride ourselves in the development of high quality professional software that is fully functional and with full support. Not fancy packaging, fancy prices or fancy names.

For further information and availability contact your local dealer, or order direct from us.

TRADE ENQUIRIES WELCOME ON ALL PRODUCTS

Hilderbay

Professional Software

Hilderbay Ltd Dept. PC12 8-10 Parkway
Regents Park London NW1 7AA
Telephone: 01-485 1059 Telex: 22870

● Circle No. 201

>NEXT MONTH

>SPEED

Do benchmark timings mean anything? How can you speed up your Basic programs? Would it be better to buy an accelerator card or a hard disc? In the special section of the January issue we look at the whole question of speed, and how to get more of it.

>REVIEWS

New micros and new software packages are popping up every day, but we will be reporting on the most interesting offerings available, including the ACT Apricot. Chris Bidmead will be looking at Concurrent CP/M and MS-DOS v2 — this was, with apologies, held over last month — plus Lotus 123, the spreadsheet with graphs capability: 123 is currently the best selling business program in the States.
On the lighter side, we will be reviewing a selection of recent books for the BBC Micro, plus Oric games.

>AND MUCH MORE!

Other features in the January issue run the gamut from the potential of Shugart's new 1,000 Mbyte optical disc drive to using a micro as an aid to bra design. A special section of BBC games listings will provide something to type over the hols while the usual rubbish is on the TV. Plus there will be all the usual news of new micros and software, our regular columns and departments, plus pages and pages of free software in Open File.

Make sure you don't miss the January issue of

Practical Computing

On sale at W H Smith and all leading newsagents after December 14.

Shopping for a Micro — BUY AN apple™

The Professional Home Solution

Apple IIe 64K Disk Drive With Controller } **£848**

Includes over **£300** of extras

TV modulator colour and sound
3 Apple books
£100 Training Voucher
Apple Monitor Voucher
Software Vouchers
Micronet/Prestel Voucher
Windfall Voucher
Apple Sports Bag

The Personal Solution

APPLE IIe

Apple IIe 64K Disk Drive with 80 column card 12" High Res. Monitor } **£989**

Apple IIe	£645
Monitor	£ 99
Colour Monitor &GB and Composite	£199
Disk Drive Without	£200
80 col + 64K	£150
Applewriter	£119
Quickfile	£ 60
Multiplan	£175
80 Col. Card	£50

The Business Solution

APPLE III

Apple III 256K Monitor III SOS System Software with Apple II emulation built in disk drive } £1999

Apple III 256K Computer as above plus Profile 5mbyte hard disk } £2800

Applewriter III	£130
Visicalc III	£170
Quickfile III	£ 55

(All 3 packages for £295)
Complete range of invoicing, ledgers and stock packages available.

THE SUPPORT PACKAGE

- **Training** — Free half day appreciation course before you BUY
  — Free one day application training when you buy your Apple from us.
- Full year guarantee on all parts and labour.
- On site maintenance available.

LISA

Why not attend one of our free seminars?

or Rent a LISA for evaluation

Please ring for details

Printers

EPSON	RX80	£242
	RX80ft	£269
	FX80	£350
OKI	82A	£299
	92	£439

For computerised solutions to business problems contact

SIMMONS MAGEE COMPUTERS LTD

13 YORK STREET, TWICKENHAM, MIDDLESEX TW1 3JZ

01·891·4477

ALL PRICES EXCLUSIVE OF V.A.T.

Class micro

Brian Boyde-Shaw offers a view of school computing in the age of computer literacy.

THE DAY begins with assembly. In troops the lower-school population in a two-dimensional array. The headmistress is on the dais and over her head is a large monitor screen which currently displays the continuous sequential file holding the timetables for the lower-school classes.

The proceedings start. Miss Sharp, the lower-school music teacher, sits at her BBC Model T and plays the school hymn. She still prefers the personal touch. At a nod from the headmistress, Mr Keen the chief audio-visual technician presses a couple of function keys and a flat Oxford accent delivers the day's notices.

That done, they march out to their classrooms, showing their plastic-card passes to the card-reading machine at the classroom door. Class registration is automated now, and school lunch, if required, has been ordered.

Watchful eye

Design and Technology is the first period of a crowded day. It starts as the students of class A$, sitting in pairs, study a preliminary design for a new turtle to be used in the primary school next door. In the corner the D and T master sits and scans his screen, flicking from console to console, keeping a watchful eye on his students' activities.

Maths is next. The software for simultaneous equations has been down-loaded straight from the Department of Education in London by a technician, and all is ready. They file in, handing in the screen dump of their latest homework attempt. It will be read later by Mr Trigg, the maths master, with the aid of a character scanner coupled to the school's admin computer. Some D and T students are working on an illicit interrupt program to ensure that their class has a 100 percent pass rate at the next readout.

Maths over, it is morning break time. Robbie Robot, as the kids call him, together with his team of robot helpers are touring the school corridors, dispensing non-fizzy, vitamin-fortified drinks and government-issued wholemeal biscuits. Playtime is no longer synonymous with body activities. There is no football, netball, chase or plain rowdiness now — except perhaps the occasional whoop of joy as the 1,000,000th space invader bites the dust in the many activity rooms scattered throughout the lower school. Unseen, the school security computer registers pupils' names, scores and reaction times into its data bank for a use that even the main school head does not care to think about.

Period 3, from a seven-period day, sees the class in the art rooom. No easels, brushes or messy paints are to be seen, but 30-odd colour monitors stare remorselessly towards the centre of the room, awaiting switch-on. Free expression is on today's menu. Picasso would have been in his element.

As usual Miss Drew, the art teacher, sits at her master console overviewing the proceedings, adding as required — or, more often, as is not required — a spot of guidance via her remote-control light-pen. When the bell sounds all screen pictures are automatically downloaded to the Arttech arts master computer. Those it judges to be the best are sent on to the Department of Education for banking. Art is on the decline natonally, and the goverment wants to step up interest, so the Minister for Arts is gathering information.

Last lesson of the morning is history, and the early 20th century is the period under investigation. The history room is double screened at each work point. Above the VDU is a colour TV, ready to be used at a touch of a function key on the computer below. Sets of earphones are plugged into each set as the lesson has sound as well as full colour.

After 10 minutes viewing, the pupils create their own interpretation of the events they have just seen, using block and high-resolution graphics on the VDU. The history master, nearing retirement, longs for the good old days: 30 kids standing around a single computer borrowed for half an hour from the maths department, doing multi-choice questions.

Lunch time

Plastic plates, plastic cutlery and plastic food in clear plastic dispensers — lunch time has not changed much, despite the pill prophets. It is eaten in its usual disorderly orderly fashion: no meal tickets to hand in, no smiling or grumbling dinner ladies in sight, not even any jokes at the teacher's expense.

The activity rooms fill up. Zaps, groans, whistles and explosions abound. In a corner, two bespectacled youngsters are playing three-dimensional chess. In the centre of the room three turtles are lumbering at level 1 down the centre of the room, following a painted track as an impatient group of level sixers look on. Pictures of Seymour Papert and Margaret Thatcher have pride of place on an end wall.

A bust of Sir Clive Sinclair stands proudly above a glass-cased ZX-80. Hand-held games machines, complete with antennae, hold the attention of half of the room. Pete Lowe, a level sixer, has just had his latest game accepted by the Activity Branch of the Department for nationwide UHF downloading.

The bell sounds. All screens go blank, the turtles grind to a halt and the chess pieces refuse to move. Partly completed games are automatically stored for future use at an after-school activity session.

Melody

Lesson 5 is music in the 21st century. Mr Sharp, a recently qualified music teacher, encourages his charges to design their own futuristic compositions, using the latest BBC Model T with built-in synthesiser. At any hint of a melodious outpouring, Mr Sharp's keen ears direct him to the required function keys to download the attempt for posterity and later vetting. He probably read about the monkey theory when he was at college.

Physics is next. The lower school prides itself on being the first in the county to have a fully automated computer-controlled physics laboratory. All real and simulated experiments in the latest AEB syllabus, DES controlled, can be called up for on-screen video or real-time action. Last period of the day is sociology, and today's investigation is a favourite with class A$. The latest implementation of the Life program, with full sound and vision, fills the big screen in the hall.

The final bell sounds and the class disperses, after clocking their cards at the classroom door. Homework will be awaiting them at home, downloaded by the main lower-school activity computer.

Young Colin Sparkes races home. Yesterday, his 13th birthday, he got the latest add-on from Fuller — quadraphonic colour and sound for his ZX-Meson. But the TV system is on the blink and the repair man is held up.

Retreating to his room Colin frantically pulls open the door of his wardrobe. His hands scrabble about on the top shelf. He races down the stairs into the back garden and aims for the back fence. In the kitchen dialling in her latest menu, a neighbour hears the tinkle of thin glass. She looks through the window. Nestling neatly in the centre of the hydroponic bed of cucumbers, in the computer-controlled greenhouse, is a black-and-white striped football.

Brian Boyde-Shaw is at the Byte Microcomputing Centre, Avon.

CONTACT US NOW FOR OUR
CRACKING CHRISTMAS OFFERS

- Established six years
- Professional experience
- Free consultations
- Bespoke software
- Delivery and installation
- Full after sales support
- Computer courses

ozwise computers

236 Imperial Drive, Rayners Lane, Harrow, Middlesex. Tel 01-429-1060

● Circle No. 334

Expansion for Genies and TRS80

Direct from the manufacturer — No expansion interface required

Disc Drive that plugs directly into the keyboard

£230

The DP2000 combines a Canon disk drive with disk controller, parallel printer interface and power supply in a sleek but sturdy steel case. All you need is your computer and a disk operating system. (We even supply a 13amp plug!) Extra drives can be connected.

Parallel Printer interface with Disc Controller

£86

The DP1000 plugs directly to the keyboard. Just plug in your computer to one side and your disk drive and printer to the other side and off you go! Comes complete with P.S.U. in a sleek but sturdy steel case.

Dealer Enquiries Welcome

Gnomic

Colour Genie Owners

NEW! NEW!

connect a disk drive for £99 only with the WIZARD interface

The Wizard is an interface which connects direct to the cartridge port on the Colour Genie keyboard. The Wizard comprises a disc controller, with 25ms interrupt driven heartbeat output to provide a real time clock, Centronics parallel interface and power supply, enclosed in a sleek, sturdy, steel case. It even has a mains plug with the correct fuse already attached.

The Wizard was designed and is manufactured by us in our own factory. The design utilises the experience we have gained over the last two years in designing and manufacturing a similar interface for the Video Genie and TRS 80 Model I computers.

Further disc drives can be added using a standard daisy chain cable. The printer interface can be used whether or not a disc drive is connected.

WIZARD £99

QDOS

QDOS is the disc operating system for the Colour Genie with Wizard interface.

QDOS facilities include:

Append, Attrib, Auto, Backup, Basic, Click, Copy, Date, Dir, Dump, Format, Free, Kill, Lib, List, Load, Print, Prot, Rename, Time, Verify, Trace.

QDOS is also specifically designed to Read and Write files set up by most disc operating systems for the Video Genie and TRS-80 Model I computers. You can therefore transfer your files and maintain compatibility.

QDOS also includes an extended colour Basic with over 30 additional commands:

QDOS £35

SPECIAL INTRODUCTORY OFFER

Buy the Wizard interface and a disc drive from us and get QDOS FREE.

For example:	£	
Wizard	99	
Canon 110 Drive	179	
Ribbon cable	19	
TOTAL	297	with FREE QDOS

Disk Drives for TRS 80, Genies, BBC, Dragon, etc.

