Personal Computer World

16-BIT OLIVETTI BENCHTEST

Canada $2.75/US $2.50/FF 8.80/FL 4.00/SFr 7.20/IR £1.11/
BFr 90.00/SKr 12.80/DKr 21.00/Lire 4200/DM 5.50

September 1982 75p

BRITAIN'S LARGEST SELLING MICRO MAGAZINE



WIN £5000 WITH YOUR MICRO
Enter the far-from-elementary PCW Manhunt!

NEW MODEL

LOWER COST



Cromemco System One

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

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

Call MicroCentre for Cromemco

MicroCentre Ltd
(Complete Micro Systems)

Britain's independent Cromemco importer

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

MICRO TRAINING FOR COMPUTER USERS

6 Micro courses at Digitus

Which would you like to attend?

Digitus is running a number of courses to train users and potential users in the basic skills of micro-computing. Conducted at our Central London Workshop, the courses provide hands-on experience of microcomputers, demonstrations of working systems and tutorials on your particular needs.

INTRODUCTION TO MICROCOMPUTERS

One day's concentrated information on microcomputing aimed at the potential user in small and large organisations. A practical course which includes business applications of micros, guidelines on selecting microcomputer systems and an introduction to programming.

FUNDAMENTALS OF PROGRAMMING IN BASIC

A two day course designed to teach the first principals of programming in BASIC. Aimed at those with some understanding of micros who want to learn how to instruct their computer to perform tasks.

IMPROVE YOUR BASIC

A two day course for those who have learned Basic from hands-on experience and want to brush up their BASIC techniques and learn some timesaving software tools.

WORDSTAR WORDPROCESSING

A one day course for people who want to learn the fundamentals of wordprocessing. Uses the popular Wordstar wordprocessing package available on most CP/M micros and teaches by hands-on use.

DATASTAR INFORMATION MANAGEMENT

The DataStar data entry, retrieval and management system is a powerful aid which enables the educated user and computer professional to build inform ation systems economically and rapidly.

MICRO-PRO SOFTWARE TOOLS

In addition to Wordstar, Micro-Pro Inc have produced a variety of aids to improve productivity in offices and systems departments. This one day course includes: Mail-Merge linked to Wordstar • Supersort sorting utility • CalcStar rows and columns manipulation • DataStar information manager • harnessing the 'Star' products together.

Training for Computer Professionals
Course in: Micro Technology for Management • Local Area Networks • Micros for Computer Professionals.
Courses are run at the Workshop or on site. Telephone or write for details.

Micro Technology Workshop Set in 8,500 sq.ft in Central London, the Workshop is a few minutes from Covent Garden, Trafalgar Square, Charing Cross, Embankment and Waterloo stations. Specialist areas include: Personal Computers, Technical Systems, Business Systems, 16 bit and Local Network Systems, Bookstore and Training Rooms.

Booking and Fees The fee for all courses is £80 per day plus VAT, payable 14 days prior to starting date.

All courses provide access to an extensive range of micro hardware, software and expertise.

Note: Wordstar and DataStar are registered trademarks of Micro-Pro Inc.

Booking Form (Please complete in BLOCK capitals)
To Digitus Ltd, 10-14 Bedford Street, London WC2E 9HE. Tel 01-379 6968

☐ Reserve places as follows:

Name of delegate ..... Date .....

Name of delegate ..... Date .....

Name of delegate ..... Date .....

Courses/dates

Introduction to Microcomputers		☐ Oct 11
Fundamentals of Programming in Basic		☐ Oct 12/13
Improve your Basic		☐ Oct 14/15
Wordstar Wordprocessing	☐ Sept 21	☐ Nov 9
DataStar Information Management	☐ Sept 22	☐ Nov 10
Micro-Pro Software Tools	☐ Sept 23	☐ Nov 11

Digitus

Company/address .....

.....

Name ..... Position .....

Signature ..... Tel.No. .....

PCW/9/82

INSIDE PCW

REGULARS

82 NEWSPRINT
Newscaster Kewney regales us with the latest micro newsround.

95 CTUK! NEWS
The tale of a 'Town this month.

96 SUBSCRIPTIONS
Creature comforts page.

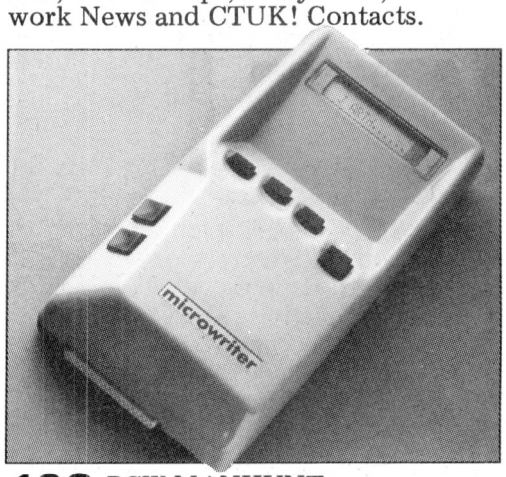
101 COMMUNICATIONS
PCW's equivalent of Speakers' Corner.

110 BANKS' STATEMENT
Furfuraceous fiend Martin Banks presents his latest. . . statement?

145 BRAIN DUMP
Editor Rodwell shoots his mouth off about his personal proliferation of computer hardware.

183 NEWCOMERS START HERE
If you've never read PCW before, GOTO this page!

185 DIRECT ACCESS
Including In Store, Transaction File, User Groups, Diary Data, Network News and CTUK! Contacts.



FEATURES

115 P FOR PERFECT
The conclusion of our study of the UCSD p-System.

120 PCW SHOW PREVIEW
A breakdown of what's in store at the Barbican in September.

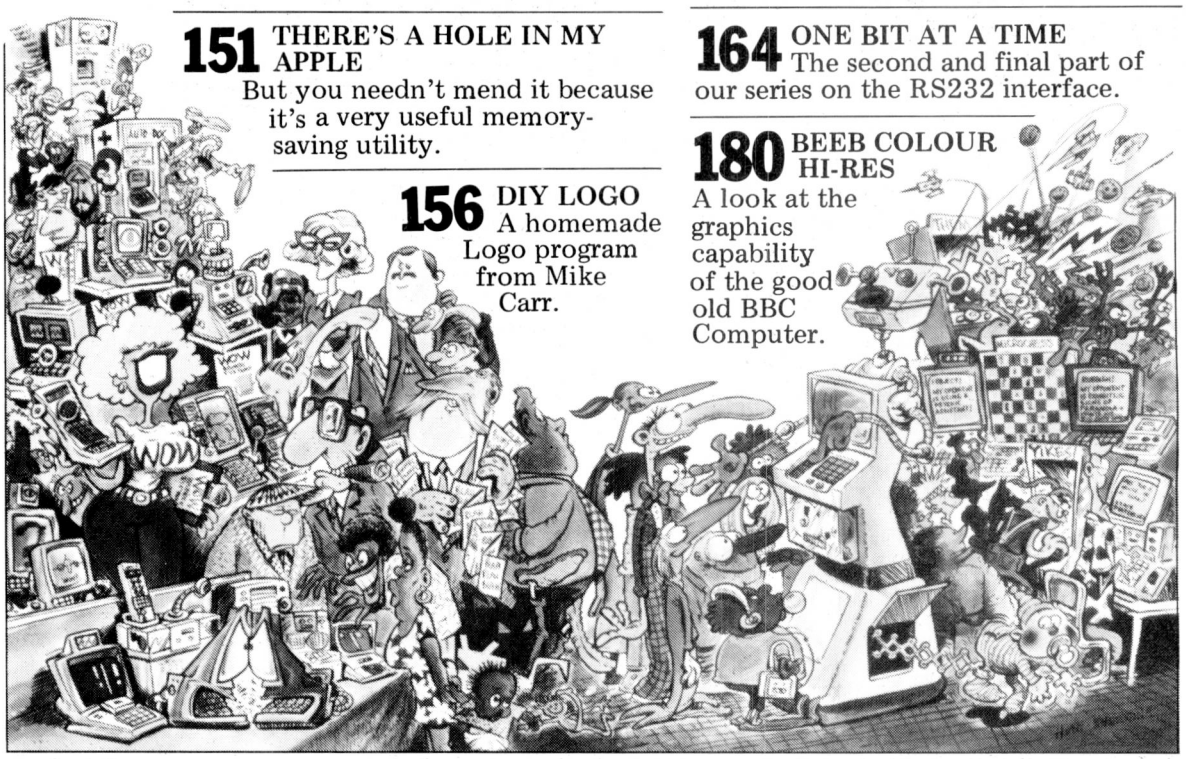
151 THERE'S A HOLE IN MY APPLE
But you needn't mend it because it's a very useful memory-saving utility.

156 DIY LOGO
A homemade Logo program from Mike Carr.

163 PCW MANHUNT
Put your micro to good use in PCW's competition.

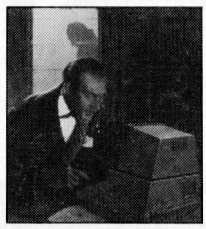
164 ONE BIT AT A TIME
The second and final part of our series on the RS232 interface.

180 BEEB COLOUR HI-RES
A look at the graphics capability of the good old BBC Computer.



Founder Angelo Zgorelec; **Managing Editor** Dick Pountain; **Editor** Peter Rodwell; **Programs Editor** Maggie Burton; **Consultant Editor** David Tebbutt; **Sub Editor** Steve Mann; **Art Director** Perry Neville; **Art Editor** Phoebe Creswell-Evans; **Designer** Gillian Lockhart; **Art Assistants** Rick Gadsby, Jonathan Sellers; **Typesetting** Jane Hamnell, Patrick Dineen; **Group Advertisement Manager** John Cade; **Advertisement Manager** Patrick Dolan; **Assistant Advertisement Manager** Claire Fullerton; **Advertisement Production** Vic Lime, Anna Williamson.

Vol 5 No 9 September 82



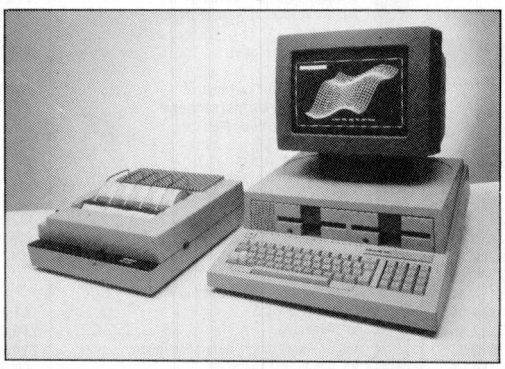
Cover illustration: Paul Simmonds

BENCHTESTS & REVIEWS



98 MICROWRITER REVISITED
Our illustrious Editor gets his sticky fingers all over this revamped portable word processor.

104 OLIVETTI M20
Olivetti's contribution to the world of 16-bit computing.



141 CRAMMING IT IN
Now you can squash even more data onto your disks with E40, a CP/M data compression package.

146 DATABASE BENCHTEST
Kathy Lang explores Aquila, for any CP/M machine.

148 WORD PROCESSOR BENCHTEST
An in-depth look at Select running on the NEC PC-8000.

153 SCREENPLAY
Lovable games freak Dick Olney examines some more offerings for the ZX81.

169 CALCULATOR CORNER
Two new calculators from Hewlett-Packard dissected, as always, by Dick Pountain.

TECHNICALLY SPEAKING...

161 COMPUTER ANSWERS
Micro problems posed and solved.

172 PCW SUBSET
More assembler subroutines for your collection.

174 TJ's WORKSHOP
Useful bits and pieces for your micro.

198 PROGRAMS
Our monthly pot-pourri of readers' listings.

ODDS & ENDS

198 LEISURE LINES
More teasers to addle your brains from J J Clessa.

213 BLUDNERS
Blush!

216 BACK ISSUES
Find out what you've missed and catch up.

288 CHIP CHAT
More scurrilous snippets of disparaging data from the micro world.

CHANGE OF ADDRESS
The editorial & business address of Personal Computer World is now:
PERSONAL COMPUTER WORLD
62 OXFORD STREET
LONDON W1
TEL 01 636 6890
This is the new address and telephone number for all communications other than subscription and back issue enquiries.

Subscriptions Manager Stuart Cruickshank; Subscription rates UK: £11.50, Overseas £20.00; Subscription Address 53 Frith Street, London W1A 2HG. **© Computing Publications Ltd, 62 Oxford Street, London W1. No material may be reproduced in whole or in part without written consent from the copyright holders.** **Printed by Chase Web Offset, St Austell, Cornwall. Distributed by Seymour Press, 334 Brixton Road, London SW9. Tel: 01-733 4444.**

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

spectrum

Spectrum is a new, rapidly expanding group of independent retailers who specialise in selling a range of popular home computers.

Our group policy is simple: we won't be beaten on price and 'know-how'. We can make this claim because our bulk buying power ensures that we select and buy at the best prices and then can pass on the benefits to you.

We guarantee if you find an item advertised and in stock at any other retailer at a better price than us, we will match that price.

You will see we quote our prices both including and excluding VAT – no hidden 15% to suddenly uplift your bill but also making our prices easier to compare with our competitors.

To ease payment we accept Barclaycard and Access as well as our own Spectrum Charge Card. Longer term credit terms are also available.

We believe our product 'know-how' is crucial to you as a customer. In every one of our centres there are personnel who have been trained by the manufacturers or distributors themselves. So we know what we are talking about on the products we sell and can help every customer, including the complete beginner, find and understand the equipment to suit his or her needs. For us it's not just a matter of simply handing over a box and leaving you on your own to figure it out. Our service includes 'hands on' experience that we can pass on to you.

After sales care is also well catered for. Our own Spectrum Service Centres will insure that should your machine 'go down' we will get it up and running as quickly as possible. We can also offer extended warranties at reasonable prices.

When it comes to mail order delivery we use Securicor for despatch to anywhere in the British Isles. The cost is low and the service is good. Further details are available from your local shop at the time of ordering.

Finally, we should point out that although not every Spectrum centre carries every advertised item, they can always be obtained quickly from our central warehouse. If you have any difficulty, please telephone Spectrum Customer Service on (0727) 66646.

Spectrum Computer Group is a division of Spectrum (UK) Ltd – Britain's largest photographic retailing group.

ATARI®



ATARI 400

£217.30

£249.90 INC.VAT

Developed by the Company famous for its TV and arcade games the Atari Computers have superb colour graphics and facilities for the manipulation of visuals on the screen.

In-built "player-missile-graphics" enable the user to compose games to very professional standards. Any key on the keyboard can be made to produce any character the user wishes on the screen. Atari Computers have an extra microprocessor onboard especially to enable these unique features. There are over 200 programmable colours and tones and a wide range of programmable sounds.

Plug a "BASIC" cartridge in and you have a comprehensive computer.

The model 400 has 16K of RAM and a touch sensitive keyboard. The 800 model has a professional style typewriter keyboard and a memory which is user expandable to 48K. Add disk drives (up to 4) and a printer and you have a system of adequate power for business uses.

	EXC VAT	INC VAT
ATARI 800 16K COMPUTER (EXPANDABLE)	£434.70	**£499.90**
ATARI 410 PROGRAM RECORDER	£43.48	**£50.00**
ATARI 810 DISK DRIVE	£260.83	**£299.95**
ATARI 822 THERMAL PRINTER	£230.43	**£264.99**
ATARI 850 INTERFACE FOR DOT MATRIX PRINTER	£117.39	**£134.99**
ATARI 16K RAM EXPANSION FOR 800	£56.52	**£64.99**
ATARI GAMES PADDLES (PAIR)	£12.13	**£13.95**
ATARI GAMES JOYSTICKS (PAIR)	£12.13	**£13.95**
ATARI THERMAL PRINT PAPER (2 ROLLS)	£3.48	**£4.00**
ATARI BLANK DISKETTES (5)	£13.91	**£15.99**
SOFTWARE		
INVITATION TO PROGRAMMING (1)	£13.87	**£15.95**
INVITATION TO PROGRAMMING (3)	£19.96	**£22.95**
CONVERSATIONAL FRENCH	£34.74	**£39.95**
CONVERSATIONAL GERMAN	£34.74	**£39.95**
CONVERSATIONAL ITALIAN	£34.74	**£39.95**
CONVERSATIONAL SPANISH	£34.74	**£39.95**
MUSIC COMPOSER	£31.26	**£35.95**
TOUCH TYPING	£13.87	**£15.95**
ASTEROIDS	£26.04	**£29.95**
MISSILE COMMAND	£26.04	**£29.95**
PACKMAN	£26.04	**£29.95**
SPACE INVADERS	£26.04	**£29.95**
STAR RAIDERS	£26.04	**£29.95**
SUPER BREAK-OUT	£21.30	**£24.50**
VIDEO EASEL	£21.30	**£24.50**
COMPUTER CHESS	£21.30	**£24.50**
GRAPHIT	£12.13	**£13.95**
WORD PROCESSOR (DISK)	£86.91	**£99.95**
ASSEMBLY EDITOR	£34.74	**£39.95**
DE-RE ATARI	**£17.00**	**No VAT**



The VIC 20 really is extraordinary value for money. It does so much for so little.

It's fully expandable to 27½K user RAM, has a full size typewriter keyboard and plugs straight into your home TV.

COMMODORE VIC 20

£173.90

£199.99 INC.VAT

Micro soft 'BASIC' is standard but additional machine language is available via plug in cartridges. There is also a choice of other programs for chess, music and languages as well as games. Printer disk drive and other peripherals, software and books are all available to further expand your use and enjoyment.

	EXC VAT	INC
VIC C2N cassette unit	£39.09	£44
VIC Printer (plain paper, tractor)	£200.00	£230
VIC Single floppy disc drive (5¼")	£344.35	£396
3K RAM expansion cartridge	£26.04	£29
8K RAM expansion cartridge	£39.09	£44
16K RAM expansion cartridge	£65.17	£74
Super expander Hi Res cartridge	£30.39	£34
Joystick	£6.52	£7
Games paddles (pair)	£11.74	£13
GAMES		
Programmers Aid cartridge	£30.39	£34
Machine Code Monitor cartridge	£30.39	£34
Introduction to Basic (1)	£13.00	£14
"Avenger" (ROM)	£17.35	£19
"Star Battle" (ROM)	£17.35	£19
"Jelly Monsters" (ROM)	£17.35	£19
"Super Lander" (ROM)	£17.35	£19
"Road Race" (ROM)	£17.35	£19
"Rat Race" (ROM)	£17.35	£19
"Blitz" cassette	£4.34	£4
BOOKS		
Learn Computer Programming with the Commodore VIC	£1.95	No
VIC Revealed	£10.00	No
VIC 20 Programmers Reference Guide	£14.95	No
VIC Computing Magazine	£0.95	No

ACCESSORIES

Prince PC31 – 12" Green Monitor. **SPECIAL PRICE**	£86.91	£99.
SANYO		
Slim 3G Cassette Recorder (for use with Nascom)	£26.04	£29
CTT 3106 14" Colour TV Set	£199.96	£229.
ACCUTRAK		
C12 Cassettes	£0.43	£0
Single sided, double density disks (for Commodore, Atari, Apple, Tandy etc.)	£1.70	£1
Double sided, double density disks (for Sharp and Superbrain)	£2.87	£3
Single sided, double density, double track disks (for Nascom and Commodore 8050)	£2.30	£2
Disk Bank Interlocking cases for diskettes	£3.91	£4
Disk head cleaner	£13.00	£14
Single part 11" x 9½" printer paper, box of 2200 sheets	£10.39	£11

ALFRETON
Gordon Harwood
69/71 High Street
Alfreton Derbyshire
Tel: 0773 832078

ASHFORD
Ashford Computer Centre
2 Station Road
Clarendon Parade
Ashford Middlesex
Tel: 07842 44955

BASILDON
Godfrey's
28-32 East Walk
Town Centre
Basildon
Essex
Tel: 0268 289379

BASINGSTOKE
Fisher's
2/3 Market Place
Basingstoke
Hants
Tel: 0256 22079

BIRMINGHAM
Sherwoods
Great Western Arcade
Birmingham 2
Tel: 021 236 7211

BRADFORD
Photosave
18 Cheapside
Bradford BD1 4JA
West Yorkshire
Tel: 0274 308598

BRIGHTON
Capricorn
1 Queens Road
Brighton
Sussex
Tel: 0273 29634

CAMBRIDGE
KP Ltd
12a Kings Parade
Cambridge
Tel: 0223 68087

CARDIFF
Randall Cox
18-22 High St Arcade
Cardiff
Tel: 0222 31960

DERBY
C T Electronics
The Spot
Derby
Tel: 0332 44760

GLASGOW
Victor Morris Ltd
340 Argyle Street
Glasgow G2
Tel: 041 221 8958

GUILDFORD
The Model Shop
23 Swan Lane
Guildford
Surrey GU1 4EQ
Tel: 0483 39115

HARROW
Camera Arts
(Micro Computer Division)
24 St Ann's Road
Harrow Middlesex
Tel: 01 427 5469

HATFIELD
Micro World
2 Crawford Road
Hatfield Herts

LEEDS
Bass & Bligh
4 Lower Briggate
Leeds W Yorkshire
Tel: 0532 45445

LONDON SE9
Square Deal
375 Footscray Road
New Eltham
London SE9
Tel: 01 859 1516

LONDON W11
Electroleisure
120 Notting Hill Gate
London W11
Tel: 01 221 7029

MACCLESFIELD
Camera & Computer Centre
118 Mill Street
Macclesfield
Cheshire
Tel: 0625 27468

MIDDLESBROUGH
McKenna & Brown
190 Linthorpe Road
Middlesbrough
Tel: 0642 248345

NEWCASTLE
Turners
29-31 High Friars
Eldon Square
Newcastle
Tel: 0632 612901

NEWCASTLE-ON-TYNE
Newcastle Camera & Computer Mart
16 Northumberland Court
Newcastle-on-Tyne
Tel: 0632 327461

NOTTINGHAM
Cameo Computers
8/9/10 Trinity Walk
Nottingham
Tel: 0602 42912

READING
David Saunders
Computer Centre
8 Yield Hall Place
Reading
Berks
Tel: 0734 580719

TEDDINGTON
"Andrews"
49 Broad Street
Teddington
Middlesex
Tel: 01 977 4716

WALLINGTON
Surrey Micro Systems Ltd
53 Woodcote Road
Wallington
Surrey
Tel: 01 647 5636

WATFORD
SRS Microsystems Ltd
94 The Parade
High Street
Watford
Herts
Tel: 0923 26602

WEST BROMWICH
Bell & Jones
39 Queens Square
West Bromwich
Tel: 021 553 0820

WIGAN
Wilding Ltd
11 Mesnes St
Wigan
Lancs
Tel: 0942 44382

WOKING
Harpers
71-73 Commercial
Woking
Surrey
Tel: 04862 61061

WORCESTER
David Waring Ltd
1 Marmion House
High Street
Worcester
Tel: 0905 27551

we won't be beaten on prices. Just compare them!

nascom



SPECIAL EDITION! UNIQUE TO SPECTRUM

The Nascom is a British designed and built microcomputer and one of the first home micros to appear in this country, some five years ago.

Since then, it has been developed into one of the most powerful and expandable systems around.

It can have up to 206K onboard memory, combined with superb colour graphics, disk drives, printers and various input/output facilities can be added.

Such is the versatility of this micro that it has been adopted for numerous commercial applications including hotel booking systems, blood grouping, weaponry and satellite tracking.

Previously looked upon as a machine for the knowledgeable hobbyist only Spectrum now bring you the opportunity to embark upon this remarkable sphere of computing in the easiest possible way. A ready to plug in and use 'SPECIAL EDITION' Nascom programmable in machine code or BASIC is now available from us.

If you are serious about computing the 'SPECIAL EDITION' is your starter pack. The initial machine provides 8K of memory but a simple plug in board upgrades your computer to 56K.

THE NASCOM 'SPECIAL EDITION'

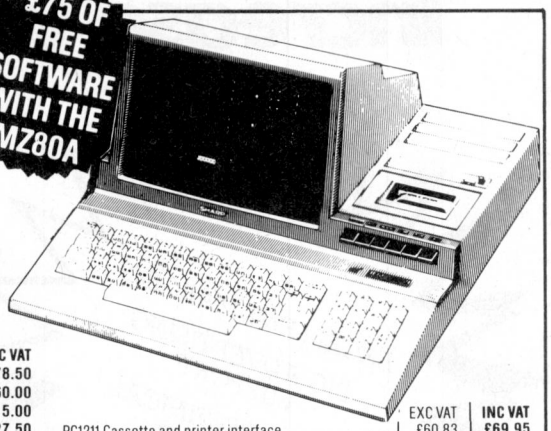
£429.95

£494.44 INC. VAT

	EXC VAT	INC VAT
THE NASCOM 'SPECIAL EDITION'	£429.95	£494.44
'SPECIAL EDITION' 48K RAM BOARD	£130.00	£149.50

SHARP

£75 OF FREE SOFTWARE WITH THE MZ80A



The MZ80A is the newcomer to the Sharp range with the serious user very much in mind in the design.

A complete stand-alone 48K system incorporating a profiled typewriter keyboard with numeric pad and a 9" green display screen. The "BASIC" contains a number of very useful additions over the previous models.

A full line up of peripherals further add to the versatility of this machine.

INCLUDES £75 OF FREE SOFTWARE.

SHARP MZ80A

£477.38

£548.99 INC. VAT

SHARP PERIPHERALS FOR MZ80A	EXC VAT	INC VAT
* Twin floppy disk unit (5¼")	£590.00	£678.50
* Single floppy disk unit	£400.00	£460.00
* Floppy disk interface card	£100.00	£115.00
* Floppy disk cable	£24.00	£27.50
* Master diskette and manual	£31.00	£35.66
* 80 col printer inc. cable, I/O card and ROM	£415.00	£477.25
* 80 col friction printer, I/O card and ROM	£475.00	£546.25
* 132 col printer, inc. cable, I/O card and ROM	£845.00	£971.75
* Expansion unit (required for disk drive and/or printer)	£100.00	£115.00
* Universal interface card	£45.00	£51.75
* Assembler tapes and manual	£42.00	£48.30
* FDOS	£85.00	£97.75
* MZ80K to MZ80A converter tape	£10.00	£11.50

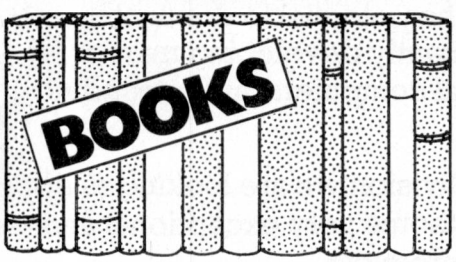
Hand held computers from Sharp give you a pocket genius at your command. We sell the well established PC1211 and the new 1500.

The PC1211 packs high performance functions with Basic language into a slim, compact body. You can extend your PC1211 with a cassette interface or printer/cassette interface.

The new PC 1500 takes technology close to personal computer ability. Its compact body has 16K bytes of ROM and 3.5K bytes of RAM. With an extended alpha basic numeric. You can then go further with the 4K or 8K RAM upgrades. There's also, for the first time in hand held computers, a four colour graphic printer or a combined printer and cassette interface.

	EXC VAT	INC VAT
PC1211 Computer	£65.00	£74.75
PC1211 Cassette interface	£11.26	£12.95
PC1211 Cassette and printer interface	£60.83	£69.95
PC 1500 Computer	£147.78	£169.95
PC 1500 Printer/cassette interface	£130.39	£149.95
PC 1500 4K RAM upgrade	£43.43	£49.95
SHARP PERIPHERALS FOR MZ80K		
* Twin floppy disk unit (5¼") including I/O card, diskette, manual and cable	£702.49	£807.86
* Dot matrix printer	£378.91	£435.75
* Expansion interface (required for either/both above)	£96.00	£110.40
* Machine code language tape and manual	£17.57	£20.20
* Assembler tapes and manual	£36.00	£41.40
* Basic compiler	£40.00	£46.00
* Pascal	£40.00	£46.00
* Double precision basic	£38.00	£43.70

BOOKS



We stock an extensive range of books to help you. Here are just a few to whet your appetite.

CP/M Handbook	£11.50
DON'T	£9.65
Programming the Z80	£11.95
Programming the 6502	£10.75
Your First Computer	£7.75
BASIC Handbook (2nd edition)	£14.95
A-Z of Computer Games	£5.60
Atari Basic	£5.95
Basic 'BASIC'	£9.95
BASIC Computer Games	£6.95
BASIC Computer Programs for Business (VOL I)	£8.55

NO VAT ON BOOKS

STOP PRESS!

Just arriving very limited quantities of the 'Magic'

DRAGON 32K COMPUTER

Sensational Value at

£173.48

£199.50 INC. VAT

Also the first of the Cartridges *from*

£17.35

£19.95 INC. VAT

Cassettes *from*

£6.91

£7.95 INC. VAT

DEALERS: Spectrum Computer Centres operate on an exclusive area basis and if you would like to know more about our group, contact Mike Stern or Alan Warren now on (0727) 66646. Spectrum (UK) Limited, Unit 6, Marlborough Trading Estate, Latimore Road, St. Albans, Herts.

Prices correct at time of going to press. E. & O. E.

spectrum COMPUTER GROUP

Dealers,

Increase your profits with LSI

EXCELLENT MARGINS
BIG ADVERTISING SUPPORT
FULL TECHNICAL BACK-UP

Business Opportunities that cannot be missed!



LSI Computers Limited, one of Britain's most progressive and entrepreneurial computer manufacturers whose products have, in a relatively short space of time, captured a significant market share, and whose products have the potential to dominate in the demanding and constantly developing market of small business and personal computers, are expanding their Dealer network.

Through our OEM Division we are looking to appoint Dealers all over the U.K. for some very exceptional and technically advanced microcomputer products.

Massive Success

OEM business is very important to LSI, and we are dedicated to offering our next generation computers through our Dealer network. Using our reputation and financial strength, we are implementing a vigorous programme of research and development to secure the very latest technology and products for our Dealers. In an era of unparalleled growth and keen competition LSI are more than confident of maintaining their justifiable reputation for

LSI COMPUTERS

Putting Britain back in front

Ring

Copse Road, St. John's, Woking, Surrey GU21 1SX Telex: 859592

technical innovation and achievement and their ability to provide the market with the right product at the right time and at the right price.

Our Dealer programme offers you the opportunities of higher sales of demanded products at excellent margins. There's an ambitious stock programme, full engineering and technical support facilities, and a substantial and exciting advertising and promotional programme already established – in all a package that we can rightfully predict will bring our Dealers massive success. The 8 bit System M-Three continues it's amazing success and it's complimentary partner, the eagerly awaited 16 bit, High performance micro, System M-Four is soon to be launched. In addition, we are able to offer our dealers attractive arrangements on a range of Daisy Wheel and Matrix printers. **And for the larger OEM, specially configured machines totally badge engineered in your own colour schemes.** All at amazing and highly competitive prices.

And that's not all, our exciting new, high performance, low cost word processing system, still under wraps for now, is to be launched in a very, *very* big way this Autumn.

Move Now!

Grasp this amazing opportunity to ensure your future prosperity. Act NOW – phone Laurie Bright on Woking (04862) 23411 today to discuss this fantastic offer in more detail – you could be just one phone call away from a long and prosperous partnership.



Laurie Bright ***Woking (04862) 23411***

New ZX81 Software from Sinclair.



A whole new range of software for the Sinclair ZX81 Personal Computer is now available – direct from Sinclair. Produced by ICL and Psion, these really excellent cassettes cover games, education, and business/household management.

Some of the more elaborate programs can only be run on a ZX81 augmented by the ZX 16K RAM pack. (The description of each cassette makes it clear what hardware is required.) The RAM pack provides 16-times more memory in one complete module, and simply plugs into the rear of a ZX81. And the price has just been dramatically reduced to only £29.95.

The Sinclair ZX Printer offer full alphanumerics and highly-sophisticated graphics. A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. So now you can print out your results for a permanent record. The ZX Printer plugs into the rear of your ZX81, and you can connect a RAM pack as well.

Games

Cassette G1: Super Programs 1 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Invasion from Jupiter. Skittles. Magic Square. Doodle. Kim. Liquid Capacity.
Description – Five games programs plus easy conversion between pints/gallons and litres.

Cassette G2: Super Programs 2 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Rings around Saturn. Secret Code. Mindboggling. Silhouette. Memory Test. Metric conversion.
Description – Five games plus easy conversion between inches/feet/yards and centimetres/metres.

Cassette G3: Super Programs 3 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Train Race. Challenge. Secret Message. Mind that Meteor. Character Doodle. Currency Conversion.
Description – Fives games plus currency conversion at will – for example, dollars to pounds.

Cassette G4: Super Programs 4 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Down Under. Submarines. Doodling with Graphics. The Invisible Invader. Reaction. Petrol.
Description – Five games plus easy conversion between miles per gallon and European fuel consumption figures.

Cassette G5: Super Programs 5 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Martian Knock Out. Graffiti. Find the Mate. Labyrinth. Drop a Brick. Continental.
Description – Five games plus easy conversion between English and continental dress sizes.

Cassette G6: Super Programs 6 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Galactic Invasion, Journey into Danger. Create. Nine Hole Golf. Solitaire. Daylight Robbery.
Description – Six games making full use of the ZX81's moving graphics capability.

Cassette G7: Super Programs 7 (ICL)
Hardware required – ZX81.
Price: – £4.95.
Programs – Racetrack. Chase. NIM. Tower of Hanoi. Docking the Spaceship. Golf.
Description – Six games including the fascinating Tower of Hanoi problem.

Cassette G8: Super Programs 8 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Star Trail (plus blank tape on side 2).
Description – Can you, as Captain Church of the UK spaceship Endeavour, rid the galaxy of the Klingon menace?

Cassette G9: Biorhythms (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – What are Biorhythms? Your Biohythms.
Description – When will you be at your peak (and trough) physically, emotionally, and intellectually?

Cassette G10: Backgammon (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £5.95.
Programs – Backgammon. Dice.
Description – A great program, using fast and efficient machine code, with graphics board, rolling dice, and doubling dice. The dice program can be used for any dice game.

Cassette G11: Chess (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Chess, Chess Clock.
Description – Fast, efficient machine code, a graphic display of the board and pieces, plus six levels of ability, combine to make this one of the best chess programs available. The Chess Clock program can be used at any time.

Cassette G12: Fantasy Games (Psion)
Hardware required – ZX81 (or ZX80 with 8K BASIC ROM) + 16K RAM.
Price – £4.75.
Programs – Perilous Swamp. Sorcerer's Island.
Description – Perilous Swamp: rescue a beautiful princess from the evil wizard. Sorcerer's Island: you're marooned. To escape, you'll probably need the help of the Grand Sorcerer.

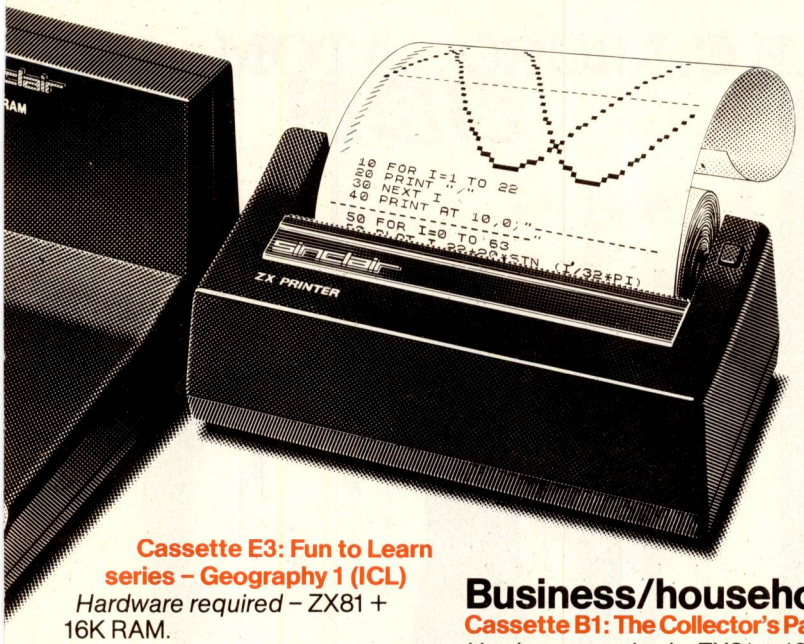
Cassette G13: Space Raiders and Bomber (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £3.95.
Programs – Space Raiders. Bomber.
Description – Space Raiders is the ZX81 version of the popular pub game. Bomber: destroy a city before you hit a sky-scraper.

Cassette G14: Flight Simulation (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £5.95.
Program – Flight Simulation (plus blank tape on side 2).
Description – Simulates a highly manoeuvrable light aircraft with full controls, instrumentation, a view through the cockpit window, and navigational aids. Happy landings!

Education

Cassette E1: Fun to Learn series – English Literature 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Novelists. Authors.
Description – Who wrote 'Robinson Crusoe'? Which novelist do you associate with Father Brown?

Cassette E2: Fun to Learn series – English Literature 2 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Poets, Playwrights. Modern Authors.
Description – Who wrote 'Song of the Shirt'? Which playwright also played cricket for England?



Cassette E3: Fun to Learn series – Geography 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Towns in England and ales. Countries and Capitals of Europe.
escription – The computer shows you map and a list of towns. You locate ıe towns correctly. Or the computer ıallenges you to name a pinpointed cation.

assette E4: Fun to Learn series – istory 1 (ICL)
ardware required – ZX81 + 16K RAM.
rice – £6.95.
rograms – Events in British History. ritish Monarchs.
escription – From 1066 to 1981, find ıt when important events occurred. ecognise monarchs in an identity arade.

assette E5: Fun to Learn series – athematics 1 (ICL)
ardware required – ZX81 + 16K RAM.
rice – £6.95.
rograms – Addition/Subtraction. ultiplication/Division.
escription – Questions and answers n basic mathematics at different vels of difficulty.

assette E6: Fun to Learn series – usic 1 (ICL)
ardware required – ZX81 + 16K RAM.
rice – £6.95.
rograms – Composers. Musicians.
escription – Which instrument does ames Galway play? Who composed eter Grimes'?

assette E7: Fun to Learn series – ventions 1 (ICL)
ardware required – ZX81 + 16K RAM.
rice – £6.95.
rograms – Inventions before 1850. ıventions since 1850.
escription – Who invented television? Vhat was the 'dangerous Lucifer'?

assette E8: Fun to Learn series – pelling 1 (ICL)
ardware required – ZX81 + 16K RAM.
rice – £6.95.
rograms – Series A1-A15. Series B1-B15.
escription – Listen to the word spoken n your tape recorder, then spell it out n your ZX81. 300 words in total uitable for 6-11 year olds.

Business/household

Cassette B1: The Collector's Pack (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £9.95.
Program – Collector's Pack, plus blank tape or side 2 for program/data storage.
Description – This comprehensive program should allow collectors (of stamps, coins etc.) to hold up to 400 records of up to 6 different items on one cassette. Keep your records up to date and sorted into order.

Cassette B2: The Club Record Controller (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £9.95.
Program – Club Record Controller plus blank tape on side 2 for program/data storage.
Description – Enables clubs to hold records of up to 100 members on one cassette. Allows for names, addresses, 'phone numbers plus five lots of additional information – eg type of membership.

Cassette B3: VU-CALC (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £7.95.
Program – VU-CALC.
Description – Turns your ZX81 into an immensely powerful analysis chart. VU-CALC constructs, generates and calculates large tables for applications such as financial analysis, budget sheets, and projections. Complete with full instructions.

Cassette B4: VU-FILE (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £7.95.
Programs – VU-FILE. Examples.
Description – A general-purpose information storage and retrieval program with emphasis on user-friendliness and visual display. Use it to catalogue your collection, maintain records or club memberships, keep track of your accounts, or as a telephone directory.

How to order

Simply use the FREEPOST order form below and either enclose a cheque or give us your credit card number. Credit card holders can order by phone – simply call Camberley (0276) 66104 or 21282 during office hours. Either way, please allow up to 28 days for delivery, and there's a 14-day money-back option, of course.

sinclair
ZX81
SOFTWARE

Sinclair Research Ltd,
Stanhope Road, Camberley, Surrey, GU15 3PS.
Tel: Camberley (0276) 66104 & 21282.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR.
Please send me the items I have indicated below.

Qty	Cassette	Code	Item price	Total
	G1: Super Programs 1	30	£4.95	
	G2: Super Programs 2	31	£4.95	
	G3: Super Programs 3	32	£4.95	
	G4: Super Programs 4	33	£4.95	
	G5: Super Programs 5	34	£4.95	
	G6: Super Programs 6	35	£4.95	
	G7: Super Programs 7	36	£4.95	
	G8: Super Programs 8	37	£4.95	
	G9: Biorhythms	38	£6.95	
	G10: Backgammon	39	£5.95	
	G11: Chess	40	£6.95	
	G12: Fantasy Games	41	£4.75	
	G13: Space Raiders & Bomber	42	£3.95	
	G14: Flight Simulation	43	£5.95	
	E1: English Literature 1	44	£6.95	

Qty	Cassette	Code	Item price	Total
	E2: English Literature 2	45	£6.95	
	E3: Geography 1	46	£6.95	
	E4: History 1	47	£6.95	
	E5: Mathematics 1	48	£6.95	
	E6: Music 1	49	£6.95	
	E7: Inventions 1	50	£6.95	
	E8: Spelling 1	51	£6.95	
	B1: Collector's Pack	52	£9.95	
	B2: Club Record Controller	53	£9.95	
	B3: VU-CALC	54	£7.95	
	B4: VU-FILE	55	£7.95	
	ZX 16K RAM pack	18	£29.95	
	ZX Printer	27	£59.95	
	Post & packing – *only* if ordering hardware		£2.95	

TOTAL £ ____

I enclose a cheque/postal order to Sinclair Research Ltd for £ ____

Please charge my *Access/Barclaycard/Trustcard no.
**Please delete as applicable.*

Mr/Mrs/Miss

Address

NSA 18

ZX81 SPECTRUM..B.B.C. MICRO..ATOM..VIC

NEW!

Spectral INVADERS

The very first, perfect arcade quality Machine Code game on cassette for the sensational

SINCLAIR ZX Spectrum



Just £5 inclusive
12 months guarantee

ORDER YOURS TODAY!

BUG-BYTE SOFTWARE

BUG-BYTE SOFTWARE, FREEPOST (No Stamp req.) LIVERPOOL L3 3AB.

BBC CHESS



The very first, powerful and exciting chess game for the BBC Micro. One thousand levels of play, plus many options including setting up board for chess problems, saving games on tape etc. Deals with castling and en passant.

£11.50 inclusive

SINCLAIR ZX81

MAZOGS	£8.00	DICTATOR	£9.00
STARTREK	£5.00	DAMSEL & THE BEAST	£5.00
ZXAS ASSEMBLER	£5.00	CONSTELLATION	£8.00
ZXDB DEBUGGER	£5.00	PROGRAM PACKS 1-8 (each)	£4.00
ZSTK TOOLKIT	£6.00		
INVADERS	£3.00		

VIC-20

ANOTHER VIC IN THE WALL	£7.00
VIC GAMMON	£7.00
VIC PANIC	£7.00
VIC COSMIADS	£7.00
VIC ASTEROIDS	£7.00

ATOM

BUY 2 GET 1 FREE!

ALL PRICES INCLUDE POSTAGE

Please send me _____

I enclose cheque/P.O. for _____

OR Please debit my Access 5224 _____

BARCLAYCARD 4929 _____ Expiry date _____

Name _____

Address _____

_____ Code _____

Dealers Discount Available

ACCESS, BARCLAYCARD ORDERS WELCOME ON 24hr ANSAPHONE 051-227 2642, or mail to:

BUG-BYTE SOFTWARE, FREEPOST, (No stamp req.) LIVERPOOL L3 3AB.

P.C.W.9.82

VISA

ZX81..SPECTRUM..B.B.C. MICRO..ATOM..VIC

If we can't supply the programs you need,

INFORMATION MANAGEMENT - WORD P
ROCESSING - ACCOUNTING - STOCK CO
NTROL - INVOICING - SALES LEDGER - PU
RCHASE LEDGER - DATA ANAL SIS - STAT
ISTICS - PAYROLL - FINANCIAL PLANNING
FINANCIAL MODELLING - PROJECT PLAN
NING - TIME COS ING - PETROL ST
ATION MANAGE MENT - RETAIL C
ONTROL - CASH B OOK - HOTEL BILL
ING - DAIRY MANAGEMENT - HOTEL BOO
KING - TACHOGRAPH ANALYSIS - NEWSA
GENTS MANAGEM ENT - COSTING - PL
ANNED MAINTENA NCE - BOILER EVAL
UATION - STRUCTU RAL ENGINEERING
STRUCTURAL ANAL SIS - PLANE FRAME

who can?

Commodore handles a greater, more comprehensive range of software than any other micro-computer company.

Each software package has been written by an expert in his field to provide the most effective solution to an endless number of business problems.

The Commodore range of systems is vast, encompassing businesses as diverse as farming and pharmacy.

Small and large businesses alike, from dentists and solicitors to huge corporations like ICI and Guinness. Whatever the size of your business, it's our business to help make you more efficient and more profitable.

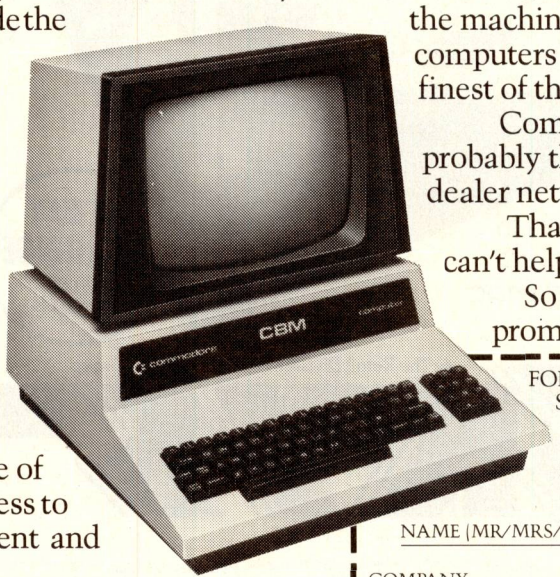
In fact, the problems we can't solve immediately are few and far between. And as we're the most widely used business computer system in the country, even the most specialist program is easier to find and cheaper to buy.

Of course, the finest software is only as good as the machines that process it and Commodore computers and peripherals are, quite simply, the finest of their kind.

Computer systems that are backed by probably the most expert and comprehensive dealer network in the country.

That's why we're so confident that if we can't help, no-one can.

So why not come in and talk to us. We promise you'll feel the same way.



FOR FULL DETAILS, CUT THIS COUPON AND SEND TO:
COMMODORE INFORMATION CENTRE,
675 AJAX AVENUE, SLOUGH, BERKS,
SL1 4BG, OR TEL: SLOUGH (0753) 79292.

NAME (MR/MRS/MISS) _____

COMPANY _____

POSITION _____

ADDRESS _____

_____

TELEPHONE _____ 02PCW001

commodore
Changing business for the better.

Microcomput

The best names, best

Laskys, the biggest specialist retailer of quality electronic technology in Europe now bring you a nation-wide network of purpose-built Microcomputer Centres, backed by a team of specialist consultants. All ideal environments for you to test run and select your microcomputer.

Right for your needs.
With APPLE, OSBORNE, SHARP, COMMODORE, HEWLETT PACKARD, ATARI, you can be confident that a microcomputer from Laskys will be right for your needs. Whether you plan to use it in a business application, to teach your children the language of the future, or as a new and fascinating hobby, Laskys have the system that is right for you.

Laskys give you the best price also.
Massive micro-computer buying power is the reason. As the big-gest specialist electronics retailer in Europe Laskys are able to supply microcomputer systems soft-ware and peripherals at the best prices.

Laskys exclusive guarantee & service centre network
Laskys have resources beyond the reach of many. Your micro-computer system is backed by Laskys network of microcomputer after-sales service and maintenance centres equipped with the latest technology and staffed by micro-computer professionals. Plus, Laskys offer a 1 year guarantee (2 years on Apple and Sharp) under the terms of which all repairs and service work are carried out FREE of charge on both parts and labour.

Why not visit or ring your nearest Laskys store **NOW.**



14 DAY EXCHANGE on all purchases

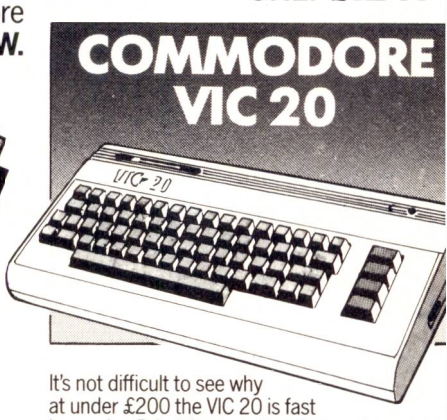
APPLE



Apple double offer! £110 off Apple II system & £139.90 Visicalc 3.3 FREE! Apple II with Disc Drive. Controller and Monitor III.

ONLY £1249·

COMMODORE VIC 20

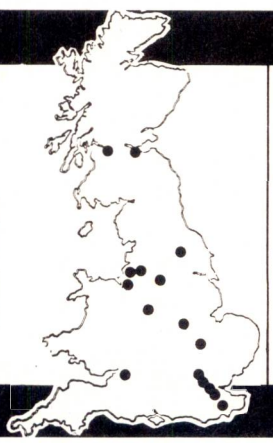


It's not difficult to see why at under £200 the VIC 20 is fast becoming Britain's top selling Colour Computer. It uses any ordinary domestic colour television s as it's display screen. You can even add printers, recorders and disc drive. A wide range of programmes including games, educational and business packages are available.

ONLY £199·

The Retail Division of The Ladbroke Group

LASKYS



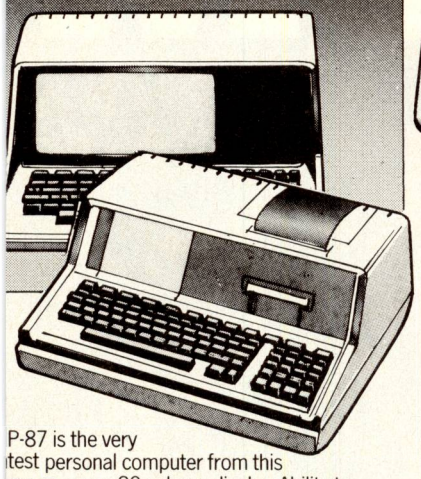
LONDON & HOME COUNTIES. OXFORD ST, W1 Opening Sept. 1982. 7/9 QUEENSWAY W2, 01-229 6425 Queensway open Sun. 12 to 6pm. 42 TOTTENHAM COURT RD., W1 01-636 0845 Reopening Sept. 1982. BROMLEY 22 Market Square, 01-464 7829. KINGSTON Eden St., 01-546 1271. LUTON 192 Arndale Centre, 0582 38302. SLOUGH Queensmere Centre, 0753 24401. WATFORD Charter Place, 0923 47488. **SOUTHERN ENGLAND.** BRISTOL 16/20 Penn St., 0272 20421. MAIDSTONE 79/81 Week St., 0622 678165. **MIDLANDS & NORTH.** BIRMINGHAM 19/21 Corporation St., 021-632 6303. CHESTER 7 The Forum, Northgate St., 0244 317667. LIVERPOOL 33 Dale St., 051-236 2828. MANCHESTER 12/14 St. Mary's Gate, 061-832 6087. NOTTINGHAM 1/4 Smithy Row, 0602 415150. PETERBOROUGH Queensgate Centre, 0733 313513. PRESTON 1/4 Guildhall Arcade, 0772 59264. SHEFFIELD 58 Leopold St., 0742 750971. YORK 10a Coney St., 0904 641221. **SCOTLAND.** EDINBURGH 4 St. James Centre, 031-556 2914. GLASGOW 22/24 West Nile St., 041-226 3349.

Prices include 15% VAT and are correct at time of going to press. All offers subject to availability.

Credit facilities available arranged through leading finan houses. Please ask fo written details.
All credit offers are subject to acceptanc

ers at Laskys.
service, best back-up.

HEWLETT PACKARD



P-87 is the very
test personal computer from this
mous name. 80 column display. Ability to
ow high resolution graphics. Internal memory
xpandable to over 500,000 bytes. Handles very
rge VISCALC® work sheets.

ONLY £1889.00

P85. The only totally portable personal computer
ystem that offers alpha and graphic VDU, printer,
gh-speed tape storage, BASIC language
terpreter and memory – all in one box. It weighs
nly eighteen pounds and tucks under your arm.
hould you need, it can be expanded with the
ddition of discs and plotters.

ONLY £2089.00

OSBOURNE 1

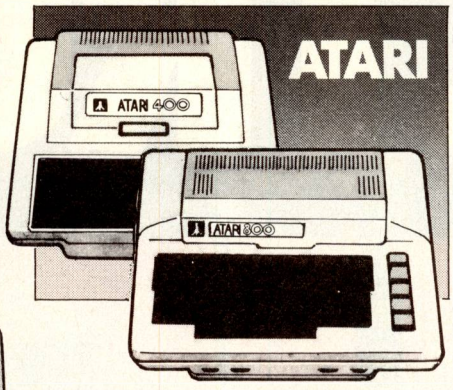


he portable computer that you can take with you
st about anywhere. A system in a briefcase to make you more productive in your work, your business, your profession. With the hardware and software tools you need to go to work right away, on the jobs you do for hours every day.



ONLY £1439.00

ATARI



A superb choice for the personal user and hobbyist, the 400 or more powerful 800 from Atari. Inexpensive, value for money system, with a rapidly growing range of accessories and software to lead you on to new skills. You can even add printers, recorders and disc drive. A wide range of programmes including games, educational and business packages are available.

ATARI 400 – **£199.90**

ONLY ATARI 800 – **£499.00**

SHARP



MZ-80A personal computer is designed for business or home use and always ready to run. The CRT, keyboard and cassette-based data storage are one complete system that leads the operator into an incredible new computer world. Comes complete with free software package incorporating programmes, basic language manual and cassette.

ONLY £549.00

MZ-80B. The new-era personal computer for versatile software and hardware applications. It is loaded with a 64-K byte dynamic RAM giving direct access to the data. It is extremely flexible. Many computer languages may be used, plus it has probably the best graphic capability of any micro on the market.

ONLY £1149.00

BEST CHOICE OF PERIPHERALS AND SOFTWARE

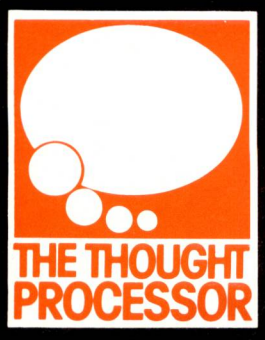
Laskys experienced staff will gladly help you choose the best peripherals and software to develop your computer system.

APPLE	
Apple Silentype II Thermal Printer	£229.00
Apple II Disc Drive	£339.00
Apple II Disc Drive with Controller	£399.00
ATARI	
A410 Cassette Data Recorder	£49.90
A810 Disc Drive	£329.00
COMMODORE	
VIC 1530 Cassette Data Recorder	£44.90
VIC 1540 Disc Drive	£399.00
HEWLETT PACKARD	
HP 7470 Plotter with option Apple/PET Compatible	£1069.00
HP 9134 Winchester Disc Drive	£3289.00
HP 9135A Winchester Disc Drive with 5¼" floppy disc back-up	£4169.00
SHARP	
MZ 80 SFD Disc Drive	£449.00
EPSOM	
MX 80 FT/3 printer	£439.00
Tec Starwriter	£1289.00

See our extensive range of other software and accessories. Big choice in store.

The 5th Personal Computer World Show

SEE US ON STAND 336



MiCROL©

SPECTRUM

THE DATA BASE

48K CASSETTE SYSTEM

AVAILABLE NOW

For 48K Spectrum only

Cassette plus 40 page Manual



£9.95

14 day money-back option backed by MiCROL usercare

low-cost microdrive add-on available soon

To order simply complete the coupon, and FREEPOST with your cheque, made payable to **MiCROL** (UK Mail Order). Allow 28 days for delivery.

Telephone orders — credit card holders can order by telephoning (0233) 312 866 from 9-5.30 Monday to Saturday, stating name and address, Card No. (Access & Barclaycard) and item(s) required.

THE THOUGHT PROCESSOR **MiCROL©**

SPECTRUM

(0223) 312866

Distributed Worldwide Exclusively by Tempus of Cambridge.

38 Burleigh Street, Cambridge CB1 1BR.

Post to — **MiCROL (UK Mail Order)**
Freepost, 38 Burleigh Street, Cambridge

Please send me..... number of copies of The Database
I enclose cheque/P.O. £9.95 + 50p p + p (£10.45 total)
I wish to pay by Access/Barclaycard
(Delete whichever not applicable)
Please Print Name & Address

Card Number .....

Signature.....

Name .....

Address.....

.....

Credit card valid if signed by cardholders.

PCW4

VOL.1: 25 BASIC PROGRAMS AVAILABLE NOW

If you want to get the best from your powerful new Spectrum, you need the powerful **USE AND LEARN** series from **MiCROL**.

£9.95

Produced by Top British Professionals, volume 1 features 25 practical programs on cassette *plus* a 100 page guide packed with ideas and techniques to improve your own program-writing skills.

The 25 programs give you immediate access to many popular applications:

Games to entertain and challenge you.

General interest programs to demonstrate a wide-ranging potential of your 16K or 48K Spectrum.

And important programing aids to help you write your own programs more effectively. In addition to their practical value, each of these programs illustrates the easy-to-learn techniques featured in the **USE AND LEARN** manual. Time-saving ways to create and control graphics and sound.

Designing reliable command, prompt and help sequences. The meaning (and importance) of terms like trees, tables, sorts and searches. And how the simple but powerful technique of structured programing works in practice — to make program-writing faster and your program more reliable.



Find out for yourself how **USE AND LEARN** makes getting the most from your Spectrum both easy and enjoyable.

Send today for Volume 1 and we will also keep you posted with details of further titles in the **USE AND LEARN** series.

To order simply complete the coupon, and FREEPOST with your cheque, made payable to **MiCROL** (UK Mail Order). Allow 28 days for delivery.

Telephone orders — credit card holders can order by telephoning (0233) 312 866 from 9-5.30 Monday to Saturday, stating name and address, Card No. (Access & Barclaycard) and item(s) required.

THE THOUGHT PROCESSOR **MiCROL** ©

SPECTRUM

(0223) 312866

Distributed Worldwide Exclusively by Tempus of Cambridge.

38 Burleigh Street, Cambridge CB1 1BR.

Post to — **MiCROL (UK Mail Order)**
Freepost, 38 Burleigh Street, Cambridge

Please send me..... number of copies of Use and Learn
I enclose cheque/P.O. £9.95 + 50p p + p (£10.45 total)
I wish to pay by Access/Barclaycard
(Delete whichever not applicable)
Please Print Name & Address

Card Number .....

Signature.....

Name .....

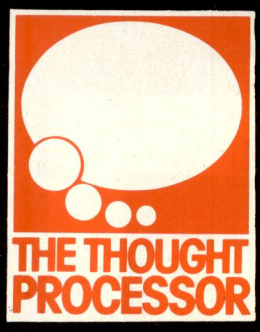
Address .....

.....

Credit card valid if signed by cardholders.

PCW4

Designed by Sesames(UK)Ltd



MICROL©

SPECTRUM

USE AND LEARN

16/48K CASSETTE SYSTEM

GW Computers Ltd

TeleVideo



TS 802 & 802H Features:

- *Z80A 4 MHz processor with direct memory access*
- *64 Kbytes of RAM main memory*
- *4 Kbytes of EPROM for system diagnostics and boot loading*
- *Dual floppy disk controller (TS 802), and hard disk controller (TS 802H)*
- *Dual minifloppy disks: 1 Mbyte capacity (TS 802) Single minifloppy disk (.5 Mbyte capacity), plus 10 Mbyte Winchester 5¼-inch hard disk (TS 802H)*
- *Green phosphor CRT (25 rows by 80 columns)*
- *Typewriter-style detached keyboard*
- *Full-screen attributes, editing, smooth scroll, 25th status line, 11 function keys, numeric key pad*
- *2 RS-232C serial ports. These are jumper selectable for any combination of modems or printers*
- *CP/M 2.2 operating system*
- *Attractive tabletop enclosure, fully integrated with CRT, CPU, RAM and disk drives*
- *1 RS-422 high-spped port*

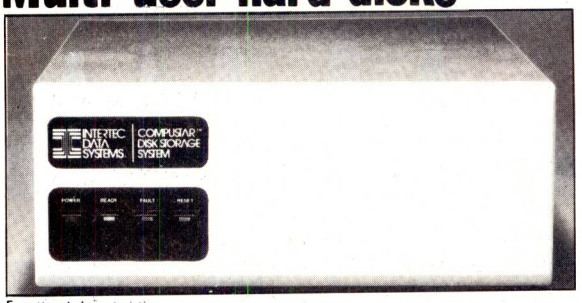
TeleVideo's TS 802 and TS 802H microcomputers are low-cost, powerful single-user integrated computer systems. TeleVideo has combined its top of the line CRT display with an advanced design single board computer (Z80, 64K RAM) with 5¼ floppy disks and Winchester hard disk all in one attractive tabletop enclosure. A detached typewriter-style keyboard is also included. The TS 802 computer features two 5¼-inch Winchester disk drive for 10 Mbytes of data storage, and a single 500 Kbyte minifloppy disk unit.

Both the TS 802 and 802H use the industry standard CP/M 2.2 operating system. This lets the user fulfill a wide variety of information and word processing needs using a multitude of commonly available application programs.

The TS 802 and TS 802H can accommodate serial printers and modems through the RS-232C serial ports.

When it comes time to expand to a multi-user system, you can utilize either your TS 802 or 802H as a satellite user station in the overall system without modification.

Multi-user hard disks



Functional characteristics

The CompuStar 10 megabyte Disk Storage System (DSS) consists of read/write and control electronics, read/write heads, a track positioning mechanism, a spindle drive mechanism, dual disks, an air filtration system, and our exclusive 255 user controller – all packaged in a compact desktop enclosure. Although designed primarily to accommodate multiple CompuStar Video Processing Units (described at left), the unit can easily be connected to a single SuperBrain Video Computer System to facilitate additional disk storage. When used with CompuStar VDUs, however, the integral Z80 based controlle will permit up to 255 users to 'share' the resources of the disk with minimual CPU response degradation.

Read/Write Heads and Disks

The recoding media consists of a lubricated thin magnetic oxide coating on a 200mm diameter aluminium substrate. This coating for mulation, together with the low load force/low mass Winchester type flying heads, permits reliable contact start/stop operation. Data on each disk surface is read by one read/write head, each of which accesses 256 tracks.

G.W. COMPUTERS LTD. 01-636-8210, 01-631-4818, TELEX 892031 TWCG

THE NEW DBMS (DATABASE)*

DBMS2 is a *record relational* as well as a *file relational* database management tool that is capable of being at different times, many different things. **The one core program** can be set up to perform tasks normally associated with the following list.

Accounting	Budgeting	Cashflow
Stock control	Address mailing	Letter writing
Simulations	Time recording	Filing
Calc-type predictions	Hospital indexing	Profit analysis
Bureaux services	General analysis	Mathematics
Answer *what-if's*	Employees records	Tabulate values
Print reports	Sort files	Edit records

Within hours perform all the above in **French** or **German**.

The list is as endless as that which meets the requirements of your own imagination.

Within the appropriate frames of reference you could ask questions like the following.

Find someone whose name begins with W, who is either in London or Birmingham, and available for work at a salary of less than 10,000.00, and is under 40 years of age, not married, of credit worthiness grade 1, with a car, prepared to travel, and who likes horses, does not mind the hours he works, is congenial and has good references. *When you find such persons* produce a printed list of them showing their names, telephone numbers, and what their salaries are as well as their salary *if increased by 10%* and show their availability for work. At the end of the list enumerate the total of such persons.

Find all stock items that are codes *micro-computers* that are either in warehouse 1 or warehouse 2, where the quantity on hand is more than 50 units, the cost is less than 1000.00, the selling price higher than 2000.00, that are not in cartons, bought from supplier 52, allocated more than 20, rated for tax at 15% and weigh less than 50 lbs. *When you find such categories* then print a report showing the description, cost price, quantity on hand, lead time for refills, what the selling price *should be if raised by 12.3%* as well as the profit in either per-cent or round figures of that projected selling price.

Find all patients who suffered from cold, that are either girls or women younger than 23 years old, and who live in London at a socio-economic grade higher than 3, do not smoke, have more than 3 children, are currently at work and where treatment failed to effect a cure in under 6 days. **When you find such persons** then print a list showing their age, marital status, income, and frequency of illness in the past 2 years.

Currently you can ask **5 types** of questions **20 times** for a single selection criterion, and then you can compute **10 mathematical relationships** between the questions for the individual **as well as** for the total number of matches. In all some **60** bits of information relating to **one** record or a **group of records** on simply one permutation of the selection criterion, with a cross referencing facility as well.

Every word in the system, as well as the file architectures, print masks, and field attributes, is capable of alteration by you **without** programming expertise (but with some thought).

ALL IN ONE PROGRAM FROM G. W. COMPUTERS. *THE DBMS2 !!*

24 HOUR ANSWER PHONE — LEAVE ADDRESS FOR STANDARD INFORMATION PACK

THE G.W. BEST SYTEM DEAL IN THE U.K.

*** ALL YOU NEED FROM A COMPUTER SYSTEM ***

DATABASE MANAGEMENT + WORD-PROCESSING + MODELLING + DIY INTERPRETER + SERVICE

01 –	CPM HANDBOOK	10.00
02 -	50 BASIC EXERCISES (BOOK)	10.00
03 –	BOX PAPER (2000 SHEETS)	20.00
04 –	DBMS3 (DATABASE)	575.00
05 –	MAGIC WAND (W'PROCESSOR)	190.00
06 –	MBASIC–80 (LANGUAGE)	150.00
07 –	MAGIC CALC (MODELLING)	175.00
08 –	DIAGNOSTICS	125.00
09 –	MSORT & DSORT	75.00
10 –	RECOVER + AUTOLOAD	25.00
11 –	INSTANT BASIC (BOOK)	10.00
12 –	DISKFULL OF GAMES	50.00
13 –	3 LIBRARY CASES	15.00
(NOT INC VAT)		1430.00

CHOOSE ANY COMPUTER TERMINAL
CHOOSE ANY PRINTER OVER 1000 PNDS

ADD 10% FOR 12 MONTH WARRANTY
ADD 175.00 FOR CABLES, DELIVERY AND INSTALLATION
ADD 150.00 FOR BLANK DISKETTES

THEN YOU GET THE LEFT-HAND LIST

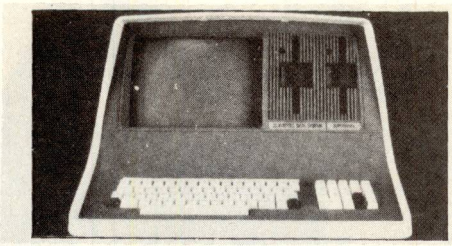
***** FREE *****

TRAINING OPTIONALLY EXTRA 100.00

CALL ONLY BY APPOINTMENT AT 55 BEDFORD COURT MANSIONS, BEDFORD AVENUE, LONDON W.C.1. TELEX 892031 TWC G.

GW Computers Ltd

SUPERBRAIN™

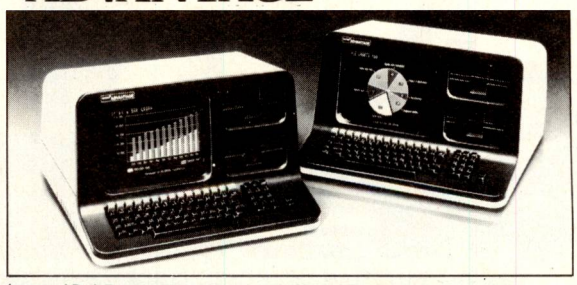


SuperBrain users get exceptional performance for just a fraction of what they'd expect to pay. Standard SuperBrain features include: two double density mini-floppies with 350k bytes of disk storage, 32k of RAM memory (expandable to 64k) to handle even the most sophisticated programs, a CP/M® Disk Operating System with a high powered text editor, assembler, debugger and a disk formator. And, with SuperBrain's S-100 bus adaptor, you can add all the programming power you will ever need. . . almost any type of S-100 compatible bus accessory.

SuperBrain's CP/M operating system boasts an overwhelming amount of available software in BASIC, FORTRAN, COBOL, and APL. Whatever your application. . . General Ledger, Accounts Receivable, Payroll, Inventory of Word Processing, SuperBrain is tops in its class. And th SuperBrain QD boasts the same powerful performance but also features a double-sided drive system to render more than 700k bytes of disk storage and a full 64k of RAM. All standard!

Whatever model you choose, you'll appreciate the careful attention given to every engineering detail. A full ASCII keyboard with numeric pad and user-programmable function keys. A non-glare, specially focused 12-inch CRT for sharp images everywhere on the screen. Twin Z-80 microprocessors to insure efficient data transfer to auxiliary peripheral devices. Dual universal RS-232 communications ports for serial data transmission. And, a single board design to make servicing a snap!

ADVANTAGE



Integrated Desk Top Computer with 12 inch Bit-Mapped Graphics or Character Display, 64Kb RAM, 4 MHz Z80A,® Two Quad Capacity Floppy Disk Drives, Selectric* Style 87 Key Keyboard, Business Graphics Software.

The North Star ADVANTAGE™ is an interactive integrated graphics computer supplying the single user with a balanced set of Business-Data, Word, or Scientific-Data processing capabilities along with both character and graphics output. ADVANTAGE is fully supported by North Star's wide range of System and Application Software.

The ADVANTAGE contains a 4 MHz Z80A® CPU with 64Kb of 200 nsec Dynamic RAM (with parity) for program storage, a separate 20Kb 200 nsec RAM to drive the bit-mapped display, a 2Kb bootstrap PROM and an auxiliary Intel 8035 microprocessor to control the key-board and floppy disks. The display can be operated as a 1920 (24 lines by 80 characters) character display or as a bit-mapped display (240x640 pixels), where each pixel is controlled by one bit in the 20Kb display RAM. The two integrated 5¼inch floppy disks are double-sided, double-density providing storage of 3600Kb per drive for a total of 720Kb. The n-key rollover Selectric style keyboard contains 49 standard typewriter keys, 9 symbol or control keys, a 14 key numeric/cursor control pad and 15 user programmable function keys.

G.W. COMPUTERS LTD. 01-636-8210, 01-631-4818, TELEX 892031 TWCG

* * * THE NEW DBMS III (DATABASE) * * *

The DBMS III is an exhanced version of DBMS II with additional facilities that make it (we believe) unsurpassed in overall capability world-wide.

For the first time, it is possible to pre-determine the entire route of this program from its own built in self-drivers. The notion of getting information 'at the touch of a button' is rarely even achieved by other programs whereas in DBMS III it is surpassed.

It will take you tome to master the technique of setting up files that are particular to your activities, but when this is accomplished you will be able to 'clone-copy' the program DBMS III in such a manner that each copy may become dedicated functionaires to specific tasks for as long as you wish.

The end result will be a number of disks whose sole purpose in life will be to perform specific tasks **WITHOUT ever touching a single key.** Say your company is a garage; you want stock-level re-order reports; your stock file contains 20,000 records of parts where among other information you have 'MINIMUMS', MAXIMUMS', 'PRESENT STOCKS' and 'COST'. You design a report so that all records where stock is below minimum, the stock is subtracted from the maximum to produce a re-order report and the cost of such an order. Having set up the files and print report forms, you now enable the **DBMS III SELF-DRIVERS,** to pre-ignition.

Every time you want a stock-re-order-cost-report you simply follow this procedure, with the computer and printer switched on:

Insert the 'STOCK-FILE DISK' and the 'DBMS III FUNCTIONARY DISK', close the drive doors, and walk away. On your return you will find your report ready for action.

Imagine being able to do that for most of the tasks you have about you? Hospital serum analysis reports, Production control process reports, Ledger analysis reports, Clients address reports, Housing management reports, In fact most anything whose nature concerns information.

Additional features include field protection, classified fields, passwords to files, increased number of fields, screen form designing, automatic 10 second screen refresh for network systems, additional search/maths functions.

A leader in database and information processing at this time. The DBMS III (575.00 exc vat and exc mbasic 80). Only from G.W. Computers Ltd.

24 HOUR ANSWER PHONE — LEAVE ADDRESS FOR STANDARD INFORMATION PACK

Superbrain * Corvus DSK /		North Star *		Televideo / NEC/OKI	* Printer
SUPERBRAIN 320K	1695.00	NORTH STAR 700K	2495.00	OKI MICRO-82A	575.00
SUPERBRAIN 700K	2195.00	NORTH STAR 5.3M	3495.00	OKI MICRO-83	795.00
SUPERBRAIN 1500K	2595.00	TELEVIDEO 7.6M	4595.00	OKI MICRO-83A	850.00
COMPUSTAR 10 OK	1695.00	TELEVIDEO T'MNL	1195.00	EPSON MX80FT	475.00
COMPUSTAR 20 320K	2495.00	TELEVIDEO 700K	2395.00	EPSON MX100	675.00
COMPUSTAR 30 700K	2695.00	VTR MIRROR DUMP	695.00	TEXAS 810	1295.00
COMPUSTAR 40 1.5M	2995.00	7 STATION M'PLEX	695.00	DRE 8820	1295.00
COMPUSTAR 10M DSK	2950.00	N'STAR 16 BIT CRD	595.00	NEC 3350	1395.00
CORVUS 5.6M H'DSK	1950.00	N'STAR 5MG DISK	1695.00	NEC 5510	1795.00
CORVUS 10M H'DSK	2950.00	NEC 8001/12/31	1850.00	NEC 5525	2095.00
CORVUS 20M H'DSK	3950.00	IBM 16 BIT	2850.00	QUME 9/45	1695.00
		FORTRAN-80	200.00		
MBASIC 80	150.00	PASCAL (VARIOUS)	175.00	COBOL-80	320.00
CIS COBOL	420.00	SUPER SORT	120.00	WORD-STAR	250.00
MAIL MERGE	55.00	BASCOMPILER	190.00	CBASIC	75.00
DATASTAR	190.00	MAGIC CALC (CPM)	175.00	MAGIC WAND	190.00
DBMS & BUS 8.00	675.00	DBMS III	575.00	T/MAKER	150.00
DBMS (EXTENDED)	425.00	LETTERIGHT	100.00	DBMS & BUS	675.00
MSORT & DSORT	75.00			UTILITIES	150.00
JVC 7700 VIDEO TR	625.00	JVC 7300 VIDEO	550.00	TELETYPE 43	250.00
FREEDOM PHONE	110.00	6KM FREE PHONE	350.00	COMPUPHONE	175.00

WE STOCK A FULL RANGE OF INTERTEC-SUPERBRAIN, TELEVIDEO SYSTEMS, IBM SYSTEMS, ALTOS SYSTEMS, NORTH STAR SYSTEMS, OSBORNE 1, SIRIUS 16 BIT, PLUS A LARGE RANGE OF PRINTERS (MOST IN STOCK 1), CALL FOR PRICES.

FORMATS: (FOR BASIC, DBMS II, = N'STAR & SUPREBRAIN 5"). (FOR SUPER CALC = 8", ZENITH, XEROX, APPLE, VECTOR.. (FOR MAGIC WAND/CALC = N'STAR & SUPERBRAIN)

ANY OF OUR COMPUTER TERMINALS AUTOMATICALLY INCLUDE *****FREE*****

***** MAGIC WAND WORD PROCESSING SOFTWARE *****
***** TESTING AND DELIVERY *****
***** 90 DAY WARRANTY *****
*****SUPERBRAINS INCLUDE MBASIC AS STANDARD*****

Due to long term contractual commitments, we are only giving restricted demonstrations by appointment at one of our London offices. We export to all countries. Contact Tony Winter on 01-636 8210 or 01-631 4818 and if unavailable then leave a call-back message (clearly stating your telephone number and name) on the 24 hour answer phone, we call back anywhere in the world.

FOR 1 YEARS WARRANTY ADD 10% HARDWARE COST. MAINTENANCE PRICES PLEASE CALL

MAIL ADDRESS G.W. COMPUTERS LTD. 55 BEDFORD COURT MANS. BEDFORD AVENUE W.C.1. LONDON
TELEX 892031 TWC G ..... BOSTON OFFICE TELEX 94-0890

CONTACT 01-636 8210 OR 01-631 4818 AND IF UNAVAILABLE THEN LEAVE A CALL-BACK MESSAGE (CLEARLY STATING YOUR TELEPHONE NUMBER AND NAME) ON THE 24 HOUR ANSWER-PHONE OR SIMPLY LEAVE YOUR ADDRESS AND WE'LL MAIL YOU A STANDARD INFORMATION PACK. WE REGRET WE DO NOT OPERATE A READER'S REPLY CARD SERVICE. TERMS: C.W.O. OR C.O.D. (PRICES EXCLUDE V.A.T.) SOFTWARE SALES ARE 'MAIL ORDER ONLY'. NO DEALERS.

IMPORTANT!!! NO HARDWARE IS ANY VALUE WITHOUT THE SOFTWARE, AND OUR SOFTWARE IS UNEQUALLED.
BUY A COMPLETE SYSTEM AND GET MOST OF THE SOFTWARE FREE



Unleash the power of your micro with Corvus hard disc networking systems.

Whatever microcomputer system you have now, or are considering buying in the future, Corvus 6, 10 and 18Mb hard-disc systems will give it a mighty boost in performance. And to exploit this power to the full, Omninet will link your computers, disc drives and peripherals in the world's fastest local microcomputer network.

Corvus hard-disc and Omninet give you massive data storage with fast access...and installation couldn't be simpler.

Corvus technology enables a micro-computer to handle 600 times more data 20 times faster than traditional floppy-based systems, and you have no more worries about damage, theft or loss of valuable information.

Using easily installed twisted-pair cable, the Corvus Omninet local network enables up to 64 microcomputers to be interconnected over 4000 feet, sharing up to 40Mb of mass storage and expensive peripherals. You get multifunction capability at each keyboard, file protection, and electronic mail at incredibly low cost.

Modems and gateways will link to other networks, providing national and international communications.

Available for Apple II and III, PET, Superbrain, S-100, IBM, Rank Xerox, NEC and DEC LSI 11.

Whether your particular application is scientific, business or educational, Corvus systems are compatible with the best micro for the job – a well-established 'favourite' or one of the recently introduced 'big names'.

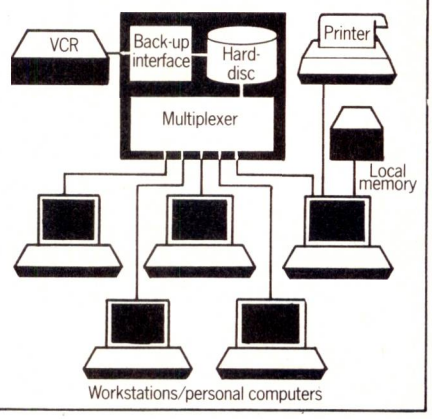
Miracle – a cost-effective network for the individual office, laboratory or classroom.

Small installations can also reap the benefits of Corvus technology. With his own dedicated computer and associated memory, each user has interference-free access to a 5, 10 or 18Mb central data-base, and communication with other computers and peripherals in the network. Miracle gives you disc storage, network multiplexing and tape back-up interface in one convenient package.

Comprehensive languages and field-proven applications software packages.

BASIC, COBOL, FORTRAN, PASCAL, ALGOL, and APL give you the choice to suit your application, and software packages include Accounting Systems, Payroll and Stock Control, Addressing/Mailing, Database Management and the Microplanner project management (PERT) control system.

Typical five-user Miracle system



Consult the experts. Ask Keen.
London 01-236 5682/3/4
Nottingham 0602 412777

Keen Computers

Please send me more information on Corvus hard-disc and networking systems.

Name_____

Position_____

Company/Establishment_____

Address_____

_____ Tel:_____

PCW9

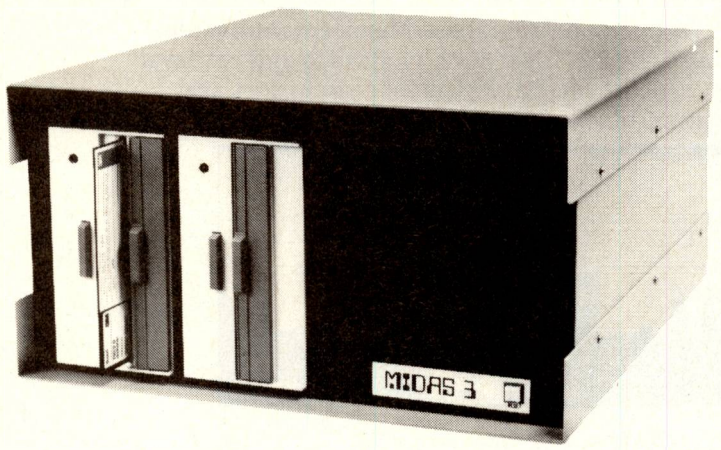
Please post to Keen Computers, Marketing Department, 5 Giltspur Street, London EC1A 9DE.

sirton computer systems

THE SPECIALISTS IN S100 SYSTEMS

MIDAS S100 SYSTEMS

MIDAS 1 : From £895
MIDAS 2 : From £1,890
MIDAS 3D : From £3,100
MIDAS 3HD : From £5,495
MIDAS 86 – 16 Bit : From £3,520



- Our versatile **Z80** Microcomputers are available as standard units or custom configured to your exact specification from a comprehensive range of stocked **S100** boards.
- Disc storage capacity of the **MIDAS 3** can be 2M Bytes, expandable to over 80M Bytes with a Winchester Hard Disc Unit in our **MIDAS 3HD** range.
- **MIDAS** runs **CP/M** and MP/M. Other Software includes M-BASIC, C-BASIC, FORTRAN, COBOL, CIS-COBOL, PASCAL and Word Processing.
- A **MIDAS 3D** with 64K RAM and 2M Bytes storage on two 8" drives with two Serial I/O Ports and CP/M only **£2,965.**
- Printers, VDUs and other peripherals stocked to give complete package system at keen prices.

BOARDS

We stock over 50 different S100 Boards from quality manufacturers: Advanced Micro Digital, Godbout, SSM, Micromation, Dual, CCS, S D Systems, Morrow, Pickles & Trout etc.

PROCESSOR
Z80 Starter Kit
Single Board Computers
8085/8088 CPU
Z80A CPU 4MHz (4 types)
8086

EPROM
2716 EPROM (2x16K)
2708/2716/2732 Programmer

VIDEO BOARDS
24x80 I/O Drive
24x80 Memory Mapped

DISK CONTROLLERS
Single Density 5" or 8
Double Density DMA
Floppy or Hard Controllers

RAM
Static RAM 16-64K 24 Bit addressing
Statis RAM 8x64K or 16x32K RAM/
Battery Back-up
Memory Manager

I/O BOARDS
2S/2P or 4S/2P or 3P/1S etc
A/D & D/A 8 or 12 bit
IEEE 488 Interface

MISCELLANEOUS
Real Time Clocks
Graphics 512x256 (B/W)
Colour Graphics 312x290
Maths Board AMD 9511
Extender Boards/Logic Probe
Motherboards 7-20 slot

We are pleased to discuss your requirements and will advise you as to whether your needs can be met with one of our computers.

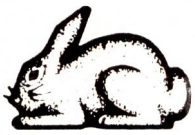
All of our systems are specials as they are configured to suit your specification, thus ensuring that you get what you want rather than what happens to be available.

Write or phone for a catalogue.