CANON slim Disc Drives	Bare Drive	with case & P.S.U.
110 40 track single sided	£139	£179
210 40 track double sided	£179	£209
220 80 track double sided	£229	£269
Ribbon cable £19		

64K Ram for TRS80 and Video Genie

This allows a full 48K Ram for Basic plus an additional 16K Ram for machine code overlay. This area can be used as a Ramdisk, printer spooler, storage space for spreadsheet or a database programs, or just an extra large adventure.

In a second mode it allows for 12K of Ram within the bottom 16K block to allow modification of the Basic interpreter.

Supplied complete with small machine code driver.

64K Ram £52.50
48K Ram (only) £43.50

All prices exclusive of VAT and Carriage

GENERAL NORTHERN MICROCOMPUTERS LTD.

Dept. PC1283, 8 Whitworth Road, South West Industrial Estate, Peterlee, Co. Durham, SR8 2JJ.

Telephone: Peterlee (0783) 860314 (24 hour Answering Service)

Credit Facilities Available

● Circle No. 335

NEW

For home or business the IBM compatible Advance 86a

16 Bit Micro-Computer

Under £350*

For the home user start with Model A with its massive 144K RAM, 64K ROM and outstanding typewriter style keyboard that fits within the base unit for portability and storage.
Note the large return key and position of the numeric keyboard. Fast retrieval from storage and fast action on games is achieved by the use of the Intel 8086 16 bit micro-processor running at 4.77 MHz.
The Advance 86A runs IBM PC software.

Specification

CPU Type	16-bit 8086 running at 4.77 MHz.
RAM	128K or 256K with parity plus 16K video
ROM	64K.
ROM Contents	Diagnostics, Basic, Cassette O/S
Languages Included	Basic
Type of Keyboard	Full 84 keys tactile
Keyboard Facilities	10 programmable keys
Character Set	256 in ROM
Method of Display	TV, RGB, Comp/Sync colour or monochrome monitor
Display Facilities	Full screen handling, 4 screen paged
Text	80 x 25 or 40 x 25
Graphics Resolution	320 x 200 or 640 x 200
Colours Available	16
Graphics Facilities	Scroll, reverse image
Cassette Recorder	Audio
Interfaces Included	Cassette port, light pen, joystick, Centronics
Sound	Built-in speaker
Operating System	Built-in ROM
Printers	Any using Centronics parallel interface
Comments	Hardware and software compatible with IBM PC User-upgradeable to Model B Provision for 8087 Arithmetic Processor

The business user can upgrade to Model B by adding the Advance Expansion box containing 2 x 5.25" disc drives providing 720K storage at £852.80.*
The Advance 86 Model B offers the business micro-computer buyer an IBM compatible disk-based system with twin drives, with Word Star, Mailmerge and Calcstar software (MS/DOS) for only £1200 plus VAT & Delivery.

Advance 86 Models A & B are designed and marketed by Advance Technology UK Ltd.

*Ex VAT.
Dealers are now being appointed.
Deliveries commence November.

Advance Technology UK Ltd.
8A Hornsey Street, London N7 8HB

IN THE MEANTIME . . .

To Advance Technology UK Ltd., 8A Hornsey Street, London N7 8HB PC 2

- ☐ Please send Model 86A, Micro-Computer & Keyboard I enclose £404.99 including VAT & Delivery.
- ☐ Please send Model 86B which includes Model 86A plus Expansion Box & Software.
- ☐ I enclose £1200 plus £180 VAT plus £10 Delivery

Cheque/Barclaycard/Access No. _____

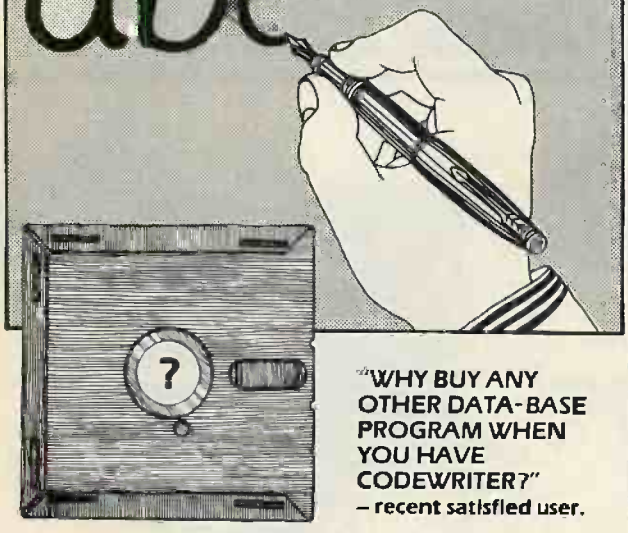
Name _____ Company _____

Address _____ Address _____

● Circle No. 337

CodeWriter

makes data-base and related programming as simple as abc



"WHY BUY ANY OTHER DATA-BASE PROGRAM WHEN YOU HAVE CODEWRITER?" – recent satisfied user.

Forget about the expense of hiring a professional programmer or the restrictions of 'off-the-shelf' programs. Become your own program designer producing microsoftware to suit your specific requirements. Codewriter enables you to do this, you type commands in your own everyday language, just as you would write them on paper . . . it's as simple as ABC!

When you've completed your design, Codewriter will write the program code and store it on your own disk whilst you sit back and watch. At anytime, you can of course modify the programs you've designed.

Your programs may include data bases printed reports, calculations and comparisons between fields of data, development of menus, forms, letters, memos, cheques, invoices, statements, mailing labels . . . the possibilities for design are endless. Codewriter operates with most popular micros and will be demonstrated fully at your local dealer.

For details on Codewriter, complete and return the coupon to;

DYNATECH MICROSOFTWARE LTD.

Rue du Commerce, Bouet, St. Peter Port, Guernsey, Channel Islands.
Telephone 0481 26081 Telex 4191130

name _____

address _____

_____

_____ tel. _____

PC

● Circle No. 226

THE CITY'S MAIN DEALER FOR "ZORBA" THE EXCITING NEW PORTABLE COMPUTER FROM TELCON

ZORBA The Portable Personal with MORE

CP/M
64K RAM
800K ON TWIN DISCS
PROFESSIONAL SPEC
PROFESSIONAL KEYBOARD
7" SCREEN
WORDSTAR
MAILMERGE
CBASIC
CALCSTAR
UTILITIES INCLUDE
M80, L80 LIB80 &
CREF 80 19 PROGRAMMABLE KEYS
READS DATA DISKS FROM:- IBM, PC, OSBORNE, SUPERBRAIN, XEROX 820, DECVT180 & KECOMP.

SIRIUS RING FOR BEST PRICES **APRICOT**

JUKI 6100 DAISYWHEEL
SHINWA CT1 CP0 MATRIX
EPSON FX80 MATRIX
EPSON RX80 MATRIX
STAR 510 MATRIX
MICROLINE MATRIX

SUPER BRAIN
SHARP PC1251
SHARP PC1500
SHARP MZ-711
ORIC

CITY SYSTEMS
OF CANNON STREET
RING
01-248-9988

● Circle No. 227

PRINTERS MRL ! FREE DELIVERY !

STAR Dot Matrix £

DP51C (100CPS-80COL) — 235

DP515 (" " -136 ") — 325

Friction & Tractor SUPER VALUE

EPSON Dot Matrix

RX80 Friction 100 CPS — £248

FX80 F & T 160 CPS — £370

JUKI Daisywheel 18CPS — £375

PAPER RIBBONS & REFILLS ETC.

INTERFACES TO FIT MOST MICROS

e.g. SPECTRUM PRINTER DRIVER (Parallel) WITH FREE CABLE & WORDMANAGER £30

ATARI PRINTER DRIVER (parallel) WITH FREE CABLE £40

AND MANY MORE ON OFFER!

DISK DRIVES

£

5¼" SS/DD 400K — 150 (Both 80 track)

5¼" DS/DD 800K — 210

8" SS/DD — 230

10 FLOPPY DISKS 5¼" £15

LOCKABLE CASE FOR 100 DISKS JUST £19

LOOK

APPLE Compatible 5¼" CARD £200 CPM CARD £49 !

DISK CONTROLLER £40 ETC.

TANDY MODEL 3/4 DRIVE KIT £375

(Controller, fittings, power supply, DOS, 1 Drive)

PLEASE ADD 15% VAT

MICRO RESEARCH LTD.
Industrial Unit 6, Knightsridge East,
LIVINGSTON, EH54 8LJ, West Lothian Scotland.

0506 31605 24Hrs

● Circle No. 228

Until now, finding out about home computers was about as simple as

focusing your right eye here

and your left eye here.

Mind boggling isn't it? But now there's Computer Choice, a new monthly magazine that gives you the facts and advice you need to choose your first home computer.

And when you've bought your computer it also helps you get the most out of it.

The first issue is out now for 60p and includes our special Buyer's Guide on micros under £200, a comparison of the Oric, Spectrum and Sord and a report on what Oric owners like and dislike about their computers and software.

As well as an article on how to learn Basic and reviews of all the latest games and software. Plus lots more to make choosing a computer easy. And owning one fun.

● **Circle No. 229**

DISKING

FLOPPY DISKS FAST

FREE with EVERY TEN-PACK of diskettes from DISKING at these prices.

The complete DISKING DATA PROCESSING package

1 - SEE 10 LIBRARY BOX

Value £2.50

★ ★ PLUS ★ ★

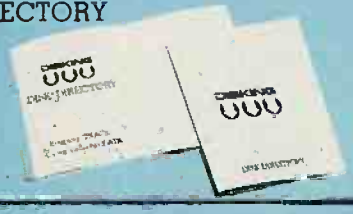
2. DISKWRITER

Value 20p

You may purchase these separately at £9.90 for 50 (specify blue or black ink)

★ ★ PLUS ★ ★

3 - DISK DIRECTORY



Value 99p

FREE LORUS GOLD PLATED QUARTZ WATCH WITH GENUINE SOLID LEATHER STRAP

LORUS are part of the SEIKO group of companies

Order FOUR Ten-packs of any brand of diskettes (5¼" or 8") using the coupon opposite, or if telephoning credit card orders mention this ad. At these prices you will receive a FREE Quartz Watch. Order EIGHT Ten-packs and you will recieve TWO Quartz Watches and so on. Please specify when ordering whether you require Gents or Ladies models. Offer ends 28th February 1984.

This offer supercedes and replaces all previous offers.

DISKETTE PRICES EXC VAT

MEMOREX

MEMOREX - With Five Year Warranty

Now with an unconditional Five Year Warranty, MEMOREX add further proof of their excellent Reliability. This, coupled with faultles performance, surely make this household name the best value for money around.

5¼" DISKETTES

Certified for Single OR Double Density and all with hub ring reinforcement.

PRICES EXC VAT	10-40	50-90	100+
3481 S/Sided 48 tpi Soft Sect	21.90	20.90	19.90
3483 S/Sided 48 tpi 10 Hard Sect	21.90	20.90	19.90
3485 S/Sided 48 tpi 16 Hard Sect	21.90	20.90	19.90
3491 D/Sided 48 tpi Soft Sect	27.90	26.90	25.90
3493 D/Sided 48 tpi 10 Hard Sect	27.90	26.90	25.90
3495 D/Sided 48 tpi 16 Hard Sect	27.90	26.90	25.90
3504 S/Sided 96 tpi Soft Sect	27.90	26.90	25.90
3505 S/Sided 96 tpi 10 Hard Sect	27.90	26.90	25.90
3506 S/Sided 96 tpi 16 Hard Sect	27.90	26.90	25.90
3501 D/Sided 96 tpi Soft Sect	35.90	34.90	33.90
3502 D/Sided 96 tpi 10 Hard Sect	35.90	34.90	33.90
3503 D/Sided 96 tpi 16 Hard Sect	35.90	34.90	33.90

48 tpi suitable for 35 and 40 track operation
96 tpi suitable for 77 or 80 track operation

All free gift offered at any time by DISKING are subject to availability. Disking reserves the right to substitue any similar alternative item or withdraw the offer without notice.