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

sirton computer systems

RABBIT SOFTWARE

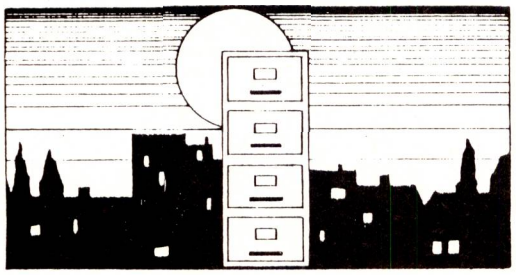


380 STATION ROAD,
HARROW, MIDDX.
HA1 2DE.

Tel: 01-863-0833

RABBIT BASE

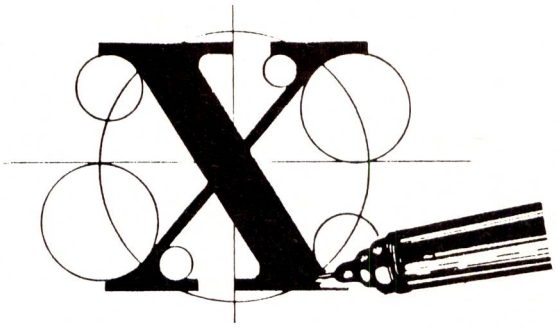
Your own personal Database Management System for your VIC-20. Ideal for any storage and retrieval of any type of record. Powerful search, sort and calculation features.



RETAIL PRICE £14.99

RABBIT WRITER

The wordprocessor for your VIC-20. This program requires 16K RAM Expansion. 'Rabbit Writer' enables the rapid and easy creation of text and its printing to the printer. 'Rabbit Writer' has powerful editing and right hand justification and has many other Word-processing features via the appropriate function keys such as indenting, centering, etc. and enables expanded characters to be printed. It also has the facility to merge i.e. names and addresses from Rabbit Base.

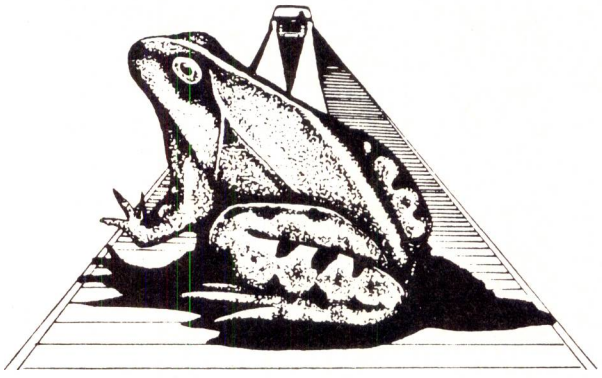


RETAIL PRICE £19.99

NOW ITS HERE !!

FROGGER

Bring the famous pub game home. First cross the motorway without getting run over and then home across logs and turtles. But beware of snakes crocodiles and submerging turtles. Incredible multi-colour mode graphics written in machine code.



RETAIL PRICE £9.99

SPACE STORM

Amazing 3D Graphics of the popular asteroid game. Superb value for money. One of Rabbits best-selling games.



RETAIL PRICE £6.99

Super Worm	£4.99	Rabbit Functions	£4.99	Cosmic Battle	£4.99
Night Flight	£4.99	Ski–Run	£4.99	Rabbit Chase	£4.99
Charpet 20	£4.99	Dune Buggy	£4.99	Code Breaker	£4.99

Available from Vic Dealers or Direct from:

Rabbit Software
380 Station Road,
Harrow, Middlesex HA1 2DE.

Telephone: 01-863 0833
Credit Cards Accepted.



RABBIT SOFTWARE

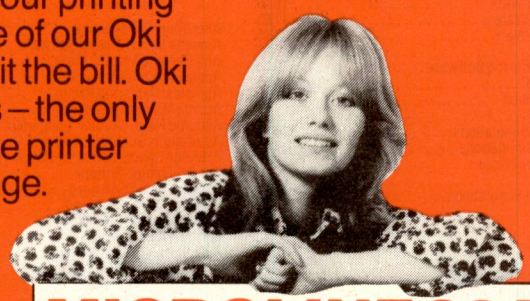
Please send me _____
I enclose cheque/PO for _____
OR Please debit my Access 5224 _____
Barclaycard 4929 _____ *Expiry date* _____
Name _____
Address _____
_____ *Code* _____
Dealers discount available
ACCESS, BARCLAYCARD ORDERS WELCOME
Mail to: RABBIT SOFTWARE
380 STATION ROAD, HARROW,
MIDDX. HA1 2DE.

X-DATA

has the right models at the right price.

Whatever your printing needs, one of our Oki printers will fit the bill. Oki Microlines – the only complete printer range.





MICROLINE 80

- 80 column
- 80 cps
- block graphics
- pin, friction or tractor feed

NOW £235

MICROLINE 83A

- Full 136 columns
- 9 x 9 matrix
- 120 cps bi-directional
- and all features of 82A

NOW £499





MICROLINE 82A

- 80 column
- 9 x 9 matrix
- 120 cps bi-directional
- multiple interface capability
- pin-addressable or block graphics
- etc., etc., etc.

NOW £349

MICROLINE 84

- Full 136 columns
- Mode 1 – 200 cps (400 cps skip)
- Mode 2 – near letter quality
- High-resolution graphics
- Down-line-loadable character set
- Total flexibility

NOW £949

Ring Jane for your local stockist

X-Data Limited, Equipment Wholesalers.

750-751 Deal Avenue, Slough Trading Estate, Slough, SL1 4SH

Telephone: Slough (0753) 72331; Telex: 847728

See us on stand 360 at the PCW SHOW

STARTECH

Absolutly the lowest prices!

apple computer apple computer apple computer apple computer apple computer

ADVENTURE

Adventure (Microsoft); Microsoft ... 13.95
Adventure In Time; Phoenix Software ... 17.95
Akalabeth; California Pacific ... 15.95
Ali Baba + 40 Thieves; Quality Software ... 17.95
Alkemstone; Dakin 5 ... 18.95
Beneath Apple Manor; Quality Software ... 10.95
Castle Wolfenstein; Muse ... 13.95
Castles of Darkness; The Logical Choice ... 17.95
Cosmo Mission; Astar International ... 13.95
Cranston Manor; On Line ... 15.95
Creature Venture; Highlands Comp Services ... 12.95
Crown Of Arthain; Micro Lab ... 16.95
Crush Crumble + Chomp; Automated Simulations ... 13.95
Curse Of Ra; Automated Simulations ... 14.95
Cyborg; Sentient Software ... 15.95
Dark Forest; Sirius Software ... 15.95
Datestones of Ryn; Automated Simulations ... 10.95
Deep Sea Treasure; Avant Garde ... 7.95
Doom Cavern + Sorcerer; Synergistic Software ... 10.95
Dragon Fire; Dakin 5 ... 21.95
Dragons Eye; Automated Simulations ... 12.95
Dungeon Campaign; Synergistic Software ... 9.95
Empire I World Builders; Edu-Ware ... 16.95
Empire II Stella Sharks; Edu-Ware ... 17.95
Empire III Armageddon; Edu-Ware ... 17.95
Epoch; Sirius Software ... 15.95
Escape From Arcturus; Synergistic Software ... 18.95
Galactic Empire; Broderbund ... 11.95
Galactic Revolution; Broderbund ... 11.95
Galactic Trader; Broderbund ... 11.95
Hellfire Warrior; Automated Simulations ... 18.95
Invasion Orion; Automated Simulations ... 14.95
Jabbertalky; Automated Simulations ... 14.95
Journey; Softape ... 10.95
Keys Of Acheron; Automated Simulations ... 10.95
Labyrinth; Broderbund ... 13.95
Mad Venture; Micro Lab ... 12.95
Missing Ring; Datamost ... 15.95
Mission Asteroids; On Line ... 10.95
Morlocks Tower; Automated Simulations ... 10.95
Mummy's Curse; Highlands Comp Services ... 14.95
Mystery House; On Line ... 11.95
Odyssey; Synergistic Software ... 14.95
Oldorf's Revenge; Highlands Comp Services ... 9.95
Palace In Thunderland; Micro Lab ... 12.95
Race For Midnight; Avant Garde ... 15.95
Rescue At Rigel; Automated Simulations ... 14.95
Rings Of Saturn; Dakin 5 ... 18.95
Soft Porn Adventure; On Line ... 13.95
Sorcerer Of Siva; Automated Simulations ... 14.95
Space Adventure; Siera Software ... 14.95
Survival Adventure; U.S.A. ... 13.95
Tarturian; Highlands Comp Services ... 12.95
Tawalas Last Redoubt; Broderbund ... 17.95
Temple Of Asphai; Automated Simulations ... 18.95
Terrorist; Edu-Ware ... 14.95
Time Zone; On Line ... 40.95
Ultima; California Pacific ... 17.95
Ulysses And Golden Fleece; On Line ... 15.95
Upper Reaches of Asphai; Automated Simulations ... 20.96
Wilderness + Dungeon; Synergistic Software ... 14.95
Wilderness Campaign; Synergistic Software ... 10.95
Wizzard + Princess; On Line ... 14.95
Zork 1; Infocom ... 19.95
Zork 2; Infocom ... 19.95

BOARD GAME

Kabul Spy; Sirius Software ... 17.95
Bishops Square; Datasoft ... 15.95
Casino; Datamost ... 21.95
Crossword Magic; L & S Computer Ware ... 26.95
Gomoku; Softape ... 10.95
Michrochess 2.0; Personal Software ... 12.95
Sargon II (Chess); Hayden ... 19.95

BOOK

Beneath Apple Dogs; Quality Software ... 9.95

BUSINESS

Address Book (Mail List); Muse ... 23.95
Apple Bullitin Board; Software Sorcery ... 43.95
Correspondant; S. W. Data Systems ... 32.95
Data Dex; Information Unlimited ... 140.95
Data Disk (Data Factory); Micro Lab ... 17.95
Data Factory; Micro Lab ... 72.95
Data Factory 5.0; Micro Lab ... 139.95
Data Graph; Hayden ... 25.95
Data Manager DB + Mail List; Hayden ... 32.95
Data Plot; Muse ... 27.95
DB Master; Stoneware ... 104.95
DB Utility Pack II; Stoneware ... 47.95
DB Utility Pack No. 1; Stoneware ... 47.95
Desk Top Plan II; Personal Software ... 131.95
Easymailer (Mail List) 40; Information Unlimited ... 33.95
Easymailer Pro. 80 Col.; Information Unlimited ... 87.95
Easymover; Information Unlimited ... 27.95
Easywriter (WP) 40 Col.; Information Unlimited ... 47.95
Easywriter Pro. 80 Col.; Information Unlimited ... 115.95
Electronic Price Sheet; Stoneware ... 41.95
Home Account; Continental Software ... 36.95
Home Money Minder; Continental Software ... 21.95
Investment Decisions; Mesa Research ... 54.95
Invoice Factory; Micro Lab ... 108.95
Letter Perfect; LJK Enterprises ... 73.95
Magic Window (WP); Artsci ... 46.95
Magic Words; Artsci ... 32.95
Mail Room; Continental Software ... 17.95
Mailing List; Software Sorcery ... 32.95
Mailing List/Database Synergistic Software ... 25.95
Micro Information System; Muse ... 16.95
Micro Memo; Stoneware ... 19.95
Modifyable Database II; Synergistic Software ... 43.95
Personal Filing Sys (PFS); Software Publishing Corp. ... 40.95
Personal Report Sys. (PRS); Software Publishing Corp. ... 40.95
Store Manager; Heyes Micro Products ... 130.95

Super Scribe II; On Line ... 62.95
Super Text II; Muse ... 68.95
Visiblend; Micro Lab ... 25.95
Visicalc; Visicorp ... 105.00
Visidex; Visicorp ... 127.95
Visifactory; Micro Lab ... 37.95
Visifile; Visicorp ... 120.95
Visiplot; Visicorp ... 98.95
Visischedule; Visicorp ... 149.95
Visiterm; Visicorp ... 53.95
Visitrend/Visiplot; Visicorp ... 148.95

GRAPHICS UTILITY

A23D2 Enhancement; Sub Logic ... 13.95
A26E1 Graphics; Sub Logic ... 32.95
Apple World; U.S.A. ... 27.95
Bill Budge 3D Graphics; California Pacific ... 17.95
Combo Enhanced Graphics; Computer Station ... 30.95
Game Animation Package; Synergistic Software ... 25.95
Hi-Res Secrets; Avant Garde ... 60.95
Higher Graphics II; Synergistic Software ... 17.95
Higher Text II; Synergistic Software ... 18.95
Histograph; Hayden ... 17.95
Painter Power; Micro Lab ... 20.95

HI RES ACTION

Alien Rain; Broderbund ... 13.95
Amoeba Man; Turnkey Software ... 18.95
Anti Ballistic Missile; Muse ... 12.95
Apple Panic; Broderbund ... 14.95
Apploids; California Pacific ... 14.95
Arcade Machine; Broderbund ... 19.95
Asteroid Field; Cavalier Computers ... 12.95
Astroapple; Quality Software ... 10.95
B. Budge Space Album; California Pacific ... 18.95
Bakers Trilogy; Softape ... 17.95
Bandits; Sirius Software ... 17.95
Beer Run; Sirius Software ... 14.95
Bloody Murder; Stoneware ... 10.95
Borg; Sirius Software ... 12.95
Both Barrels; Sirius Software ... 13.95
Bug Attack; Cavalier Computers ... 13.95
Chop Lifter; Broderbund ... 13.95
Cieling Zero; Turnkey Software ... 16.95
Computer Football; Sirius Software ... 14.95
Cops + Robbers; Sirius Software ... 14.95
County Fair; Datamost ... 12.95
Cross Country Rally; Continental Software ... 16.95
Cross Fire; On Line ... 13.95
Cyber Strike; Sirius Software ... 19.95
Cyclod; Sirius Software ... 15.95
Demon Derby; Broderbund ... 13.95
Dog Fight II; Micro Lab ... 9.95
Dung Beetle; Datasoft ... 15.95
Falcons; Piccadilly ... 13.95
Fender Bender; California Pacific ... 11.95
Fire Bird; Gebelli ... 12.95
Flight Simulator; Sub Logic ... 18.95
Fly Wars; Sirius Software ... 17.95
Frogger; On Line ... 17.95
Galaxy Wars; Broderbund ... 13.95
Gamma Goblins; Sirius Software ... 12.95
Genetic Drift; Broderbund ... 13.95
Gobblers; On Line ... 13.95
Gorgon; Sirius Software ... 17.95
Hadron; Sirius Software ... 15.95
Hi-Res Golf; Avant Garde ... 17.95
Hyperspace Wars; Continental Software ... 17.95
International Grand Prix; Riverbank Software ... 17.95
Jaw Breaker; On Line ... 13.95
Jelly Fish; Sirius Software ... 17.95
Lemmings; Sirius Software ... 15.95
Meteroids In Space; Quality Software ... 10.95
Missile Defence; On Line ... 13.95
Mouskattack; On Line ... 16.95
Orbitron; Sirius Software ... 12.95
Outpost; Sirius Software ... 12.95
Phantoms Five; Sirius Software ... 12.95
Pinball; Sub Logic ... 17.95
Pool 1.5; Innovative Design S. Ware ... 17.95
Raster Blaster; Budge Co. ... 14.95
Retro Ball; Sierra Software ... 17.95
Roach Hotel; Micro Lab ... 18.95
Sabotage; On Line ... 13.95
Shuffel Board; Innovative Design S. Ware ... 13.95
Snake Byte; Sirius Software ... 12.95
Sneakers; Sirius Software ... 12.95
Snoggle; Broderbund ... 17.95
Space Eggs; Sirius Software ... 12.95
Space Quarks; Broderbund ... 13.95
Space Warrior; Broderbund ... 12.95
Star Thief; Cavalier Computers ... 13.95
Suicide; Piccadilly ... 13.95
Swashbuckler; Datamost ... 19.95
Thief; Datamost ... 12.95
Three Mile Island; Muse ... 19.95
Threshold; On Line ... 18.95
Track Attack; Broderbund ... 13.95
Trick Shot (Pool); Innovative Design S. Ware ... 19.95
Twerps; Sirius Software ... 15.95
Zero Gravity Pinball; Avant Garde ... 15.95
Red Alert; Broderbund ... 13.95
Hi-Res Soccer; On Line ... 13.95

LANGUAGE

Asm Lang. Development Sys; Hayden ... 24.95
Expediter II Compiler; On Line ... 39.95
Fourth II (Language); Softape ... 31.95
Hayden Applesoft Compiler; Hayden ... 87.95
Lisa 2.5 6502 Assembler; On Line ... 45.95
Tasc Applesoft Compiler; Microsoft ... 80.95

STRATEGY GAME

Air Traffic Controller; Avant Garde ... 7.95
Battleship Commander; Quality Software ... 10.95
Cartels + Cuthroats; Strategic Simulations ... 17.95
Network; Edu-Ware ... 10.95
Operation Apocalypse; Strategic Simulations ... 27.95
Robot Wars; Muse ... 18.95
Shattered Allience; Strategic Simulations ... 27.95
Southern Command; Strategic Simulations ... 17.95
Tanktigs; Avalon Hill ... 14.95
Tigers In The Snow; Strategic Simulations ... 17.95
Torpedo Fire; Strategic Simulations ... 27.95
President Elect; Strategic Simulations ... 17.95

UTILITY

Apple Doc (Utility); S. W. Data Systems ... 25.95
Applesoft Prog Optimizers; Sensible Software ... 11.95
Appsoft Structured Basic; Sensible Software ... 12.95
Back It Up; Sensible Software ... 30.95
Bag Of Tricks; Quality Software ... 20.95
DDU + Single Disk Copy; Software Sorcery ... 28.95
Deadly Secrets; Broderbund ... 17.95
Disk Organiser II; Sensible Software ... 13.95
Disk Recover; Sensible Software ... 13.95
Disk Utilities; Softape ... 15.95
Dos Boss; Beagle Bros ... 13.95
Dos Plus; Sensible Software ... 12.95
Dossource 3.3 Dos Listing; Lazer ... 18.95
Linguist; Synergistic Software ... 18.95
Memory Management II; On Line ... 23.95
Multidisk Catalog III; Sensible Software ... 12.95
P.I.T.S.; Software Sorcery ... 30.95
P.U.M.P.; Software Sorcery ... 19.95
Program Line Editor; Synergistic Software ... 18.95
Programmers Utility; S.W. Data Systems ... 9.95
Quick Loader; Sensible Software ... 12.95
Super Disk Copy III; Sensible Software ... 13.95
Text Editor; On Line ... 43.95
Utility City; Beagle Bros ... 15.95

HARDWARE

Excel-9 (6809 With "Flex"); ESD Laboratory Co. Ltd. ... 164.95
Eprom Blaster 2708/16; Apparat Inc. ... 95.95
Propotyping Board; S.S.M. ... 16.95
23 Key Keypad (Visicalc); Keyboard Company ... 101.95
A.B.T. 10 Key Keypad; A.B.T. ... 65.95
Microbuffer Epson (16K); Practical Peripherals ... 86.95
Microbuffer II (16K); Practical Peripherals ... 149.95
Microbuffer II (32K); Practical Peripherals ... 186.95
Ram Card (16K) Pascal CPM; Computer Stop ... 49.95
10 Meg Hard Disk System; Computer Stop ... 1644.95
Videx 80/24 Video Card; Videx ... 179.95
Omnivision 80/24 Video; Computer Stop ... 144.95
Videx Inverse Rom; Videx ... 14.95
Videx Switch Plate; Videx ... 12.95
Videx Graphics Eprom; Videx ... 14.95
U Term 80/24 Video Card; U Micros ... 151.95
Videx Soft Switch Card; Videx ... 18.95
Z80 Softcard; Microsoft ... 203.95
U Z80 (Z80 Card); U Micros ... 72.95

Z80 CPM (Z80 Softcard Required)

Calc Star; Micro Pro ... 73.95
Data Star; Micropro ... 102.95
DBase II Relational DBase; Ashton Tate ... 318.95
Mailman; Standard Micro ... 65.95
Mailmerge; Micropro ... 47.95
Select (WP); Select Information ... 176.95
Select + Superspell; Select Information ... 247.95
Spell Star; Micropro ... 69.95
Supercalc; Sorcim Corp ... 164.95
Wordstar; Micropro ... 137.95
DBase II Manual; Ashton Tate ... 33.95
Alds Z80, 8080 Assembler; Microsoft ... 57.95
C Basic; Compiler Systems ... 75.95
Fortran 80; Microsoft ... 90.95
Mac Macro Assembler; CCS ... 54.95
Basic Compiler (MBasic); Microsoft ... 172.95
Bstam Micro to Mainframe; Byrom ... 108.95
Bstam Micro To Micro; Byrom ... 108.95
Fabs B Tree File Access; Computer Control ... 108.95
Tex (Text) Formattter); Digital Research ... 43.95

Please send me _____

I enclose cheque/P.O. for _____

NAME _____

ADDRESS _____

Please add VAT at 15% to all orders.
Postage FREE in U.K.
Dealers Discount Available.
Access, Barclaycard orders Welcome on 051-256 8244

BARCLAYCARD VISA Access

STARTECH
63 Lisburn Lane
Tuebrook, Liverpool, L13 9AF

Expand Your Marketplace

with the UCSD p-System Version IV

If you are developing applications packages the UCSD p-System now lets you reach the widest possible marketplace with the minimum investment and the minimum of fuss.

The "p-machine"
The p-System was developed at the University of California at San Diego (UCSD) from the concept of an "ideal machine" which can be mimicked by any ordinary microprocessor (in which the machine architecture is dictated by production convenience), and it allows the generation of screen and processor independent software.

Independence established at last
The system has a new release, Version IV, and already it's very popular. It's fitted and running on the latest microcomputers being delivered by IBM, Apple, ITT, Texas Instruments, Philips, Xerox, DEC, Tandy, Northstar, Altos, Osborne, Superbrain and others.

The same friendly face
On each of these machines, the user is presented with the same friendly face, the same easy-to-use operating system, the same p-machine code. So the same programs run without recompilation. And it helps you write very large programs too - with lots of separately constructed pieces, programs can be much larger than the memory of your machine.

What you get
The UCSD p-System gives you a complete programming development system which lets you write programs in UCSD Pascal. You get a screen editor, a line oriented editor, a compiler for UCSD Pascal, a native code assembler, a linker, a debugger, a filer and a host of utilities - such as disk recovery.

Other machines
In addition to the systems listed in the coupon below, fully fitted systems can also be obtained on request for the following machines - IBM Personal Computer, TRS80 model II or III, Superbrain, Altos 8000, LSI 11, Xerox 820.

Qty	Item	Unit Price	Total
	UCSD p-System for Northstar Horizon (includes User Manual) Ready to run	£425	
	Z80 Adaptable System (includes User Manual, Installation Guide, Internal Architecture Guide) Requires fitting & disk conversion	£455	
	CPM Adaptable System (includes User Manual, Installation Guide, Internal Architecture Guide) 8" IBM SS SD Disk Sectors 128 bytes	£455	
	Version IV User Manual	£45	
	Version IV Installation Guide	£15	
	Version IV Internal Architecture Guide	£15	

I enclose a cheque/postal order to Microtraffic Systems Ltd for £ _____ (total unit price plus 15% VAT)

OR Please charge my credit card account Access ☐
Barclaycard ☐ American Express ☐

Signature _____
Name _____
Position _____
Company _____
Address _____

Tel _____

Microtraffic Systems Limited
45/46 Chalk Farm Road,
London NW1
Tel: 01-485 9190 / 24 hour service 01-485 3781

MICROTRAFFIC SYSTEMS

UCSD p-System is a trademark of the Regents of the University of California

Kuma Computers Limited

11 York Road, Maidenhead, Berks. SL6 15Q
Tel: (0628) 71778 9 Telex: 849462 TELFAC KUM

PROFESSIONALS IN SOFTWARE APPLICATIONS:INTERFACING

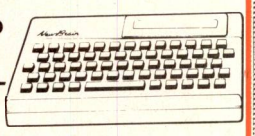
Sirius - 1.
The best price/performance you've ever seen on a **personal computer: £2395 + VAT For 128K, 1.2 Mbyte, 16 bit, available software includes:- CP/M86, MSDO, Mbasic, COBOL, PASCAL, FORTRAN. etc.**



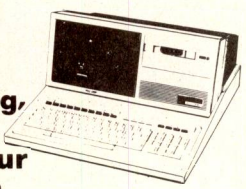
Osborne - 1: **You can take it anywhere. CP/M + 64K RAM, Dual discs interfaces and Wordstar, Super Calc, Mbasic. All for £1250.00 + VAT. Ask us about additional software.**



Newbrain:
The only professional micro of this size: Phone us for immediate *FREE* delivery + SOFTWARE CATALOGUE Newbrain AD with onboard display £232.61 + VAT.

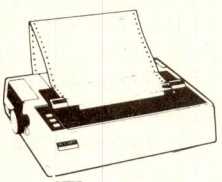


SHARP A + B;
Computers and systems with a *Wealth of software applications* programs. "WDPRO" Wordprocessing, Database, Accounts, Mail Lists etc. Phone Now for our new Autumn 170 Program Catalogue.



SHARP ≡ KUMA ≡ SOFTWARE

Printers:
Matrix **- from £380.00 + VAT.**
Epson **Mx 80F/T3 *NEC (C.itoh)***
Daisywheel **- from £476.50 + VAT.**
Brother **8300 *Tec*** **Star Writer**



Applications:
Direct experience of office applications, phone us for advice on ledgers, stock control, payroll and word processing.

Software: **the established leader for Sharp Computers.**
Training: **Financial planning, information storage and word processing. One day introductory seminars.**

MAIDENHEAD (0628) 71778

Kuma Computers Ltd.,11 York Road, Maidenhead, Berks. SL6 1SQ.
Tel: (0628) 71778/9 Telex: 849462 TELFAC Kum

CRA

AS THINGS GET TOUGH

As a man thinketh, so he will be
This is a major breakthrough programme in human development disiplines which is destined to effect the lives of thousands of thinking men and women. It engages a remarkable new concept – **A MULTI-DIMENSIONAL APPROACH TO HUMAN SUCCESS AND TOTAL ACHIEVEMENT**

WHAT DO YOU DESIRE? UNFORTUNATELY, THIS PROGRAMME CAN ONLY OFFER TOTAL WINNING KNOWLEDGE, THE BASIC ELEMENT SO ABSOLUTELY NECESSARY FOR POSITIVE HUMAN DEVELOPMENT.



A must for the Listening Library of every thoughtful man and woman
GROWTH and RENEWAL

Develop The Action Qualities And Success Attitudes of the Winner

POSITIVE SELF-IMAGE
POSITIVE SELF-CONTROL
POSITIVE SELF-DIRECTION
POSITIVE SELF-AWARENESS

Even the first instructional tape will return to you many times over in the form of valuable self-redirection and attitude reinforcement, your investment.

POSITIVE SELF-DISCIPLINE
POSITIVE SELF-ESTEEM

POSITIVE SELF-EXPECTANCY
POSITIVE SELF-MOTIVATION
POSITIVE SELF-PROJECTION
POSITIVE SELF-DIMENSION

ACTION
Each unit of human life is composed greatly from dreams derived from the unconscious. He who has the ability and know-how to translate them into positive reality, will truly be placed amongst the great. **Anais Nin**
BROADSIDE 1 – THE INSTRUMENT OF HUMAN DEVELOPMENT

SELF-REALIZATION
A lesson in winning – Broadside 1 is not a psychological gimmick but a profound professional in-depth study into the attitudes and the qualities that go into the formation of the total winner. It is a programme based upon years of exhaustive research, using clinically controlled feedback studies, into the ever present human desire for success and achievement as the basic motivating winning force that brings men and women alike to the forefront of our society. It is a unique and masterful attempt to define and to formulate into a controlled audio pack, the exact guide lines for creating the winner.

The motivated need
Have you ever given thought as to why some people are more successful than others? The secret of the successful lies in direct relation to their positive attitudes and their defined purpose control.

BB

To: Broadside Associates
2 The Spinney
North Cray
Kent

GUARANTEE
I understand that if I am not fully satisfied, I can, within 15 days after despatch, return the complete programme and obtain a full refund.

Please send me the full Broadside 1 programme for which I enclose a cheque/postal order (crossed) for the sum of £25 (inc VAT and Postage) made payable to BROADSIDE (allow a maximum 28 days for delivery)

PLEASE PRINT

Name . . . . . .

Address . . . . . .

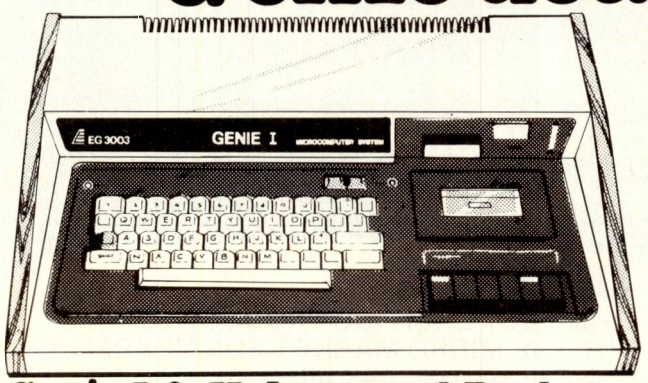
. . . . . .

Postcode . . . . . County . . . . . .

THE HUMAN RESOURCES ORGANISATION

BROADSIDE ASSOCIATES
2 THE SPINNEY, NORTH CRAY, KENT
Tel: 01-302 9119

Wherever you are in the UK there's a Genie dealer nearby





Genie I & II Approved Dealers

AVON Microstyle, Bath, 0225 334659/319705. **BEDFORD** Comserve, Bedford, 0234 216749. **BERKSHIRE** P.C.P., Reading, 0743 589249. Castle Computers (Windsor), 07535 58118. **BIRMINGHAM** Ward Electronics, Birmingham, 021 554 0708. Consultant Electronics, Birmingham, 021 382 7247. A. E. Chapman and Co., Cradeley Heath, 0384 66497/8. **BUCKINGHAMSHIRE** Photo Acoustics, Newport Pagnell, 0908 610625. **CAMBRIDGESHIRE** Cambridge Micro Computers, Cambridge, 0223 314666. **CHESHIRE** Hewart Electronics Macclesfield, 0625 22030. Mid Shires Computer Centre, Crew, 0270 211086. **CORNWALL** A B & C Computers, 11 Brockstone Road, St. Austell, Cornwall, St. Austell 64463. **CUMBRIA** Kendal Computer Centre, Kendal, 0539 22559. **DORSET** Blandford Computers, Blandford Forum, 0258 53737. Parkstone Electrics, Poole, 0202 746555. **ESSEX** Emprise, Colchester, 0206 865926. **GLOUCESTERSHIRE HAMPSHIRE** Fareham Computer Centre, Fareham, Hampshire, Fareham,231423, **HERTFORDSHIRE** Photo Acoustics, Watford, 0923 40698. Q Tek Systems, Stevenage, 0438 65385. Chrisalid Systems and Software, Berkhamsted, 044 27 74569. **KENT** Swanley Electronics, Swanley, 0322 64851. **LANCASHIRE** Harden Microsystems, Blackpool, 0253 27590. Sound Service, Burnley, 0282 38481. Computercat, Leigh, 0942 605730. BEC Computerworld (Liverpool) 051-708 7100. **LEICESTERSHIRE** Kram Electronics, Leicester, 0533 27556. **LONDON** City Microsystems, EC2, 01 588 7272/4. Wason Microchip, N18, 01 807 1757/2230. Premier Publications, Anerley SE20, 01 659 7131. **NORTH EAST** Briers Computer Services, Middlesborough, 0642 242017. General Northern Microcomputers, Hartlepool, 0783 863871. HCCS Associates, Gateshead, 0632 821924. **NOTTINGHAMSHIRE** Midland Microcomputers, Nottingham, 0602 298281. Mansfield Computers, Mansfield, 0623 31202. East Midland Computer Services, Arnold, 0602 267079. Electronic Servicing Co., Lenton, 0602 783938. **NORFOLK** Anglia Computer Centre, Norwich, 0603 29652. Bennetts, Dereham, 0362 2488/9. **OXFORDSHIRE** Micro Business Systems, Whitney, 0993 73145. Pebbleglow Ltd. (Thame) 084421 5368. **SCOTLAND** Esco Computing, Glasgow 041 427 5497. Edinburgh: 031 557 3937. Computer and Chips Ltd. St. Andrews, 0334 76206. Scotbyte Computers, Edinburgh, 031 343 1055. Victor Morris and Co., Glasgow, 041 221 8958. **SHROPSHIRE** Tarrant Electronics, Newport 0952 814275. **SOUTH WEST** Diskwise, Plymouth (0752) 267000. West Devon Electronics, Yelverton, 082 285 3434. Bits and Bytes, Barnstaple, 0271 72789. **SUFFOLK** Elgelec Ltd., Ipswich, 0473 711164. **SURREY** Catronics, Wallington, Surrey, 01 669 6700/1. Croydon Computer Centre, Thornton Heath, 01 689 1280. **WALES** Tryfan Computers, Bangor, 0248 52042. **WEST MIDLANDS** Allen TV Services, Stoke on Trent, 0782 616929. **WILTSHIRE** Everyman Computers, Westbury, 0373 823764. B&D Computing (Swindon), 0793 762449. **YORKSHIRE** Media 5 Ltd; Sowerby Bridge 0422 33580. Advance TV Services, Bradford, 0274 585333. Huddersfield Computer Centre, Huddersfield, 0484 20774. Comprite, Bradford, 0274 668890. Superior Systems Ltd., Sheffield, 0742 755005. Photo Electrics, Sheffield, 0742 53865. Ebor Computer Services (York) 0904 791595. **NORTHERN IRELAND** Business Electronic Equipment, Belfast, 0232 46161. Brittain Laboratories, Belfast 0232 228374.

Sole Importers:

LOWE electronics

Chesterfield Road, Matlock, Derbyshire DE4 5LE.
Telephone: 0629 4995. Telex: 377482 Lowlec G.

DATALINK

MICROCOMPUTER SYSTEMS (U.K.) LIMITED

Microcomputer hardware and software for business, educational, industrial and scientific application.

Apple

WE ARE THE BIGGEST SUPPLIER IN THE WEST COUNTRY
Why? – We're the longest established, friendliest, the most experienced AND we give superlative service and advice.
This adds up to the best deal in Apples you'll find at the most sensible prices.

Give us a call for all Apple requirements.

Osborne 1

THE MOST EXCITING PRODUCT TO HIT THE MICRO MARKET FOR YEARS!
The fully portable 64K micro – printer, VDU, disks, mains/batteries together with a tremendous Software package worth £800 alone!
only £1250!! (Ex VAT)
AND LOOK AT OUR SPECIAL BONUS OFFER!
A FREE 12" Green Monitor and A Box of Top Quality BASF DISKS in a Library CASE – WORTH £200!! All FREE with each OSBORNE

BASF Diskettes

Genuine German made First Quality
FULLY GUARANTEED
Per Box 10
5¼"

Single sided, single density, soft sectored	£13.50
Single sided, double density, soft sectored	£17.50
Double sided, double density, soft sectored	£20.30

P&P 50p Prices ex VAT

We stock the full BSF range

SPECIAL OFFERS

VIC 20 COLOR COMPUTER – £169.00 inc VAT (Plus £2 Carriage)
ZENITH 12" GREEN MONITOR – £99.00 ex VAT (Plus (£5 Carriage)

HUNDREDS OF SPECIAL SOFTWARE OFFERS – eg NEW VISICALC 3.3 £112

DATALINK

MICROCOMPUTER SYSTEMS (U.K.) LIMITED
10, Waring House, Redcliffe Hill,
Bristol BS1 6TB.
Tel: Bristol (0272) 213427

Authorised Dealer and Service Centre for
apple computer commodore COMPUTER

24hr answering service

To: **DATALINK MICROCOMPUTER SYSTEMS (U.K.) LIMITED**

Please send:
- ☐ Full Price List
- ☐ Quotations for (please attach details)
- ☐ Items listed (cheque enclosed)

Name .....

Address .....

.....

Tel No. .....

Just when you thought it was safe to go back to the keyboard. . .



ASYLUM II

. . . THE ADVENTURE CONTINUES. The graphics wizardry of Frank Corr and the deadly imagination of William Denman have once again joined forces to produce a world of evil genius. Hordes of maddened army ants will pick your bones. Killer clowns will send you screaming. Clever guards will tax your ingenuity. And a hundred other confrontations with a nightmare world may leave you a babbling idiot.

Graphics are instantaneous and three-dimensional. The building has over 1500 locations. Full English sentences may be entered, with comprehension surpassing the legendary Asylum I.

You need not have seen Asylum I in order to master Asylum II. You will need cunning and stealth to survive this newest world of insanity.

The industry greeted Asylum I with one word. INCREDIBLE. For Asylum II, only one word is required . . . AWESOME!

TRS80 Model I/Model III/ Tape: £11.75
Disk: £13.50.

ANGLO AMERICAN SOFTWARE CO.

138a, STRATFORD ROAD, BIRMINGHAM B11 1AG. Tel. 021-771 2995

NEC 8023B-C

FAST 100CPS
DOT MATRIX PRINTER/PLOTTER FASTER THAN MX80!
BETTER GRAPHICS THAN OKI 82A!



The Most Advanced Low Cost Printer Outstanding Graphics, Print Quality & Performance

Recommended Price £399

Our Price £350 carriage free plus VAT = £402.50 inc.

Plus free box of paper (2,000 sheets 11" x 9¼") worth £20!

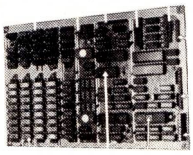
Stand Alone Serial Interface (to 9,600 baud) with PSU & 4K buffer £115 inc.

- ☐ 100CPS print speed
- ☐ Bi-directional logic seaking — increment mode
- ☐ 80, 136 column
- ☐ High resolution dot graphics — 144 x 160 dots/inch
- ☐ proportional spacing
- ☐ 7 x 9 dot matrix for alphanumerics & symbols
- ☐ 8 x 8 dot matrix for character generator graphics
- ☐ Output to printer on character by character or dot by dot basis
- ☐ Auto reversal (up to down) of ribbon maintains clarity for long period
- ☐ ASCII 96 characters — JIS 160 characters — character generator graphics 64 characters — European 14 characters
- ☐ Horizontal & vertical tabbing
- ☐ Lower case descenders
- ☐ Superscript subscript, underlining
- ☐ Several character sizes & styles (Pica, elite, proportional, reduced, enlarged, enhanced etc)
- ☐ 5 unique alphabets
- ☐ Greek and Math symbols
- ☐ Adjustable tractors
- ☐ Single sheet friction feed
- ☐ Powerful programmable paper feed
- ☐ Special ribbon cartridge
- ☐ Backward carriage return
- ☐ 4.5" to 10" paper width
- ☐ Original plus 3 copies
- ☐ Centronics type parallel interface (standard)
- ☐ 2K Buffer

Optional plug-in serial (RS232C) interface with own PSU, selectable baud to 9,600 and 4K buffer £99 + £1 P&P + VAT = Total £115

THE BIGBOARD

OEM — INDUSTRIAL — BUSINESS — SCIENTIFIC
SINGLE BOARD COMPUTER PCB



Vast user group & biomonthly Journal "MICROCORNUCOPIA" details sent with documentation.

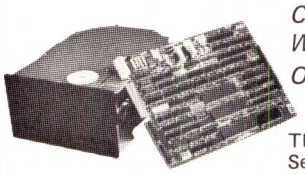
- ☐ 64K RAM
- ☐ 2 x RS232
- ☐ 24 x 80 characters
- ☐ Parallel ASCII Keyboard Port
- ☐ Real Time Clock
- ☐ 2K System Monitor
- ☐ Size: 8½" x 13¾" same size as an 8" drive
- ☐ Z80 CPU
- ☐ Two Port parallel
- ☐ Video Port
- ☐ Floppy Disk Controller (1771) for up to 4 8" SSSD drives
- ☐ Runs CP/M 2.2
- ☐ 2K Character Generator (upper & true lower case)
- ☐ Requires +5V @ 3A, ±12V @ 0.5A

Available ONLY as blank PCB which comes complete with full documentation, the Character Generator ROM, the PFM 3.3 Monitor ROM and a diskette with the Source of BIOS, BOOT, PFM 3.3 Monitor and Printer Routines

£115 + £5 P&P + VAT = Total £138

XEBEC S1410

THE DEFINITIVE LOW-COST CONTROLLER FOR 5¼ INCH WINCHESTER DISK DRIVES
ONLY £260 + VAT = £299 inc.



The Industry standard Xebec S1410 5¼" Seagate compatible disk drive controller provides a compact, cost-effective, field-proven microprocessor-based controller to operate up to two drives.

- ☐ Extremely low power requirements
- ☐ Industry standard Host Interface (SASI)
- ☐ Automatic error correction
- ☐ Exactly fits theform factor of 5¼" drives
- ☐ Complete on-board data separator logic
- ☐ Multi-sourced gate array technology
- ☐ User programmable drive characteristics
- ☐ Burst error length status reporting
- ☐ Compact PCB design
- ☐ Extensive controller and drive diagnostics

Apple II Host Adaptor £100 + VAT (£115 inc.)
S100 Host Adaptor £150 + VAT (£172.50 inc.)
IBM Personal Computer Host Adaptor £150 + VAT (£172.50 inc.)



maxell

Floppy Disks

Ultimate in Quality — Manufactured & tested to meet MIL-STD-105-D !
Better than DYSAN ! WHY SETTLE FOR LESS? MAXELL diskettes are regarded as the standard that all others attempt to duplicate.
Certified 100% error free over the entire recording surface.

5¼" Specify Soft or 16 Sector when applicable
(MD = Softsectored MH = Hard 16 Sector)

MD1	or MH 1	SS/SD	£25 for box fo 10 (£28.75 inc.)
MD1D	0r MH1D	SS/DD	£30 for box of 10 £34.50 inc.)
MD2D	or MH2D	DS/DD	£35 for box of 10 £40.25 inc.)
MD1DD		SS/QD/96TPI	£35 for box of 10 (£40.25 inc.)
MD2DD		DS/QD/96TPI	£45 for box of 10 (£51.75 inc.)
MD2HD	NEW	DS/High density/96TPI 154 tracks for new YE-DATA YD380T 1.6Mbyte drive . . . . . P.O.A.	

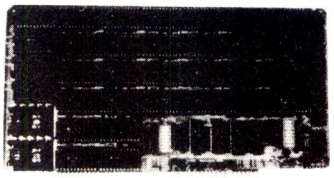
8"	(FD = Softsectored FH = Hard 32 Sector)	
FD1-128	Soft SS/SD Preinitialized IBM format 26 sectors 128 bytes	£30 for box of 10 (£34.50 inc.)
FH1-32	Hard SS/SD 32 sectors Preinitialized IBM format 26 sectors 256 bytes	£30 for box of 10 (£46.00 inc.)
FD2-512D	Soft DS/DD Preinitialized IBM format 15 sectors 512 bytes	£40 for box of 10 (£46.00 inc.)
FD2-1024D	Soft DS/DD Preinitialized IBM format 8 sectors 1024 bytes	£40 for box of 10 (£46.00 inc.)
FD2-XD	Soft DS/DD Uninitialized Can be formatted to any byte confirguration	£40 for box of 10 (£46.00 inc.)
FH2-32D	Hard DS/DD 32 Sectors	£40 for box of 10 (£46.00 inc.)

64K S100 STATIC RAM

NEW!

LOW POWER!

RAM OR EPROM!



Supplied as partial Kit
Blank PCB + Docu. + 64K SRAM (32 x TMM2016P 150NS RAMS)
ONLY £130 + VAT (£149.50 inc.)

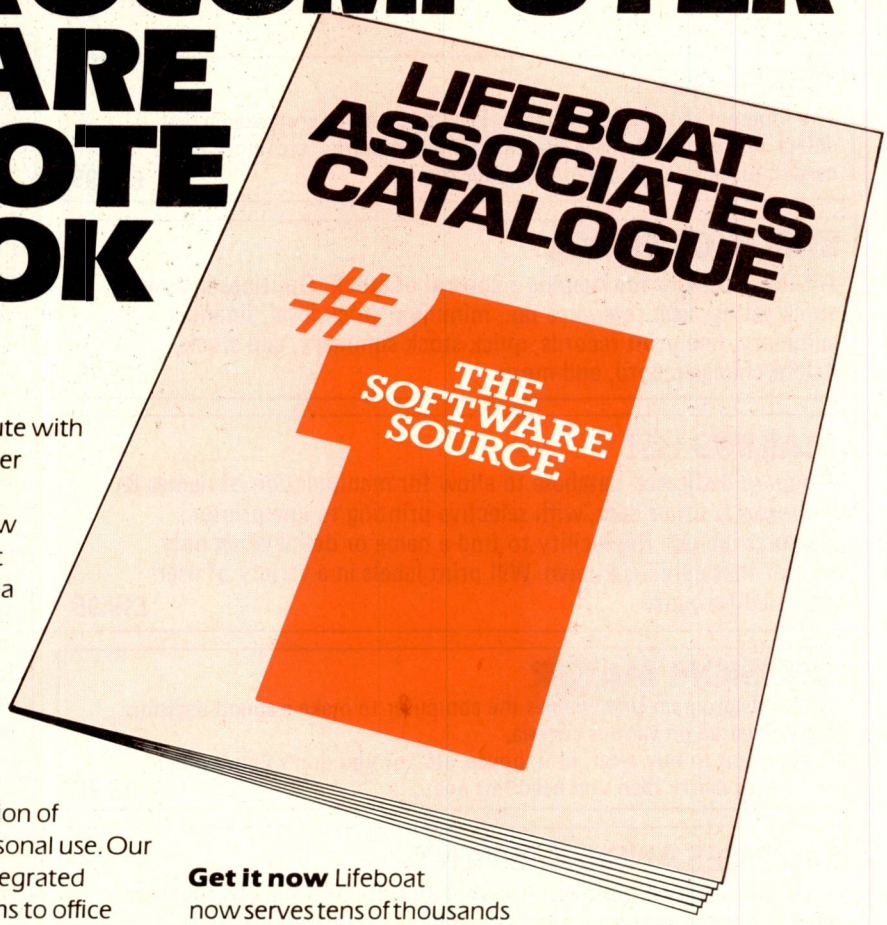
Blank PCB + Docu. ONLY £50 + VAT £57.50 inc.)
TMM2016 150NS (2Kx8) Chips ONLY £2.80 plus VAT

FEATURES
- * Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- * Fully supports IEEE 696 24 BIT Extended Addressing.
- * 64K draws only approximately 500 MA.
- * 200 NS RAMs are standard. (TOSHIBA makes tmm 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- * SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
- * 2716 EPROMs may be installed in any of top 48K.
- * Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
- * Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
- * BOARD may be partially populated as 56K.

Vincelord Ltd

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

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 **PCW/9/82**

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)

TI-99/4A * VIC 16K * ATARI 400/800 * SHARP MZ-80K/A/B * BBC MICRO * SINCLAIR SPECTRUM

Functional cassette software by Dale Hubbard

Buy 2 at £19.95 - take 1 at £5.95 FREE!!!

DATABASE

The program that everyone needs. Facilities include sort, search, list, delete, change, totals, save file, line print if required, etc. etc. Can be used in place of any card index application. **£19.95**

STOCK CONTROL

All the necessary for keeping a control of stock. Routines include stock set up, user reference no., minimum stock level, financial summary, line print records, quick stock summary, add stock, delete/change record, and more. **£19.95**

MAILING LIST

A superb dedicated database to allow for manipulation of names & addresses & other data, with selective printing to line printer. Features include the facility to find a name or detail when only part of that detail is known. Will print labels in a variety of user-specified formats. **£19.95**

DECISION MAKER

A serious program that enables the computer to make a sound decision for you based on various criteria.
If you want to buy a car, hi-fi, house, etc., or you don't know which woman to marry then you need this one. **£5.95**

INVOICES AND STATEMENTS

Ideal for the small business. A complete suite of programs together with generated customer file for producing crisp and efficient business invoices and monthly statements on your line printer. All calculations including VAT automatic and provision for your own messages on the form produced. *Not Spectrum **£19.95**

RUBIK SOLVER

It's not our policy to offer games but we make an exception here for a program to solve the cube from ANY position. Shorthand notation makes learning the solution by heart possible for most active brains. **£12.95**

THE CATALOGUER

This dedicated database is ideal for use in any situation where a catalogue could be utilised. E.g. stamp collection, coins, photos, slides, books, records etc. **£19.95**

COMMERCIAL ACCOUNTS

A gem of a program, all for cassette, with the following features:—

Daily Journal
Credit Sales
Cash Sales
Credit Purchases
Purchases – other
Sales Ledger
Purchase Ledger
Bank Account
Year to Date Summary

A fully interactive program suitable for all businesses. Files can be saved and loaded and totals from one file carried forward to another on cassette. Particularly useful from a cash flow point of view, with an immediate accessibility to totals for debtors and creditors. Bank totally supported with entries for cheque numbers, credits and, of course, running balance. **£19.95**

HOME ACCOUNTS **£19.95**

Runs a complete home finance package for you with every facility necessary for keeping a track of regular and other expenses, bank account, mortgage, H.P. etc etc etc!! You'll wonder how you ever managed without it.

CHOPIN - LES ETUDES

Six beautiful studies from Opus 10 and 25 performed for you live by Mr. Computer Spellbinding!!! *Not Spectrum **£5.95**

MOTOR ACCOUNTANT

Find out exactly what that car is costing you and keep a data file with all your expenses therein! **£5.95**

RECIPE FILE

Let all those computer widows have a bash! The wives will really enjoy the fun of this program designed to keep all her recipes. Will even suggest a menu for the day/week! Excellent value.

£19.95

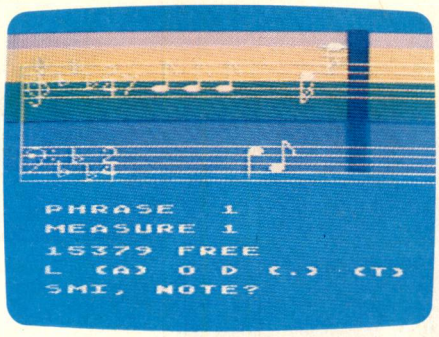
All programs supplied with exhaustive documentation.
Send cheque or P.O. or Cash (registered) or Credit Card no. to:

Gemini Marketing Ltd

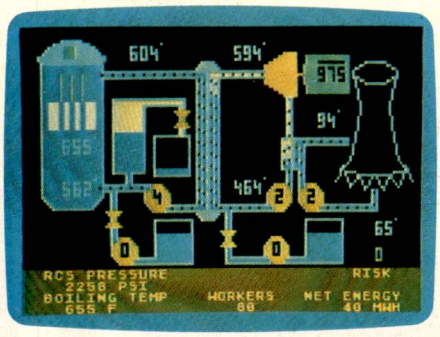
Dept PCW (4) **9 Salterton Road, Exmouth, Devon EX8 2BR**
Or telephone us with your credit card order on **(03952) 5832**
All orders despatched by return – no waiting.
All prices include VAT and post & packing except Hardware. Full range of Sharp peripherals available – please 'phone for quotations.
Please state machine type and memory size when ordering software.



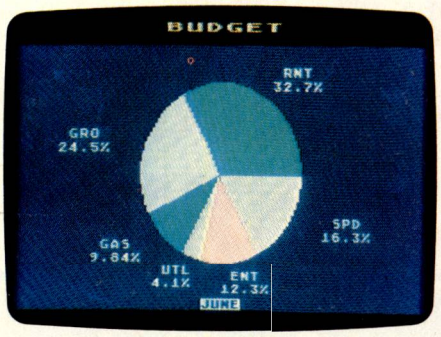
Access Welcome



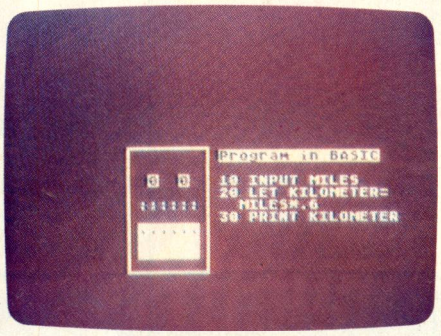
Music Composer



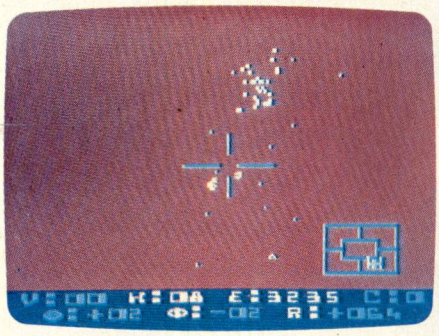
Scram



Graph-it



Intro to BASIC 1



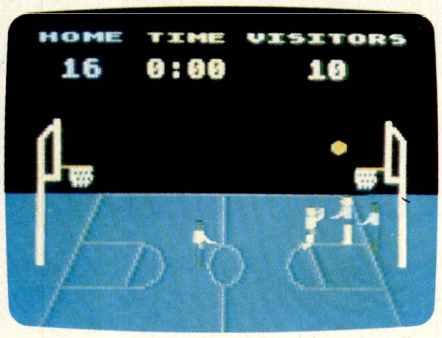
Star Raiders



European Countries



Missile Command



Basketball

3.7 million reasons why the Atari Home Computer is something to see. The display screen used with our computers is composed of 192 horizontal lines, each containing 320 dots. Delivering colour and luminosity instructions to each dot for a second requires 3.7 million cycles...a lot of work for the normal 6502 processor.

That's why the Atari computer has equipped its 6502 with its own electronic assistant. It's called ANTIC, and it handles all the display work, leaving the 6502 free to handle the rest. What this means to you is uncompromisingly spectacular display capabilities without loss of computer power needed to carry out the demands of your program.

That's a quality you just don't find in ordinary home computers. And it's one of the reasons some computer experts say that Atari computers are so far ahead of their time.

There's more...which is what you'd expect from Atari Language. The Atari Home Computer uses several programming languages to give the user maximum control of its extraordinary capabilities. PILOT, Microsoft BASIC and Atari BASIC are understood and spoken by the Atari computer. You'll also find our Assembler Editor cartridge indispensable for machine language programming.

Sound. An Atari computer has four sound generators, or voices, activated by a separate microchip. This leaves the principal microprocessor chips free to perform other tasks. And you can take full advantage of this capability which is designed for easy programming.

Change. Atari Home Computers have been designed to make change and expansion easy. The Atari computer has a modular operating system that can be easily replaced as new technology develops. If you need it, memory expansion requires no more than inserting additional RAM modules.* And the Atari ROM cartridge system also makes it easy to change languages. In short, your Atari computer won't become obsolete by future developments...because it already incorporates the future.

Sharing. To learn more about the amazing capabilities of Atari Home Computers, either visit your local dealer or fill in the coupon below.

THE GRAPHIC DIFFERENCE BETWEEN ATARI® COMPUTERS AND ALL THE OTHERS.

*Atari 800™ computer only.



Please send me FREE a brochure, price list and the address of my nearest stockist.

Name_____

Address_____

_____

_____

PCW 3

Atari International (UK) Inc.
Windsor Hse., 185-195 Ealing Road, Alperton, Wembley, Middlesex.

ATARI®

A Warner Communications Company

THE VERSATILE COMPUTER

with the features you need for TODAY and TOMORROW

*Z-80
(8 bit processor)
*8088
(16 bit processor)
*128K ram
*8035 keyboard
processor
*S-100 slots

*Green phosphor
high resolution
screen
*Integrated
floppy & winchester
disc drives
*Detatched
ergonomic
keyboard



The Vector 4 is an advanced 8/16 bit desk top computer.
It allows you to take advantage of the existing 8 bit CP/M programs while also providing 16 bit processing power.
The future is built into the Vector 4 with its Z-80 and 8088 processors,

128k of main memory (expandable to 256k), 3 S-100 expansion slots and standard software facilities with high resolution graphics that are second to none. Floppy disc and hard disc systems are available. Nationwide sales and servicing.

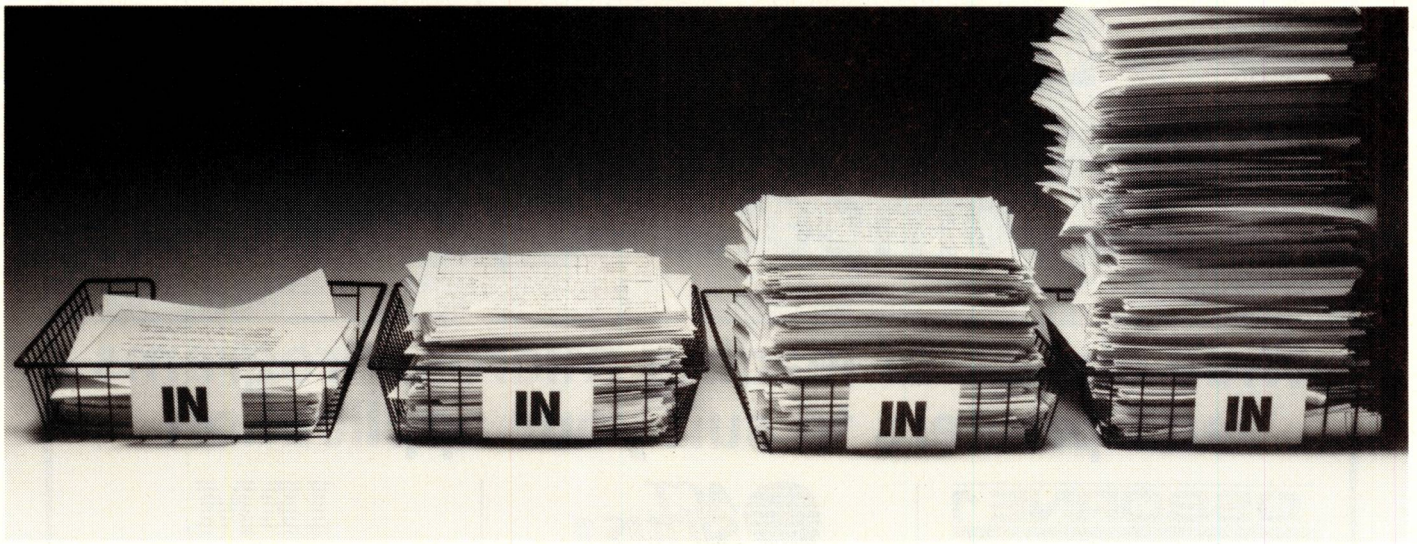
Let ALMARC show you tomorrow's computers today.

Almarc
DATA SYSTEMS

Almarc Data Systems Ltd,
Great Freeman Street,
Nottingham NG3 1FR.
Tel: (0602) 52657
Telex: 37407 Almarc/G

Almarc Data Systems Ltd,
Ward International Building,
Green Street,
High Wycombe,
Bucks. HP11 2RF.
Tel: (0494) 23804.

FOR TOMORROW'S SYSTEMS TODAY



Now there's a personal computer with the power to take your growing needs in its stride.

The ICL Personal Computer

Choosing the wrong personal computer can work out very costly, because though they grow to meet your needs, they just don't grow enough.

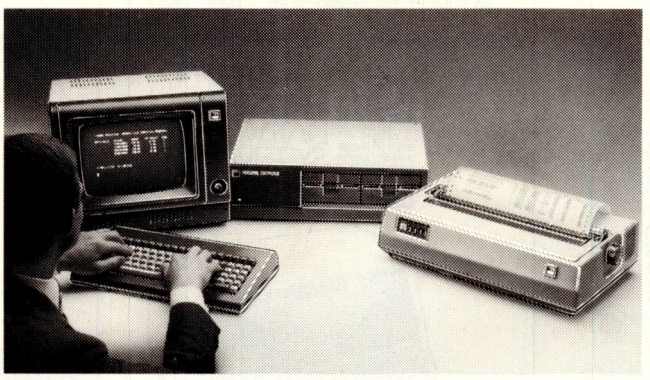
The new ICL Personal Computer gives you more.

It's a versatile, professional personal computer. It can start with a single Visual Display Unit, naturally, and it has a wide range of functions to meet your increasing requirements.

And it can grow larger than most other personal computer systems, because its capacity for additional hardware is greater.

Starting at £2,925 with one VDU.

The ICL Personal Computer provides a range of options enabling you to have a system tailored to meet your changing needs.



For example, by adding a fixed-disc, you can have eight times the original storage capacity, and support up to 4 VDUs. And there is an extensive range of Personal Computer hardware.

Wide range of application software available, providing limitless possibilities.

So your secretary can do her word processing, you can do your forecasts, and your accountant can do the invoicing, all at the same time.

That's what makes the ICL Personal Computer more than just a personal computer.

And because ICL is Europe's leading computer company, with thousands of satisfied users in over 80 countries worldwide, we can offer ICL Trader Point service back-up that's second to none.

What more could you ask for, apart from a demonstration?

ICL
trader point

To: ICL Trader Point, ICL House, Putney, London SW15 1SW.
Please send me further information on the new ICL Personal Computer.

Name _____ Position _____

Company Name & Address _____

_____

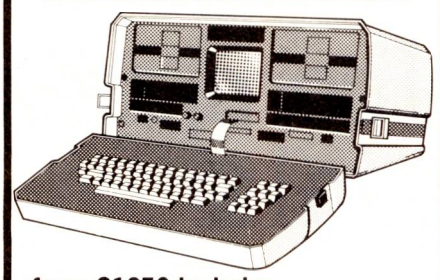
Telephone _____

Type of Business _____ PCW2

Look into Inchico. Professional micro systems at competitive prices.

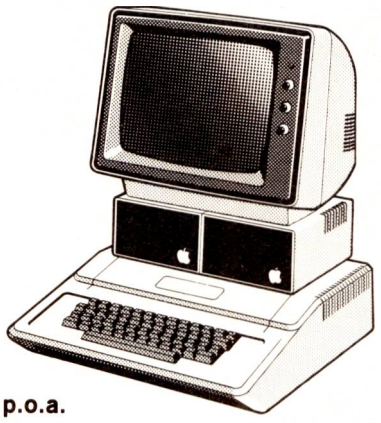
Wide choice of leading micros, programs and printers to suit your application

OSBORNE 1



from £1250 includes WORDSTAR, MAILMERGE, SUPERCALC, MBASIC + CBASIC worth £800 FREE!

apple® II



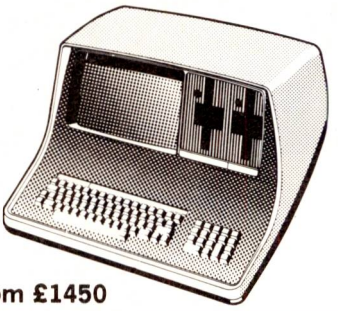
p.o.a.

ACT Sirius 1



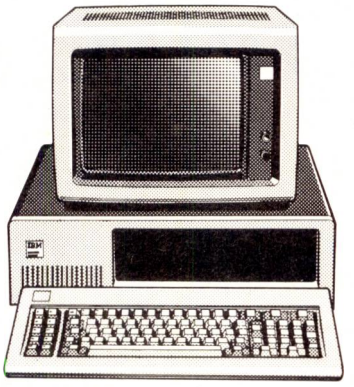
from £2195 includes MBASIC

INTERTEC DATA SYSTEMS. SUPERBRAIN™



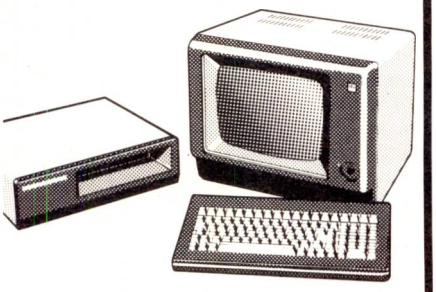
from £1450

IBM Personal Computer



from £2600

ICL Personal Computer



p.o.a.

All prices ex VAT

Try before you buy, or lease, at Inchico's Winchester Showroom

Installation, training and maintenance services are available.
For full information complete our coupon or telephone to arrange showroom demonstration.
PLEASE SEND ME FULL INFORMATION ON MICRO COMPUTER SYSTEMS:
☐ Osborne 1 ☐ Act Sirius 1 ☐ IBM Personal ☐ Apple II ☐ Superbrain ☐ ICL Personal

Name _____ Company _____

Address _____

Tel No _____ Application _____

Inchico Systems
Computer Hardware/Software Products,
13 City Road, Winchester, Hants. SO23 8SD
Telephone: Winchester (0962) 51930

INCHICO

PCW

OUR APPLE PRICES TURN OTHERS GREEN.

C/WP Computer prices are so low, we reckon they're the most competitive you will find for a standard factory-fresh Apple with a full 12-month warranty.

And we're not just clever at keeping prices down: C/WP are experts in CP/M and its software. If you already have a 48K Apple II with two disc drives it could cost you only £200 to make it a CP/M APPLE.

If you are starting from scratch, you can buy a complete CP/M APPLE for under £2,000.

Write or 'phone for our full CP/M hardware and software list.

If you're hungry for an Apple at these prices, contact C/WP Computers on 01-828 3127.

APPLE-CP/M OFFER

	EX-VAT PRICES	
	C/WP PRICE £	TYPICAL PRICE £
Apple 48K Europlus	579	812
2 Apple disc drives with controller	550	690
Microsoft CP/M system with Z80A processor	200	220
16 K RAM card	70	106
Green screen monitor 24MHz	90	159
80 column card	150	200
Epson MX 80T printer	300	360
Printer interface	80	92
10 Floppy discs	20	31
	2039	2670

Items available separately at same price.

SOFTWARE FOR CP/M

	C/WP PRICE £ EX. VAT
Wordstar 3.0	180
Wordstar training pack	40
Calcstar	140
dBase II	395
M Fortran	120
CIS COBOL + Forms-2	515
M Basic Compiler	210

C/WP

C/WP Computers
108 Rochester Row, London SW1P 1JP
Telephone: 01-828 3127

BIG VIC SAVERS from the Experts

The VIC CENTRE



SAVE £20!

FOR STARTERS

The complete VIC-20 colour computer kit to get you started.

The VIC is friendly, clever and very powerful. Our Starter Kit comes complete with:
The VIC 20 colour computer
The VIC cassette deck
10 blank cassettes
The VIC games joystick
The teach yourself "Introduction to Basic, Part 1" and the VIC User Manual.
We supply a 13 amp plug and give you the VIC Centre twelve months warranty

Your VIC Starter Kit saves £20 on RRP (before VAT) and will be mailed complete and ready to go.

£217
excl VAT

Total price £249.55 incl VAT + £4 post & packing and insurance.



SAVE £20!

GETTING BIGGER

Got a VIC 20? Then you will probably want to expand its memory capacity and use cartridges such as the Programmers Aid or the Super Expander. With the VIC Centre Expansion Package you can take your VIC up to 30K with the Arfon Expansion Unit with its seven slot mother board and integral power supply. The aluminium cover will allow you to neatly position your monitor or TV set.

For just £180 excluding VAT the Getting Bigger kit saves you £20 and has:
The Arfon Expansion Unit
Cover to take TV
A 16K Ram expansion cartridge
A choice of either *Programmers Reference Guide* or *VIC Revealed* and a choice of *Super Expander* or *Programmers Aid* or *Machine Code Monitor* cartridges

£180
excl VAT

Total price £207.00 incl VAT + £4 post & packing and insurance

HAVE FUN AT OUR EXPENSE

Any three VIC Centre cassette games for just £17.50 excl VAT
Choose from:
Blitz
Canyon Fighter
Star Wolf
Tunesmith
PR Software
Packman
Invader Fall
Vic Cube
Othello
Super Moon Lander
Total price £20.12 inc VAT + £2 post & packing

Any 3 excl VAT
£17.50

Any 3 excl VAT
£43.50

Any three VIC cartridge games from the VIC Centre for just £43.50 excl VAT
Choose from:
Super Slot
Road Race
Avenger
Super Lander
Alien Game
Amok
Bounce Out
Alien Blitz
City Bomber
Black Hole
Total price £50.02 inc VAT + £2 post & packing

The VIC Centre, 154 Victoria Road, Acton, London W3 (near North Acton tube station) has the widest range of VIC accessories. All the items below are available mail order – just telephone with your credit card number

Hardware and Peripherals	Price excl VAT
RS 232C Cartridge	30.39
IEEE Cartridge	47.39
Vic 3K Rampack	26.04
Vic 8K Rampack	39.09
Vic 16K Rampack	65.17
Programmers Aid	30.39
Super Expander (High Resolution)	30.39
Machine Code Monitor Cartridge	30.39
Joystick	6.52
Lightpen	25.00
Joystick (plotting)	13.00
Lowcost RS232C	22.99
Tool Kit	25.00
Vic Kit II	29.00
Games Port Adaptor Cable	17.25
ROM Switchboard	29.00
RS232C fully implemented	49.00
Cartridges	
Satellites & Meteorites	21.73
Cloudburst	17.38
Renaissance	21.73
Star Battle	17.35
Jelly Monsters	17.35
Spiders from Mars	21.73
Meteor Run	21.73
Omega Race	17.35
Cassettes	
Introduction to Basic (Part I)	13.00
Codebreaker Codemaker	6.95
Vic Seawolf, Trap, Bounce Out	7.82
Monster Maze, Math Hurdler	6.95
Amok	6.08
Simple Simon	6.08
Masterwits	6.08
Kiddie Checkers	6.08
Wallstreet	6.08
Alien Blitz	6.95
Vicalc	7.82
Hangman-Hangmath	6.95
Ski-Run	4.34
Dune Buggy	4.34
Super Worm	4.34
Worm	3.47
Cosmic Battle	4.34
Codebreaker	2.60
Viterm A	8.49
Star Wars	6.08
Crazy Balloon	7.82
Jungle	4.34
Rabbit Functions	4.34
Cassettes requiring additional 3K memory	
A-Maz-Ing	6.08
Missile Command	7.82
3D-Maze	6.95
Dragon Maze	6.95
Asteroid Belt	7.00
VPM	7.82
Vicat	7.82
Skymath	6.08
Space Division (Level 1)	6.08
The Alien	6.95
Frogger	7.82
Charset 20	4.34

All the above prices are excl VAT, add £1 per order, postage & packing.

To order Send mail order to:
ADDA Home Computers Ltd, FREEPOST, London W3 6BR – you do not need a stamp – enclosing details of your order + cheque to include VAT + postage & packing
Instant telephone orders: Telephone the VIC Centre on 01-992 9904 and quote your Visa, Access or American Express number

adda
HOME COMPUTERS LTD

ACT

pulsar

See us at the Personal Computer World Show The Barbican 9-12 Sept. 1982.

INDUSTRY-STANDARD 16-BIT BUSINESS SOFTWARE.

The new PULSAR business software is 16-bit software specially developed for new generation 16-bit personal computers.

It's inherently faster and more powerful than traditional 8-bit software.

The result: More and more business users are choosing PULSAR, making it one of the industry standards on 16-bit personal computers.

Only PULSAR meets the five key requirements for 16-bit business software:

PORTABILITY

PULSAR is primarily written in the PASCAL portable language. So your investment in software is protected, regardless of how often you change your system.

PEDIGREE

PULSAR has been developed by ACT's own software engineers as a true 16-bit system. And ACT has more than 15 years experience in business software – computer bureaux using ACT programs produce more than 3 million statements every year and handle business applications for more than 2000 companies. PULSAR incorporates many facilities that were previously available only on large mainframe computers.

INTEGRATION

ACT supplies integrated business software, linking every aspect of business accounting. Now with PULSAR, this integration is taken a stage further with word processing and business management tools able to share information and files with accounting applications.

USER-FRIENDLY

PULSAR is really easy to use. Documentation is to the highest standards in the industry, taking the operator step by step through the system. A simple question and answer routine on the computer screen prompts the user at every turn.

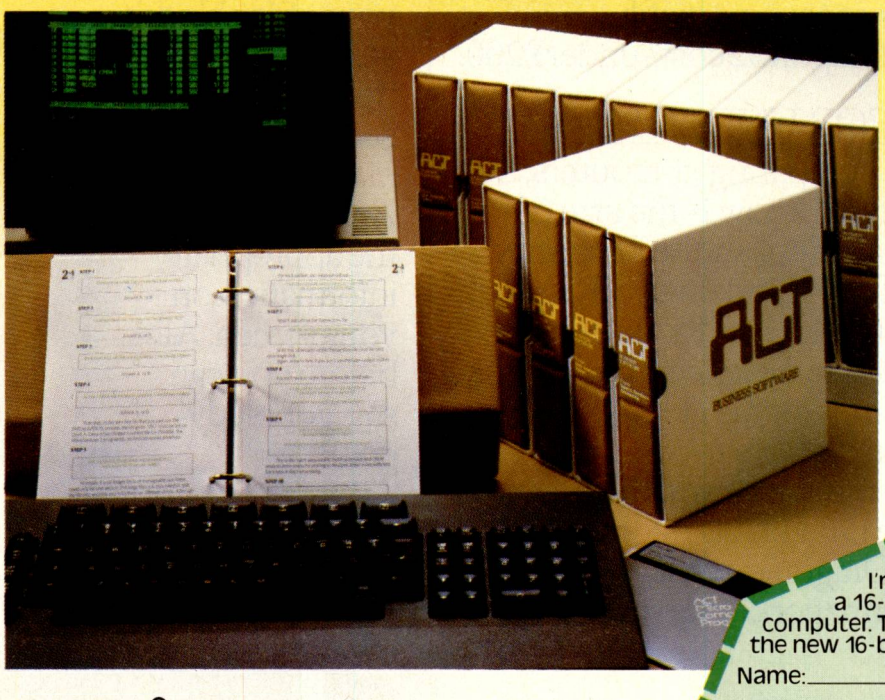
TOTAL SUPPORT

ACT is used to providing on-going support for its users. Not only is there a "hot-line" to resolve queries, but also a fully equipped training school open to all PULSAR users.

THE PULSAR RANGE...

PULSAR ACCOUNTING
Pulsar Sales Ledger
Pulsar Purchase Ledger
Pulsar Nominal Ledger
Pulsar Payroll

PULSAR ORDER PROCESSING
Pulsar Stock Control
Pulsar Invoicing
Pulsar Order Handling



PULSAR FINANCIAL MANAGEMENT
Pulsar Data Analysis
Pulsar MicroModeller
Pulsar SuperCalc
Pulsar MultiPlan

PULSAR OFFICE SYSTEMS
Pulsar WordStar (word processing)
Pulsar Mailmerge (mailing)
Pulsar Select (word processing)

I'm buying a 16-bit personal computer. Tell me more about the new 16-bit PULSAR software.

Name:_____

Position:_____

Company:_____

Address:_____

_____

_____

Telephone:_____

Application_____

PCW/9/82

ACT

pulsar **16 BIT-SOFTWARE FOR 16 BIT PERSONAL COMPUTERS**

The ACT octagon encapsulates our philosophy of providing users with a single source for their computing solutions.
ACT products include personal computers – network micro-computer systems – turnkey mini computers and a total range of services, including software development, computer field engineering, computer supplies, and a complete range of Bureau services.
The eight specialist ACT companies are each leaders in their field and are wholly owned by Applied Computer Techniques (Holdings) p.l.c., one of Britain's largest and most successful computer companies.

For more information on 16-bit Pulsar Software complete the coupon and post to ACT (Microsoft) Ltd., FREEPOST, Birmingham B16 8BR or phone 021-454 8585

The new Dragon 32. So well designed, you'll even understand this ad.

If you're already a computer expert, may we refer you to the box of technical specifications displayed opposite.

If you're not, may we refer you to the new Dragon 32 Family Computer. A computer so easy to understand, you won't understand why all the others seem so difficult.

And the new Dragon 32 costs under £200.

32K RAM FOR UNDER £200?*

When you're comparing computers, the first thing you need to know is the size of the memory. In plain English, the Dragon has approximately 32 thousand units of Random Access Memory. (32K RAM for those who prefer to be blinded by science.) This means that the Dragon's memory is at least twice as powerful as its competitors.

With a memory this powerful, the amount of information the Dragon can store is literally vast. But the Dragon doesn't just make it easy to store information. It makes it easy to use, too.

USER-FRIENDLY?

You may have heard of the term 'user-friendly.' Reverting to plain English once more, this means simply that the computer will go out of its way to understand you, rather than vice-versa.

The Dragon 32 is so user-friendly, it practically licks your hand.

You tap (literally) its vast resources through a beautifully-designed keyboard that's as easy to use as a typewriter.

On this keyboard, you type in a language which is surprisingly close to the English you talk every day. The Dragon 32 will receive your order. Understand it. Send it to the appropriate section of its massive brain. And then display the appropriate information on your screen. All before you can say 'gobbledygook.'



*TV not included in price.

SPECIFICATIONS
6809E MICROPROCESSOR. Pet, Apple, Atari 400, BBC Micro, and VIC 20 still have the less powerful 6502.
32K RAM (as standard). At least twice the power of similarly priced machines. Expandable to 64K RAM.
EXTENDED MICROSOFT COLOUR BASIC (as standard). Featuring: ADVANCED GRAPHICS (set, line, circle, paint, print, draw, rotate and print using). ADVANCED SOUND 5 octaves, 255 tones. AUTOMATIC CASSETTE RECORDER CONTROL. FULL EDITING with INSERT and DELETE.
9 COLOUR, 5 RESOLUTION DISPLAY.
USE WITH ANY U.H.F. TV and/or separate P.A.L. monitor.
PROFESSIONAL QUALITY KEYBOARD. Typewriter feel. Guaranteed for 20 million depressions.
PRINTER (Centronics parallel).
JOYSTICK CONTROL PORTS.

FIRE YOUR IMAGINATION.

Learning how to use the Dragon 32 won't cause you to experience any problems. Learning what you can use it for will cause you to experience something entirely different.

Delight. Surprise. Fascination. And challenge.

The Dragon offers a range of some of the most popular computer games in the world. From those celebrated space battles to mind-boggling adventures in seemingly unfathomable dungeons and caves.

As if by magic, a simple typed message will command the Dragon to create your own drawings. Then it will colour and paint them in 9 colours.

And it's clever enough to create virtually any image you want - circles and arcs as well as straight lines.

The Dragon will also play and compose music with you, with a range of 5 octaves. And it works with any UHF TV or PAL monitor.

LEARNING THROUGH PLAYING.

All of this makes the Dragon the ideal machine to build your children's interest in the world of computers as they become increasingly more vital. School-children already enjoy using computers.

The Dragon is the first computer specifically for the family - so by enjoying yourselves at home, you and your children can soon become expert enough to create your own programs.

PRODUCT / FEATURE	DRAGON 32	SINCLAIR SPECTRUM	ACORN ATOM	VIC 20	TI 99/4A	BBC MICRO 'A'
PRICE	£199	£125	£175	£190	£199	£300
STANDARD RAM SIZE	32K	16K	8K	5K	16K	16K
STANDARD AVAILABLE RAM FOR HIGH RESOLUTION GRAPHICS	26K	9K	N/A	N/A	14K	3K
EXTENDED MICROSOFT BASIC AS STANDARD	YES	NO	NO	NO	NO	NO
PROFESSIONAL-TYPE KEYBOARD	YES	NO	YES	YES	YES	YES

BRILLIANTLY SIMPLE GUIDE.

The Dragon is living proof that you don't have to be an expert in computerspeak to be an expert in computers. It comes with the easiest-to-understand instruction manual ever written for a home computer.

Every step, every explanation, is made clear - even if you're a beginner. In minutes, it will show you how to write a simple program. Within hours, you'll be fascinated. And from then on, you'll continue to be astounded by the new world which the Dragon's power and versatility will open up to you.

See the new Dragon 32 in your High Street. At under £200, it's not just the first family computer. It also has all the features an expert could wish for.

Except perhaps the jargon.

DRAGON 32

The first family computer.

To: Jean Webster, Dragon Data Ltd, Queensway, Swansea Industrial Estate, Swansea, Glamorgan SA5 4EH.
Tel: 0792 580651.

Please send me further information about the Dragon 32.

Name _____

Address _____

_____

_____ PCW

A member of the Mettoy Group of Companies.

RSONAL CO

LONELY Genie I Microcomputer, early eighties, with large peripheral family but currently unattached, would like to meet interesting, attractively packaged software, Genie or Tandy specification, for programming, problem solving, entertainment and long-lasting friendship. Reply in confidence. Box No RS232.

ANSWERING MACHINES

Office certified



ingenious ...but lonely!

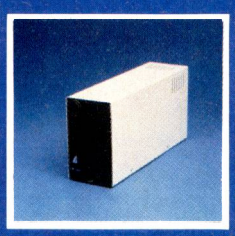
Buying your first Genie I microcomputer is just the start of a long and enthralling adventure, for it won't be long before you will want to expand your system with some of the wide range of peripherals which make up the complete Genie System.



Firstly there is the **Expansion Box,** which immediately expands your Genie's capacity to 32K RAM, and up to 48K RAM if required. It can be connected to 4 disk drives, a printer, RS232 interface or S100 cards.

Then there is the **Printer,** a compact unit with 80 column, 5 x 7 matrix print-out, which connects to your Genie through the Expander, or via the Parallel Printer Interface.





The **Disk Drive** gives you greater storage capacity and full random access file handling, with the option of double-density through a special adapter.
New Dual Disk Drive now available!

Finally, there is Genie's very own **12" Monitor,** a must if you want to let the rest of the family watch their T.V. in peace!
Available in B & W or green tube.



The supreme advantage of the Genie I system is its compatibility with the TRS 80, which means that literally 1000's of pre-recorded programs are already available, just waiting to be plugged into your Genie!

The recent improvements in the Genie system, including Extended Basic, sound unit and machine language monitor, make it the ideal system for the committed hobbyist, and an excellent and easy-to-use educational tool.

SPECIAL TECHNICAL GENIE HOT – LINE ON 0629 4995
for all your technical advice and service back-up on any aspect of the Genie system direct from the experts!

Please send me FREE, 16 page colour brochure on the Genie Computer System. I enclose 25p postage.

Name _____

Address _____

_____

Telephone _____ PCW•82

LOWE electronics
Chesterfield Road,
Matlock,
Derbyshire DE4 5LE.
Telephone: 0629 4995.
Telex: 377482 Lowlec G.



It's our Birthday

SEE US AT THE SHOW !!

Two years old this August, Pete & Pam Computers send greetings to all their customers.

In August 1980 Pete and Pam Fisher set up a business selling hardware and software for Apple Computers. In two years the business has grown to encompass offices in both London and Lancashire, 22 employees and an annual turnover that is rapidly approaching eight figures.

We have earned distributorships from over 50 hardware and software companies, many of whom are "household" names, including BASF, Broderbund, Epson, Interactive Structures, NEC, Orange Micro, On-Line Systems, Micro Pro., Microsoft, M & R, Saturn Systems, Sirius Software, Videx, Versa Computing and Zenith, to name but a few.

Surprised? If you already deal with us, you won't be.

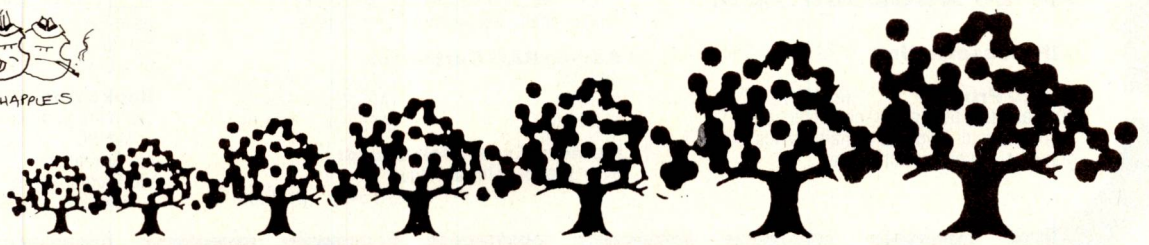
Our reputation for sound advice, comprehensive stocks and prompt delivery has been a major consideration in the decision of over 500 Apple dealers, numerous multi-national and large companies and many thousands of individuals to buy from Pete and Pam.