Verbatim®

Datalife by Verbatim - With Five Year Warranty

VERBATIM have not become the World's favourite floppy disks by accident. Perfect magnetic media is their stock in trade, and to prove it they now offer an unconditional FIVE YEAR warranty on all DATALIFE products.

5¼" DISKETTES

Certified for Single OR Double Density, and all with hub ring reinforcement.

PRICES EXC VAT		10-40	50-90	100+
MD525-01	S/S 48 tpi Soft Sect	22.90	21.90	20.90
MD525-10	S/S 48 tpi 10 Hard Sect	22.90	21.90	20.90
MD525-16	S/S 48 tpi 16 Hard Sect	22.90	21.90	20.90
MD550-01	D/S 48 tpi Soft Sect	29.90	28.90	27.90
MD550-10	D/S 48 tpi 10 Hard Sect	29.90	28.90	27.90
MD550-16	D/S 48 tpi 16 Hard Sect	29.90	28.90	27.90
MD577-01	S/S 96 tpi Soft Sect	28.90	27.90	26.90
MD577-10	S/S 96 tpi 10 Hard Sect	28.90	27.90	26.90
MD577-16	S/S 96 tpi 16 Hard Sect	28.90	27.90	26.90
MD557-01	D/S 96 tpi Soft Sect	36.90	35.90	34.90
MD557-10	D/S 96 tpi 10 Hard Sect	36.90	35.90	34.90
MD557-16	D/S 96 tpi 16 Hard Sect	36.90	35.90	34.90

48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation

8" DISKETTES

PRICES EXC VAT		10-40	50-90	100+
FD34-9000*	S/S S/Dens. Soft Sect	31.90	30.90	29.90
FD32-9000*	S/S S/Dens. 32 Hard Sect	31.90	30.90	29.90
FD34-8000	S/S D/Dens. Soft Sect	31.90	30.90	29.90
FD32-8000	S/S D/Dens. 32 Hard Sect	31.90	30.90	29.90
DD34-4001	D/S D/Dens. Soft Sect	36.90	35.90	34.90
DD32-4000	D/S D/Dens. 32 Hard Sect	36.90	35.90	34.90

*For critical applications

DISKING stock around 80,000 of the world's finest diskettes and normally ship within FOUR working hours! Whether you want 1 or 100 ten-packs we are waiting.

Call Joan or Roger on 0428 722563 any-time. ACCESS, VISA or DINERS cards welcome.

Verex

5¼" DISKETTES

PRICES EXC VAT		10-40	50-90	100+
MD200-01	S/S S/Dens. Soft Sect	19.90	18.90	17.90
MD200-AS	S/S S/Dens. Apple only	19.90	18.90	17.90

8" DISKETTES

PRICES EXC VAT		10-40	50-90	100+
FD34-1500	S/S S/Dens. Soft Sect	22.90	21.90	20.90
FD32-1500	S/S S/Dens. 32 Hard Sect	22.90	21.90	20.90
DD34-1501	D/S D/Dens. Soft Sect	29.90	28.90	27.90

DISKETTE CARE AND MAILING

NEW LOW PRICES

DISK DRIVE HEAD CLEANING KITS

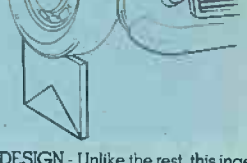
We're fed up with being asked whether our disk drive head cleaning kit actually works. So here's the proof:-

BEFORE AFTER

Can you really risk that breakdown?

CK5 for 5¼" disk drives	14.90
CK8 for 8" disk drives	14.90

The NEW DISKING 'SUPERMAILER'



(5¼" only)

* COPYRIGHT DESIGN - Unlike the rest, this ingenious mailer has a flute crossing action when folded, resulting in a virtually unbendable mailer.

* CAVERNOUS CAPACITY - will take, one, two, three or even four diskettes WITH envelopes.

* FULL INSTRUCTIONS - Each DISKING 'SUPERMAILER' is printed with full instructions

*PACKED IN 100'S - For convenience

1 PACK	2 PACKS	3+ PACKS
24.90	22.90	19.90

50,000 diskettes normally in stock
most orders shipped inside 4 hours.

DISKING INTERNATIONAL

FREEPOST, LIPHOOK, HANTS GU30 7BR, UK
TELEPHONE (0428) 722563
TELEX 858623 Telbur G or 858393 Telbur G

ALL PRICES PER TEN-PACK

maxell

MAXELL - The Gold Standard

Maxell consistently meet or exceed all standards, and have run disks under conditions designed to find weak points and wear. They couldn't and you won't. These diskettes are the quietest in operation we know.

5¼" DISKETTES

Certified for Single OR Double Density
48 tpi media with hub ring

PRICES EXC VAT		10-40	50-90	100+
MD1-D	S/Sided 48 tpi Soft Sect	24.90	23.90	22.90
MH1-10	S/Sided 48 tpi 10 Hard Sect	24.90	23.90	22.90
MH1-16	S/Sided 48 tpi 16 Hard Sect	24.90	23.90	22.90
MD2-D	D/Sided 48 tpi Soft Sect	32.90	31.90	30.90
MH2-10D	D/Sided 48 tpi 10 Hard Sect	32.90	31.90	30.90
MH2-16D	D/Sided 48 tpi 16 Hard Sect	32.90	31.90	30.90
MD1-DD	S/Sided 96 tpi Soft Sect	32.90	31.90	30.90
MD2-DD	D/Sided 96 tpi Soft Sect	42.90	41.90	40.90
MD2-HD	D/Sided 96 tpi High Density ..... Cobalt doped 1.6 MByte capacity	59.00	56.00	53.00

8" DISKETTES

PRICES EXC VAT		10-40	50-90	100+
FD1-128	S/S S/Dens. Soft Sect	29.90	28.90	27.90
FH1-32	S/S S/Dens. 32 Hard Sect	29.90	28.90	27.90
FD1-XD	S/S D/Dens. Soft Sect	34.90	33.90	32.90
FH1-32D	S/S D/Dens. 32 Hard Sect	34.90	33.90	32.90
FD2-XD	D/S D/Dens. Soft Sect	39.90	38.90	37.90
FH2-32D	D/S D/Dens. 32 Hard Sect	39.90	38.90	37.90

Dysan CORPORATION

DYSAN - For The Decisive

When you think of disks you often think of DYSAN. DYSAN have the reputation for TOTAL dependability whatever the application. They may cost a little more but data is irreplaceable.

5¼" DISKETTES

Certified for Single OR Double Density, and all with hub ring reinforcement.

PRICES EXC VAT		10-40	50-90	100 +
104/1D	S/S 48 tpi Soft Sect	25.90	24.90	23.90
107/1D	S/S 48 tpi 10 Hard Sect	25.90	24.90	23.90
105/1D	S/S 48 tpi 16 Hard Sect	25.90	24.90	23.90
104/2D	D/S 48 tpi Soft Sect	37.90	36.90	35.90
107/2D	D/S 48 tpi 10 Hard Sect	37.90	36.90	35.90
105/2D	D/S 48 tpi 16 Hard Sect	37.90	36.90	35.90
204/1D	S/S 96 tpi Soft Sect	36.90	35.90	34.90
207/1D	S/S 96 tpi 10 Hard Sect	36.90	35.90	34.90
205/1D	S/S 96 tpi 16 Hard Sect	36.90	35.90	34.90
204/2D	D/S 96 tpi soft sect	46.90	45.90	44.90
207/2D	D/S 96 tpi 10 Hard Sect	46.90	45.90	44.90
205/2D	D/S 96 tpi 16 Hard Sect	46.90	45.90	44.90

48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation

8" DISKETTES

PRICES EXC VAT		10-40	50-90	100 +
3740/1	S/S S/Dens. Soft Sect	30.90	29.90	28.90
101/1	S/S S/Dens. 32 Hard Sect	30.90	29.90	28.90
3740/1D	S/S D/Dens. Soft Sect	37.90	36.90	35.90
101/1D	S/S D/Dens. 32 Hard Sect	37.90	36.90	35.90
3740/2D	D/S D/Dens. Soft Sect	41.90	40.90	39.90
101/2D	D/S D/Dens 32 Hard Sect	41.90	40.90	39.90

UK SHIPPING RATES EXC VAT

Official University, College and school orders welcome written or telephoned

5¼" DISKETTES
1-2 Packs each pack @ 95p
3-5 Packs each pack @ 75p
6-9 Packs each pack @ 60p
10+ Packs ★POST FREE★

5¼" CLEANING KITS
Same postal rate as packs of 5¼" diskettes. 10+ POST FREE

5¼"NEW 'SEE 10' LIBRARY BOXES
SEE 10 1-4 off @ 40p
SEE 10 5-9 off @ 30p
SEE 10 10+ @ 20p

8" DISKETTES
1-2 Packs each pack @ £1.60
3-5 Packs each pack @ £1.20
6-9 Packs each pack @ 90p
10+ Packs ★POST FREE★

8" CLEANING KITS
Same postal rate as packs of 8" diskettes. 10+ POST FREE

8" LIBRARY BOXES
LB8 1-4 off @ 60p
LB8 5-9 off @ 45p
LB8 10+ off @ 30p

DISKING SUPERLUXE DISK LIBRARY (5¼" ONLY)
Same postal rate as 5¼" diskettes. 10+ POST FREE

DISKING SUPERMAILERS (5¼" ONLY)
100-Pack Complete with sealing labels 3.00

DISKING DISK DIRECTORIES
10-Pack 2.00

DISKING DISKWRITERS
50-Pack £1.00

LOCKABLE DISKETTE STORAGE
All versions £2.00 each for one, £1.30 each for 2-7, 8+ postfree.

NORMAL ORDERS - We now welcome any official Government orders
We are now happy to accept any official orders with a minimum value of £30.00 from Government Departments, Ministries and Local Authorities. We do this on the understanding that invoices will be settled within thirty days or preferably less please.
Alternately, you may send your remittance with your order if you so wish.
All other non Government bodies, cheques with order please payable to DISKING. If you are a large establishment, and cannot raise cheques without an invoice please post or telephone us your order, and we will send a pro-forma invoice by return, for your accounts department to pay against.
Also bear in mind, that you do have to pay VAT, which will be added to these prices.
If you are in any doubt, please see the order form on this brochure to help you with your calculations, or telephone us for assistance.

CREDIT CARD ORDERS
We welcome Access (Mastercharge), Barclaycard (VISA) & Diners Club International, & there is NO credit card surcharge. You may write your c/card No. on your order or telephone the order day or night, 365 days a year. You may speak for as long as you like, (but don't leave long gaps otherwise our machine thinks you've gone home) and don't forget to give the following details -
1 The Cardholder's Name, Address and day time telephone number
2 Delivery Address if different
3 First Class, ordinary or special post
4 Your Credit Card Number
5 What you wish to Order.
You may leave the rest to US!!

URGENT ORDERS
If you're posting your order, omit the word FREEPOST from our address, and use our normal postcode GU30 7EJ and do not forget to stamp it FIRST CLASS. If you are a Government body as defined under 'NORMAL ORDERS' and are telephoning your official order OR are an individual or company using your credit card No., please make it clear that you wish to pay for your goods to be sent to you by FIRST CLASS POST.

FIRST CLASS RATES EXC VAT	MINIDISKS	8" DISKETTES
First TEN-PACK	2.00	2.50
Second and subsequent TEN-PACK	1.50	2.00

DESPERATE ORDERS U.K.
Your options are - DATAPOST Which will deliver the goods within the United Kingdom overnight (usually before 10 am the next day) provided they are ordered and paid for from DISKING by 3.00 pm or EXPRESSPOST Which will deliver the goods the SAME DAY provided they are ordered and paid for from DISKING by 10.30 am, and provided you are no further north than Manchester.
These services put great stress on our sales order processing and packaging departments. Please therefore, spare a thought for our girls, and make sure that -
a) The required goods are in stock and
b) A full complement of manpower and vehicles are available at DISKING.