You've read about us. We'd like you to talk to us. Our sales and service staff will be pleased to assist. Call us today.

Pete & Pam Computers

Head Office: **Waingate Lodge, Waingate Close, Rossendale, BB4 7SQ** Phone: (0706) 227011 Telex: 635740 Petpam G
London Office: **103-5 Blegborough Road, London, SW16 6DL** Phones: 01-769 1022/3/4 & 01-677 2052





.....and still growing!

INTEREST FREE CREDIT

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

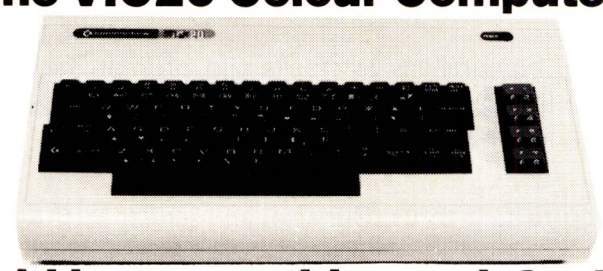
from MAPLIN

On Atari & VIC computer hardware

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

You pay 10% down, then 10% per month for a further nine months. (to nearest penny) Example: VIC20 Colour Computer. Cash Price £199.99. Credit terms: £19.99 down then £20 per month for nine months: Total £199.99. Credit quotations on request.

The VIC20 Colour Computer



could be yours this week for just
£19.99 down.
Cash price and total credit price £199.99.
Order as AF47B

VIC 20 ACCESSORIES:

C2N Cassette Unit (AF48C) £44.95

VIC20 Printer: (AF49D) £230.00
80 characters per line, 30 characters per second, tractor feed, full alphanumerics and graphics, double size character.

VIC20 Disk Drive: (AF50E) £396.00
170K storage on standard single-density, single-sided, soft-sectored floppy disks.

Add-on RAM Cartridges:

3K RAM	(AF51F)	£29.95
8K RAM	(AF52G)	£44.95
16K RAM	(AF53H)	£74.95

Memory Expansion Board:
6 ports for plug-in cartridges (AF54J) £125.95

Introduction to BASIC Cassettes

Part 1	(AC57M)	£14.
Part 2	(AC58N)	£14.

Joysticks and Paddles:

Single Joystick	(AC53H)	£7.
Pair of Joysticks	(AC37S)	£13.
Le Stick	(AC45Y)	£24.
Pair of Paddles	(AC30H)	£13.

Programming Aid Cartridges

Super Expander: 3K RAM and Hi-res graphic	(AC54J)	£34.
Programming Aid: Additional commands, function Key programming etc.	(AC55K)	£34.
Machine Code Monitor	(AC56L)	£34.

Game Programs

Avenger Cartridge	(AC59P)	£19.
Star Battle Cartridge	(AC60Q)	£19.
Super Slot Cartridge	(AC61R)	£19.
Jelly Monsters Cartridge	(AC62S)	£19.
Alien Cartridge	(AC63T)	£19.
Super Lander Cartridge	(AC64U)	£19.
Road Race Cartridge	(AC65V)	£19.
Rat Race Cartridge	(AC66W)	£19.
Blitz Cassette	(AC67X)	£4.

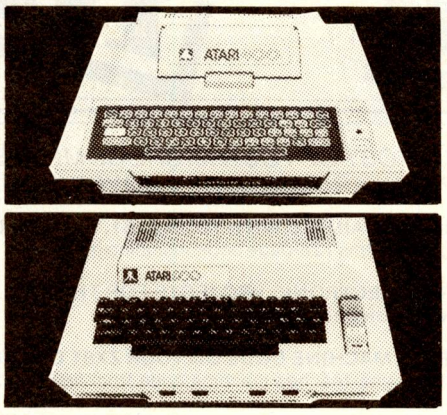
Books About VIC

Learn Programming on the VIC	(WA31J)	£2.
VIC Revealed	(WA32K)	£11.
VIC Programmers Reference Guide	(WA33L)	£16.



Consoles available:

tari 400 with 16K RAM	**(AF36P)**	**£249.95**
tari 400 with 48K RAM	**(AF37S)**	**£319.00**
tari 800 with 16K RAM	**(AF02C)**	**£499.00**
tari 800 with 48K RAM	**(AF55K)**	**£590.00**



:s of other hardware:

sette Recorder	(AF28F)	£50.00
‹ Drive	(AF06G)	£299.95
rmal Printer	(AF04E)	£265.00
ter Interface for 400	(AF41U)	£59.95
ter Interface for 800	(AF42V)	£59.95
rface Module	(AF29G)	£135.00
sawriter	(AF43W)	£169.00
16K RAM Module	(AF08J)	£55.00
48K RAM Module	(AF44X)	£125.35
48K Upgrade for 400	(AF45Y)	£75.00
Floppy Disk	(YX87U)	£2.50
Le Stick	(AC45Y)	£24.95
Joystick Controllers	(AC37S)	£13.95

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

)W YOU CAN JOIN THE U.K. ATARI COMPUTER OWNER's CLUB. An independent user's group.
ur issues of the club magazine for only £1.60! Address your subscription to Ron

THE CHOICEST GEMS OF ATARI SOFTWARE FROM MAPLIN

Adventure Games

Star Warrior	-C-32K-(BQ24B)	£28.95
Rescue At Rigel	-C-32K-(BQ21X)	£22.45
Invasion Orion	-C-32K-(BQ23A)	£18.95
Datestones of Ryn	-C-32K-(BQ22Y)	£14.95
Galactic Empire	-C-24K-(BQ14Q)	£14.95
Hi-Res Adventure // 2	-D-48K-(BQ25C)	£24.95
Analog Adventure	-D-32K-(BQ33L)	£16.95
Adventure Land	-C-24K-(BQ00A)	£14.95
Pirates Adventure	-C-24K-(BQ01B)	£14.95
Mission Impossible	-C-24K-(BQ02C)	£14.95
Voodoo Castle	-C-24K-(BQ03D)	£14.95
The Count	-C-24K-(BQ04E)	£14.95
Strange Odyssey	-C-24K-(BQ05F)	£14.95
Mystery Fun House	-C-24K-(BQ06G)	£14.95
Pyramid of Doom	-C-24K-(BQ07H)	£14.95
Ghost Town	-C-24K-(BQ08J)	£14.95
Savage Island I	-C-24K-(BQ09K)	£14.95
Savage Island II	-C-24K-(BQ10L)	£14.95
Golden Voyage	-C-24K-(BQ11M)	£14.95
Energy Czar	-C-16K-(YG53H)	£9.95
Kingdom	-C-8K-(YG55K)	£9.95

Teach-Yourself Programs

Conversational French	-5C-16K-(YG44X)	£39.95
Conversational German	-5C-16K-(YG45Y)	£39.95
Conversational Spanish	-5C-16K-(YG46A)	£39.95
Conversational Italian	-5C-16K-(YG47B)	£39.95
Touch Typing	-2C-16K-(YG49D)	£15.95
States & Capitals	-C-24K-(YG56L)	£9.95
European Countries & Capitals	-C-16K-(YG57M)	£9.95

Learn Programming

Invitation to Programming	-C-8K-(YG43W)	£15.95
Basics of Animation	-C-32K-(BQ57M)	£11.95
Basics of Animation	-D-32K-(BQ58N)	£11.95
Player Missile Graphics	-C-16K-(BQ59P)	£18.95
Player Missile Graphics	-D-24K-(BQ60Q)	£18.95
Display Lists	-C-16K-(BQ51F)	£11.95
Display Lists	-D-24K-(BQ52G)	£11.95
Horiz/Vertical Scroll	-C-16K-(BQ53H)	£11.95
Horiz/Vertical Scroll	-D-24K-(BQ54J)	£11.95
Page Flipping	-C-16K-(BQ55K)	£11.95
Page Flipping	-D-24K-(BQ56L)	£11.95
Master Memory Map	-Book-(XH57M)	£4.00

Business Programs

Visicalc	-D-32K-(YL39N)	£119.95
Word Processor	-D-32K-(YG42V)	£99.95
Calculator	-D-24K-(YG50E)	£16.95
Graph—H	-C-16K-(YG51F)	£13.95
Statistics	-C-16K-(YG52G)	£13.95

Arcade Games

Star Raiders	-E-8K-(YG66W)	£29.95
Asteroids	-E-8K-(YG60Q)	£29.95
Space Invaders	-E-8K-(YG70M)	£29.95
Missile Command	-E-8K-(YG64U)	£29.95
Super Breakout	-E-8K-(YG67X)	£24.50
Tari Trek	-C-24K-(YL36P)	£8.95
Tari Trek	-D-32K-(YL37S)	£11.95
Star Trek 3.5	-C-32K-(BQ15R)	£14.95
Race In Space	-C-16K-(BQ35Q)	£14.95
Shooting Gallery	-C-16K-(BQ36P)	£14.95
Mountain Shoot	-C-16K-(BQ12N)	£10.95
Jawbreaker	-D-48K-(BQ26D)	£20.64
Basketball	-E-8K-(YG61R)	£24.50
Tank Trap	-C-16K-(YL34M)	£9.95
Tank Trap	-D-32K-(YL35Q)	£12.95

Home Game Programs

Scram	-C-16/24K-(YG58N)	£17.50
Cypher Bowl	-C-32K-(BQ20W)	£29.50
Thunder Island	-C-16K-(BQ37S)	£10.95
Rotating Tilt	-C-16K-(BQ48C)	£14.95
Lunar Lander	-C-16K-(BQ16S)	£10.95
Sunday Golf	-C-16K-(BQ13P)	£10.95
Darts	-C-16K-(BQ42V)	£19.95
Tournament Pool	-C-16K-(BQ45Y)	£19.95
Snooker & Billiards	-C-16K-(BQ44X)	£19.95
Chess	-E-8K-(YG63T)	£24.50
Cribbage & Dominoes	-C-16K-(BQ43W)	£14.95
Poker Solitaire	-C-16K-(BQ17T)	£10.95
Blackjack	-C-8K-(YG62S)	£9.95
Fast Gammon	-C-8K-(YL33L)	£16.95
Reversi (Othello-type)	-C-16K-(BQ19V)	£14.95
Gomoko	-C-16K-(BQ18U)	£14.95
Hangman	-C-8K-(YG54J)	£9.95
Humpty Dumpty & Jack & Jill	-C-16K-(BQ38R)	£19.95
Hickory Dickory Dock	-C-16K-(BQ39N)	£19.95
British Heritage Jig-Saw Puzzles	-C-16K-(BQ40T)	£19.95
European Scene Jig-Saw Puzzles	-C-16K-(BQ41U)	£19.95
Atari Safari (25 Programs)	-C-16K-(BQ49D)	£18.95
Atari Safari (25 Programs)	-D-16K-(BQ50E)	£24.95
Mind Bogglers (3 Programs)	-C-16K-(YL38R)	£11.95

Utilities

3D-Super Graphics	-D-48K-(BQ28F)	£29.95
3D-Super Graphics	-C-48K-(BQ29G)	£29.95
Atari World (Graphics)	-D-48K-(BQ27E)	£43.95
Assembler Editor	-E-8K-(YG68Y)	£39.95
Assembler	-C-16K-(YL32K)	£19.95
6502 Disassembler	-C-8K-(YL30H)	£9.95
6502 Disassembler	-D-8K-(YL31J)	£12.95
Character Generator	-C-16K-(YL27E)	£9.97
Character Generator	-D-16K-(YL28F)	£12.50
Telelink	-E-8K-(YG59P)	£21.50

Music Programs

Music Composer	-E-8K-(YG48C)	£35.95
Movie Themes (use with Music Composer)	-C-16K-(BQ34M)	£9.95

Computer Languages

Operating System A+	-D-48K-(BQ30H)	£49.95
OS Forth	-D-24K-(YL29G)	£49.95
Pilot (Consumer)	-E-8K-(YG69A)	£54.00
Basic A+	-D-48K-(BQ31J)	£49.95
Basic A+ & Operating System A+	-D-48K-(BQ32K)	£99.50

Key: C = Cassette. D = Disk. E = Cartridge.
2C = 2 Cassettes etc. 8K: 16K etc. shows minimum memory requirement.

end sae now for our new software leaflet with details of all the above programs. Order As XH52G — Issue 2.

Subscribe now to America's leading Atari-only magazine — Analog — 6 issues per year for just £9.00. Order as GG24B.

New titles this month

Learn Programming:

Invitation to Programming 2	-C-16K-(BQ67X)	£22.95
Invitation to Programming 3	-C-16K-(BQ68Y)	£22.95

Business Programs:

Personal Financial Management	-D-32K-(BQ65V)	£49.00
Mortgage and Loan	-C-16K-(BQ66W)	£13.95

Arcade Games:

Caverns of Mars	-D-32K-(BQ69A)	£24.50
Centipede	-E-16K-(BQ70M)	£29.95
Pac-Man	-E-16K-(BQ71N)	£29.95
K-Razy Shoot Out	-E-16K-(BQ63T)	£29.95
Mous kattack	-D-32K-(BQ77J)	£22.95
Ghost Hunter	-C-16K-(BQ64U)	£24.50
Galactic Chase	-D-32K-(BQ61R)	£19.95
Galactic Chase	-C-16K-(BQ62S)	£16.95

Home Programs:

Video Easel	-E-16K-(BQ72P)	£24.50

Computer Languages:

Microsoft Basic	-D-32K-(BQ74R)	£59.95
Pilot (Educator)	-E&2C-16K-(BQ75S)	£79.95

Utilities:

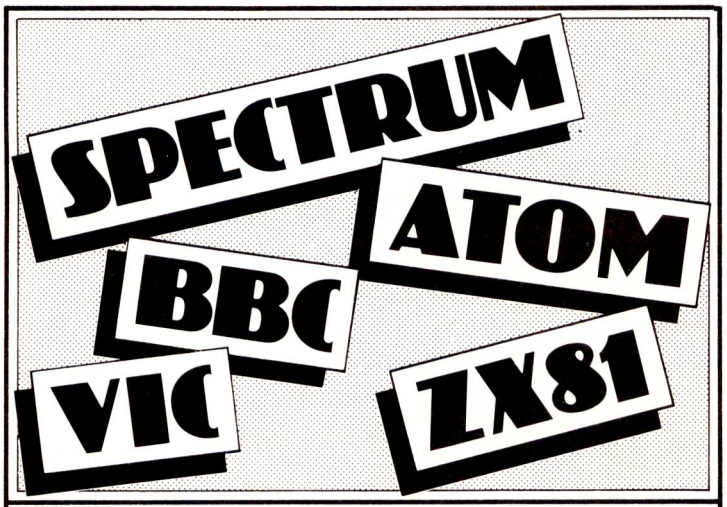
Macro Assembler	-D-32K-(BQ73Q)	£59.95
K-DOS (Superior disk operating system)	-D-32K-(BQ76H)	£53.95

MAPLIN

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

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

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



MAKE THE MOST OF YOUR MICROCOMPUTER WITH OUR POPULAR RANGE OF PROVEN BOOKS:—

☐ **GETTING ACQUAINTED WITH YOUR ZX81**, by Tim Hartnell. Eighty plus programs in this 128-page book, including draughts. **£5.95**

☐ **20 SIMPLE ELECTRONIC PROJECTS FOR THE ZX81 and other computers** by Stephen Adams **£6.45**

☐ **MASTERING MACHINE CODE ON YOUR ZX81 OR ZX80**, by Toni Baker. 180 pages, teaches machine code from first principles. **£7.50**

☐ **49 EXPLOSIVE GAMES FOR THE ZX81**, edited by Tim Hartnell. **£5.95**

☐ **34 AMAZING GAMES FOR THE 1K ZX81** by Alastair Gourlay. **£4.95**

☐ **THE GATEWAY GUIDE TO THE ZX81 AND ZX80**, by Mark Charlton.Over 60 programs and routines, ZX BASIC explained in detail. **£6.45**

☐ **LEARN PASCAL ON ZX81 ZX SPECTRUM OR BBC MICRO-COMPUTER WITH 'PASCAL FOR HUMAN BEINGS'**, by Jeremy Ruston, which contains a 12K compiler so you can run a limited version of Pascal on your ZX81, ZX Spectrum or BBC Microcomputer. Book, plus compiler listing. **£4.95**

☐ **LET YOUR BBC MICRO TEACH YOU TO PROGRAM**, by Tim Hartnell, over 40 programs, BBC BASIC from first principles **£6.45**

☐ **THE BBC MICRO REVEALED**, by Jeremy Ruston. The full story on the BBC Microcomputer for the serious user. **£9.95**

☐ **GETTING ACQUAINTED WITH YOUR VIC 20**, by Tim Hartnell, with over 60 programs to get your VIC up and running from day one. **£6.95**

☐ **SYMPHONY FOR A MELANCHOLY COMPUTER** by Tim Hartnell. 24 great Vic games. **£6.95**

☐ **39 TESTED PROGRAMS FOR THE ACORN ATOM** Best of Interface edited by Tim Hartnell **£6.45**

☐ **GETTING ACQUAINTED WITH YOUR ACORN ATOM**, by Trevor Sharples and Tim Hartnell. 184 pages, 80 programs, including draughts. **£7.95**

☐ **INTERFACE**, the monthly magazine published by the **NATIONAL ZX USERS' CLUB** is just £9.50 (U.K.), £12.50 (Europe) for 12 issues. **Sample copy**, with many programs for your ZX computer, book, software and hardware reviews, education, contact addresses, **just £1.**

**All ZX81 books now contain Spectrum supplement, not available separately. All our ZX81 programs will run on your ZX Spectrum.*

Please send me the items marked. I enclose £ .....

Name: .....

Address: .....

.....

.....

Please make cheques payable to **INTERFACE** and send the above form, or a copy, to: **INTERFACE, Dept. PCW 44-46 Earls Court Road, London W8 6EJ**

Please allow up to 28 days for delivery.

Be honest. When was the last time you could tear yourself away from the tedium of the office, and fly off to another part of the world to secure a new order, investigate a new business opportunity, or simply enjoy yourself? If you've become your own worst paid executive working all hours on paperwork, book-keeping or general administration, the chances are it's longer than you care to remember.

COMPLETE SOLUTION

So isn't it time you met the Genie III? A business system specifically designed to meet the requirements of those businesses employing less than 250 people. Anyone from a corner shop keeper to a wholesaler, to an engineer. The Genie III will help them all, and it will help *you*, providing the complete solution for sale/purchase, sales ledger and nominal ledger. In addition, the system can be expanded to other functions, such as stock control, invoice reminders and word processing. – in fact, generally help you run your business much more effortlessly.

RELEVANT SOFTWARE

The package consists of a powerful, compact and reliable microcomputer, with a full-size keyboard, built-in screen, 64K of RAM, and dual disk drives as standard. Also included is a quality matrix printer giving a choice of 80 or 136 characters per line, three different type-faces, and the option of using roll paper, single sheets or even multiple copies. Relevant software programmes for the Genie III have been specially produced by TABS, one of Britain's largest suppliers of business software packages, and the complete system is covered by a special one-year maintenance contract . . . all for around £3,250.

EXPERT INSTALLATION

If by now all this sounds too good to be true, come and see for yourself. You can meet the Genie III at one of the specially selected SUPERDEALERS, whose technical expertise and experience in the fields of installation, software and maintenance is proven. It could be the first step towards a more successful future for you and your business.

U.K. SUPERDEALERS

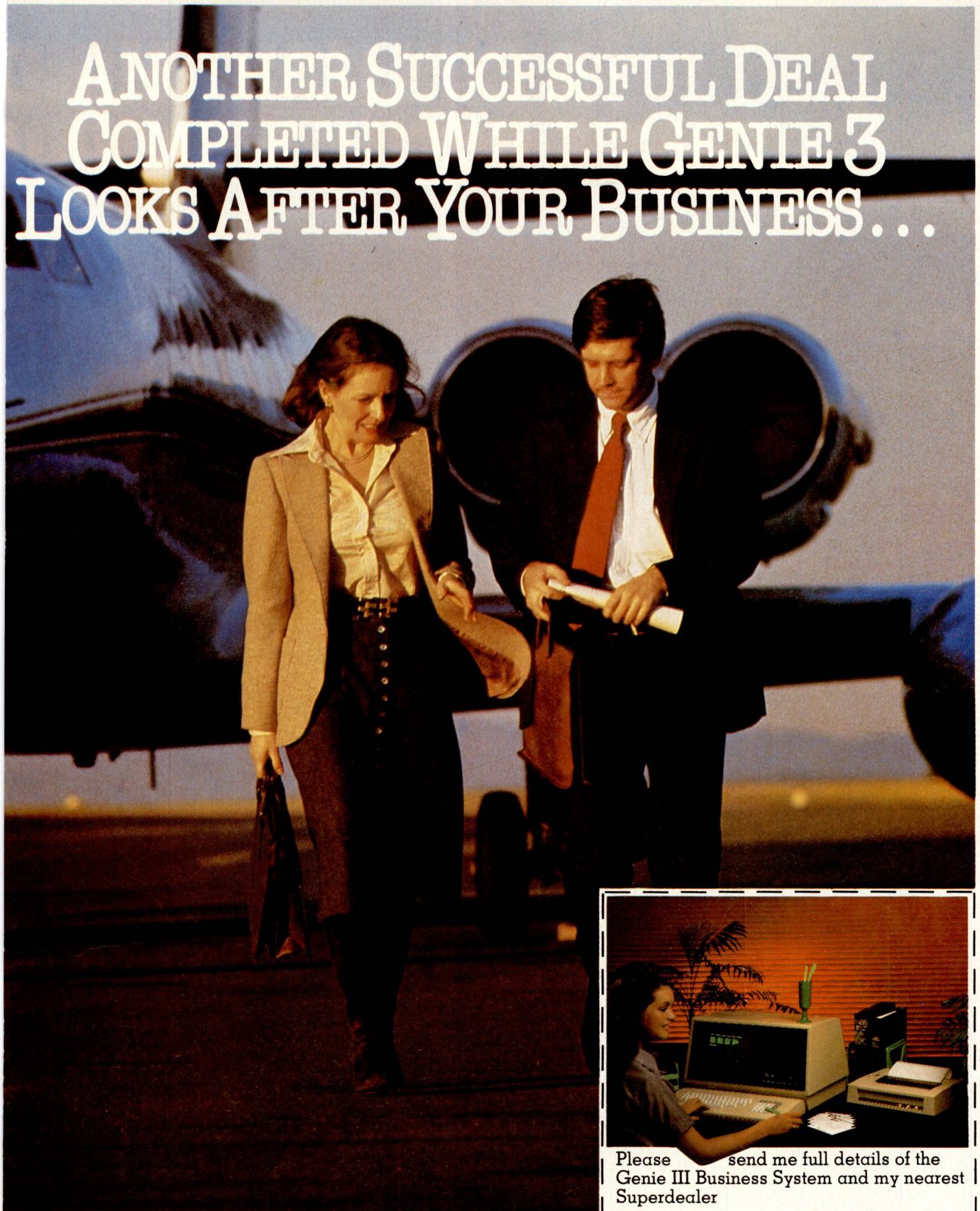
We have a network of superdealers throughout the U.K. (including Northern Ireland). For advice on your nearest stockist, ring our SUPERDEALER MANAGER on 0629 4995.



Genie

the key to successfu

ANOTHER SUCCESSFUL DEAL COMPLETED WHILE GENIE 3 LOOKS AFTER YOUR BUSINESS...



Please send me full details of the Genie III Business System and my nearest Superdealer

Name _____

Company _____

Position _____

Address _____

_____

_____ Tel. No. _____

PCW.9.82

LOWE electronics

Chesterfield Road,
Matlock,
Derbyshire DE4 5LE.
Telephone: 0629 4995.
Telex: 377482 Lowlec G.

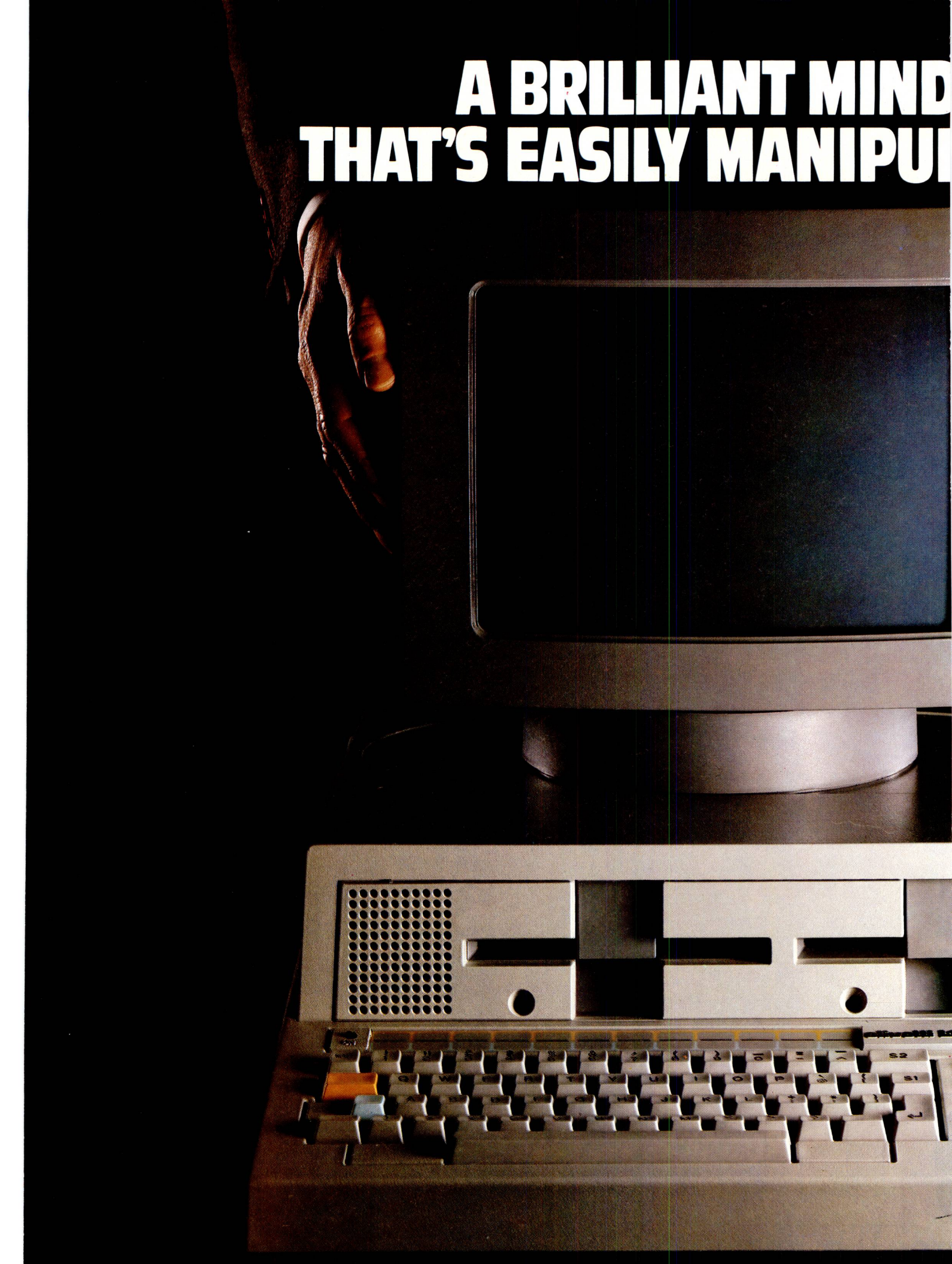
small business!

SUPPLIED AS STANDARD

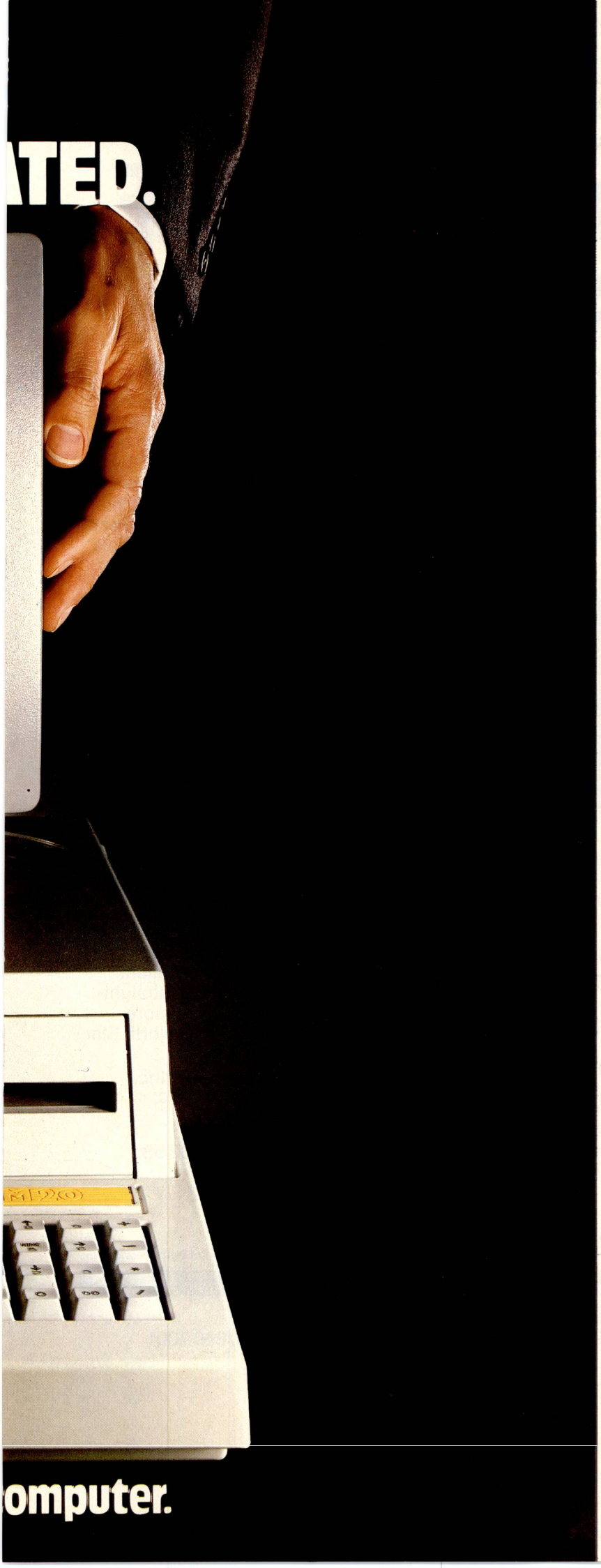
Accounting Business Systems

TABS

A BRILLIANT MIND
THAT'S EASILY MANIPUL



The remarkable new Olivetti M20 personal



Please forgive our boasting but the new Olivetti M20 really does make the current crop of computers look like toys for adults.

It's simply the most advanced personal computer in Britain.

The 16-bit central processing unit and 'bus' allow larger more complex programs to be run on larger amounts of data and at far greater speed.

It has two 5¼" mini floppy disk units with a capacity of 320k bytes each that are integral to the system.

(These can be further extended with the addition of a hard disk.)

And it has a minimum internal capacity of 128K bytes.

The result is an extremely powerful computer with interfacing capabilities that allow it to communicate with a wide range of peripherals.

That's proof that it's brainy, but it's also beautiful.

The visual brilliance and clarity of the VDU can be controlled as its position can be swivelled and tilted to suit the operator.

And as well as handling up to two thousand characters, the screen can produce a variety of complex, high resolution graphics.

Naturally, lines, circles, ellipses, bar charts and pie charts are a cinch.

But the screen can actually split itself into sixteen independent windows.

It's all clever stuff but its language is simple.

It uses Microsoft®Basic which has been developed to a new level of professionalism.

In fact, the advanced PCOS*operating system combined with its programming language make the M20 easier to use than a typewriter.

But if you do manage to get lost there's a 'Help' function to guide you.

The M20 also has the reassuring ability to run through its circuits every morning and if any are faulty it'll tell you.

So Olivetti's national and international network of service engineers can work even faster.

Send off the coupon and find out why the M20 is simply brilliant.

And brilliantly simple.

*CP/M available.

For more information on the M20 Personal Computer please send this coupon to Valerie Belfer.

British Olivetti Ltd., Olivetti House, PO Box 89, 86/88 Upper Richmond Road, London SW15 2UR.

Name

Position

Company

Address

Postcode

OEM enquiries welcome.

olivetti

® Microsoft Basic is a registered trademark of Microsoft Inc.

North Star's ADVANTAGE is easy to see.

The best value in microcomputing.

The North Star ADVANTAGE is the perfect low cost microcomputer for business or personal use. With 720Kb of floppy disk storage, or an optional 5Mb Winchester disk, the North Star ADVANTAGE offers the most memory in its price/performance class. And it comes with advanced business graphics software at no extra cost. You can look everywhere, but you won't find a better microcomputer for the money.



High performance computing and high performance software.

The North Star ADVANTAGE system offers high speed computing based on the Zilog Z80A® microprocessor, the most accepted 8-bit microprocessor in the world, plus an Intel 8035 auxiliary processor. 64Kb of RAM main memory delivers fast program execution, with an additional 20Kb of RAM for the graphic display. North Star provides graphics software compatible with CP/M® and HDOS operating systems and application packages, and most standard languages. There are thousands of CP/M compatible software programs available throughout the world. Or you can choose any of the North Star application packages available for word processing, financial analysis, accounting and data base management.

Graphic displays for every need.

The free North Star ADVANTAGE BUSIGRAPH™ package makes it possible to generate line, bar, pie, and 3-dimensional charts, plus complex 3-dimensional forms. Reports can be transformed into impressive hard copy graphic displays in a matter of seconds.

Build a network of ADVANTAGES.

One North Star ADVANTAGE computer can be linked to other North Star ADVANTAGES by twisted pair cable using North Star's new network interface and software package. This allows you to have a low cost network of individual systems sharing the more expensive peripherals. This can be the first step toward fully automating an entire office or department.

Convenient design and service.

The North Star ADVANTAGE is a fully integrated microcomputer in an attractive, integrated enclosure. It provides high reliability and excellent operator comfort, plus straightforward servicing. For more information about the North Star ADVANTAGE, contact...

North Star Computers Inc.
Arabellastrasse 5/133 c,
Postfach 810623,
D-8000, Munich 81,
Telephone (089) 91 83 58,
Telex 521 5772 ibs

FOLLOW THE STAR
NorthStar™

CP/M is a registered trademark of Digital Research, Inc.

North Star Computers Inc.
14440 Catalina Street, San Leandro, CA 94577 USA (415) 357-8500, TWX/Telex (910) 366-7001

The comart communicator

RELIABLE BRITISH MADE MICROCOMPUTER SYSTEMS

from JAROGATE



- EXPANDABLE
- FLEXIBLE
- VERSATILE

TYPICAL APPLICATIONS

- ☐ ACCOUNTS
- ☐ WORD PROCESSING
- ☐ COMMUNICATIONS
- ☐ COLOUR GRAPHICS
- ☐ FINANCIAL PLANNING
- ☐ PROCESS CONTROL
- ☐ DATA BASE MANAGEMENT
- ☐ STOCK CONTROL
- ☐ PAYROLL

OPTIONAL SUB-SYSTEMS

- ☐ HD200 18.7M BYTE 8" WINCHESTER DISK SYSTEM
- ☐ CB200 13.4M BYTE CARTRIDGE BACK UP UNIT

MODELS
CP100 2 x 390 K BYTE/DRIVE 5¼" FLOPPY DISK
CP200 2 x 790 K BYTE/DRIVE 5¼" FLOPPY DISK
CP500 1 x 790 K BYTE/DRIVE 5¼" FLOPPY DISK
AND 4.8M BYTE 5" WINCHESTER HARD DISK

SPECIFICATIONS
Z80A PROCESSOR
10 SLOT S100 BUS
CP/M and MP/M OPERATING SYSTEMS
2 SERIAL PORTS; 1 PARALLEL PORT

JAROGATE LTD. is a Company that specialises in all areas of microcomputer applications. Due to this wide range of expertise, **JAROGATE LTD.** is swiftly becoming one of the leading names in the microcomputer industry.

CONSULTANCY Our services include:— system analysis, software design, programming, hardware design, hardware maintenance and systems integration.

SALES As well as distributing a wide range of hardware, software and consumables,

JAROGATE LTD. also provide technical advice to all users, whether experienced or first time.

SUPPORT and MAINTENANCE **JAROGATE LTD's** team of experienced engineers and programmers are available to give full after-sales support.

JAROGATE LTD. offer nationwide hardware maintenance of all products sold.

Also available for multi-user applications — THE JAROGATE MP5 MULTI-PROCESSOR SYSTEM.

Jarogate Ltd. are main dealers for Comart, Cromemco and North Star ranges of systems and boards.

JAROGATE LTD.
the microprocessor consultants

197-213 Lyham Road, Brixton, London SW2 5PY Telephone 01-671 6321

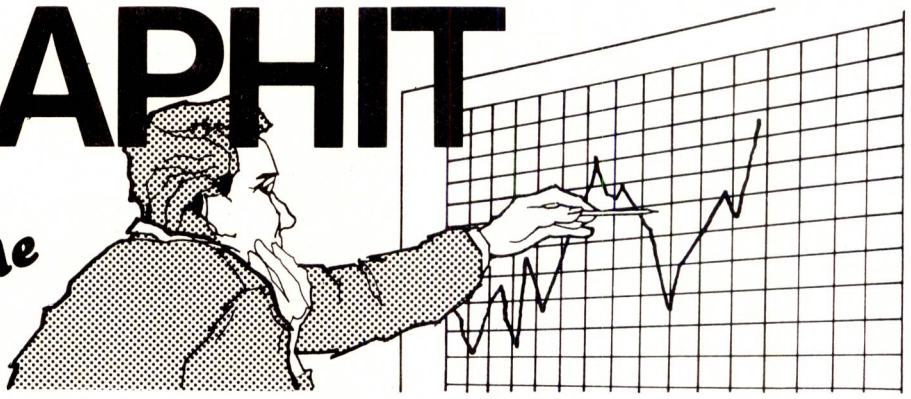
CP/M, MP/M and CP/NOS are Registered Trade Marks of Digital Research.

INNOVATIVE

TRS 80-GENIE SOFTWARE

from the professionals

GRAPHIT



Visicalc compatible

There are a number of programs which will portray graphs on a Microcomputer. Indeed, we stock two already, Graph Plotter and Plotter. Graphit, however, is the ultimate of such programs. It has been written solely for displaying graphs. It is compatible with Visicalc DIF files. Hence such a file constructed with Visicalc can be fed into Graphit and a graph display obtained. Users may also, however, insert data directly from the keyboard into Graphit. This data may then be fed into Visicalc for further processing.

Every function that we can think of that would be of use to a person requiring a graph has been included in Graphit. Labels may of course be used and these may be transposed from the side to the bottom or vice versa at any time. A great deal of work has been put into manipulation of the display in the sense of magnification, or changing the scale. The program will itself first of all calculate an appropriate scale but thereafter this may be altered in almost any way. Thus a small section of the graph may be made to occupy the whole of the screen. Alternatively a large proportion, or all, of the data may be displayed at once. In other words, the program has complete flexibility of display of the graph.

Scrolling is supported in either a latitudinal or longitudinal direction and by one column or by a complete page. If, for instance, the months for one year are set up along the bottom of the screen with sales figures up the side, the user can move along in either direction from month to month or jump six months at a time and show the whole page — the display facilities are almost endless. And display, when you come to think of it, is what a graph is all about.

The graph as shown on the screen may be printed out to a line printer or the raw data on its own can be printed out. The axis can be changed at any time so that if, as in the example mentioned above, we have the months along the bottom of the screen, by one simple keystroke they can be made to go up the side, and the sales figures along the bottom, with the graph changing accordingly of course.

At any time the zig-zag display can be changed for the step and of course vice versa.

Perhaps the most important feature, has been left until last. Graphit was specifically commissioned and the specification called for ease of use, as the prime requirement. Not only, therefore, is a comprehensive manual supplied, but also at almost any time while using the program the H key can be pressed for help, whereupon all of the available commands are displayed. Graph programs in the past have rather suffered from being included in other software. This one concentrates entirely on drawing graphs and gains a lot thereby. Available on disk only, compatible with the Genie I and II and the original Genie, together with the Tandy Models I and III.

(Visicalc is a Registered Trademark of the Visi Corp.)

Graphit on disk ..... £17.00 + VAT = **£19.55**
75p P & P please.

MOLIMERX LTD

A J HARDING (MOLIMERX)

1 BUCKHURST ROAD, TOWN HALL SQUARE, BEXHILL-ON-SEA, EAST SUSSEX.

TEL: [0424] 220391 / 223636 **TELEX 86736 SOTEX G**

TRS-80 & VIDEO GENIE SOFTWARE CATALOGUE £1.00 [**refundable**] plus £1 postage.

INNOVATIVE

TRS 80-GENIE SOFTWARE

from the professionals

LDOS

VERSION 5.1
THE TRS-80™ OPERATING SYSTEM
MODEL I AND III

* **DOUBLE** Sided & **DOUBLE** Density support.
* **AUTOMATIC** Density recognition.
* 35, 40, 77, 80 and any other track counts are supported.
* All available drive stepping rates are supported.
* Hard Drive support, can be **HANDLED AS A SINGLE DRIVE.**
* Hard drive partitioning, one drive can act as up to six.
* Intermix 5", 8" and Hard drives, up to a total of 8 drives.
- Compatible with the Model I Radio Shack Expansion Interface.
- Upward compatible with **TRSDOS** (2.3 & 1.2 as documented).
- Fully supports Microsoft language products for the **TRS-80.**
- Complete media compatibility Model I to Model III and back.
- Full support for **LOBO's LX-80** interface.
- Full support for **AEROCOMP LC** double density controller**(DDC).**
- Full support for **PERCOM's DOUBLER II.**
- Complete documentation (well over 250 pages).
- Complete technical information.
- A Quarterly **LDOS** users magazine (The **LDOS QUARTERLY**).
- A liberal update policy.
- An enhanced **BASIC (LBASIC)** including:
  - > Upward compatible with Microsoft Basic.
  - > High speed **LOAD** and **SAVE.**
  - > Run multiple programs with common variables.
  - > **BLOCKED** (variable length) files are supported.
  - > **DOS** commands may be executed from **LBASIC.**
  - > Built in string array. **SORT.**
  - > Single stepper for debugging.
  - > Several new statements and file modes.
- A compiled **JOB CONTROL LANGUAGE (JCL).**
- **CONV**ert utility to move files from Model III **TRSDOS.**
- An Extended Debugging and Monitor program (with disk access).
- **CMDFILE** for movement of disk and/or tape system **(/CMD)** files.
- Device independent operation.
- Full **LINK**ing, **ROUTE**ing, **FILTER**ing and **SET**ting are supported.
- Mini**DOS** feature for constant access to certain **DOS** commands.
- **RS-232 DRIVER** for serial support.
- Sophisticated communications software included.
- Wildcard characters and partial Filespecs are supported.
- **DATED FILES,** show when a file was last written to.
- Backup: Mirror, by Class, if Modified, by Date, by Extension, etc.
- Selectable **PURGE** for fast disk "cleanup" of unwanted files.
- Print formatter, for control of printer output.
- Built in printer **SPOOLER,** to both disk and ram.
- Joblog to record all system operations with time stamps.
- **UPPER** and *lower* case support, throughout the system.
- Blinking cursor with selectable cursor character.
- 128 character **TYPE AHEAD** buffering for keyboard input.
- Assign strings to individual keys with Key Stroke Multiply **(KSM).**
- **SUPER FAST** operation with the **SYSRES** feature.
- Extensive user control and system feedback.
- Advanced **PATCH** utility for easy maintenance.
- Complete transportability of software among all **Z-80 LDOS** systems through the use of the **LDOS** high ram supervisory call system **(SVC).**

* Specific hardware is required to use these features.

LDOS for TRS-80 I/III and all current Genie machines
£85.00 + V.A.T. and P & P £3 Receipted Parcel Post

MOLIMERX LTD

A J HARDING (MOLIMERX)

1 BUCKHURST ROAD, TOWN HALL SQUARE, BEXHILL-ON-SEA, EAST SUSSEX.

TEL: [0424] 220391/223636 **TELEX 86736 SOTEX G**

TRS-80 & VIDEO GENIE SOFTWARE CATALOGUE £1.00 [**refundable**] plus £1 postage.

INNOVATIVE

TRS 80-GENIE SOFTWARE

from the professionals

JUMBO



Fantastic new flying simulation

Occasionally a program comes along of such magnitude that it is hard to describe it, especially within the space allowable in an advertisement. Jumbo is such a program. There have, of course, been flying simulation programs before, but they have all rather fallen into the trap of trying to produce a graphic representation of the ground at some stage or other in the program, thus taking up space, and/or they have concentrated on the single act of flying. In other words, although one gets the feeling of flying a small aircraft, one is not going anywhere.

Jumbo is a fantastically accurate simulation of flying a Boeing 747. These planes are not small, and are not flown by eye. They are flown by eyes and instruments, and the instrument graphics in this simulation are really first class. As you may know, the primary instrument of an aircraft is the artificial horizon. This is simulated very well, and includes instrument landing approach indicators. Graphic maps of very high quality are produced and it is possible to fly in all of the British Isles including Southern Ireland, and to New York on the Eastern U.S. seaboard. The actual airports are at London, Birmingham, Manchester, Prestwick, Edinburgh, Belfast, Shannon and New York.

The program was written by two authors who combined their joint skills to produce a unique piece of software. The programmer got the last byte of performance out of the machine and the pilot the last drop of authenticity out of the simulation. Other simulation programs produce at best a similarity towards flying. With Jumbo you really feel that you are behind the controls.

The authors have used a number of gimmicks and programming techniques. For instance, it is possible to switch on an automatic pilot and to jump forward in time in increments of one minute or one hour — otherwise of course a flight from London to New York or vice versa would take some 8 hours to simulate. Whilst in this time skip the various controls are left as they are but fuel consumption and distance to go are taken forward at their correct rate.

A chart is supplied containing various items of data which you will need, including the take-off data for a 747 with various take-off weights, flap retractions, climb and cruise speeds and descent distances.

Realising that not everybody can fly a 747 and that there is even a large proportion of the population that cannot fly anything, two important items of assistance have been added. First of all is the documentation. This is split into two parts. The second is a "manual" on flying the 747. In other words, the instructions for running the program. The first part, however, is what amounts to an instruction manual for flying. It assumes that the user knows nothing about aircraft and although we do not purport that it gets anybody up to any sort of standard after it has been assimilated, the reader should have sufficient knowledge of flying and the theory of flight to fly in the program itself. The second feature of assistance to the novice pilot is a feature in the program which enables the user to practice landings. When the program is started, if one presses the P key, the aircraft is automatically put 11 miles out from London Airport approaching on an instrument landing.

The controls are pretty well complete, even to dive and wheel brakes. The flying track may be continuously monitored on the map display. Bearing and distance to your intended point of landing are available all the time. The instruments, incidentally, consist of:

Artificial horizon	Attitude	Fuel
Aileron indicators	Compass	Elapsed time
Indicated airspeed	Turn indicator	Distance to landing
Power setting	Flap indicator	Rate of climb
Elevators	Altimeter	

Six maps may be chosen, as follows:

Scotland, Northern England, Southern England, Ireland, Eastern U.S.A., The whole of the U.K.

Route information and present position are shown on the map displayed. It is very difficult to think of any factor that the authors have overlooked. Even the quite meaningful thinning of the air with increasing height, which greatly affects the airspeed indicator in real life, is taken into consideration. Rather than having a fixed stalling speed, this continuously changes with the flight configuration, the weight, height and power setting, again as it does in real life.

We like to think that we publish good programs. Jumbo is outstanding. It is available on tape or disk for 16K or 32K memory machines. It is compatible with the Model I and Model III Tandy, Video Genie, Genie I and Genie II machines.

Tape ..... £15.00 + VAT = **£17.25**

Disk ..... £17.00 + VAT = **£19.55**

Plus 75p P & P please.

MOLIMERX LTD

A J HARDING (MOLIMERX)

1 BUCKHURST ROAD, TOWN HALL SQUARE, BEXHILL-ON-SEA, EAST SUSSEX.

TEL: [0424] 220391/223636 **TELEX 86736 SOTEX G**

TRS-80 & VIDEO GENIE SOFTWARE CATALOGUE £1.00 [**refundable**] plus £1 postage.

AMERICAN EXPRESS Cards Welcome

BARCLAYCARD VISA Buy it with Access

A bigger range than the Himalayas



The Acorn Atom From £118 plus VAT.

Personal Computing – Instructional and Fun

To get the best out of personal computing you need two things – hardware that is powerful and reliable – software that uses the hardware to the full. The Atom range is just that.

The Atom – tried and tested

The Atom was designed to last – inside and out. Outside a rugged, high impact case with a proper keyboard. Tested to withstand children as well as adults. Inside a powerful operating system that will never be bettered. It is available in several versions so you can choose what you want. And there is an enormous range of additional boards that fit inside the casing – start where you like – add more power, more versatility when you need it.

The Accessories – something for everyone

Diskpacks, printers, monitors, plug-in ROM's, manuals, other languages, arcade-type games, business and household software. Whatever you want to do – teach your children, run your business – you can't do better than choose the Atom range.

Available Nationwide

Not just mail order, the Atom range can be bought through a national dealer network – they will help and advise you. And in the unlikely event of breakdown they will be there. Like our equipment Acorn Computers are here to last.

ACORN COMPUTER

Acorn Computers Limited, Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN Tel: (0223) 245200.

FREE Catalogue

For full details of the complete range and a list of dealers just fill in the coupon or write to us.



To: Acorn Computers Ltd, Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN Tel: (0223) 245200.

Please rush me a complete list of the Atom range.

Name: _____

Address: _____

_____

_____

_____

Postcode: _____

PCW 55

A
SI

THE 16-BIT PERSO

The ACT Sirius 1 is more than the UK's best-selling 16-bit personal computer. It is the only one with such a large choice of 16-bit software — business and scientific programs specially developed to take advantage of the high speed 16-bit Intel 8088 microprocessor at the heart of every Sirius.

Combine this faster and more powerful software with the advanced specifications of the Sirius 1 and you can see why more and more business users are choosing Sirius.

Because Sirius users have both the latest microcomputer technology and the powerful 16-bit software that takes full advantage of it.

Ergonomics plays a vital part in the design of ACT's Sirius 1. The screen tilts and swivels to suit the user and glare is eliminated.

The display is razor sharp, and the brilliance and contrast can be adjusted using keys on the low profile detachable keyboard.

UP TO 896 KBYTES RAM

128 Kbytes of RAM memory as standard easily upgraded to a massive 896 Kbytes ensures plenty of capacity for fully fledged business software and associated record files.

Within the basic system is 1.2 Mbytes of floppy disk storage, with 2.4 Mbytes double sided disks available as an option. More than any other comparable personal computer.

As a result, the Sirius is suitable from the start for large record processing applications. And with 5 and 10 Mbyte Winchester disk drives scheduled for early introduction, the Sirius can easily match your own organisation's growth.

SOFTWARE THAT TALKS BACK

And built into every Sirius is a revolutionary new concept: An audio decoder that can play back verbal messages and prompts under program instruction to assist the non-computer people to get acquainted with the software more quickly.

NEW 16-BIT SOFTWARE

All the big names in applications software are on the Sirius: ACT's Pulsar for accounting, WordStar for word processing, MicroModeller for financial modelling and SuperCalc the "spread sheet" program.

Plus the exciting SELECT, the only word processor that teaches you how to use it in less than 90 minutes.

And more than 100 top software companies are currently developing specialist software for every business and profession from the motor trade to solicitors.



The ACT octagon encapsulates our philosophy of providing users with a single source for their computing solutions.

ACT products include personal computers — network micro-computer systems — turnkey mini computers and a total range of services, including software development, computer field engineering, computer supplies, and a complete range of Bureau services.

The eight specialist ACT companies are each leaders in their field and are wholly owned by Applied Computer Techniques (Holdings) p.l.c., one of Britain's largest and most successful computer companies.

See us at the Personal Computer World Show The Barbican 9-12 Sept. 1982.

CT rius 1

NAL COMPUTER

Price £2,395



MORE LANGUAGES

The Sirius has more available programming languages than any newly-introduced personal computer. MicroSoft's BASIC 86, interpretative or compiled, CBASIC, a choice of several versions of COBOL, three different PASCAL's and a full scale FORTRAN.

The benefits? Programmers and software houses are making the Sirius their first choice computer for business software development.

Unlike other personal computers, the ACT Sirius 1 is delivered with the two industry standard operating systems at 16-bit level — MS-DOS and CP/M-86. Once again a guarantee now of the widest choice of off-the-shelf 16-bit software.

And further operating systems are under development. The much vaunted UNIX and a new system to support a low cost local area network.

COMMUNICATIONS

The Sirius is the ideal communications system, with two independent RS232 communications ports in addition to parallel and IEEE 488 ports. Available NOW are all the facilities required to communicate directly with large, mainframe computers.

Further backing is available by way of a dedicated Sirius Training Centre, run by ACT and open to all.

To support the product ACT has a truly professional network of systems dealers, hand picked for its knowledge of the business environment, enabling top quality support to always be close at hand.

ACT SIRIUS 1 — THE COMPLETE 16-bit personal computer.

To know more about the 16-bit ACT Sirius 1 and its exciting range of 16-bit software, clip the coupon and return it to:—

ACT (Sirius) Ltd.,
FREEPOST,
Halesowen, West Midlands,
B63 1BR.

Or call for details now on

021-501 2284

Price excludes VAT.

I need to know more about the ACT Sirius 1 and the new 16-bit Software.

Name:_____

Position:_____

Company:_____

Address:_____

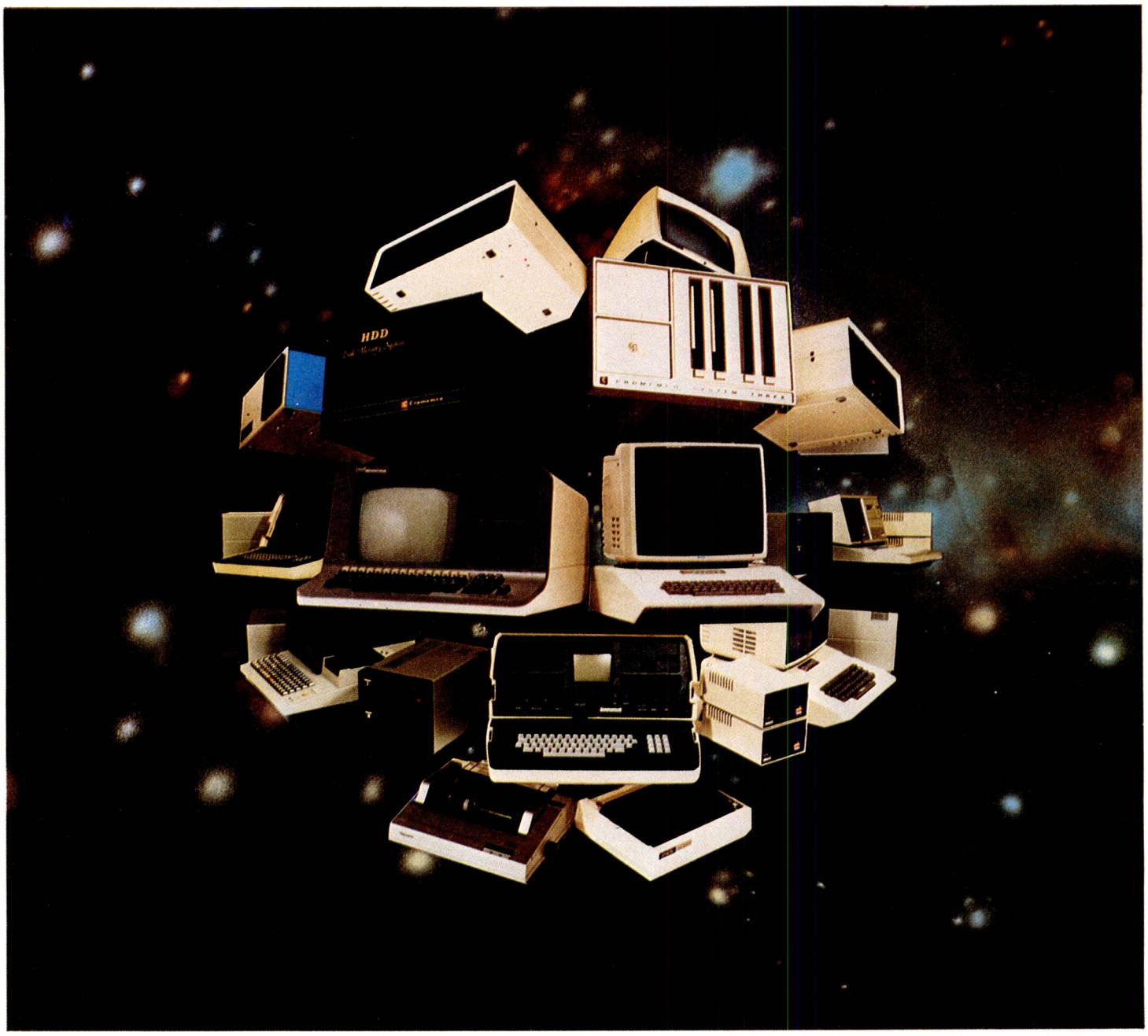
_____

_____

Telephone:_____

I may qualify for a dealership. Please send a dealer application pack☐

PCW/9/82



The choice is yours...

Xitan Systems, the South Coast's leading centre for microcomputer hardware and software, offer a choice of over twenty systems from seven major manufacturers.

apple Popular desktop computers for personal and small business use.

comart Communicator range of sophisticated British S100 business systems.

commodore VIC–20, the ideal introduction to computing.

Cromemco Computer range for professional use, with numerous options.

XITAN SYSTEMS

Xitan Systems Limited
23 Cumberland Place
Southampton SO1 2BB
Telephone 0703 38740
Telex 47388 CHACOM G.

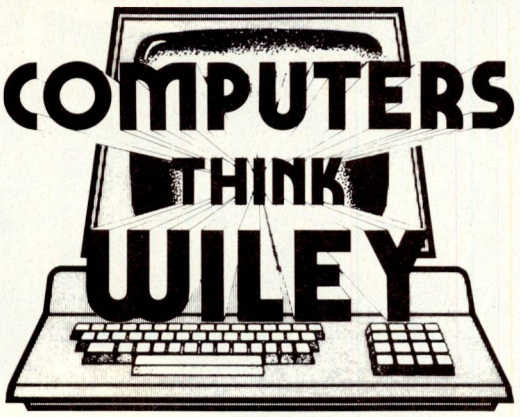
NorthStar The Advantage desktop computer with business graphics.

OSBORNE The briefcase-sized system that took America by storm: a complete business system in a compact, portable package.

SHARP The elegant MZ80B desktop computer, with a range of options.

XITAN The essential back-up for every system, Xitan offer unrivalled knowhow in commercial, industrial, educational and scientific microcomputer applications.
Xitan's services include system development, hardware and software support, and fast and effective service in the field.

THINK COMPUTERS THINK WILEY



NEW AND RECENT BOOKS

UNIX — THE BOOK

by **M. Banahan** and **A. Rutter,** *Department of Computer Science, University of Bradford*

UNIX is an operating system for computers ranging from main frame, through mini, to micro computers. UNIX is rapidly becoming the standard by which other operating systems are judged. Unlike CP-M, it looks set to take over a major chunk of the market on 16 bit, 32 bit, and larger machines. UNIX is both an operating system and a language, the language is called 'C'. The 'C' language compiler is designed to be portable, so it is relatively simple to move the whole system from machine to machine.
UNIX provides file security and owners of files in the file store can permit just themselves, or other individuals in a group to use the files. Also, the allowed use may be to read, write or execute particular files. The basic library of 'C' routines can be extended by the user so that extended — and personalised — UNIX utilities are allowed.
There are now several UNIX systems for micro computers and UNIX itself is now being offered on the emerging breed of 16 bit 'super' micros that will dominate the 1980s. This important and immensely readable book will dispel much of the ignorance about this remarkable operating system.

August 1982 — approx. 160pp
0905104218 — (paper) approx. $12.70/£6.50
Published by Sigma Technical Press

ATARI® SOUND AND GRAPHICS

by **H. Moore, J. Lower,** and **B. Albrecht,** *all of Dymax Corporation*

A self-paced, self-instructional guide to artistic programming with the Atari 400 and Atari 800 microcomputers. It teaches simple programming techniques for creating sounds and images using the Atari's highresolution graphics and sophisticated color and somic capabilities. Programs range from games to more serious artistic applications, and include composing and playing melodies, drawing cartoons, creating sound effects, and combining animation and sound. It teaches elementary BASIC programming in the context of each newly introduced technique.
Wiley Self-Teaching Guide

June 1982 — 240pp
0471 09593 1 — (paper only) $13.20/£6.75

FAST BASIC:
Beyond the TRS-80™ Basic

by **G. Gratzer,** *The University of Manitoba, Winnipeg, Canada;* with **T.G. Gratzer**

A sophisticated programming language book designed to overcome some of the shortcomings of BASIC. It shows readers how to use fewer than 25 functions of machine (assembly) language to improve the speed of their BASIC. It covers the rudiments of assembly language; how information is stored in a computer; how to apply the concepts learned directly to BASIC.

July 1982 — approx. 300pp
0471 09849 3 — (paper) approx. $17.20/£9.85

TRS-80™ COLOR BASIC

by **B. Albrecht,** *Dymax Corp.*

This self-teaching guide to the new TRS-80 color computer outlines educational and recreational uses such as games, numbers, music, words, and color graphics.
Wiley Self-Teaching Guides

Contents: The TRS-80 Color Computer; Easy Stuff; BASIC Programs; Number Boxes; String Boxes; Skipping 'Round the Screen'; Patterns; Meandering; To Do Or Not To Do; String Magic; Super Boxes; Problems and Solutions; The Color BASIC Toolbox; Appendices.

July 1982 — approx. 256pp
0471 09644 X — (paper) approx. $11.45/£6.55

GOLDEN DELICIOUS GAMES FOR THE APPLE™ COMPUTER

by **H. Franklin, J. Koltnow** and **L. Finkel**

A unique computer game book for the Apple II microcomputer. The book includes complete, ready to use game programs for the novice, and also game subroutines that can be added to, combined, and embellished by more sophisticated programmers. It also shows how games can be used for education in home or school by explaining exactly what each game teaches and teaches programming logic and good programming style.
Wiley Self-Teaching Guides

July 1982 — approx. 256pp
0471 09083 2 — approx. $14.90/£8.55

PERSONAL COMPUTING:
Home, Professional, and Small Business Applications, 2nd Ed.

by **D.R. McGlynn**

A revised and completely updated edition of this popular guide to the capabilities and operating features of personal computers. Provides detailed, critical coverage of the limitations of hardware and software commercially available today, and explains various programming languages, from BASIC to Pascal and APL. It contains numerous photos and tables, as well as charts that list and compare equipment.

June 1982 — 350pp
0471 86164 2 — (paper only) $19.90/£11.65

APPLE is a trademark of Apple Computer Inc., ATARI is a registered trademark of Atari Inc., TRS-80 is a trademark of Tandy Corp.

Available from all good Bookshops and Computer Stores

See us at the P.C.W. SHOW STAND No. 125

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



NEW BOOKS from Prentice-Hall International

Apple BASIC

Richard E. Haskell

A thorough introduction to all aspects of BASIC programming on the Apple, this book covers graphics, home finance, games, mathematical problems and interface systems. Sample programs with illustrations and explanations are included.

☐ **£15.95 hardback c. 350 pages 13-039107-7**

☐ **£10.35 paperback 13-039099-2**

The VisiCalc Book: Apple Edition

Donald H. Beil

This practical guide to the VisiCalc software package explains how to make the most of VisiCalc on the Apple II. Topics covered include commands, debugging, creating templates, documentation, linking VisiCalc files to BASIC, and creating programs.

☐ **£11.95 paperback c. 400 pages 8359-8397-8**

PET/CBM BASIC

Richard E. Haskell

A step-by-step introduction to top-down programming which includes photographs from the computer's video screen, this book shows you how to program your PET in BASIC and create sound effects, make bar graphs, make 3-D letters on the screen, and much more.

☐ **£10.35 paperback 154 pages 13-661751-4**

Programming the TRS-80 Pocket Computer

Donald D. Spencer

This complete introduction to programming the TRS-80 Pocket Computer in BASIC provides sample programs and output displays, and covers cassette machine interfacing.

☐ **£7.15 paperback c. 175 pages 13-730531-1**

TRS-80 Assembly Language Subroutines

William Barden, Jr.

Assembly language programs with over 100 subroutines that can be used as they stand or modified are provided to cover a wide spectrum of applications.

☐ **£15.15 paperback c. 250 pages 13-931188-2**

MC68000 16-Bit Microprocessor User's Manual: 3rd Edition

Motorola Inc.

Motorola provide the latest information on developing software systems using the MC68000 family of microprocessors in this manual. Illustrated with diagrams throughout, each instruction is described in bit pattern format, and explicit examples demonstrate how each instruction operates.

☐ **£11.95 paperback 232 pages 13-566695-3**

The Z8000 Microprocessor: A Design Handbook

Bradley K. Fawcett (Zilog Inc.)

This book describes in detail the function and operation of the Z8001 and Z8002 16-bit microprocessors. Emphasis is given to the features that determine the hardware interface to the CPU, and detailed descriptions of the Z8000 instruction set and information on peripheral devices are provided.

☐ **£12.75 paperback 256 pages 13-983734-5**

Fun with Microcomputers and BASIC

Donald D. Spencer

For complete beginners, this book includes over fifty problems and programs for games such as Number Guess, Slot Machine, Russian Roulette and Buried Treasure. The programs were developed on the TRS-80 and Apple II, but can be used on the ATARI 800, PET and other microcomputers with little or no modification.

☐ **£7.95 paperback 128 pages 8359-2214-6**

Prices are correct at the time of going to press but may be subject to change.

Book Orders

These books can be ordered from your bookseller or in case of difficulty from:

Department 30,
Prentice-Hall International,
66 Wood Lane End, Hemel Hempstead,
Hertfordshire HP2 4RG, England.

Please mark the number of books you wish to order in the boxes beside each title and return the advertisement to the address above.

Name _____

Address _____

_____

_____

I enclose a cheque/P.O. for £ _____

Please add £1.00 per book for postage and packing. Payment should be made out to **INTERNATIONAL BOOK DISTRIBUTORS.** Please allow 28 days for delivery.

PCW9

Prentice Hall PHI International

MICROCOMPUTER PRODUCTS INTERNATIONAL LTD.

MPI

ROOM PCW, 8 CAMBRIDGE HOUSE, CAMBRIDGE ROAD, BARKING, ESSEX IG11 8NT, ENGLAND
Telephone: 01-591 6511 Telex: 892395

SOFTWARE FOR CP/M COMPUTERS

BYROM SOFTWARE

	Software & Manual	Manual Only
BSTAM—Utility to link one micro-computer to another also using BSTAM	£106	£7
BSTMS—Utility to link a micro to a mini or mainframe	£106	£12

DIGITAL RESEARCH

CBASIC v 2.08	£72	£15
CB-80 1.3	£295	£19
MPM 1.1	£130	£20
MPM 2.0	£273	£33
CP/M-86	£161	£30
CP/M 2.2	£97	£22
CP/NET	£120	£16
XLT86	£89	£7
SID 1.4	£47	£16
ZSID 1.4	£61	£16
MAC	£58	£16
TEX 3.0	£61	£16
DESPOOL	£29	£7
PL/1-80	£298	£30
BT-80	£156	£22

FOX & GELLER

QUICKSCREEN FOR DBASE II	£97	£13
QUICKSCREEN FOR C/BASIC/CB-80	£97	£13
QUICKSCREEN FOR MBASIC	£97	£13
QUICKCODE FOR DBASE II	£172	£20

KLH SYSTEMS

Spooler for CPM systems v3.0	£78	£7

MAGIC CIRCLE SOFTWARE

CPM SIM	£133

MPI LTD.

FORTH	£80	£22
PAYROLL	£500	£15
SALES LEDGER	£200	£15
PURCHASE LEDGER	£200	£15
NOMINAL LEDGER	£200	£15
INCOMPLETE RECORDS	£1200	£20
WHATSIT	£80	
FT NUMB	£50	

MICROPRO INC.

WORD-MASTER 1.7A	£83	£24
TEX-WRITER 2.6	£41	£19
WORDSTAR 3.0	£278	£42
MAIL MERGE 3.0 (requires Wordstar)	£83	£11
SPELLSTAR 1.0 (requires Wordstar)	£139	£11
WORDSTAR TRAINING MANUAL		£20
WORDSTAR CUSTOMIZATION NOTES	£56	
SUPER-SORT 1.6: Version 1	£139	£24
DATASTAR 1.101	£195	£28
DATASTAR CUSTOMIZATION NOTES		£56
CALCSTAR 1.2	£167	£28

TYPING TUTOR

by ANTHONY ASHPITEL



A terrific way to learn touch typing! This 'TYPING TUTOR' is an effective teaching tool for correct and speedy typing. Many, many practical exercises which gradually increase in difficulty and speed so the learner builds up his or her skills in a solid and sustained manner.

Can you really bypass this new package? For a demonstration and discussion visit Anthony Ashpitel who will be on our stand at the coming PCW Exhibition.

There are two versions: The BASIC VERSION is a stand alone package. The BUSINESS VERSION includes a fully documented training manual and also incorporates full records of each student's development in relation to his or her own progress and the progress of the rest of the class, so effective comparisons can be made in a useful and helpful way.

BASIC VERSION	£ 50
BUSINESS VERSION	£ 125

Retailer and OEM terms available

MAIL ORDER
TELE-PHONE
CREDIT CARD ORDER
* VISIT *

MICROPRO INC. APPLE VERSIONS

	Software & Manual	Manual Only
WORDSTAR 3.0	£209	£41
MAILMERGE 3.0 (requires Wordstar)	£70	£11
SPELLSTAR 1.2 (requires Wordstar)	£109	£11
DATASTAR 1.101	£165	£28
SUPERSORT 1.6	£111	£24
CALCSTAR 1.2	£109	£28

MICROTECH EXPORTS

REFORMATTER		
CPM ↔ IBM	£109	£19
CPM ↔ DEC	£109	£19

MICROSOFT INC.

BASIC-80 5.21	£206
BASIC Compiler 5.3	£228
FORTRAN-80 3.44	£289
COBOL-80 4.60	£423
M/SORT 1.012	£83
EDIT-80 2.02	£72
MACRO-80 3.43	£117
MULISP 2.12	£117
MUMATH 2.12	£145

MICRO-AP

	Software & Manual	Manual Only
SELECTOR V	£306	£28

MICROFOCUS

CIS COBOL version 4.5	£425	£25
FORMS 2	£110	£10

MT MICROSYSTEMS

PASCAL MT· 5.5	£195	£28
PASCAL MT· 5.5 with SPP	£281	£56
Library Sources	£122	
Speed Programming Pkge. (Softbus)	£139	£28

PHOENIX SOFTWARE ASSOCIATES (For Z80 only)

PLINK—Disc to disc link loader	£80	£17
PASM—Macro Assembler	£80	£17
PEDIT—Line editor with Macros	£80	£17
BUG—Very powerful debug	£80	£17
PDEVELOP Package with all the above	£215	£37
PLINK—2 Overlay Link Loader	£206	£17

FREE Full descriptive Catalogue available

Visit us at the PCW Exhibition on Stands 105,250 & 251 Barbican Centre · September 9~12

NEW PRODUCTS

ANTHONY ASHPITEL TYPING TUTORS

BASIC VERSION	£50	
BUSINESS VERSION	£125	£25

SAPPHIRE SYSTEMS

MARS	£400	£25

FOX & GELLER

QUICKCODE	£172	£20

MICROFOCUS LTD.

ANIMATOR	£225	£10
FILESHARE	TBA	

M.P.I. LTD.

MATHS PACK	£120
STATS PACK	£120

Trade Enquiries Welcome

ORDER INFORMATION

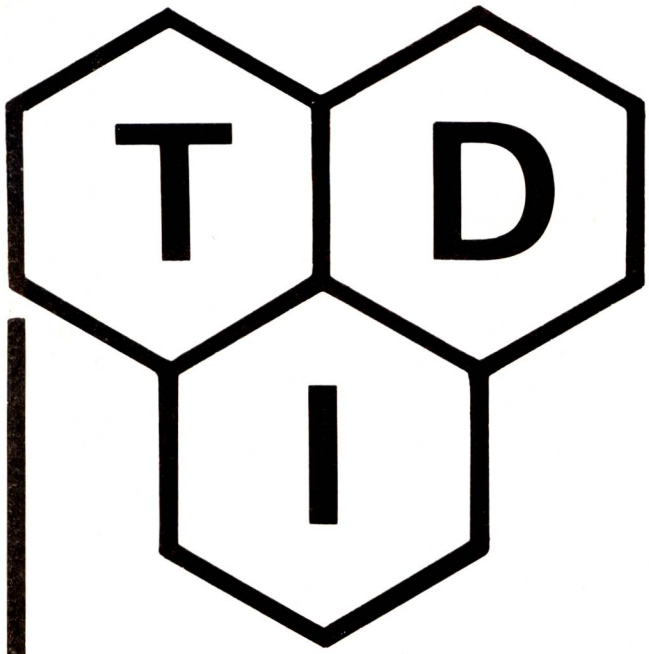
When ordering CP/M software please specify the format you require. All software items are subject to VAT. Manuals, when purchased separately, are not subject to VAT. Please add £4.00 for postage, packing and insurance on each item purchased. For overseas please add £6.50 per item. Most software in this advertisement is available from stock and a 72 hour return service is thereby offered on most prepaid orders. These details and prices are all current as of March 1982. Our prices reflect an exchange rate of U.S. $1.80 to £1.00. Should the exchange rate vary by more than 5 cents, a surcharge may be added or a discount given. All payments must be in Sterling and drawn against a U.K. bank.

MAIL ORDER TELEPHONE ORDER VISIT Send Cash, Cheque, Postal Order, IMO, Access or Barclaycard/Visa number to Microcomputer Products International Ltd., Room PCW, 8 Cambridge House, Cambridge Road, Barking, Essex IG11 8NT.

MEDIA AND FORMATS

Altos	A1	CPT 8000	A1	Industrial Microsystems 8000	A1	Nascom/Lucas	N1
APPLE CP/M-80 13 Sector	RG	Cromemco System 3	A1	Intel MDS SD	A1	NCR 8140/9010	A1
APPLE CP/M-80 16 Sector	RR	Cromemco System 2 SD/SS	R6	Intertec Superbrain SSDD	RK	NNC-80	A1
Blackhawk Micropolis Mod II	Q2	Cromemco System 2 DD/SS	RX	Intertec Superbrain QD	RS	NNC-80W	A1
British Micros Mimi	RK	CSSN Backup	T1	ISC Intercolor 8063/8360/8963	A1	North Star Advantage	P2
California Computer Sys 8 in	A1	Datapoint 1550/2150	A1	ITT 3030 DSDD	R1	North Star Horizon SSSD	P1
CDS Versatile 4	Q2	Dec VT 180 SSDD	RV	Micromation	A1	North Star Horizon SSDD	P2
Columbia Data Products 8 in	A1	Delta Systems	A1	Micropolis Mod II	Q2	North Star Horizon QD (MPI CP/M)	P3
Comart Communicator CP50	P2	Dynabyte DB8/4	A1	Morrow Discus	A1	North Star Horizon QD	
Comart Communicator CP100	P2	Exidy Sorcerer + CP/M-80	Q2	Mostek	A1	(Other CP/M)	P2
Comart Communicator CP200	P2	Exidy Sorcerer + Exidy CP/M-80 8"	A1	Multi-Tech 1	Q2	Nylac Micropolis Mod II	Q2
Comart Communicator CP500	P2	EXO	A1	Multi-Tech 2	Q2	Osborne-I	RP
Compal-80	Q2	Gemini Galaxy I	NI	Micromation	A1	Pertec PCC 2000	A1
		Heath H8 + H47	A1	Micropolis Mod II	Q2	Rade 1000 SSDD	RL
		Hewlett-Packard 125.8in	A1	Morrow Discus	A1	Rade 1000 DSDD	RM
		ICOM 3712	A1	Mostek	A1	Rair Black Box	RE
		IMSAI VDP-80	A1	Nascom (Gemini Drives SSDD)	R3	Research Machines 5.25in	RN
		Industrial Microsystems 5000	RA	Nascom (Gemini Drives DSSD)	R7	Research Machines 8in	A1

SD Systems 5.25in	R3
SD Systems 8in	A1
Shelton Signet	RK
Spacebyte	A1
Tarbell 8in	A1
TEI 8in	A1
Televideo DSDD	S5
Toshiba T200 DSDD	SF
TRS-80 Modell + Shuffle-board 8in	A1
TRS-80 Modell II	A1
Vector MZ	Q2
Vector Systems 2800	A1
Vector Systems B	Q2
Vector VIP	Q2
Xerox 820 5.25in	S6
Xerox 820 8in	A1



DID YOU KNOW THAT.....

WITHOUT TOUCHING YOUR PROGRAM YOU COULD MOVE IT BETWEEN YOUR

APPLE, IBM, and now SIRIUS 1...

You can do it with the UCSD p-System, the fastest growing software development system for microcomputers. Manufacturers, applications developers, and more than 50,000 users have already made the UCSD p-System their choice.

The p-System (Version IV) offers:—

- ★ A complete, portable software development and execution environment.
- ★ Full screen editor with Programming and Text modes.
- ★ Comprehensive file handler, library and utilities (all above for £250 plus VAT)
- ★ Fully compatible and integrated Pascal (£160) FORTRAN and BASIC compilers.
- ★ The same system for most major micros:—
  Apple, IBM, OSBORNE, DEC, TI, all Z80's, 68000'S, and NOW Sirius 1

The UCSD adaption now offered by TDI gives the following extra features:—

- ★ EXTENDED MEMORY allows bigger programs (standard)
- ★ TURTLEGRAPHICS allows the user to exploit the full abilities of the SIRIUS display. (£45)
- ★ NATIVE CODE GENERATOR allows the user to selectively generate native 8088 code giving total control over the 'trade-off' between size and speed. (£80)
- ★ XENOFILE passes CPM files to/from p-System. (£20)

APPLICATION SOFTWARE available now or soon includes:—

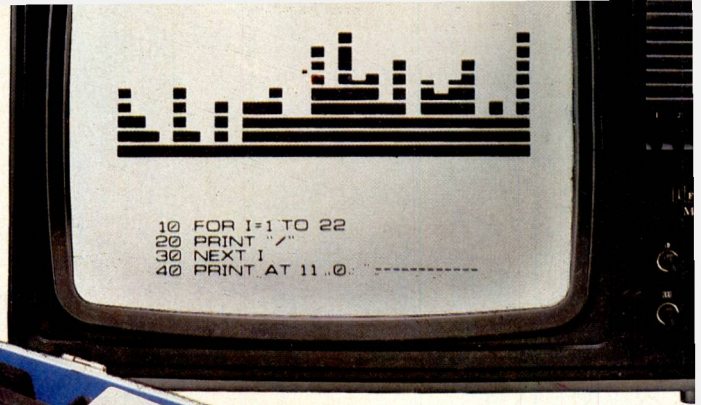
- ★ JARMAN accounting systems. Widely recognised on Apple.
- ★ INTERLINK terminal product with full error checking protocol to transmit/receive ALL types of files without corruption.
- ★ ALADIN Relational Database Manager. German authored this product is one of the first truly powerful database systems available on small computers.
  A genuine relational system the product has full screen input and enquiry facilities and even has a Pascal code generating interface.
- ★ Modula 2 Compiler.

Available from:— TDI LIMITED, 29 ALMA VALE ROAD, BRISTOL BS8 2HL
TEL: 0272-742796
(Dealer and educational enquiries welcomed)

Use your computer in the case...
Foam rubber gives complete protection...
Purpose-built for the ZX system...

ZX81 & Spectrum Custom Cases.

Just £34·95 (+P&P) each.







Turn your ZX system into a portable computing centre!

Your ZX hardware – ZX81 or Spectrum – is designed to work together as a system.

And now there's a simple way to make the most of the fact.

The portable computing centre in a briefcase.

A ZX Custom Case holds all your hardware in the most ergonomically sensible positions for easy operation. Each piece of equipment is gripped securely by shock-absorbing foam. Each connecting lead fits under the foam, so there's no chance of tangles. And as each piece is held firmly, connections are excellent.

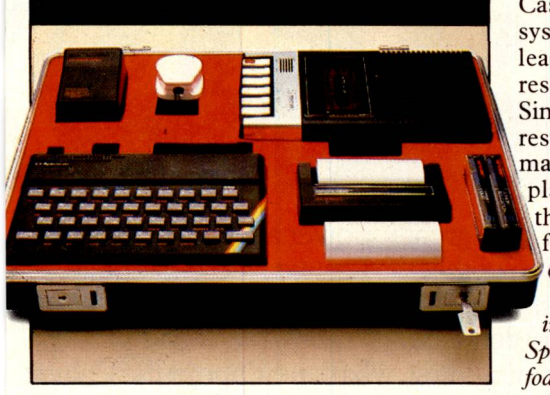
You can forget wasted time setting up or unhooking the system, too. When you've finished, simply tuck in the mains and TV leads and replace the hinged, lift-off lid. And of course, if you're taking your ZX system to college or the office, ZX Custom Cases are a lot less cumbersome than a bag or rucksack. And a lot more protective and professional.

Designed by ZX enthusiasts – for ZX enthusiasts.

Both the ZX81 and Spectrum Custom Cases were designed by a group of ZX system users and manufactured by Britain's leading case makers. Made from impact-resistant ABS, each case holds every piece of Sinclair hardware available for the respective computers – plus Learning Lab, manual, software cassettes and any cassette player up to 10½" x 5½". If you haven't all the hardware, simply leave the pre-cut foam in position, then remove it as you get extra pieces of equipment.

And when brand new hardware is introduced, or you upgrade from ZX81 to Spectrum, simply contact us for a replacement foam insert for just £4.95 (+p&p).

ZX Spectrum Custom Case now available!



Send for your ZX Custom Case – now!

ZX81 and Spectrum Custom Cases are guaranteed for two years, and cost just £34.95 (+p&p) each. Remember you could pay more for an ordinary briefcase.

To order, simply use the FREEPOST coupon. Or if you have a credit card, telephone 0276 62155, Mon-Fri, 9.30-5.30.

COMPUTEX CASES

Computex Cases (JBS), Stanhope Road, Camberley, Surrey, GU15 3PS.

Please allow 28 days for delivery. 14-day money-back undertaking.

To: Computex Cases (J B S), FREEPOST, Camberley, Surrey, GU15 3BR.

Please send me _____ (qty) ZX81 Custom Case(s) at £36.95 (inc. £2.00 post, packing, insurance) each. **01.**

Please send me _____ (qty) Spectrum Custom Case(s) at £36.95 (inc. £2.00 post, packing, insurance) each. **02.**

*I enclose a cheque/P.O. for £_____ made payable to Computex Cases.

Please debit my Access/Visa* account no. _____

*Please delete as appropriate. PLEASE PRINT.

Signature _____

Name: Mr/Mrs/Miss _____

Address _____

Reg. in England no: 991288. PCW 209



Britain can sti
an extra by

LAST year's launch of Caltext proved that an all-British word processor could bite deep into the best of the foreign competition.

This year the bytes are coming thick and fast. Our Great British Word Processors continue.

But now with greater power and an even smaller price tag. On top of that the Caltext Micro has been launched to establish British supremacy for the busines personal computer user.

But first things first, what's new about the Caltext



find
te.

Vord Processor?

Well, it's got the same easy to use and understand
inction keys that made us welcome in the beginning.