TRADE CORNER

Write or call for our very latest Autumn '83 TRADE PACK.
KEENER prices than ever before, but QUALITY maintained.
Don't buy other peoples cheap disks, they are probably batch tested and they will probably let your customer down. We know - we get sob stories on the 'phone daily. Every diskette that DISKING sells is individually certified! - for yours and our PEACE OF MIND.
You may mix and match any of our quality diskettes so that your customers may select their favourite brands. This way you can be sure of pleasing everybody.
A FREE sample unlabelled diskette will also be enclosed, which are available in 100 bulk packs and at extremely keen prices just in case you should be selling software.
If you get any enquiries for pre-formatted diskettes, do not sweat because we can obtain most of them.
BLANK CASSETTES are also available complete with library cases in either C-12 or C-15 format at £39.00 per 100, U.K. P&P £4.00.

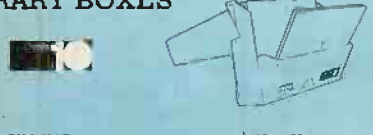
DISKETTE STORAGE

LOCKABLE DISKETTE STORAGE

These anti-static, ABS plastic diskette storage boxes come in four sizes, two for mini disks and two for 8" disks.
They have a white base with a transparent smoked lockable lid, and hold 40 or 80 diskettes.
They come complete with keys and dividers.

PRICES EXC VAT	
M35 40 minidisk capacity	14.90
M85 80 minidisk capacity	18.90
F40 40 8" diskette capacity	18.90
F90 80 8" diskette capacity	27.90

LIBRARY BOXES



PRICES EXC VAT	1-49	50+
SEE 10 for minidisks only	2.50	2.20
	1-47	48+
8" LIBRARY BOX (NOT SEE 10 Design)	2.50	2.20

The new SEE 10 us probably the best 5¼" library box around.
(FREE with every ten disks ordered)

Order any 4 Ten-packs of diskettes use this coupon and you will receive a FREE Quartz watch, specify

Gents Qty .....
or
Ladies Qty .....

QTY	PART NO.	DESCRIPTION	PRICE EXC VAT
			£
			£
			£

TOTAL GOODS VALUE EXC VAT	£
TOTAL DELIVERY AND INSURANCE	£
SUB TOTAL EXC VAT	£
VAT	£
VALUE OF CHEQUE PAYABLE TO DISKING	£

Name: _____ Tel No: _____

Address: _____

Please charge my credit card No. _____

ACCESS, VISA AND DINERS cards welcome.

● Circle No. 230

WEST COUNTRY

Avon Business Computers Ltd.,
192 Wells Road, Bristol, Avon BS4 2AX.
Tel: 0272 779452/3.
MOS Computers,
11 Portland Square, Bristol, Avon BS2 8ST.
Tel: 0272 421486.
AC Systems,
6 Cathedral Lane, Truro, Cornwall TR1 2QS.
Tel: 0872 79727.
AC Systems,
13 Heavitree Road, Exeter, Devon EX1 2LD.
Tel: 0392 211718.
AC Systems,
75 Mutely Plain, Plymouth, Devon PL4 7DS.
Tel: 0752 260861.
Devon Computers (North),
Seven Brethren Bank, Barnstaple,
Devon EX31 2AS.
Tel: 0271 74478.
Devon Computers,
The White House, 39 Totnes Road, Paignton,
Devon TQ4 5LA. Tel: 0803 526303.
JAD Integrated Services (Plymouth) Ltd.,
32 Western Approach,
City Centre, Plymouth, Devon PL1 1TQ.
Tel: 0752 29038/662616.
Deane Computer Services,
Sea Road North, Bridport, Dorset DT6 3BD.
Tel: 0308 25276.
Milequip Computers,
7 Hare Lane, Gloucester, Glos. GL1 2BA.
Tel: 0452 411010.

SOUTH & SOUTH EAST

H B Computers Ltd.,
50/60 Collington Street, Luton, Beds.
Tel: 0582 454466.
Slough Microshop,
120 High Street, Slough, Berks. SL1 1JQ.
Tel: 0753 24001.
Kingsley Computers Ltd.,
132 Desborough Road, High Wycombe,
Bucks. HP11 2PU.
Tel: 0494 449749.
Amplicon Micro Systems Ltd.,
Richmond Road, Brighton, E. Sussex BN2 3RL.
Tel: 0273 608331.
South East Computers Ltd.,
Unit 2, Castleham Road, Hastings,
E. Sussex TN38 9NR. Tel: 0424 426844.
Stuart R. Dean Ltd.,
373 Southchurch Road, Southend-on-Sea,
Essex SS1 2PY. Tel: 0702 62707.
Apollo Reprographics,
Unit 15a, West Station Industrial Estate,
Spital Road, Maldon, Essex CM9 6TW.
Tel: 0621 56933.
Computer Sales and Software Centre Ltd.,
190/192 Cranbrook Road, Ilford,
Essex IG1 4LU. Tel: 01-554 3344.
Dataview Ltd.,
Portreeves House, East Bay, Colchester,
Essex CO1 2XB. Tel: 0206 865835.
DDM Direct Data Marketing,
14 Ongar Road, Brentwood, Essex CM14 5HA.
Tel: 0277 229379/214168/230480.
Business Electronics Ltd.,
Rownhams House, Rownhams,
Southampton, Hampshire SO1 8AH.
Tel: 0703 738248/739092 (Sales).
(Also Micro magic in Plummers).
Computerstore Ltd.,
9-11 Richmond Hill, Bournemouth,
Dorset BH2 6HE. Tel: 0202 296963.
Ferranti & Craig Ltd.,
Basingstoke Computer Centre,
5 New Market Square, Basingstoke,
Hants. RG23 1JA.
Tel: 0256 52203/69750.
Microchips,
46-48 St. Georges Street, Winchester,
Hants. SO23 8BE. Tel: 0962 68085.
Alpha Business Systems Ltd.,
Electron House, Church Street,
Ware SG12 9ES. Tel: 0920 68926/7.
Photo Acoustics Ltd.,
255A St. Albans Road (Entrance in Judge
Street), Watford, Herts. WD2 5BQ.
Tel: 0923 40698.
The Computer Room,
87 High Street, Tonbridge, Kent TN9 1RX.
Tel: 0732 355962.
Alphascan Ltd.,
Little Bourton House, Southam Road,
Banbury, Oxon. OX16 7SR. Tel: 0295 75606.
Micro-Facilities Ltd.,
7/9 Church Road, Egham, Surrey TW20 9QL.
Tel: 0784 31333.
PPM Ltd.,
Hermitage Road, St. Johns,
Woking, Surrey GU21 1TZ.
Tel: 04867 80111.

EAST LONDON

CSS Systems Ltd.,
502 Kingsland Road, London E8 4AE.
Tel: 01-254 9293/1674.
Merchant Systems Ltd.,
5 New Bridge Street, London EC4.
Tel: 01-583 6774.

NORTH LONDON

Chromasonic Business Systems,
48 Junction Road, Archway, London N19 5RD.
Tel: 01-263 9493/9495.
Davinci Computer Store,
112 Brent Street, Hendon, London NW4 2DT.
Tel: 01-202 2272.
Micro Computation,
8 Station Parade, Southgate,
London N14 5BL. Tel: 01-882 5104.
Missing Link Computers Ltd.,
Abacus House, 53-55 Ballards Lane,
Finchley, London N3.
Tel: 01-349 4711.

SOUTH/CENTRAL LONDON

Cavendish Data Systems Ltd.,
74 Portland Road, South Norwood,
London SE25 4PQ.
Tel: 01-656 8941.
DDM Direct Data Marketing,
86-87 Wilton Road, Central London SW1V 1DN.
Tel: 01-834 5016/5096.
Micro Computer Centre,
28 Sheen Lane, London SW14 8LW.
Tel: 01-878 7044.

WEST/CENTRAL LONDON

Adda Computers Ltd.,
Unit 8, 1 Broomfield Road, West Ealing,
London W13 9AP.
Tel: 01-579 5845/5848.
Capital Computer Systems Ltd.,
32 Windmill Street, London W1P 1HH.
Tel: 01-636 3863.

GREATER LONDON/MIDDLESEX

L & J Computers,
192 Honeypot Lane, Queensbury, Stanmore,
Middlesex HA7 1EE. Tel: 01-204 7525.

EAST ANGLIA

Arden Data Processing,
166 Park Road, Peterborough, Cambs. PE1 2UF.
Tel: 0733 47767.

MIDLANDS

SWW Computer Systems,
Ketwell House, 75-79 Tavistock Street,
Bedford, Bedfordshire MK40 2RR.
Tel: 0234 40601.
Davidson-Richards Ltd.,
29 Charnwood Street, Derby,
Derbyshire DE1 2GU.
Tel: 0332 683231.
AOM Business Systems Ltd.,
Scotia House, 6 Highfield Street,
Leicester LE2 1AB. Tel: 0533 542845.
The Computer Supermarket Ltd.,
Unit 8, Southfolds Road, Oakley Hay Ind. Est.,
Corby, Northants.
Tel: 0536 744015 (3 lines).
HB Computers Ltd.,
20/22 Station Road, Kettering, Northants.
Tel: 0536 520910.
AJR Computer Systems Ltd.,
80 Nottingham Road, Arnold,
Nottingham NG5 6LF.
Tel: 0602 204001/206647.
Betos (Systems) Ltd.,
Bennett House, 155 Mansfield Road,
Nottingham NG1 3FR. Tel: 0602 48108.
Computer Services Midlands (Sales) Ltd.,
Dunlop India House, Abbeyfield Road,
Lenton Industrial Estate (West),
Nottingham NG7 2SZ. Tel: 0602 866366.
Jentech Services Ltd.,
Rosemary Cottages,
Nordley, Bridgnorth, Shropshire WV16 4SU.
Tel: 07462 5287.
Peach Data Services Ltd.,
5 Horninglow Street, Burton-on-Trent,
Staffs. DE14 1NJ. Tel: 0283 44968.
Business Equipment Rentals Ltd.,
99 Albert Street, Rugby,
Warwickshire CV21 2SW. Tel: 0788 65756.

WEST MIDLANDS

Business Equipment Rentals Ltd.,
Grosvenor House, 11 Grosvenor Road,
Coventry, W. Midlands CV1 3FF.
Tel: 0203 20246.
Camden Computer Systems Ltd.,
462 Coventry Road, Small Heath,
Birmingham B10 0UG. Tel: 021 771 3636.
Computer Services Midlands (Sales) Ltd.,
Refuge Assurance House, Sutton New Road,
Erdington, Birmingham, W. Midlands B23 6QX.
Tel: 021 382 4171.
Ibek Systems Ltd.,
437 Stoney Stanton Road, Coventry,
W. Midlands CV6 5EA. Tel: 0203 661162.
Microtrading Ltd.,
641 Bromford Lane, Ward End,
Birmingham B8 2EP. Tel: 021 784 0077.
Micro Business Centre Ltd.,
Wolverhampton Computer Centre,
17-19 Lichfield Street, Wolverhampton,
W. Midlands. Tel: 0902 29021/29907.
Taylor-Wilson Systems Ltd.,
Station Road, Dorridge, Solihull,
W. Midlands B93 8HQ. Tel: 05645 6192.
Walters Computer Systems Ltd.,
12 Hagley Road, Stourbridge,
W. Midlands DY8 3JD. Tel: 03843 70811.