But now it's also got an in-built Winchester
lard Disc. Giving you 8mb of storage and CP/M

software that works across all the proven business packages.

The cost? Almost £1,000 less than we launched with a year ago. From just over £3,000 to be more precise.

So what about the new British built Caltext Micro?

As you'd expect, it's easy to use. With programmable function keys, CP/M and Microcobol software to cover all the business computing requirements.

But unlike some other micros it has a full communications capability and also an in-built Winchester Hard Disc option of 5mb, 10mb or 15mb.

For such a powerful micro with immense softvare and hardware capability you might expect to pay the earth.

Not so. The Caltext Micro undercuts most micro computers by almost half. With an average starting price of around £1,700.

We're confident a more efficient British machine could ease a lot of your processing problems.



To find out how, contact us immediately for product information and the address of your nearest customer support centre.

Let's prove that Britain can still bite back.

Computer Ancillaries Limited, 64 High Street, Egham, Surrey TW20 9EY.

Telephone: Egham (0784) 36455.

Send to: Computer Ancillaries Ltd, 64 High Street, Egham, Surrey TW20 9EY.
Please send me details of the Caltext and Caltext Micro plus the address of my nearest customer support centre.

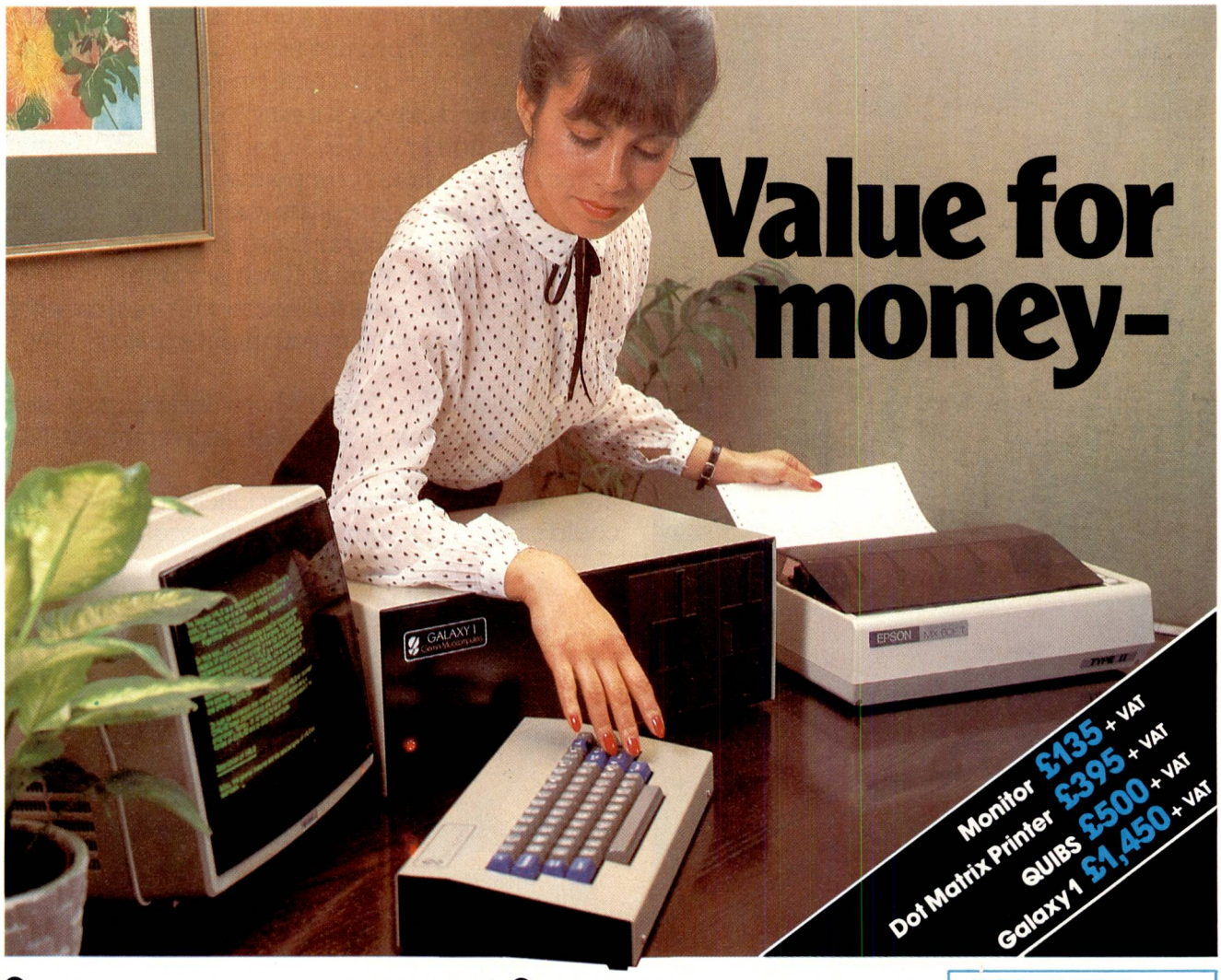
NAME

COMPANY

POSITION

ADDRESS

INFORMATION TECHNOLOGY



in a word: MicroValue.

The Galaxy 1 computer utilises the widely acclaimed Gemini multiboard modules which make it one of the most reliable 2.2 CP/M computer systems on the market.

Do not be misled by the low price. Galaxy 1 has many standard features which are extra on computers costing twice the price.

Examples of this are: full on-screen editing, keyboard type ahead, serial printer driver, parallel printer driver, graphics both block and programmable, and 64K of user RAM.

Standard software with the Galaxy 1 includes COMAL 80, a high level language; a text editing package; a Z80 assembler; a Z80 disassembler and, of course, industry standard operating system: CP/M 2.2.

QUIBS, the business package offered for the Galaxy 1, has been especially written for the Gemini modules. The extremely low cost of £500 is available because of Gemini's high volume potential. This price is substantially lower than comparable software.

Please call your nearest MicroValue dealer for full information on the system.

Galaxy 1 is an all British product with a 12 month warranty (except Disc heads which are guaranteed for 3 months).

MicroValue/Galaxy: A complete business system for less than £2,500

Includes all leads plus 2,000 sheet box of paper

AMERSHAM, BUCKS.
Amersham Computer Centre Ltd.,
(formerly Interface Components Ltd.)
Oakfield Corner,
Sycamore Road.
Tel: (02403) 22307. Tx: 837788

BRISTOL
Target Electronics,
16 Cherry Lane.
Tel: (0272) 421196

EDINBURGH
Computer Interfacing & Equipment Ltd.,
19 Roseburn Terrace.
Tel: (031) 337 5611

EGHAM, SURREY
Electrovalue Ltd.,
28 St Judes, Englefield Green.
Tel: (0784) 33603. Tx: 264475

FAREHAM, HANTS
Allegro Electronics Ltd.,
Newgate Lane Industrial Estate,
Newgate Lane.
Tel: (0329) 289123

LEEDS
Leeds Computer Centre,
62 The Balcony,
Merrion Centre.
Tel: (0532) 458877

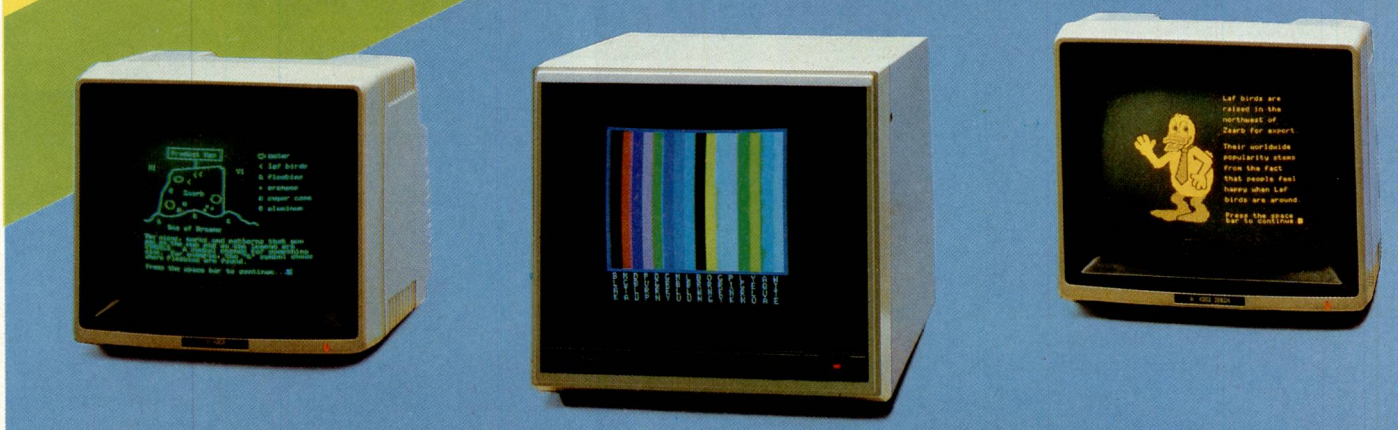
LONDON W2
Henry's Radio,
404 Edgware Road.
Tel: (01) 402 6822. Tx: 262284
(quote ref: 1400)

MANCHESTER
E.V. Computing,
700 Burnage Lane, Burnage.
Tel: (061) 431 4866

NOTTINGHAM
Skytronics,
2 North Road, The Park.
Tel: (0602) 45053/45215

WETHERBY, W. YORKS
Bits & PC's,
4 Westgate. Tel: (0937) 63774

KAGA HAVE NOW ADDED RGB COLOUR TO THEIR RANGE



The new, neat and compact Kaga 12″ RGB Colour Monitor gives brilliant definition and precise colour registration. It is the ideal monitor for all modern micro computers with RGB output.

Interface modules for the Apple III and IBM personal computers are incorporated within the monitor, permitting simple plug in compatibility. For the Apple II a Kaga RGB Convertor Card is available.

From only £235 the Kaga 12″ RGB Colour Monitor is the desk-top bargain of the year.

- Composite/separate negative-sync input available for most other personal computers.
- Unlimited colours available through linear amplifier video circuit.
- The newest 12 inches 90° deflection CRT display.

SPECIFICATIONS

KAGA 12″ RGB MONITOR
SYNC INPUT SIGNAL Composite Negative. – H/V Separate negative. – H/V Separate positive (only for IBM P/C)
VIDEO INPUT SIGNAL RGB separation/Linear/ 18MHz
DISPLAY AREA 216mm x 161mm
HORIZONTAL RESOLUTION (AT CENTRE) 400 dots (Model 101S) 640 dots (Model 201S)
DISPLAY FORMATS 1,600 characters/5x7 dots (Model 101S) 2,000 characters/ 5x7 dots (Model 201S)
POWER SOURCE AC220V-240V/50Hz
POWER CONSUMPTION 60W
DIMENSIONS 320(W) x 384(D) x 290(H) mm
WEIGHT 12.5kg

All Kaga Monitors are equipped with solid state circuitry to ensure utmost reliability. Available nationwide from Data Efficiency dealers, the range includes:

KAGA 12″ RGB (101S) MONITOR	**£235.00**
KAGA 12″ RGB (201S) MONITOR	**£365.00**
KAGA RGB CARD FOR APPLE II	**£50.00**
KAGA 12″ GREEN DISPLAY MONITOR (INC. CABLE)	**£99.50**
KAGA 12″ AMBER DISPLAY MONITOR (INC. CABLE)	**£99.50**
KAGA 12″ B/W DISPLAY MONITOR (INC. CABLE)	**£99.50**

RING 0442 40571/2 FOR DETAILS OF YOUR NEAREST STOCKIST

Trade and OEM enquiries welcome

Prices exclusive of VAT and correct at time of going to press

DE Data Efficiency Ltd

For all your Micro needs...and more.

Sole UK Distributors, Data Efficiency Limited, Computer Division, Finway Road, Hemel Hempstead, Herts HP2 7PS

NEW!

Fast CP/M Business Application Software from Padmede



at £249 per module

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

Sharp PC-3201, MZ-80B ● Apple II ● NEC PC-8000 ● DEC VT180 ● Sirius I ● Osborne I
ICL Personal Computer ● Rair Black Box ● Wangwriter
Hewlett-Packard 125 ● OKI if-800 ● Toshiba T200 ● IBM Displaywriter

Send for details of the Dealer Demonstration Pack

Padmede
COMPUTER SERVICES

351, Fleet Road, Fleet, Hants. Telephone: Fleet (02514) 21892/3. Telex: 858575.



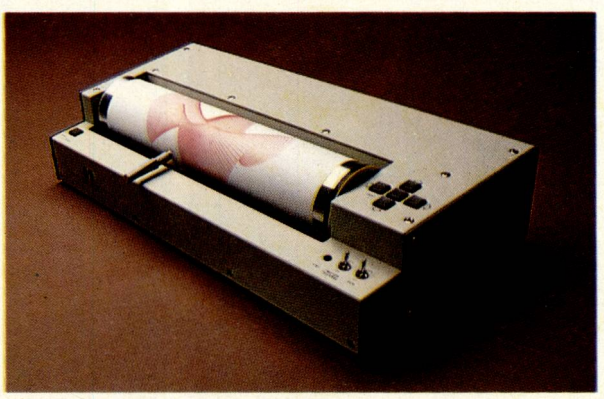
HOW TO CHART YOUR COMPANY'S FORTUNE WITHOUT SPENDING ONE.

It's a fact. A single chart or graph can tell you instantly what it takes hours to interpret from printouts or other raw data.

Now, with the Strobe 100 Graphics Plotter and Software package, you can create superb hardcopy graphics or overhead projection transparencies directly from your computer. And you can do it for a fraction of the cost of most other systems - from only £576 excluding VAT.

The Strobe System transforms complex data into dynamic, colourful visuals with a few simple commands from your computer. Charts and transparencies that once took hours to produce are plotted within minutes. Information can be presented as bar charts, pie charts, curves or isometrics in a variety of colours. And with a resolution of 500 points per inch, the Strobe 100 matches or surpasses the quality of plotters costing much more.

You can also save and modify your graphics through Strobe's menu-driven programs. A broad selection of software – including one for interfacing with VisiCalc* files – is now available.



For more information and details of your nearest stockist, Telephone: (0442) 40571/2

Trade and OEM enquiries welcome.

The Strobe Graphics System
Seeing Is Believing

Prices correct at time of going to press. *VisiCalc is a trademark of VisiCorp.

DE Data Efficiency Ltd

For all your Micro needs...and more.

Exclusive UK Distributors, Data Efficiency Ltd, Computer Division, Finway Road, Hemel Hempstead, Hertfordshire HP2 7PS Tel: (0442) 40571/2 Telex: 825554 DATEFF G

£1,350*

The MIMI 802 is a supreme example of high quality British engineering. It is a truly professional microcomputer that really does meet all the criteria of a sophisticated business machine - at a price you can afford.

Our competitors expect you to make do with the basics and then buy expensive extras in order to fulfil your needs. The MIMI 802 has all the 'extras' as standard - so when you buy a MIMI you really are getting a microcomputer that will do the job from the outset.

The MIMI's operating system OS/M† is fully CP/M‡ compatible so you have access to a very comprehensive range of software, extending from word processing to accounting.

During the next few months we will be announcing the availability of TROJAN - a major software innovation that totally simplifies the learning process and use of micros, and dramatically eases the creation of new applications programs. We are using it and generating applications software in record time - so we can guarantee its performance.

Don't settle for less... contact us or one of our dealers now.

Features include:

- Z80A at 4MHz
- 64K Dynamic RAM
- Integral D/S - D/D 5¼ ins floppy discs - 700Kb.
- Full RS232C and Centronics parallel ports.
- 96 Key ASCII keyboard - colour coded.
- 17 programmed function keys.
- Light pen socket.
- Elegant compact and light - 24 lbs.
- OS/M operating system - fully CP/M compatible.
- Disc format conversion facility.
- Wide range of software, utilities and languages.

And now with:

- Winchester disc option.
- Super high resolution graphics option* (802G-512 x 256 pixels).

NOW ALL OTHER MICROS ARE LESS THAN PERFECT

† OS/M is the trademark of Scifax Microsoftware.
‡ CP/M is the registered trademark of Digital Research Inc.



*Monitor extra, from £132. (Choice of orange or green display)
MIMI 802G (graphics version, as illustrated) £1495.

Some of our distributors:

Anita Electronic Services
34 Musters Road West Bridgford Notts
Tel: 0602 813204
Contact: Steve Conroy

Belmondo Research Ltd
68 Maple Road Horfield Bristol BS7 8RG
Tel: 0272 427428
Contact: Roger Banfield

Broadway Systems (BCSS) Ltd
5-7 Mariner Street Swansea W Glam Wales SA1 5BA
Tel: 0792 462279/474598 01-997 4764/0498
Contact: Philip Gittoes

Chris Robinson Consultants
Maple Way Kensworth Dunstable Beds
Tel: 0582 872940
Contact: Chris Robinson

City Microsystems Ltd
65 London Wall London EC2
Tel: 01-588 7272
Contact: Anthony Coulson

Computer Graphics Workshop
38 Ullett Road Sefton Park Liverpool 17
Tel: 051 733 9604
Contact: Mr Noel Runnels-Moss

BRITISH MICRO

Penfold Works Imperial Way Watford Herts. WD2 4YY Tel: Watford (0923) 48222/4395

A Hegotron Group Company



Derwent Data Systems
18 Norfolk Street Sunderland Tyne & Wear SR1 1EA
Tel: 0783 652026
Contact: Tom Maxfield

Easibee Computing Ltd
133-135 High Street North East Ham London E6 1HZ
Tel: 01-471 4884
Contact: Computer Sales Director

John Elmer Office Equip
105-107 Church Road Burgess Hill Sussex
Tel: 04446 5670
Contact: John Elmer

Leicester Micro Centre
59 Regent Road Leicester
Tel: 0533 551869
Contact: Ray Beresford

Maystar Micro Systems Ltd
62 Peach Street Wokingham
Tel: 0734 789381
Contact: Simon Hart

Microcosm Research Ltd
1 Montague Street London WC1
Tel: 01-580 9792
Contact: Peter Cheesewright

Telex: 946024

MIMI 802

YOUR DATA LIFELINE

The **DATALIFE** Series of magnetic media from Verbatim, incorporates many advanced data shielding benefits. These ensure a longer, more trouble-free recording, storage and retrieval life – quite simply Datalife is the best range of media available today.

And now BFI, the UK's major distributor of Verbatim products, has introduced a new service – called the Datalife Line. Call us on the Datalife Line and we can offer you fast deliveries, competitive prices on Verbatim products, excellent back-up and technical advice on flexible disks, mini diskettes, data cartridges, digital cassettes, alignment disks, XE disks and Datalife head cleaning kits.

CALL THE Datalife™ LINE NOW: 01-941-4066

BFI Electronics Ltd., 516 Walton Road,
West Molesey, Surrey. KT8 0QF
Tel: 01-941 4066 Telex: 261395

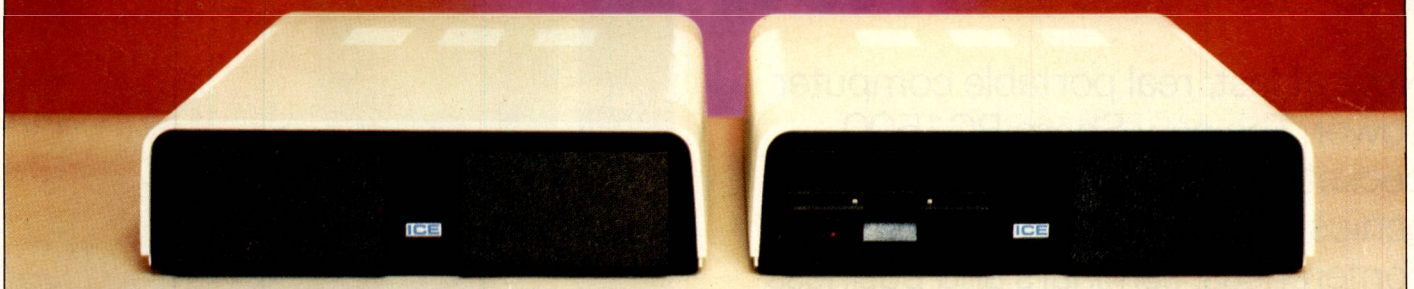
Scottish Distributor:
Computer Supplies Co., 8/18 Union Street,
Bo'ness, West Lothian, Scotland.
Tel: 050-682-3393

BFI

5¼" WINCHESTER SUBSYSTEMS FROM ICE

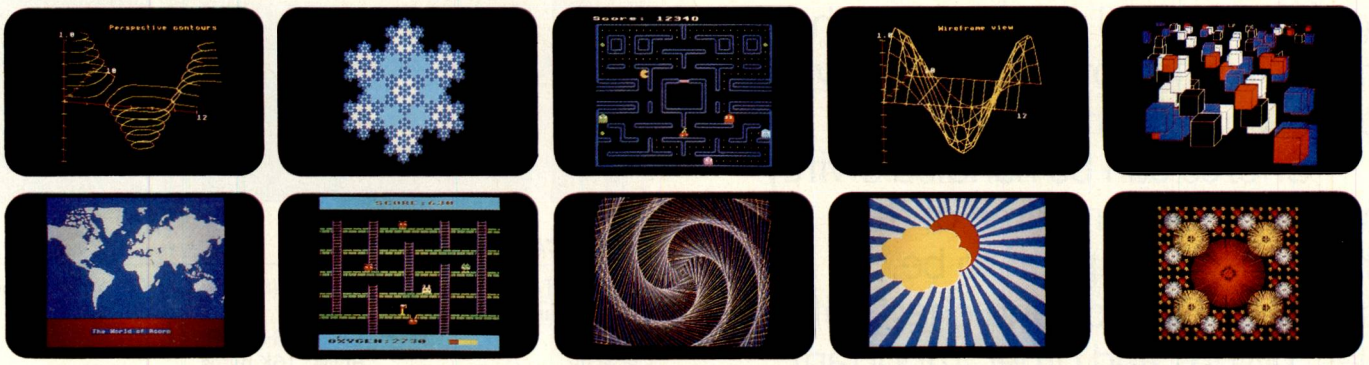
APPLE · SUPERBRAIN · IBM PERSONAL S100 BUS & Z80-BASED MICROS

FROM 3 TO 42 MEGABYTE CONFIGURATIONS WITH TAPE STREAMER BACKUP



RETAIL PRICES FROM £1350. . . . . DEALER ENQUIRIES INVITED

ICE 16/18 Littleton Road, Ashford, Middlesex, TW15 1UQ
Telephone: 07842-47271/47171 Telex: 8952042 (DPCUST G)



YOU'VE SEEN THE PICTURES NOW SEND FOR THE BOOKS

BBC Microcomputer or Acorn Atom

Acornsoft is the software division of Acorn Computers, designers and manufacturers, of the BBC Micro and Atom. We know better than anyone the capability of the machines, we know how to get the very best from the hardware. And we have produced a range of exciting games, exacting business and useful household software.

The Biggest Range Available

Acornsoft software ranges from authentic arcade games like Snapper to Algebraic Manipulation to Desk Diary to other languages like FORTH and LISP. Striking colour, amazing sound effects and powerful graphics are all used to the full. And it does not stop there. There is a complete range of manuals, accessories and plug-in ROMs.

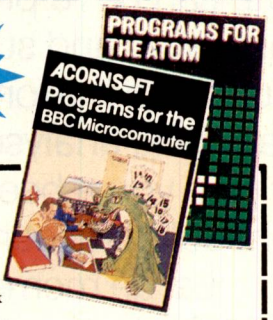
Free Brochures

Just clip the coupon or write to us and we will rush our catalogue absolutely free. Can't wait for the post ring 01-930 1614 now! Don't delay – do it today. Let Acornsoft help you get the best from our machine and open the doors to your imagination.

Acornsoft and Atom are registered trade marks of Acorn Computers Ltd.

ACORNSOFT
4A Market Hill,
CAMBRIDGE CB2 3NJ.

FREE!



Please rush me my free literature from Acornsoft.
☐ Atom
☐ BBC Please tick

Name _____

Address _____

_____

_____

_____

Postcode _____

THE GENIUS YOU CAN TAKE TO BREAKFAST.

Now, at last, real portable computer power. The new Sharp PC1500 pocket computer. A pocket-sized genius that will travel with you to conferences, seminars and business breakfasts.

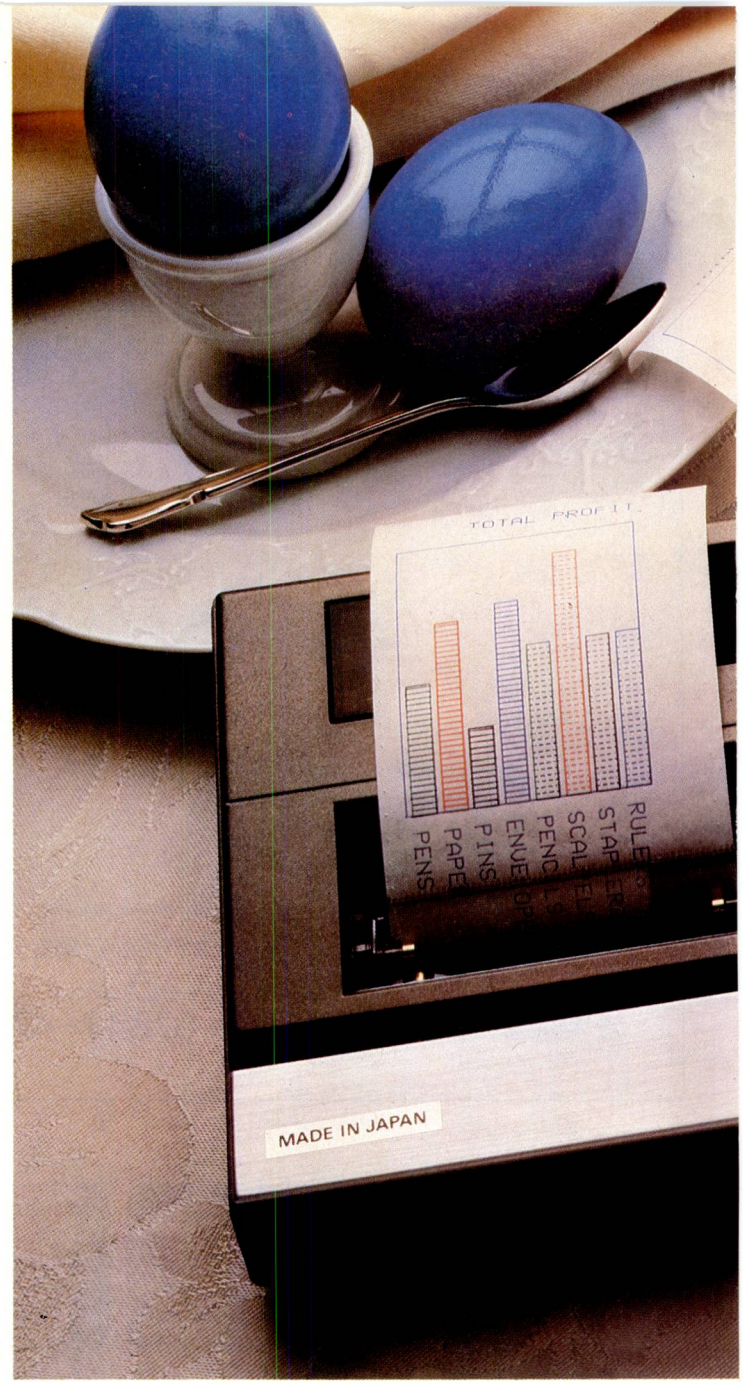
The PC1500 has the capacity and BASIC language usage that is very nearly that of the desk-size Personal Computer. When fitted with the optional 4-colour graphic printer, it is one of the most powerful pocket computers on earth.

Chores can be handled swiftly and accurately any time of day, wherever you happen to be. Estimates, records and charts of sales, billings and other important data can be re-programmed, calculated and summoned at the touch of a button. It can even play blackjack, analyse your biorhythms or give you a beeped reminder of a scheduled meeting.

Large memory capacity, up to 11.5K bytes. 4-colour print-out. Six user-programmable keys.

The incredible new PC1500. A revolution in pocket computers.

From Sharp. Where great ideas come to life.



SPECIFICATIONS PC 1500

Number of calculations	10 digits (mantissa) + 2 digits (exponent)
Program language	BASIC
CPU	C-MOS 8-bit CPU
Capacity	ROM: 16K bytes RAM: 3.5K bytes expandable to 11.5K bytes
Memory protection	C-MOS battery back-up
Display	7 x 156 dots mini-graphic display (English upper- and lower-case letters, numbers, special signs, etc.)

CE 150 Colour Graphic Printer/Cassette interface (Optional)

Colour Graphic Printer	
Power source	Built-in rechargeable battery
Printing digits	Standard 18 digits (36, 18, 12, 9, 7, 6, 5, 4 digits selectable)
Printing system	X-Y axis plotter system
Printing mode	Graph/Text switchables
Character sizes	9 different sizes from 1.2 x 0.8 mm to 10.8 x 7.2 mm (from 1/16" x 1/32" to 7/16" x 9/32")
Printing colours	Red, blue, green, black
Printing directions	Right, left, up, down
Minimum step width	0.2 mm (1/64")
Cassette Interface	Up to two cassette tape recorders can be connected

CE 151 Memory Module (Optional)

Capacity	4K-byte C-MOS RAM

CE 155 Memory Module (Optional)

Capacity	8K-byte C-MOS RAM



BASIC LANGUAGE SPECIFICATIONS
PC 1500

Commands	RUN, NEW, LIST, CONT, TR ON, TR OFF, LOCK, UNLOCK, STATUS, MEM
Statements	INPUT, PRINT, GPRINT, CURSOR, GCURSOR, PAUSE, USING, WAIT, CLS, IF . . . THEN, STOP, GOTO, ON . . . GOTO, GOSUB, ON . . . GOSUB, RETURN, ON ERROR GOTO, FOR . . . TO . . . STEP, NEXT, END, DIM, LET, REM, DATA, READ, RESTORE, BEEP, AREAD, ARUN, CLEAR, RANDOM, DEGREE, RADIAN, GRAD, BEEP ON, BEEP OFF
Functions	SIN, COS, TAN, ASN ACS, ATN, LN, LOG, EXP, DEG, DMS, RND, SQR (√‾), SGN, ABS, INT, PI (π), LEFT$, RIGHT$, MID$, ASC, VAL, LEN, CHR$, STR$; POINT
Variables	A ~ Z, A$ ~ Z$, two-letter variables possible, two-dimensional arrays applicable
Operations	+, —, *, /, (,), >, <, >=, <=, <>, =, ^, AND, OR, NOT, &
Others	INKEY$, TIME, , ; : "

CE 150 Printer

Commands	LLIST, TEST
Statements	LPRINT, TAB, LF, ROTATE, COLOR, GLCURSOR, SORGN, LINE, RLINE, CSIZE, TEXT, GRAPH, LCURSOR

Cassette Interface

Commands	CSAVE, CLOAD, CLOAD? MERGE
Statements	INPUT#, PRINT#, CHAIN, RMT ON, RMT OFF

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

Please send me details of the Sharp PC 1500

Type of application: _____

_____

Name: _____

Address: _____

_____

_____

_____

_____

PCW:1

The world of
SHARP
where great ideas come to life.



Design and specifications subject to change without notice.

Don't let its size fool you.

If anything NewBrain is like the Tardis.

It may look small on the outside, but inside there's an awful lot going on.

It's got the kind of features you'd expect from one of the really big business micros, but at a price of under £200 excluding VAT it won't give you any sleepless nights.

However, let the facts speak for themselves.

You get what you don't pay for.

NewBrain comes with 24K ROM and 32K RAM, most competitors expect you to make do with 16K RAM.

What's more you can expand all the way up to 2 Mbytes, a figure that wouldn't look out of place on a machine costing ten times as much.

We've also given you the choice of 256, 320, 512 and 640 x 250 screen resolution, whereas most only offer a maximum of 256 x 192.

Big enough for your business.

Although NewBrain is as easy as ABC to use (and child's-play to learn to use) this doesn't mean it's a toy.

Far from it.

It comes with ENHANCED ANSI BASIC, which should give you plenty to get your teeth into.

And it'll also take CP/M® so it speaks the same language as all the big business micros, and feels perfectly at home with their software.

NO OTHER MICRO HAS THIS MUCH POWER IN THIS MUCH SIZE FOR THIS MUCH MONEY.



So as a business machine it really comes into its own.

The video allows 40 or 80 characters per line with 25 or 30 lines per page, giving a very professional 2000 or 2400 characters display in all on TV and/or monitor. And the keyboard is full-sized so even if you're all fingers and thumbs you'll still be able to get to grips with NewBrain's excellent editing capabilities.

When it comes to business graphics, things couldn't be easier. With software capabilities that can handle graphs, charts and computer drawings you'll soon be up to things that used to be strictly for the big league.

Answers a growing need.

Although NewBrain, with its optional onboard display, is a truly portable micro, that doesn't stop it becoming the basis of a very powerful system.

The Store Expansion Modules come in packages containing 64K, 128K, 256K or 512K of RAM. So, hook up four of the 512K modules to your machine and you've got 2 Mbytes to play with. Another feature that'll come as a surprise are the two onboard V24 interfaces.

With the aid of the multiple V24 module this allows you to run up to 32 machines at once, all on the same peripherals, saving you a fortune on extras.

The range of peripherals on offer include dot matrix and daisy wheel printers, 9", 12" and 24" monitors plus 5¼" floppy disk drives (100 Kbytes and 1 Mbyte) and 5¼" Winchester drive (6-18 Mbytes).

As we said, this isn't a toy.

It doesn't stop here.

Here are a couple of extras that deserve a special mention.

The first, the Battery Module, means you won't be tied to a 13 amp socket. And, even more importantly, it means you don't have to worry about mains fluctuations wreaking havoc with your programs.

The ROM buffer module gives you a freedom of another sort.

Freedom to expand in a big way. It gives you additional ROM slots, for system software upgrades such as the Z80 Assembler and COMAL, 2 additional V24 ports, analogue ports and parallel ports.

From now on the sky's the limit.

Software that's hard to beat.

A lot of features you'd expect to find on software are actually built into NewBrain so you don't need to worry about screen editing, maths, BASIC and graphics.

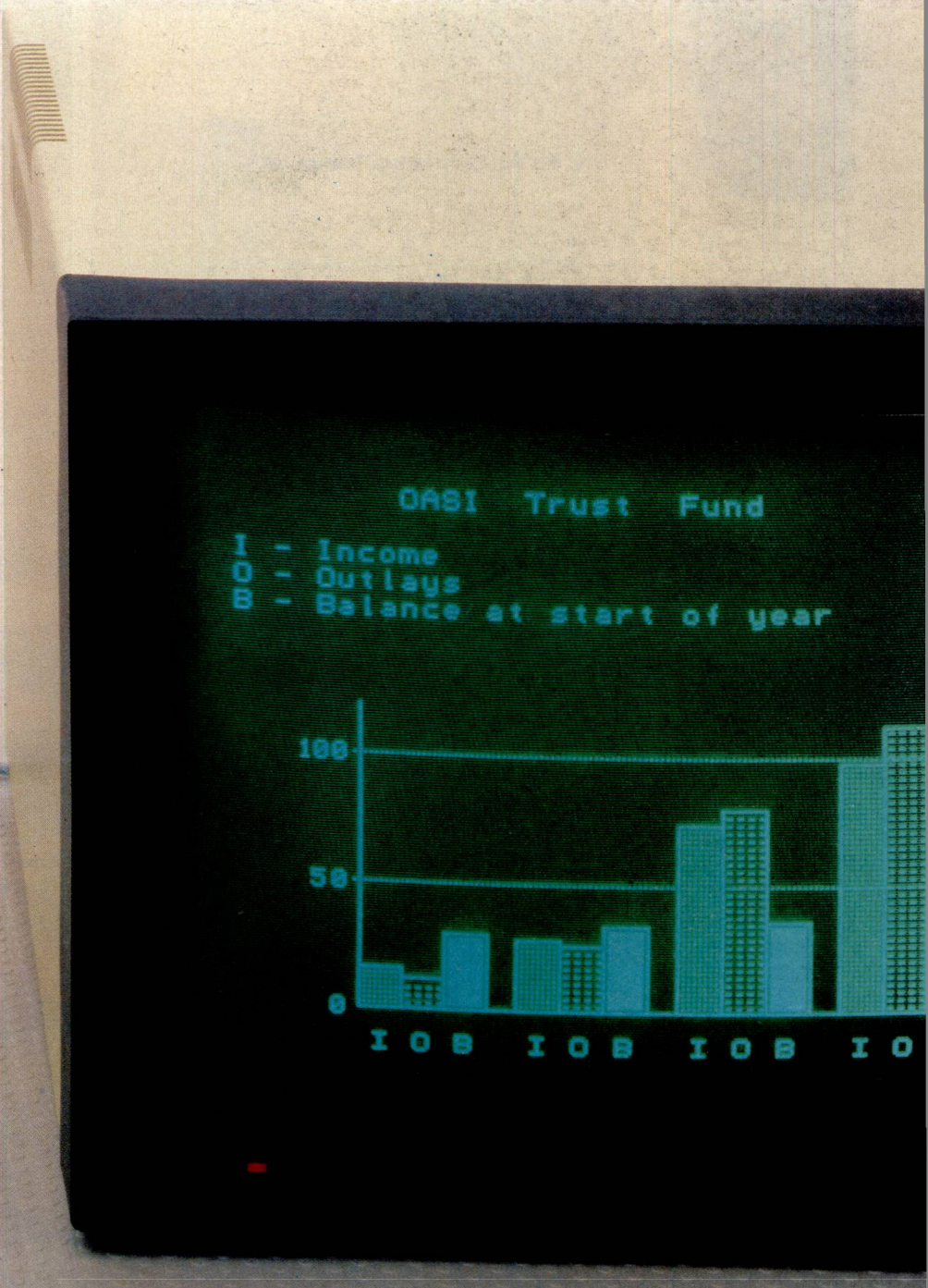
However, if you're feeling practical you can always tackle household management, statistics and educational packages. And because NewBrain isn't all work and no play, there's the usual range of mind-bending games to while away spare time.

Waste no more time.

To get hold of NewBrain you need go no further than the coupon at the bottom of the page.

With your order we'll include a hefty instruction manual so you'll know where to start, and a list of peripherals, expansion modules, and software so you'll know where to go next.

® CP/M is the registered trade mark of Digital Research Inc.



NewBrain, Grundy Business Systems Ltd. Grundy House. Somerset Road, Teddington TW11 8TD.

Each NewBrain order will include a FREE comprehensive user manual, a catalogue of expansion modules and peripherals, and a detailed list of available software.

Please send me the following:-

Quantity	Item	Price per item (Inc VAT & p&p)	Total
	NewBrain A	£233.00	
	NewBrain AD with onboard single line display	£267.50	
	Printer	£466.00	
	Monitor 12"	£142.50	
		Total £	

I enclose a cheque/Postal Order for £_____ payable to Grundy Business Systems Reader Account. NewBrain, Grundy Business Systems Ltd., Grundy House, Somerset Road, Teddington TW11 8TD.

Please debit my Access Card No:_____ my Barclaycard No:_____

Signature_____

Name_____

Address_____

_____

_____ Postcode_____ **PCW/9/82**

Registered Number 1522978
VAT Number 358661618
Please allow up to 28 days for delivery.

NEWBRAIN



NEC turns 27 years of computer experience to your personal advantage.

It takes a great computer company to make a great personal computer. And from the start, NEC has been a pioneer in computer technology. In fact, we invented the all-semiconductor computer in 1959. Now, hundreds of innovations later, we've made it personal.

We present the PC-8000, a powerful and friendly business tool that can help you get more done in a day than you ever could before. It combines some of the most reliable hardware on the market with application packages designed to make the most of its unique features. In addition, the PC-8000 accepts popular CP/M business software, making its possibilities virtually limitless.

The entire PC-8000 system is now available through better computer dealers across the country. And that means more than hardware. It means effective software, the finest documentation and extensive training to help you get the most from your personal computer. So why not turn our system to your personal advantage now.

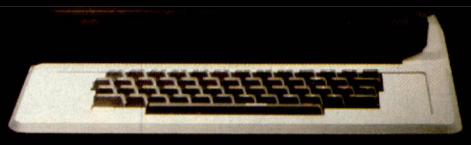
NEC
Nippon Electric Co. Ltd.
Tokyo, Japan

See us at the PCW Show Stand No. 140

NEC Telecommunications Europe Co. Limited
NEC House, 164/166 Drummond Street,
London NW1 3HP UK
Telephone: 01-388-6100 Telex: 261914

IBR Microcomputers (England/Wales Distributor) Sutton Park, London Road, Reading, Berkshire
Telephone: (0734) 664111 Telex: 848215

One Expander Card for apple leads to another....



In fact it leads to many others! Joining the amazing success of our PAL Encoder Card, these four new expander cards all featuring the unique 'Digitek Safety Tab' are ready to plug straight into your Apple Computer.

Pal Colour Encoder Card £105 This amazing card with it's on-board modulator, displays exceptional colour graphics to your TV.

16k Ramcard £91 Insert the card straight into slot Ø, and increase the memory capability of your Apple without having to remove any memory chips.

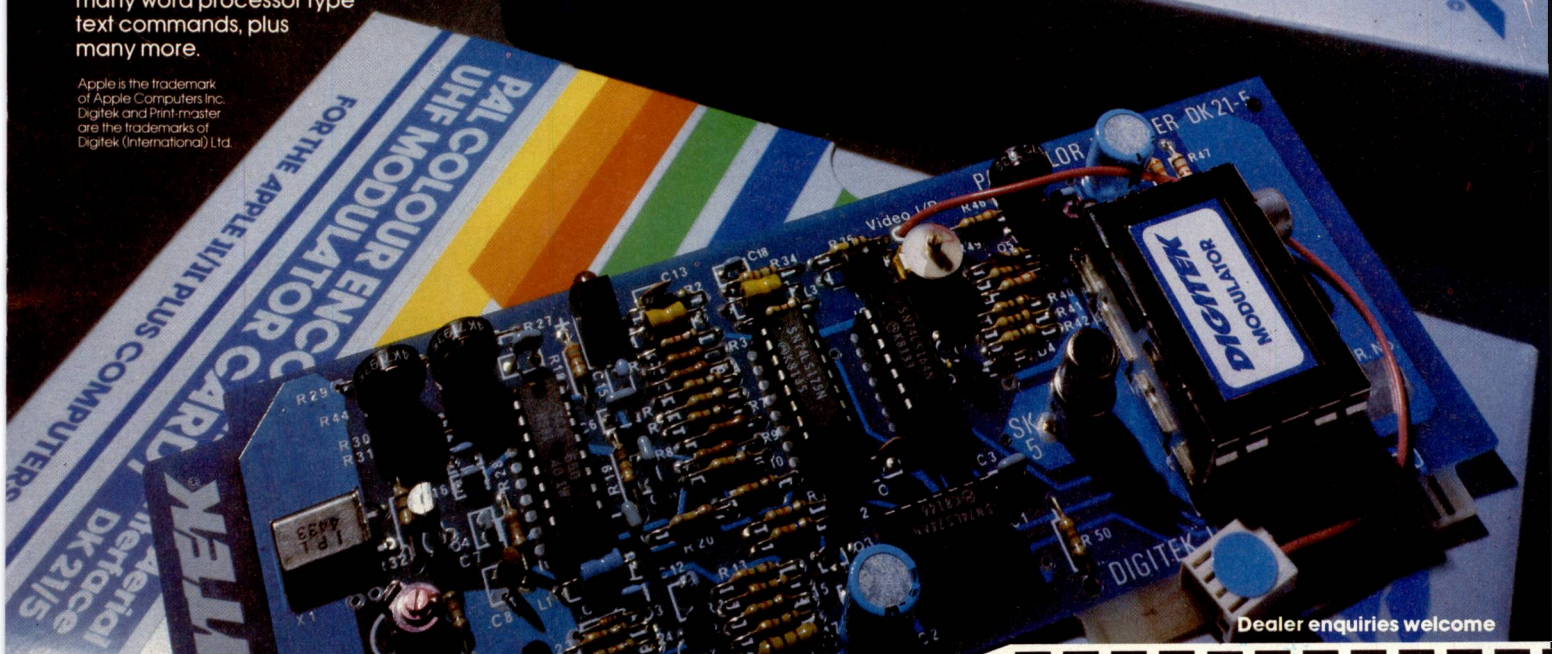
Z80 Expansion Card £110 Installing the Z80 into your Apple gives you two systems in one, which enables you to run the popular C P/M operating system.

RS232 High Speed Serial Interface £72 The RS232 Interface Card incorporates 13 selectable Baud rates from 75 to 19,200.

Print-master Interface £79 The ultimate parallel interface for Apple to all popular dot matrix printers.

The PRINT-MASTER accepts Apple protocols, 15+ software commands and has on-board graphics dump capability to all popular graphics printers. No need to load clumsy software routines – it's all at your fingertips on the PRINT-MASTER – choice of inverse printing, double size picture, 90° picture rotation, many word processor type text commands, plus many more.





Apple is the trademark of Apple Computers Inc. Digitek and Print-master are the trademarks of Digitek (International) Ltd.

Dealer enquiries welcome

The people who are really into Apples.

DIGITEK

EXPANDER CARD SERIES

Please send me
Colour Encoder £105 ☐
Ramcard £91 ☐ Z80 £110 ☐
RS232 £72 ☐ Print-master £79 ☐
Further Information ☐

I enclose my cheque for £ ☐
payable to Digitek International Ltd.
Add 15% VAT to all prices quoted.
Post and packaging FREE.
Telephone orders **0403 66550**

Name.....

Address.....

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

My card: ..... VISA

.....

Number is .....

DIGITEK (INTERNATIONAL) LTD. 37C WEST STREET, HORSHAM, WEST SUSSEX RH12 1PP.

PCW 9–82

THE IBM PERSONAL COMPUTER WITH GUESTEL CARE FROM £2890



Caring, comprehensive service...and the best deals around have established Guestel as one of Europe's leading Apple suppliers.

Now we are extending our range to bring you the IBM personal computer...and the Guestelcare comes as standard...

...naturally. Just clip the coupon and get the facts. And if you're a retail dealer and fancy a slice of the action, we can tell you why this is one profit opportunity you just won't want to miss.

GUESTEL

8/12 NEW BRIDGE STREET
LONDON EC4V 6AL
01-583 2255

15 GRAND PARADE BRIGHTON
SUSSEX BN2 2QB
0273 695264

41/43 BALDWIN STREET
BRISTOL BS1 1RB
0272 277461

Offered subject to availability

☐ PLEASE SEND ME INFORMATION ON THE IBM PERSONAL COMPUTER

☐ PLEASE ASK YOUR SALES STAFF TO CONTACT ME

NAME

COMPANY

ADDRESS

TELEPHONE

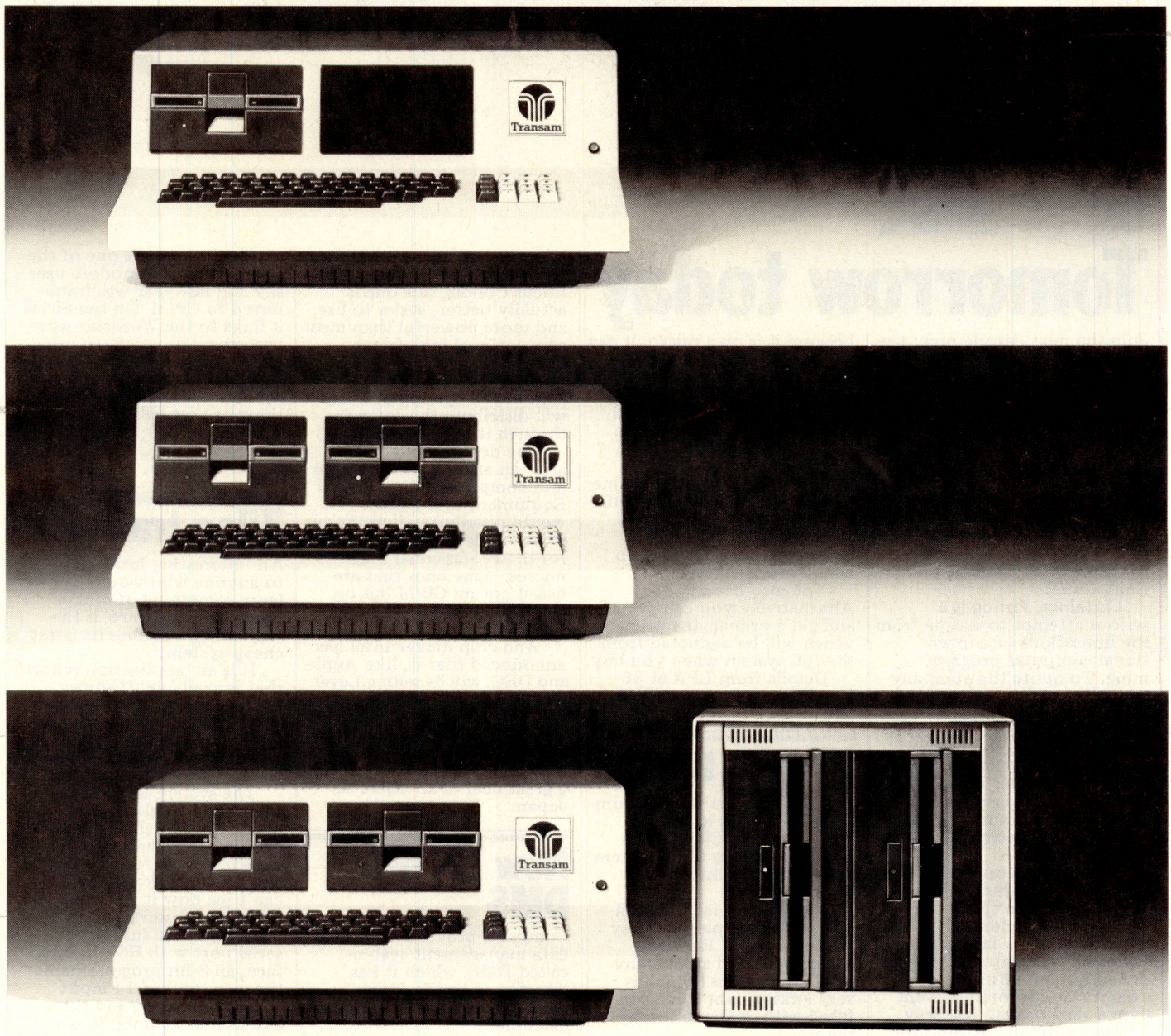
I AM A MICROCOMPUTER DEALER AND WOULD LIKE TO KNOW MORE ABOUT RETAILING THE IBM PERSONAL COMPUTER

NAME

COMPANY

ADDRESS

TELEPHONE



Designed for expanding minds

The Tuscan S100 can read and write in 18 different disc formats including IBM, RML 380Z, and Superbrain, plus many more CP/M based machines. Now with optional IEEE interface and high definition colour graphics. The versatility of the S100 Bus and CP/M make an investment in Tuscan S100 an investment in the future.

Communication with minis and mainframes? – no problem! With four different communication options, Tuscan S100 looks and feels like an intelligent terminal.

Plotters and colour printers? – no problem! Tuscan S100 is just about the most versatile cost effective micro around. 5 or 8", hard or flexible, disc drives mean power at your fingertips. We go for capacity at low cost plus professional expertise. Send for our prices now – and a list of references. (Just in case you want to check our track record.)

Transam Microsystems Ltd.,
59/61 Theobalds Road,
London W.C.1.

Telephone 01-405 5240/2113

Transam
MICROSYSTEMS LIMITED



Guy Kewney delivers his monthly package of micronews.

Tomorrow today

Join the next decade now: use MicroProlog. Forget everything you thought you needed to know about programming and learn MicroProlog.

Expect to read a lot of this sort of thing. Prolog is a programming language. But it has been invested with a great deal of superstitious awe by the fact that Japanese computer scientists have chosen Prolog as 'the core language for their Fifth Generation Computers'.

Certainly, Prolog is a serious attempt to escape from the limitations of conventional computer programming. To quote the company which has unleashed a microcomputer version of the language on the world (LPA Ltd of London), 'Prolog unifies concepts from relational databases, with powerful list processing and pattern-directed rule-based programming, all in a single framework of logic programming.'

That jargon condenses three areas which could be a lifetime study in themselves.

Relational databases attempt to allow large heaps of amorphous data to be used as neatly filed information, even if the information went in in a very thoughtless way.

List processing is what the artificial intelligence community has been doing with a list processing language called Lisp (for LIST Processing, yet) for a couple of decades, so far without any serious results except an enormous number of proofs that artificial intelligence is not possible — or at least not with Lisp, and certainly not with anything else.

Pattern directed rule-based programming is derived from what used to be called expert systems.

By putting all these things in one packet, the inventors have taken the serious risk of confusing many, in the hope of providing the rest with a chance to start doing genuinely new things. In all honesty, I doubt that they expect any customers to actually start producing expert accounting systems at this stage.

Learn the future with MicroProlog, then — but one warning. Just because this is 'Micro' Prolog it doesn't mean that it is somehow a 'cut-down' version of the real thing. It is a full Prolog but, because it is on a micro, it can add several useful abilities, such as an interactive editor (like the one which lets you type in line 30 after line 50 in Basic but still sorts them out for you), modules, and random access files.

You need a CP/M machine such as the North Star, RML-380Z or Apple II with Z80 softcard, or a system that takes eight-inch floppies to IBM 3740 standard.

You also need £185. Alternatively you can pay £7 and get a primer, the price of which will be deducted from the full system when you buy.

Details from LPA at 36 Gorst Road, London SW11 6JE.

Mickie-taking

One of the most famous computer programs is the one which the late Chris Evans wrote, turning a 6800 system into a medical interviewer called Mickie.

This system is now available on the Apple, courtesy of the National Physical Laboratory and a company called Systemics (which is very anxious not to be confused with Systematics, by the way).

Systemics describes Mickie as 'a complete system for writing, editing and running interactive question and answer programs. Its first application was for medical history taking — hence the name Mickie, for Medical Interviewing Computer. But wherever questions and answers can be represented as a flow-chart, Mickie can be used to speed and simplify computerisation.'

Details from Joy Healey on 01-863 0079.

More Cobollers

When micros first appeared, it was always agreed that the one thing they would never be able to do was run proper programs written in a proper mainframe language like Cobol.

How foolish must the inventors of MicroCobol be feeling now, with Micro Focus announcing yet another implementation of CIS Cobol for yet another micro — this time the Apple III. And, like all other Micro Focus Cobols, this one is actually better, easier to use, and more powerful than most conventional mainframe Cobols.

This new version was announced by Apple, which will distribute the software through its normal dealers.

The deal comes shortly after an announcement from minicomputer maker Digital Equipment that it, too, would distribute Micro Focus software development tools for the Professional range of micros — the ones that are based not on CP/M but on DEC's own processor, the LSI-11.

And chip maker Intel has announced that it, like Apple and DEC, will be selling Level II Cobol for its special-purpose transaction processing chip, the iTPX 86/445 microsystem.

Micro Focus is also selling a great deal of software to Japan.

Now 16-bit DMS

Compsoft provides a popular data management system called DMS, which it has transferred to the Sirius 1 from the original Commodore machines.

The program is one of the stars in the Commodore user sky and last year was transferred to CP/M. On the Sirius it links to the Wordstar word processing program, so using DMS to select details from a mailing list when retyping a standard letter, or doing anything of that nature.

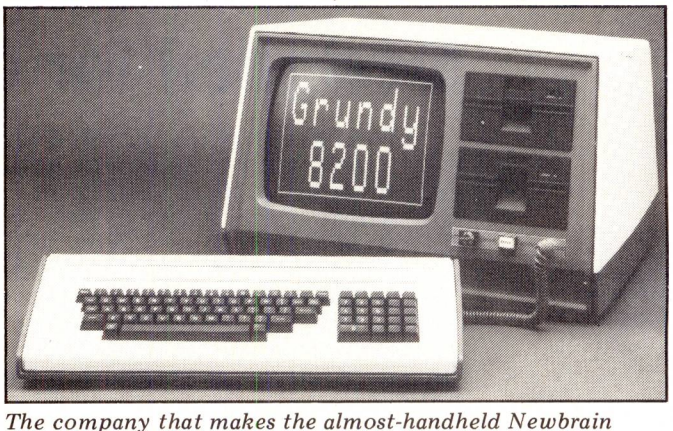
Cost is £400; details are available from Guildford (0483) 898545.

Zilog trainer

An 'interesting introduction to anyone who would like to learn something of microcomputer hardware' is the way Zilog describes its latest cheap system.

It is an 'application report' that is available. It shows 'in great detail, the design of a seven-chip microcomputer system with both a Basic and a debug facility in firmware'.

The system is based on the Z8671 single chip microcomputer, which is a member of Zilog's Z8 family. It provides 2 kbytes for the Basic and debug package (no, I can't see how it fits in either), 4 kbytes of user memory, a programmable full duplex serial port with RS232 interface, an 8-bit programmable timer, a total of 14 input and output lines, and three external interrupts. It can

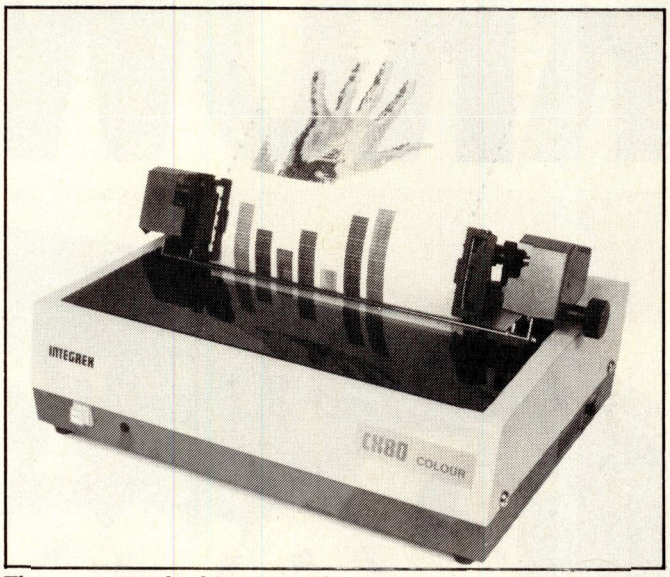


The company that makes the almost-handheld Newbrain (Grundy) also owns Ceedata, which produces this giant CP/M system called the Grundy 8200 series.

Special feature (apart from a few extra utilities in the CP/M) of this machine is the fact that like the Rair Black Box (the ICL micro) it can manage to control more than the normal maximum of 64 kbytes of memory. This one can go up to 256k — 'a feature of value in word processing applications', says Micro Memory Systems, the company which distributes it.

Apart from price, the only caveat for the unwary about expanded CP/M memory is the fact that no two rival systems are like each other, so programs do have to be available for this particular micro, not just for CP/M — but that's true of most CP/M.

Details and prices from Newbury (0635) 40405.



There you are, looking at a video screen which your Prestel set has just filled with glorious colour — a map or complicated bar chart — and you want to hang it on the wall. You have a printer connected to the set but it only makes black marks on white paper. You know there is a colour printer available, but you can't connect it to the set. . . but wait! Yes, thanks to DNCS in Manchester, there is now a Prestel interface to the CX80 cheap colour printer. Details on 061-643 0016.

be expanded to a full 124 kbytes of memory if required.

By all means write away for the report, to Zilog at Moorbridge Road, Maidenhead, Berks, or phone on (0628) 39200 but unless you know your clock signals, stick to a Sinclair ZX81 (although the Spectrum seems to have killed that one right off).

Plenty of scope

Those readers who follow events in the publishing industry will be wondering what the ex-publishers of *PCW* are going to do with themselves now that the mag has moved on.

The answer is that they're about to launch a newspaper which is intended to do for the micro trade what *PCW* has done for the micro user. Called *MicroScope*, the new sheet will be launched on 23 September, and a scan of the masthead will reveal some names familiar to *PCW* readers.

News will be handled by Peter Jackson (ex-*Microdecision*), features by Ian White (ex-*Campaign*) and international news by Gareth Jefferson, recently returned from seven years in Japan. Columnists will include individuals named David Tebbutt and Martin Banks, while the Editor-At-Large is a certain G Kewney Esq.

The ad sales team consists of Steven England and Neil Fennell.

Publication will be fortnightly, by subscription only, and the modest claim is that *MicroScope* will become 'the eyes and ears of the industry'. An introductory half-price subscription is on offer to bona fide trade enquirers.

In case you're wondering how such a shameless puff could creep into *PCW* I should point out that the software editor will be one Dick Pountain, the author of this piece. . .

Any further information should be sought on the old *PCW* number — 01-631 1433.

For snobs only

For the managing director who has to have an Apple but can't bear to have anything like his juniors have, a friend of mine has devised a very posh desk made out of pitch pine a couple of centuries old, which takes computer, disks, and the wires, and makes it look suitably managing. It costs £500 or more.

For the rest of us, DN Computer Services has put together a collection of odd office bits and pieces, including a footstool for the continuous stationery. DNCS is in Manchester on 061-643 0016.

Telex standard

Anybody thinking of building a micro to run on the Telex network should take note of the small print in an otherwise encouraging announcement by the Minister for Posts and Telegraphs. Well, okay, the Minister of Information Technology.

Ken Baker has announced that outside people (that is, people who aren't British Telecom) will be able to make and sell Telex equipment as from next year, when a published standard will be available.

Quite by the way, and with no details added, he mentioned that this would be restricted to three people from July this year, until then. These three firms would be the ones who already make 80-volt teleprinters, 'because of the imminence of the conversion of the Telex network'. The change involves the end of the 80-volt Telex printers and the substitution of 'single-channel voice frequency' teleprinters.

No mention of the possibility that Telex could be changed in such a way as to cost rather less than the arm and a leg it costs to subscribe today, I notice.

Paper problem

If everybody has a computer and they are all linked together to send messages, then there is no need for paper. Any document you can think of can be held inside computer memory.

Yet it's a fair bet that some time will have to elapse before people are happy with paperless life — at a guess, as long as it took them to become happy with paper money. That is to say, forever: you will still find workers solemnly moving gold bars from one room to another inside bank vaults to represent international money movements that have taken place on paper.

And in the meantime, paper will actually be vastly increased by electronic mail, or so thinks the American research agency International Resource Development Inc.

According to a 205-page report which it has just produced on paper-based electronic mail, 'Many new types of electronic mail systems will stimulate rather than eliminate the use of paper in the office of the future.'

It even has a handle on the size of the paper problem: 'More than 21 billion messages,' says the report, 'will be sent via paper-based electronic-mail systems in 1992, compared with less than four million in 1982 (this year).'

Paper, says IRD, will be the 'medium of transition, enabling the growing minority of white-collar workers with electronic workstations to communicate with the majority of workers who are still without "office of the future" equipment'.

Those who (IRD hopes) will buy this report will be both the electronic mail people (suppliers of computers, networks and software) and also, naturally, the paper suppliers.

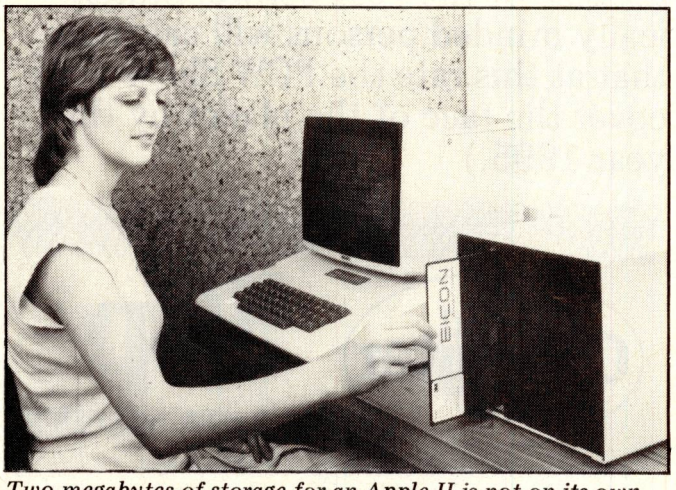
Telex, of course, is a good example of the sort of thing IRD is thinking of, where the message arrives over the wires, is printed out, and then lost in the internal mail system. In America, Western Union is described as 'well placed, if not well prepared, to take advantage of electronic mail growth'.

The report costs a mere $1200, from IRD in the US, tel (203) 866 6914.

RUN (if it's not too much trouble...)

Japanese people have trouble with computers because of an innate sense of politeness. Apparently (I have this from a Japanese gentleman but that doesn't make it true) people of this race 'customarily express themselves in imprecise words'.

The result, says Mr Taiyu Kobayashi, who is a big noise

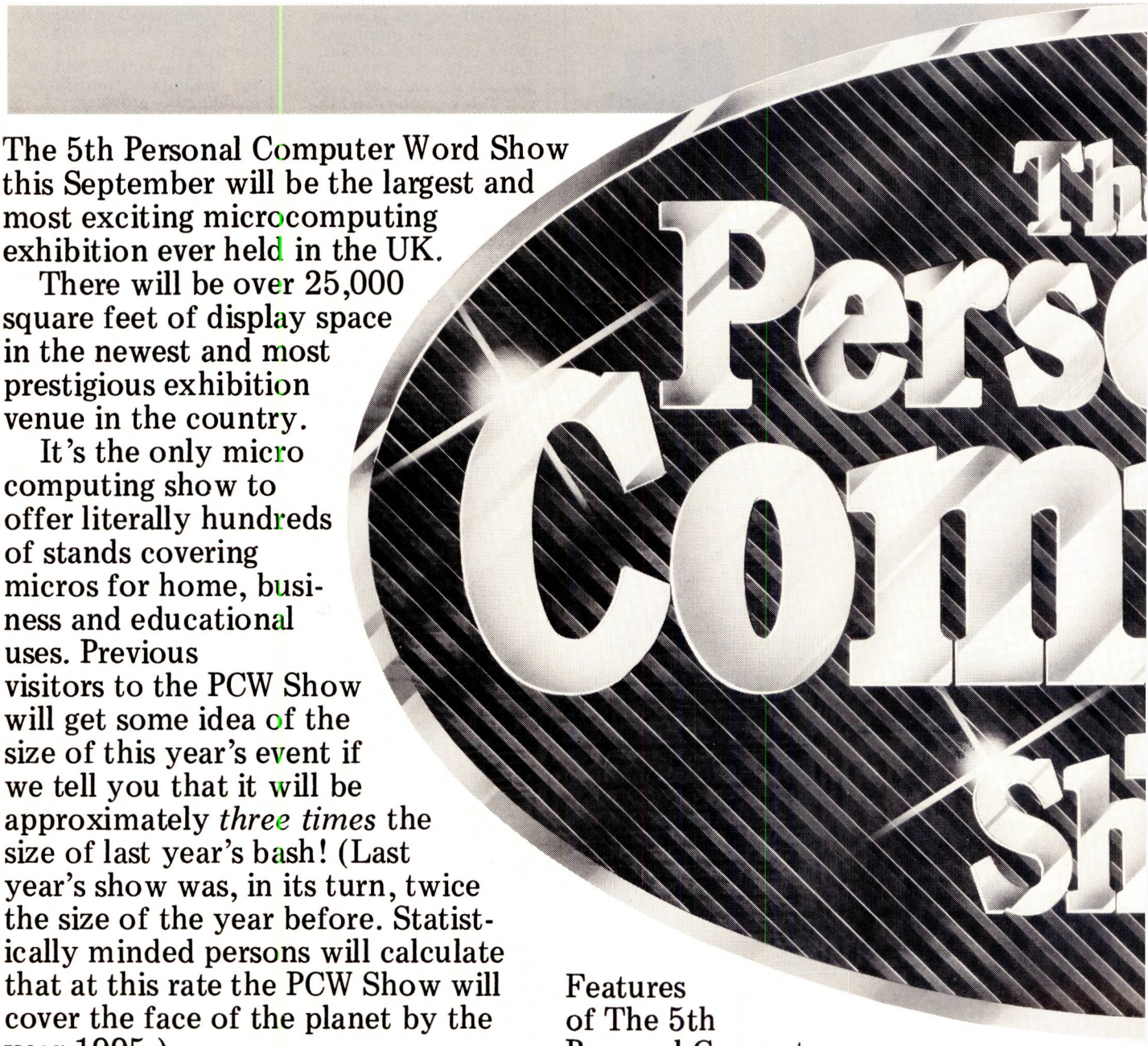


Two megabytes of storage for an Apple II is not on its own cause for too much astonishment. What makes the Eicon 8in drives unusual is the fact that data produced by an Apple and stored on these drives can subsequently be fed directly into an IBM mainframe, should you have one handy.

The drives themselves are fast, says Eicon, and use unusually little power (two watts) from the Apple.

Details on (0954) 81825.

TOMORROW



The 5th Personal Computer Word Show this September will be the largest and most exciting microcomputing exhibition ever held in the UK.

There will be over 25,000 square feet of display space in the newest and most prestigious exhibition venue in the country.

It's the only micro computing show to offer literally hundreds of stands covering micros for home, business and educational uses. Previous visitors to the PCW Show will get some idea of the size of this year's event if we tell you that it will be approximately *three times* the size of last year's bash! (Last year's show was, in its turn, twice the size of the year before. Statistically minded persons will calculate that at this rate the PCW Show will cover the face of the planet by the year 1995.)

The 5th Personal Computer World Show

50p

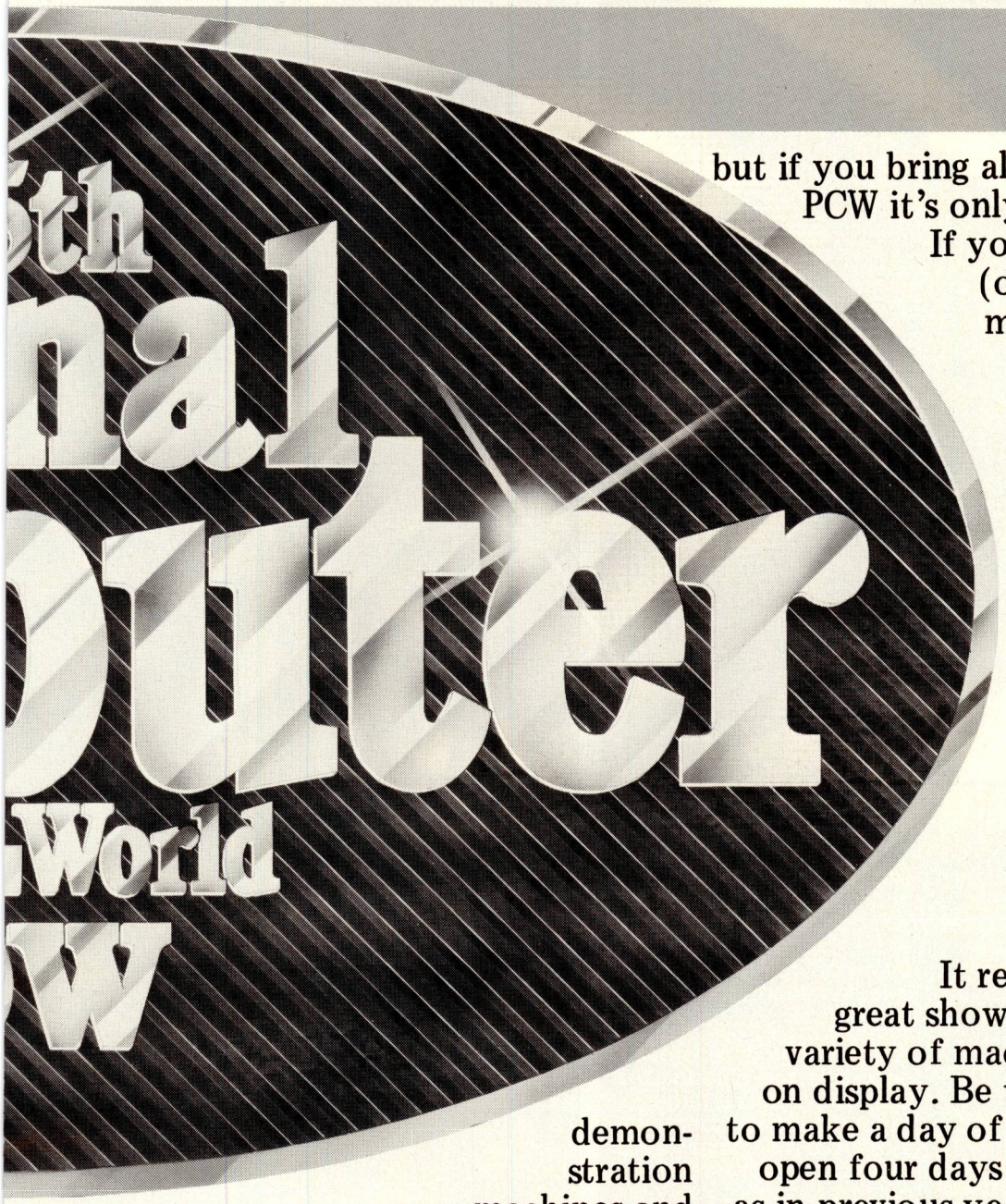
DISCOUNT VOUCHER

This voucher is worth 50p off the price of admission to the PCW Show. Only one voucher valid for each visitor. Not exchangeable for cash.

Features of The 5th Personal Computer World Show will include a Sinclair City and Acorn/BBC Arcade offering the very latest software and add-ons for these popular machines, computer chess competitions as always, and an opportunity for you to challenge a micro to a game of Computer SCRABBLE ®.

From the business angle there's free consultancy with the National Computer Centre and more

THE WORLD!



demonstration machines and business software than you could get to see in a year at your own office. But you needn't risk divorce to evaluate them. . . your wife (or husband!) and the kids can be looking at the vast array of home and educational micros in one of the other halls. It's £2.50 to get in but if you bring along a coupon from PCW it's only £2.00 per person.

If you're a business user (or potential user) of microcomputers just write with your cheque for £2.00 (payable to the Personal Computer World Show) to Tim Collins, PCW Show, 11 Manchester Square, London W1, enclosing your business card. We'll send you a special 'Fast Lane' ticket to save you the trouble of queuing.

It really is going to be a great show with a tremendous variety of machines and software on display. Be warned, you'll need to make a day of it (remember we're open four days this year, not three as in previous years) so give yourself plenty of time and wear comfortable shoes! See you there. . .

BARBICAN CENTRE, CITY OF LONDON

9–12 September 1982

® SCRABBLE is the copyright of J W Spear & Sons plc, Enfield.

WHEN YOU HAVE 637 PROSPECTS TO REMEMBER YOU NEED OUR ELECTRONIC CARD-INDEXING AND RETRIEVAL SYSTEM



Many people know Henry VIII had six wives. But few are aware of his 637 girlfriends. Poor Henry! Is it any wonder he laid about them with an axe. Just imagine trying to remember all those first names, addresses, birthdays, pigeon hole numbers and personal details.

With CARDBOX, Caxton's new electronic card indexing system, keeping and retrieving information is simplicity itself. Not only could Henry have found his ladies but he could have kept tabs on all those barons, bishops and bowmen. (Rent demands would have gone on time, confiscations would have been orderly and executioners would have been selected to suit every occasion.)

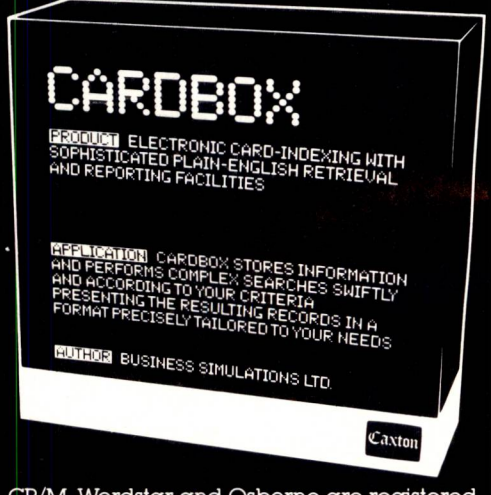
And he wouldn't have had to understand a thing about computers. CARDBOX looks like your favourite card index on the screen. You draw the card yourself. You decide where you want lines. You make up your own headings. And you fill in the details.

At this point CARDBOX stops behaving like a flat inflexible card. It becomes multi-dimensional electronic paper. You can change any information you want. You can retrieve portions of information. You can print out all or selected information from your cards.

You talk to CARDBOX in plain English. You search your records on key words or on selected criteria. CARDBOX acts like a sieve, sifting through the records reducing the number until it finds only those that meet your needs. You display records on your screen or print them out in a format of your own design. Label production for mailing is simple. You can also use CARDBOX with some of your favourite wordprocessing packages, eg Wordstar.

CARDBOX works on most popular CP/M machines including those with special screens, eg Osborne. Use the CARDBOX Tutorial to learn all about this simple, fast aid to better record management. Study the detailed Reference Manual to take full advantage of its sophisticated features.

See CARDBOX at your local computer dealer. Or we'll send it to you with a dealer list. Call or return the coupon to us.



CP/M, Wordstar and Osborne are registered trademarks of Digital Research, MicroPro and Osborne Computer Corporation respectively.

Caxton Software Publishing Company 10-14 Bedford Street Covent Garden London WC2E 9HE Telephone (01) 379 6502

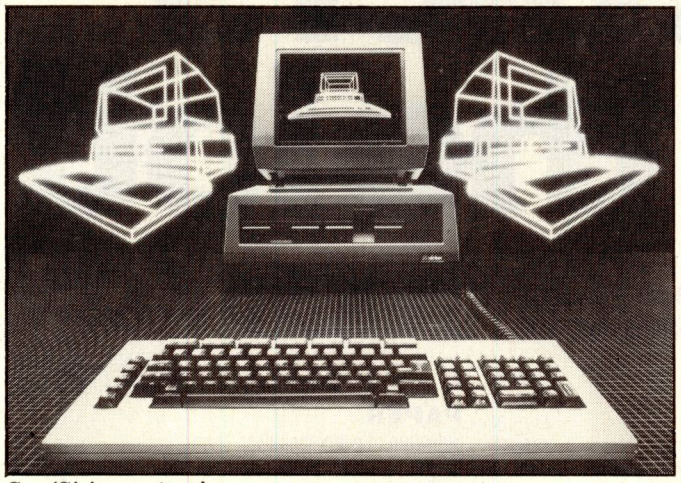
I am a ☐ User ☐ Dealer Please send me ☐ Leaflet ☐ Cardbox, I enclose a cheque for £155 (+ VAT at 15% and £2 p & p.)

Name _____ Position _____ Company _____

Address _____

Computer _____ Disk Format _____

Caxton



See 'Sirius system'

in the Japanese computer business (he's chairman of the board at Fujitsu, a company which is going to build a lot of British computers for ICL), is a conflict between the requirements of politeness and the needs of a computer.

'Being direct and exact may be considered impolite in Japan,' said Kobayashi. 'This creates difficulties with the computer, which must be told precisely what to do,' he added.

This fascinating revelation was delivered in a speech in London in June, which Kobayashi gave at a conference sponsored by the *Finanacial Times* on the subject of 'Is Japan a Pace-setter?'

Not astonishingly, the chairman of the board of Fujitsu thought Japan was indeed a pace-setter. No doubt this came as quite a surprise to the assembled delegates who'd paid good money to listen to him.

Sirius system

'Remember that old atmosphere that Apple dealers had three years ago — that they were doing something exciting, clever, new and rather wonderful?' a software producer asked recently.

'Well, today you get exactly that sort of fervour if you go to a Sirius dealers' meeting.'

Latest religious talisman for Sirius dealers is the release of the operating system which IBM commissioned for its own personal computer from Microsoft — MS-DOS.

In the rather neat phrase of ACT (Sirius agent in Britain), 'This means that many programs written for the IBM personal computer will now run on the Sirius 1 with little or no alteration. The Sirius uses the same Intel 8088 microprocessor chip as the IBM.'

And, it adds: 'The difference, however, is that while the IBM Personal Computer is not (officially) available in the UK yet — and will not be before the end of the year according to the latest reports — the Sirius is on sale at over 200 British computer dealers.'

Of course, matters aren't quite as simple as they seem. True, both IBM and Sirius can now run MS-DOS and, true, IBM hasn't yet released the IBM Personal Computer, which is therefore only available through dealers who have enterprisingly established direct import lines from America.

But a lot of software written for the Personal Computer, and written under MS-DOS particularly, has been commissioned, sponsored and marketed by IBM, on the very strict proviso that it remains exclusively IBM.

And a lot of software for the IBM machine will require very considerable alteration, both on CP/M-86 and on MS-DOS, because of the very different nature of the machinery.

Quite a lot of the Naval Task Force down in the South Atlantic was being driven around by the same turbines as Concorde uses for supersonic flight, but it would be foolish to expect too much performance similarity between a frigate and the aeroplane. The presence of an Intel 8088 inside each of the two computers is likely to prove similarly irrelevant, even with the same operating system.

This is not to say that programs for the IBM are guaranteed not to run on the Sirius. But it does mean that if you buy the Sirius to run a program you have seen demonstrated on the IBM, and the dealer cannot actually show you it in action on the Sirius, then you are sticking your neck out.

Details of MS-DOS from ACT, who will probably put you in touch with one of their fervent dealers. Phone 021-454 8585.

Lisp for BBC

A book called *Lisp on the BBC Microcomputer* is guaranteed to confuse the uninitiated so, before panic sets in, Lisp is a language in which artificial intelligence experimenters write list processing programs.

The book comes with a £17 software cassette for the BBC Computer or Acorn Atom which actually provides the Lisp language. The book itself costs £70-odd and is an introduction to the concepts of list processing.

The language Forth is available in a very similar fashion on both micros.

Full details and exact prices from Acornsoft in Cambridge, at 4a Market Hill, Cambridge CB2 3NJ, or contact dealers.

Xenophobic system

Pro-British snobs, asked to admire Unix (an operating system much favoured by American academics) and the C language which was used to write it, often say jingoistically that 'of course, C is based on BCPL, invented in Cambridge'.

So it probably is, though a fat lot of difference that makes now that C is the standard and BCPL is not. But if you wish to join the island enthusiasts and if you have a 6809-based system, then M6809 BCPL is available for about £150 or less. Details from Martin Saxon on 01-446 4648.

TLO teach-in

Bristol Apple users who have bought The Last One but find that (though it may indeed be fast and powerful) it isn't easy to use are to be offered training: a TLO Workshop on Saturday mornings. The provider is Datalink, a local store, which offers the software at a discount — £269 including VAT. Details on (0272) 213427.

But does it make house calls?

If it takes a really good engineer more than three minutes to find the fault in a microsystem, then it is going to cost more than £20 to fix. And even really good engineers are usually equipped with things like oscilloscopes and logic analysers, which were never designed to troubleshoot CP/M hardware.

Micro Doctor, says its inventor, is.

It can read out the contents of a Z80 program in ROM and disassemble it. It can find a bad bit in a RAM chip. It can print out the memory map of a micro. It can . . . here, why should I write a long list, get the details of this £300 system for yourself from Dataman Designs, Lombard House, Cornwall Road, Dorchester, Dorset DT1 1RX. Phone (0305) 68066.

Feel the width

Questions as to how 'wide' a memory chip is may sound esoteric silicon jargon. In fact, the previous absence of nibble-wide 64 kbit RAM chips has been a big handicap for microsystem builders.

The logic is simple enough once you know that eight 64 kbit RAMs make a 64 kbyte memory but that the first chip is not the first 8 kbytes. The first chip is the first bit



Playing blob-chaser games on any micro by pressing 'Z' and 'X' to move left and right is a tedious exercise. On the Sinclair ZX81, a machine without proper keys, it is downright frustrating as well.

Hence Thurnall Engineering's conviction that it will sell a lot of its add-ons, like games joysticks, with interfacing equipment.

Details and prices from 95a Liverpool Road, Cadishead, Manchester M30 5BG, or phone 061-775 4461.