YORKSHIRE

Ackroyd Typewriters Ltd.,
57/59 Leeds Road, Bradford,
W. Yorkshire BD1 5AF. Tel: 0274 731835.
Yorkshire Electronics,
Caxton House,
17 Fountain Street, Morley,
W. Yorkshire LS27 9AE.
Tel: 0532 522181.
Yorkshire Microcomputers Ltd.,
28 Ramshill Road,
Scarborough, N. Yorkshire YO11 2QF.
Tel: 0723 78136.
Deans Computer Services Ltd.,
Unit 1, Sheepscar House,
Sheepscar Street South, Leeds,
W. Yorkshire LS7 1AD.
Tel: 0532 432796.
Holdene Ltd.,
Bray House, Leicester Place,
Leeds LS2 9BH. Tel: 0532 459459.
Holbrook Business Systems Ltd.,
Moss House, High Street, Mosborough,
Sheffield, S. Yorkshire S19 5AE.
Tel: 0742 484466.

NORTH WEST

Automated Business Equipment Ltd.,
Mersey House, Battersea Road, Heaton
Mersey Industrial Estate,
Heaton Mersey,
Stockport, Cheshire SK4 3EA.
Tel: 061 432 0708/4299, 061 431 7192.
Dunglinson Micro Systems,
Brunstock, Carlisle, Cumbria.
Tel: 0228 24918/25892.
D Kipping Ltd.,
The Systems Centre, Chester Street,
Chestergate, Stockport,
Cheshire SK3 0BQ.
Tel: 061 477 3880.
Executive Reprographic & Business
Consultants Ltd.,
2-4 Oxford Road, Manchester M1 5QA.
Tel: 061 228 1637.
Cytek (UK) Ltd.,
Sandringham House,
9 Warwick Road,
Old Trafford, Manchester M16 0QQ.
Tel: 061 872 4682.
The Computer Supermarket
(Manchester) Ltd.,
Knightsbridge Mall,
Arndale Shopping Centre,
Manchester. Tel: 061 835 1116.
POS Computer Systems Ltd.,
50 Gidlow Lane, Wigan WN6 7DP.
Tel: 0942 31464.
Computers & Business Systems,
89 Manchester Road, Nelson,
Lancs. BB9 7HB. Tel: 0282 601191.

Any qu

Datel Computing Ltd.,
323 Clifton Drive,
Lytham St. Annes, Lancs. FY8 1HN.
Tel: 0253 727051.
Preston Computing Centre,
6 Victoria Buildings, Fishergate, Preston,
Lancs. PR1 2NJ.
Tel: 0772 57684/58445.
Rockliff Micro Computers Ltd.,
2 Rumford Street, Liverpool L2 8SZ.
Tel: 051 227 2568.
Stack Computer Services Ltd.,
290-298 Derby Road,
Bootle, Liverpool, Merseyside L20 8LN.
Tel: 051 933 5511.

NORTH EAST

Intex Datalog Ltd.,
Eaglescliffe Industrial Estate,
Eaglescliffe,
Stockton-on-Tees, Cleveland TS16 0PN.
Tel: 0642 781193.
Microprocessor Services,
77a Beverley Road, Hull,
North Humberside HU3 1XR.
Tel: 0482 23146.
Microware Computers Ltd.,
Priory House,
1133 Hessle High Road,
Hull, North Humberside HU4 6SB.
Tel: 0482 562107.
Currie & Maughan Microcomputers,
204-206 Durham Road,
Gateshead,
Tyne & Wear NE8 4JR.
Tel: 0632 774540.
Key Computer Services Ltd.,
28 Osborne Road,
Jesmond,
Newcastle Upon Tyne NE2 2AJ.
Tel: 0632 815157.
QMP Ltd.,
Victoria Buildings,
46 Grainger Street,
Newcastle Upon Tyne NE1 5QD.
Tel: 0632 614646.

SCOTLAND

Ayshire Office Services Ltd.,
22 Douglas Street, Kilmarnock,
Strathclyde KA1 1RB.
Tel: 0563 24255.
Dual Business Systems,
45 Fort Street, Ayr.
Tel: 0292 81776.
MBM Macmicro Business Machines,
Tulloch Street, Dingwall,
Ross-Shire IV15 9JZ.
Tel: 0349 63922.
Microcentre
(Complete MicroSystems) Ltd.,
30 Dundas Street,
Edinburgh,
Lothian EH3 6JN.
Tel: 031 556 7354.
Microcom,
Fortune House, 74 Waterloo Street,
Glasgow, Strathclyde G2 7DA.
Tel: 041 204 0812.
Robox (Office Equipment) Ltd.,
Unit 14,
Anderston Shopping Centre,
Argyle Street, Glasgow,
Strathclyde G27 PH.
Tel: 041 221 5401/2.

NORTHERN IRELAND

Northern Ireland Computer Centre Ltd.,
4 High Street, Holywood,
Co. Down,
Northern Ireland.
Tel: 02317 6548.

REPUBLIC OF IRELAND

Commodore (Concessionaries)
Ireland Ltd.,
Barton House, Francis Street,
Galway, Eire.
Tel: 091 67156/7/8.

WALES

Computer Supplies (Swansea),
Systems Division of Radio Supplies Ltd.,
82 Gower Road, Sketty, Swansea SA2 9BZ.
Tel: 0792 290047.
Reeves Computers Ltd.,
6 Walter Road, Swansea,
W. Glamorgan SA1 5NF. Tel: 0792 468103.
Reeves Computers Ltd.,
33 Bridge Street, Newport, Gwent NPT 4BH.
Tel: 0633 212331.
Reeves Computers Ltd.,
24 Spilman Street, Carmarthen,
Dyfed SA31 1LQ.
Tel: 0267 23244.
Rockliff Micro Computers,
Pendre House, High Street, Mold, Clwyd,
N. Wales. Tel: 0352 59629.
Sigma Systems Ltd.,
266 North Road,
Cardiff CF4 3BL.
Tel: 0222 34865/34869/25800.

estions?

Worried about which computer your company should get? Anxious about the size of RAM it should have, or whether or not it'll need peripherals? Simply confused by all this computer jargon?

Then talk to your local Commodore dealer. He knows more about computers in business than almost anyone. (Representing the world's leader in micro computer business systems, he has to).

All the dealers listed here were selected by Commodore because they're the best.

They choose to sell Commodore computers for exactly the same reason.

Any one of our superb machines will help solve many of your business problems.

And, finally, the answer to that one question you're bound to ask: yes, they are excellent value for money.

commodore
Changing business for the better.

For more information about the 8000 Series please telephone or write to your nearest Commodore dealer or to us at:

The Commodore Information Centre,
675 Ajax Avenue, Slough, Berkshire SL1 4BG.
Telephone: Slough (0753) 79292.

Name Position

Company

Address

Postcode Tel:

85PC01283

● Circle No. 122

apple® PRICES SLICED

APPLE IIE 64K RAM £549
(Send cheque for £654.35 including VAT & Carriage)

APPLE III 256K RAM, Monitor & System Software £1799
(Send cheque for £2103.35 including VAT & Carriage)

OTHER PROCESSORS

IBM Personal Computer	from £2599.00	DEC Rainbow with Peachcalc	from £2299.00
Epson QX–10	from £1735.00	DEC Professional 350	from £3299.00
Tycom Microframe	from £2900.00	DEC Mate II	from £2899.00

Epson HX–20 with either Epsoncalc or Intext ..... from £402.00

SOFTWARE SELECTION

IBM	Wordstar/Mailmerge	£419.00	EPSON	Supercalc	£169.00
	dBASE II	£399.00		dBASE II	£395.00
	Lotus 1–2–3	£319.00		Wordstar	£275.00
DEC	Multiplan	£165.00	Microframe	Micromodeller	£589.00
	Finar	£595.00		Wordstar	£269.00
	Wordstar/Mailmerge	£415.00		Multiplan	£169.00
	Dectext	£325.00		dBASE II	£375.00

APPLE PERIPHERALS & SOFTWARE

Disc Drive + Controller	£249.00	PFS IIE	£75.00
Disc Drive – Controller	£199.00	Monitor II	£119.00
Additional Disc III	£245.00	Apple Dot Matrix Printer	£365.00
80 Column Card IIE	£49.00	Apple Daisy Wheel Printer	£1150.00
Multiplan	£149.00	Simon Parallel Printer Card	£39.00
80 Column Card/64K IIE	£140.00	Apple Parallel Card + Cable	£95.00
Kaga 12" Green Monitor	£89.50	Super Serial Card + Cable	£100.00
Visicalc III	£149.00	Eurocolour Card (II + only)	£50.00
Apple Writer III	£112.50	U-Term 80 Column Card (II + only)	£130.00
Wordstar/Mailmerge	£335.00	U-Ram 16 (II + only)	£49.50
dBASE II	£350.00	CP/M–Z80 Card	£220.80

PRINTERS

Epson RX 80	£279.00	Epson FX 100	£569.00
Epson FX 80	£438.00	Qume 9/45	£1750.00
Epson MX 100	£475.00	Qume 11/40	£1450.00

Anadex 9501A £1025.00

*Special one off offer–2 ex-demonstration Qume Sprint 5 printers W £750.00 each (1 with Acoustic Hood)

TERMS AND CONDITIONS

Prices exclusive of VAT · Add £10.00 to order price for carriage · Order by telephone or by completing the coupon · Payment with order, either by cheque (allow 10 days to clear) or by Access, Visa, or American Express · Allow 14 days for delivery.

TO: GUESTEL LTD. 40 NEW BRIDGE STREET LONDON EC4V 6BE. TEL: 01-248 0416

PLEASE SEND ME _____

I enclose cheque number _____ for £ _____ (including VAT at 15% and carriage) made out to Guestel Ltd.

OR please debit my Access/Visa/American Express Card No _____ for £ _____

NAME _____ ADDRESS _____

_____ TELEPHONE _____

SIGNATURE _____

GUESTEL

VAT No. 328 2810 63. Reg. No. 1467301. Guestel reserve the right not to accept any order. Any acceptance will be subject to Guestel's terms and conditions.

● Circle No. 152

(THE KEY * TO SUCCESSFUL SOFTWARE SALES)

Earls Court,
London.
June 5-7, 1984

software '84
EXHIBITION AND CONFERENCE

Certainly the major software event of 1984 will be **Software '84,** to be held for the first time in Central London. **Software '84** will be totally dedicated to professional software sales and will be held from June 5-7, 1984 at Earls Court in the centre of London, the Nation's biggest commercial market place.

Such a show could only come from a company that understands the computer market. Reed Exhibitions, the country's largest exhibition organisers, will be staging **Software '84** with all the skill the company has already brought to the highly successful Compec shows.

Computer Weekly, Software and the National Computing Centre (NCC) will be sponsoring both the exhibition and the prestigious conference, running at the same time, guaranteeing a high level of interest in both events. The event has the full support of the Computer Services Association (CSA) and The Institute of Data Processing Management (IDPM) and are co-sponsored by 'Systems International', 'Practical Computing', 'Micro Business' and 'Computer Talk'.

Inevitably, top quality business visitors will be drawn to such a show, with DP professionals, dealers, OEM's and serious business and professional end-users all visiting the exhibition with nothing but software purchase at the forefront of their minds.