DE Dealers supply the lot!

Whatever your micro needs just look at the choice, just look at the prices. Everything you could need, and more!

VIDEO MONITORS AND ACCESSORIES

	£
Kaga 12" B/W Monitor inc. Cable	122.00
Kaga 12" Green Monitor inc. Cable	99.50
Philips 12" Amber Monitor inc. Cable	134.00
Kaga 14" Colour Monitor inc. Cable	249.50
Spare Perspex Screen for BMC Mk I & II/Kaga Mk I & II each	19.50

PRINTERS AND ACCESSORIES

	£
Anadex	
DP9000L (Serial/Parallel)	795.00
DP9000 (Serial/Parallel Graphics)	895.00
DP9500L (Serial/Parallel)	895.00
DP9500 (Serial/Parallel Graphics)	995.00
DP9001 (Serial/Parallel Graphics)	945.00
DP9501 (Serial/Parallel Graphics)	1045.00
Ribbon for DP9000/9500 Series	12.14
Graphics for DP9500/1	20.00
Anadex Graphics Interface Card	140.00

Please ask your DE dealer for details of the latest Anadex models.

Centronics	
150-2 (Parallel)	483.00
150-4 (Serial)	544.00
152-2 (Parallel)	556.00
152-4 (Serial)	625.00
737-2 (Parallel)	424.00
737-4 (Serial)	445.00
739-2 (Parallel/Graphics)	529.00
739-4 (Serial/Graphics)	554.00
12 Cartridge Ribbons for 150/2	39.83
12 Zippack Ribbons for 737/739	36.00
Epson–now available the new Type III's	
MX80/3	349.00
MX80FT/3	389.00
MX82	369.00
MX82FT	409.00
MX100/3	499.00
MX/APP1 Non Graphics Interface + Cable	87.00
MX/APP2 Graphics Interface + Cable	91.00
Integral Data	
Prism 132c Colour (full option model)	1395.00
Prism 80 (Tripack model)	895.00
445 Paper Tiger (Graphics)	450.00
460 Paper Tiger (Graphics)	550.00
560 Paper Tiger (Graphics)	895.00
Serial Cable for Tiger	22.50
Spool Ribbon for T440G	7.50
Cartridge Ribbon for 445 460 & 560	9.00
Graphics for T460/560	20.00
Pascal Graphics for T460/560	20.00
Graphics for T445	20.00
Pascal Graphics for T445G	20.00
Olivetti	
TH240 (High Speed Thermal)	695.00
5050 (Parallel/Matrix)	535.00
5050 (Serial/Matrix)	620.00
5100 (Parallel/Matrix)	1085.00
5100 (Serial/Matrix)	1175.00
5200 (Serial/Matrix)	1250.00
DM80/180S (High Res. Serial/Matrix)	2375.00
DY211P (Parallel/Daisy Wheel)	895.00
DY211PS (Serial/Parallel Daisy Wheel)	985.00
DY311S (Serial/Parallel Daisy Wheel)	1250.00
DY811S (Ser./Par./Daisy Wheel inc. SPR)	2050.00
Single Sheet Feed Hopper for DY211/DY311	540.00
Olivetti Fabric Ribbon (Qty 6)	21.50
Olivetti M/Strike Ribbon (Qty 6)	36.00
Olivetti S/Strike Ribbon (Qty 6)	18.00
Various 10 or 12 pitch Olivetti Daisy Wheel (Qty 1)	14.00

MOUNTAIN COMPUTER HARDWARE

Data Efficiency is the sole appointed UK distributor of the Mountain Computer range of high-quality peripherals for the Apple Computer.

	£
CPS Multifunction Card	127.00
RAMPlus+	100.00
ROMPlus+	99.00
ROMWRITER	111.00
COPYROM	38.00
Clock/Calendar Card	149.00
SUPERTALKER	141.00
A/D + D/A Channel Converter	223.00
(1/0 Cable assembly for above)	35.00
Music Systems Complete	257.00
Spare Music System Disk Pack	20.00
Spare Music System Manual	10.00
Expansion Chassis	424.00

DAISY WHEELS

Selected typefaces for both Diablo and Qume daisy wheels are available singly.

1–5	£5.50 (per unit)
6+	£4.75 (per unit)

PAPER

Selection of paper includes:

Order Codes			£
LP10	Box of 11" x 9½" 1pt	(2000 sheets)	12.65
LP1	Box of 11" x 14½" 1pt	(2000 sheets)	14.55
LP5	Box of 11" x 15⅞" 1pt	(2000 sheets)	15.01

RIBBONS

Complete range of printer ribbons are available to suit most makes of printers.

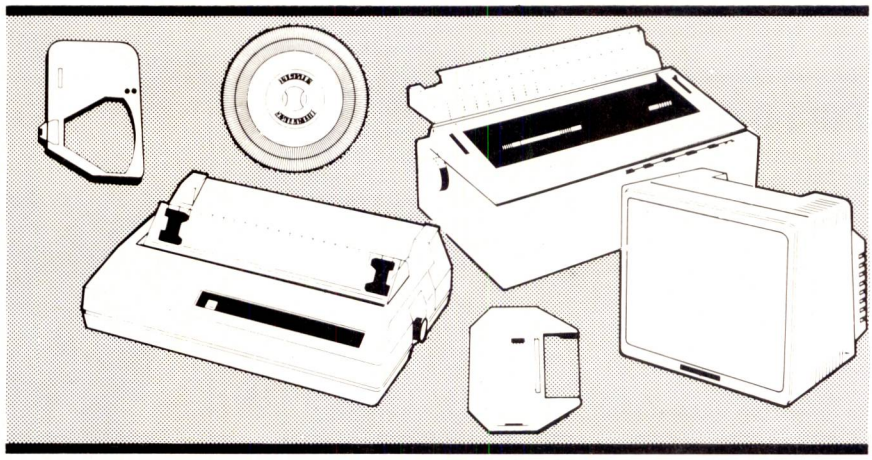
Plus

- Apple Accessories/ Interface Cards
- Supercalc®
- Dataplan®
- Floppy discs/storage
- Micro Systems furniture

Ask your DE dealer for details of the latest promotional offers.

Dealer enquiries welcome

Prices correct at time of going to press.



Ring for details of your nearest stockist (0442) 40571/2

DE Data Efficiency Ltd

For all your Micro needs...and more.

Data Efficiency Ltd, Computer Division, Finway Road, Hemel Hempstead, Hertfordshire HP2 7PS Tel: (0442) 40571/2 Telex: 825554 DATEFF G



See 'Stretching it out'

in all 64 kbits, the second chip is the second in all 64 Kbytes and so on.

This means that you can't have a 48 kbyte memory, which is a bit awkward when your micro needs to have a 16 kbyte in ROM. That's why Texas Instruments is so pleased about its new chip, which provides the first four bits of every byte in a 16 kbyte memory. Two of them provide a whole 16 kbytes, all on their own. Six of them will provide your 48 kbyte memory, and Clive's your uncle. (In case you're wondering, he had to use 32 kbyte RAMs on the Spectrum.)

Stretching it out

It is perfectly sensible to generalise and say that there is no sense in sharing one micro between two people — because the work involved in sharing outweighs the cost saving. Sometimes, however, it isn't true; and that is when a great many people want to use the same micro, but only occasionally.

An example is the Apbranch system which Saville Audio Visual has produced for Apple II users. This system is based on a special keyboard which can be as much as 1000 feet away from the Apple.

To quote Saville: 'A company wanting to put stock control on the Apple might want a terminal in the warehouse, one in goods input, one at an office desk and so on, so that they can enter data and retrieve it from various different points.'

Using the Apbranch terminal, says Saville, a standard four-terminal hook-up would cost an extra £1600 and would give access to any program running on the central Apple.

Details on York (0904) 37700.

Either/or (but not both)

Following the example set by giant computer maker Digital Equipment, a small British start-up micro company has launched a desk-top machine which uses both eight and 16-bit micros.

Setting itself apart from the example set by DEC, however, the company has produced this product, the Laser, as a multi-user, high price system and has designed it as an 'either eight or 16-bit' machine, rather than as both.

'A typical end-user configuration price,' says the company in a welter of syllabic prodigality, 'incorporating 64 kbytes of memory, eight bit processor, two disks giving 1.2 megabytes of storage, a ten-megabyte winchester disk, a serial printer and video display, would be £7900.'

Unfortunately, you can't run eight and 16-bit chips in the same box. The 16-bit Intel 8088 (as used by IBM, Sirius and DEC) is on a 'replacement board' which adds some £200 to the cost of the whole system. To run the one, you must have the other out of the box.

Anybody interested can contact Laser on Godalming (048 68) 5631.

M/C reference

For a mere 55p, a booklet on machine code for the Sinclair ZX81 has been released by Softest in Romsey.

The book is one of the rapid reference series which the firm produces. It's around the size of a tape cassette but only a few pages thick. It could actually get the keen ZX81 user started on assembler work for the first time.

Details from 10 Richmond Lane, Romsey, Hants SO5 8LA.

Cheaper Expert

Expert systems already existing on micros are quite possibly produced with something from Isis Systems, which released a software tool called Micro Expert in December 1980.

This system, says the company, has been used to produce expert systems that understand many subjects. The list goes: 'law, contracts, naval tactics, industrial planning, and fault diagnosis in chemical and industrial plants'.

Now it is cheaper. As of today, Micro Expert on a micro costs £380. On the Digital Equipment mini-computer range (PDP-11) it costs £800 and on that company's bigger VAX machine, £1200 — a good reason to use micros!

Details from Barry Parker on Redhill (0737) 71327.

Still waiting

A lot of people were planning to build business systems around the BBC Computer they may just have received from Acorn. Many of them will have been misled by me into thinking that by this time, they would be able to run CP/M software on the beast.

My apologies. The forecast was that a Z80 chip with a spare 64 kbytes of memory would be available, ready to plug into the BBC unit as a 'master processor' to run CP/M and the date forecast was March to May this year.

Fat chance!

My best information from Cambridge so far is that the add-on board with the 6502 chip in it will be out — perhaps — this month (September). Before that, business users wanting 'serious' programs will have to suck their thumbs and wait.

As for the CP/M add-on, the end of the year or later would be reasonable optimism, say my sources.

As far as the software goes, Acornsoft is (probably predictably) not aiming to license Visicalc, even on the add-on 6502 board but instead is working on its own spreadsheet program. Similarly with word processing. If I sound disappointed, that's because I am.

Towering RAM

It is called 'tower block' memory by its maker: 2 kbytes of memory which can be used either as ordinary read-and-write user memory, or as permanent memory, because it has a battery to ensure that the information never fades. It is called Memic, and you can get details of how to use it on boards which are too close together to take the tower block from Cambridge Microelectronics, 1 Milton Road, Cambridge, tel: (0223) 314814.

Bug Byte branches out

After ACT, now a big hardware dealer, software distributors are not two a penny in this country — so the news that Bug Byte of Liverpool now has 90 dealers to pass out its Acorn, PET and Sinclair programs to us must be significant.

Bug Byte isn't lacking in ambition, at least. 'Our target is to have 500 dealers within the next 12 months,' said Tony Baden, partner with Tony Milner in the business.

As an incentive to dealers, Bug Byte is offering discounts for cash, monthly prizes, point of sale display materials, promotional packs and a 12-month guarantee on its games.

Talking of 12-month guarantees, I admire ACT's nerve in announcing that the Sirius has had its warranty period 'quadrupled' because of its astonishing reliability.

This is what I call positive thinking with a vengeance. A less enthusiastic fan of the company than its publicity man might have been tempted to describe the operation as 'bringing the warranty period up to the bare excusable minimum of 12 months,' together with some suitable apology for having foisted a 90-day warranty off on the public for so long.

And before you write and complain, Mr Publicity old mate, yes I know other people offer 90 days and now they know what I think of them, too.

Bug Byte, anyway, is on 051-227 2642.

More micros for schools

Lovers of statistics who have noted that 'every secondary school in Britain now has at least one micro' (a quote by Ken Baker's Information Technology Ministry) and that there are well over 5000 secondary schools, will be encouraged by a move to put these machines into primary schools too.

By the end of 1984, says Baker, up to £9 million will have been spent (starting 1 October this year) in up to 27,000 schools, buying up to £18 million worth of computer hardware for children in the five-to-ten year bracket.

The scheme doesn't just cover any old micro. You

This could be the hardest £100 you'll ever earn

At Open Computer Services we're so confident in the quality of our software packages that we throw down this challenge:

For every bug you find in our packages, we will give you £100.

To qualify, just buy any of these packages – payroll, sales ledger, purchase ledger, general accounting/nominal ledger – and if you detect a bug, send a report on the fault together with your name, address and licence number.

Sadly you may well find it difficult to detect any £100 bugs.

But at least you can take some consolation from having acquired some very good software indeed.

Software systems for most 8 bit and 16 bit microcomputers including IBM Personal, Sirius and Xerox using CP/M and MS-DOS operating systems.

OPEN COMPUTER SERVICES

Aqua House Old Steine Brighton BN1 1EL Tel. (0273) 671666

Dealer discounts available

have to want a Sinclair Spectrum (the big one with a 48 K byte user memory) or a big 'B' BBC micro with disk interface (but no disk) or the RML 480Z (cheaper, at //818, than the original 380Z).

The thing we are all supposed to get excited about, I suppose, is the fact that the Sinclair machine is now approved, and by the Department of Industry, too. And we'd all said how the mandarins of the DoI couldn't stand Uncle Clive!

Wyh, we must have been wrong after all (yawn). (Have I got the message right, DoI?)

I'd be a wee bit more impressed if the Spectrum wasn't priced at £346 — with a black-and-white monitor, you see — or £472 with a colour monitor. I'm sure the monitor sales are very valuable to Microvitec in Bradford but a colour monitor really is wasted on the Spectrum, which has its output bandwidth restricted to prevent PAL dot crawl.

Positive Positron

One of Britain's more interesting new microcomputer builders, Positron, has taken the important step of starting to look for a distribution chain without which (as even IBM will discover), serious micro marketing cannot be tackled.

The unusual machine, designed originally for video control as well as personal data processing, appeared for the first time at Compec North. Potential dealers who couldn't get to that show should contact Peter Loftus, the marketing director, on 061-228 3678.

British Micro is the company led by Manas Hegoyan (the man who so nearly bought Nascom after it went bust) which produces the best-value British CP/M machine.

Like Positron, BM is now pushing its Mimi design through retailers in this country; previous sales had largely been abroad and only a few hundred machines were built.

A big brother, with a 16-bit processor option, should be available very shortly.

The company has now announced a list of over 30 dealers all round the country (only seven in London) — for details or a local address, contact Gerald Roll, marketing manager on Watford 48222.

Beeb bug

There are a lot of theories about why the BBC Computer is less than perfect at saving and then loading programs on tape. There are also some hard facts — obtainable, of course, by joining the independent national user group.

To summarise, however, the BBC microcomputer wil will not reliably SAVE because it has a bug that corrupts the first block-header, one time in 16. There is a machine code fix for this and if that won't work for some reason (no room in memory, perhaps) it doesn't happen at the slow tape message speed, only the fast 1200 baud rate.

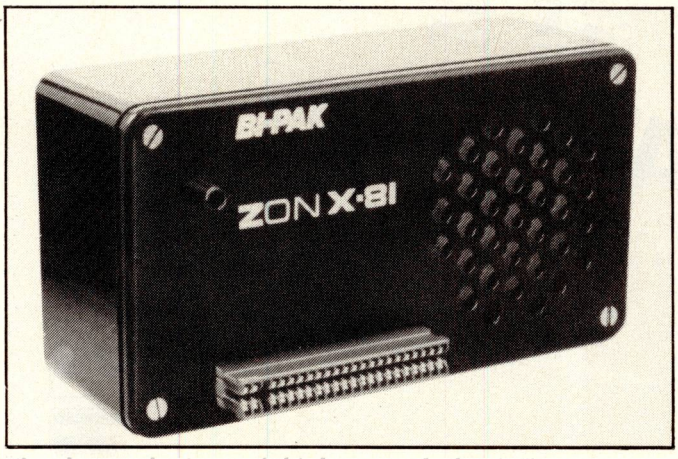
The machine will not reliably LOAD because many recorders have phase problems, only just audible, but crucially distorting to the timing mechanism of the machine. Unfortunately, some commercial duplicating firms are churning out BBC program tapes with this fault.

It may sometimes fail to both LOAD and SAVE because of earth loops — either one too many or one too few will do it — set up in the cables from computer to cassette recorder. This one is curable by unplugging or plugging in the 'record', 'mic' and 'remote' plugs until it works.

And it may fail to SAVE because some tape recorders are too sensitive and the BBC produces too loud a sound for the input circuits. Usually a 5k resistor, say users, needs to be put between recorder and computer to cure this.

Most of this information I got from Sheridan Williams' Beebug mag. I also discovered that BBC Basic gets very confused over the length of strings if they grow during the program, because it picks a new bit of memory to store them in each time they grow by eight bytes. And I found a way to avoid this, too.

Details of the user group and its invaluable magazine (£8.90 buys membership for a year, including the newsletter) from Beebug, Dept 1, 374 Wandsworth Road, London SW8 4TE.



The plug on the front of this box reveals that it fits onto a Sinclair ZX81; the loudspeaker holes reveal that it makes sounds. Like the BBC and VIC sound devices, this has three channels plus a noise channel. Like the BBC Computer, this one can control the 'envelope' of the sound. It costs a mere £30, including postage and VAT, and can be programmed in Basic 'to produce piano, organ, bells, helicopters, lasers, explosions, Space Invaders, etc,' says Bi-Pak Semiconductors of PO Box 6, Ware, Herts; tel Ware 3442/3182.

Setting standards

The micro manufacturers are working hard, trying to find a way of using disks so that they can all read each other's data off the magnetic surfaces.

And at the same time, the disk manufacturers are working hard, trying to devise standards to make the same thing possible.

The latest move, following several announcements (from Osborne and others) of operating systems that can read alien disks, comes from Dysan, Verbatim, Shugart and Tabor (who all make disks) who want to agree on a standard for the newest tiny disks, the microfloppy.

Maxell, through its UK distributor CPU Peripherals, has already launched one of these 'Compact Floppy Disks' (see pic) — only prototype and preproduction ones so far — for the computer designers to play with.

But the other four are worried by the Japanese lead in this market. And while they claim to be working for a standard just to make life easier for the rest of us, nobody need be too astonished if they eventually settle on a standard which is subtly different from the devices already available (in the US) from Japan.

CPU Peripherals is in Shepperton, Middlesex TW17 8AQ; tel Walton-on-Thames 46433. Verbatim is represented by BFI Electronics (01-941 4066) and Willis Computer Supplies (0279 506491).

Snap it up

Words like 'copy' are four-letter epithets in the program business, and there is a new phrase to use in polite society.



See 'Setting standards'

Programs like Snapshot, released as the latest weapon 'in the escalating arms race between Apple disk copiers and disk protectors', does not copy programs — it 'backs them up'.

Programs which Snapshot can 'back up' include difficult disks like Visidex, new releases of Visicalc, and even the well-known back-up maker, Locksmith.

Snapshot is not just a program but an electronic device. It works on the presumption that a program runs in perfectly normal machine code, no matter how cleverly it may be disguised on the disk.

So Snapshot circuitry interrupts the program while it is running and dumps the contents of memory to an unprotected back-up disk. The method will not work with programs that make repeated reference to their own source disks — things like Adventure, or accounting packages.

The trouble is that, if this method becomes commonly adopted, the only really safe method of making sure that a program will run only on one machine is to tamper with the machine itself. Apple users have suffered from a host of 'dongle' devices — scrambler circuits which plug into the games port. Apart from the obvious fact that they prevent the use of the games port for games, they are never the same from one program to the next.

So, to use a protected program, inevitably one ends up lifting the lid off and mucking about inside the Apple — sometimes dropping the video monitor, sometimes only the disks. I won't use the things.

Snapshot is available from Dark Star Systems for £95 including VAT. Details from 54 Robin Hood Way, Greenford, Middlesex.

Up in arms

Both Apple and Atari are quite right, of course, to take the tough line they do about imitations, even if they take exactly the opposite viewpoint to each other.

Apple is getting very steamed up indeed about Far East imitation Apple IIs being

Bags of expertise



THE BYTESHOP

PERSONAL COMPUTERS

Commodore Vic range
Sharp MZ 80 range
Osborne

commodore VIC OSBORNE SHARP

Sharp and Commodore Vic printers
Sharp disk drives
Osborne monitors and adaptors
Epson MX 80/100 range of printers

Books	Paper
Games software	Print wheels
Cassettes	Ribbons
Diskettes	Labels

Shopping List

XITAN SYSTEMS

VISA

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

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

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

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

Nottingham
The Byteshop,
92A Upper Parliament Street
Tel: 0602 40576

Southampton
Xitan Systems
23 Cumberland Place
Tel: 0703 38740

·Members of the Comart group of companies

sold for (I am told) under £200. Atari, on the other hand, couldn't give a soggy damn about imitation Ataris. It has steam under high pressure, however, to be released in an angry jet at anybody who copies the software which runs on its machines.

That, of course, is something that Apple doesn't mind too much — you can produce software to run on Apple till the cows come home, and Apple will help you all it can.

One software dealer I know has a good stock of Atari games and the like and, on the strength of this stock, got a customer for an Atari micro. The order was turned down flat by Atari because the dealer proposed to run non-Atari software on the machine.

On that note, I must report that I have wasted at least one week in the last three by playing a game called Snapper, produced by Acornsoft for the BBC Computer.

Pacman, Atari's game that is taking the US by storm, was originally available on an arcade machine before the current video game version appeared in the shops. Any difference between Pacman and Snapper is virtually undetectable by me. On track record, I would expect Atari to take up arms against Snapper. I'll let you know what happens.

Conservative figures

Trying their hand at market research, the retailers of Curry's (the Micro-C stores) have discovered that there are some 600 specialist retail outlets for micros in the UK, and some 217,000 systems sold.

These estimates are conservative, to say the least. I pass them on for historians to chuckle over: the Curry figures show that the £100 to £500 value market, with Atari, Vic and Texas Instruments quoted (no mention of Acorn, Tangerine, Ohio, Nascom, Transam, Tandy, Sharp, Video Genie and other minority single board systems) has 'over 50,000 micros installed' — in total, that is, not just over the last 12 months as some might imagine.

Business systems between £500 and £4000 account for 12,000 installations, says Micro-C. This is quite a trick, since Apple has averaged well over 1000 systems a month for well over two years, and Commodore does twice that (excluding the 30,000-odd VIC 20s) and has done so for at least three years, average. Only another 5000 systems, worth £4000 to £10,000, can be found in Britain they say.

Whatever might have happened to all the Superbrains, Princes, Sirii, Horizons, Cromemcos, Tuscans, RML 380Zs, Signets, Torches, Hewlett Packards, Casus, Osbornes, and the like, can only be guessed at. Probably there is some kind of misprint involved.

The misprint theory is substantially enhanced by the Curry's figure of 150,000 Sinclair machines sold, a figure easily exceeded just on the ZX81, ignoring its predecessors.

Easy bus

A great many Commodore computers were sold because the machines all included an output and control port called the General Purpose Bus (to IEEE-488 standard) which could be used to control scientific instruments.

A great many more would have been sold, however, if that wretched bus had been easy to use. It isn't really Commodore's fault that it was, instead, fiendishly complex.

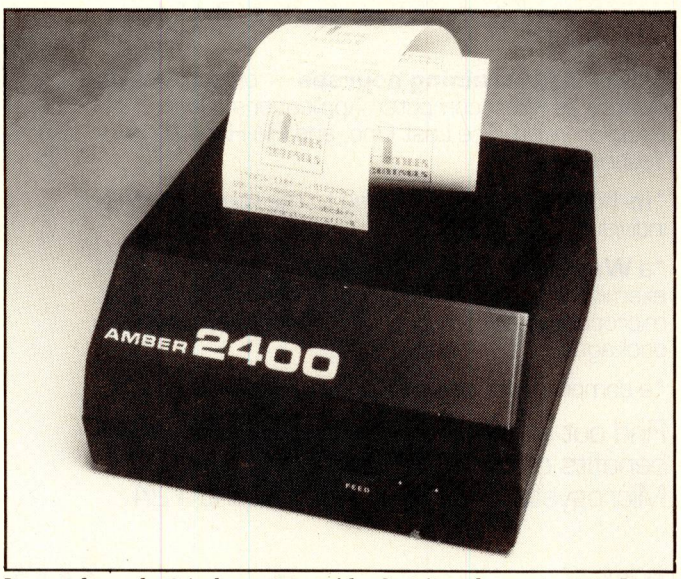
Simplifying the job of driving remote devices through the bus, Rhombus has released an operating system which gives control of the bus to an extra 56 commands which look like Basic commands.

Rhombus supplies the software in chip form, a 4 kbyte ROM and a 125-page manual.

No apologies for the following string of jargon terms — those who don't understand the bus aren't going to learn it here — which will explain in outline what has been done. I quote:

'An on-screen bus monitor is implemented, and all commands can be called from a Basic program. BOS deals easily with binary, hex, BCD and ASCII data transfers. All the bus commands (GET, DCL, SPE and so on), together with SRQ, SERIAL and PARALLEL polls are available. There are no "time-outs". Character strings of up to the full length of 255 bytes can be input to Basic string variables (including the null byte — zero). Block data transfers, to or from PET memory locations, can be done at up to 6 kbyte per second rates, with decimal or hex addressing. A reliable GET½ routine is provided, and there are no "ILLEGAL DIRECTs".'

Price is £83. Specify which Commodore series machine you want to plug it in to. Contact Rhombus for its BOS data sheet (send self-addressed envelope) at 87 Bourne Way, Hayes, Kent BR2 7EX.



It may be only 24 characters wide, but it only costs £70. It may not be suitable for invoicing posh customers — but it does print on plain paper. It is the Amber 2400 printer, and builder Amber Controls says that it is capable of attachment to a great many home computers because a large range of serial and parallel interfaces are provided as standard.

Details from Amber at Walworth Industrial Estate, Andover, Hants; tel 65951.

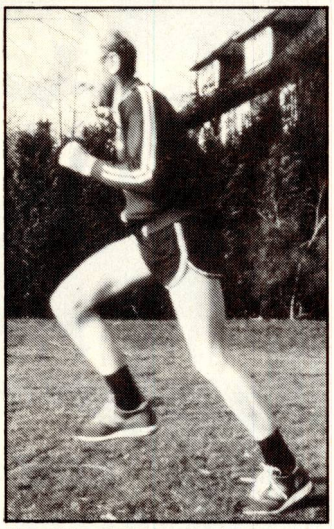
Sirius hard disk

Sirius 1 is a computer that provides a fair bit of disk storage, but there is always a need for more — so the news that Corvus hard disks are available from Keen Computers will be welcomed by many users.

Their enthusiasm will not be based on the incredibly low price of the Corvus disks (because they aren't incredibly cheap) but on the fact that Corvus disks are networkable, so that two or more Sirius users can share the same hard disk.

The really clever thing about the Corvus net, however, is the fact that it is a Z80-based CP/M microsystem and you can use it to run all those useful CP/M programs which still aren't available on the 16-bit version, CP/M-86. Of course, you will probably have to convert your CP/M programs from your own system to this one, but that's another story — and maybe a shorter one.

Extra files called 80.CMD and 86.COM are supplied in CP/M-86, to let you switch from eight to 16 bits. And Keen Computers believes that all files generated under either CP/M are identical in structure, 'which means that any files created under one operating system may be used by the other, with no restrictions'.



See 'Sinclair slashed'

Sinclair slashed

An enormous price cut for te ZX81, down to £50, is expected to stop its drop in sales, says Clive Sinclair.

The price cut from 1 August was originally described as 'not necessary' when Sinclair launched the newer and better ZX Spectrum in April. But sales — Sinclair says he can't give details — have not held up as anticipated.

Reports from W H Smith that over-the-counter sales of the ZX81 had 'dried up' were denied by Sinclair. But he said that the drop in sales were not available 'because it isn't clear what seasonal factors are at work, and so on'. And he (rather reluctantly) refused to confirm one suggestion that sales had halved.

'We know that price cutting on this works — we had spectacular boosts in American sales by cutting the price from $150 to $100. I think sales trebled, actually,' he said.

The picture shows Clive practising for the half-marathon he helped sponsor in Cambridge in July. 'Of course I finished!' he expostulated contemptuously. 'It's only half a marathon, after all.' Having completed two New York Marathon runs, I suppose he's entitled to a little pride in his legs.

The 5th Personal Computer World Show

Would you benefit from the micro?

What is available?

Will Raise Many Questions... ...Find the answers on Stand 124

How do you choose the right system ?

How do you use it in the right way?

Those are difficult questions for anyone looking at microcomputers for their business — particularly for the first-time user. On stand 124 at The 5th Personal Computer World Show you'll find some straight answers,

That's where the Microsystems Centre is offering short, impartial, individual consultancy sessions — **absolutely free of charge.**

To book your free session couldn't be easier.

Our microcomputer system will display the times available. Simply select the most convenient time, key in the few brief details requested, and pick up the appointment slip produced on the printer.

Then, when you've seen what's available at the show, come back to the stand at your chosen time, and meet one of our experienced consultants who will help you put it all in perspective.



The Microsystems Centre, a division of the UK National Computing Centre, is independent of all suppliers and does not sell systems.
That's what gives it its impartiality and authority.

Its aim is to promote the use of microcomputers to improve efficiency, profitability, and competitiveness. Consultancy is just one of the ways in which it meets that objective. The Centre also offers:

* short public **training courses** — on subjects as diverse as Microcomputer Applications, Basic Programming, The Last One, and File Handling Techniques;

* **in-house training** tailored to the specific needs of individual organisations;

* a **Workshop** where prospective users can examine for themselves some fifteen different microcomputers and over one hundred software packages;

* a comprehensively stocked **bookshop.**

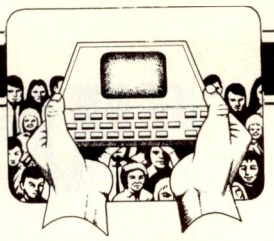
Find out about all of these — and the added benefits of **membership** of the Microsystems Centre — on Stand 124.

Microsystems Centre

11 New Fetter Lane London EC4A 1PU Telephone: 01 353 0013/4/5
a division of the UK National Computing Centre

CTUK!NEWS

by David Tebbutt



It's been another good month for ComputerTowns — three more have started: Ashford in Kent, Church Stretton in Shropshire, and South Shields in, er, the north. Congratulations to all concerned. Readers can find the addresses of the first two organisers, Christopher Bates and Peter Earthy, in the ComputerTown Contacts at the back of the magazine. The organisers of the third, Dave Gallagher and Pam Collier, can be contacted via John Bone (also listed) for the moment.

Please forgive me for being a little terse this month. The reason is that I would like to hand the rest of the column over to Ron Dixon, Chairman of ComputerTown North-East, who tells the story of one ComputerTown's development:

"We thought a few notes about our history could be of help to those who worry that they could not organise a CTUK. Early in 1981, four members of the Newcastle Personal Computer Society (NPCS) read the original article in *PCW*. They were Steve Christian, Dave Thompson, John Bone and Richard Powell. This confirmed their own feelings about computer literacy. No organisation seemed to be interested in letting Joe Public in on the act so CTNE was born. It was as simple as that. Looking back, it seems that the most attractive feature of the proposed plan was that it would be a totally independent group, while still having national representation.

Its first meetings were at two community fairs or fetes and they went 'like a bomb'. The next problem was to find a venue for regular meetings. We had already agreed that they were to take place during the day. We didn't like the idea of a too-formal setting so a school or college was not for us. (You will probably have gathered by now that we're a rather informal crew. This is reflected in everything we do but of course this format may not suit other groups.) We found a small shop unit which was available for £3 on a Saturday and we thought this very good value.

Our first meeting in January had very little publicity but attracted all of 12 people as well as the four Grand Originals. We even got an extra computer, which lived in the flat above the shop. By March our regulars had expanded to 20 and we were getting too big for the shop — but where to next?

An old local church in central Gateshead was in the process of being converted into a community centre. We were lucky enough to move there two weeks before the official opening and have met there ever since on most Saturdays between 10am and 5pm. We now have over 60 regular members and about 20 regular microcomputers. Our members come from all walks of life: teachers, students, road sweepers, surveyors — you name them, we've got them.

Our formal organisation comprises a Chairperson, Secretary and Treasurer and we also have representatives of the three age groups. The most important is group A, our under-15 bracket, represented by Kevin Dixon. Dave Thompson leads group B (15-25) and is our representative on the management committee of Trinity Centre, Ian Simpson brings up the rear for the older generation in group C (over 25). Sylvia represents the interests of the Centre and keeps us out of trouble. Andy Stoneman is our treasurer and his age (16) shows again our view on his generation. John Bone is our secretary.

Two recent visitors to Geordieland were their Royal Highnesses the Prince and Princess of Wales. Andy and Kevin had the pleasure of meeting them. The Prince's Trust last year purchased a Video Genie for CHIPS, our sub-group, and it was the star exhibit, if you discount a local punk rock group.

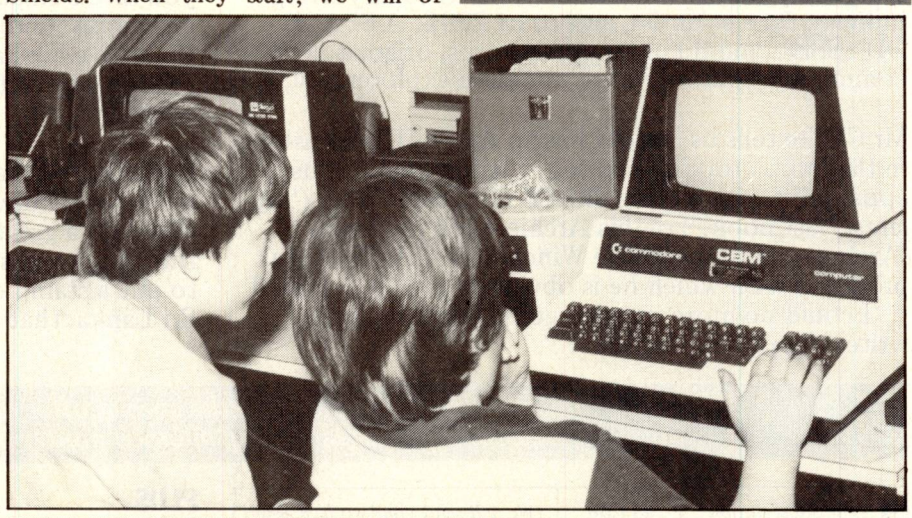
Two of our members, Dave Gallagher and Pam Collier, are soon to start a ComputerTown in nearby South Shields. When they start, we will of course be there to support them.

At the time of writing, we have just had an incredible free offer of at least six terminals from the Trustee Savings Bank. It should be interesting to see just how many interfaces can be persuaded to operate with them.

How do you measure the success or lack of it with a group like ours? All I know is that we seem to enjoy ourselves and we keep coming back so there must be some attraction. Vandalism has only once raised its ugly head, when an Atom had a match struck on it. One such incident these days is not too bad, we think."

Now, if you'd like to follow CTNE's example, do write to me for a set of guidelines to help you on your way. I look forward to hearing from you.

For further details of CTUK! write to: CTUK!, 7 Collins Drive, Eastcote, Middlesex HA4 9EL. Please enclose a large SAE for your reply.





Busy scenes at CTNE

SUBSCRIBE TO PCW

"JUST SKIMMED THE LAST THREE ISSUES AND FOUND THEM FASCINATING..."

Arthur C Clarke

It's amazing what goes on in the basement of *Personal Computer World.* Our erstwhile subscriptions manager, for example, engaging in correspondence with Arthur C Clarke! (For the uninitiated few, ACC is arguably one of the world's most visionary living individuals: a scientist, author of 2001: A SPACE ODYSSEY and 60 or so other works, originator of communications satellites, undersea explorer, etc, etc).

Mr Clarke tells us that he has an Apple II 'languishing in the lab... too busy to touch it for weeks'. Busy, apparently, completing SPACE ODYSSEY two ('my *latest*, last book!') on his Archie word processor (Archives III, 5 megabyte Winchester disk, Wordstar program) with which he is obviously deeply satisfied — 'I could no more imagine going back to a typewriter than to a slide rule...'.

We make no bones about our delight that Mr Clarke takes the trouble to write to us from his home in Sri Lanka and comment on *Personal Computer World* so favourably. As a subscriber to *PCW*, not only will you save a small fortune (see the rates below) but you can count yourself in august company. Remember that Clive Sinclair described *PCW* a short while ago as 'clearly one of the leading computer journals in the world'.

Well, that's always been our aim. And if it's true that a person is known by the company he keeps, you could do a great deal worse than fill in the coupon on the right hand side of this page. You won't even need to put a stamp on your envelope... unless you live in Sri Lanka, that is!

For a limited period only, here are the special offer rates for a subscription to Britain's largest selling microcomputer publication.

1 *Year Subscription (U.K. only)*	*£11.50*	*(We will send you* two free issues *at the end of your subscription before reminding you to renew. You get 14 issues for the price of 12 issues if you subscribe now!)*
2 *Year Subscription (U.K. only)*	*£19.50*	*(You receive 24 issues, saving yourself £3.50 off the full current subscription price. Plus you protect yourself against future increases in cover prices and postal rates which will probably amount to a saving of £5.00 over the period.)*
3 *Year Subscription (U.K. only)*	*£29.50*	*(You receive 36 issues, saving yourself £5.00 off the full current subscription price. Plus you protect yourself against future increases in cover prices and postal rates which will probably amount to a saving of £7.00 over the period.)*

PLUS

We have now arranged for special 'first-off-the-press' copies to be mailed direct to subscribers which will ensure that they arrive either on the same day or one or two days in advance of national distribution in the U.K.

PLUS

Existing subscribers can take advantage of any of the offers above. Just tick the 'this is an extension subscription' box on the coupon and enclose your payment. The additional copies will be added to your existing subscription automatically. You do not *have to wait until it is time to renew (by which time this offer will probably have been withdrawn). Save money by extending your subscription today!*

PLUS

We have completely reorganised our Subscriptions Department and any problems, change of address, special requests etc. etc. will be promptly dealt with by an extremely 'user-friendly' human being *should you need to write to us.*

PLUS

We send subscription copies of PCW in a tough polythene wrapper. It will reach you promptly every month, unfolded *and in good condition.*

PLUS

You can pay for your subscription to PCW by cheque, postal order or by using Barclaycard (Visa)/American Express or Access. And you don't even need a stamp for your envelope. Use the coupon on the right.

Why do more people read PCW than any other microcomputing magazine in Europe? Subscribe today!!



THE GALAXY 1 COMPUTER

The cost effective solution to your computer needs for only £1,450*

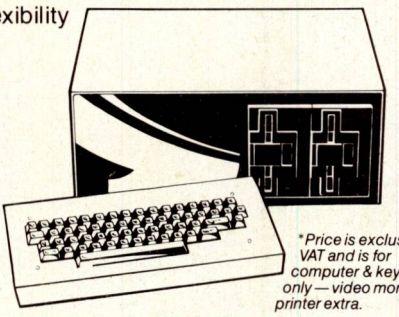
The Galaxy 1 desk top computer system can be used in education, small business applications, word processing, stock control and a host of other environments. Our choice of CP/M as the operating system means that our customers can select a suitable application package from the widest possible range.

However, unlike our competitors, we supply not only the hardware but all the essential system software needed to start using the Galaxy 1 as soon as it is installed. We have adopted COMAL-80 as our standard language. This structured basic is rapidly gaining widespread acceptance and popularity especially in the education market, offering much greater flexibility and ease of use than existing Basics. We also supply a very powerful Z80 assembler/editor called GEM ZAP with GEM PEN, a compact but very powerful word processing package. The system software suite is completed with GEM DEBUG, a useful machine code program de-bugging utility.

Modular design means reliability and ease of maintenance. Unlike many other manufacturers Gemini offer a full one year warranty (except Disc heads which are guaranteed for 3 months). Our distributors carry a full range of replacement boards thereby facilitating a quick, efficient and cost effective back up customer service.

Features include:

- **Twin Z80 Processors**
- **64K Dynamic RAM**
- **800 K Disc Based Storage**
- **80×25 Screen Format**
- **Dual Printer Interfaces**
- **Modular Design**
- **CP/M 2.2 Operating system**
- **COMAL-80 – Structured Basic**
- **Z80 Editor/Assembler**
- **Text Editor & Formatter**
- **Program De-Bugging Utility**



**Price is exclusive of VAT and is for computer & keyboard only — video monitor & printer extra.*

BRITISH MADE

Telephone Amersham 28321 for the name and address of your nearest distributor.
**** Dealer enquiries invited.***

Gemini Microcomputers Oakfield Corner, Sycamore Road, Amersham, Bucks HP6 5EQ.

MICROWRITER Revisited

Peter Rodwell re-assesses a unique text processing device.

Nearly two years have passed since I first reviewed the Microwriter, the device which enables you to 'type' single-handedly, to store your text either in the machine's own memory or onto tape and to print it out onto paper.

Since I first encountered it, the Microwriter has undergone considerable development, and the company which makes and markets it — Microwriter Ltd — has revised its marketing strategy and is now ready to hit the world with what is now not only a unique text-handling device but a very sophisticated one at that.

But first, for those of you who may never have heard of the Microwriter before, or who missed my original review, here's a brief outline of what the Microwriter is, what it does and how it is used.

The Microwriter was invented by expatriate American Cy Endfield. He hit on the idea when, after buying one of the early pocket calculators, he was trying to figure out a way of incorporating a word game into a hand — held electronic device.



The problem, he felt, was that using one key for each letter would require a very fiddly keyboard. The alternative, a chord keyboard with one key for each finger, had the drawback that learning the key combinations appeared impossible. Cy Endfield's big breakthrough was in devising a particularly clever and easy system for learning the key combinations by using the shapes of the letters themselves as mnemonics — each letter is formed by pressing the keys which correspond to the main features of its outline.

Exactly how this works can best be seen from Figure 1, taken from one of the handy reference cards supplied with the

Microwriter. When I first tried my hand at Microwriting, it took me about half an hour to learn the basic alphabet and about three weeks to learn all the other symbols and to build up speed to the point at which it was quicker and more convenient to Microwrite than to use a pen or a typewriter. This appears to be an average learning curve; the record for learning the key combinations is 1½ minutes!

Probably the most difficult part of learning to use the Microwriter is persuading yourself to try it in the first place, for the sight of a skilled user tapping away can be quite awe-inspiring: it just looks impossible. Once you get over that hurdle and actually try it out for a few minutes, it quickly becomes obvious that there's really nothing to it. The whole system is so well thought out that there's really no excuse for failing to learn!

Given that it's easy to learn, what do you do with it once you've mastered it? Well, the Microwriter is very nearly a portable word processor. 'Very nearly' because, although it allows you to enter, sort, retrieve and print out text it lacks facilities such as searching and replacing which are found on real word processors. But in its relaunched form, the Microwriter is an extremely powerful and versatile device; as you'll see, describing it as 'very nearly' a word processor hardly does it justice. Its great advantage over conventional word processors is, of course, its portability: I'm Microwriting this review while sitting outside in the sun, for example!

Hardware

The most immediately obvious physical change to the Microwriter is its case, which has changed from white to two-tone brown and cream and appears to have been flattened slightly and generally smartened up. The old LED display has been replaced with a 14-character LCD dot matrix unit which displays both upper and lower case characters and is much nicer.

On the front edge of the device is a massive socket which allows maintenance engineers access to the system's internal signals. Next to this is the socket for the battery charger. On the back edge are sockets for the RS232, TV and cassette interfaces and the on/off switch. There are in fact three ways of turning the Microwriter off: you can use the on/off switch, in which case when you turn on again you'll find yourself at the beginning of whatever's in memory; you can execute a series of key combinations; or you can simply leave the machine alone and it will turn itself off after eight minutes. In the last two cases, turning it on again puts you straight back to the point in memory where you were when you turned off — a handy feature.

Inside the machine some considerable development work seems to have taken place. There's still an RCA 1802 CMOS processor at the heart of things and there's still 8k of CMOS RAM to hold the text — enough for about 1200 words. The RAM is permanently powered by the rechargeable battery pack, incidentally, so its contents are retained even when the unit's switched off. The batteries power the unit for about 30 hours and it can be recharged overnight or while you're still using it.

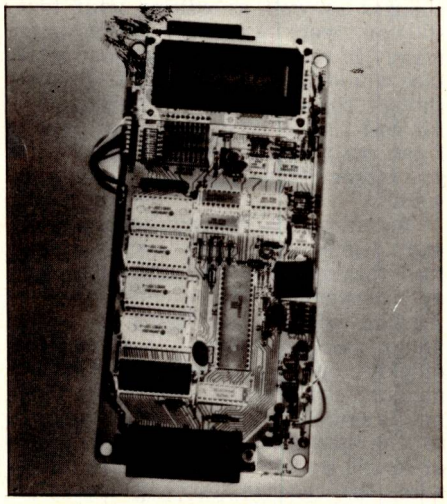
The original Microwriter had two PCBs inside; the new model has only one, yet the cassette and RS232 interfaces, previously separate units, have been fitted inside the main unit. This eliminates one of my earlier gripes — the untidy tangle of wires and the constant plug-swapping which resulting during a heavy editing, taping and printing session.

The TV interface remains a separate, external unit which you purchase as an optional extra. It has, however, become a little smaller and now uses the battery charger as its power supply instead of running from the mains.

New facilities

A whole host of new facilities has been added to the Microwriter, of which the two most exciting are on-screen writing for the video interface and the ability to communicate with other equipment such as word processors and computers.

On the earlier model it was only possible to dump text a screenful at a time to the video interface. The facility was useful for checking whether you had formatted the text correctly



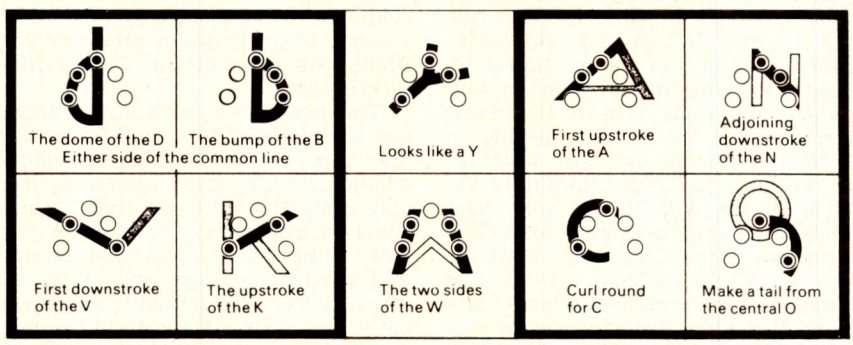


Fig 1 Part of the alphabet learning card (copyright Microwriter Ltd)



The video interface has outputs for TV and monitor.

Photography by David Leigh

MICROWRITER Revisited

for printing but, if you hadn't, changes had to be made within the Microwriter and the text re-dumped to the screen for rechecking. Now, though, the display is fully interactive and you not only see what you write as you write it but can make on-screen formatting changes as well as editing your text. If you were using the Microwriter mainly in one location , the video interface would be well worth getting. Good though the Microwriter's display is, I for one find it far easier to write when I can see a whole block of text in one go rather than just a 14-character window.

As before, the Microwriter has insert and delete commands and you can read through your text either forwards or backwards — the window has two scrolling speeds, the higher of which jumps along a word at a time fairly quickly but still readably. Text in memory can be split into separate documents and there are commands to jump to the start or end of each doument or to the start or end of memory. Likewise, the cassette handling works on documents rather than on total memory contents, so it's possible to do crude block moves by placing document markers around the block, taping it, erasing it, moving to the point in text to which you want to move the block, entering insert mode and playing in the tape. I found the tape interface easy to use and had absolutely no trouble at all with it. A very neat feature when reading tapes is an indicator on the display to show when the tape recorder's volume is at the optimum setting — with my Pearlcorder I found that tapes loaded perfectly over a very wide volume range, from full volume right down almost to the minimum setting.

Once you've written your text, you'll want to print it out somehow. The Microwriter has a standard RS232 interface with programmable baud rates from 110 to 4800 and adjustable framing (stop bits, parity, etc) so it will interface to any standard printer. Among the many new facilities added to the machine are what are called 'menu items' for setting and altering various system parameters, including all those for the RS232 interface. Once you've set the machine up to work with your printer, the settings are retained even when you switch off so you can then forget about them.

When the Microwriter prints text, it automatically prints a line feed and carriage return at the last space before the 60th character on each line; unfortunately it doesn't right-justify text. The line length can be altered with a menu setting or the facility can even be suppressed entirely. Other menu items allow you to preprogram certain key combinations to produce a string of up to three ASCII characters in a text stream — useful for sending instructions to a printer for turning bold printing or underlining on or off.

The menu settings allow you to configure the Microwriter as a terminal for use with a word processor or computer. I had no trouble at all in hooking up to my Cromemco for use with Cromemco's so-called 'word processing' package and in fact I now tend to use the Microwriter as a dumb input terminal in preference to the normal, typewriter-style VDU, although the latter is still used to display the computer's output, a 14-character display being pretty useless for this purpose.

There are two points worth noting when using the Microwriter as a terminal. Firstly, it's necessary to suppress the auto CR-LF facility as this plays havoc with a computer; and secondly, while you're using it as an input terminal, everything you type not only gets sent to the computer but is also put into the Microwriter's own memory so that, in a long session, you have to stop occasionally to clear it out. A memory full early warning is given on the display when there's only space left for 256 more characters.

Documentation

As well as upgrading the machine, Microwriter Ltd has revamped its documentation. Each Microwriter now comes with two booklets, a beginner's guide and a more advanced book, plus a series of very useful reference cards which you can keep in the machine's carrying case.

The beginner's guide firstly teaches you the alphabet key combinations and then takes you step by step through the remaining widely-used functions, including using the video interface, printing out text and using the cassette interface. Generally, the documentation is well-written, concise and clear and manages to teach without condescending — not always the case in the micro world. The beginner's book is enlivened with small cartoons featuring a cube-shaped entity reminiscent of the Tate and Lyle symbol.

Things are rather more serious in the second book, which provides full details of all the remaining facilities, including detailed descriptions of all the menu settings, what they do, their default values and how to change them, with plenty of information on interfacing the device to other machines. As the Microwriter can transmit the complete ASCII character set, including control codes, an ASCII table is thoughtfully provided.

The reference cards include the recommended learning sequence for alphanumerics plus a complete list of all the menu settings, with spaces for you to write down the values of any you change.

Prices

In my first review of the Microwriter, I incurred Cy Endfield's displeasure by stating that I thought the machine was overpriced. What I neglected to say in the review was that this was not solely my opinion but the result of showing the machine to some 30 or 40 people. All were very impressed until they heard that it cost £500, at which point they tended to wince or laugh and change the subject.

The basic Microwriter, including carrying case, cassette lead, charger and documentation, and with six months' warranty, is now £485 plus VAT. In fact the price has dropped in real terms, for not only has inflation taken its toll in the last two years but the RS232 and cassette interfaces are included both in the machine and in its price (they were optional extras before). And, of course, a very large number of extra features have been added to the machine. Still, though, I have to report winces from those to whom I have shown the device, a reasonable cross-section of potential Microwriter users.

Whether you would be prepared to pay this money for such a device is, obviously, a decision only you can make. Personally, I find it invaluable — not only because it allows me to write outside in the sun but because I find it quicker and easier to use than a conventional qwerty keyboard. And I suspect that this is the case with a great many Microwriter users: the qwerty keyboard can be an intimidating thing, especially for the businessman who has neither the time nor the inclination to learn touch-typing. The Microwriter has certainly gained favour not only in all sorts of business environments but in government departments, too: the Home Office has long used them, particularly for the preparation of documents too hush-hush to be given to a typist.

The Microwriter's six-month guarantee can be extended by a further 12 months for £28.75 and a similar scheme, costing £19.55, applies to the TV interface. Additionally, for £28.75 a year, Microwriter offers a loan scheme: if your Microwriter breaks down, you can take it to the nearest Microwriter centre (a network of which is being established across the country) and borrow another one while yours is being repaired.

Conclusion

The new Microwriter is a very attractive and versatile device which in a single package provides an easy-to-learn-and-use alternative to the qwerty keyboard plus a versatile text processor and a communicating terminal which can easily be interfaced to a computer or word processor.

I feel that the £485 + VAT purchase price may still act as a deterrent to many people — you've got to be able to justify that sort of expenditure in most businesses and the Microwriter isn't something which will immediately impress the accountant, even though I'm certain many people would find it a distinct productivity aid. Likewise, it would be expensive to equip a whole office with them, particularly if they were being used purely as input terminals; there's probably a market for a cheaper, 'cut-down' version which can act only as a dumb input device.

I must admit, though, that my main reason for wanting the device's price dropped is to encourage its wider use. I think it's a super device, embodying some really inspired thinking, which deserves to succeed.

END

COMMUNICATIONS

PCW welcomes correspondence from its readers but we must warn that it tends to be one way! Please be as brief as possible and add 'not for publication' if your letter is to be kept private. Please note that we are unable to give advice about the purchase of computers or other hardware/software — these questions must be addressed to Sheridan Williams (see 'Computer Answers' page). Address letters to: 'Communications', *Personal Computer World,* 62, Oxford Street, London W1A 2HG.

Ode to Joy

I felt I simply had to write to you to share with your readers my delight at the wonders of the micro-computer! As a teacher, I can also share this pleasure with my pupils; or at least I will when our MEP computer arrives. One advantage of promising it more than a year before its delivery is that I should be ready for it when it comes. My BBC Basic should be quite good by then because I shall have my BBC ROM in my Atom; after two month's wait it must be due soon.

Perhaps I can improve my Machine Code programming from that book I ordered three months ago — the author must have finished writing it by now. Could it be that the delay is caused by the 6502 running at only 1Mhz? That is a little slow by today's standards.

In the meantime I suppose I shall have to continue bouncing away on the keys of my Atommmm.

Chris O'Donoghue, Enfield

Don't let it get to you Chris, take a Valium. . . Ed

Ooops! Part 27

It is all very well taking a sarcastic approach when writing ('Newsprint' July) about new equipment, but one should make sure that one has one's facts right first.

In the press release we sent to you on the NCR 9010, we made it very clear that it is a family of microprocessor systems. The personal computer is just one of the series. Other systems in the series we announced will include: small business system, satellite terminal network controller, factory terminal controller and a scientific workstation.

We also made it very clear that the personal computer was one of the systems which would not be released until later this year. Because of this we did not give any further details of the personal computer in the release. The price we quoted as an example was very clearly stated as being £5,700 for the satellite terminal, *not the personal computer.*

In fact it looks as though the price for the personal computer version of the NCR 9010 will be around £2,500. This will include a 64k processor, two integrated 5¼in minifloppy disks and a matrix printer. It will also handle colour and graphics. We feel this makes it competitively priced and good value for money, as is the whole of the 9010 family.

Perhaps *you* should 'go away and try again' and get your facts straight next time.

Michael Fenton Webster, Manager, Press and Public Relations, NCR Ltd

Appeal

We are a Cheshire Home for the physically handicapped, and have recently bought an Apple II microcomputer, now being adapted for use by severely handicapped operators, initially as an aid to solving some very basic problems and for recreation, viz:

1. Communication — between (a) residents and staff; (b) resident and resident.
2. Letter writing — through word processing etc.
3. Games — from chess through to Space Invaders.

We intend to set up a central library of programs, specifically for use by handicapped operators, and adapt programs to suit their physical capabilities. The library will be available to all interested parties, who wish to donate and borrow programs. At present we are looking for programs in three formats: 1. program listings; 2. Apple II floppy discs; 3. TRS-80 cassettes. Floppy disks and cassettes will be returned.

The idea is to provide a link between all organisations and individuals who are working in the field of computing for the physically handicapped. We would welcome enquiries from schools, colleges and residential homes, etc. If interested, please write, enclosing a SAE, to:

Seven Springs Cheshire Home, Pembury Road, Tunbridge Wells, Kent TN2 4NB.

Computer Literacy OK!

I had been thinking about computer literacy for some time, and reading several articles in your July issue made me clarify my own thoughts.

David Tebbutt's article on Computer Literacy was extremely interesting and, I feel, drew some very good conclusions along with one that was totally incorrect! I think that he is absolutely right in saying that most people have no need to know about bits and bytes, PEEKs and POKEs, Boolean algebra and flowcharts. Many of the introductory books and articles for the layman fall into this trap, and often leave the readers more confused about computing than before. Not only are they confused but, unless they are determined to succeed, they can be made to feel very inferior when talking to those already initiated into the 'brotherhood'. When I became a professional programmer, over ten years ago, I found that my language, Cobol, was despised by some of the longer-established programmers because it allowed upstarts like me to write programs without the dedicated training necessary to use assembly languages.

As with enthusiasts in other spheres, far too many of the computer fraternity are in love with their technical skills. It is often noticeable that many of the programs, proudly presented by their authors, don't actually *do* anything that would be recognised as useful by an outsider. We have many versions of very similar games, and there is much boasting about the economies of memory that have been achieved. There are numerous 'toolkit' programs and chips on the market, all of them claiming to make it easier to develop programs by providing special facilities for the input of Basic key words, but few of them make any difference to what programs can do for the end user. It seems to be implied by the advertising that the personal computer owner will spend all his (it always seems to be *his*) time developing programs, but very little time using the results!

So far I have seemed to agree with David Tebbutt all the way and you may wonder what I consider to be his serious error. This is the assumption that computer literacy is the things mentioned so far. We can pursue the analogy with ordinary literacy and realise that literacy is knowing how to *use* language properly, while knowledge of phonemes, morphemes and such things can be left to the professional student of linguistics. Similarly real computer literacy is knowing how computers can be used to help us in what we want to do, even if we have to ask someone else to write the program for us.

In the article by the teacher it is pointed out that the headmaster's request to store the names and addresses of his children is not much use because loading the file from tape would be much too slow. This is true, but it would be wrong to conclude that the computer cannot help. If the school could manage to obtain a cheap printer, such as the Seikosha, then an inexpensive word-processing program could be used to ensure that the printed list could be kept up to date, and so avoid the problems of using a much-corrected piece of paper. I use the program WORD4WORD to keep an index to my programs and am in the process of creating similar indices from my records and books. It would also be possible to create similar indices for magazine articles and pamphlets.

I feel that an understanding of these, and similar, possibilities is really computer literacy and should be encouraged as much as possible. Many of the programmers who at present write rather aimless programs could do worthwhile work if the potential users were sufficiently 'literate' to make sensible specifications of their requirements. I lecture at a management training centre and am regularly asked by students to explain 'what computers can do', and a good understanding of opportunities and limitations would probably lead to an improvement in the standing of computers, even though it would make it more difficult for the professionals to pull the wood over the users eyes!

Education in 'computer literacy' is certainly necessary, but we can leave out almost everything about the use of individual languages and computing devices. We must, however, talk about validation — what part of the input can be checked by a program — and the different types of file, depending on the way in which the user wants to access the data. It will also be necessary to talk about exception conditions — how do we know what possibilities there are, and what must be done with them if they arise? Even my own computer users group managed to fall into the old trap of one subscription for those under eighteen and another for those over, without saying what was to happen to those who were eighteen! Perhaps we ought

to talk about decision tables, and other methods of analysing problems. The solutions can be left to the programmer but the problem can be analysed properly only by the user.

Concern with programming as an Art Form leads to the current spate of articles in the various enthusiasts magazines showing how to convert one version of Basic to another. These are not as useful as they seem because it is difficult for the reader to remember all the details, especially the effect of PEEKs and POKEs, and because Murphy's Law ensures that the program you would like to convert is written in a dialect not yet covered. Your own wallchart, which is excellently printed, does not cover the RML 380Z used by my son's school, and some of the TRS-80 details are incorrect. TRS-80 Basic is much closer to the standard than implied by the chart, and I have never come across PRO mode which is mentioned in the LLIST column. If I can find these errors in the version I use how do I know if the other versions are correct?

Perhaps the real need is two complementary series of articles. The first would be useful algorithms for solving problems, presented on the assumption that I know all that is necessary about screen handling or printer controls. The second would be instructional materi material on programming a particular machine, and could be ignored by anyone not using that make. The present system of printing programs in specialised form can be very frustrating. On many occasions I have found a listing for a routine which would be very useful and hav have then had to abandon it because of PEEKs or POKEs which might or might not be significant. Instead of giving conversion notes perhaps the programmer could be persuaded to explain what each section of the program does, and give an outline of the underlying alogorithm. I have managed to make use of program listings containing all kinds of peculiar statements if I understood the basis for them.

David H Wild, Hemel Hempstead

REM explained

How glad I was to find a rare mention of CDOS in your article (Braindump — July). Since we acquired our Cromemco System 3 I have been looking for information on CDOS or even a detailed description of C/PM.

In your article you asked what REM is supposed to do. I discovered by chance that it is used to put REMarks into Batch files.

Your other point about the RUN mod may, I think, be a symptom of a more fundamental problem. If a program has been LINKed to run at a location other than 100H, it is loaded as normal but a header is inserted which moves the program and transfers control to the start location. Obviously if the area where the program is initially loaded and where it is run overlap, then a subsequent jump to 100H will produce a mixed up program.

On a different but similar topic, that of Fortran overlays. I have found an easy way of passing data between programs. If the variables in both programs are declared in the same order then they will have the same addresses in the data area. The programs can be linked with the data areas above the program areas and at a common location. Then load the second program, escape from it and SAVE only the program area. Using this method and the CDOS call to link programs produces a form of overlay for any LINKable programs.

John G B Burns, Edinburgh

Covering computers

I was particularly interested to read 'Banks' Statement' in the July issue of *PCW* on the subject of computer insurance.

For some time now, we have been negotiating with insurance companies to obtain comprehensive microcomputer insurance cover at reasonable rates. Such cover should, in our opinion, extend to all risks, transit, increased cost of working and breakdown/derangement.

All risks cover is now comparatively easy to obtain but the rates quoted in *PCW* are designed to include a host of electrical equipment rather than just microcomputers and, by virtue of the range of these items and the various uses to which they are put, the length of exclusions increases.

The article, I believe, confuses consequential loss and breakdown insurance. Consequential loss is essentially the additional costs incurred when, as a result of loss or destruction, alternative arrangements have to be made before the replacement machine arrives. An extension to that is the cost of reinstating lost data and programs. A businessman who relies heavily on his micro could suffer enormously if, as a result of fire, he loses a substantial proportion of his databank. In that event, much overtime and the employment of temporary staff may be necessary to get back to where he started before the accident.

Finally, breakdown insurance is an alternative to an expensive maintenance contract. Quite simply, if the computer breaks down, the insurance will pay the cost of repair (after the small initial excess). In this context, the word 'derangement' is important. It could be that the machine does not completely break down but plays up, in which case an adjustment is necessary rather than a repair. If derangement is not included in the breakdown cover, the cost of the latter would be excluded.

All these insurances are now available and, to give an example, insurance for a machine with a value of £2500 insured for all risks (including transit), with a further £3000 increased cost of working insurance, can be bought for £22.50. Breakdown and derangement cover is far more expensive but is still only about half the cost of a maintenance agreement.

We shall be at the *PCW* show in September but, if we can be of assistance to your readers in the interim, then please quote our Freepost address.

Geoffrey Hoodless & Associates, Freepost, Woking, Surey GU21 3BR.

Further Factor Facts

Permit me to continue the correspondence on factoring large integers. I have recently completed a study of efficiency of various factoring algorithms (for a first-degree course dissertation) and the following remarks are perhaps relevant.

A W Bain takes a rather simplistic view with his division algorithm. With his 1,000 primes he can expect to factor numbers up to about 10^8. If it takes him 15 minutes to calculate these and probably as long to use his factoring algorithm and bearing in mind that the cost of the algorithm is $O(N^{1/2})$ then I calculate that it would take him about 10^{65} years to factor 150-digit numbers. Certainly 'not in a million years', Mr Bain. Your algorithm is suitable for factoring numbers up to say 10^{10}. I used a 32-bit machine (an IBM 370/165) and it was found practical to use this algorithm to factor numbers less than the word-size of the machine ($2^{32} \sim 4 \times 10^{10}$).

For larger numbers we use other algorithms. Knuth's 'Semi-numeric Algorithms, The Art of Computer Programming volume 2' (second edition, Addison Wesley) has an excellent description of algorithms which beat the Exhaustive Search hands down. In particular I found the Monte Carlo algorithm most efficient in the range 10^8—10^{15} and the Continued Fraction method most efficient in the range 10^{15}—? However, not even these algorithms on our best computers would be capable of factoring 150-digit numbers if their factors are as large as 60 or 70 digits.

D A Faganchini is more cautious and closer to the truth. Sometime in the future we may be able to factor 150-digit numbers, just as today we can factor 40-digit numbers, and before electronic computers maybe 7 or 8 digit numbers. However we can still use encryption algorithms if we use say 500-digit numbers which presumably we will not be able to factor. It is only when somebody can demonstrate a programmable algorithm which factors numbers of *any* size in a practical time that encryption algorithms of this sort will become valueless. I for one doubt that such an algorithm exists.

Any readers requiring further information on this subject should read Knuth's book or can write to me at Emmanuel College, Cambridge.

R J MACMILLAN, Weymouth

That wall chart

I am writing with reference to the Master Program Converter Wallchart supplied with the July issue of *PCW*. I found that the TRS-80 graphics codes were incorrect — the blank graphic shape should be 128 not 129 and the full graphic shape should be 191 not 192.

As you can see the error is continued through the whole list. I decided to mention this to save future errors.

Trevor Lillington, Rickmansworth

Thanks Trevor, and everyone else who has written in pointing out errors in the multi-coloured monster. We will be publishing all the corrections soon! — Ed.

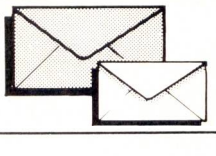
One Spectrum does not...

I saw my first Spectrum of summer on Friday 2 July 1982.

Is this a record?

I HIGTON, London E17

No — Ed



COMPSOFT

DMS

THE ULTIMATE IN DATA MANAGEMENT SYSTEMS

NOW AVAILABLE FOR THE **ACT sirius 1**



Compsoft's DMS is everything you ever dreamed possible in computer software. Fast, efficient and reliable, DMS is the only complete integrated system for information management. No matter how unusual your record-keeping problem, DMS will help you to solve it.

DMS needs no programming. Working in conversational English, it creates files, stores records, searches and sorts on multiple criteria, calculates, writes letters, and prints lists, reports, and self-adhesive labels.

Full guides are available for DMS in the Medical World, Personnel, Client Records, Subscription Records and Mailing, Stock, Job costings, Library Records, etc. etc.

Running on the Commodore Pet and virtually any micro running CP/M and MP/M II, all systems cost £400 or less. Every version now includes the DMS letter writer option as standard.

THE COMPSOFT HEADQUARTERS AND TRAINING CENTRE, HALLAMS COURT



Brochures, guides and technical information are free on request from:

DATA MANAGEMENT SYSTEM

COMPSOFT

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

BENCHTEST
PERSONAL COMPUTER

Chris Sadler and Roger Oliver take a close look at an elegantly styled 16-bit micro from Europe's largest office equipment supplier

OLIVETTI M20

One of the real advances that microcomputers have made over larger computers is their level of standardisation. Whereas big machines always have their in-house designed processors and software, microcomputers tend to be based around very few microprocessors and software products. Because of this, the appearance of so many packages that run in these environments means that new machines based on different processors have very little chance of catching up. Olivetti chose the Z8001 on which to base its M20 microcomputer. As it isn't a minicomputer in a micro box (like the Onyx), Olivetti decided to write its own operating system, although, as a concession to the rest of the micro world, it offers the mandatory Microsoft Basic. On an unusual machine the question must be whether it has sufficient features over a more standard system to make it worth having.

Hardware

The Olivetti M20 comes packaged in two detachable units, the main box and the monitor box. The main box houses the main board, a power supply and fan, the keyboard, and (on the review machine) a couple of disk drives. The monitor stands on a circular plinth, with respect to which the screen can be tilted. A shallow oval tray on top of the main box will accept the base of the plinth so that the monitor can be conveniently positioned in relation to the keyboard. The monitor draws its power from the main box — a single power cable drives the whole machine.

The keyboard has a numeric pad in addition to the qwerty layout. All 72 keys are grey (as is the plastic casing) except for a yellow one and a blue one on the left-hand side. The manual suggests that the blue and yellow keys are respectively control and command keys, although on the review machine both were labelled 'SHIFT', which makes it much harder to remember which is which.

There is a reset key above the coloured ones, and two mysterious keys labelled 'S1' and 'S2'above the Return key... more about these in the software section. All keys auto-repeat when held down for more than a short time. The keyboard is 'sculpted' and the keys make a positive click sound. Ten different character sets are available, as follows: USA ASCII, Italian, French, British, German, Spanish, Portuguese, Norwegian/Danish, Swedish/Finnish and the USA ASCII + Basic. The review machine was the last of these, with a Basic keyword etched on the front edge of each alphabetic character key.

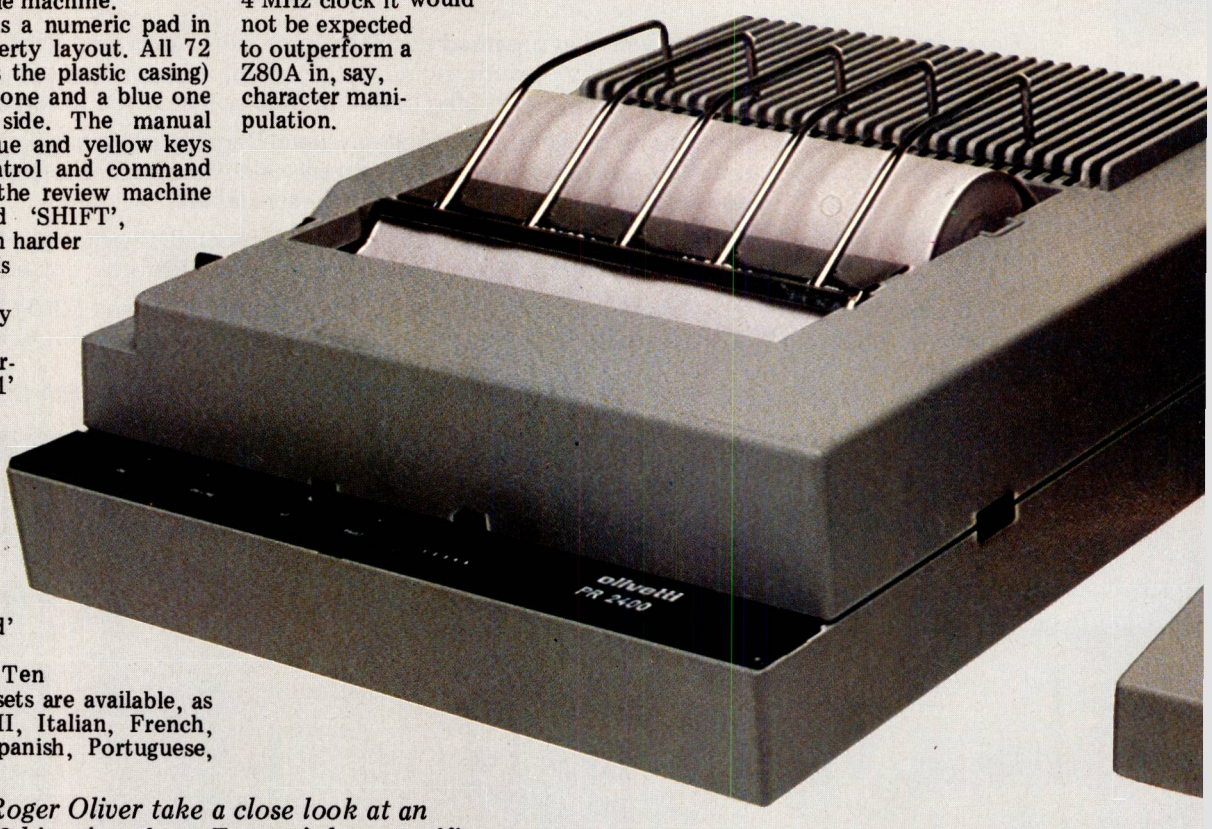
Above the keyboard are two horizontal slots (unmarked) for the disks. Unusually, the rightmost drive is nominated drive zero. The disks are 5¼in soft-sectored double-density double-sided, 35 tracks/side, 320 kbytes unformatted. This drops to 286 kbytes formatted, which doesn't compare particularly well with other DDDS disks.

The main PC board has three edge-connectors which extrude from the rear of the cabinet. One of these is for the monitor; the others are a parallel (Centronics) and serial (RS232C) interface for the different printers. Two screws at the back secure the top and, once this is lifted off, everything else seems to slide apart very neatly. The keyboard mounting and disk drive mounting lift away to reveal the main board.

The processor chip is at the front of the board. It is a Z8001, Zilog's 16-bit, capable of addressing more than 64k. Along with a 16-bit data bus, this should offer a speed advantage over 8-bit systems in arithmetic operations and memory access, although with a 4 MHz clock it would not be expected to outperform a Z80A in, say, character manipulation.

To the left is the ROM area — on the review machine there were two chips in place, sockets for another two and space on the board for another four, giving 8k for ROM. Further back on the board are other devices like disk controller, etc. On the right-hand side there is 128k of RAM (the standard configuration), beyond which the board becomes a motherboard to three small expansion sockets and two larger ones. Each of the smaller sockets can accept an additional board with 32k of memory, so the maximum memory is 224k if the monochrome monitor is used. The colour monitor, however, uses one slot and so gives a maximum memory of 192k. The review machine had a black and white monitor and a single memory expansion card (ie, 160k).

The two larger sockets (50 connectors per side — the pinouts undocumented) are for an IEEE-488 interface socket and a pair of RS232 (or 20 mA loop) ports, and pop-out panels exist at the rear of the cabinet to allow for the necessary cabling. The board gives the appearance of a clean, uncluttered (and not particularly densely populated) design, although the review machine had a few 'fixes' snaking between the chips. On the extreme right at the back is a recessed, spring-loaded switch, allowing the system to be rebooted by sticking something sharp into the recess. The review machine showed evidence that people just don't carry sharp things around with them anymore as the area surrounding the reboot hole looked scratched and scribbled-on.



Olivetti offers a choice of four printers — a thermal one (which we had), a fast (140 cps) or slow (100 cps) matrix printer, or a daisywheel. The thermal printer and the slow matrix printer are capable of screen-dump graphics.

The screen can be configured for 16 lines of 64 characters or 25 lines of 80 characters (rather crammed together) with a corresponding alteration of character size. Likewise, graphics can be resolved to 512 x 256 pixels or 480 x 256 pixels. The colour monitor provides black, red, green, yellow, blue, magenta, cyan and white, while the black and white monitor supports reverse video. With its non-glare glare surface, the screen gives a crisp, steady image and the system runs very quietly. On power-up the system performs seven seconds' worth of diagnostic tests, sizing up the memory, testing which drives are on-line, etc. If, during the self-test, one of the keys B, D or L is pressed, the following events occur:

B: boots the Basic subsystem directly;

D: loops through the disk-testing portion of the diagnostic until some other key is pressed;

L: loops through the entire diagnostic until some other key is pressed.

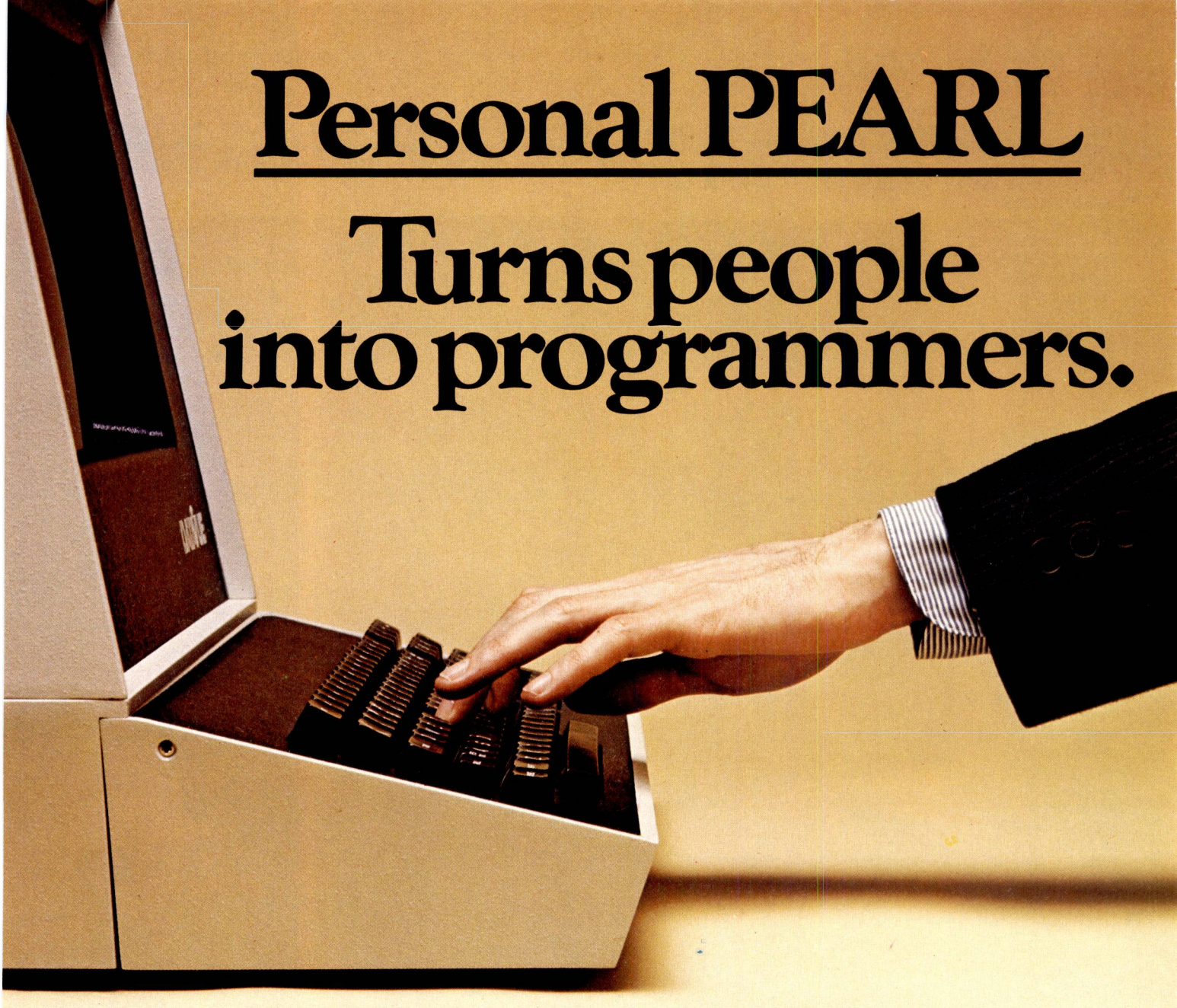
When we tried the disk test, we discovered that drive 0 would not work and, although the disk test was run repeatedly thereafter, it never signalled this fact. On taking the system apart,



Photography by Kokon Chung

Personal PEARL

Turns people into programmers.



If you could program a computer by simply telling it the result you wanted, without using complex codes or languages, then anyone could become a programming professional. Sounds fantastic?

But now it's possible with Personal PEARL, and all for less than £200. It generates quality Business Programmes, Data Management, Costing, Mailing – in fact you create your own library of programmes that matches your operation today, and tomorrow.

After all, no-one understands your business better than you. So let Personal PEARL take the technology out of computer programming, and you'll find yourself writing professional business software – at the touch of a button.

pearl

Pearl Software International (UK) Limited, PO Box 34, Poole, Dorset, BH14 8AR.
Tel: Parkstone (0202) 741275

Please send more details of Personal PEARL.

Name:_____

Company:_____

Address:_____

_____ Tel:_____

Computer Make:_____

Disk Size:_____ VDU Make:_____

Pearl Software International (UK) Limited,
PO Box 34, Poole, Dorset, BH14 8AR.
Tel: Parkstone (0202) 741275

OLIVETTI M20

we discovered that the drive had slipped its belt, and it worked perfectly once that was repaired.

Software

Software consists of the operating system PCOS (Professional Computer Operating System) and a large Microsoft Basic subsystem.

The first thing one can say about PCOS is that, by microcomputer standards, it is big. On the review machine, it left only 58k of user memory out of an original 160k. PCOS is composed of three parts: a nucleus, which contains system primitives, memory and device control code, etc; a set of memory-resident utilities (ie, commands); and a set of disk resident (transient) utilities. Memory is configured according to the Z8001 segmentation scheme as follows:

Segment	
0	PCOS kernel
1	Basic interpreter and PCOS utilities
2	PCOS variables, Basic stack and tables, user memory
3	Screen bitmap (and colour bitmap)
4	Diagnostics and Bootstrap

In PCOS, 'system' programming consists of:

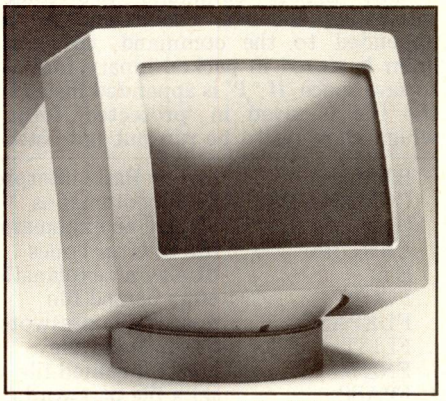
i) controlling which of the utilities will be transient or resident;
ii) manipulating files and volumes;
iii) 'programming' the keyboard;
iv) setting certain operating parameters;
v) constructing a turnkey boot-up program.

The system disk is distributed with certain utilities compulsorily resident (marked as such in the table of PCOS commands which follows this section). Transient utilities are those which are loaded from disk when invoked and overwritten when they complete. Any utility which is going to be used more than once or twice in a session can be 'locked' into memory by means of the PLOAD command. It is possible to generate a new version of the operating system by PLOADing a set of utilities into the resident area and then PSAVE-ing the whole memory image onto a new system disk.

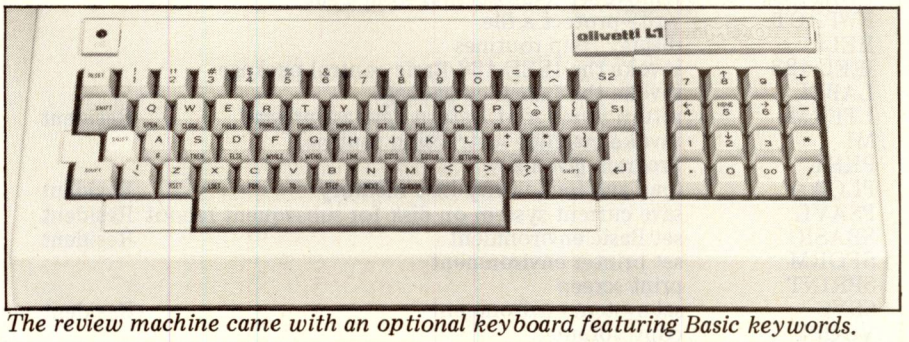
Volumes and the files which are stored on them can be manipulated by means of a series of commands which begin with 'V' and 'F' respectively. Thus, FCOPY transfers a single named file while VCOPY would back up a whole disk. Strangely there is apparently no command for deleting files! The Basic manual suggests using the Basic command KILL, which involves invoking the Basic interpreter, issuing the KILL command and then exiting from Basic — all just to delete a file! However, we discovered a utility (undocumented) on the system disk named FKILL.CMD which sounded like what we were looking for — anyway, it worked.