With that kind of captive audience you can't afford not to be a part of this important event. So turn the key to the booming software market and make **Software '84** the key to successful software sales. The first step is to fill in the coupon below:

Return to: The Exhibition Manager, **Software '84,** Reed Exhibitions, Surrey House, 1 Throwley Way, Sutton, Surrey SM1 4QQ

I am interested in exhibiting at **'Software '84'.** Please send me full details. ☐

I am interested in visiting **'Software '84'.** Please send me a visitor registration form. ☐

I am interested in attending **'Software '84'** Conference. Please send details. ☐

Name _____ Position _____

Company _____

Address _____

_____

Telephone No. _____ Telex _____

software '84
EXHIBITION AND CONFERENCE

SHOPWINDOW

northern computers

THE COMPUTER CENTRE OF THE NORTH

THE showroom for all the leading micros

easy parking off the M56 (junc 12) · VIC 20 · VIC 64 · BBC micros · Newbrain · Acorn Atom · Books · Apple 11e, 111 · Dragon · Electron · Games · Sinclair Spectrum

Secondhand computers · EASY PAYMENTS
ALL ACCESSORIES SALES AND SERVICE ·

northern computers
Churchfield Road, FRODSHAM Cheshire WA6 6RD

TEL: FRODSHAM (0928) 35110

WE WILL PURCHASE AND PUBLISH YOUR PROGRAMS! Call Steve Rhodes for details

● Circle No. 240

8080 BASIC COMPILER
This compiler is supplied complete with an assembler and linker on 8" CP/M format disks for only ... £35.00

8080 SMALL C COMPILER VERSION 2
This compiler is available as C source on 8" CP/M disks for only £25.00

FIG-FORTH
Installation manual + source listing £12.50
Available for the following CPU's: 6502, 8080/Z80, 6800, 68000, PDP-11/LSI-11. FORTH Disc systems available from £25.00

RED A PORTABLE SCREEN EDITOR IN C
RED is a text editor available as source for either BDS C or Small C (specify when ordering). Works with any video terminal which has cursor addressing. Supplied on 8" CP/M disk £40.00
Some 5" CP/M disk formats available, please state No of tracks, reserved tracks and sectors, skew factor, and density required.

CONGUIN SOFTWARE
14 GOODWOOD CLOSE, MORDEN, SURREY, SM4 5AW
No personal callers please. Phone 0524 381423

● Circle No. 241

COMPUTER FURNITURE

Many other models available

Write or phone for full details to:
Crowther-Cosine
6 Middleton Rd, Whittington, Lichfield, STAFFS WS14 9NB
Tel: 0534 432376

● Circle No. 242

Snail Software

INCOMPLETE RECORDS / NOMINAL LEDGER ✱
LVL II VIDEO GENIE / TRS80 48K
Finished accounts from incomplete records. Full nominal ledger, running totals of all debtors, creditors, stock and capital assets. Weekly and quarterly cash, bank, VAT and nominal accounts summaries. Detailed profit & loss and balance sheet. Comprehensive manual. 22.50

SCRIPT 32 – DRAGON
A versatile wordprocessor, produces text to your format. Complete with manual. 9.95

– SPECIAL OFFERS –
MAILBAG for Dragon ✱ 8.00
DRAWER (Compiled) for Genie 9.95

✱ BBC disk versions available soon.

Dealer enquiries welcome. SNAIL SOFTWARE, 21 Bell Lane, Ludlow, Shropshire, SY8 1BN. TELEPHONE (0584) 4303.

● Circle No. 243

HIGHLY PROFITABLE AGENCIES OFFERED NATIONWIDE

Manufacturer of BBC Micro compatible DISK-DRIVES seeks commission agents to sell on full or part-time basis to dealers, computer clubs, volume users and individuals. Sales literature, price lists, sample and full support offered to technically competent entrepreneurs. Initial investment of £150 covers start-up kit. All areas available on a county basis.

Applications in writing to:
Box No. 1004
Practical Computing

● Circle No. 244

STILL *the lowest prices anywhere*

FLOPPY DISK DRIVES
TEAC TOSHIBA

TEAC 48TPI 0.5MB unformatted **£150**
TOSHIBA DOUBLE SIDED 96TPI 1MB unformatted **£175**

SYSTEMS ENCOTEL

ENCOTEL SYSTEMS LTD, 7 IMPERIAL WAY
CROYDON AIRPORT IND. EST., CROYDON
Tel: 01 680 6040 (6 lines) / 01 686 9687
Telex 8951921 ENCO G

● Circle No. 245

NEWBURY DATA PRINTERS

8510 from £480.00
1550 from £600.00
are, what other printers want to be

Continuous Stationary 1000 SHTS
11 × 9½ plain £5.25
11 × 9½ plain (zip margins) £6.00
11 × 14½ plain/lined £7.00
Min. Quantity = 1 Box (2,000 sheets)

Contact Chris Pearce
CDP Consultants Ltd.
Wicken Rd., Clavering, Essex CB11 4QT.
(079985 617)

● Circle No. 246

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. 247

Programming & Consultancy Service

We can help with . . .
Programming · system design · user manuals · technical training · hardware and software selection. We are at home on micros, minis and mainframes — in all major languages.

Mike Lewis Consultants Ltd
48 Willoughby Road
London NW3
tel: 01-794 3886

● Circle No. 248

SCIENTIFIC SUBROUTINE LIBRARY

VOLUME 1 — STATISTICS AND FITTING FUNCTIONS
Mean, SD, normal distribution, partial expectation, Chauvenets criterion, least squares fit to polynominal and arbitrary function, repetitive least squares fits, covariance matrix, chi-squared statistic, matrix inversion, solution of simultaneous equations.

VOLUME 2 — LINEAR PROGRAMMING
Reduction of a Simplex tableau, integer programming, partial integer programming, conversational linear programming system, least cost mix problem.

VOLUME 3 — FURTHER STATISTICS
Ranking, quantiles, frequency, 2-way table, correlation coefficient, T, chi-squared and F distributions and their inverses, T test, chi-squared test, Wilcoxson test, linear and multiple regression, ANOVA 1-way and 2-way.

VOLUME 4 — TRANSFORMATIONS & SORTING ALGORITHMS
Fourier, FFT, Laplace, numerical integration and differentiation, Exchange sort, Quicksort, Shell sort, Tree sort.

Manuals including full source listings with implementation notes and documentation —
BASIC £25 per volume
PASCAL £30 per volume
Software in CP/M (8" SSSD) or DEC RT-11 (RXO1) formats — £75 + VAT per volume.

CP/M TO DEC FILE TRANSER
Software to read and write RT11 format RXO1 diskettes under CP/M. Supplied on 8" SSSD diskette — £25 + VAT.

MICRO LOGIC CONSULTANTS LTD.
57, Station Rd., Southwater, Horsham, W. Sussex.
Telephone: 0403 731818

● Circle No. 249

Every computer needs
CHATTERBOX II
"Listen creep, I am the leader....."

For ZX81
SPECTRUM
BBC
TRS 80
APPLE
NASCOM
VIC/PET/64
(Please state)

TAKE US TO YOUR LEADER

SPEECH SYNTHESIS BY WILLIAM STUART SYSTEMS

£49 COMPLETE OR £39 (DIY KIT)

NEW! EXCLUSIVE! PITCH CONTROL

CHATTERBOX II ™ can say anything!

Genuine phoneme synthesis - not just recorded speech - hence unlimited vocabulary.
Programmable pitch for more natural intonation (exclusive to Wm Stuart Systems)- solid tone cabinet for quality sound - integral beep/music amplifier. **PLUS** expansion socket for BIG EARS voice recognition system. Full instructions technical notes and software supplied with this outstanding educational unit.
DEALER ENQUIRIES WELCOME

As seen on BBC TV "Computer Programme"

BIG EARS

STOP! GO! LEFT! RIGHT!

SPEECH INPUT FOR ANY COMPUTER

Hugely successful Speech Regnition System, complete with microphone, software and full instructions.
BUILT TESTED & GUARANTEED
PLEASE STATE COMPUTER: UK101, SPECTRUM, ATOM, NASCOM2, Vic 20, Micron, ZX80 81, PET, TRS80, MZ80K, APPLE II, BBC MICRO

ONLY £49

ZX81/SPECTRUM NEW!

MUSIC SYNTHESISER (Stereo) +16 LINE CONTROL PORT

VIBRATO CONTROL

Play 3-part music, sound effects, drums etc. Full control of attack, decay and trequency. Input/Output lines provide control and monitor facility for Home Security, Robot Control, Model Railway etc. etc. Works with or without 16K RAM.

Full instructions/software included. Add keyboard to make a live performance polyphonic synthesiser! Note: up to 3 units can be used simultaneously; giving 9 music channels & 48 I/O lines

AMAZING VALUE AT ONLY
£19.50 (KIT)
£25.50 (BUILT)

SOFTWARE

THE COMPOSER
Synthesiser Music Programme
Enter & play 3 part harmony. Includes demonstrations (Spectrum ZX81) recommended £7

TALKING HANGMAN
For Chatterbox
The classic game claims its victims with a dry vocal accompaniment (Spectrum) £6

ZX ARP/DRUMSEQ
Fascinating synthesiser demonstrations. Generates automatic sequences and plays from keyboard. Some weird effects (Spectrum) £6

CHROMACODE??????
Can you defuse the bomb by cracking the secret combination before time runs out? With Chatterbox voice output (Spectrum) £6

COLOUR MODULATOR KIT £16 BUILT £22
RGB in, PAL/UHF out (not for ZX)

Please add VAT at 15% to prices.
Barclay/Access orders accepted by telephone

All enquiries S.A.E. please

WILLIAM STUART SYSTEMS Ltd
Quarley Down House
Chalderton
Nr. Salisbury
Wiltshire, SP4 0DZ
Tel: 098 064 235

● Circle No. 250

DBASE II

ON SITE TRAINING

Phone Mike Gardner on

01-421 0266

cats software

96 Grimsdyke Road,
Hatch End Pinner
Middx HA5 4PW

● Circle No. 252

Superbrains

NEW OR SECOND HAND
WE BUY, SELL & REFURBISH

MICROMODS LTD.,
53 ACTON RD., LONGEATON, NOTTINGHAM
NG10 1FR. Tel: 06076 64264

● Circle No. 253

ZORBA

THE SERIOUS PERSONS PORTABLE
PLUS
LUCAS LOGIC LX80
The Low Cost 80cps Printer
(A great Parternship)
ADD
DBASEII
The Most Powerful Micro Database
(Now the system is complete)
And you can take it anywere
Deliveries are immediate

Contact Chris Pearce
CDP Consultants Ltds
Wicken Rd., Clavering, Essex. CB11 4QT
(0799 85) 617

● Circle No. 254

OPEN HOUSE FOR NOVICES AND BEYOND

Choose your time — day or evening
Learn at your own pace on OSBORNE, RAIR or BBC BASIC, D BASE II, SUPERCALC, WORDSTAR, Graphics
Introductory Course £45
Also evening club

Brochure from:
MICROCOMPUTER ADVISORY CENTRE
Polytechnic of the South Bank
Borough Road,
London SE1 0AA
or ring: 01-928 8989 ext. 2468

● Circle No. 256

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. 257

TRS-80
VIDEO GENIE

NEWDOS-80
APL-80
PASCAL-80
FORTH (MMS)

Details of these and over 200 other programs are contained in our new loose leaf catalogue price £1.00 (refundable) from:-

MICROCOMPUTER APPLICATIONS
41 QUEEN'S ROAD
BLANDFORD FORUM
DORSET DT11 7LA

TEL: (0258) 55100

POOLS PREDICTION

"POOLSWINNERS"

The most sophisitcated Pools Prediction Aid available. Gives probabilities of score draws, draws, homes or aways, based on two databases holding over *20,000 matches* (included).
The databases are automatically updated as results are entered.
Can be used in simple mode, or with parameter adjustments to develop your own unique forecast method.
Fully documented, available now for Apple, Spectrum (48K), Dragon, ZX81 (16K), BBC Model B, Commodore 64 (others — please enquire).
£15.00 (discs/tapes)

"POOLSDATA"

Complete record of all English Football League matches 1978-83. Teams, scores and dates of 10,000 matches held in simple format, ready for your analysis. Starter analysis programs and full documentation included. Available for Apple, Spectrum, ZX81, BBC, Dragon, Commodore series.
Discs (5 year) £15.00
Tapes (5 year) £12.50 all prices
Tapes (2 year) £7.70 (p&p included)

SELEC SOFTWARE (PC)
37 Councillor Lane,
Cheadle, Cheshire
061-428 7425

● Circle No. 251

4B microcentres ltd

Telephone (0295)
67551
North Bar, Banbury,
Oxon. OX16 0TF

● Circle No. 255

PRINTER PROBLEMS?