Security works on two levels — disk and file. As usual, a disk may be hardware write-protected (by physically blocking a 'write-permit' hole on the disk); it may also be password-protected against any unauthorised access. Files may also be software write-protected and password-protected. Basic programs may be SAVEd so that they can be executed but not LISTed or RUN.

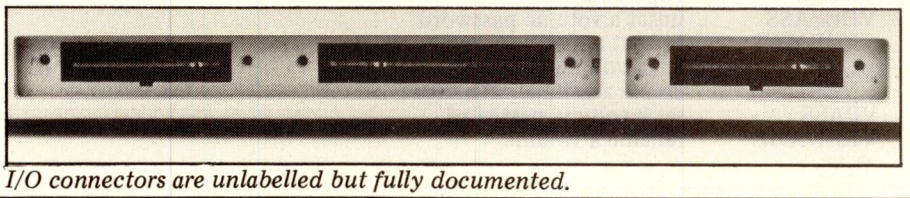
Any key which generates a printable character can be reprogrammed, by means of the PKEY command, to produce any other character, or a string of characters. In particular, the substitution string can be a Basic or PCOS command, or a sequence of commands, separated by the ASCII codes for CR and LF. A series of PKEY commands can be saved on disk and downloaded at the start of each session, thus customising the keyboard — the Basic keywords printed on the keycaps are enabled in this way through a file on the system disk named SCIENTIFIC.BAS. (The key COMMAND is depressed in conjunction with the desired keyword key to obtain the Basic keyword.) A whole sequence of commands initiated by a single keystroke is as close as PCOS allows to the sort of command file processing obtainable in other operating systems (eg, SUBMIT in CP/M).



Standard black and white VDU



The review machine came with an optional keyboard featuring Basic keywords.



I/O connectors are unlabelled but fully documented.

Basic reserved words

Commands

AUTO	LLIST	RUN
CONT	LOAD	SAVE
DELETE	MERGE	SYSTEM
EDIT	NAME	TRON
FILES	NEW	TROFF
KILL	NULL	WIDTH
LIST	RENUM	

Statements

CALL	LINE INPUT
CHAIN	LINE INPUT #
CIRCLE	LET
CLEAR	LPRINT
CLOSE	LPRINT # USING
CLOSE WINDOW	LSET
CLS	ON ERROR GOTO
COLOR	ON GOSUB
COLOR=	ON GOTO
CURSOR	OPEN
DATA	OPTION BASE
DEFDBL	PAINT
DEF FN	PRESET
DEF USR	PSET
DEFINT	PRINT
DEFSNG	PRINT #
DEFSTR	PRINT USING
DIM	PRINT # USING
DRAW	PUT
END	PUT£
ERASE	RANDOMIZE
ERROR	READ
EXEC	RSET
FIELD	RESTORE
FOR/NEXT	RESUME
GET	RETURN
GET #	SCALE
GOSUB	STOP
GOTO	SWAP
IF... GOTO... ELSE	WHILE/WEND
IF... THEN... ELSE	WINDOW
INPUT	WRITE
INPUT LINE	WRITE #

Functions

ABS	HEX$	RND
ASC	INKEY$	SCALEX
ATN	INPUT$	SCALEY
CDBL	INSTR	SGN
CHR$	INT	SIN
CINT	LEFT$	SPACE$
COS	LEN	SPC
CSNG	LOC	SQR
CVD	LOG	STR$
CVI	LPOS	STRING$
CVS	MKI$	TAB
EXP	MKD$	TAN
EOF	MKS$	USR
ERL	MID$	VAL
ERR	OCT$	VARPTR
FIX	POINT	WINDOW
FRE	POS	

Three commands exist for configuring the environment for a particular session. SSYS takes five parameters which set the time and date, the number of (256 byte) blocks by which files are to be extended, the screen format (eg, 25 lines by 80 characters, etc) and a disk read/write verification switch. SBASIC allows the user to define the amount of open files and windows permissible and the size of the I/O buffers. Clearly, the more open files and windows allowed for and the larger the record buffer, the less memory there is for the user's code. As a rule of thumb, each window needs 90 bytes and each file needs 600 bytes in addition to its record buffer. By comparison, each memory-resident utility takes about 1800 bytes. The command SFORM sets up the printer. One of the parameters is the type of printer (eg, 'pr2400' for the thermal type) so it may not be too straightforward to interface a printer not supplied by Olivetti to the

OLIVETTI M20

M20. One parameter is an optional string which, if supplied, will be printed as a title at the top of each page of printout.

Access to the printer is gained by appending '+PRT' onto the end of every command. Output is directed to the printer only as long as that command is operative — in the case of BASIC (the command which invokes the Basic subsystem) all screen I/O within the subsystem will be copied to the printer. The manual mentions '+CIN' (for Communications INput), which directs input from the serial port to the system (in place of keyboard input). '+CONS' resets both of the above, returning both input and output to the console.

On boot-up, once the memory-resident portion of PCOS is in place, the system searches for a file called INIT.BAS, first on drive 0 and then on drive 1. If it finds one it will begin executing the program, which can contain PKEY commands and S-type environment commands as well as an ordinary Basic program. Thus the system can be made completely turnkey and the whole machine customised every time it is switched on.

Other commands include SPRINT, which dumps a given window from the screen to the printer with an optional title or time/date entry, and LABEL, which enables one to write a title, vertically or horizontally, at a given point on the screen and up to 16 times the normal character size. A number of user aids discussed in the manual were not present on the review system. These included HELP, COMMANDS and ERRORS, which provide lists of commands and error numbers, together with facilities to obtain a description of individual commands and error numbers — but how satisfactorily they work we cannot tell.

Three facilities which are available within Basic require access to utilities within the operating system, and these should be resident if Basic is to make calls to them. They are the IEEE-488 extension package; MI, a utility which enables a Basic program to pass a Z8001 machine code instruction directly to the processor; and LTERM. The two keys S1 and S2 mentioned in 'Hardware' are actually the equivalent of the Return key, except that the utility LTERM keeps track of which of the three 'return' keys was actually depressed. This enables a programmer to provide users with a variety of input keys — useful for setting up menus, Y/N answers, and so on.

PCOS seems to be an irritating operating system to use — it doesn't react in a very consistent manner. Sometimes it is necessary to specify the disk from which one wishes to work, and at other times not. System reset is sometimes achieved with RESET+ CNTRL and sometimes with RESET+ SHIFT (the RESET key should be depressed fractionally after the other one). The PCOS file security system lays traps for the unwary. You need only mistype one key when resetting a disk password and fail to realise it and you are in trouble, as there's no way of breaking a forgotten password.

Even worse, since once the password has been correctly supplied access is granted, even if the password is changed, you will receive no indication for the rest of the session. Thus, at the end of the session you might (as you should) take a back-up copy onto (assuming a rolling sequence of disks) a previous copy! Incidentally, if the colon is left off the volume specifier when the VLIST command is used, PCOS announces that the disk is empty — this may give you a heart attack (where are my files?) or, even worse, persuade you that the disk in question is nice and empty and suitable for back-up!

Other criticisms are that there seems to be no way for users to create their own utilities for insertion into the system and that there is no opposite to the PLOAD command whereby resident commands can be made transient. Neither is there any way of finding out which commands are resident in any given PSAVEd system. Finally, although none of the 'help' files were supplied with the review system, some intriguing undocumented commands were found (FFREE, FKILL, FMOVE, FNEW, PRUN, RKILL, SCOMM, SDEVICE, VALPHA, VMOVE, VQUICK). Table 1 shows the documented commands.

The high level language provided with the M20 is Microsoft Basic Version 5.2, with special extensions covering the graphics capabilities and the IEEE-488 interface. All the basic commands, statements and functions are listed in Table 2.

The SAVE command has some interesting features. Unless an ',A' is appended to the command, the program is stored in packed binary format to save space. If ',P' is appended instead, the file is saved in 'protected' form, which allows it to be run but not listed or altered in the future. TRON and TROFF set the trace flag; if it is on, line numbers are displayed as the program executes. There are the usual control structures: FOR. . . NEXT, IF. . .THEN . . . ELSE, WHILE. . . WEND and GOSUB.

Arithmetic may be performed in 2-byte integers, 4-byte single precision and in 8-byte double precision. Functions for conversion between these are provided. Using DEFINT, DEFSNG, DEFDBL and DEFSTR, implicit variable typing by initial letter of variable name is possible. For example, the statement

10 DEFSTR S, U—W

will cause all variables beginning with the letters S, U, V and W to be of type STRING. Implicit typing may be overwritten by adding a character at the end of the name: ie, % for integers, ! for single precision, £ for double precision and $ for strings.

Data files may be either sequential or random. The former are set for input (ie, read), output (write) or append when they are opened; they are processed with the INPUT#, LINE INPUT# (ie, ignore delimiters), PRINT# and PRINT# USING statements. Random files are handled completely differently; the file is declared to be random when it is opened, and the maximum record length is also declared. Unfortunately, it is not possible to set the file to be read-only or write-only if it is a random access file. Communication between program and file is conducted via a buffer. GET# transfers a record from file to buffer and PUT# vice versa. To extract data from the buffer, the FIELD statement assigns specific buffer locations to field names. The field names must not appear on the LHS of an assignment if they are to be used later to address the buffer; hence the LSET/RSET statements are required to place data in the buffer. Since only string data can be placed in the buffer, the functions CVI, CVS, CVD and MKI$, MKD$, MKS$ are needed for interconversions.

BASIC	invoke Basic interpreter	Resident
COMMANDS	list all commands	
[COMMAND]?	display an explanation of the specified command	
ERRORS	list all error codes	
E n	display an explanation of error code number n	
FCOPY	copy named file	
FDEPASS	unset a file password	
FLIST	list a named file	Resident
FNEW	create a named file	
FPASS	set a file password	
FUNPROT	remove write-protection from a file	
FWPROT	write-protect a file	
HELP	display Help routines	
IEEE-488	invoke the IEEE-488 Basic control package	
LABEL	invoke the Labelling package	
LTERM	return number of Return key last pressed	Resident
MI	invoke machine instruction routine	
PKEY	program given key	
PLOAD	load and lock utility into memory	Resident
PSAVE	save current system on disk for subsequent reboot	Resident
SBASIC	set Basic environment	Resident
SFORM	set printer environment	
SPRINT	print screen	
SSYS	set system environment	Resident
VCOPY	copy volume	
VDEPASS	unset a volume password	
VFORMAT	format a disk	
VLIST	list a volume directory	Resident
VNEW	create a volume on a disk	
VPASS	set a volume password	
VRENAME	rename a volume	

Table 1

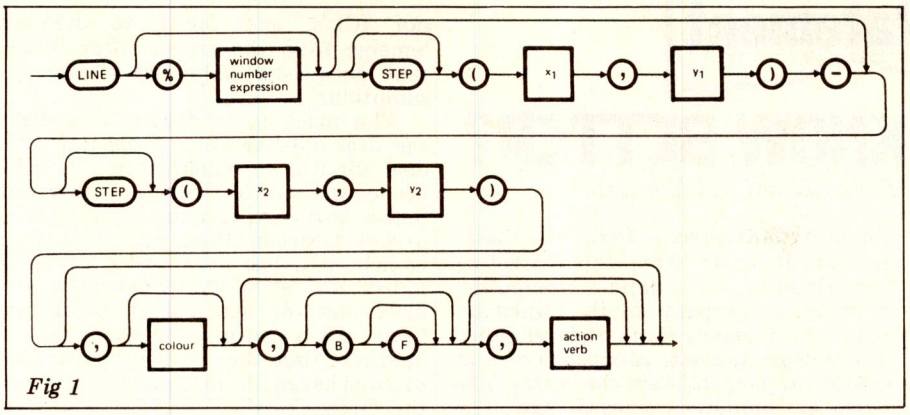


Fig 1

The most interesting features of the Basic's graphics facilities is that the screen can be divided into a maximum of 16 independent windows. (Strictly speaking, they are not real graphics windows since they cannot overlap non-destructively.) The WINDOW function subdivides the current window (either horizontally or vertically) and returns the new window number. The WINDOW% (expression) statement causes the user to 'move' to the window given by the expression. The usual DRAW and CIRCLE statements are available; the former is very complex since it also has to double for the MOVE command (ie, changing position without drawing a line). When drawing a line one can AND, OR, XOR and complement with the existing screen contents. The COLOR statement allows one to select four out of eight colours for use at any given time and to set foreground and background colours for each of the windows.

A nice feature of the graphics is that it is possible to store part of the screen display (text and graphics), pixel by pixel into an array, and to recreate the image at a later date. The PAINT statement allows any enclosed space to be filled in.

The IEEE-488 interface is apparently accessible to the user via a set of Basic keywords, but these are not documented in the Basic manual. There is an IEEE-488 Parallel Interface Reference Guide which comes with the actual interface, so perhaps they are described there. By means of these keywords it is possible to read or write data from compatible devices: assign talker/listener status to other devices; receive and respond to service requests from other devices; and act as a controller for other devices.

Generally speaking, the syntax of the Basic is rather complex (see Figure 1). There are examples of one keyword being made to perform too many functions. For example, WINDOW can be used as a function which takes on the number of a new window (which is created as a 'side effect') and which has a special case when it takes on the number of the current window (and no new window is created); WINDOW can also be a command causing another window to become the current window.

Fairly sophisticated program segmentation facilities are provided. It is possible to CHAIN programs together so that one 'calls' another. Communication between programs is via data files or COMMON variables. The latter seem to be like the Fortran facility in that a block of memory is set aside for access by various routines. According to the Basic manual, variables in COMMON statements in different programs are matched by position and type, and not by name. Thus, if one has

10 COMMON A$, N

in one program, and

10 COMMON B$, X

in another, and they were CHAINed, then A$ and B$ would access the same location, as would N and X. Unfortunately, this feature did not appear to work perfectly on our machine. One can also MERGE programs with the current program, allowing subroutines and blocks of code to overlay one another as they are needed.

Potential

The product literature explicitly directs the Olivetti M20 at the commercial and scientific user. This is backed by an apparently sound maintenance and guarantee policy and a list of software products. For the scientific user there is the option of the IEEE-488 interface, which grants access to a range of laboratory equipment, and a set of Basic graphics calls to assist with the display of information. In addition, the Basic BM8 ran exceptionally quickly so that the system, with the propriety Olinum (scientific subroutine library) and Olistat (statistical subroutine library), is probably a reasonable number-cruncher. On the engineering side, there are a few design and numerical control packages.

On the business side, there are Olispec, which provides the usual accounting suite; Oliword for word processing; Olientry for data preparation; and sales and production management packages and specialised packages for solicitors, independent schools, quantity surveyors, builders and electricians. Finally, there is Multiplan, the Microsoft forecasting and modelling package. Utilities include ISAM, Olisort and Olidoc — for 'documenting' a Basic program — together with Oliterm (a terminal emulator) and Olicom (a remote batch entry package).

There is also Olimaster, which purports to be an author language for 'development of interactive instruction' but we felt that the system was not really flexible enough to find widespread educational use. The system is not suitable for the hobbyist.

We have mentioned this software under 'Potential' rather than 'Software' because it was not available to us for review. Of the 10 or so independent software suppliers listed by Olivetti, we managed to contact about half; most of these said that work on the packages was near to completion, and most seemed to be established companies that had worked with Olivetti's minicomputer and accounting machine operations.

Expansion

Most of the hardware expansion features have been mentioned in the 'Hardware' section. In summary, a fully expanded system would offer twin floppy disks, 244 kbytes (with black and white monitor) or 192 kbytes (colour monitor) of main memory, an IEEE-488 parallel interface and a pair of RS232 or 20 mA current loop serial ports. A recent advertisement for the system in the computer press mentioned a hard disk but we could find no evidence for this, either in the documentation or on the board.

On the software side, the price list mentions an assembler (and, indeed, with CALL and EXEC the Basic interpreter is configured to interface with assembler routines) and again the advertisements spoke of Pascal, but we found no mention in the product literature. Presumably, Olivetti feels that offering access to IEEE-488 based peripherals will take its potential market as far as it wants to go.

Documentation

The manuals are masterpieces of slow, careful explanation and are probably ideal for an extended tutorial on fundamental microcomputer operations, with long sections on the use and abuse of floppy disks and a lot of trouble taken with the initial 'getting started'

GOTO page 213

Benchmark timings

BM1	1.3
BM2	4.0
BM3	8.1
BM4	8.5
BM5	9.6
BM6	17.4
BM7	26.7
BM8	1.6

All timings in seconds. For an explanation and listing of the Benchmark tests, see PCW *Vol 4 No 11, November 1981.*

Technical data

CPU :	Z8001, 4 MHz
Video:	16 x 64 or 25 x 80 character display; 512 x 256 or 480 x 256 pixel graphics, black and white or colour
RAM:	128k as standard + up to three 32k boards
ROM:	2k standard, expandable up to 8k
Comms:	Centronics parallel and RS232 serial, standard; IEEE-488 and two ports RS232 or 20 mA loop
Keyboard:	72 keys, programmable
Bus:	Olivetti's own — 16 data lines
Disks:	One or two, 320k (unformatted) 5¼in floppies
Printers:	Thermal, matrix or daisywheel

Banks' Statement

OLD ENOUGH TO KNOW BETTER?

Martin Banks explores the facts behind ICL's micro

I must admit that I am really quite glad that I've found out. I am pleased that it is official after all this time. I had suspected of course for a while that it might be the case, you know , for there have been signs around for the perceptive to see. But no: it is much better that it is official.

The personal computer has come of age. Yes, it's official. It is fair to say that it is not yet mature, for surely that will only come when the industry (or a product of it) receives the Royal Warrant. That hasn't happened yet, though it probably will, for it is a British company that has officially announced that the personal computer has got as far as coming of age.

It may surprise some of you to realise that it is a British company which has made this official announcement. I must admit that I was a little taken aback myself. I had considered that when the announcement came it would be perhaps from the likes of Apple, or maybe the dear Commodore. After all Apple has managed to grow in archetypal leaps and bounds to become one of the biggest manufacturers of computers in the world. It might be reasonable to assume that the honour of officially announcing that the personal computer has come of age might go to the big A.

Then again there has been the jolly blue giant, the computer balance sheet against which all other computer balance sheets are measured and found wanting. Yes, dear old IBM went and did it last year, didn't they. Out of the corporate thought popped the IBM Personal Computer, an event which prompted some observers at the time to even say that the personal computer had now come of age.

But of course it hadn't — at least, not officially. Even though the IBM machine had lots of clever bits designed into it, not least being Intel's 8088 microprocessor and lots of memory and the speed of 16-bit processing and things, the personal computer had not yet come of age. No.

But now it has, and it is a British company that has done it. What is more, that company is the oft-maligned 'flagship' of the UK computer industry, International Computers Ltd — ICL. Now our flagship has been through a hard time recently and has ranked amongst the sick and the lame. But daring surgery and the occasional transplant has seen what would appear at first light to be a miraculous recovery. It is hoped for all concerned that the patient's long term prognosis is indeed as good as it appears now.

In fact it is from one of these transplants that the company's ability to make its official announcement has become possible. You may have seen the announcement yourself. It appeared in June, in one of the colour supplements without which each Sunday newspaper becomes just a more verbose edition of its daily kin.

To be fair, the official announcement did not come directly from ICL itself. Rather, it came from the marketing Department of Baric Computing Services, a company jointly owned by ICL and Barclays Bank (no relation). There, spread across two pages of said colour supplement were the words 'The Personal Computer Comes Of Age'. The copy went on to enthuse: 'Sooner or later it was bound to happen. One system, from a world-famous computer company emerges from the crowd'.

Hands up to all those who, at this point, feel the urge to praise ICL for its magnanimity in pointing towards IBM, or perhaps DEC. But no, we would be wrong to make such misguided assumptions, for the advertisement Baric placed continued with the words: 'The Personal Computer from ICL'.

I must admit that my own thoughts on first seeing this advertisement, tucked up in bed on a Sunday morning as I was with equal portions of tea, toast and a hangover, tended towards half-hearted amusement. Further reading of the copy strengthened this view, for it finished with the classic 'negative' joke: 'We're not in the entertainment business.'

For that time on a Sunday morning I found it a joke that worked quite well. Others, I found out later, were not so well disposed towards the copy. Some, it must be admitted, patently refused to see the joke. One, who has struggled long and hard to establish a niche in the industry, told me quite plainly that he thought it '******* arrogant'. I could see some logic in that point of view.

I could also see some logic in the suggestion that maybe, just maybe, the advert was not entirely... how should I say... honourable. Now, it told no actual lies, but by the same token it implied one hell of a lot more than was actually there. For example, the phrases 'emerges from the crowd', 'The Personal Computer from ICL'.

The implication is that here is something significant from the company, something that 'comes into view from obscurity' (Oxford English Dictionary). Mark Potts take note.

Although our computer industry's flagship company does in fact manufacture the machine, it is neither new, nor ICL's, and for it to suddenly 'emerge from the crowd' after all this time does seem to be just a trifle presumptious.

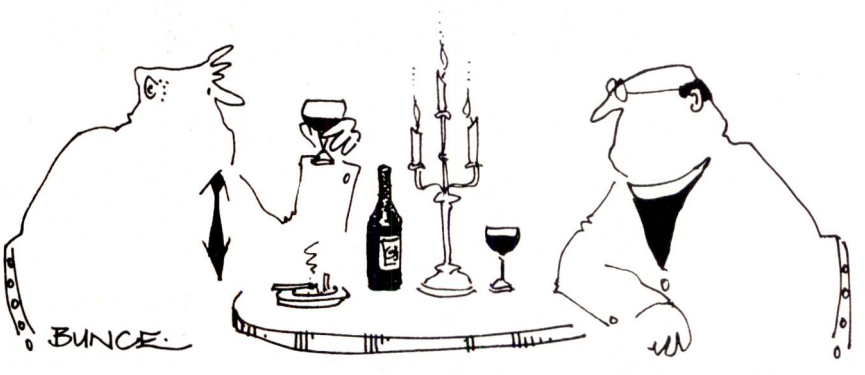
The machine of course, is actually the dear old Black Box from Rair. The deal for ICL to manufacture it under licence was struck between the two companies last year, and in the intervening period between then and its official launch, ICL has resprayed it. There is indeed a momentary tendency to speculate that the new colour might have been ICL's normal scheme for its hardware, but the company has chosen to avoid having the machine re-christened the 'Orange Box'.

The Black Box has been around now for several years and has been developed and enhanced by Rair over that period of time into a sound, if unspectacular, small business machine. It has been a consistent seller, though it has never reached the dizzy heights of the likes of Commodore, Apple or Uncle Clive. In practice, that level of volumetric pressure on sales would probably have been painful for the company.

Now it can certainly be argued that the financial and manufacturing clout of ICL could change that for the Box. The company has the resources to be able to turn on production quite significantly. But is such effort worth expending on this particular machine? With all due respect to Rair, it must be said that if the Black Box was ever going to be *that* significant, then maybe it would have happened back in 1978 when it first appeared. The sages nodded their collective heads appreciatively when the Box appeared; they did not jump about orgasmically like they did with some others.

ICL has got into the personal computer business, and many would say it's not before time. The way it has made its move, however, on the back of a modestly successful small business system, leaves something to be desired. At a time when the likes of IBM and Digital Equipment, respectively numbers one and two in the computer industry charts, have observed the trends in the computer industry and not just followed them, but predicted and anticipated future movements, ICL still seems to be dabbling one tiny little toe in the water.

Maybe when it finds that the water is okay, if occasionally a little choppy and rough, it will then produce a machine of its own that really justifies the hyperbole of 'one system, from a world-famous computer company emerges from the crowd'. END



'Well, here's to computer dating. Let's hope they iron out the bugs soon...'

comart communicator

Efficiency you'll never outgrow

Microcomputer based business systems provide management and operational information quickly and accurately. Microcomputers put computer power in the hands of your existing staff to improve their efficiency and cost effectiveness whilst increasing your control and flexibility.

Comart Communicator microcomputer systems are British designed and British made. Systems for Management, Sales, Accounting, Production Control, Word and Data Processing are just a few of the applications available. You can select from a range of single or multi-user systems with the option of adding extra data storage and communications facilities at a later date. So you can choose a Communicator system, for today, with the confidence that it can expand to meet the needs of tomorrow.

Comart is the complete microcomputer group. From system development to after sales service. Together with our nationwide network of dealers, Comart assures you of national support–locally.



For your copy of our business brochure fill in the coupon today or call us on 0480-215005. NOW!

Main Dealers

Birmingham
Byteshop Computerland
94/96 Hurst Street
Tel 021-622 7149

Dublin
Lendac Data Systems
8 Dawson Street
Tel 0001 372052

Glasgow
Byteshop Computerland
Magnet House
61 Waterloo Street
Tel 041-221 7409

Leeds
Holdene
Manchester Unity House
11/12 Rampart Road
Tel 0532 459459

London
Byteshop Computerland
324 Euston Road NW1
Tel 01-387 0505

Digitus
Lading House
10/14 Bedford Street
Covent Garden WC2
Tel 01-379 6968

Jarogate
197/213 Lyham Road
Brixton SW2
Tel 01-671 6321

Manchester
Byteshop Computerland
11 Gateway House
Piccadilly Station Approach
Tel 061-236 4737

Nottingham
Byteshop Computerland
92a Upper Parliament Street
Tel 0602 40576

Southampton
Xitan Systems
23 Cumberland Place
Tel 0703 38740

Dealers

Bristol
Senton
27 St. Nicholas Street
Tel 0272 276132

Cambridge
Cambridge Computer Store
1 Emmanuel Street
Tel 0223 65334

Cheshire
Holdene
82a Water Lane
Wilmslow
Tel 0625 529486

Edinburgh
Holdene Microsystems
48 Great King Street
Tel 031-557 4060

Manchester
NSC Computers
29 Hanging Ditch
Tel 061-832 2269

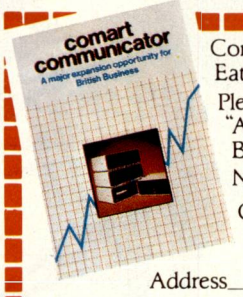
Norwich
Anglia Computer Centre
88 St. Benedict's Street
Tel 0603 29652

Sheffield
Hallam Computer Systems
1 Berkeley Precinct
451 Ecclesall Road
Tel 0742 663125

Warwickshire
Business and Leisure
Microcomputers
16 The Square
Kenilworth
Tel 0926 512127

Watford
Lux Computer Services
108 The Parade
High Street
Tel 0923 29513





Comart Limited, Little End Road, Eaton Socon, St Neots, Cambs. PE19 3JG.

Please send me a copy of your brochure "A major expansion opportunity for British business."

Name_____

Company_____

Position_____

Address_____

PCW/9/82 Tel. No._____

A member of the Comart group of companies

Comart Limited
St. Neots Cambs PE19 3JG
Tel (0480) 215005
Telex 32514 Comart G


THE BEST WILL ALWAYS STAND OUT
FROM THE CROWD.

IOTECHNOLOGY PLC, 4 PLAYHOUSE YARD, BLACKFRIARS LANE, LONDON EC4V 5EX. TELEPHONE 01-248 4876.



WARNING

Lynx sighted at Barbican.

Sorry chaps, this is not an excuse to don the safari suit, more the announcement of the new Lynx computer.

Like its namesake, it's a real mean machine.

Micro size, micro price (under £200) with a macro memory of 48K expandable to 192K.

Plus its own external power supply.

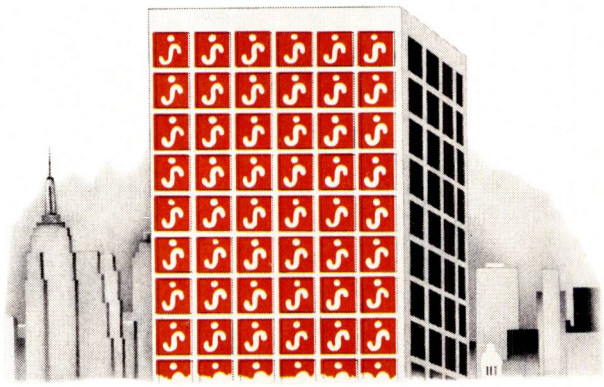
And a typewriter keyboard.

The Lynx computer will be on show at the Barbica Personal Computer World Exhibition, on Stand 269 in Hall A on the upper level.

So drop in and put it through its paces.

But beware . . . it bytes.

CAMPUTERS LYNX



SOON EVERY OFFICE WILL HAVE ONE!

Every business needs fast, reliable accounting systems to improve its profitability!

JARMAN COMPUTER SYSTEMS produce integrated programs which have been specifically planned to realise the fullest potential from a microcomputer.

- **PAYROLL & PERSONNEL RECORDS**
- **SALES ACCOUNTING WITH INVOICING**
- **PURCHASE ACCOUNTING WITH COSTING**
- **NOMINAL LEDGER WITH BUDGETARY CONTROL**
- **STOCK CONTROL**

JARMAN COMPUTER SYSTEMS are designed by experienced business men, rather than 'computer experts' to provide you with the most flexible programs which can be operated by your existing staff with very little training.

All our integrated software is available for Apple II and Apple /// computers in a range of configurations to suit the needs of businesses of all sizes, and is currently satisfying the stringent requirements of several multi-national companies. Our systems are programmed in the Pascal language to optimise the speed and capability of the desk top computer.

Our carefully selected nationwide network of dealers have been chosen for their professionalism and for their experience in installing and supporting business systems.

Contact us soon—we will be pleased to give you all the information and advice you need—there is someone in your area waiting to be of help.

JARMAN
Computer Systems
6A, DOLPHIN SQUARE, TRING,
HERTS HP23 5BW.
TELEPHONE: TRING (0442 82) 6841/2/3.

P FOR PERFECT?

Part 3
The Translators

Concluding Sue Eisenbach and Chris Sadler's appraisal of the UCSD p-System

The name 'p-System' is a carefully thought out attempt on the part of SofTech to dispel the widely-held idea that 'UCSD' stands for Pascal alone. We hope that the last two articles, describing the structure and philosophy of the operating system, its utilities and applications packages, have shown this not to be the case. This article, however, deals with the different translators provided by SofTech for program development.

The high-level languages offered by SofTech are UCSD Pascal Fortran 77 and Basic. All of these feature compilers which produce p-code object programs. In particular, there is no run-time environment in which Basic programs are directly interpreted. When one decides to develop programs in a particular language, the procedure is to name the relevant .COMPILER and .LIBRARY files as SYSTEM files on the system disc. Commands like R(un will then automatically deal with the source file in the correct language. However it is possible to mix modules written in different languages once they have reached the p-code stage.

SofTech is committed to providing native-code compilers so that the p-code interpretation phase can be by-passed for the sake of speed. To date, however, only the Z80 and 8088/8086 compilers offer this facility. There is also an Adaptable Assembler.

UCSD Pascal

The syntax of UCSD Pascal differs from standard Pascal, having numerous extensions and some omissions. Most users of UCSD Pascal (or the numerous 'look-alikes' — eg, Pascal M, Onyx Pascal, Corvus Pascal) would be loth to give up the extensions although most users look forward to SofTech bringing UCSD Pascal up to the new ISO standard. The manual says it will 'eventually comply with the standard' and it is to be hoped that 'eventually' will err on the side of sooner rather than later.

One glaring limitation is the restriction of the data type FILE to disk-resident files. In standard Pascal, a file is simply defined as a sequence of components, all of the same type, which may be associated with secondary storage and peripherals', but which may equally be entirely memory-resident where it provides an extremely useful structured data-type. Another shortcoming in relation to the standard is the absence of the facility whereby PROCEDUREs or FUNCTIONs can be declared as formal parameters in other procedure or function calls. This is a surprising omission, especially in view of the fact that this same feature is implemented in the underlying p-code. The major areas where UCSD offers extensions beyond the standard are in its string-handling capabilities, its memory management facilities, concurrency and I/O intrinsics.

UCSD Pascal has a pre-declared type STRING which caters for string variables from 0 to 255 characters in length. The length of any particular string can vary dynamically during the program's life, and there is a set of string-handling intrinsics by means of which strings can be manipulated within the program, although it is also possible to perform manipulations using standard Pascal and treating the strings as PACKED ARRAYs of CHARs.

The string-handling intrinsics are:
CONCAT, which accepts a variable number of strings and returns a single (concatenated) string;
DELETE, which removes a given number of characters from a given position in a string;
INSERT, which inserts a given string at a given position within another string;
and POS, which returns the starting position of a given sub-string within a string.
Finally, READ and READLN have been extended to cope with string input.

As a language, Pascal was designed for teaching good programming concepts. As such it is frequently somewhat deficient in the practical features needed to get a large, real application program developed and running quickly and without using up excessive amounts of memory — a common problem for programmers on microcomputers. UCSD Pascal tries to take these requirements into account by providing several tools for dealing with large programs. These include the idea of segmentation, whereby object modules within a program can be nominated to remain on the disk at run-time and brought into memory (where they replace other segments) only when required; and the idea of external units — collections of pre-compiled modules which are incorporated into a particular application program during linking.

The keyword SEGMENT is a reserved word in UCSD Pascal which, if placed before a PROCEDURE or FUNCTION, makes the loading of that segment independent of the loading of the main program segment. The segment therefore becomes a candidate for swapping in and out of memory. The run-time system, in general, copes with the interchange of segments but there are two intrinsic procedures, MEMLOCK (for locking a segment into memory), and MEMSWAP (for releasing a locked segment), which allow a programmer to intervene. In addition, it is possible to CHAIN disjointed program segments together.

The UNIT is divided into three sections: an INTERFACE section where all identifiers accessible from outside the unit are declared; an IMPLEMENTATION part where the actual code of the module appears; and a third section which can contain initialisation and termination code; The function of a unit is two-fold — firstly it can be used to store pre-compiled modules during program development, which saves having to compile error-free code over and over again during a particularly intensive debugging phrase. The second (and really more legitimate) application is to use the UNIT to offer users of a particular system a library of useful routines (eg, a graphics package or a statistics library) which they can call on in their own programs simply by including a USES statement in their code.

The 'initialisation and termination' section gives the designer of the unit an opportunity to ensure that the environment in which the modules will execute is the correct one (eg, on a graphics display, the screen is cleared and the cursor is set to a pre-defined position), and that the system is returned to 'normal' when the program completes. Facilities exist within the p-System to construct libraries from one or more units or even to incorporate a unit into the system libray.

Version IV of UCSD Pascal has been extended to allow for the initiation and control of concurrent processes — ie, modules which execute together, sharing the use of the processor. This facility is important, for instance, for the control of hardware devices, and hitherto programmers have had to resort to assembly-language programming to achieve this. Processes are declared like procedures except that the reserved word PROCESS is used; and are initiated from within a program by means of the intrinsic procedure START. A single process may be started more than once and the run-time system divides its attention between all the currently active processes. START takes additional (optional) parameters. one of which is a priority value to influence this division of attention; another is a 'stacksize' to control the amount of memory the process gets.

Interprocess communication is achieved by means of semaphores. A semaphore is initialised by the intrinsic procedure SEMINIT (identifier) where the identifier has already been declared as a SEMAPHORE. The intrinsic WAIT causes a process to pause until a given semaphore is available, while SIGNAL makes the semaphore available. Finally ATTACH is used to associate a semaphore with a hardware interrupt, thus making it possible to do real-time programming in Pascal (ie, via a hardware clock interrupt).

There are low-level I/O intrinsics which give the programmer control over all the peripherals, although they must be used carefully since the increased power increases the vunerability of, for instance, the filing system to programming errors. BLOCKREAD or BLOCKWRITE enable the direct access of logical blocks on disk files and allow rapid handling of arrays. UNITBUSY, UNITCLEAR, UNITREAD, UNIT-

STATUS, UNITWAIT and UNITWRITE offer the programmer total control of any I/O device on the system from within the program. Finally there is IORESULT which, after any standard I/O operation, returns a value between 0 and 18, reflecting the outcome of that operation. If the automatic I/O checking is disabled, the outcome of I/O faults is left in the hands of the programmer, and IORESULT is the diagnostic which provides a means for producing 'user proof' programs.

High-level I/O diverges from standard Pascal in the inclusion of a file type INTERACTIVE, which is similar to the type TEXT except that the automatic GET during the RESET operation is suspended. The standard files INPUT and OUTPUT are of type INTERACTIVE as is the UCSD 'standard' file KEYBOARD, which is a non-echoing version of INPUT. Most other implementers of Pascal compilers have solved this problem by a technique known as 'lazy I/O' whereby the automatic GET is queued until the first READ is encountered, and subsequent GETs are treated likewise. These different methods of solving the same problem mean that no interactive Pascal program can be moved from UCSD to a standard Pascal system without alteration of the code. Another extension is the provision of a second parameter, the file-name, for RESET and REWRITE. The intrinsic SEEK enables the programmer to reposition the file-pointer and thus allows random access file handling. Finally, the keyword CLOSE allows (through parameters) for the insertion or deletion of file-names from the disk directory.

Other extensions include: a CASE statement which 'falls through' if the selector is undefined; the ability to nest comments; the ability to compare arrays or records (by means of = or ◊; and EXIT, which when encountered causes the immediate termination of the block or program.

Long integers can hold numbers up to 36 digits long and the intrinsic STR serves to convert such numbers into strings for output purposes. PACK and UNPACK are not implemented, although PACKED is, and packed arrays of characters (these are implicit strings) can be manipulated by FILLCHAR, MOVELEFT and MOVERIGHT. The standard files INPUT, OUTPUT and KEYBOARD are always opened when a program begins execution and the program heading declaration is ignored. The implementation of SETs is rather impressive — they may have a maximum of 4080 elements. The intrinsic GOTOXY controls the cursor of the logical device CONSOLE, while REDIRECT and EXCEPTION can be used to enable or disable I/O redirection. Heap space is managed by NEW and DISPOSE, which deal in single records, VARNEW and VARDISPOSE which deal with a given number of words of memory, and MARK and RELEASE which together clear a predefined area in the heap.

Like many other Pascal compilers, UCSD Pascal supports the feature of compile-time options which appear as pseudo-comments somewhere within the text of a program. These include options for: switching I/O checking on and off; switching range checking on and off; conditional compilation of sections of code (useful for debugging); the inclusion of other source files during compilation; the production of listing files; the suppression of normal compiler message output (suitable for slow terminals); and the incorporation of user-defined libraries.

A useful option which has been omitted but which would not be too difficult to incorporate would be a switch which flagged all deviations from ISO Standard Pascal. Using this, a programmer who had developed a program under UCSD could obtain some help with converting the code to standard Pascal before transferring it to run under some other compiler. At a recent USUS(UK) conference, Tony Addyman, chairman of the ISO Pascal Standards committee, congratulated the p-System owners on selecting an operating system which made them independent of hardware manufacturers but pointed out that a standard Pascal compiler would make them independent of software manufacturers as well.

Standard Pascal was designed as a teaching language but UCSD Pascal seeks to go beyond this, providing a set of general-purpose problem-solving features and sufficient flexibility to allow most users to program a high-level solution to most problems, be they system, control or conventional applications. When it was originally developed many were sceptical as to whether a usable compiler could be implemented on a microcomputer at all, and UCSD Pascal was regarded as highly innovative. Today new machines and more demanding users make it important that all aspects of the p-System, not least its compilers, should be the subject of a continuous programme of improvement.

Fortran

The Fortran 77 compiler offers a sensible entry into the UCSD p-System for anyone with an established base of (Fortran) software, although the language is not quite as tightly bound to the operating system as is Pascal itself. According to the manual, SofTech Fortran is 'closely related' to the ANSI Fortran 77 standard subset. In fact, two features of the subset are not implemented: namely, the ability to pass function and subroutine names as parameters, and the allocation of equal amounts of storage space to INTEGER and REAL data elements. The compiler will compile standard Fortran IV programs. The compiler is credited to Silicon Valley Software Inc, both in the manual and on screen when the compiler is invoked.

On the other hand, several aspects of the 'full' Fortran 77 definition have been implemented, including the ability to reference array elements and to call functions from within a subscript expression; the ability to use integer expressions as limit specifications in DO loops and implied DO loops or as I/O unit numbers; and the ability to use an arithmetic expression within the I/O list of a WRITE statement or as the value of a computed GOTO. In addition, both random access and sequential files are permitted to be either formatted or unformatted, in line with the full standard.

The compiler supports four directives (a la Pascal), denoted by a $ in column one. $INCLUDE provides the conventional include facility (nesting up to five deep), useful for handling COMMON blocks and other declarations. $USES declares a library file, and $EXT declares an assembly language routine as callable from the code currently being compiled. $XREF produces a cross-reference listing. In addition to the code-file, the compiler will (optionally) produce a listing file consisting of a line-numbered listing which incorporates a procedure-relative instruction counter, and a symbol table. (In fact, the listing file is not as optional as it might be since typing 'n' in response to the question 'Listing file?' results in the production of a data file named 'n' on disk.) Compile-time errors are flagged immediately below the line in which they occur and are referenced by number. There are 186 compile-time errors ranging from 1 (fatal error reading source block) to 405 (read error on scratch file). Those up to 200 are syntax errors; the rest refer to compiler directives or peripheral problems.

The syntax of SofTech's Fortran 77 supports a single main program (optionally headed by a PROGRAM statement) together with an arbitrary number of subroutines and functions, headed by SUBROUTINE and FUNCTION statements respectively. Each of these is termed a 'program unit' and every program unit must be terminated by an END statement. There can be no trailing blanks after the final END statement — if there are any, the compiler tries to compile them! Statements within each program unit must be ordered so that, if they exist, specification statements precede DATA statements, which precede statement function statements, which precede executable statements.

Specification statements include IMPLICIT, DIMENSION, INTEGER, REAL, LOGICAL, CHARACTER, COMMON, EXTERNAL, INTRINSIC, SAVE and EQUIVALENCE. The data type CHARACTER allows for strings with lengths up to 127 bytes; the default length is one byte. These can be manipulated somewhat like other data types (eg, character 'constants' are allowed, assignments and (lexical) comparisons are possible) but no operators act on character variables, and variables of different lengths may not be associated together in EQUIVALENCE statements. INTRINSIC is used to declare all references to the subroutine library within the current program unit. SAVE is used to preserve a dynamically allocated common area when returning from a subroutine in which the COMMON blocks are defined. Since the p-System allocates common areas statically, its use is not necessary in SofTech's Fortran 77 and it was implemented only for sake of compatibility with the Fortran 77 standard.

Fortran 77 expressions are evaluated in the conventional way with normal operator precedence. The result of an integer division is truncated towards zero (ie, rounded down if positive and up if negative). Mixed INTEGER and REAL expressions are evaluated as REAL. Relational operators (.EQ. etc) with operands of like

type (INTEGER, REAL and CHARACTER, but not LOGICAL) may be employed. In the case of CHARACTER variables, operators like .GT. exploit the ASCII ordering. In addition to the usual '=' style computational assignment, there is a label assignment statement (ASSIGN — TO —) whereby the value of a variable can be set to an existing statement label number. (This includes FORMAT statement labels.)

Assignments to a REAL variable are, if necessary, converted (ie, if the expression is of type INTEGER) while, in the opposite instance, a REAL expression is truncated to 'fit' into an INTEGER variable. Likewise, CHARACTER variables are padded with trailing blanks or truncated when a length mismatch occurs on assignment.

Control statements include unconditional, computed and assigned GOTOs, arithmetic and logical IFs, the IF — THEN — ELSEIF — THEN... ELSE — ENDIF construct, together with DO, STOP, PAUSE, CALL and RETURN. The Fortran IV type constructs (ie, the GOTOs) may not jump into blocks of executable statements. The DO loop is tested at the top, in contrast with Fortran IV which tests at the bottom of the loop so you always get one pass through the block.

STOP and PAUSE can be used to halt execution and both can take an argument (INTEGER or CHARACTER) which will be printed on the console when the statement is executed. In the case of PAUSE, execution is recommenced when a key on the keyboard is pressed. In functions and subroutines RETURN transfers control back to the calling routine — however, the terminating END statement performs the same function, so anyone who believes that subroutines should have only one exit can dispense with the RETURN altogether.

SofTech Fortran 77 formatted records are constructed as character strings consistent with external p-System operations. This means, for instance, that a file of formatted records can be read by the system editor, and that formatted data files are portable from one p-System to another. No such guarantees exist for unformatted records which employ machine dependent internal representation. The symbol '*' can be used as a unit number number in READ and WRITE statements, denoting the device CONSOLE. I/O statements include OPEN, CLOSE, READ, WRITE, BACKSPACE, ENDFILE and REWIND. OPEN has four optional switches, as follows:
STATUS = NEW/OLD
ACCESS = SEQUENTIAL/DIRECT
FORM = FORMATTED/
UNFORMATTED
and RECL = record length; while CLOSE has STATUS = KEEP/DELETE.

Random access is handled by including a REC=⟨record number⟩ field into READ and WRITE statements. All the normal format specifiers are permitted and in addition the ' ' (backslash) symbol serves to suppress the automatic CRLF so that interactive screen I/O can do question and answer on the same line. Logical (L) format accepts (on input) and produces (on output) the abbreviations T and F for .TRUE and .FALSE. .

Table 1 shows the intrinsic functions

Basic

When we first thought of writing this series of articles we arranged for SofTech to send us one of the first Version IV p-System Basic disks. It was some considerable time before we actually got round to trying it out and we found that the compiler crashed on even the most trivial (ie, two line) Basic program. At the next USUS(UK) conference we buttonholed Jean Gianetta of the SofTech sales team, who confessed that early releases of the Basic had had problems, especially on the LSI-11 interpreter. She duly sent us a subsequent version which works. What surprised us, though, is that we had not heard a word about any such problems on the USUS grapevine, from which we are forced to conclude that p-System users, faced with Pascal, Fortran 77 or Basic tend to choose one of the first two.

The second surprise was that the p-System Basic dialect does not show any signs of being influenced by Pascal — as do, for example, Comal or even BBC Basic. The table of Basic reserved words implemented in SofTech Fortran shows what the syntax is like. There is a full range of string handling functions and special I/O features for handling functions and special I/O features for handling, for instance, money input data. Programs can be split up into libraries and subroutines with parameters and local variables. Like most compiled Basics, p-System Basic doesn't require line numbers to be in ascending numeric order, or even to exist at all. Each instruction is terminated by carriage return, which implies only one instruction per line, although it is possible to suppress this by enclosing the CR in Pascal-type comment delimiters. There are several compiler directives which, for example, turn I/O and range checking off, or switch to handling transcendentals in the library in 'a manner consistent with Texas Instruments machines'.

What with this cryptic remark and a few other odd things (eg, the command DISPLAY to write to the screen) we were curious as to where this dialect of

Type Conversion	INT, IFIX REAL, FLOAT ICHAR CHAR
Truncation and other Numeric Manipulation	AINT, ANINT, NINT IABS, ABS MOD, AMOD ISIGN, SIGN IDIM, DIM MAX0. MAX1, MIN0, MIN1 AMA0, AMAX1, AMIN0, AMIN1
Transcendentals	SQRT EXP ALOG, ALOG10 SIN, COS TAN ASIN, ACOS ATAN, ATAN2 SINH, COSH TANH
Lexicals	LGE, LGT LLE, LLT
End of File	EOF — returns TRUE or FALSE. (not standard Fortran 77)

Table 1 Fortran intrinsics

BENCHMARK TIMINGS

BM1	1.3	
BM2	1.5	
BM3	2.6	
BM4	4.0	UCSD
BM5	4.2	Basic
BM6	11.4	
BM7	15.7	
BM8	5.1	

All timings in seconds. For an explanation and listing of the Benchmark tests, see PCW *Vol 4 No 11, November 1981.*

BASIC RESERVED WORDS

CONTROL FLOW CONSTRUCTS
GOTO
ON—GOTO
IF—THEN—ELSE
FOR—TO—STEP NEXT
GOSUB
RETURN
ON—GOSUB
LET
STOP
END — must exist at the end of a program;

▶

DEF [function type] function name [(parameter list)];
FNEND — necessary to end multi-line functions;
SUB subroutine name [(parameter list)] — starts a subroutine;
SUBEND — last statement in a subroutine;
SUBEXIT — terminates a subroutine call within a subroutine;
CALL subroutine name [(parameter list)] — calls a subroutine;
UNIT unit name — must exist at the start of a Basic program or subroutine that is to be compiled seperately and linked into a larger program.

I/O RESERVED WORDS

PRINT — sends output to printer;
DISPLAY — directs output to screen (like most Basics' PRINT);
ERASE ALL — clears the screen;
AT (line number, column number) — positions cursor at the specified place on the screen;
BELL — rings the bell;
USING — controls formatting in DISPLAY, PRINT and ASSIGN statements;
IMAGE — provides a format for a USING statement;
PUNCTUATION — allows the altering of monetary symbols for currency symbol digit separators and decimal points;
INPUT — can be used with AT, BELL, SIZE (max length acceptable for a given string) or a quoted string so that it can provide output as well as input);
ACCEPT — similar to INPUT except that it reads entire input into one string variable;
DATA
READ
RESTORE — repositions a file pointer and reinitialises a DATA statement;
INKEY — always returns 0;
INKEY$ — returns the next character frpm the keyboard buffer;
INTERNAL — binary format for a file;
REC — accesses an INTERNAL file record;
RELATIVE — random access file;
SEQUENTIAL — sequential access file;
OPEN — for files;
CLOSE — for files;
UPDATE — default mode for opening files, allows reading and writing;
APPEND — only allows writing to the end of the file.

ARRAY RESERVED WORDS

ASSIGN — associates a virtual array with a disk file;
DIM
OPTION BASE — used to set base index of an array, eg, to 1.

STANDARD FUNCTIONS
ABS
SIN
COS
TAN
ATN
EXP
LOG
INT
SGN
SQR
RND
RANDOMIZE
ASC — returns the decimal value of the first character in the string argument;
BREAK — finds the first character in a string that appears in a second string;
SPAN — compares characters in a string;
NUMERIC — returns —1 if string is a valid number and 0 otherwise;
VAL — returns numeric value of a string;
STR$ — returns a string given a numeric value;
POS — returns the position of one string in another;
RPT$ — returns a string which is a specified number of repetitions of the argument string;
UPRC$ — change all lower case letters to upper case;
CHR$
SEG$ — extracts a substring from a string;
DAT$ — returns month/day/year;
TIME$ — retuns hour/minutes/seconds;
FREESPEACE — returns number of free bytes;
EOF — returns 0 if not at end of file and a positive number otherwise;
FTYPE — returns 0;
TAB — loves to a tab position in a PRINT or DISPLAY statement;
ERR — returns an error number (0 if no error).

Table 2

P FOR PERFECT?

revealed that TI had commissioned SofTech to produce a version of its Business Basic.

Native code generation

Z80 and 8086 processor based p-Systems can take advantage of native code (n-code) generators. Since these accept p-code files as source, programs written in any high-level language can be rendered into n-code. In general, native code generation will be limited to specific procedures or functions within the high level source code which are bracketed by compile-time switches (ie, ($N+) and ($N—). Any assembly language routine referenced within such a procedure must be linked in before the code-file is submitted to the native code generator. Users looking for speed, therefore, have a fairly flexible regime — they can code in a high-level language for convenience, compile to native-code for the more crucial routines and finally hack out the assembler themselves for the bits which they absolutely cannot leave alone.

Conclusion

When it was first conceived as a university teaching project, the UCSD p-System was a realisation of some innovative ideas about Pascal on microcomputers, portability and the functionality of microcomputer operating systems. These features are not only available to all of us through SofTech's Version IV p-System, but are also being pursued by many software companies who have been influenced by the original San Diego project.

As users of micro computer systems who employ the p-System both at home and at work, equally for its power, its portability and its ease of use, and who have found information, enlightment and entertainment in its user community USUS, we can recommend the p-System for serious consideration by all microcomputer users. Finally, USUS (UK) may be contacted through

Mark Woodman
Mathematics Faculty
Open University
Walton Hall
Milton Keynes MK7 6AA

END



'Goodbye Harold, I've left you for good. For dinner see program one... clean shirts see program two...'

Test-drive your software!

Microplanner	**Rental £99**
	RRP £695
Decision Modeller	**Rental £99**
	RRP £535
VisiSchedule	**Rental £38**
	RRP £195

Micromodeller	**Rental £99**
	RRP £595
dBase II	**Rental £79**
	RRP £395
microFinesse	**Rental £70**
	RRP £350

£29 Rental

	Retail
Supercalc	£175
Visitrend/plot	£165
Visifile	£161
Zardax	£160
Wordstar	£145
Datastar	£140
Easywriter (PRO)	£140
DBMaster	£135

£19 Rental

	Retail
Calcstar	£120
Visicalc	£113
Visiplot	£111
Word Plus (Speller)	£110
Time Manager	£105
ASCII Express II	£100
General Manager	£100
Complete Graphics Pack	£100

Our unrivalled list of business and technical software also includes accounting systems and expansion cards.

and if you decide to buy- the rental is free

The Software Rental Bank gives you the opportunity to evaluate software on your own machine, with your own data, before committing yourself to a purchase.

The Software Rental Bank offers a unique range of services.

- ★ Short-term rental of software packages and firmware products for 7, 14 or 28 days depending on your class of membership.
- ★ Free rental if you decide to purchase.
- ★ A really wide range of software and advice to help you make the right choice.
- ★ Access to the newest software available — a chance to simply 'taste' some of the latest and most controversial products.
- ★ Speedy service. Rent software by telephone or by mail — all the items on our ***Software Asset Listing*** are held in stock.
- ★ An advisory 'hot line' in case you have difficulty with a rented package.

The Bank is currently supporting the Apple II computer — including CP/M products for use with the Z80 card. Software for other microcomputers including Apple III, Sirius, IBM and other CP/M machines will be added to the Bank shortly.

Membership of the Bank

- ★ Full Membership costs £70 a year and allows you to rent up to £700 worth of software at any one time for 14 days.
- ★ Members periodically receive our ***Software Asset Listing*** which gives details of the packages available for rental. Members are encouraged to nominate new items for addition to our stock.
- ★ Larger organisations which may have microcomputers at a number of different locations can opt to join as Corporate Members.

To receive our brochure and software list phone Ruth Oliver on 0908-53491 or clip the coupon below.

THE SOFTWARE RENTAL BANK

I would like to receive the Software Rental Bank brochure.

Name _____

Organisation _____

Address _____

_____

_____

Telephone _____ Machine _____

Send to: The Software Rental Bank Ltd., **PCW** Sept. 82
58 North Street, Leighton Buzzard, Beds LU7 7EN.

SHOW PREVIEW



The 5th Personal Computer World Show

9–12 September 1982 Barbican Centre, City of London

The 5th *PCW* Show will be at least three times the size of last year's event at the Cunard Hotel in Hammersmith, and will also last for one extra day. The idea of dividing the exhibition into two sections was so effective last year that we've decided to do so again. Several companies have stands booked in both sections, and every aspect of computing is covered by one stand or another. Even the less publicised areas such as insurance, laboratory equipment and packaging are represented, so the Show is very much more than a collection of similar micros.

Several new products will be launched during the four days, including two or three new computers, several new peripherals and some new books and magazines. Indeed, the publishing industry seems to be almost as much in evidence as the microcomputer industry! Visitors will be able to buy or order most of the goods that take their fancy while they are there and many will be at special show prices. There will definitely be something for everyone: games for the

kids (young and old!), packages for education and business at all levels, clubs for enthusiast and beginner alike, and a multitude of peculiar devices for the expert. If you need advice on choosing a micro for your business, the National Computing Centre and the Association of Independent Computer Specialists will be on hand to help out. For the confused or just plain uninitiated, ComputerTown UK! and a varied collection of clubs (in Computer Club Corner) will answer your questions or put you in touch with clubs in your area.

Several special features have also been laid on. One of these is the chess competition, which has been a part of the Show ever since the first one. This year it will be the Third European Microcomputer Chess Championship. We've also got the added attraction of a Scrabble championship — computerised, of course, using Apple IIs. This will be open to any visitor who cares to fill in a registration form, and will use a package written by Peter Turcan and perfected by Little Genius. The package is exactly like the Spears game as far as rules are concerned, but players in the tournament will have a mere two minutes in which to make each move. Scrabble will be on sale from Apple dealers throughout the UK from 9 September. Little Genius will also take orders for it.

The winner of this contest will be the visitor who gets the highest score during the course of the competition, which will finish at about noon on the Sunday so there's time to present the prize. Little indication has yet been given as to what the winner will get for the struggle — but rumour has it that it will be a computer.

A viewdata system providing news, information and a Show guide has been set up by Electronic Insight. Monitors will be spread throughout the exhibition area. Acorn and Sinclair software villages have been organised, as well as a 'Sirius City'; providing the chance to browse through all the latest developments on these micros. (Acorn, incidentally, will be flaunting robot arms and lasers on its hobbyist stand, apparently.)

The Barbican Centre should serve as an ideal venue for the largest micro show in Britain. It has extensive facilities for the disabled, plenty of space in which to bash keyboards and lots of places in which to phone your friends or have a quick snack. Special hotel and travel packages have been arranged for visitors who have come a long way; these include transport, show tickets and accommodation. Priority tickets are available for hurried businessmen — anyone who writes to the Show organisers, Montbuild Ltd, either on headed notepaper or enclosing a business card, will have the opportunity to use a special 'fast lane' at the entrance to the Centre, which means they won't have to queue. Discount vouchers are being printed in several magazines offering a reduction of 50p on the entrance fee of £2.50, and reductions are given on advance bookings of 10 or more. Details of discount schemes can be obtained from Timothy Collins at Montbuild Ltd, 11 Manchester Square, London W1. Information on the hotel packages comes from Frank Gilbert of Pharaoh and Hughes on 01-995 8995.

Finally, if anyone is interested in entering the Chess Championship they are welcome to call our offices for an application form.

For details of opening hours etc, see the Show advertisement on page 84.



LOOK OUT! THERE'S A SNAPPER ABOUT



Flashing 'Power Pills' – after snapper has eaten them the ghosts turn blue.

Snapper makes eating noises as he snaps the ghosts, dots and fruit.

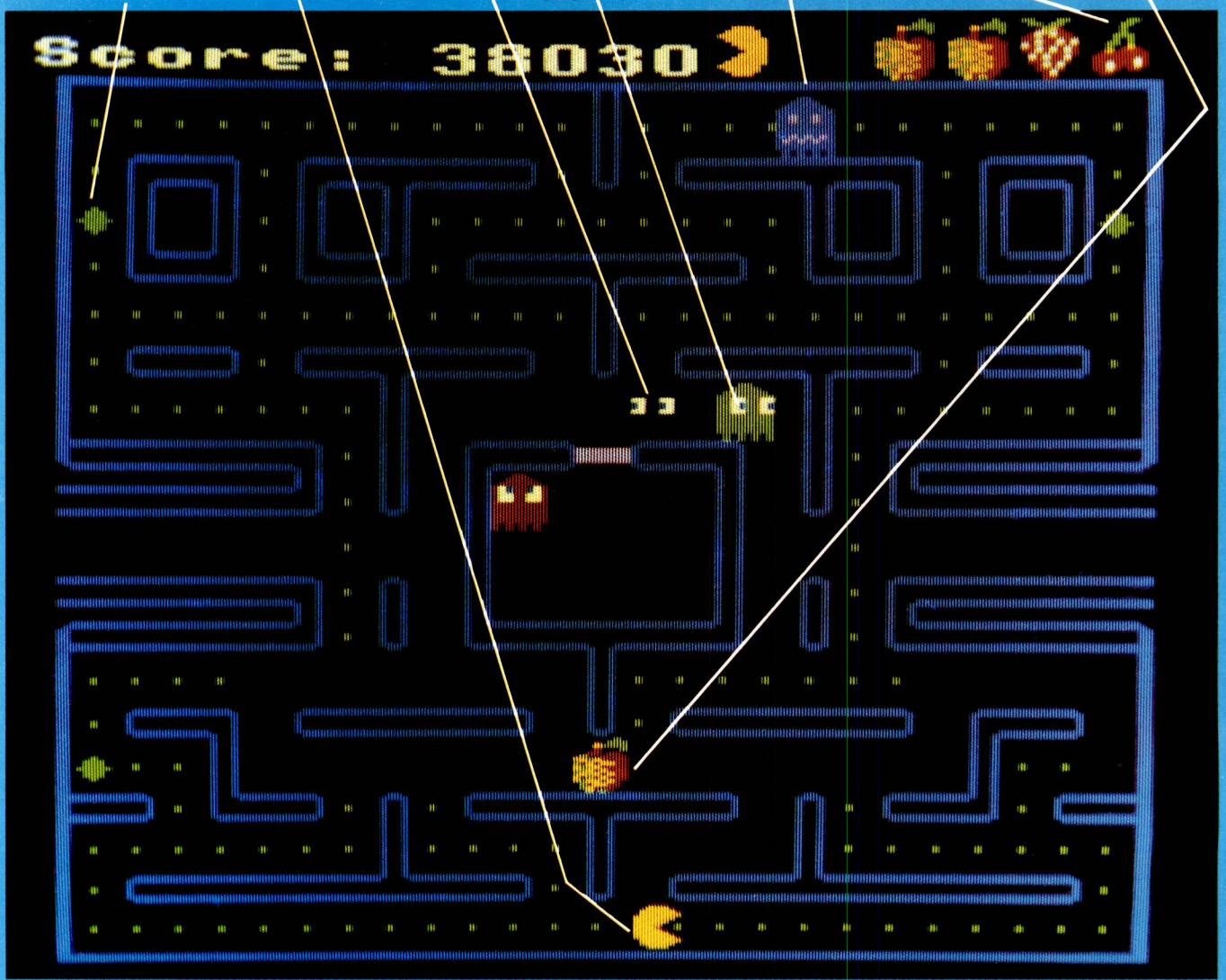
After the ghost has been 'snapped' their eyes return to the cave.

The ghosts eyes always look in the direction they are going.

Blue ghost ready for eating. If not eaten quickly they flash and revert back.

Fruits increase in value with higher scores.

Bonus points awarded for eating fruit.



Snapper - the new addictive arcade-style game for the BBC micro from Acornsoft.

Snapper's food is fruit and he must eat to stay alive. Ghoulish ghosts try to gobble him up and he can't fight back until he has found and eaten a power pill.

A total of 1,000 points is the minimum to rank among the top eight players on the high-score table – but the highest known score is 127,000!

For full details of this and other exciting games for the BBC Microcomputer System ring 01-930 1614 or write to:

ACORNSOFT

Acornsoft Ltd 4a Market Hill CAMBRIDGE CB2 3NJ.

The 5th Personal Computer World Show

STAND BY STAND

A breakdown of exhibitors at Britain's largest microcomputing show

Stand no: 317/322, 200
Acorn Computers Ltd, Fulbourn Road, Cherry Hinton, Cambridge.
Tel: 0223 245200

Acorn has stands planned in both hobbyist and business areas of the Show. Networks of Atoms and BBC Computers will be on the hobbyist stand; these will be complete with disk drives, file servers and printers. Robotic arms and lasers will also be a feature of this stand. Visitors will be able to gain 'hands-on' experience of Acorn hardware and the latest software from Acornsoft.

The business stand will also feature a network of BBC Computers providing demonstrations of many business, educational and industrial applications.

Stand no: 259, 160
Adda Computers Ltd, Mercury House, Hanger Green, Park Royal, Ealing, London W5 3BA. Tel: 01-997 6666

On Adda's home computing stand, the VIC-20 will take pride of place. There will be special offer prices on the complete VIC-20 starter pack, which includes the VIC-20, cassette deck, joystick, Introduction to Basic, ten blank cassettes and even a mains plug. A large selection of software will be on view.

Commodore business systems will be the order of the day on the business stand. Word processing, Silicon Office, database management, Visicalc and the multi-user MuPET will be demonstrated.

Special prices on all these products will be offered to any visitor who orders within seven days of visiting the Show — tickets are needed to qualify. Details of Adda's continuous Open Days programme are available from its offices in London, Reading and Slough.

Stand no: 444
Addison-Wesley Publishers, 53 Bedford Square, London WC1B 3DZ.
Tel: 01-631 1636

Addison-Wesley covers a large range of micro-related subjects in its titles and is also moving into the area of software publishing, particularly for education. Its latest venture is in magazine publishing in conjunction with Acorn Computers — Acorn User. The latest issue, aimed at the Atom, BBC and Econet user, will be sold from the stand along with a selection of books.

Stand no: 268
Adventure International, 736 Commerce Circle, Longdale Industrial Park, Longdale, Florida 32750, USA

Adventure International will be featuring a wide range of software for several of the most popular microcomputers, including TRS-80, Apple, Atari and CP/M. Several arcade-type games will be introduced, and 'playstations' for eager gamesters to try out the programs before buying them will also be an attraction.

A newly formed business division will exhibit its series of Maxi business application programs.

Stand no: Computer Club Corner
Amateur Computer Club, 142 Windermere Road, London SW16 5HE.
Tel: 01-764 4043

The ACC is the national organisation representing the interests of all the major user groups and small computer clubs in the UK. In this capacity it has again been asked to organise the amateur stands at the Show.
National clubs covering users of the following machines will be present: Apple, BBC, Commodore, Compucolor, Sharp, Sorcerer, Tandy and Tangerine, together with the Association of London Computer Clubs, Forth Interest Group, 68 Micro Group, etc.

The Club Database will again be a feature; this locates and prints out details of the nearest club to a specified locality.

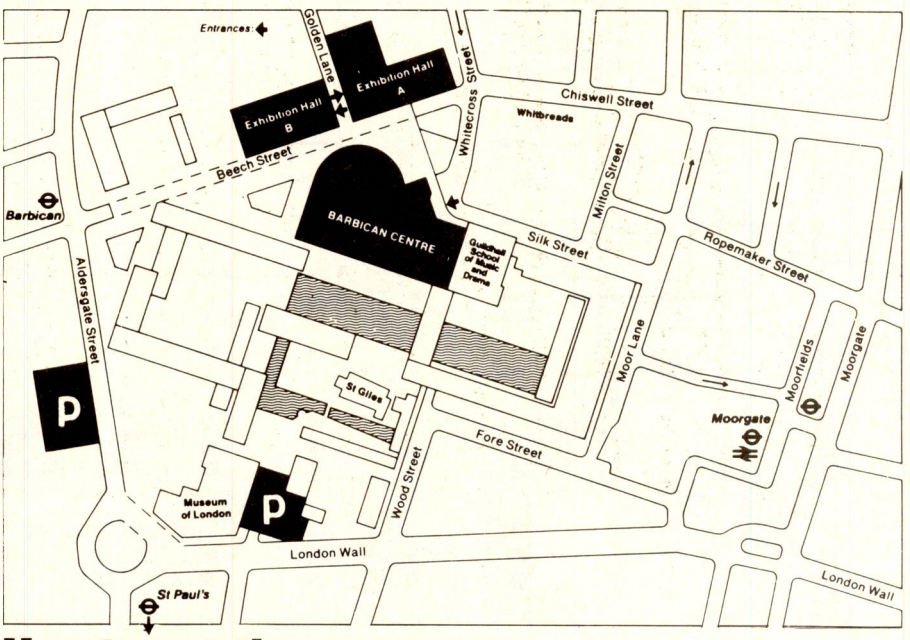
Stand no: 263
Applied Systems Knowledge Ltd, London House, 42 Upper Richmond Road West, London SW14 8DD.
Tel: 01-876 0102

Details unavailable at press time.

Stand no: 281
Artic Computing Ltd, 396 James Reckitt Ave, Hull, North Humberside.
Tel: 0482 75284

The latest products from this company will be at the Show. Among these is ZX Forth, a full implementation of Fig Forth for the ZX81. Another new product is a full editor, assembler and debugger for the ZX81. This has all the features of assemblers written for much larger machines and costs only £9.95.

A Pack-Man type game will be available, along with ZX Chess which will play in 1k. Artic also has a range of RAM expansions.



How to get there

By underground
Barbican, St Pauls, Bank, Liverpool St, or Moorgate
By train
Holborn Viaduct (SR), Cannon St (SR) or Broad St (ER).

Stand no: 102
Association of Independent Computer Specialists. Enquiries to John Baldachin (Secretary), 203 Kilburn High Road, London. Tel 01-624 9336.

The AICS is showing the services, software and equipment of some of its members. Its byword is 'the professional approach to computing' and all members are thoroughly vetted to ensure a high standard of technical experience and ability. If you have a consultancy problem involving any size of computer, an AICS member could help you solve it.

The 5th Personal Computer World Show

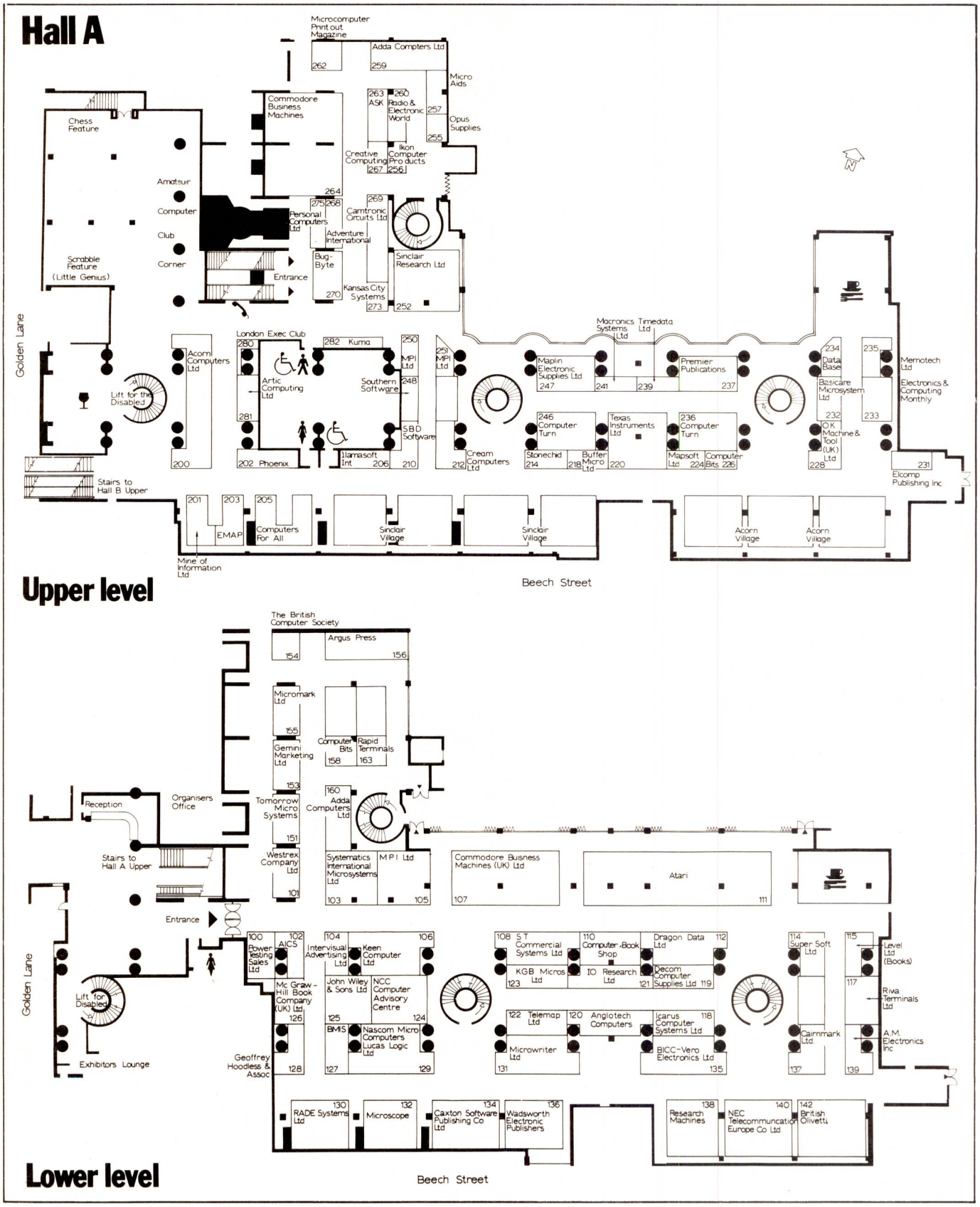
Stand no: 111
Atari International (UK) Ltd, 59 Alperton Lane, Wembley, Middlesex. Tel: 01-998 8844

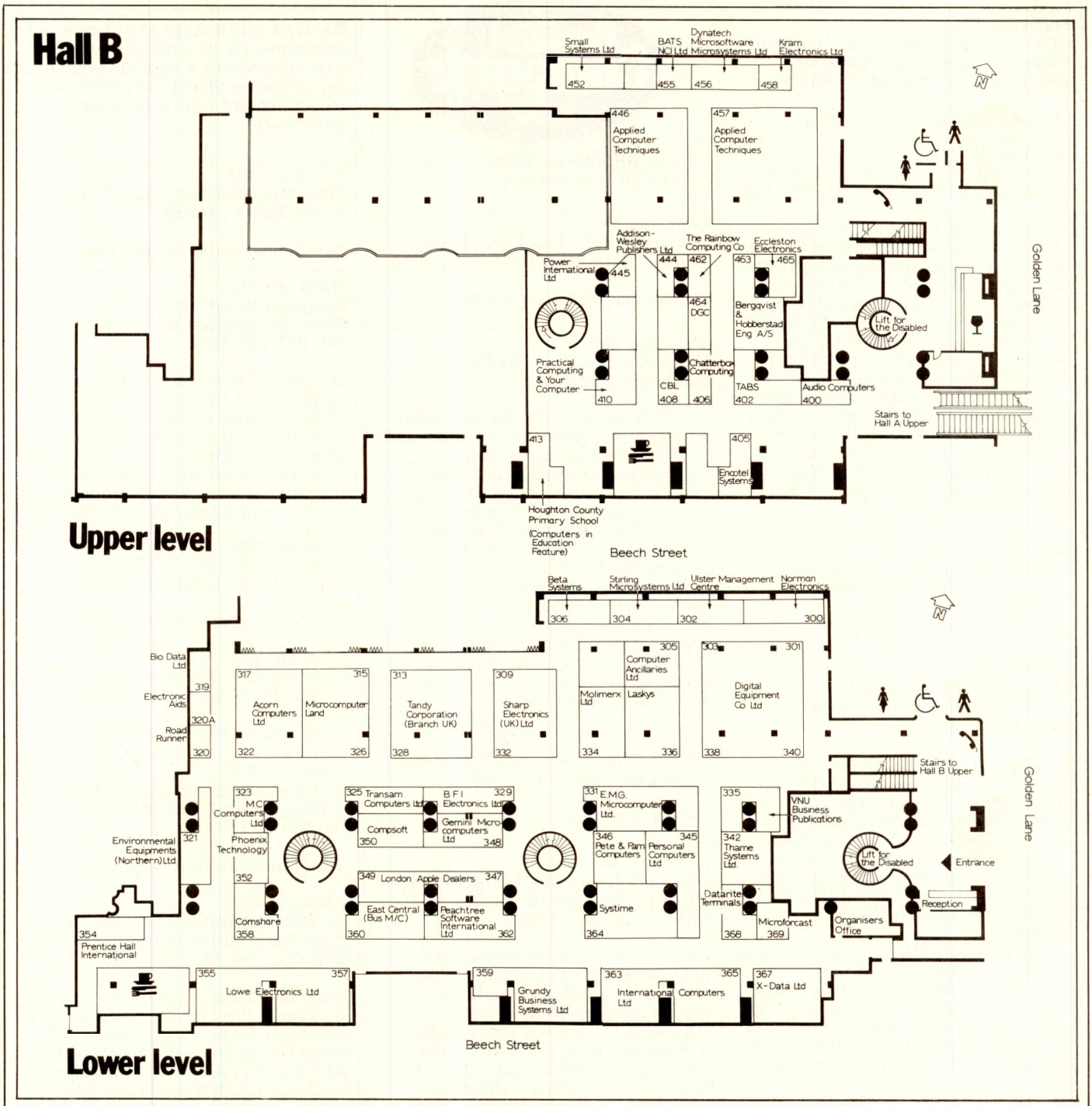
There will be ample opportunity to see and use Atari computers at this stand and a full range of software will be on display. Items from the Atari Program Exchange will be on the stand and several new products will be featured.

Stand no: Stand no: 139
AM Electronics Inc, 3446 Washington Avenue, Ann Arbor, MI 40104, USA

Details unavailable at press time.

Stand no: 120
Anglotech Computers, Old Crown, Windsor Road, Slough, Berks. Tel: Slough 74201





The Shelton Instruments 1000 series of business micros will be on this stand running packages from a range of applications software. The micros themselves are winchester-based and will be run as a multi-user system under Shelton's operating system, McNOS. The systems are low in price and cover a wide spectrum of sizes, capabilities and applications. Dealer enquiries are welcome.

Stand no: 446/447
Applied Computer Techniques (Holdings) PLC, ACT House, 111 Hagley Road, Birmingham B16 8LB. Tel: 021 454 8585

Details unavailable at press time.

Stand no: Stand no: 400
Audio Computers, 87 Bournemouth Park Road, Southend. Tel: 0702 613081

Details unavailable at press time.

Stand no: not known
Automation Facilities Ltd, Blakes Road, Wargrave, Berks. Tel: 0735 223012

Details unavailable at press time.

Stand no: 232
Basicare Microsystem Ltd, 5 Dryden Court, London SE11 4NH. Tel: 01-735 6408

From Basicare Microsystem comes the Organic Micro, a range of units to add considerable power to your ZX81. Using products from this series, you can enable the ZX81 to retain programs when switched off, drive an 80-column printer or play high resolution games with sound and joysticks. Each unit costs under £30 on average.

Stand no: 455
BATS-NCI Ltd, 375 Regents Park Road, London N3 1DG

Details unavailable at press time.

Stand no: 463
Bergqvist & Hobberstad Engineering A/S, Herluf Trolles Gade 20/21, 1052 Copenhagen K, Denmark. Tel: 01-133 188

The Model 170Z is a monitor specially designed for use with the ZX81. It gives a better quality picture than a domestic TV, at the same time tidying up all the trailing cables connected to the machine. The ZX81 plugs into a slot at the front of the monitor and is then connected to power supply which will also drive the ZX printer. Any ZX81 peripherals can be connected. The monitor will also work as a conventional monitor with other micros and is equipped with a video output jack enabling output to two screens at once.

Stand no: 329
BFI Electronics Ltd, 516 Walton Road, West Molesley, Surrey KT8 0QF. Tel: 01-941 4066

Details unavailable at press time.

Stand no: 135
BICC-Vero Electronics Ltd, Industrial Estate, Chandlers Ford, Eastleigh, Hants SO5 37R. Tel: 04215 66300.

Details unavailable at press time.

Stand no: 319
Biodata Ltd, 6 Lower Ormond Street, Manchester MI 5 QF. Tel: 061-236 1283

Biodata manufactures Microlink, a modular computer interface which links laboratory and monitoring equipment to microcomputers. The system allows the setting of an initial configuration and the potential for later expansion. It can be used with micros such as the CBM, Hewlett Packard and Sirius and comes with a detailed programming manual.

The system consists of a mainframe containing an IEEE interface and power supply, into which up to 18 modules are plugged. A selection of modules is available for applications in chemistry, engineering, electronics, physics and many others.

Stand no: 127
BMIS, Suites 101-110, 35 Piccadilly, London W1. Tel: 01-437 5505

Details unavailable at press time.

Stand no: 154
The British Computer Society, 13 Mansfield Street, London W1M 0BP. Tel: 01-637 0471

The British Computer Society is the major representative body of the computing profession in Britain. There are three grades of membership: Associate Member, Member and Fellow. Those who are interested in computing but not eligible for full membership can become Associate Members. This enables them to participate in the activities of the Society.

Members are entitled to the following benefits: regular copies of Computing (in which the society publishes a page of news) and the society's journals, price reductions on other publications and on the society's conferences and events, and the right to join up to nine specialist groups.

Stand no: 142
British Olivetti Ltd, 86/88 Upper Richmond Road, Putney, London SW15. Tel: 01-785 6666

Details unavailable at press time.

Stand no: 218
Buffer Micro Ltd, 374a Streatham High Road, London SW16

Details unavailable at press time.

Stand no: 270
Bug-Byte Microcomputer Software, 99-100 The Albany, Old Hall Street, Liverpool L3 9EP. Tel: 051-227 2299

Bug-Byte's speciality is entertainment. Spectral Invaders for the ZX Spectrum was the first program of its kind on the market for that computer and several others from the same company have been market firsts. A network of dealers has been set up, both nationwide and abroad (the USA and South Africa). All software comes with extensive documentation.

Stand no: 137
Cairnmark Ltd, 106 Church Road, London SE19 2UB. Tel: 01-771 3614

Details unavailable at press time.

Stand no: 269
Camputers Ltd, 36a Hills Road, Cambridge CB2 1LA.

The PCW Show will be the first public outing of the Lynx, the new home and small business computer from Cambridge-based Camputers. The Lynx incorporates a range of features normally associated with more expensive machines at a price of around £150 + VAT. With a 48k memory (expandable to 192k), proper typewriter keyboard and integral power supply, the Lynx has high resolution colour graphics and built-in speaker, making it ideal for games and educational use. Camputers will also be displaying a complete Lynx system with disk drives and printer.

Stand no: 408
CBL, 8 King Street Lane, Winnersh, Wokingham, Berks RG11 5AS.

Details unavailable at press time.

Stand no: 134
Caxton Software Ltd, Lading House, 10-14 Bedford Street, London WC2E 9HE. Tel: 01-379 6502

Caxton supplies an electronic card index with almost universal applications called Cardbox and a linear programming problem-solver (Optimiser) which will answer 'what if' questions using previously input data. Cardbox sells for £155 and will run on CP/M machines. Optimiser costs £295, running on Apple equipment.

Caxton is also on the look-out for experienced programmers with ideas for new packages. Caxton products are now sold worldwide through many different dealers and retailers.



Stand nos: 107, 266/278
Commodore Business Machines, 675 Ajax Avenue, Trading Estate, Slough, Berks. Tel: Slough 74111

Commodore will demonstrate a number of its new machines. The VIC will be on the stand with a range of software and accessories. On its business stand, software applications will be the order of the day, including Silicon Office, Prestel, accounting and word processing and many more.

Stand no: 305
Computer Ancillaries Ltd, 64 High Street, Egham, Surrey.

Details unavailable at press time.

Stand no: 110
Computer Bookshop, 30 Lincoln Road, Olton, Birmingham B27 6PA. Tel: 021-707 7544

Computer Bookshop is a wholesale supplier of microcomputer books, servicing the small computer industry via bookshops and microstores. Publishers represented include Sybex, Compusoft, Osborne/McGraw-Hill, Sams, Interface and Wiley and titles range from general programming to machine-specific books.

Stand no: 205
Computers For All, 72 North Street, Romford, Essex. Tel: 70 60725

Details unavailable at press time.

Stand no: 358
Comshare Ltd, 32/34 Great Peter Street, London SW1P 2AB. Tel: 01-222 5665

Details unavailable at press time.

Stand no: 267
Creative Computing, 39 E Hanover Avenue, Morris Plains, NJ07950, USA. Tel: 201-540 0445

Details unavailable at press time.

Stand no: 234
Database Publications Ltd, 68 Chester Road, Hazel Grove, Stockport, Cheshire SK7 5NY. Tel: 061-456 8383

Computer Dealer was launched in June this year as the first international trade newspaper for the micro industry. It covers all aspects of the micro marketplace and is produced to newspaper deadlines, which means it can take last-minute stories or advertisements right up to the day it goes to press. It is mailed first class to UK dealers and airmailed to dealers in the rest of the world.

Windfall is Britain's only Apple magazine, with contributions from some of Britain's leading Apple experts. It aims to show the Apple user how to make his micro more powerful and his programs more exciting, with in-depth features on the Apple's music, speech and graphics capabilities. Back numbers will be available on the stand together with a variety of Apple logo T-shirts, ties and necklaces.

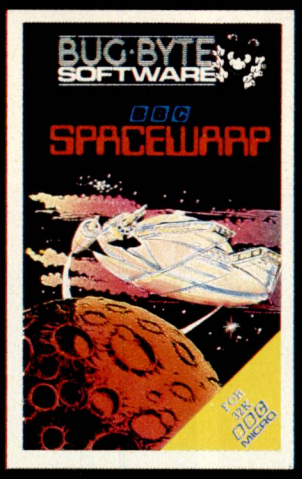
Stand no: 368
Datarite Terminals, 144/146 High Road, Chadwell Heath. Tel: 01-590 1155

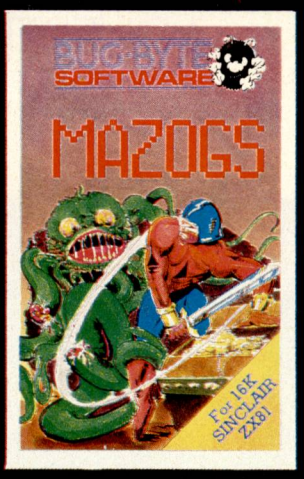
Details unavailable at press time.

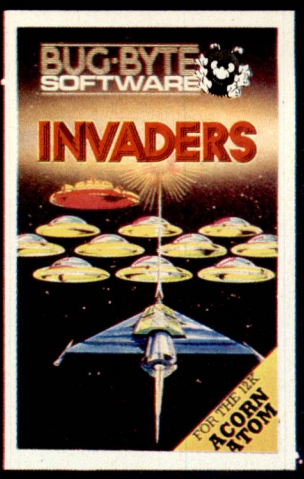
Stand no: 119
Decom Computer Supplies Ltd, James House, Welford Road, Leicester LE2 7AE. Tel: 02403 7540

Decom supplies everything you need in

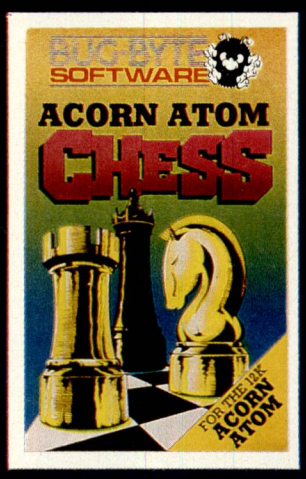


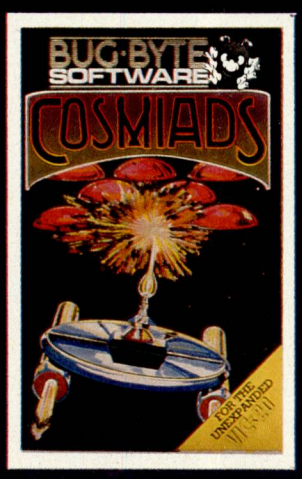


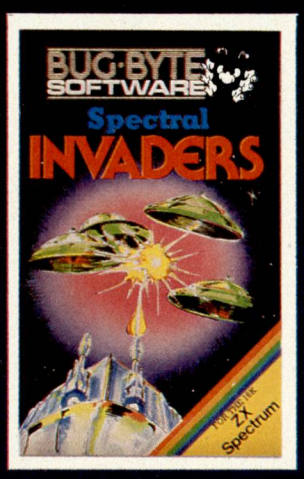


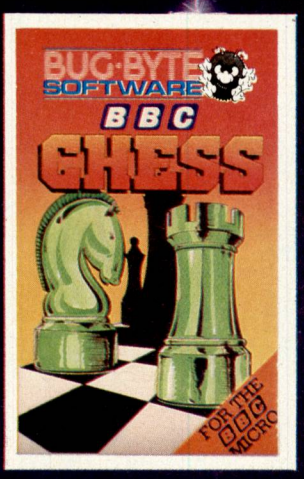


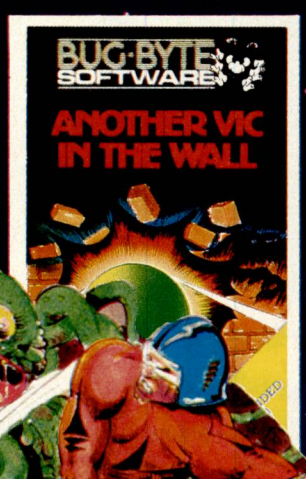
WHAT'S YOUR GAME?

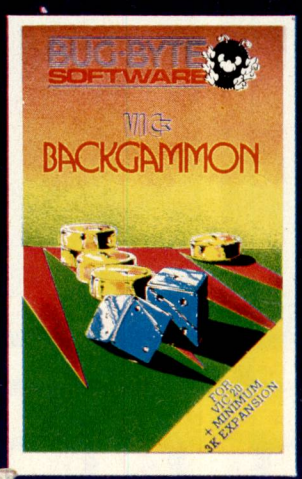




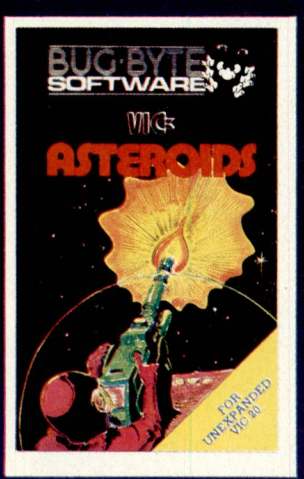












FOR OWNERS OF ZX81, SPECTRUM, BBC MICRO, ATOM, COLOUR GENIE, VIC.

Bug-Byte games are best sellers. Tens of thousands of contented customers testify to that, so do consistently hot reviews in the popular micro-press. If your game isn't shown, don't worry, we probably have more quality games for more machines than any other software house – we just couldn't fit them all in. Bug-Byte games are available at good computer shops everywhere, or direct from our Liverpool office.

BUG-BYTE SOFTWARE

FREEPOST (NO STAMP REQUIRED) LIVERPOOL L3 3AB.

PLEASE SEND ME FULL DETAILS, MY COMPUTER IS _____

NAME: _____

ADDRESS: _____

_____

_____

PCW/82

ATTENTION DEALERS! For special introductory pack send coupon and business card to Mark Butler

ADVERTISEMENT



BERGQVIST
& HOBBERSTAD
ENG. A/S

20-21 Herluf Trolles Gade,
1052 Copenhagen K., Denmark.
Telephone 451 133 188.
Telex 16031 berhab dk.
Trade enquiries welcome.

B+H

the way of supplies to run a computer system. Magnetic media, stationery, ribbons, labels and binders make up some of its product categories. Recently introduced is a surge corrector which will regulate the flow of mains electricity.

Stand no: 301
Digital Equipment Company Ltd, PO Box 110, Imperial Way, Reading, Berks. Tel: Reading 868711

Digital will display its new family of personal computers which comprise the professional 350 and 325 at the top of the range and the Rainbow 100 further down. The Rainbow is a twin-processor CP/M micro which will run both 8-bit and 16-bit software. All Digital's personal computers are equipped with the same full function keyboard, compact display monitor and system box containing disk drives and computer hardware. The Professional 350's extended system box can contain a 5¼in winchester type unit with 5 Mb of storage.

Stand no: 112
Dragon Data Ltd, The Mettoy Centre, Lodge Farm Industrial Estate, Northampton NN5 7DN. Tel: 0604 51075

This company has just launched its all-British home computer, the Dragon 32, designed with family learning in mind. It gives nine colours, a five-octave sound generator and 32k of user RAM for just £199.95. Arcade and adventure game software will be on display along with programming tutors which allow users to examine the structure of software.

Stand no: 456
Dynatech Microsoftware Ltd, Summerfield House, Vale, Guernsey. Tel: 0481 47377

If you are looking for a program to write your programs for you, Dynatech boasts a large range. This includes CORP and Codewriter. Dynatech also runs a holiday micro training school in Guernsey, using program generators with various micros. Some of these will be featured alongside the software on the stand.

Stand no: 360
East Central Business Machines Ltd, 139/147 Mile End Road, London E1. Tel: 01-790 9991.

Details unavailable at press time.

Stand no: 465
Eccleston Electronics Ltd, Legge Lane, Birmingham B1 3LG. Tel: 021-236 6220

Eccleston and Hart Ltd produces expanded polystyrene for packaging various components including computer parts. A business back-up system for providing an emergency power supply is also available.

Softcell Ltd produces and imports software and hardware from the USA for the Atari. It supplies RAM boards (guaranteed for four years) for upgrading both the 400 and 800. A perspex moulded case for Atari, VIC-20 and BBC computers can be bought to enhance the appearance and protect the machine.



Stand no: 231
Elcomp Publishing Inc, 53 Redrock Lane, Pomona, CA91766, USA

Elcomp will show its new products for the Atari, VIC-20, Apple II, Sinclair and OSI. These include a word processor, monitor and macro assembler for Atari, available on disk or cassette, plus many games, books and add-ons. The Elcomp Forth compiler will also be available for Atari and Apple II. Dealer enquiries are welcomed.

Stand no: 320
Electronic Aids (Tewkesbury) Ltd, Mythe Crest, The Mythe, Tewkesbury, Glos GL20 6EB. Tel: 0386 831020

Electronic Aids will be showing a range of sophisticated but competitively priced commercial software for the Commodore PET. The range includes accounting systems for companies with hundreds of employees and others specifically designed for the one-man business. All systems shown are in daily use and are supported with a thorough back-up service. Educational software and packages for school administration are also available.

Stand no: 233
Electronics & Computing Monthly, 67 High Street, Daventry, Northants. Tel: 03272 71702

Details unavailable at press time.

Stand no: 228
Electroware, Dutton Lane, Eastleigh, Hants SO5 4SL. Tel: 0703 610944

This company is a division of OK Machine & Tool (UK) Ltd, and will be exhibiting its range of connectors, cable, tools, PCBs, DIP sockets, enclosures and packaging accessories. Special offers will be made throughout the Show.

Stand no: 203
EMAP Business and Computer Publications Ltd, Petersham House, 57a Hatton Garden, London EC1N 8JD

Titles in the EMAP stable include Which Computer?, Computer & Video Games, What Computer?, Educational Computing and Which Micro? Specialist titles cover IBM, word processing and networking. All these magazines will be on sale on the stand, along with back issues, subscription details and special offers.

Stand no: 331
EMG National Microcentres, 2 Fleming Way Industrial Centre, Gatwick, Crawley, West Sussex. Tel: Crawley 519211

Offering more than just computers, EMG National Microcentres believes that the businessman is looking for a guaranteed solution rather than a 'do-it-yourself' micro. Its solution consists of in-depth training, a 12-month guarantee, on-site maintenance, system development services, long-term support and supplies.

In addition to all this EMG has a team of programmers who will write software tailored to exact requirements, as well as an extensive range of packaged software. It is backed by the British Rail Pension Fund and runs a national network of dealers.

Stand no: 405
Encotel Systems Ltd, 7 Imperial Way, Croydon Airport Industrial Estate, Croydon, Surrey. Tel: 01-686 9687

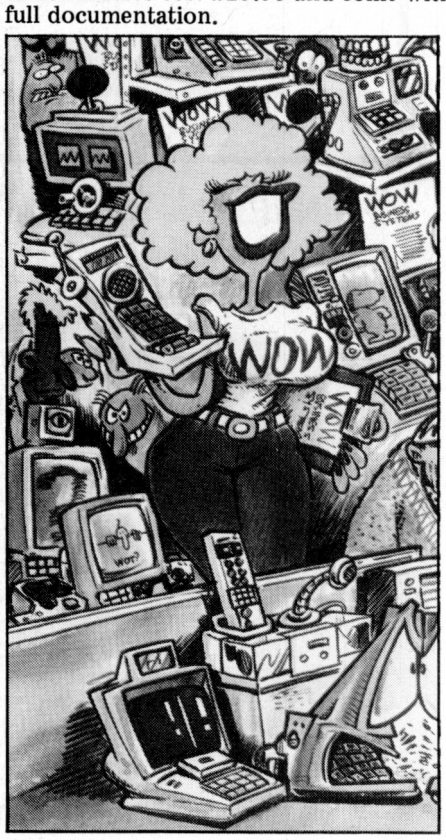
Details unavailable at press time.

Stand no: 321
Environmental Equipment (Northern) Ltd, Environ House, 64 Welsh Row, Nantwich, Cheshire CW5 5ES. Tel: 0270 625115

On display will be the complete range of A3 intelligent XY digital plotters and supporting software. The new WX4371 drum plotter will be featured. This has four pens, 43 intelligent functions and a pen speed of 200mm/second at a price of £1395. The WX4671 digi-plot will be on the stand along with the rest of the series and visitors will be able to test these plotters for themselves. All orders taken during the Show will be at a 10% discount.

Stand no: 153
Gemini Marketing Ltd, 9 Salterton Road, Exmouth, Devon EX8 2BR. Tel: 03952 5832

If you would rather not spend your cash on a disk drive and expensive disk-based software for a home computer, Gemini attempts to fill the software gap with cassette-based programs which will not make so much of a hole in your pocket. These run on such machines as the BBC Computer, VIC-20, MZ-80K, A & B, Atari and Spectrum, covering applications like accounts, stock control and database. Modules cost £19.95 and come with full documentation.



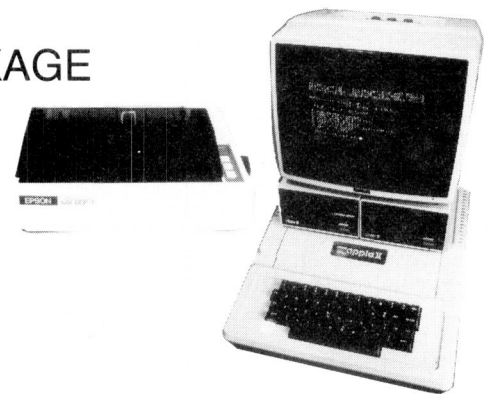
STOP HERE

APPLE SYSTEMS

WANT TO BUY AN APPLE][?

£550

HERE'S HOW!!!
PURCHASE OUR HARDWARE PACKAGE



HARDWARE
★ 48K APPLE][
★ DISK W/CONTROLLER
★ DISK W/OUT CONTROLLER
★ BMC 12" GREEN SCREEN HI RES MONITOR
★ MX80 F/T2 HI RES PRINTER
★ PRINTER INTERFACE

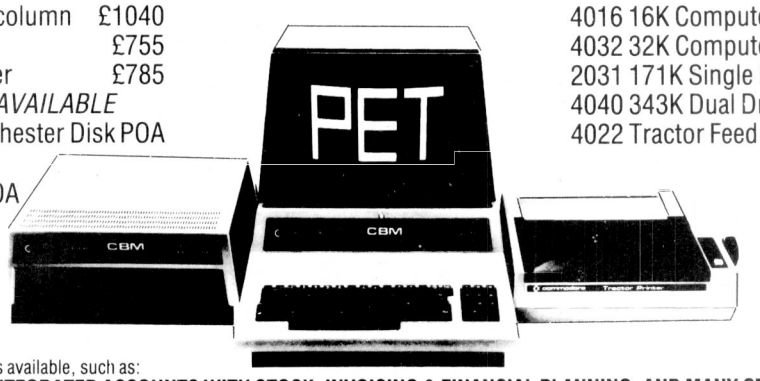
SOFTWARE AVAILABLE
INVOICING
PURCHASE/SALES LEDGER
PAYROLL
VISICALC
VISIDEX
VISITREND/VISIPLOT
WORD PROCESSING

HARDWARE PACKAGE PRICE £1699

PET SYSTEMS

Ideal for: YOUR BUSINESS • EDUCATION • WORD PROCESSING

8032 32K Computer 80 column	£755
8096 96K Computer 80 column	£1040
8050 950K Dual Drive	£755
8023 Tractor Feed Printer	£785
NEW PRODUCTS NOW AVAILABLE	
8422 22 Megabyte Winchester Disk	POA
9000 SuperPet 134K	
MULTI LANGUAGE	POA



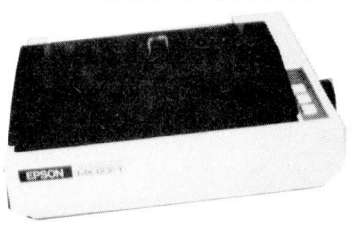
4016 16K Computer	£445
4032 32K Computer	£560
2031 171K Single Drive	£349
4040 343K Dual Drive	£560
4022 Tractor Feed Printer	£350

Choice of software packages available, such as:
WORD PROCESSING, INTEGRATED ACCOUNTS WITH STOCK, INVOICING & FINANCIAL PLANNING, AND MANY OTHER APPLICATIONS

LONDON'S MAIN EPSON DISTRIBUTOR

PRINTERS

TYPE III PRINTERS
NOW AVAILABLE



EPSON MX100 £480
15½" carriage, 254 columns, hi res graphics, true descenders, bi directional.

EPSON MX80 £320
Dot-matrix printer Pet and Apple compatible. True bi directional, 80 cps.

EP80 MX82 £355
As MX80 plus high resolution graphics, parallel and serial. Interfaces.

EPSON MX80 FT/1 £340
Dual single sheet friction and tractor feed, 9 wire head, true descenders.

EPSON MX80 FT/2 £380
An FT/1 with high resolution graphics.

SEIKOSHA GP100 £189
Dot matrix 5x7, 80 columns, 30 cps graphics, double width characters.

TERMS

All items carry 1 year guarantee parts and labour. Delivery at cost. All prices exclusive of VAT. Please add 15% VAT. Telex 22568. Offical orders welcome.
JUST PHONE FOR FURTHER DETAILS

VISA

CHROMASONIC electronics

48 JUNCTION ROAD, ARCHWAY, LONDON N19 5RD TEL 01-263 9493 263 9495 TELEX 22568

100 yards from Archway Station and 9 Bus Routes

Stand no: 348
Gemini Microcomputers Ltd, Oakfield Corner, Sycamore Road, Amersham, Bucks. Tel: 02403 28321

Details unavailable at press time.

Stand no: 359
Grundy Business Systems Ltd, Grundy House, Somerset Road, Teddington, London TW11 8TD.

On the Grundy stand will be the Newbrain personal computer, together with its associated peripherals. Developed in the UK, this micro is designed primarily for business users, but could prove to be useful to educational establishments and the enthusiast. All models offer 29k ROM and 32k RAM, the latter being expandable to 2Mb. The Newbrain will connect to a domestic TV.

Stand no: 128
Geoffrey Hoodless & Associates, 20 Leafield Close, St John's, Woking, Surrey GU21 3HW. Tel Woking 61082

'All-risk' computer insurance is this company's speciality. It also arranges maintenance cover for meeting the cost of hiring alternative equipment while existing equipment is repaired and has in its portfolio policies to cover the cost of maintenance itself. Requirements can be discussed on the stand.

Stand no: 118
Icarus Computer Systems Ltd, Deane House, 27 Greenwood Place, London NW5 1NN. Tel: 0202 295952

Icarus is the main UK distributor for the Superbrain and sole UK agent for the Columbia range of micros. Details on products for both of these will be part of its contribution to the Show. The Compustar hard disk system for the Superbrain will be exhibited. The Columbia range of CP/M and MP/M micros comes in a series of 320k to 80Mb, including a multi-user system for up to 16 users. There will also be details on products for these machines on the stand.

Stand no: 256
Ikon Computer Products, Kiln Lane, Laugherne, Carmarthen, Dyfed

This company manufactures a floppy tape system for the Nascom and will show this product along with others in its range. These will include a speech/sound synthesiser with a 15-bit user I/O port which can output either through a hi-fi system or through the system's own loudspeaker.

The 5th Personal Computer World Show

Stand no: 363
International Computers Ltd, ICL House, Putney, London SW15. Tel: 01-788 7272

Details unavailable at press time.

Stand no: 104
Intervisual Advertising Ltd, 22 Brook Street, London W1Y 1AE.
Tel: 01-499 2503

Details unavailable at press time.

Stand no: 121
IO Research Ltd, 6 Laleham Avenue, Mill Hill, London NW7 3HL.
Tel: 01-959 0106

This company will show its new range of colour graphic display controllers, the Pluto family. These will be demonstrated connected to a number of different micros. Also for the first time, the Pluto Palette will be displayed, giving the Pluto a wide range of colours. IO Research will also have details of its IONET local area network.

Stand no: 462
Jupiter Cantab Ltd, 22 Foxhollow, Bar Hill, Cambridge CB3 8EP. Tel: 0954 80437

The two founders of this company (originally known as Rainbow Computing) played a major role in the design of the ZX Spectrum. Their latest venture is the Ace, the first micro designed specifically to run Forth. It sells at £90 (all-inclusive) and contains 3k of RAM, a full size moving-key keyboard, an internal loudspeaker and user-definable high-resolution graphics. The 8k ROM drives a full Forth interpreter with integer and floating point arithmetic and an editing system specifically designed for running Forth on a small computer.

Stand no: 273
Kansas City Systems, Unit 3, Sutton Springs Road, Chesterfield S44 5XE.
Tel: 0246 850357

Details unavailable at press time.

Stand no: 106
Keen Computers Ltd, 5 Giltspur Street, London EC1. Tel: 01-236 5682

Keen is sole UK distributor for Corvus and will feature the Concept 16-bit micro which will function either as a single micro or as a workstation in the Corvus Omninet network. The Concept has an A4 size bi-directional screen which adds something in the way of ergonomic versatility and CP/M compatibility ensures access to a good selection of software.

Stand no: 123
KGB Micros Ltd, 14 Windsor Road, Slough, Berks SL1 2EJ. Tel: Slough 38581

Details unavailable at press time.

Stand no: 458
Kram Electronics Ltd, Victoria House, 17 Highcross Street, Leicester LE1 4PF.
Tel: 0533 27556

The Andromeda, a Z80 dual disk CP/M machine, will be launched at this stand. Designed for business use, this will be priced at £1299. Also on display will be Kram's disk drives which have not been unpopular over the past few months, along with the Olivetti Praxis 35 daisy-wheel printer. A TRS-80/Video Genie expansion box giving 32k of extra RAM, printer interface and disk controller should prove to be an attraction. Other products will be shown but details are unavailable at press time.

Stand no: 336
Laskys, Hardman House, The Hyde, London NW9 6JJ. Tel: 01-200 0444

Details unavailable at press time.

Stand no: 115
Level Ltd (Books), PO Box 438, Hampstead, London NW3 1BH.

Details unavailable at press time.

Scrabble Feature
Little Genius Ltd, Suite 504, Albany House, 324 Regent Street, London W1.
Tel: 01-625 5693

The Scrabble contest will run from this stand. Little Genius will be distributing the Scrabble package among dealers shortly, and it will be available from the first day of the Show — through Apple dealers only. Little Genius can, however, accept dealer orders for it at the Show.

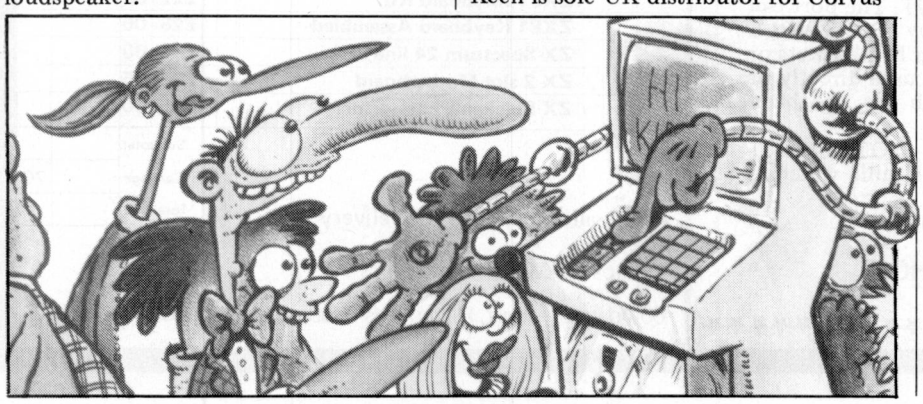
As a game it is modelled exactly on the original and has an extensive dictionary based on Chambers. It allows for all Scrabble-playing possibilities; it will give a list of letter values and square codes on request, as well as the option to see other players' racks. Projected retail price is £24.95.

Stand no: 347/349
London Apple Dealers, c/o Appletex, 7/8 Bedford Court, The Avenue, London W4. Tel: 01-995 5446

Details unavailable at press time.

Stand no: 355/357
Lowe Electronics Ltd, Chesterfield Road, Matlock, Derbyshire DE4 5LE.
Tel: 0629 4995

Details unavailable at press time.



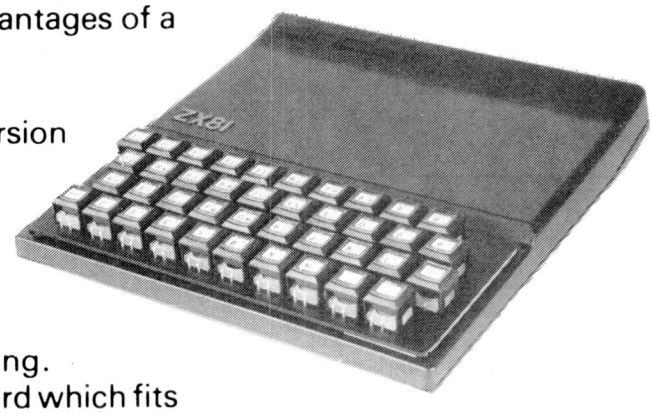
KEMPSTON MICRO ELECTRONICS

PRESENTING THE NEW . . .

ZX KLIK - KEYBOARD

IF YOU ARE like many ZX81 users and are fed up with the dead 'touch sensitive' key pad then consider the advantages of the new KEMPSTON KLIK-KEYBOARD. This is a genuine push button keyboard which has been designed as an exact replacement, being no larger than the existing key pad, but offering all the advantages of a full size keyboard. Consider these facts:

- Fits on to the ZX81.
- No soldering needed on the assembled version (just plug in)
- No trailing wires.
- No special case required.
- Positive feedback from keys.
- Full two colour legends supplied.
- Full back-up service offered, including fitting.



This is a genuine 40-key, push button keyboard which fits into the recess formed after peeling off the existing touch sensitive keypad.

The kit comes with a precision drilled P.C.B. finished in matt black, 40 keys, 2 colour legends, connecting tails, adhesive pads and a full set of instructions.

41 key version also available priced £23.00 (kit) £26.50 (built)

STOP PRESS – STOP PRESS– STOP PRESS

ZX Spectrum Hard Ware.
We are proud to announce that we have developed a 24 line Input/Output port built EXCLUSIVELY for the Sinclair Spectrum. The port makes use of the new Sinclair BASIC commands IN and OUT. The port can be configured in a variety of modes by ONE SIMPLE command. Output is via either 16 pin DIL sockets or edge connector. The new port can be used directly or with a 28 way Mother Board which has also been developed.

Note that this is DEFINITELY NOT a ZX81 MODIFICATION but a purpose built unit which is built and fully tested before despatch.

Please send a SAE for further details.

SEE US AT THE PCW SHOW

PCW9

Your Name and Address _____

Date

Quantity	Description	Unit price	Amount
	ZX81 Keyboard Kit	**£22 50**	
	ZX81 Keyboard Assembled	**£26 00**	
	ZX Spectrum 24 line PPI	**£16 50**	
	ZX 2 slot Motherboard	**£16 95**	
	ZX Stackable connector	**£ 5 50**	
		Sub total	
		Carriage	70
		Total due	

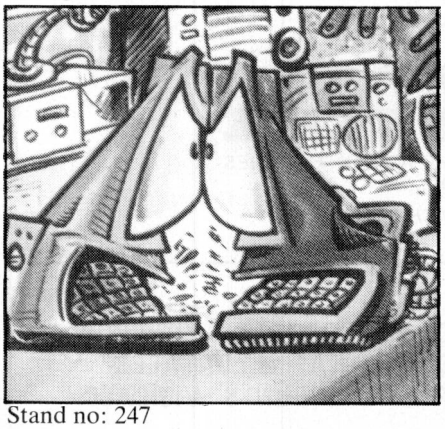
Please allow 21 days for delivery

Kempston Micro Electronics

60 Adamson Court, Hillgrounds Road, Kempston, Beds MK 42 8KZ

Stand no: 241
Macronics Systems Ltd, 26 Spiers Close, Knowle, Solihull, West Midlands B93 9ES. Tel: Knowle 3693

Macronics not only supplies 'flicker-free' games for the ZX80 but was also the first company to develop a disk drive for the ZX81. The ZX81 will be on the stand supporting both 5¼in and 3½in drives as well as some add-on boards. Software for all the Sinclair micros will be on demonstration throughout the Show.



Stand no: 247
Maplin Electronic Supplies Ltd, PO Box 3, Rayleigh, Essex. Tel (mail order): 0702 552911

Maplin will have eight Atari computers on its stand for you to use. Each will have a different piece of software running on it which you can try out or just watch. Over 150 different Atari software titles will be available and you will be able to browse through the entire library. Both machines and software will be on sale, together with Maplin's own ZX81 keyboard. Details of the Maplin free credit scheme can also be obtained.

Stand no: 224
Mapsoft Ltd, Unit A, Oak Road South, Hadleigh, Benfleet, Essex. Tel: 0702 554002

Mapsoft is a wholesale software distributor and will be displaying its range of software and hardware for the Atari computers. Old and new trade customers will be able to sit down and browse through the large number of items available and take away Mapsoft's excellent colour catalogue. Titles include the latest arcade and adventure games with superb colour graphics and a wealth of languages, utilities and educational programs. All titles are stocked in depth and the company's fast service and excellent trade discounts make this stand well worth a visit.

Stand no: 323
MC Computers, 8 Park Street, Newbury, Berks. Tel: 0635 44967

A range of I/O cards for Apple computers, a family of interface modules for IEEE-based systems (including serial to IEEE converters) and Pi — a specially packaged Apple II for use under harsh conditions — will be on display.

Stand no: 126
McGraw-Hill Book Co (UK) Ltd, Shoppenhangers Road, Maidenhead, Berks SL6 2QL. Tel Maidenhead 23432.

Details unavailable at press time.



Stand no: 235
Memotech, 3 Collins Street, Oxford OX4 1X2. Tel: Oxford 722102

On display will be Memotech's series of memory expansions for the ZX81. Four new products will also be available: the Memopak HRG (high resolution graphics) a Centronics type parallel printer interface, an RS232 and a plug-in keyboard.

Room has also been made on the stand for parent company Orchid Ltd, which will unveil the Orchid SM1, a hi-res colour computer with video frame handling facilities.

Stand no: 257
Micro Aids, 2 Boston Close, Culcheth, Warrington, Cheshire WA3 4LW. Tel: 092 576 2804

Micro Aids has a good range of accessories for the cleaning, protection and maintenance of computers and related equipment. This includes transport cases, covers and other environmental enhancements.

Stand no: 315/326
Microcomputerland, 172/174 Tottenham Court Road, London W1. Tel: 01-388 5011

Details unavailable at press time.

Stand no: 262
Microcomputer Printout Magazine, PO Box 2, Goring, Reading RG8 9LR. Tel: 049162 789

Details unavailable at press time.

Stand no: 105, 250/251
Microcomputer Products International Ltd, 8/11 Cambridge House, Cambridge Road, Barking, Essex. Tel: 01-591 6511

A well-established mail order company offering CP/M software, hardware, books and magazines, MPI is able to provide software for over 80 different machines. Over 70 proven systems will be on display and books and magazines will be available at special exhibition prices. Dealers and retailers can join the MPI National Dealer Network through formal registration.

Stand no: 413
Micros and Primary School Education, c/o Don Walton, 40 Home Farm Road, Houghton, Huntingdon, Cambs.

MAPE is a national organisation supported by the government in its aims to promote and develop awareness and effective use of microelectronics as an integral part of the philosophy of primary education. It has 14 regions covering the country and membership is available to any school or person with an interest in the application of microtechnology to primary education. MAPE publishes a journal, Micro-Scope, and can provide information on software, insurance, classroom practice and in-service training.

Stand no: 369
Microforecast, 31/33 High Holborn, London WC1V 6BD. Tel: 01-404 0564

Details unavailable at press time.

Stand no: 155
Micromark Ltd, Ravenscroft Road, Henley-on-Thames, Oxon. Tel: 04912 77926

Stand no: 132
MicroScope, 14 Rathbone Place, London W1P 1DE. Tel: 01-631 1433

Launching on 23 September, Micro-Scope will be the first fortnightly newspaper for the microcomputing industry, and will be available on subscription only to bona fide members of the trade. not the general public. It is designed to provide a trustworthy and up-to-date source of news. Anyone in the trade wishing to know more about either subscribing or advertising should call by the stand for a drink and a chat.

Stand no:
MicroValue Group, Interface Components Ltd, Oakfield Corner, Sycamore Road, Amersham, Bucks. Tel: 02403 22307

Two all-British micros will be on this stand — the Galaxy 1 from Gemini Microcomputers and the Quantum 2000 from Quantum Computer Systems. Both are Z80 machines using the Gemini Multiboard system and both run CP/M. They have double and triple disk drives respectively, offering 800k and 2.4Mb of storage. Software available includes CP/M 2.2, Comal-80, a Z80 assembler/editor, a text editing package and a machine code debugging aid. A business system written specifically for these machines (QUIBS) will be demonstrated at the Show.

Stand no: 131
Microwriter Ltd, 31 Southampton Row, London WC1. Tel: 01-831 6801

Microwriter will be showing the recently launched Microwriter Mk IV, a much-enhanced version of the hand-held word processing device operated through a single hand chord keyboard. With its internal rechargeable batteries and 8k of memory, the Microwriter can be used as a portable word processor; text can



L & J COMPUTERS

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

OFFICIALLY APPROVED COMMODORE DEALER

THE "PET" SPECIALISTS

GET THE BEST OF BOTH WORLDS!

WE CAN SUPPLY ALL YOUR 'PET' NEEDS AT CASH & CARRY PRICES

OR WE CAN SUPPLY INSTALL AND TRAIN YOUR STAFF AT THE NORMAL PRICE WITHOUT ANY EXTRAS!!

TRY US! YOU WILL NOT BE DISAPPOINTED

4016 16K Computer	£550	**£460**
4032 32K Computer	£695	**£575**
2031 171K Single Drive Floppy Disk	£395	**£350**
4040 343K Dual Drive Floppy Disk	£695	**£575**
4022 Tractor Feed Printer	£395	**£350**
8032 32K Computer	£895	**£750**
8096 96K Computer	£1195	**£995**
8050 950K Dual Drive Floppy Disk	£895	**£750**
8023 Tractor Feed Printer	£895	**£750**
8422 22 Megabyte Winchester Disk	£3495	**£3250**
9000 Superpel 134K Multilanguage Computer	£1495	**£3250**

TOOL KITS (BASIC 2 & 4), SUPERCHIPS...
AND ALL SORTS OF OTHER CHIPS

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

COME AND SEE THE NEW VIC-20

£165.00 FULLY WORKING AND OPERATIONAL

ASK US ABOUT ALL THE ADD-ON-GOODIES THAT GO WITH THE VIC...!

MASSES OF BOOKS ON THE PET & VIC

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

Send us a large stamped addressed envelope (12 x 9) and we will be delighted to send you all our current information
PRICES DO NOT INCLUDE VAT

PERSONAL SHOPPERS WELCOME
PHONE & MAIL ORDERS ACCEPTED.

ALL GOODS SENT SAME DAY WHEREVER POSSIBLE LARGE SAE FOR LISTS ETC.

YOUR QUICK-LEARN WAY TO BASIC OR COBOL

IN YOUR OWN HOME, IN YOUR OWN TIME, AT YOUR OWN PACE.

Learn computer programming quickly and easily through the renowned ICS "Open College" system, taking the course at your own pace and in your own time.

Use the famous ICS study texts, backed up by your own expert tutor, and learn computer programming, the proven way, with ICS home study.

Courses:

Introduction to Computer Programming
Programming in BASIC
Programming in COBOL



CACC Approved by CACC

ABCC Member of ABCC

ALL DETAILS FREE—SIMPLY RETURN THE COUPON BELOW

Please send me your prospectus on Computer Programming

Name _____

Address _____

_____

ICS School of Computer Programming

Post to: Dept 347Y
ICS School of Computer Programming
160 Stewarts Road,
London SW8 4UJ

Div. National Education Corporation

01 622 9911 (all hours)

SPECIAL OFFER

ZX81 ROM EXPANSION BOARD

FREE POWERFULL MACHINE CODE MONITOR IN 2K ROM

Lion Viewdata TV, announce a ROM expansion board for the Sinclair ZX 81. As an introductory offer a powerful advanced machine code monitor in 2K ROM is provided free for a limited period, with every board purchased.

The use of the ROM expansion board provides a simpler and inexpensive way of running programs using additional ROM's instead of time consuming and difficulties of cassette loading. Expansion ports are also provided for memory expansion and our Lion MXV07 Prestel adaptor which gives the additional facilities to the ZX81 of Prestel, unlimited Telesoftware and Autodial Memory Push-button dialing facilities for under £50.

The monitor ROM provided is a powerful advanced machine code monitor which debugs programs in preparation, displays memory, flags etc. in a versatile user friendly way *and in Hex*. Other programs will be available soon or, users can avail themselves of our ROM services — 12 hrs if you use a Prestel adaptor — for their own programs.

The ROM expansion is very easy to use it simply plugs into the rear edge connector and takes 2K or 4K ROM's 2716, or 2732. Additional memory can be added if required.

LION VIEWDATA TV
18 Harcourt Terrace London SW10
01 373 5218

s.a.e. for further details please.

be printed out on any printer with an RS232 interface or can be up- or downloaded to or from a word processing system or microcomputer. A video interface is available to allow on-screen editing and text can be saved onto cassette through the integral tape interface.

Stand no: 137
Mind Your Own Business, 106 Church Road, London SE19 2UB. Tel: 01-771 3614

Mind Your Own Business is the only UK business magazine with editorial consistently devoted to the understanding, selection and use of computer systems. Regular articles are carried on the PET and Apple, and a series is being published on CP/M and various compatible business packages.

Stand no: 201
Mine of Information Ltd, 1 Francis Avenue, St Albans, Herts AL3 6BL. Tel: 0727 52801

Mine of Information is an established bookseller and consultancy specialising in personal computers. Their 'top 100' book list serves as a guide to the books which are up to date and good value for money. MoI also markets a game called 'MoI Othello' for ZX81. Versions of this game for ZX Spectrum and the BBC Computer will also be available.

Stand no: 334
Molimerx Ltd, 1 Buckhurst Road, Town Hall Square, Bexhill-on-Sea, East Sussex. Tel: 0424 220391

Among other packages for the TRS-80 and Video Genie, Molimerx will introduce SMAL-LDOS, a subset of its operating system LDOS. This will be available with a price reduction voucher against the purchase of LDOS itself. An update to its AJEDIT word processing system will be introduced.

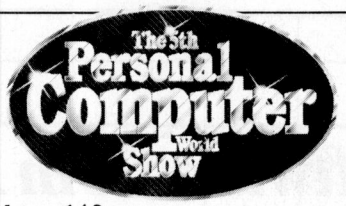
Stand no: 129
Nascom Microcomputers, Lucas Logic Ltd, Welton Road, Wedgnock Industrial Estate, Warwick CV34 5P2. Tel: 0926 497733

Details unavailable at press time.

Stand no: 124
The NCC Microsystems Centre, Oxford Road, Manchester M1 7ED. Tel: 061-228 6333

The aims of the Microsystems Centre are to inform and educate businessmen on the applications and potential of microcomputing and to encourage its use in improving efficiency and competitiveness.

The Centre provides a number of one or two-day training courses, a consultancy service, a bookshop and a workshop where prospective buyers can examine software and computers free of charge. Annual subscription costs £50, including a starter pack comprising an hour-long advisory session and a cassette course on choosing a small business computer. Quarter-hour consultancy sessions are being offered to businessmen at the Show free of charge.



Stand no: 140
NEC Telecommunications Europe Ltd, NEC House, 164/166 Drummond Street, London W1P 3HP. Tel: 01-274 7122

Personal computers, including the 8000 series, are NEC's main concern. One system on show will be the Benchmark word processing package which offers full word processing capability on a micro with full colour graphics and the NEC Spinwriter thrown in for less than £4000. A new, winchester-based, networking/mass storage system compatible with existing PC-8000 CP/M software will make its public debut.

Stand no: 410
Newnes Technical Books, Borough Green, Sevenoaks, Kent TN15 8PH. Tel: 0732-884567

(see Practical Computing)

Stand no: 228
OK Machine & Tool (UK) Ltd, Dutton Lane, Eastleigh, Hants SO5 4AA. Tel: 0703 610944

OK will be showing its wide range of electronics hardware, including bench tools, soldering irons, wire-wrapping kits and tools, IC tools, PCBs, cases, enclosures, connectors, sockets and test instruments. The full range of products is distributed throughout the UK by leading electronic and computer stores, and a free 48-page Electroware catalogue is available.

Stand no: 255
Opus Supplies Ltd, 10 Beckenham Grove, Shortlands, Kent BR2 0JU. Tel: 01-464 5040

The Opus range includes Athana disks (which are provided with free library cases for safe storage), lockable filing boxes to hold 40 or 80 disks, disk mailers, head cleaning kits, ribbons and listing paper.

Computer desks are among the new products from Opus, and dynamic and static RAM and EPROM chips will be sold at competitive prices.

Stand no: 362
Peachtree Software International Ltd, 43/53 Moorbridge Road, Maidenhead, Berks SL6 8LT. Tel: 0628 32711

Peachtree is a part of MSA, the mainframe software company. It markets and supports accounting and office productivity systems. Two ranges of accounting systems are available. One is written in MBasic and the other in CIS Cobol. Products are available on most leading micros under CP/M, CP/M-86, MP/M, MSDOS and Unix operating systems.

Stand no: 345-366, 275
Personal Computers Ltd, 218 & 220/226 Bishopsgate, London EC2M 4JS. Tel: 01-377 1200

Personal Computers is the oldest Apple dealer in the UK and will be showing Apple II and III. Plenty of application software will be demonstrated, with the emphasis on business. Personal's new tax package, Taxpayer*1, will be on the stand — this is designed for the professional accountant and for personal data analysis. Other applications will include financial modelling, graphics, banking and commodity analysis.

Stand no: 346
Pete & Pam Computers, Waingate Lodge, Waingate Close, Rossendale, Lancs BB4 7SQ. Tel: 0706 227011

600 lines of Apple related products is this company's boast. A distributor for over 50 software and hardware companies, including Epson, NEC, On-Line Systems, Micro Pro, Microsoft, Sirius Software and Zenith — to name a few — the company aims to provide prompt delivery, personal service and sound advice.

Stand no: 202
Phoenix Marketing Services, Oaklands House, Solartron Road, Farnborough, Hants GU12 9QL. Tel: 0252 514990

Details unavailable at press time.

Stand no: 352
Phoenix Technology, 158 Camberwell Road, London SE5 0EE. Tel: 01-701 8668

A selection of European colour and monochrome monitors will be on show from Phoenix. These come in a range of sizes from 9in to 14in; there are also differing resolutions. Monochrome monitors can be bought with either a white or green phosphor and buyers can choose between a metal or plastic case.

Stand no: 445
Power International Ltd, 146a London Road, North End, Portsmouth, Hants PO2 9DJ. Tel: 0705 699031

This company will be introducing a new selection of power conditioning and distribution products for the electronic office. For the home user this includes a mains plug with built-in interference filter which replaces the conventional plug to give protection against interference present in the mains electrical supply.

Stand no: 100
Power Testing (Sales) Ltd, 137a High Street, Brentwood, Essex CM14 4RX. Tel: 0277 220617

On show at this stand will be the Power Bank, a mains voltage regulator which will alleviate the possibility of damage to computers or software from mains irregularities. The unit requires no maintenance and micro and printer simply plug into it.

Stand no: 410
Practical Computing/Your Computer, IPC Electrical-Electronic Press, Quadrant House, The Quadrant, Sutton, Surrey. Tel: 01-661 3500

Newnes Technical Books will be selling

Outstanding Software from Apple Orchard

Six quality products to help you make the most of your Apple

PROTECT YOUR SOFTWARE INVESTMENT
With Copy II Plus

Copy II Plus gives you the power to make back-up copies of most of the "protected" software packages currently available.

INSURANCE
With Copy II Plus you can protect your valuable software investment. Make back-up copies of Visicalc, DB Master, the Apple Special Delivery range, and many more; keep your originals safely locked away from the wear and tear of everyday use.

EASILY PAYS FOR ITSELF
While some software companies offer replacement of expensive damaged diskettes, many do not. With Copy II Plus you eliminate the time, expense, and worry of costly accidental damage to your valuable software.

£50

THE FILER
a new Apple Disk Utility

SAVE TIME
Fed up wasting valuable time waiting for disks to copy? With the FILER's fast and accurate copy program you can make completely reliable back-up copies of your disks in 35 seconds. The FILER is ideal for backing-up your data disks, and for copying all unprotected disks.

OTHER FEATURES
The FILER package also contains a disk drive speed check, a disk drive test, and a sophisticated file manager. Options include: Catalog with space on disk, Copy Files, Copy DOS, Delete, Lock and Unlock Files, and Change Booting Program (name and filetype).

£16

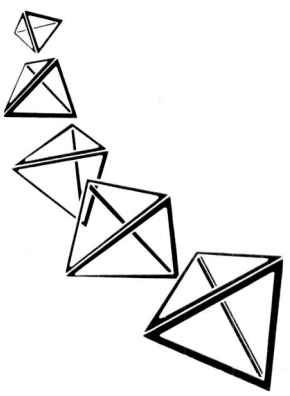
Electric Duet

from insoft

– the only music synthesiser for the Apple that plays two part music without the need for expensive extra hardware.

£20

GraFORTH The Apple Graphics Language



The Apple Graphics language from insoft – specially created to get the most out of the graphics capabilities of your Apple.

- draws 3D images in colour, at rates that make animation easy
- user defined character sets (any size, colour or typeface)
- text and graphics can be mixed on any part of the screen
- music can be included in programs
- excellent manual shows how to use the full capabilities of the system.

Ideal for entertainment software development, scientific and educational uses, and any application where sophisticated graphics are required.

Demo available for £4 (refunded if you buy).

£50

THE HOME ACCOUNTANT

A comprehensive and powerful Personal Financial system.

Runs up to 5 cheque-books, cash, and credit cards • Up to 100 budget categories • Flag taxable items • Graph actuals v. budget • Easy-to-use – less than an hour a month to maintain • Demo available for £4.

£55

THE GENERAL MANAGER

The latest quality product from On-Line Systems, The General Manager is a true hierarchical database – not just a file manager. Use it for anything from a simple names and addresses file to a complex customer accounts system.

The General Manager offers all the features you expect from a database program, and more:–

- Hierarchical structure gives greater efficiency in data storage and retrieval.
- Retrieve information on several sort criteria, industry and/or searches.
- Full range of calculation abilities, including logical operators.
- The powerful data access commands provided by the Applesoft interface enable you to input or output data to and from Applesoft Files. Information can also be selected and written to text files.
- Data can be spread over 100 disks on 1-4 disk drives.
- Expand or change your database with no loss of data.

A demo disk costing £4 is available, describing these features in more detail.

£79

All products require Apple II 48K, DOS 3.3

Prices exclude VAT – please add 15%. We accept Access and Diners Club. Dealer enquiries welcome.

Please send cash with order, or phone or write for more details to:–

Apple Orchard Ltd (Dept S)
17 Wigmore Street
London W1
Tel: 01-580 5816



personal computing books for hobbyists, technicians and students. New books announced at the Show will include Computing Is Easy, a book for younger ZX81 users.

Sharing the stand with Newnes will be two of Britain's best-known personal computer magazines. Practical Computing offers programming advice, machine and software reviews and application articles for a professional and business audience. Your Computer is designed for those who are acquiring computers costing less than £300, such as the BBC Computer, ZX Spectrum, ZX81, VIC-20 and Acorn Atom. Both magazines will be selling current and back issues at the Show.

Stand no: 237
Premier Publications, 208 Croydon Road, London SE20 7YX.
Tel: 01-659 7131

Permier Publications will be displaying its current range of UK101/Ohio/TRS-80/Video Genie enhancements, including low-cost microdrives and disk controller cards, disk operating systems, screen enhancements and Basic enhancement firmware products. An important new range of UK101/Ohio hardware will be exhibited, including a 512x256 high resolution graphics card, a colour board giving 16 foreground and background colours, and a 256-character programmable character generator with software-selectable enhancements. New firmware products including a superb assembler/editor will be on show.

Premier's highly successful daisywheel word processing system based on WordPro4 Plus will be displayed, together with the Premier hardware and software range for the TRS-80 and Video Genie families including, hopefully, a colour Genie.

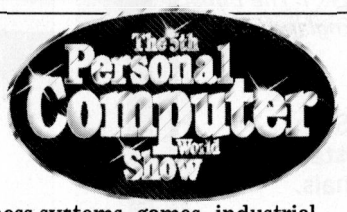
In association with Kram Electronics, Premier is developing a new disk-based system for the hobbyist, educational, scientific and business markets, based around the 6502 with other processor cards becoming available. All user software will be booted up from disk on startup. The system includes 512x512 graphics, modem, sound generator, facilities for colour and many other features. A pre-production unit will be displayed and Premier's staff will be on hand to answer your queries.

Stand no: 354
Prentice Hall International, 66 Wood Lane End, Hemel Hempstead, Herts HP2 4RG. Tel: 0442 58531

From a good selection of microcomputer books, several new titles will be displayed, dealing with many aspects of personal computing. Titles on the BBC Computer, Apple, PET, VIC, TRS-80 and Atari will be included. There will also be books available on programming languages, operating systems and other subjects.

Stand no: 130
Rade Systems Ltd, 53-55 Ballards Lane, London N3 1XP. Tel: 01-349 7411 (4 lines)

This company is a London-based manufacturer of advanced microcomputers. The Rade single board computer has proved to be suitable for several applications, including small to medium



business systems, games, industrial control and research and development. Each board is configured to run under CP/M 2.2. A range of add-on boards contributes to the overall flexibility of the system.

Stand no: 260
Radio & Electronics World, 200 North Service Road, Brentwood, Essex.
Tel: 0277 213819

Details unavailable at press time.

Stand no: 138
Research Machines Ltd, Mill Street, Botley Road, Oxford OX2 0BW.
Tel: 0865 49866

Details unavailable at press time.

Stand no: 117
Riva Terminals Ltd, Woking Business Park, Albert Drive, Woking, Surrey.
Tel: Woking 71001

Having previously specialised only in the distribution of printers and displays, Riva Terminals will be showing, for the first time, the Episode Type 1 microcomputer. This full-feature 8-bit computer with 64k RAM and two 5¼in disk drives is supplied in an attractive plastic case which takes up no more desk space than a sheet of A4 stationery. Weighing only 15lb, it will work with all types of printer or display and can be supplied with most industry standard CP/M software. Every Episode is supplied with CP/M 2.2 and Supervyz, a program which makes CP/M more user-friendly by changing its commands into a series of menus. Supervyz is available for any popular CP/M machine and the Episode will retail for less than £1000.

Stand no: 320
Roadrunner Electronic Products Ltd, 116 Blackdown Rural Industries, Haste Hill, Haslemere, Surrey GU27 3AY.

Roadrunner is a manufacturer and distributor of a wide range of electronic and computer-related products. Its large stock holdings enable it to give a 'same day' service on most items.

Its product catalogue will be available at the Show, featuring a good selection of circuit board and enclosure accessories. The main exhibit will be the Roadrunner wiring system and an introductory kit will be on sale from the stand. Roadrunner will also be introducing a group of branded word processing products.

Stand no: 210
SBD Software, 15 Jocelyn Road, Richmond, Surrey TW9 2TJ.
Tel: 01-948 0461

SBD imports and distributes Apple and Atari from the USA using many different suppliers. UK software can also be obtained through this company. Products cover applications such as word processing, database management and financial planning aids. Games and hardware add-ons are also on its stocklist. At the Show SBD will run a games competition in which a prize goes to the highest scorer on the 'game of the day'.

Stand no: 309
Sharp Electronics (UK) Ltd, Sharp House, Thorp Road, Manchester M10.

Sharp will be exhibiting its well-known range of micros and pocket computers. The new MZ-80A personal computer, based on the Z80 processor chip, will be a feature as will be the more upmarket MZ-80B.

The PC1500, with an RS232 interface, incorporating 16k of ROM, a qwerty keyboard and 3.5k to 7.5k of RAM, retails at £179.95. An add-on four-colour printer/cassette interface is also available.

The PC3201 business computer is now available with CP/M 2.2. Implementation of this consists of a relocate board which relocates the PC3201 monitor ROM and replaces it with dynamic RAM. The computer comes with a financial modelling package and retails at £2,995.

Stand no: 252
Sinclair Research Ltd, 23 Motcomb Street, London SW1X 8LB.
Tel: 01-235 6949

Sinclair will be showing the recently launched ZX Spectrum personal computer and also giving one of the first public presentations of a new range of Spectrum cassette-based software. The Spectrum features full colour graphics, enhanced Sinclair Basic, sound generator and a moving-key keyboard. Sinclair will also be showing the ZX81 together with the RAM pack and ZX Printer.

Stand no: 452
Small Systems Engineering Ltd, 2/4 Canfield Place, London NW6 3BT.
Tel: 01-328 7145

This stand will feature a range of products for the Sirius 1. The Sirius 80 card plugs into one of the expansion slots, allowing all standard CP/M-80 programs to be run. The low-powered 256k RAM card gives extra RAM space and includes a utility which allows the card to be used as a disk drive.

A range of CP/M software is available for both the Sirius and the PET, together with a selection of PET peripherals which will include the Flowriter intelligent daisywheel printer.

Stand no: 248
Southern Software, PO Box 39, Eastleigh, Hants SO5 5WQ.

Launched at the Show will be Southern Software's database manager for TRS-80 and Video Genie, Electronic Notebook. Features of this system are retrieval on any field, menu-driven data entry and retrieval and a programmer interface to Basic. In addition, the ACCEL3 compiler and full screen editor will be demonstrated.

Stand no: 108
ST Commercial Systems Ltd, 26 New Broadway, Ealing, London W5 2XA.
Tel: 01-840 1926

Details unavailable at press time.

SOUND TRAINING

CP.SOUND TRAINING: 1 The Elms, Tillington, Hereford, England (0432 279404)

WE'VE GOT IT TAPED. . !Step-by-Step AUDIO TRAINING. . . Designed, tested and produced by training professionals.

Learn on YOUR OWN MICRO. . . in YOUR OWN OFFICE. . . and at YOUR OWN SPEED.

Two standard AUDIO CASSETTES, talk you through WORDSTAR. . . Backed up by a TRAINING MANUAL for quick reference and revision. . . A set of JOB AID CARDS and a set of CHECKLIST CARDS to prompt and guide you as you build your confidence. The COMPLETE SOUND TRAINING.

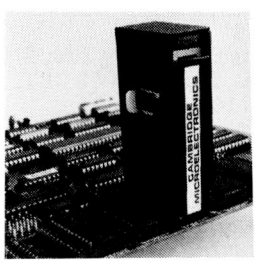
WORD PROCESSING WITH **WORDSTAR**®

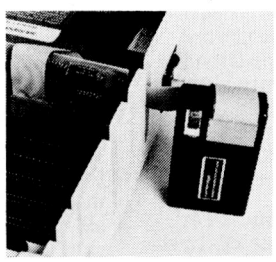
Our INTRODUCTOR PRICE £65 (plus £11.32 VAT and P&P) (Payment with order please)

Distributor enquiries welcomed.

® Wordstar. . a trademark of Micropro International Corp', San Rafael, California.

MEMIC T1618 L1424 — 2 kilobyte CMOS RAM with battery backup





T1618 1.42" x 2.92" x 0.8" L1424 2.4" x 4.0" x 1.02"

MEMIC is a family of CMOS memory units with integral batteries, making them directly pluggable into most EPROM/ROM and byte wide RAM sockets. Data can be written into MEMIC even when plugged into a ROM/EPROM socket by using the fly-lead R/W connector provided. Two versions cater for either restricted board space or restricted height situations. No hardware or software changes are required.

- 2K x 8 Organisation
- Towerblock model (T1618) for minimum board space
- Low-Profile model (L1424) for stacked daughter boards
- Replaces most popular 24 pin ROMs, EPROMs & byte-wide RAMs
- Fast, Static RAM. Better than 200nSec access time
- No special signals or software required to save memory
- TTL compatible Inputs & Outputs
- Lithium primary battery (L1424) or Rechargeable NiCd, battery back-up
- Low Operating Power Dissipation
- Very low power standby gives months of non-volatility
- Battery ON-OFF switch (L1424)
- Hi-K, Lo-K, 2K switch selectable
- Switchable CS for taking into Standby
- Low Cost, Low Power, Small Size
- Supplied with Clear User Instructions
- One year parts warranty

£29.95 incl.

CAMBRIDGE MICROELECTRONICS LTD
One Milton road Cambridge CB4 1UY
(0223) 314 814

TRUE 16 bit!



Olivetti M20

Q. When is a 16 bit computer not a 16 bit computer?
A. When it only has an 8 bit data bus. Eg. 8088 cpu.
Q. Why buy a 16 bit computer that is not true 16 bit?
A. You tell us! It appears many people are doing just that. But now they have a real choice at a sensible price with the introduction of the new Olivetti M20.
Q. High Resolution Graphics?
A. The M20 has S12 x 256 bit-mapped graphics as standard, and they may be mixed with characters. The screen can also be split into up to 16 independent windows for multiple comparisons of data.

The colour model provides even more effective graphics.
Q. Speed?
A. Substantially faster than the "half" 16 bit micros, inevitably it is also a lot quieter. Z-8001 cpu.
Q. Software?
A. A wide range of business, scientific and engineering programs will be available in a matter of weeks for the official launch. M-Basic 5.2 is supplied as standard.
Q. Servicing?
A. Nationwide through Olivetti Engineering.
Q. Finance?
A. Leasing and rental through Olivetti Finance.
Q. Where can I get one?
A. From us, we can demonstrate right now.

OLIVETTI M20 — a classic 16 bit microcomputer from the small business computer experts for no more than the price of a Sirius.

M20D: 160K RAM, Dual disks, monochrome	£2395
M20C: 192K RAM, Dual disks, colour	£3262
M20S: 128K RAM, single disk, monochrome	£1895

Brighton Computer Centre

130 LEWES ROAD
BRIGHTON BN2 3LG
(0273) 688946
MON-SAT 10AM-6PM

Stand no: 304
Stirling Microsystems Ltd, 241 Baker Street, London NW1. Tel: 01-486 7671

Details unavailable at press time.

Stand no: 114
Supersoft Ltd, 1st Floor, 10-14 Canning Road, Wealdstone, Harrow, Middlesex. Tel: 01-861 1166

Details unavailable at press time.

Stand no: 103
Systematics International Microsystems Ltd, Cleves House, Hamlet Haverhill, Suffolk CB9 8EE. Tel: 0440 61121

S I Microsystems will exhibit packages from its wide range of business software. These are written for many different micros and are in use all over the world. Packages can link together to form a suite or be used individually.

Stand no: 364
Systime Ltd, Concourse Computer House, 432 Dewsbury Road, Leeds LS11 7DF. Tel: 0532 702211

Details unavailable at press time.

Stand no: 402
TABS Ltd, Sopers House, Chantry Way, Andover, Hants. Tel: 0264 58933

Details unavailable at press time.

Stand no: 313
Tandy Corporation, 10-12 Floor, Thameway Tower, Bridge Street, Walsall, W. Midlands. Tel: 0922 648181

Tandy's new 16-bit micro, the Model 16, will be the star of the company's stand, but Tandy is unveiling a whole range of other new products: the DTI data terminal, a low-cost terminal; a double density disk drive kit for the Model I; a high resolution graphics board kit for the Model II plus an upgrade board to give the II 128k of RAM; a new range of printers including low-cost dot matrix, daisywheel and plotter printers; and a large range of new business, educational and home software.

Tandy will also have a whole classroom of networked Model IIIs with instructors on hand to answer education-oriented questions.

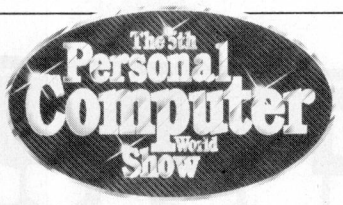
Stand no: 122
Telemap Ltd (Electronic Insight), Bushfield House, Orton Centre, Peterborough PE2 0UW.

Details unavailable at press time.

Stand no: 220/242
Texas Instruments Ltd, MS36 Manton Lane, Bedford. Tel: Bedford 3496

Texas will be at the Show for the first time this year, armed with the TI99/4A home computer. The new TI88 programmable calculator will also be on display (for the first time in the UK).

A new peripheral expansion system and speech synthesiser will be demonstrated for the TI99/4A. Visitors will be able to investigate different programming languages as well as other examples of the capabilities of home computers.



Stand no: 342
Thame Systems Ltd, Thame Park Road, Thame, Oxfordshire.
Tel: Thame 4561

Details unavailable at press time.

Stand no: 239
Timedata Ltd, 57 Swallowdale, Basildon, Essex SS15 5BZ. Tel: 0268 411125

Timedata will be showing its latest selection of books and software for the ZX81 and Atom, including The Explorers' Guide to the ZX81 and a new publication, Exploring Spectrum Basic. The company's Eurocard RAM boards for Atom and other 6502/65XX based machines will be on display.

Add-ons for Apple are also available from this company and details of all products will be available on the stand.

Stand no: 151
Tomorrow Micro Systems, 2 Bridge Street, Hadleigh, Ipswich, Suffolk.
Tel: 0473 823698

East Anglia-based Tomorro Micro Systems will demonstrate complete business systems, utilising M/A-COM OSI Keyfamily microcomputers. Networking and timesharing will be features of these machines.

Software to cover most major business requirements will be 'up and running', including software for security and environmental control. Staff will be on hand to answer questions and discuss problems.

Stand no: 325
Transam Computers Ltd, 59/61 Theobalds Road, London WC1.
Tel: 01-405 5240

Details unavailable at press time.

Stand no: 125
John Wiley & Sons Ltd, Baffins Lane, Chichester, West Sussex PO19 1UD.
Tel: 0243 784531

Now in its 175th year in publishing, John Wiley will display much of its large selection of computer books and software. Titles cover all levels and aspects of computing.

It is hoped that their first software products for IBM and Apple will be demonstrated and details of a new book by Tim Hartnell on the ZX Spectrum will be forthcoming. Wiley looks forward to meeting dealers, distributors and potential authors.

Stand no: 367
X-Data Ltd, 750/751 Deal Avenue, Slough Trading Estate, Slough, Berks.
Tel: 0753 72331

Three new Oki printers will be on this stand for the first time. Two are the latest additions to the Microline series. Both offer high-resolution graphics and NLQ print. No details are yet available on the third printer.

Other recent products to be shown by X-Data are the Kitten and the Sphinx, two mini-winchester disk subsystems. These have host adaptors available for Apple, LSI, Multibus, S100, TRS-80, PET, IBM and others. The Microline 84 136-column printer and the Remex RFD960 mini disk drive which provides storage capacity of 1 Mb per disk will also be there.

Stand no: 302
Ulster Management Centre, Manor House, Rathlin Island, Ballycastle, Co Antrim. Tel: 02657 71220

A range of management and business training software will be on show at this stand, demonstrated on the Apple II. The software is well documented and varies from straightforward self-assessment programs for management evaluation to a sophisticated 'business game generator' and a management trainers' 'Micropak'.

Subjects covered range from finance to interpersonal skills, industrial relations to marketing methods and concepts. Over 20 new packages will be available for perusal with the added bonus that each purchaser during the Show will receive a free entry to the Centre's competition. Non-purchasers can buy a copy of the 'Software Riddle' for £10.

Stand no: 335
VNU Business Publications, 62 Oxford Street, London W1. Tel: 01-636 6890

VNU will feature its microcomputing titles at the Show (now including *Personal Computer World*). There will also be one forthcoming publication, Computer Answers, which will be launched in November and will have leading experts to answer your queries. What Micro?, launched in May, provides a useful Buyers Guide, drawn from a database system. The next issue will be in November. MicroDecision, now well-established in its market, will also be available.

Stand no: 136
Wadsworth Electronic Publishing Company, 10 Davis Drive, Belmont, CA 94002, USA.

WEPCO is a new publishing company which aims to provide up-to-date information for the computer world. Education will be a priority, mainly at a higher and secondary level initially, but expansion outside the classroom is planned, not only into the home but also into business and industry. Computer user publications will also be produced. Prospective authors will be welcome.

Stand no: 101
Westrex Company Ltd, Bilton Fairway Estate, Greenwood, Middlesex UB6 8PW. Tel: 01-578 0957

Westrex will be showing its Pasca 640 Z80 CP/M micro. This comprises a 12in VDU, twin 8in floppy disk drives and serial and parallel I/O ports. A 20 Mb winchester system will be demonstrated working with a Pasca. As a leading distributor for Epson products, the company will be exhibiting the complete range and offering special prices for orders taken at the Show. END

Software for CP/M™

MICROPRO

		£
WORDSTAR	MICROPRO's comprehensive word processing system	250.00
MAILMERGE	Added power to WORDSTAR for mailing lists, standard letters, etc	60.00
SPELLSTAR	Dictionary on a disk for WORDSTAR spelling checking	120.00
DATASTAR	MICROPRO's data entry, validation and retrieval system	170.00
SUPERSORT I	Sorting, extracting and merging at high speed from MicroPro. Includes Relocatable version for inclusion in your own software	120.00
CALCSTAR	MICROPRO's spread sheet and financial modelling system. Combine with WORDSTAR to get impressive end results.	150.00
WORDMASTER	Video text editor for programmers and simple Word Processing	60.00

MICROSOFT

		£
BASIC-80	MICROSOFT's popular and powerful BASIC Interpreter (MBASIC)	150.00*
BASIC Compiler	Compile your BASIC-80 programs for speed and protection	190.00*
FORTRAN-80	Fortran compiler to ANSI X3.9 1966 except COMPLEX data	210.00*
COBOL-80	The COBOL compiler for microcomputers. (BASIC, FORTRAN and COBOL compilers include MACRO-80, LINK loader, LIBrary manager and CREF utilities.)	310.00*

MISC

		£
CBASIC-2	COMPILER SYSTEMS widely used compiler/interpreter for BASIC	65.00
CB-80	CBASIC compatible compiler	280.00
PASCAL/M	SORCIM's PASCAL	120.00
SUPERCALC	SORCIM's spread sheet and modelling system	170.00
MILESTONE	Project Management and Scheduling from Organic Software	160.00
dBASE II	Relational Database Management from Ashton Tate	380.00
dUTIL	Programming aid for dBASE II	50.00
QUICKSCREEN	Screen formatter for dBASE II	90.00
MICROSTAT	Statistical program library from ECOSOFT for (and needs) BASIC-80	150.00
PLI-80	Digital Research PLI Compiler	310.00
BT-80	Record Retrieval for PLI-80	125.00
MAC	Digital Research 8080 Macro Assembler	57.00
SID	8080 Symbolic Debugger	47.00
ZSID	Z80 Symbolic Debugger	63.00
DESPOOL	File Print Spooler for CP/M	31.00
TEX	Tex editor	63.00
SPELLBINDER	Lexisoft's Wordprocessing and Office Management System	275.00
PRO PASCAL	Z80 True Pascal Compiler	190.00

All products are available in 8" SD, SS, Superbrain 5" SS, North Star Horizon QD format except those marked * which are not available in North Star format.

THIS ISSUE'S SPECIAL OFFER

FREE **WORDSTAR TAPE CASSETTE TRAINING PACK** WITH EVERY WORDSTAR and MAILMERGE PURCHASE

(Offer ends 30th September 1982)

All products are supplied complete with full originators documentation.

Please send large s.a.e. for full details. **TRADE ENQUIRIES WELCOME**

Ordering Instructions: Cash with order. Specify disk format. Add £3.00 per item P&P. Add 15% VAT

BARCLAYCARD VISA

the soft option (UK) LTD

PO BOX 11 CRANBROOK KENT TN17 2DF Tel. (058 080) 310

CRAMMING IT IN

E40 is a new British package which enables you to compress text files on disk to as little as 40 per cent of their original size. Because it's an interesting subject, we asked E40's author, Dennis Andrews, to introduce the subject, while Dick Pountain puts E40 through its paces.

We tend to think of computers as machines for complicated calculations, and when computers were new and expensive their primary function was indeed to compute. Today, the great bulk of computer use is for storage of data or text and the two simplest operations — fetch and store — occupy most of a computer's active life.

To meet this demand, cheap removable media becomes essential: the quantity of data is just too large for fixed disk or memory to hold. Current removable disks are fairly slow, not because they must be but because it is economic. The new bulk requirements of the computer are to view, to print, to transfer, to edit — these are mostly slow operations, and really fast response is not worth paying for.

These two factors provide the soil for a new development to grow: compression codes. It has long been realised that the eight-bits-per-character of ASCII is wasteful and that the English language contains redundancy which would permit a more compact representation of characters. Procedures which do this are called compression codes.

The theory

The principal difficulties in making an effective compression code are the time and space requirements. In theory, compression to 15 per cent is possible (or at least claimed; maybe the limit is nearer 25 per cent with real data files). However, the drawbacks are prohibitive: the existing techniques would need enormous word dictionaries — and an enormous amount of time to scan them — or else they would need to do a statistical analysis of the data before starting to code at all, which is *much* slower but not quite so bulky. By contrast, E40 codes in about the same time as it takes to PIP a file from one place to another, and the coding procedure occupies just 11k. Compression is to around 3.2 bits per character.

This seemingly impossible speed is *because* the file is compressed: the extra processing time is offset by the reduced time for disk I/O. The decode process is actually faster than a straight transfer of the equivalent ASCII file.

There is no net space loss, either. This is obvious for the disk itself but, surprisingly, it is also true of memory space requirement. For example, Wordstar in a typical 60k system administers a 30k buffer. Set aside 11k for E40 and the remaining 19k holds the equivalent of around 47k of ASCII.

Both of these results are relative: if the available buffer space is small, then E40 may intrude; if the media transfer is fast, then processing time does exceed the saved I/O time. However, coding is still rapid: using a winchester, one can compress a typical 300-page novel in about three minutes — a small price for doubling the apparent size of the winchester!

While the basic idea of E40 came in the proverbial flash, the specification emerged only gradually and some significant user features were added after the code itself had been standard for months.

The original aim was a compression of around 3 to 1. This is possible using the techniques of Keele Codes but the process would run slowly and the program would be bulky. The figure of 40 per cent or 2.5 to 1 does not sound very different but its time and space requirements are in a different ball-park. In the other direction, one could have a faster process which compresses to, say, 50 per cent; but that would be a poor bargain, quite apart from its lesser attractiveness. At the present state of the art, disk I/O defines the limiting speed, not the processing. If compression were 50 per cent instead of 40 per cent, then the extra I/O would more than offset the reduced processing time, with a floppy disk system. It gradually became apparent that the optimum compromise lay around 40 per cent and, surprisingly, this was true for both mainframe and micro. The ratio of processing time to I/O time is about the same in each case when removable media are used.

In practice

Having defined compression, one still has to strike a balance between memory requirement and speed. This is a property of the implementation, not of the code itself. The target set — and reached — was that E40 coding should take in all about the same time as a simple transfer. In particular, we had winchester-to-floppy backup in mind in choosing speed. For an all-floppy system, therefore, E40 coding is usually faster than straight transfer.

Robustness was an essential feature of the specification from the start. The compression ratio must present no risk to the user: his data must be as safe in E40 code as in ASCII. The code was therefore made self-correcting, so that noise in the communication line, or damage on the disk, has a localised effect only. E40 recovers almost immediately if the compressed file is deliberately corrupted.

This recovery feature was judged very important; one could achieve better compression if the requirement was relaxed but then no one would risk using the code. This recovery feature is unique to E40. Some compression codes are very vulnerable to errors — for example, with Huffmann codes an error in any bit means that the remainder of the file is unreadable. One can prove mathematically that Huffmann codes offer the best possible compression — but at what a price!

Two other features are incorporated for security:

a) There is a Verify option. (CP/M has no automatic readback verification when writing to disk.) This slows archiving by about 20 per cent.

b) The user may introduce checksums into the codestream, and can select their spacing over wide limits.

The latter feature was designed for noisy communication channels but can be used if desired for extra security in any application. In reality, E40 is as safe or as unsafe as ordinary ASCII and one should take the same precautions with both. Whatever level of backup is selected, it costs half as much using E40.

The current implementations of E40 are not the fastest possible; instead they represent the best compromise between space and speed for current hardware. It seems likely that in the future memory will become cheaper and media will run faster. If so, we can speed E40 by a factor of two just by writing a greedier implementation — which means that E40 can keep up with hardware developments and the code can remain standard in the long term while retaining its costless character.

All files compressed by E40 have a 32-byte leader. This idea developed from the perception that compression would be as important in communications as for static storage of files. The leader contains all the vital statistics of the compressed file and allows it to be treated as a message, with no other protocol required. The leader defines the code, the filename, the size, the size when expanded, the checksum and other options which affect coding. (Options such as Verify, which do not affect the form of coding, do not appear in the leader.)

This idea developed gradually, though the bare notion of E40 as a message format came at an early stage.

Portability

An E40 message is universal and it is independent of hardware/instruction set/operating system. Any two machines equipped with E40 can communicate. The package offered for CP/M includes a communication utility called XKC, which transmits or receives files through a serial port. CP/M communication devices do not transmit 8-bit data words and will not receive nulls. Therefore, XKC converts the file to a 7-bit format without nulls. The net time saving is a little better than two-to-one over direct ASCII transmission.

Some operating systems will be able to transmit E40 compressed files direct without this conversion, achieving 40 per cent of transmission time instead of 46 per cent. These systems do not strictly need XKC but it will be offered anyway, as many operating systems lack

CRAMMING IT IN

a built-in computer/computer transfer utility.

Although XKC is profiled to CP/M, the E40 message which it carries is not. The code is guaranteed invariant, and is not shackled to any hardware, software or operating system. It is linked only to the English language and to ASCII (or an equivalent 8-bit character set). The code is also fully developed and is based on very extensive numerical research. We do not have plans for E38 or whatever, and are reasonably sure that no one else will better it by a fraction that is worth having. We know the drawbacks of each adjustment and have rejected far more than were finally incorporated.

This policy of invariance must be allied with a readiness to accommodate current practices; therefore E40 offers some tailored extensions, of which XKC is one example. Another variable is the end-of-file character — present in some operating systems but not in others. Therefore E40 excludes the end-of-file character from the message and the decode program EKC adds it back. Consequently, if a file is transmitted between systems it is correctly terminated in each host. (Nevertheless, the user does have an option to treat the end-of-file character as data. This is another tailored extension, largely to accommodate dBase II files; these sometimes include the CP/M end-of-file character CTRL-Z.)

E40 also has parameters which are geared to Wordstar. Most word processing systems use a 127-character set but Wordstar uses the eighth bit to distinguish fixed and reassignable formatting. We wondered whether to treat 'soft space' and 'soft return' as special characters but decided not to, because that would link E40 to one microcomputer product. Instead, the user has an option: code all 256 characters, or strip the eighth bit and fix the format. The latter gives much better compression. However, the second choice is not irreversible: there is a decoding option RESOFT which puts back the 'soft' spaces and returns.

This seems a long way round — but it achieves the intended aim: the compressed E40 file is completely standard and has optimal compression. One can pass it to another system which would baulk at Wordstar's character set; equally, one can receive a file written on another system and edit it using Wordstar, using all of Wordstar's formatting facilities. If one works exclusively with Wordstar, then both options can be preset in the program image. (All E40 options can be set as command parameters or in the program image, whichever the user prefers.)

Other extensions of E40 will be in the software interface, so that, for example, word processing software can read and write E40 files directly. Obviously, this can be achieved in short order by an overlay/chaining procedure, but it would be more efficient to build a software interface which is active throughout the word processing.

Compression utilities save money in the obvious way that disks take longer to fill up, or phone bills are halved. The less obvious savings are just as important.

Even experienced computer users find that disks can become very muddled and contain a mixture of finished and unfinished work, work of different kinds, and backup copies. This applies as much to winchesters as to floppy disks — perhaps even more so.

E40 offers a way to avoid this. The basic principle is to distinguish two roles for a disk: work-disks and completed work. Let us call these disks TEM and FIN. Work disks TEM are temporary and each relates to one enterprise or class of work. Completed work is copied onto FIN disks, using E40 instead of PIP. The completed work is thereby distinct in form as well as taking less space. FIN disks are classified, too, to form a compact library. Backup copies would be made anyway, so nothing is lost, but space is saved and the whole operation becomes methodical without any special effort.

Each TEM disk contains .TXT and .BAK copies of every file, which is the ideal arrangement when first editing a document. But FIN disks do not need to contain the last-version-but-one. In effect, then, FIN disks contain about five times as much material as the equivalent TEM disks; or the product of a working week rather than a working day.

Another saving occurs when the TEM disk becomes full. If one does not distinguish TEM and FIN, then DISK FULL usually results in the last file being copied to a new disk to continue work. There is considerable wastage on the first disk. Worse yet, the wasted space may be filled out of sequence because one can find no other disk handy. That work is as good as lost if it is set aside for any length of time.

These things do not happen when TEM and FIN are distinct. When TEM becomes full, the *earliest* work on it is transferred to its own FIN — if it is not already done — and is then deleted from TEM. Thus TEM is continually reassigned, and the current work is never taken out of it.

This work method requires two other classes of disk: system and archive. The latter is a straight copy of the FIN disk, made with suitable frequency; this provides far better security than two copies on one disk. Disks can be damaged, have corrupted directories, or just get lost. The system disk(s) contain editors, assemblers and the basic utilities.

In addition, TEM disks contain KC, and FIN disks contain EKC (and PIP for loading archive). That way, only one disk change is required at any stage of updating.

The four uses do not necessarily require four physical disks. With a winchester, all but archive can reside in it, and some floppy disks are large enough to contain both system and TEM files.

Are there any snags? Are the files less accessible? On the contrary, EKC can throw a file on the screen quicker than TYPE can do (though it takes 19.2 kbaud to demonstrate the benefit). Files can be transferred to new disks or via a line in less than half the time. E40 files peculiarities of British patent law may cause the application to be withdrawn. American patent law is different in two respects: (a) precedents exist for patenting computer programs; and (b) there is no publication of unsuccessful patents, ie, those judged 'obvious' in the legal sense. In British patent law, no one has yet established that the hurdle of 'not obvious' can be crossed at all by any computer program, however subtle. Further, all UK patents are published *before* they are examined. That means

```
stat huge.txt

 Recs  Bytes  Ext Acc
  128    16k    1 R/W A:HUGE.TXT
Bytes Remaining On A: 134k

A>kc

Encode KCE40
07-Jan-82  Copyright 1982 (C) Keele Codes Ltd. Licence No.SH001008

*=huge.txt

FILE COMPRESSED

*

stat huge.*

 Recs  Bytes  Ext Acc
   57     8k    1 R/W A:HUGE.E40
  128    16k    1 R/W A:HUGE.TXT
Bytes Remaining On A: 126k

A>ekc

Decode KCE40
07-Jan-82  Copyright 1982 (C) Keele Codes Ltd. Licence No.SH001008

*=huge

KCE40   HUGE.TXT          8k         16k        0000

Filename exists: Overwrite ? y

FILE EXPANDED
```

Fig 1

CHECKOUT

Dick Pountain reports on E40 in use.

I checked out the E40 compression utility on the Sharp MZ80B under CP/M 2.2 without any communications hardware; I couldn't check the operation of XKC as a result. The version I tested was the original release which lacked the RESOFT option for expanding Wordstar files; this is included in all current releases of the software.

The package consisted of three CP/M COM files called KC, EKC and XKC. The first of these compresses files, the second expands them again; XKC is for serial communications with other machines.

Keele Codes has very cleverly designed the syntax of KC and EKC to be similar to that of PIP so that experienced CP/M users will have no trouble in adapting to its use. To compress a file HUGE.TXT you merely type 'KC', which loads the program and gives a sign-on message and the '*' prompt, as for PIP. Then 'B:SQUASH=A:HUGE.TXT' will compress the file into a file called SQUASH.E40 on drive B. The file type E40 is assigned automatically by the program. The shortest form allowed is '*=HUGE.TXT' which compresses into a file with the default name HUGE.E40 on the currently logged drive. A message FILE COMPRESSED signals successful completion.

To expand a file, type EKC, which loads the program and produces the '*' prompt. When you name the file for expansion a line of parameters is displayed which includes the original and final names and sizes and any options set. This line ends with the prompt GO? to which only the answer 'Y' will initiate expansion; any other answer returns the * prompt. FILE EXPANDED signifies success. Again the shortest form of the command is '*=SQUASH' which assumes the file extension E40 on the current drive and expands the file under its original name which is always saved in the header of the compressed file. Since this may involve overwriting the original version of HUGE.TXT, EKC asks you if you wish this to happen and gives you a chance to change the file name. Figure 1 shows the printout from one of the test sessions using KC followed by EKC.

Since KC and EKC are 10 and 12k long (ie, 22k total), it is feasible on a machine like the Sharp with 340k per drive to have them resident on all your work disks (I already do this with CP/M system, PIP, STAT and BACKUP).

The programs come with an 18-page manual which explains their use clearly and concisely for the experienced CP/M programmer. The less technical user will only require the one page summary of syntax in order to use KC and EKC.

So how well does it work? I tried it out on a 16k ASCII file generated with a text editor and achieved a reduction to 44.5 percent, a little short of the theoretical minimum. Transferring this file to another drive using PIP took 14 seconds. Using KC the transfer took 17 seconds and using EKC took 9 seconds. So decoding a compressed file onto another drive is significantly faster than using PIP while compressing is slightly slower.

I next tried E40 on a Lisp source file of 12k and here only achieved a reduction to 66 per cent, in line with what Keele Codes claims for program text (the reduction is less because program code is not plain English and contains a high percentage of unusual words).

Various other flavours of ASCII file produced compressions between 42 and 60 per cent, with the average being around 44 per cent for English text (most of it technical with a high unusual word count).

Using E40 on a Wordstar text file initially *increased* its size slightly; this is because I didn't use the [z] option which strips off the eighth bit for its 'soft' carriage returns which results in very inefficient coding by E40 as these constitute 'abnormal' characters. Running E40 again with [z] appended to the command produced a reduction to 45 per cent. Expanding this file restores the original text exactly but certain Wordstar options for re-editing, such as changing the margin width or reformatting, are lost. The current release of E40 has RESOFT, an optional parameter [r] to the EKC command, which restores the parity bit in appropriate places when expanding the file and so retains all of Wordstar's features.

I was unfortunately unable to get hold of a database file to try E40 on; with some DBM systems these contain much wasted spaced and so really large compressions to below 40 per cent are said to be achievable.

In summary, E40 did all it was claimed to do on the material I tried it on; it is no harder to use than PIP and can be used as a regular CP/M utility. It can provide a useful increase in disk space (Osborne and Apple owners would benefit substantially) as well as saving time when archiving large numbers of files. It is not really worth using it on program source but on text files it performed well and in line with its author's claims.

For further details contact Keele Codes on (0742) 686040.

that you may not only fail to protect your idea but it becomes public can also be decoded direct to the printer.

The only delayed access is when another program needs the original ASCII — eg, when a word processor is used to print a file which is no longer in TEM. Then one must run EKC first, at the cost of a few seconds. This event is rare in practice: most printing is done at an early stage in the file's life. Similarly, it is rare to re-open editing of a file that has left TEM.

The benefits are frequent, however: the operations which are speeded by E40 are the common ones, transfer and viewing. One must put in this pan too the savings made in general housekeeping. When E40 is used routinely, files are more easily located, there are fewer false moves and there are fewer transfers needed to keep the system up to date. Best of all, you do not have that drawer full of old disks saved in case they contain the only copy of something!