3 DAYS* GETS YOU BACK IN ACTION!

The buying and installation of printers and peripherals is only the beginning. What about maintenance? Or repair?

When a machine out of action can mean time and money, who do you turn to for fast, reliable service? The Northamber Service Centre.

After all, we are the only authorised Epson Service Centre in the U.K.

As well as immediate repair, we offer a choice of very flexible Service Contracts starting at £28pa, covering a wide range of products.

So you can choose the contract that suits you the best.

Whichever one you choose, we guarantee a 3-day turn around on back to base repairs.

To find out more about how the Northamber Service Centre can help you, contact your local dealer, or Northamber on

01-390 6166

The authorised Epson and Anadex Service Centre.

NORTH AMBER

Canberry House, Tolworth Close, Tolworth, Surrey.

*Not including delivery time.

● Circle No. 258

SOFTWARE

For simple bookkeeping & VAT record:- Designed for small business & the self employed. A simple to use program combining sales cash book and purchase day book, included VAT calculation and analysis can be printed if required

For Apple II 48K Disc £9.99 inc.
For Spectrum 48K Tape £7.99 inc.

JADE TRADING
409 ILFORD LANE, ILFORD, ESSEX

● Circle No. 259

supercharge your SUPERBRAIN

- *Much improved operating systems
- *Fast and friendly utilities
- *Powerful programming aids
- *Unbreakable security routines
- *Hi, Med & Lo Graphics
- *Screen handling info pack
- *Communications to outside world
- *Memory-mapped Wordstar & Formstar
- *Video-output for extra monitors
- *Hard-disk & back-up systems

Software from SeeDee, Phipps, Keele, McMillan
Hardware from ICE, Fullbrook, Micronex

Full details from:

COMPUTER FACILITY
0734 867855
32 Redlands Road, READING, Berks.

● Circle No. 260

PROGRAMMERS

We urgently require good quality software for the ZX Spectrum. For the right material we offer — Improved market penetration — Expert presentation — Worldwide Distribution — Total distribution in the U.K. and a high 25% Royalty.

SPARTAN SOFTWARE
9 Cotswold Terrace,
Chipping Norton, Oxon.

● Circle No. 261

Insure your computer

Impact damage, fire, theft and transit cover for all your computer equipment.

£1 to £1500	Cover £8 p.a.	with	£10 excess
£1501 to £2500	Cover £16 p.a.	with	£15 excess
£2501 to £8000	Cover £16 p.a.	with	£25 excess
£8001 to £10000	Cover £20 p.a.	with	£25 excess

Write or telephone today for further details.

KGJ Insurance Brokers (Stourbridge) Limited
6 Hagley Road
Stourbridge
West Midlands DY8 1QK
Tel: Stourbridge (STD code 03843) 5333/2545/77391

● Circle No. 262

POSEIDON COMPUTER SERVICES LTD.

Of Hampton S.W. London Dealer
FOR SIRIUS 1 APRICOT & PULSAR

COMPETITIVE PRICES — FULL UK DELIVERY

Bespoke Software and Consultancy

01 941 1447/5986 TELEX 8954665 GITS

CIF / I=O / FOB — *EXPORT/IMPORT SPECIALISTS FOR COMPUTER EQUIPMENT AND SOFTWARE*

POSEIDON COMPUTER SERVICES LTD
01 941 1447/5986 TELEX 8954665 GITS

● Circle No. 263

HAVE YOU CONSIDERED BAR CODES

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 identificaiton, etc. etc. 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.

APPLE 2 PET BBC micro

A complete low cost bar-code identification system is available for these micros. It contains all the hardware, software and documentation needed to read and print bar-codes (using an Epson dot matrix printer). Most bar-code formats may be read and the system may easily be patched into an existing applications program.

£199.00 + VAT

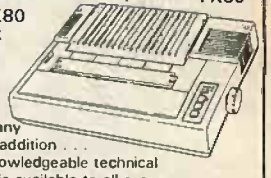
***** NEW *** RS232 bar-code reader**

This new stand-alone unit decodes the bar-code and converts it into ASCII for transmission to the host computer via a RS232 port. Complete with scanning wand, power supply & cables. Works with virtually any computer.

£385.00 + VAT

More information on these products is available on request. Please state your micro & area of interest. The decoder board is available separately to OEMs.

DOT MATRIX & DAISYWHEEL PRINTERS LOWEST PRICES GUARANTEED!



EPSON FX80 RX80
NEC 8023 STAR
SHINWA CP80
BROTHER TEC
etc. etc. etc.

Our pricing policy is to match or better any other advertiser. In addition . . . enthusiastic and knowledgeable technical advice and backup is available to all our customers. Delivery is from stock to your door, often within 24 hours. Phone for a quote or write for full lists.

ALTEK (PC) 1 GREEN LANE WALTON ON THAMES SURREY
please phone before calling (0932) 244110

● Circle No. 264

SHARP

Wide range of sensibly priced cassette software, business, education, games, utilities.

MZ-700 MZ-80 A&K

send s.a.e. for catalogue:—

DAVID COMPUTER SOFTWARE

38 South Parade, Bramhall, Stockport SK7 3BJ.

● Circle No. 265

DISK DRIVE SALE

Full range of BBC Drives.	
S/Sided, 40 Track	£179.00
D/Sided, 40 Track	£230.00
Plus Disc & Manual. All other combinations/ capacities available.	
Bare Drives, No case, No Power Supply.	
Shugart SA200 40 Track, D/density	£125.00
YE-DATA 580 D/sided, D/density 500K	£210.00
Power supplies & cabinets	
Power Supply, will run dual drives.	Only £35.00
Single cabinets.	
2/3rds or 1/2 Height + room for P.S.	£20.00
Dual Cabinets.	
For two half height drives + room for P.S.	£25.00
Drive Cables. 1 Drive £12.50. 2 Drives	£17.50

PHOENIX SYSTEMS, 42, Princes Street, Manchester. Tel. 061-236-1172.

● Circle No. 266

HX-20, case microcassette. VGC. Offers over £395. Tel. Burnham (06286) 4262

APPLE IIE Two Disc Drives Green Monitor Microline 82A Printer Unused. £1,400 01-960 5373

DAISY WHEEL PRINTER Brother HR1 Apple interface and cable. Six months old £500. Dr. Simmonds 01-692-7171. Ext. 2053

MZ80K Business Programs, Disc based, unused. H.B. Accounts Package consisting of Integrated Sales-Purchase and Nominal Ledgers £400; WDPRO Word Processor £45: Sumlock Stock Control £35: Kuma CALC 3.1d visical type program £35: Dean Database v3.1 £35: Ardensoft Toolkit £20. Tel: 0400 73009

SHARP MZ-80B Software sale including many useful adapted CP/M utilities. Enquiries Peter Philips GPO 7849 Hong Kong.

TELEVISED (1983) TS802H 10 Mbyte Microcomputer, Wordstar, Mailmerge, Datastar, Calcstar, Spellstar, Supersort, Bstam, DBase2, CBasic, MBasic, Cobal, Pascal, PL/1, List Over £8,000 Accept £3,800 Plus VAT. Telephone 01-486 1670 anytime.

BUSINESS SOFTWARE for the Newbrain Computer Invoice & Credit Note; Cash Book; Purchase Day Book; Sales Day Book. Full Details & Sample Output from:- Cornix-Micro, 16 Kneesworth Street, Royston, Herts. Tel: Royston (0763) 46065

MANNESMAN TALLY MT140L letter/data quality 132/218 column 160 c.p.s., dot matrix printer. Both tractor & roller feed. RS232 interface with 2k buffer (X on X off). Hardly used (rrp £940 incl. VAT) a bargain at £825. Telephone 0900 815788 after 6.30 p.m.

TRS-80 MODEL II SYSTEM complete with second 8' disk drive unit and system desk is no longer needed. This CP/M system is complete with assorted software including Wordstar. Also included two spare 8' disk drive chassis and supply transformer. Cost £3,500.00 when new. £750.00 for quick sale. Call Dave Whittaker 01-202 4366 (Office hours)

TRS80/1 48K plus interface and disc drive. Good buy £500. Ken Wiber (Worthing) 0903-202693.

TRS-80 MODEL 1 48K, 1 disc drive SCRIPSIT word processor, VISCALC spreadsheet program, TRSDOS, DISC BASIC and all manuals £650. Phone 021-556-3431 (Day) 021-526-3564 (Evenings).

HP 75C "Financial Calculator" program. Simulates "N, I, PV, PMT, FV" keys for Interest and annuity calculation. Also Include "day of Week" and "days between dates programs. A must for all financial calculations. Price £20 includes magnetic cards and instructions. S.L. Kang 336 Watford Way, Hendon NW4.

ACORN ATOM, fully expanded, VIA, disk pack, toolkit, joystick, software, will split, £540 o.n.o. Tel. (0279) 52846 evenings.

VIDEO GENIE and EG3014 expansion box together with software for sale. Sensible offers 'Phone 0829-40569.

EXCHANGE or **SELL** complete 16mm Bolex cine outfit RXVS finder 17-85mm Pan cinor zoom lens — Rare 10mm — 16mm — 25mm — 75mm Switar lens — 150mm Yvar lens — Assessories — Spare reflex body — Hilo body — 25mm two 75mm Yvar lens — Octometer — Pro 16mm Splicer pro 16mm Murray editor — arms on stand — 16mm Sound ampro projector — Original transformer — Films — Cartoons — etc. **Wanted** Complete outfit Apple.II.E. (Series) Computer — Monitor — Printer Disks — Storage to value £2,500 — IBM May be considered adjustment if required 0278-58404 Genuine offers only please or exchange — phone evenings Best.

MICRO ADS ORDER FORM—25p per word

Micro Ads are accepted from PRIVATE readers only and must be submitted on (or a photocopy of) the order form below. All advertisements must be PRE-PAID — Help our typesetter to help you by PRINTING your advertisement clearly. Please make cheques or postal orders payable to 'PRACTICAL COMPUTING' and enclose it with your advertisement to Room L310, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

					£2.50
					£3.75
					£5.00
					£6.25
					£7.50
					£8.25
					£9.50
					£10.75

NOTE: Advertisements will be published in the next available issue and we cannot guarantee to print an advertisement in any specific issue.

DATA DISK LTD.

Data Disk (Consumables)
St James Street
Okehampton
Devon 0837-4346

The small Company with the big name in consumables

COMPARE OUR PRICES

PRINTERS

"Star" DP510 Printer (RRP £289 + VAT) (80 column/ 100 CPS)	OUR PRICE ONLY £270 Including VAT "Free Delivery" No Extras
"Star" DP 515 Printer (RRP £399 + VAT) (136 Column 100 CPS	OUR PRICE ONLY £375 Including VAT "Free Delivery" No Extras
The New "JUKI" 610 Daisywheel (RRP £399 + VAT)	OUR PRICE ONLY £375 + VAT "Free Delivery" No Extras

ALL CARRIAGE FREE

Floppy Disks by BASF

5¼" Single Sided/Single Density = £15.00 for 10 + VAT
Single Sided/Double Density = £22.00 for 10 + VAT
Double Sided/Double Density = £24.00 for 10 + VAT
8" Disks and Quad Density also available
5¼" Plastic Library Cases £2.75 + VAT each

NEW FROM FRANCE!
LIBRARY CASES IN BROWN/CREAM.
5¼" 20 - Capacity = £2.80 + VAT
8" 25 - Capacity = £5.75 + VAT
Lockable Filing Cases with carrying handle Brown/Cream for 5¼" disks × 100 capacity ONLY £18.50 + VAT

Other lockable filing cases;
5¼" 40 - Capacity = £15.50 + VAT
5¼" 90 - Capacity = £21.95 + VAT
8" 40 - Capacity = £22.95 + VAT
8" 90 - Capacity = £31.95 + VAT

Contact us for all your computer needs. Anything from ribbons, listing paper, labels, disks, printers etc. etc.

Everything on mail order, enquire for our comprehensive price lists.

Free delivery on all printers and disks
Nominal charge for all other ranges.

EPSON FX-80 = £425.00 including VAT
EPSON RX-80 = £285.00 including VAT
OKI MICROLINE 83a = £525.00 including VAT
OKI MICROLINE 80a = £225.00 including VAT

LISTING PAPER
11" × 9½" Single pt = £9.60 + VAT per box of 2000
11" × 14½" Single pt = £12.40 + VAT per box of 2000
All other sizes available. Either plain or green lined.

To Data Disk.
Please Supply .....
Please Supply .....
Please Supply .....
Please Supply .....
Enclosed my cheque/money order Total .....
Delivery to:- (Name) .....
Address .....
.....
.....
Telephone No .....

Trade and Dealer Enquiries Welcomed. More Agents Urgently Needed Nationwide.

● Circle No. 320

Advertisement Index

A
A&G Computerware 62
A-Line Computers 192
ACT Pulsar 42,43
ACT Sirius 150,151
ADP Hotel Services 62
ATA 99,107
Advanced Technology 205
Aimgram 62
Akhter Instruments 200
Anglia Computer Centre 64
Asco Business 64

B
B.B.C. 98
BASF 52,53
Beebug 186,192
Bits & P.C's 64
Broincom 142.143

C
C.K. Computers 97
CAE Teleprinter 35
Cambridge Computer Consultants 197
Cambridge Micro 61
Chiltern Electronics 6,66
City Systems 206
Clientscene Computers 140
Comart 41
Commodore 210,211
Commodore Business Machines 82,83
Compsoft 9
Computech 49
Computer Choice 207
Computer Interface Design 186
Computer Trade Show 56
Control Universal 138
Crofton Electronics 155
Crown Business Centre 187
Crown Dust Covers 66

D
Data Disk 218
Data Warrior 87
Dennison Kybe IFC
Digithurst 132
Disking International 208,209
Dynotech 206

E
Epson 157
Epson HX20 44
Epson QX10 36
Euro Electric 190
Everyday Electronics 132

F
Fox & Geller 141
Fraser Associates 185

G
GW Computers 22,23
General Northern Micro 204

H
HM Systems 58,59
Hal Computers 132
Hilderbay 201

I
IBM Computer Systems 186
Icarus Computer Systems 90,91,112
Informex 182
Inmap 68
Intec 57

J
John Wiley 139

K
KGB Micros 14
Keyboard Hire 190
Kuma 185

L
LSI Computers 74.75
Laserbug 178
Laskys 63,65
Lifeboat Associates 149
Linear Graphics 170
Logic 3 33
Lomax 178
London Computer Centre 16,66
Longman Software 114
Lucas Logic 192

M
MPSL 67
MS Consultants 191,193
Matrix Computer Engineering 138
Mayfair Micros 138
Memotech 10,11,12
Micro Business 199
Micro Miracles 193
Micro Peripherals IBC
Micro Research 206
Microcomputer Products 131
Microcomputer Services 140
Micromanagement 163,164,165,166,167
Micronix 55
Microprocessor Engineering 191
Microsoft 20
Microvalue 168,169
Microware Ltd 80
Modus Systems Ltd 54
Mountaindene 177
Mytek Computing 196

N
NEC 176,177
Northern Computer Fair 46,47

O
O1 Computers 180
OKI Electric Europe 34
Opus Supplies 147
Oric Products 17,18,19
Ozwise Computers 204

P
Perfect Software 38,39
Pete & Pam Computers 188,189
Phipps Associates 130
Power Testing 187
Precision Software 160

Q
QUME (UK) 60,61
Quantum Computer Systems 144

R
Rair 4

S
Sage Computers 24
Sanyo Marubeni BC
Sharp Electronics 50,51
Shurland Computers 187
Simmons Magee 202
Sinclair Research 25,26,27,28
Sintrom Electronics 191
Sirton Computing 40
Soft Option 128
Software 32
Software 84 152
Sord Samuel 136
Sprakefield 193
Stemmos 48,53
Swan Packaging 185,196
Symbiotics 194

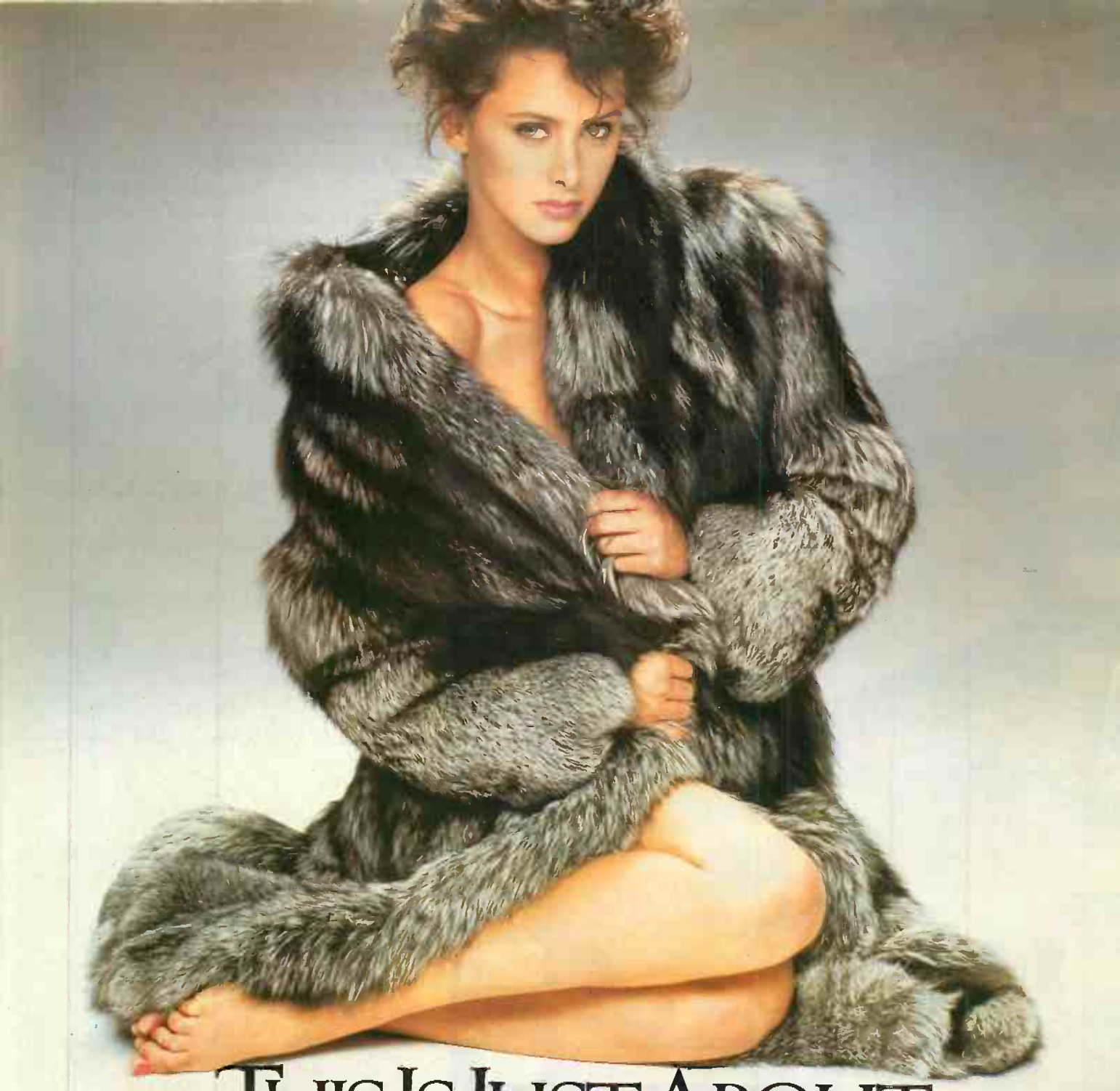
T
Tandy Corporation 73
Tycom 212

U
U-Micro Products 92

V
Vega Computers Ltd. 190

W
WBM Business 173
Wireless World 198

Y
Your Computer Christmas Fair 158,159



THIS IS JUST ABOUT THE ONLY SOFTWARE THAT CAN'T BE SUPPLIED.

Unfortunately £5,000 fur coats are one form of software that can't be supplied (much to the regret of our female staff).

However, Sanyo now include a fully documented software pack with every micro computer sold.

Supplied by Micropro, this comprehensive package includes Wordstar, Mailmerge and Spellstar along with a financial modelling package (Calcstar) plus Infostar which includes Reportstar, Supersort and Datastar.

If, however, your requirements are a little more specialised, you can now obtain numerous Sanyo-compatible programmes to meet just about anyone's needs.

To find out more about our computers and the names/addresses of the software dealers who supply Sanyo-compatible programmes, just fill in the coupon below

SEE SANYO, THEN DECIDE

SANYO

Name

Company

Position in Company

Address

Tel. no.

PC1 Return to: Marketing Dept., Sanyo Marubeni (UK) Ltd., Sanyo House, 8 Greycaine Road, Watford, Herts.

• Circle No. 322

NOMINATIONS FOR BEST PRINTER AWARDS 1983

Best Star — STAR DP510/DP515 Matrix Printers

available for around **£289 and £399 ex VAT**

- ★ 80 Column (DP510), 136 Column (DP515)
- ★ 100 CPS, Bi-Directional Logic Seeking
- ★ Friction, Tractor and Roll Holder as standard
- ★ Full standard features including 2.3k Buffer

Best Performer — JUKI 6100 Daisywheel

available for around **£399 ex VAT**

- ★ 18CPS — Bi-Directional Logic Seeking
- ★ 10, 12, 15 CPI + Proportional Spacing
- ★ "Drop in" Daisywheel — Triumph Adler Compatible
- ★ Supports all Wordstar features
- ★ Diablo protocols — IBM Selectric ribbon
- ★ 2k Buffer as standard — 100 character Daisywheel

Best Newcomer — SHINWA – CTI CP80 Matrix Printer

available for around **£289 ex VAT**

- ★ 80 CPS — Bi-Directional Logic Seeking 80 Column
- ★ Friction and Adjustable Tractor Feed
- ★ Patented Square Needles up to 9 x 13 matrix
- ★ Hi-Res Graphics and Block Graphics

Best Producer — HERMES 612 WPQ Printer

available from around **£1950 ex VAT**

- ★ Up to 400CPS and Word Processing Quality at 120 CPS
- ★ 10, 12 or 15 CPI — programmable to 1/360" spacing
- ★ 132 column at 10 CPI

All now on general release – see them at your local dealer

Best Distributor:–

Micro Peripherals ltd

69 The Street, Basing, Basingstoke, Hants. RG24 0BY
TEL: (0256) 3232 (12 lines) TELEX: 859669 MICROP G

Please send technical details, printout samples and local dealer details to:– ● Circle No. 321

Name: ..... Position .....

Company: .....

Address: .....

.....

Micro Peripherals, 69 The Street, Basing, Basingstoke, RG24 0BY