Database back-up

Compression can be as great as 5:1 with database files, mainly because they contain reserved but unfilled space. (Where this is not the case, compression of a database is much like any other text.)

The use of E40 doubles the maximum size of the database which can be backed up from winchester to floppy. It postpones the day — which comes all too soon — when segmentation becomes necessary for backup. When a database has reached this size, there is a temptation to risk fewer backups because it has become tedious. One may even have no room on the source disk for the segments.

Secrecy and patents

I must disappoint your curiosity as to how E40 works. Keele Codes Ltd has maybe a nine-month lead in which to establish E40 as a standard. By all means compare input and output and try to figure it out — but we won't help you!

The basic ideas of E40 are the subject of a patent application — but the peculiarities of British patent law may cause the application to be withdrawn. American patent law is different in two respects: a) precedents exist for patenting computer programs; and b) there is no publication of unsuccessful patents, ie, those judged 'obvious' in the legal sense. Under British patent law, no one has yet established that the hurdle of 'not obvious' can be crossed at all by any computer program, however subtle. Further, all UK patents are published *before* they are examined. That means you may not only fail to protect your idea but it becomes public property instead, which seems unfair. Copyright remains, of course, and the code E40 is protected by copyright — not just the particular way of executing it.

The company Keele Codes Ltd is legally quite independent of the university. However, there are close links: all the members of the company are also members of the university and the company pays the university for the goods and services it uses. This symbiosis works very well. The university gains money at an opportune time, and can sell offpeak computer time to a convenient customer. (All really heavy computing is reserved for the summer.)

It is an interesting thought that 10 years ago E40 would almost certainly have become a scientific paper rather than a commercial product. . .

END

DISKS DISKS DISKS

LOWEST PRICES FOR THE BEST

5.25" DISKS - BOXES OF 10

	£	QTY.	AMOUNT
VERBATIM			
Single or Double Density			
S-SIDE/SOFT SECTOR (40 TRACK)	16.50		
D-SIDE/SOFT SECTOR (40 TRACK)	23.00		
S-SIDE/SOFT SECTOR (77 TRACK)	24.00		
Add £1.25 for PLASTIC CASE			
MEMOREX			
S-SIDE/S.DENSITY/S.SECTOR	15.70		
D-SIDE/D.DENSITY/S.SECTOR	19.70		
BASF			
S-SIDE/S.DENSITY/S.SECTOR	15.00		
S-SIDE/D.DENSITY/S.SECTOR	18.80		
D-SIDE/D.DENSITY/S.SECTOR	23.00		
HEAD CLEANING KIT	16.30		
LIBRARY BOX	1.90		
POSTAGE/PACKING (UK)			
DISKS/CLEANING KIT	£1 /BOX		
LIBRARY BOX	50p/BOX		
	TOTAL EXC.VAT		
	VAT 15%		
	TOTAL PAYABLE		

Send to: PINNER WORDPRO,
34 CANNONBURY AVE.,
PINNER,
MIDDLESEX, HA5 1TS.

Name..... Tel No.....

Address.....

.....

My Access/Barclaycard No.....
(Delete as appropriate)

Also supplied at competitive prices

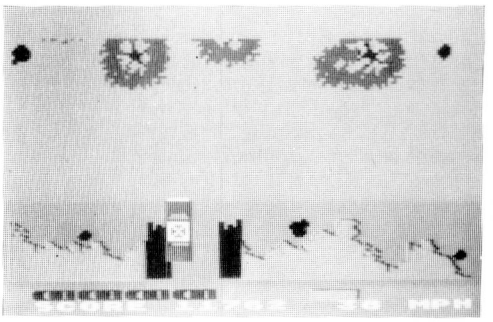
HARD SECTOR/OTHER FORMATS MINI-DISKS AND 8" DISKS
PLEASE CONTACT US FOR DETAILS OF QUANTITY DISCOUNTS
(over 4 boxes) AND TRADE ACCOUNTS

TELEPHONE CREDIT CARD ORDERS ANYTIME

01-868 9548

Pinner Wordpro

more for ** ATARI



"HAZARD RUN"

If you've wanted to join those good old country boys and drive the General Lee through Hazard County. . .

NOWS YOUR CHANCE

In HAZARD RUN, you must make the treacherous run through Crooked Canyon, past Bryan's Pond to the jump at Hazard Creek and safety.

For 24K Atari 400 & 800. Needs a joystick. On cassette.

Also still available BETA FIGHTER. A1 or 2 player game set on a realistic 3D Martian Landscape. For 16K Atari 400/800.

Joysticks required. On cassette at £15.50 (inc VAT).

Available from:

ALLRIAN DATA SERVICES
1000a, Uxbridge Road,
Hayes, Middx.
UB4 0RL.

£21.50 (INC VAT)
P&P Free

AN Artworx PRODUCT

We've opened up the whole country.

SPECIAL PRINTER PRICES
Aug/Sept All Models
Floppy Disks £12 per box

MASS MICROS

- *WE SUPPLY NATIONWIDE*
- *WE INSTALL NATIONWIDE*
- *MAINTAINED NATIONWIDE*
- *BEST PRICES NATIONWIDE*
- *LEASING SCHEMES*

Our unique service allows you to buy anywhere in the UK with the confidence and knowledge that the equipment we supply is at the right price and supported.
Our experience of putting together the correct system for you ensures full satisfaction.

* COMPLETE RANGE OF SOFTWARE, PRINTERS AND PERIPHERALS
* 12 MONTHS NEXT DAY SERVICE INCLUDING PARTS, LABOUR AND TRAVEL TO YOUR SITE

- **ASK FOR SERVICING QUOTES ON NEW AND EXISTING EQUIPMENT**



AUTHORISED DEALERS
commodore
ICARUS
SUPERBRAIN
apple
TABS

MASS MICROS

Wellson House, Brownfields,
Welwyn Garden City, Herts.
Tel: Welwyn Garden (07073) 31436/7
Telex 298641

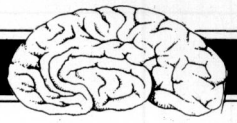
Please send for FREE information pack on Apple ☐ CBM ☐ Superbrain ☐
Printers ☐ Maintenance ☐

Name .....

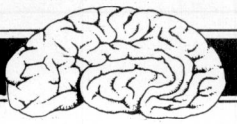
Company .....

Address .....

Ref. PCW/1 ..... Tel No: .....



BRAIN DUMP



Peter Rodwell reports from somewhere in the centre of a jumble of computers, cables, disks, printers. . .

COMPUTER CORNUCOPIA

Yes, it's arrived! I'm talking, of course, about my Sinclair Spectrum, which, regular 'Dump readers may recall, had yet to be delivered when I last filled this column with my ramblings.

Well, I'm now the possessor of a 48k Spectrum – and jolly good fun it is, too, although lack of time has prevented me from spending the obligatory long nights 'exploring the system envelope'. Two things struck me immediately on trying the machine out for the first time: it makes a funny and slightly irritating buzzing sound, and it's necessary to tune the TV set very carefully to get a good colour picture. This latter problem may be due to the fact that (without wishing to boast) I have a remote control TV with tiny pre-set tuning knobs which take a lot of adjustment even with TV stations.

Lack of time has also prevented my building a port through which to transfer my WP program from the Cromemco. What has been taking up my time has been a Sirius 1, one of which has also infiltrated the Rodwell flat which, with these and the occasional Benchtest machine, now has the look of a crazed terminal junkie's hideaway. I've wanted a Sirius ever since I Benchtested it at the end of last year.

Fascinating though the Sirius is, though, it has to earn its keep and I have been pounding away to transfer a suite of programs I wrote for the Cromemco to handle payments for the magazine's contributors. The change of ownership of *PCW* means the old program needs large alterations anyway and I'm now struggling to convert both program and self from Cromemco's nice but idiosyncratic Basic to standard Microsoft Basic under MS-DOS.

The Cromemco looks a little forlorn next to Chuck Peddle's technowonder, but there's plenty of life left in it. For a start it's going to become a rather expensive but reasonably intelligent printer buffer, taking output from the Sirius and printing it or storing it on disk for later printing if it's in the middle of a job when I send more stuff to it.

At this point I'd like to thank the small group of people who contacted me about my RUN command for the Cromemco. This involved a patch to the operating system to restart a program in memory without reloading it from disk. The REM command, several of you pointed out, is used as a remark in batch command files, so my patch would have caused havoc were I in the habit of using such things, which I'm not. This, apparently, is documented in later CDOS manuals which I don't have. Okay, CDOS freaks, try this: the intrinsic commands lookup table contains two entries for the Attributes command, one spelt ATRIB, the other ATTRIB. Is there any reason why I shouldn't use one of these for RUN instead of REM?

Having both an 8-bit and a 16-bit machine at my fingertips also gives me a chance to play with XLT-86, the Digital Research utility which translates 8080 source code into 8086 source code. From a preliminary look at it, it seems quite interesting, although there's still quite a bit of manual work to be done to the resulting code before you have a working CP/M-86 CMD file. Of particular importance, naturally, is the question of how efficient the resulting translation is compared to a program written directly in 8086 code, taking full advantage of the '86's power. I'll keep you posted.

END

ALGRAY SOFTWARE

TRS-80 model I & III – VIDEO GENIE SOFTWARE

AIR ATTACK TRS-80 16k, model I & III – **£8.95**

Presenting a new dimension in Arcade games: The Third! Defend the East Coast against hordes of enemy aircraft swarming in. Excellent graphics, machine code with sound.

FROG RACE TRS-80 16k, model I & III – **£5.95**

From the arcades comes FROG RACE. Your aim is to see Road Safety observed! Cross a motorway then a river hopping on the backs of the crocodiles, logs etc. Progressively more difficult until you are eventually squashed! drowned! or eaten!; Collect a few lady frogs for a bonus!!! Super fast machine code with sound.

PET

SUB COMMANDER ROMS 2,3,4, 16k & 32k – **£9.95**

Command a WWII sub on a seek and destroy mission, graphics plus tactical display add up to a game of tactics and deep cunning.

MAZEMAN ROMS 2,3,4 8k – **£9.95**

Everybody must have seen 'PACMAN' in the arcades, if not your quest is simple, simply steer your eater around a maze avoiding the inhabitants until you get the power pills scattered around and then chase them. An added dimension with this variation is the ability to set the speed and number of ghosts. WITH SOUND!

ASTROIDS ROMS 2,3,4 8k – **£9.95**

You must have seen this game somewhere, so buy it and spend endless hours clearing the space lanes.

VIC-20

SPACE STORM 3k – **£6.95**
COSMIC BATTLE 3k – **£4.95**
SUPER WORM 3k – **£4.95**
JUNGLE 3k – **£4.95**
CODE BREAKER 3k – **£4.95**

ATARI

CAVERNS OF MARS 16k – **£23.95**
CONVERSATIONAL FRENCH 16k – **£31.95**
GERMAN 16k – **£31.95**
ITALIAN 16k – **£31.95**
GHOST HUNTER – **£17.95**
FROGGER – **£19.95**

PLUS LOTS MORE IN OUR CATALOGUE – 75p (refundable on purchase)
Please specify machine, memory etc.
All prices fully inclusive of VAT, post & packing etc. (no extras); Use our freepost address:
FREEPOST, ALGRAY Software, 33 Bradbury Street, Barnsley, S. Yorkshire S70 6BR

BENCHTEST SOFTWARE

AQUILA

Kathy Lang continues her database evaluation series

Aquila is an information retrieval system intended primarily for applications which involve a mixture of keyword information and running text,such as bibliographic records. It uses a clear menu-driven approach which takes the user through the various options available at each stage of processing. The system, which is distributed in this country by the originators, Kent Barlow Associates, was prompted by the need to provide the ability to process on micros the kind of bibliographic database often found on large computers and hence has the ability to import subsets of some of these, such as BIOSIS, the data base of books and papers on biological subjects.

Aquila uses one file for each set of data, and no connection is possible between files. The overall structure of each record within a file is fixed and must be defined in advance, but lengths of fields within records need not be specified, as records are packed to take exactly the amount of storage the actual data requires. Retrieval is on the basis of searches which can request matching of predefined keyword fields or of words within running test. Searches can be saved for subsequent re-use.

Aquila has two types of field — predefined fields, which are of the conventional keyword type, named and consisting of a single item, and undefined fields, which are simply free text. A record may contain up to 20 predefined fields, in addition to a field which every record must have — the 'accession number', which is used to ease the retrieval of particular records for amendment. Predefined fields may be up to 38 characters long, undefined fields up to 255 characters, and the total size of the record must not exceed 472 characters. Total file size carries the usual CP/M restrictions — one disk for floppy disk systems, eight megabytes on hard disk systems.

All data is assumed to be textual — there is no provision for calculation or for testing data against a range of values, nor for special treatment of dates, though there is a limited 'wild card' facility.

Once the structure of a file is specified it cannot be changed, and there are no facilities for reading from external files other than those in the special formats for which a preprocessor is available.

Input and updating

Data input and updating in Aquila is entirely screen-based. Display of records is in a standard format which the user cannot change, and simply displays in order the names of the fields specified by the user when the record structure is set up. This set-up process is carried out when the database is created. It involves giving, for each predefined keyword field, a full name and an abbreviated name of two letters; no length need be specified, as Aquila stores in each field the exact information it needs to hold with no padding characters.

Once the number and names of the predefined keyword fields have been defined you can then put data into the files. Each record is given a record number (sequentially allocated) by Aquila, and must also be given an 'accession number' by the user. Aquila then displays on the screen the name of each keyword name in turn; when all have been input, you then get the opportunity to put in free field text. Finally, the record is displayed to give you the chance to make any necessary changes.

For record amendment, the individual record is accessed by record number. To save you keeping a separate list or printing out the whole data file, Aquila allows you to print out a list showing the correspondence between the record number and the accession number. Once retrieved, you must go through the record in order, either accepting the current value of each field or replacing it completely — you can't edit a field, nor can you jump directly to the field you want to change, though you can finish the amendment as soon as you've completed your changes. Aquila then displays the amended record; you can either accept it or else have the record restored to its original state and start the amendment again.

Once you have finished putting data in or amending, you must instruct Aquila to create a search file (an inverted form of the file to permit searching on selected criteria — rather like creating a set of indexes). This is a lengthy process for a file of any size, and the manual recommends doing this in a slack period or overnight.

Displaying data

Records are always displayed completely, with one record on the screen at a time — you can't choose to display only certain fields. Access is either by record number (as in the amendment process) or by position in the retrieval sequence. For instance, if a search (see below) finds ten records, you can display them all, the first five, or just one of them.

Printing data

Records are printed in the same format as the screen display, and there are no facilities within the main part of Aquila for user-defined print formats. There is, however, an optional text processor which can be accessed from the main menu, which will format data written out as part of the selection process onto a disk file.

Selection

The selection facilities in Aquila are extremely powerful, and form the main core of the package. When a file of data is formed, Aquila is then asked to create a search file. During this process, the data is stored in such a way that every predefined keyword field is indexed, and also every word in underfined fields apart from those included in the STOP file. A standard STOP file, containing words like 'in', 'on' and 'to', is provided with the package, but you can create STOP files of your own for particular applications. Once this search file has been created, you can then select records according to desired criteria.

There are two elements in the search process. Any predefined field, or word in an undefined field, may be part of a term set. For instance, you can use the command FIND to search for all records in which the 'supplier' field is 'British Rail', and this selection then becomes the first Term Set. If you then require further selection, say to extract all the records referring to 'engines' sold by British Rail, you would then FIND a second set of records with 'engine' as the product and produce a search set by using FIND to combine the two Terms Sets with AND, to give all those records which had British Rail in the Supplier field and engines in the Product field.

The set of commands to do this, and Aquila's responses, are shown in Figure 1, where the /? is a prompt; the material

```
/? FIND SU=BRITISH RAIL
T1    15 KW=SV=BRITISH RAIL
S1    15 T1 — T1/OR/
/? FIND PR=ENGINE
T2    35 KW=PR=BRITISH RAIL
S2    35 T2 — T2/OR/
/? FIND S1/AND/S2
S3    12 S1/AND/S2
```

Fig 1 — Search sequence

Kent Barlow Information Associates
(AQUILA)

Create/Update?Amend Database Which function? N

Enter N to create a new data base
Enter O to update/amend an existing database

Create new database

Enter database name? INMAIL

How many predefined keywords do you want? 4

Enter prompt for keyword 1? DATE OF RECEIPT

Enter code for this keyword? DR

Fig 2 Menu

remaining on those lines is typed by the user and the other lines by Aquila.

Term sets can be produced either by matching keywords (or words in an undefined field) exactly, or by a limited form of 'wild card' used at the end of the item to be matched. For instance, PART* will match PARTY, PARTITION, PARTNER, etc. When the 'wild card' asterisk is used, Aquila gives a separate term set number to each exact match, so it's easy to rule out the ones you don't need. Search sets combine term sets with AND, OR and NOT. Up to 2000 Term and Search sets could be used together in a single search in my version of Aquila. Once you have the desired selection (and Aquila will tell you how many records your search has revealed), you can display the records on the screen, print them or write them to a disk file. You can also save the search itself, for subsequent re-use.

Tailoring and adaption

Aquila has limited services for adapting the software to particular requirements. The package can be adapted quite easily to a variety of terminals. When creating a search file, Aquila uses a stop file of words which are not to be indexed, and this file can be edited by the user. But there are no facilities for optional indexing interactively — you have to decide in advance which words you don't want indexing.

Data for Aquila searches can be written out to subfiles, for subsequent processing by other programs. But Aquila can only read files created by itself or by preprocessors written specially to pack the data into its internal format. These preprocessors permit interfacing with several standard databases, and this is one of the main inspirations for Aquila, enabling libraries, educational institutions and researchers to acquire subsets of these sets of data for processing on their own micros.

User image

The software is another example of the curate's egg syndrome. The menu system is straightforward and comprehensive: the menu for creating a new file of data is shown in Figure 2 as an example.

Thereafter the program leads the user through the options available at each stage, in a way which should permit a novice to use the package without much trouble and largely without help from the manual. The only exception is in the search terminology, which I found rather confusing, but which one could easily get used to. The less desirable aspects of the user image include the restriction of using only the record number for access to individual records, and the use of two-character abbreviations for variable names in searches. The use of symbols, rather than a name or prompt, to request input of free text fields is also rather confusing.

The documentation is straightforward and easy to use, though for most purposes, other than the formation of searches, you wouldn't really need it. I did find one real howler, though — the user is advised, if he gets in a real muddle, to press the reset button (at the cost, on most systems, of losing all his current work at best) and this is in the opening section when being given advice on how to use the backspace key, and without any warning of the dangers. However, this was an exception in an otherwise well-written manual.

Costs

Aquila costs £310 for the software, with extra charges for interfaces to other databases. Some telephone support is available from Kent Barlow, included in the price, and I found them very helpful with my queries.

Conclusions

Aquila is clearly aimed at a particular section of the market for data management systems — those which have a mixture of fixed fields and free text, and in particular the bibliographic area, in which there are a number of very large databases which are used by many people in schools, higher education and research, as well as in some commercial areas. The facilities for creating, updating and searching should be quite adequate for such applications, and in particular the ability to create a complete word index to free text with the use of a 'stop' list is as far as I know provided only by Aquila. It is a pity, though, that this is done by creating a complete new search file every time the data is changed,on a batch basis, which could be too inflexible and time-wasting in some applications.

More serious drawbacks for bibliographic applications could be the limitation to 472 characters per record and the absence of sorting facilities. If these limitations don't affect your application, then in this rather specialist area Aquila would be well worth considering.



PCW welcomes approaches from would-be writers, even those who may never have appeared in print before. In this game it is often those with practical experience who have important things to say so we don't mind too much if their prose is less than perfect. Providing that submissions have a sensible structure and follow a logical sequence, we can take care of the polishing. Here are some tips:

If the article is already written, simply send it in, making sure that your name, address and 'phone number appear on both the article and the covering letter. If you have submitted the same work to other magazines you should tell us — it would be embarrassing (to say the least) if the same article appeared in more than one.

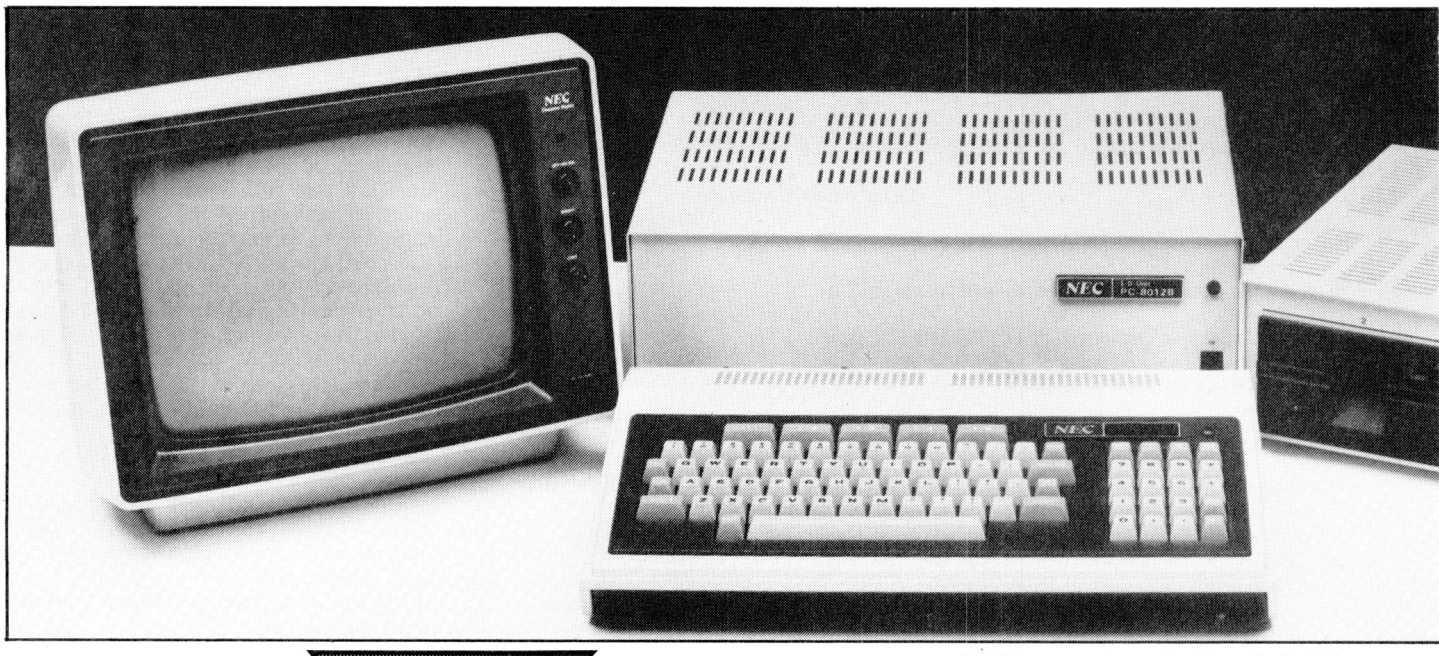
If you have an idea for an article or a series, write us a letter outlining your ideas. A one or two page synopsis giving the proposed structure, sequence and content will give us a sound basis for discussion. Please give us a daytime 'phone number if possible.

If you have nothing specific in mind but feel qualified to conduct case studies, Benchtests or whatever then drop us a line saying what you'd like to do and why you think you're qualified to do it. We're not particularly looking for strings of academic qualifications — experience carries just as much weight.

Dick Pountain is always on the lookout for interesting calculator features and we wouldn't mind seeing one or two readers getting on their soapboxes but remember: even articles such as this need a structure.

Reading *PCW* will give you a good idea of the style we prefer. You may notice that we try to avoid pomposity at one extreme and flippancy at the other (except in 'Chip Chat', that is).

Finally, have a look through back issue indexes and try not to re-invent any wheels. Oh, we almost forgot — *PCW* does pay for all published work.



BENCHTEST SOFTWARE

SELECTED WORDS

Jane Bird casts an eagle eye over an easy-to-use CP/M word processing package

There is much talk in the computer fraternity about the next generation, the so-called 'fifth generation'. These machines will have pre-programmed intelligence so that they can give the end user the illusion that he is interacting with a thinking being.

Fifth-generation computers will eliminate such mundane tasks as writing programs for anyone but systems designers who will be cloistered away somewhere out of view. Instead, the end user will be able to talk to the machine, explain his problem in an elementary version of his native language and get an intelligible response. The first machines providing natural language interaction will come on micros for specialist subjects like engineering field maintenance and these are expected to arrive within the next two years.

Apart from engineering, an obvious use for such systems is in the office, where people are accustomed to dealing with text all the time. And in office automation so far we have seen systems which are only a fraction along the way to being user-friendly to the extent of understanding natural language. We can and should expect far more intelligible systems because they are perfectly within the realms of current software capability.

However, the Select word-processing package from Bonsai is notable for its user-friendliness and does go some way towards apparently understanding what the user is doing. This is probably unnecessary for the dedicated personal computer user but it will be very comforting to the non-initiated who want to use a word-processor. In fact, Select is characterised by up-front user-friendliness rather than by exciting and powerful text manipulation. But it certainly provides the fundamentals. While easy to use, it is likely to be slow. Certainly when it is used on the NEC PC8000 provided for this Benchtest I found myself waiting 20 seconds for the next frame. If you have not used a personal computer before, you may not mind the wait too much — but if you're an old hand it's very frustrating.

So Select concentrates on being user-friendly, and the first example of this is in the special Teach package. Teach takes the user step by step through the process of editing with Select and includes lots of little exercises and tests. Select certainly does make claims to be exactly the kind of 'intelligent' system described above. 'Welcome to word-processing. Now a computer has finally learned to think the way you do,' says Teach.

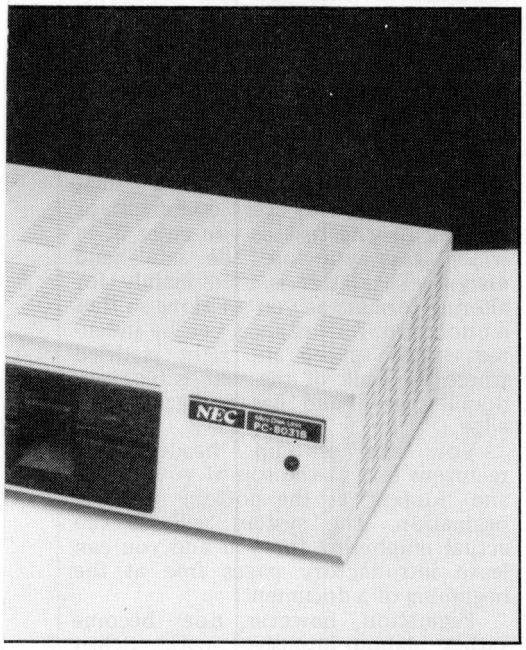
In theory you can do the whole thing in 90 minutes — but unless you're feeling really on the ball, I wouldn't recommend it. Spread over two sessions, the 26 lessons are manageable, although I felt the need to go back to the beginning again to check how to start.

Starting to use Select

This can be tricky, because Select is designed to run on any CP/M machine. The widespread support for this operating system means that you may be using one of an enormous number of different micros. So the first thing to do is to check that you know how to make the best use of your particular hardware. For example, the PC8000 has only two keys for controlling the direction of the cursor. This means you have to use the shift key for two of the four required directions, and of course there is no diagonal to go straight to the top or the bottom of the screen. However, the PC8000 has five function keys at top of the keyboard which Select uses for moving the cursor left, right and down, as well as for tabbing and setting the shift lock. In normal lower case you can use one of the original cursor directions for cursing up.

While still on the subject of hardware, I should mention that this can be the root of a lot of the problems with speed. Other micros can presumably perform faster, although a Select salesman told me that it really doesn't make much difference if you use a 16-bit as opposed to an 8-bit (the PC8000) machine. So if you're actually buying a machine specifically to run Select for word-processing, then take a good look at response times first.

When loading Select, other minor machine-dependent problems can arise. On the PC8000 disk drives are identified by numbers whereas Select gives them letters, but if you're doing word-processing you probably know your alphabet well enough to solve that problem! Select also asks you to do your immediate erasing by using the backspace key but my keyboard had no such key; it required you to cursor left instead.



So the major hurdle you first have to to clear is that of customising Select. The Select manual gives simple instructions on how to do this, assuming that you have used a hardware manual to fit your system together and format your disks.

Select is organised in two parts: the system funtions and the editing facility. The same command keys perform either system or editing functions, according to which mode you are in. This can cause some confusion at first. Whereas Q is for Quit in both modes, E is for Edit in the systems commands but stands for erase when editing. This latter function is performed by D for Delete in the system commands, but D stands for Display in the editing commands.

Whenever you call up Select, the main menu appears on the screen. This lists all the different things you can do with Select. 'The best way to learn Select is to *put the manual down now!* Type "T for Teach", suggest the manual. So here's what happens when you do.

Learning with Teach

The whole idea of Teach is to enable an absolute moron to use Select. The trouble is that you do feel rather conscious of being treated like a moron. What happens is that Teach sets up a series of exercises and tells you if you got them right or wrong. It openly acknowledges its own limitations. ('I'm afraid I'm not clever enough to tell you what you got wrong'), but it does see fit to offer (facile) comments of congratulations or sympathy according to how brilliantly or appallingly you're performing.

Your first hint of this come after the very first lesson, which tells you how to use the cursor. It can't actually work out whether you experimented with the cursor or not, but it still bounces back with the message 'CONGRATULATIONS, YOU'RE MOVING THE CURSOR AND RARING TO GO'.

Assuming you keep going, you are treated throughout to such warm encouragements as 'YOU'RE HOT', and 'WOW! AM I IMPRESSED', and 'MY! MY! YOU DO SEEM TO BE GETTING THE HANG OF IT. NOW TRY ON YOUR OWN.'

There was only one point at which I really did get angry and that was when male chauvinism started creeping in. During the lesson on GO TO, the package invites you to try it out with 'BET YOU CAN'T WAIT TO GIVE 'ER A GO!"

Teach certainly is very helpful in familiarising you with Select and how it works. Of course, it depends whether you're the type who likes reading manuals or whether you don't start learning until you get your hands on the machine. You can get hands on straight away with Teach and even though this is bound to lead to mistakes, the same system seems resilient enough to cope with most errors and get you back where you started from.

However, we did have some bugs in our Teach package, and the most irritating one appeared on the Move lesson. Every time I followed the instructions on this lesson, I invoked the message JFILE ERROR, PRESS ANY KEY and, upon pressing the key, I lost Teach completely and found myself back at the Select main menu. So I never got to practise Move interactively. Other bugs were less spectacular. One which lists all the functions you can perfom with Select kept coming up with garbage across the top line.

Teach screens are well set out, so that, although it is rather irksome to spend a long time reading the green phosphorescence, that task is made as easy as possible. You first get a screen defining the task for that particular lesson, then you get an exercise screen which gives instructions in the top section and the text to work on in the bottom half. If that goes okay, then you are invited to do the test again, this time without the instructions visible on the screen. At the end of any lesson you can either go back over what you just did, continue with the next lesson (it doesn't have the gall to stop you continuing if you got the last lesson wrong), or quit the session. But you cannot exit in the middle of a lesson — which is tedious if all you want to do is quickly refer back.

And that brings me on to what is probably the most frustrating aspect of Teach: the slowness of getting from one screen to the next. Several that I timed took over 20 seconds, and no matter how exciting you may find your new computer it doesn't take you long to get impatient with that kind of response time.

Before I leave the subject of Teach, I must mention that it is by no means a comprehensive explanation of the system; it is for instruction in editing, not system facilities such as Merge and Spell.

Editing facilities

To enter text, you have to be in Insert mode but in order to make any changes you have to exit from Insert and call up the appropriate editing function for what you want to do.

Without doubt the single most frustrating thing in the whole of Select is the fact that every time you press backspace in normal insert mode you delete what you go back over. To change 'debate' to 'rebate' you either have to backspace all the way and retype the whole thing, or you have to change from Insert mode to Xchange mode, go back and change the character, and then move back into Insert mode before continuing to enter text. This seems an extraordinarily and unnecessary procedure for the most minor of alterations.

Similarly, should you wish to do something as basic as changing a five letter word for a six letter word then you must first go into Xchange mode for the first five characters and then you have to finish Xchange and move into Erase mode to get rid of the last one. Finally, you have to get back into Insert mode in order to carry on entering text.

A small problem with continually entering and deleting text occurs if you are habitual enough to always put two spaces after a full stop. The package is not clever enough to get rid of these spaces if they are wrapped around to the beginning of the next line so you can get lines curiously indented a mysterious one or two spaces.

Another minor irritation is that you cannot open a document to edit it straight at a specified page; you have to go through the interim stage of getting to the first page and making use of the editing command GO TO to select the desired page number. However, one very useful facility if you're not quite sure what page you want is Display, which throws up the next screen immediately.

A problem I encountered in getting to know the system concerned when to use the Escape, and when the Return key. The manual defines the difference between them as being that Return is to tell the system that you have finished adding information to a command. Escape, on the other hand, is to end a command, allowing you to select the next command from the menu which is permanently displayed on the top line of the screen. You can also press Escape when you want to abort a command. So Escape both enters and



The NEC (courtesy of Bonsai Computers) has a full typewriter-style keyboard.

Photography by Kokon Chung

SELECT

aborts. Feeling confused? If you are switching between different functions, such as creating a document, editing it, and then continuing to insert new text, you have to use the Escape key a surprising number of times. Escape also executes the Erase function and Return is used for making a forced end of line while in Insert mode.

The design principle behind it is apparently that it gets rid of the need for special format and control keys, but I find it makes life at least as confusing as using the traditional control keys. All the WP user needs is to be able to see his text on the screen and have it updated as he goes along, and he doesn't need or want to be bothered with special entry modes.

It becomes apparent as you continue to use Teach that the letters of the alphabet do not perfectly align themselves to correspond to possible functions of word-processing. It is all very well to call setting up a new document Create and give it the mnemonic C, as with D for Display or E for Erase. But when it gets to Print you realise that you've already used up P for Pointer. So the command for printing (unformatted) text from the screen is O for Output. (The Select main menu command for printing formatted text is Print, however, as one would expect.)

X for Exchange is the convenient function you invoke for overtyping. V for Verify is a handy feature which brings back a screen you have inadvertently caused to go blank. It redisplays your current screen so that you can check all the changes have been made as you intended.

Locate is a search command and will find any character, word or phrase in your document. L also has the anomaly that if the string you are looking for contains a forced end of line then you have to put it in quotation marks.

Move is the highly useful facility — the keystone is WP in fact — which enables you to transport a whole block of text from one part of your document to another.

Then there seems to be an unnecessary number of commands to do really quite similar things. For deletion there are both Erase and Zap commands. Erase works differently from most editing commands in that you move the cursor to the relevant position in the text, press E, then move the cursor to one space after the bit you want scrapped. Once the area is properly defined you press Escape. This has the strong disadvantage that you can't press Escape to abort the command if you decide you don't want to erase that portion of text after all, because this is how you actually perform the deletion. Instead, you have to 'curse' all the way back until there is no longer any area of text marked out for erasure. Erase has two further properties. E followed by a space kills a word, and E followed by a full stop kills a sentence.

Zapping, on the other hand, deletes a block of text which has been identified by setting pointers at beginning and end. I fail to see why this facility has to have a separate name as it could just as well be carried out by using Erase plus Pointers. It seems to be the result of a desire to fill out the Select ABC and indulge the juvenile thrill of using this piece of comic-strip lingo.

Another unnecessary duplication is that there are three different commands for copying text that you have already created: Copy, Write, and Append. The first two involve the use of pointers. These are set to the beginning and end of the section you wish to copy. The new location for the section of text is identified by positioning the cursor. The copy facility doesn't destroy the text in its original location and it could be useful if you are compiling a document which quotes the same piece of text several times. (On the other hand, if you simply had a rather long, unwieldy name you had to keep using then it would be easier to mark it with a unique string such as XYZ and then use the global search and replace string facility, Replace.)

Write is designed to create a new document which consists of a block of text taken from your current document.

Append simply replicates a complete document. Somehow, I always end up thinking of legal secretaries and turgid conveyancing documents when I come across these facilities, and I really do think one copying function should provide all that most users will want. Considering Select's lack of facilities, such as the creation of special characters, or simple adddition of columns of figures, or even the lack of ability to draw a vertical line on the screen for forms, the plethora of copying facilities seems excessive.

Formatting

To start designing your document formats, you must turn to the manuals, as Teach explains only editing procedures. The easiest to remember are those which are displayed constantly at the top of the screen when you are in Insert mode. They relate to producing characters in bold face, underlined, subscripted or superscripted. Again, these commands are keyboard-dependent and if you have an Apple, for instance, you may have to set up special control characters to do them. But with the PC8000 it is simple — just a case of remembering to put the appropriate character at the end of the section as well as the beginning so that you don't end up underlining pages of your document. The characters are '—' for underline, ' ' for bold, '[' for subscript and ']' for superscript.

Once you have chosen a suitable format for your characters, you will want to determine print formats to decide page layout. Select is quite versatile in this respect; the chief drawback being that the justification facility is rather limited. You cannot opt for justification by spaces between characters or punctuation marks, but only by the spaces between words. This can yield overlarge spaces when particularly long words are used.

There is no special facility for altering the pitch to give gradations of text of different density. But you can choose either six or eight vertical lines to the inch.

One great help when designing page layouts is a section in the manual which gives examples. It is a quick and easy reference to what you can do, and it was the way I found out that you can only have enforced spaces between the left hand margin and the first character if you use left, and not right, justification. (You need to know this in setting up headers.)

There are two ways you deal with formatting — either on the special format page that goes with every document, or actually on the text as you enter it, in which case you use the left hand margin. The latter is used mainly for altering formats as you go along so that a quotation, for instance, can be indented, single spaced and right justified where the bulk of the text is blocked, double-spaced and has a ragged right edge.

You can set up 'headers' for recurrent text at the top of your pages, and 'footers' at the bottom for, say, pagination. The system will do the actual numbering for you and you can leave introductory pages free at the beginning of a document.

Pagination, however, does become rather labour-intensive with Select because there is no clear line across the screen showing where the ends of your pages come. This means that you will constantly find paragraphs spreading themselves over page boundaries, and the only way to fix this is to go through the document and define forced ends manually. An if you want to insert pages or other large amounts of text then you will have to review all your subsequent page boundaries again.

Merge and Spell

Select includes two valuable document preparation facilities, Merge and Spell. Spell is a proofreading tool and picks up spelling mistakes for 'multiple thousands of words'. It can also be customised so that is you use a lot of jargon it can pick up spelling mistakes in that. It highlights misspelt words for your attention as it reads through.

Merge is an essential facility if you are using WP for business and are sending lots of standard letters to people on a mailing list. It will insert individual information in each letter and then print the appropriate address on an envelope.

Conclusion

In conclusion, Select is an easy to use WP system which provides most of the basics. It would suit somebody who had not used a micro before, but it quickly becomes frustratingly slow. The software seems resilient; indeed Bonsai claims 100 man-years of testing has been applied. Select makes a noble effort to demystify computers — but there's still lots of scope for improvement.

END

Benchmark timings

BM1	24.0
BM2	44.0
BM3	19.0
BM4	31.0
BM5	31.0
BM6	41.0

All timings in seconds. For an explanation of the word processor Benchmarks, see PCW, *April 1981.*

'There's a hole in my Apple...'

M J Parrott describes a crafty way to fit an Apple program around the hi-res graphics area

From time to time it can be useful to leave a space within a Basic program to incorporate perhaps a machine code program or data space. This is also true for a special reason on the Apple II when one wishes to protect the hi-res pages from program text. The usual way round this particular problem is to load the Basic text above the hi-res pages either by changing the beginning of program pointer ($67,68) before loading it (usually in an EXEC file) or by letting the program relocate itself to above the hi-res page when it RUNs by using a utility such as the &LOMEM: developed by Neil Konzen (*Apple Orchard*, March 1980).

The drawback with loading a program above the hi-res pages is that approximately 6k of memory is left fallow; it can only be used for machine code routines or shape tables. Also, the &LOMEM: utility does not work for very long programs because of the way in which it calculates the new link addresses of the relocated text.

It is desirable therefore to be able to load a program at the normal starting location ($801), to continue up to the area of memory to be protected (this is $2000 to $4000 for hi-res page 1 and $2000 to $6000 for hi-res pages 1 and 2 together), to jump over this area of memory and to continue up to the end of program text.

This is actually quite easy to do and the program listed will allow you to do it without problem. In essence the only work required is to move the latter part of the program and to change the link addresses where required. There are, however, a couple of provisos, but before pointing these out it is probably best to indicate the general construction of an Applesoft Basic program.

When you type in a Basic program it is constructed from memory location $801 (2049) upwards. Memory location $800 will contain a zero value. The actual line of Basic you type in is not stored exactly as you type it. If you call the monitor (CALL-155) and type 800L you can examine the start of any programs you have previously typed in or LOADed. The first two bytes of the line are the link address. In reverse order, these point to the start of the next line of Basic. Perhaps the best way of demonstrating this is via an example such as the short program:

```
10 PRINT "HELLO"
20 GO TO 10
```

If you type this in, call the monitor and type 800.817 and press ⟨return⟩ you will see the following:

```
0800— 00 0E 08 0A 00 BA 22 48
0808— 45 4C 4C 4F 22 00 16 08
0810— 14 00 AB 31 30 00 00 00
```

The values 0E,08 are the link addresses for line 10 and point to location $80E where the next line, 20, starts. At this location appear the link addresses for this line — they point to $816 where you will find the value 00,00. This is how Applesoft knows it has reached the end of a program.

Going back to the first line, the next two locations contain the line number expressed as a hexadecimal number stored in two bytes in reverse order, ie, 0A 00 for the decimal value 10. Next follows the text of the line. The PRINT command appears as a single byte in the 'tokenised' form BA. There then follow seven bytes which spell out "HELLO" in standard ASCII (with the high bit set low). Next is the end of line token, a zero byte. The next line has its link addresses, its line number and the tokenised form of 'GOTO', which is AB, followed by the number of the object line stored as ASCII values. Then come the end of line token (0) and the two zero value link addresses which signify the end of the program.

In general, then, any line of Basic is sandwiched between two zero bytes and this is the first proviso on relocating part of a program; the second part must start with a zero byte so that it looks like a normal line of Basic to Applesoft. The second proviso is that the last line of the first part of a split program must be one that does not simply move on to the next line (because it isn't there). In other words this last line must be either a GOTO or a RETURN.

If these two conditions are met and the link addresses are adjusted after splitting then a program will run quite

GOTO page 211

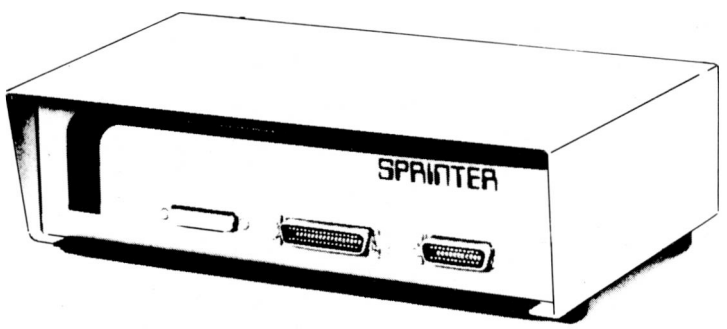
```
9  REM

'CLEARSPLIT' IS ASSEMBLED BY
THIS APPLESOFT PROGRAM

10  TEXT : HOME
20  PRINT "THE MACHINE CODE PROGRAM 'CLEARSPLIT'"
30  PRINT "IS NOW BEING ASSEMBLED UNDER HIMEM:"
39  REM

LOOK AT MACHINE'S HIMEM AND
CALCULATE STARTING LOCATION FOR 'CLEARSPLIT'
(I.E. $200 BELOW HIMEM)

40 P =  PEEK (116) - 2
50 HI =  PEEK (115) + 256 * P
60  FOR I = HI TO HI + 332
70  READ V: POKE I,V: NEXT
79  REM

NOW DATA HAS BEEN ASSEMBLED FOR
A 48K MACHINE.  IF YOURS IS
ALSO 48K LINES 80 TO 190
INCLUSIVELY MAY BE DELETED

80  IF P = 148 THEN  GOTO 200
90  POKE HI + 11,P: POKE HI + 35,P
100  POKE HI + 40,P: POKE HI + 56,P
110  POKE HI + 61,P: POKE HI + 75,P
120  POKE HI + 80,P: POKE HI + 85,P
130  POKE HI + 106,P: POKE HI + 133,P
140  POKE HI + 173,P: POKE HI + 182,P
150  POKE HI + 186,P: POKE HI + 189,P
160  POKE HI + 191,P: POKE HI + 197,P
170  POKE HI + 200,P: POKE HI + 287,P
180  POKE HI + 294,P: POKE HI + 300,P
190  POKE HI + 303,P
200  PRINT : PRINT : PRINT : PRINT "INSERT YOUR DESTINATION DISC"
210  PRINT "AND PRESS RETURN TO SAVE IT"
220  GET T$: IF  ASC (T$) <  > 13 THEN 220
230  PRINT  CHR$ (13) +  CHR$ (4)"BSAVE CLEARSPLIT ,A"HI",L333"
239  REM

THE DATA FOLLOWS

240  DATA  169,76,141,245,3,169,20,141,246,3,169,148,141,247,3,96,0,0,0,0,
     169,189,32,192,222,32,103,221,32,82,231,165,80,141,16,148,165,81,141,
     17,148,169,193,32,192,222,32,103,221,32,82
250  DATA 231,165,80,141,18,148,165,81,141,19,148,216,160,1,177,103,208,3,
     76,18,212,56,173,16,148,233,11,141,16,148,176,3,206,17,148,165,103,13
     3,80,133,94,165,104,133,81,133,95,160,1,177
```

```
260  DATA 80,240,221,205,17,148,240,17,176,33,133,95,136,177,80,133,80,133
     ,94,165,95,133,81,144,228,133,155,136,177,80,205,16,148,176,8,170,165
     ,155,133,95,138,144,228,56,165,94,233,1,133,155
270  DATA 165,95,233,0,133,156,24,165,175,105,1,133,150,144,2,230,176,56,2
     29,155,141,16,148,165,176,133,151,229,156,141,17,148,24,173,16,148,10
     9,18,148,133,148,133,175,170,173,17,148,109,19,148
280  DATA 133,149,133,176,168,138,32,147,211,165,117,72,165,118,72,160,3,1
     77,155,133,117,200,177,155,133,118,32,32,237,104,133,118,104,133,117,
     160,3,177,155,56,233,1,145,155,200,177,155,233,0,145
290  DATA 155,160,5,169,171,145,155,162,255,232,189,0,1,200,145,155,201,0,
     208,245,24,165,155,105,1,133,155,144,2,230,156,24,169,1,109,18,148,16
     0,0,145,155,141,18,148,72,144,3,238,19,148
300  DATA 173,19,148,200,145,155,133,156,104,133,155,177,155,240,14,160,4,
     200,177,155,201,0,208,249,200,152,24,144,211,76,108,214 .



9  REM

DATA FOR THE MACHINE CODE PROGRAM 'CLOSESPLIT'

10  DATA 32,88,252,165,103,133,94,165,104,133,95,56,160,1,177,94,240,22,13
     3,81,229,95,201,1,240,2,176,15,136,177,94,133,94,165,81,133,95,56,176
     ,228,76,18,212,165,94,133,0,165,95,133,1
20  DATA 177,94,133,156,136,177,94,133,155,56,165,175,241,94,133,80,165,17
     6,200,241,94,170,160,0,177,155,145,94,136,208,249,230,95,230,156,202,
     48,6,208,240,164,80,208,236,200,177,0,240,34,200
30  DATA 200,200,177,0,208,251,200,24,152,101,0,160,0,145,0,133,80,165,1,1
     05,0,200,145,0,133,1,165,80,133,0,56,176,217,24,165,0,105,3,133,175,1
     65,1,105,0,133,176,32,108,214,76
39  REM

THE PROGRAM BEGINS HERE
BY BEING POKED IN

40  DATA 208,3
50  TEXT : HOME
60  PRINT "THE MACHINE CODE PROGRAM 'CLOSESPLIT'"
70  PRINT "IS NOW BEING ASSEMBLED AT $300 (768)"
80  FOR I = 768 TO 768 + 152: READ J: POKE I,J: NEXT
90  VTAB 10: PRINT "INSERT YOUR DESTINATION DISC"
99  REM

NOW SAVE IT TO DISC

100  PRINT "WHEN READY PRESS <RETURN>"
110  GET T$: IF  ASC (T$) <  > 13 THEN 110
120  PRINT  CHR$ (13) +  CHR$ (4)"BSAVE CLOSESPLIT,A768,L153"
```

HOW TO USE YOUR PRINTER WITHOUT WASTING COMPUTER TIME:

Your computer is capable of sending data at many thousands of characters per second but the fastest Epson can only print 100 characters per second and most daisywheel printers are even slower.
This means your computer is forced to wait for the printer to finish one line before it can send the next. A costly waste of time.

THE NEW SPRINTER ACCEPTS DATA AS FAST AS YOUR COMPUTER CAN SEND IT.
SPRINTER stores the data in its own memory buffer and then takes control of the printer. This frees your computer for more productive functions.



Problem: Connect a 20 character per second Word Processor serial printer to your computer but don't tie the computer up for 20 minutes during a 25,000 character print.
Answer: SPRINTER

Problem: Attach a letter quality serial printer to a parallel output computer for Word Processing.
Answer: SPRINTER

Problem: Save money by attaching a low cost matrix printer to a serial output computer.
Answer: SPRINTER

Problem: (Insert your interfacing problem here)
Answer: SPRINTER

SPRINTER *COSTS £249.00 including P&P (VAT extra)*

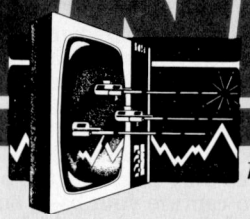
SO WHY WASTE ANY MORE TIME?

CALL US NOW FOR YOUR SPRINTER AND LET YOUR COMPUTER GET ON WITH SOME REAL COMPUTING.

GB COMPUTER PRODUCTS LIMITED, 14 GREENWOOD GROVE, WINNERSH, WOKINGHAM, BERKSHIRE, RG11 5LH
Telephone 0734 786635 or 791678, Telex 847783 GDB CS G

SPRINTER IS A TRADEMARK OF MUTEK.

SCREENPLAY

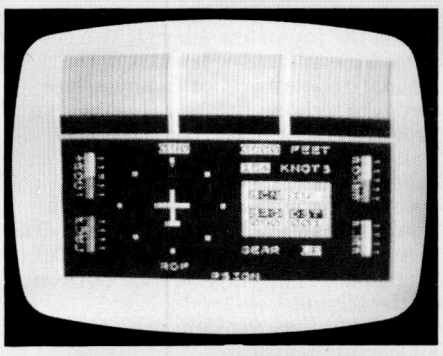


Dick Olney takes a further look at ZX81 games

I was going to cover the Acorn Atom this month, but because of the number of games I've been sent for the ZX81 recently — including the new Sinclair/Psion offerings — I decided to have a second look. (Atom owners may rest assured, however, that a full review is on its way!) As you'll know if you read last month's 'Screenplay', I don't rate the ZX81 very highly as far as arcade-type games are concerned but, nevertheless, its cost has given it predominance in the British home market, and games software for this machine is thus likely to reach the widest audience of all.

By the time you read this, many ZX81 enthusiasts will have already placed their orders for the Spectrum, which promises to change the face of home computing in this country. Meanwhile Sinclair has entered the games arena (its initial efforts were trivial, to say the least) with an impressive set of software produced by Psion Ltd in association with Micro Gen. The latter can supply joysticks for use with some of these games for £29.95 each (including extension board), though unfortunately I was unable to review these.

One of the most interesting Psion tapes was the Adventure set (see Fantasy Games review). Although this is the only such game I have reviewed on the ZX81 there are several others available, and I would recommend them to anyone who is disinterested or disappointed with the arcade type games. I have met many people who spurned Space Invaders, yet became almost obsessed when confronted with a good adventure. Anyway, here's another selection of games for Uncle Clive's classic. I have indicated in the reviews whether or not they require the 16k RAM.



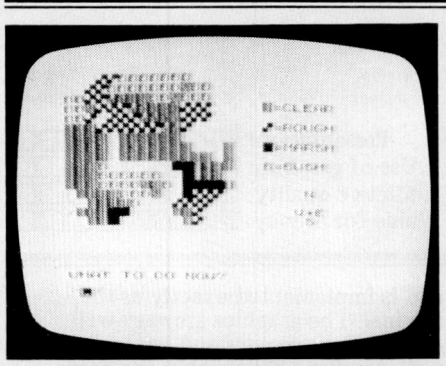
Game: Flight Simulation
Supplier: Sinclair/Psion
Price: £5.95

The leaflet which comes with this game suggests it simulates the flight of 'a small, high-performance, two-engined, propellor-driven aeroplane'. Not being a pilot I don't know whether this is completely accurate — but certainly all the fundamental features of flying are included. The cursor keys represent the aeroplane's joystick, which is confusing at first since the ↑ key in fact sends you into a dive (joystick forward). The 'P' and 'O' keys increase or decrease throttle, 'F' and 'D' do the same for flap extent, and 'G' lowers or raises the undercarriage.

There are three screen formats which you can move between at will. The cockpit display shows a full instrument panel with power, flap and fuel gauges, altimeter, speedometer, rate of climb and heading indicators and a selection of navigational aids. The latter give your position relative to any one of six beacons. A map of the area with the positions of the airport and beacons can be obtained by pressing the 'M' key. The third display is used for landing and shows a view out of the cockpit window, together with your speed and altitude.

There is no set task involved in this simulator — you just take off, fly the aircraft between the various beacons, and land (there is in fact an option just to practise the landing). It is very well done, however, and good use is made of the ZX81. As you might expect it does need the 16k RAM pack!

Presentation: ▰▰▰▰▰▱▱▱
Addictive quality: ▰▰▰▱▱▱▱▱
Value for money: ▰▰▰▰▰▱▱▱



Game: Fantasy Games
Supplier: Sinclair/Psion
Price: £4.95

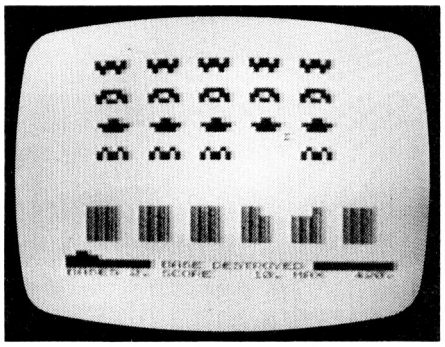
Many people are still under the impression that all computer games involve frantically pressing buttons amidst what is to them visual and often auditory chaos. For any readers who may be guilty of this, adventure games — as they have come to be called — are 'role playing' games in which you are presented (sometimes with the aid of a map) with a scenario and a task or tasks. You must direct your actions, again usually through verbal commands, in order to explore and solve the various problems you are confronted with.

Although I have reviewed adventure games in the past, it is difficult to give them the coverage they deserve, partly because of the time it takes to really acquaint myself with them; and anyway it's often difficult to know what to say without giving too much away. This pair of adventures is particularly noteworthy because they provide a sort of introduction to games of this genre. The first, 'Perilous Swamp', is extremely simple but should help you get the hang of things. You are given a small square map showing areas of impassable swamp and dry(ish) land with your position marked (you start at the edge), as well as that of a princess whom it is hoped you will save from an evil wizard. At each move you encounter some beast, invariably guarding a valuable item of treasure, and are given the option to fight, run or bribe. You begin with a limited number of combat points, and any running or fighting will use up a certain amount of these (in the latter case depending on the combat strength of the beast itself), while you can only bribe if you have already ripped off some treasure elsewhere. Your success at fighting depends on how many combat points you decide to use, and on running or bribing on the potential or whim of your adversary. If you're lucky you'll rescue the princess and carry her back to the edge of the swamp — otherwise you get killed.

On the other side of the tape is an adventure called 'Sorcerer's Island' with a similar format, but a much more extensive map and greater flexibility of commands. Your task is simply (?) to escape from the island. This is considerably more interesting and challenging enough for the most avid adventurer. I must admit I didn't even get close to finishing it, but there seemed to be plenty of surprises.

These games from Psion are certainly not as sophisticated as many adventures I've seen, but they offer a valuable oportunity for the beginner to become acquainted with one of the most promising areas of computer leisure. I firmly believe that adventure games will one day be almost as widespread and popular as crosswords, and may well prove to have a more lasting appeal than their arcade-type counterparts. Anyway the limitations that the ZX81 places on the latter definitely make this and its fellows the better value for money.

Value for money: ▰▰▰▰▰▰▱▱
Presentation: ▰▰▰▰▰▱▱▱
Complexity: ▰▰▰▱▱▱▱▱



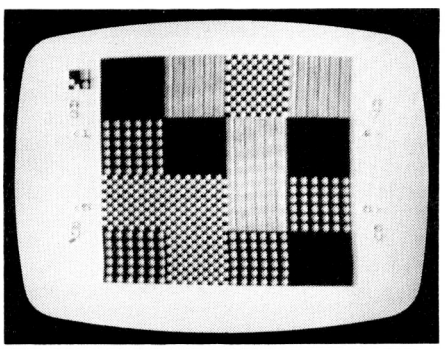
Game: Space Raiders and Bomber
Supplier: Sinclair/Psion
Price: £3.95

The first of this pair is a standard version of Space Invaders, with very chunky rather oversized graphics. You fire 'I's at the aliens using the space key ('Z' and SHIFT are used for movement) and they drop asterisks on you. There are no flying saucers and the raiders do not speed up as their numbers lessen. They need only reach the top of your shields to capture your base, not the bottom of the screen — which is somewhat disturbing to start with. Three speeds of play are possible; dubbed normal, fast and superfast, but these do not vary as much as one might think.

Bomber is the familiar game where you have to destroy skyscrapers before your plane crashes into them. The plane moves across the screen dropping one line on each cycle. The various-sized skyscrapers are destroyed by bombs or forward-firing missiles, of which only one may appear on the screen at any time. The game can be played at nine different speeds.

Both of these need 16k of RAM. Neither of them is original or particularly inspiring. I must have played dozens of versions of Space Invaders and, although I assume that many people are still playing this grandfather of games, I can't help feeling that it is about time the games publishers gave it a decent burial.

Presentation: ▰▰▰▱▱▱▱▱
Use of graphics: ▰▰▰▰▱▱▱▱
Addictive quality: ▰▰▱▱▱▱▱▱
Value for money: ▰▰▰▱▱▱▱▱



Game: The Nowotnik Puzzle & other diversions
Supplier: Phipps Associates
Price: £5.00

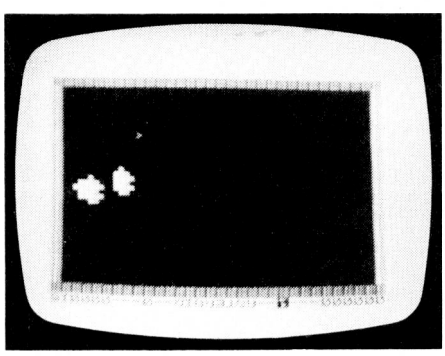
Here is a trio of programs written by one Dr David Nowotnik to run on a 16k ZX. The puzzle to which this gentleman lends his name is a cross between one side of a Rubik's cube and those flat plastic novelties where, given a single space, you have to rearrange the pieces into some prescribed pattern. The screen starts out divided into four squares, each with a markedly different shading, and the program proceeds to shuffle these into an unrecognisable form. Your task, of course, is to get the puzzle back to its original configuration. For purposes of movement, the puzzle is divided into four overlapping bands (top and bottom, and left and right halves) each of which can be moved in either direction, as if the outer edges were joined up. The original squares are well dispersed throughout the screen, and it is exceedingly difficult to bring together their constituent parts. The puzzle has five skill levels, varying from hard to almost impossible, and contains full instructions with examples. I've never really had the patience for this sort of thing, but as puzzles go the Nowotnik is certainly a good one.

The second program is called 'Demolition' and is, as the name suggests, along the lines of Breakout. Here the wall moves slowly *upward* and the bricks are knocked out by an asterisk which is dropped from the top. In fact the asterisk shoots across the screen and is hurled down at the wall in the desired position by pressing any key. When the first wall (or what remains of it!) gets about halfway up another appears at the bottom, and so on until any brick reaches the top. Despite the simplicity of this game, I enjoyed it, though it was definitely relaxing rather than exciting.

The final program, called 'Tenpins', is exactly that. You are shown an aerial view of the alley with the ball on one side and the pins set up on the other. The ball moves steadily up and down across the top of the alley (if you see what I mean!) and when it is in the desired position you press any of the keys 1-9 to bowl it. The actual key you press will determine the strength of your bowl and the trick is — more speed less accuracy. When the ball reaches its goal the pins which it has knocked down gradually disappear. One or two players can take part and a full scoreboard is displayed at the bottom of the screen.

This package is nicely presented — all the programs carry full 'integral' instructions — and is good value for money. None of the games are immensely impressive in themselves, but they complement each other well.

Presentation: ▰▰▰▰▰▰▱▱
Use of graphics: ▰▰▰▱▱▱▱▱
Addictive quality: ▰▰▰▱▱▱▱▱
Value for money: ▰▰▰▰▱▱▱▱

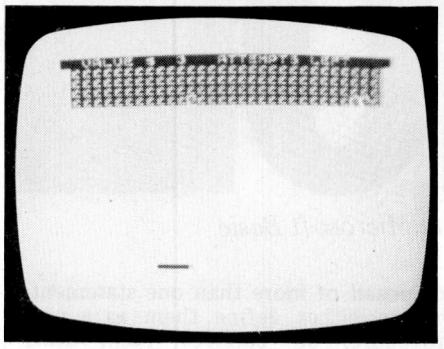


Game: Asteroids & Invaders
Supplier: Silversoft
Price: £5.95 and £4.95

These are Silversoft's versions of the old originals to run with 16K. The Asteroids (called 'Meteor' in the program but 'Asteroids' on the pack) uses different characters to represent the direction the ship is facing (eg, 'A' for up, 'V' for down, " for left and the graphics characters such as L for diagonals) which, though partly effective, do make it difficult to take the game seriously. There are no special features such as hyperspace, so apart from movement and firing the only other control is thrust. This will move the ship whilst you are pressing the key, but does not give actual acceleration as in the original, so that motion ceases when you remove your finger. There are ten speed options and movement is fluent so the game, as far as it goes, plays quite well. Despite its limitations this is just the thing for Asteroid addicts.

Much the same can be said for the Invaders. It too has ten speed options and is implemented exactly as the original. The graphics are very well done and movement and controls work well, resulting in probably the best version of Space Invaders, you'll get for the ZX81. Despite any reservations about the insistence of games publishers to maintain such strong links with their pre-history through endless versions of this game (see the Space Raiders review), this is possible the best game of its type played on this machine. There's a message there somewhere!

Presentation: ▰▰▰▱▱▱▱▱
Use of graphics: ▰▰▰▰▱▱▱▱
Addictive quality: ▰▰▰▱▱▱▱▱
Value for money: ▰▱▱▱▱▱▱▱

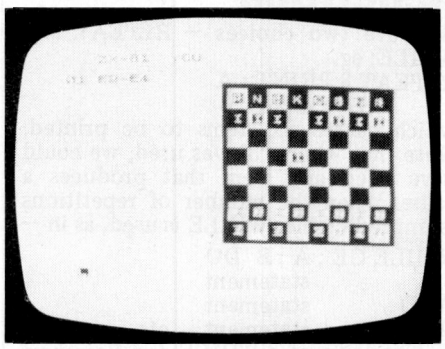


Game: 1k Breakout
Supplier: J K Greye Software
Price: £4.95

Despite the unoriginality of this game it's probably the best investment you can make for the 1k machine. The 'wall' is made up of reverse image '£'s which change into normal '$'s when hit and thus your score is given in dollars. Each game consists of ten balls, which are served from the top of the screen, and the bat is moved using the '5' and '8' keys. There are options for three different speeds and two bat sizes, and these are changed by BREAKing the program and performing various POKE functions.

One annoying aspect of this game was that instead of having an overriding direction the bat doesn't move at all if the two keys were pressed simultaneously. Since I tend to keep one finger on the 'recessive' key in these games, using the other to reverse direction and hence never being stationary, I found my bat halting at the most inconvenient times! Nevertheless a good game and, as I've said, one of the best you'll get in 1k.

Presentation:
Use of graphics:
Addictive quality:
Value for money:



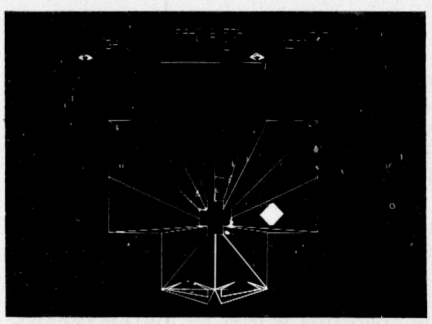
Game: Chess
Supplier: Sinclair/Psion
Price: £6.95

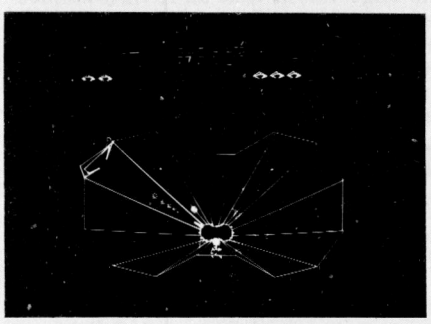
A fully fledged chess package with six playing levels, this offering from Sinclair/Psion runs on a 16k machine. The board is displayed over half the screen and is quite clear, except that it's a bit difficult to see which colour each of the pieces is. The leaflet suggests you use a normal chessboard alongside this game just to be sure, which sounds like good advice. All moves are possible including castling and en-passant, and you can choose which colour to play. Moves are input using the usual alpha-numeric cartesian coordinates (1-8 and A-H), and the only major criticism I have is that these codes are not displayed beside the board for quick reference.

There is a facility to set up the board to solve problems or simply create interesting situations, which can be used at any time in the game. It is also possible to change sides at any point. The standard of play is very high as the blurb on the package proudly announces; even skill level two can beat the average player. One side of the cassette contains a 'Chess clock' simulator for timing games, though of course this can't be used alongside the chess program itself.

Presentation:
Special features:
Playing skill:
Value for money:

ARCADE ACE





Tempest first appeared last summer and must be the fastest machine I've ever seen. The battle scenarios consist of magnificent line graphic structures whose perspective gives the impression of looking down a long tube. Using a rotary control, you guide a yellow pincerlike object around the near edge. Your weaponry consists of a fire button which projects missiles along the walls of the tube, and a 'superzapper' which eliminates everything in view.

A number of objects are thrown against you. The most valuable, fireballs, look like badly drawn Xs and fly up and down the tube at the same speed. These can be hard to get rid of, but they only appear when the game is quite well advanced. Pulsars move between adjacent lines, making the lines themselves intermittently lethal. They must be destroyed between pulses. Flippers literally flip-flop up the tube and look very like your pincers except that they are red. If they reach the top of the tube they move menacingly around the edge. Since the 'superzapper' can only be used once in each frame, it is often most useful when several flippers are closing in on you and preventing movement.

Purple diamond-shaped objects are called 'tankers' and, though quite easy to destroy, they split into two flippers if hit or if they reach the top — so watch out! Finally 'spikers' are small green spirals which move up and down the tube on the end of spikes. When one tube has been cleared these spikes remain and must be avoided when you 'zoom down the tube'. If you are successful you find yourself at the edge of another tube of a somewhat different shape. I don't know how many shapes there are — plenty to keep me going, at least! You are given three pincers to start with and get an extra at 20,000.

I must assume that the name of this game refers to the noises which accompany it. The rapid action leads to a remarkable cacophony of whizzes and bangs. Undoubtedly the most impressive feature of Tempest, however, is the colour graphics which can only be described as spectacular. There may not be as much in the way of controls as something like Defender, and certainly the stategy is not as complex, but the very speed of Tempest makes it a real challenge.

This game was one of the last of its type to appear, coming as it did at the beginning of the rise in popularity of 'cute' games such as Pac Man and Frogger and has consequently attracted less attention than it might have. In some respects it's a bit too overwhelming and would thus quickly deter any but the most enthusiastic and quick-witted novice. It's definitely worth a try, however, if only for the unusual graphics. END

DIY LOGO

Mike Parr presents 'Pogo' — a 16k implementation of Logo in Microsoft Basic

In the April 1982 *PCW*, Harvey Mellar looked at the Logo language in general terms, and indicated the educational possibilities of an easy-to-use procedure-defining facility coupled with turtle graphics.

Logo is now becoming available on some micros (Apple, TI) but is not yet widespread. No problem! In Figure 3 there's a listing of a Logo system written in Microsoft Basic which runs in 16k. Some 'uncommon' features of Basic have been avoided (eg, the ELSE), thus the program, though written on a TRS-80 Model I, will run on most systems without major alterations. Later, I'll describe how to carry out any modifications.

Pogo?

Though Logo is not rigidly defined, the version in this article has one major omission — list processing — hence I call it 'Pico Logo', or 'Pogo'. What it does have, however, is simple procedure defining with local variables (which allow recursion) plus turtle graphics and IF, REPEAT, WHILE and assignment statements. In short, most 'standard' Logo turtle graphics programs will work in Pogo.

To any Logo distributors who are concerned that my free system will put them out of business, don't worry! Pogo is slow, being an interpreter written in an interpreted language. Typically, a ten line procedure definition takes at least 30 seconds to be translated into an internal machine code, which is then interpreted. Editing and input of procedures is reasonably fast, though.

The language

In this section I'll describe in detail the Logo subset features, referring to Pogo where a major difference exists.

When you load and run the Pogo system, it prompts you with C?, meaning that a command is required. You may choose to do a calculation — PRINT SUM 3 7 will display the result '10'. SUM is a built-in procedure which needs two 'arguments', and which produces a result. PRINT is a procedure which takes one value and displays it on the screen. Note that an argument can be a procedure call, as in PRINT SUM 3 PROD 4 6. Here, Logo first evaluates 4 times 6, then adds 3, then finally prints 27. For subtraction, multiplication and division we have DIFF, PROD and QUOT respectively.

To 'teach' Logo the meaning of a new word, use the TO command, as in

```
TO SHOWTWICE 'NUMBER
10 PRINT ; NUMBER
20 PRINT ; NUMBER
END
```

When you embark on typing a definition, you will be prompted by NE?, which means 'type a numbered line or END'. The rules for inserting and deleting lines are the same as in Basic. This definition also introduces two new symbols — the quote and the semicolon — which Pogo uses to distinguish variables from procedure names. More precisely, a semicolon indicates the value of a variable, and the quote indicates the name of a variable. (Logo uses a colon, but this confounds most Basic INPUT statements.)

Anyway, back to SHOWTWICE. The purpose is to print a number twice, but we require that it works for any number. In Logo, this is simple — we make the procedure accept a value to work on, and (arbitrarily) we have called this value NUMBER. In Pogo all variables are local to the procedure in which they occur, thus the programmer has an unrestricted choice of names. To test the procedure, we may type

```
SHOWTWICE 6
```

causing

```
6
6
```

to be printed. This procedure has a printing effect, but no result. To return a value we use the RESULT statement, as in

```
TO DOUBLE 'N
10 RESULT SUM ; N ; N
END
```

and might test it with

```
DOUBLE 8
DOUBLE DOUBLE 3
```

which print 16 and 12 respectively.

As well as TO, we have EDIT, which allows one to alter an existing procedure; LIST, to display a definition; and ERASE, to remove a definition from memory.

To compare values, we have the six procedures EQ, NE, GT, LT, GE, LE. 'True' and 'false' are represented in Pogo as 1 and 0, thus

```
PRINT EQ 10 PROD 2 5
```

causes 1 to be displayed, as 10 is equal to 2 times 5.

To illustrate the IF...THEN...ELSE statement, here are two simple procedures:

```
TO MAX 'A 'B
10 IF GE ; A ; B
20     THEN RESULT ; A
30     ELSE RESULT ; B
END
```

which could be tested by

```
PRINT MAX 6 9  (9 is printed)
```

and

```
TO SHOWPOSITIVE 'N
10 IF GE ; N 0 THEN
20                PRINT ; N
END
```

which displays a value only if it is positive. In Logo the layout of a program is up to you, except that spaces are used to separate items.

When one of the options of an IF is composed of more than one statement, we can either define them as a new procedure, or 'connect' them using AND, as in

```
IF EQ 'A 'B
      THEN PRINT ; A
      AND PRINT ; B
```

Repetition

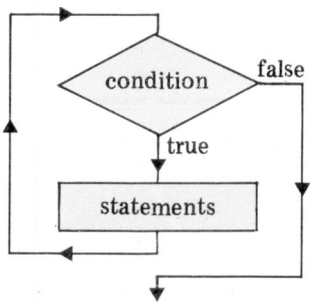
We have two choices — REPEAT and WHILE; eg,

```
REPEAT 3 PRINT ; A
       AND PRINT ; B
```

which causes six items to be printed. Note that where '3' was used, we could have used any item that produces a value. When the number of repetitions is unpredictable, WHILE is used, as in —

```
WHILE GE ; A ; B  DO
                  statement
AND               statement
AND               statement    etc.
```

The logic of a WHILE as a flowchart is



Presumably, the repeated statements will affect the terminating condition otherwise the program will loop for ever. Note that, to maintain compatibility with Logo, a WHILE may use either DO or THEN.

The problem is that, where an IF is contained within a WHILE, an AND could be linked to either statement. Full Logo allows us to use square brackets to overcome ambiguities, but the Pogo rule is that an AND is connected with the nearest IF or WHILE. Where this rule is unsuitable for your program logic, consider using an extra procedure definition to get round the problem.

Assignment

Whereas in Basic we write A=B + C, in Logo we write

```
MAKE 'A SUM ; B ; C
```

Again, any new variables that we invent are automatically made local to the current procedure, and will be re-created every time the procedure is entered — this allows recursion.

Graphics

Turtle graphics are a major feature of Logo, and enable procedures to be

defined which draw shapes. We have FORWARD, RIGHT, PENUP, PENDOWN. To draw an 'L' shape on the screen we could enter

```
FORWARD 6 AND RIGHT 90 AND
   FORWARD 6
```

Here are three useful procedures:

```
TO LEFT 'DEGREES (turn left)
10 RIGHT DIFF 360 ; DEGREES
END
TO FD 'N (allow FD as short for
FORWARD)
10 FORWARD ; N
END
```

Finally, to backtrack N steps without drawing a line:

```
TO BACK 'N
10 RIGHT 180
20 PENUP
30 FORWARD ; N
40 PENDOWN
50 RIGHT 180
END
```

We can now define a procedure to draw a shape with N equal sides of length L (called a polygon in geometry).

```
TO POLYGON 'N 'L
10 REPEAT ; N
20     FD ; L
30     AND RIGHT QUOT 360 ; N
END
```

If your program frequently draws squares, it might be worth having a special definition:

```
TO SQUARE 'N
10 POLYGON 4 ; N
END
```

Other built-in procedures

These are peculiar to Pogo. Firstly, to read in a number while the program is running, use INPUT:

```
PRINT SUM INPUT INPUT
```

which asks you for two numbers, then prints their sum.

To produce random numbers in range 0 to 9, use RND, eg,

```
REPEAT 100 PRINT RND
```

Finally, a 'quick and dirty' patch. In full Logo, we may use global variables and lists. In Pogo, PEEK and POKE can be used to provide global variables and arrays, while still keeping the overall size of the system small. Unlike similar Basic statements, full-length integers can be stored and recalled from an area of memory, as in

```
POKE 1234 6 (put 1234 in 6th
location)
PRINT PEEK 8 (print contents of 8th
location)
```

By suitable choice of procedure names, the effect of global arrays and variables can be obtained. Note that you cannot 'crash' your underlying Basic interpreter with Pogo PEEK/POKE.

Other statements

The two remaining statements — STOP and QUIT — are simple, but might be confused with similarly named Basic statements. STOP causes a return from the current procedure to the calling procedure, whereas QUIT stops the program completely, allowing the user to type fresh commands.

Setting up Logo

Firstly, a brief guide to the overall operation of the system. Typed-in procedure definitions are stored in a linked list. When a procedure call is typed, the appropriate procedures (because the call may itself involve other calls) are translated into an internal machine code, similar in nature to the stack-based p-code of many Pascal translators. Finally, this code (held in an integer array) is interpreted.

I adopted this approach mainly because I had a suitable interpreter subroutine, and didn't want to re-invent wheels — especially my own. A further benefit arises from the splitting of a relatively complicated program into two simpler separate routines which can be written and tested independently.

Now to details. The system is portable but not intelligible, due to Basic's primitive control structures, short variable names, and lack of named subroutines. It is a tight fit in 16k, so there are few comments, and those that do exist employ a shortand:

a. 'C' means 'subroutine to compile and check an item'. Each language item has its own compilation subroutine, which may need to call other similar subroutines (or even itself) if nested items exist. This method of compilation is known as 'recursive descent'.

b. The 'WH' comment indicates the start of a 'WHILE' loop. The program was planned (on paper) using Pascal-style loops, and then converted to Basic. Thus

```
WHILE condition DO
   BEGIN
        statements
   END
```

becomes in Basic —

```
1999 IF NOT condition THEN 3000'WH
        statements
2999 GOTO 1999
3000 etc.
```

The listing

As listed, the program runs on a TRS-80 Model I Level II machine in 16k, but alteration to other Microsoft Basic systems is no problem. Refer to these lines:

Line 20 — if your Basic doesn't need a CLEAR, remove it.

Lines 10050 and 10060 — if you have more than 16k, you can usefully increase some of the K variables, as indicated in figure 1.

Line 20005 — clear the screen.

Lines 23400 to 23460 -- their purpose is to draw a line (usually an approximation in characters or pixels) from an initial position X,Y that is A units long at an angle of AN degrees. Afterwards, X and Y are updated to the new position. If you need to resort to POKE, alter line 23440 to plot a suitable character (eg,*) at the closest position to X and Y — ie, at INT (X+0.5) and INT (Y+0.5). To be on the safe side, include a check that X and Y do in fact correspond to a legal screen position. Finally, if you have the luxury of high-definition graphics (meaning that lines will be shorter), you may choose to multiply X and Y by a scale factor.

Line 29115 — read a line from cassette to L9$.

Line 29420 — transmit L9$ (including its trailing space) to cassette.

Filing procedures

The listed program has two filing commands. FETCH will load the next procedure from cassette, and FILE, followed by a procedure name, will write a procedure onto cassette. To run the system with named files (either on

Vital Variables

K9	number of Logo lines in total (16k, 100. 24k, 200)
K8	number of reserved words
K7	size of c() code array (16k, 200. 24k, 300).
K6	size of compiler stack (16k, 20. 24k, 40)
NU()	number of line
TE$()	text of line
LK()	link (ie, pointer) to next line
CS()	compiler stack
C()	holds internal machine code, and also interpreter run-time stack
SY$	current symbol being compiled
TY$	— and its type.
L9$	I/O line
ID$	input device — K M F — keyboard, memory, or file.
EL$	end-of-line flag
0D$	output device — S F — screen or file.
E0	error occurred
PU	Penup/pendown
P	interpreter program counter (also misc. compiler pointer)
PK()	PEEK/POKE array (16k, 10. 24k, 100)

Error codes

Number	Meaning
1	missing ; before variable
2	illegal item after ;
3	missing THEN in IF statement
4	missing THEN or DO in WHILE statement
5	missing ' after MAKE
6	illegal item after ' in MAKE
7	procedure name after '
8	reserved word after '
11	not enough room to hold the internal machine code.
20	attempt to define a procedure twice
21	illegal item after TO
22	missing ' in TO
23	missing variable in TO
24	procedure does not exist

tape or disk) would require the addition of OPEN and CLOSE statements using (for example) the procedure name as a file name.

Recent developments

In that essential book *Turtle Geometry*, forms of 'pursuit' games are described — to program these, it is useful to be able to run a 'hunter' and 'evader' procedure simultaneously. Though details are not included in the current listing, I have extended the language to allow this 'concurrent' or 'parallel' running, and also to allow procedures to interact using the technique of semaphores.

Reference

'Logo Learning', Mellar. *PCW* April 1982.
Turtle Geometry. Abelson and diSessa. MIT Press 1981.

```
10 PRINT"LOGO MK1"'MIKE PARR
20 CLEAR 1000:GOSUB 10000:GOSUB 40100:ID$="K"
100 'FOREVER,DO:
205 EO=0:PRINT"C";:GOSUB 29100:C$=" ":GOSUB 28000
210 IF SY$="TO" THEN GOSUB 800:GOTO 350
220 IF SY$="EDIT"THEN GOSUB 700:GOTO 350
230 IF SY$="LIST" THEN GOSUB 1200:GOTO 350
240 IF SY$="FILE" THEN GOSUB 1300:GOTO 350
250 IF SY$="ERASE"THEN GOSUB 1500:GOTO 350
260 IF SY$="FETCH"THEN ID$="F":GOTO 350
290 S3=0:S4=0:S1=0:EO=0:GOSUB 5100:I=0:GOSUB 9010
294 GOSUB 7000:ID$="K":IF EO=1 THEN 350
296 PRINT"ABOUT TO RUN:-":GOSUB 20000
350 GOTO 100'END LOOP
700 'EDIT SY$
720 GOSUB 28000:GOSUB 1000:IF P1=0 THEN E=24:GOSUB 9990:RETURN
725 XP=OP:X1=P1:X2=P2:XN=LK(P2)'TEMP
730 PRINT"NE";:GOSUB 29100:GOSUB 28000:GOSUB 900
740 IF(P1=X1)AND(P2=X2)THEN RETURN
750 IF X1=P5 THEN P5=P1:GOTO 770'ELSE
760 LK(XP)=P1
770 IF X2=P6 THEN P6=P1:RETURN
780 LK(P2)=XN:RETURN
800 'TO
810 GOSUB 9400:IF EO=1 THEN RETURN
820 GOSUB 40400:TE$(X)=L9$:NU(X)=-1:P1=X
825 GOSUB 40400:LK(P1)=X:TE$(X)="END ":NU(X)=-1:P2=X:PRINT"NE";:
    GOSUB 2910C
830 GOSUB 28000:GOSUB 900
850 IF P5=0 THEN P5=P1:P6=P2:ID$="K":RETURN
860 LK(P6)=P1:P6=P2:ID$="K":RETURN
900 'EDIT A DEF
910 IF NOT(SY$<>"END") THEN 960'WH
920 IF TY$<>"NUM" THEN PRINT"NUMBERED LINE OR END PLEASE!":
    GOTO 950
925 NL=VAL(SY$)
930 IF EL$="Y" THEN GOSUB 40500:GOTO 950'DEL
940 TL$=RIGHT$(L9$,LEN(L9$)-P9+1):GOSUB 40500
950 PRINT"NE";:GOSUB 29100:GOSUB 28000:GOTO 910
960 RETURN
1000 'SEARCH FOR DEF
1010 F=0:P=P5:OP=0
1020 IF NOT((P<>P6)AND(F=0)) THEN 1070'WH
1030 IF NU(P)<>-1 THEN OP=P:P=LK(P):GOTO 1060
1040 IF TE$(P)="END " THEN OP=P:P=LK(P):GOTO 1060
1050 N$=RIGHT$(TE$(P),LEN(TE$(P))-3):N2=1:X$=""
1052 IF NOT(MID$(N$,N2,1)<>" ") THEN 1054'WH
1053 X$=X$+MID$(N$,N2,1):N2=N2+1:GOTO 1052
1054 IF X$=SY$ THEN F=1
1055 IF F=0 THEN OP=P:P=LK(P)
1060 GOTO 1020
1070 IF F=0 THEN P1=0:P2=0:RETURN'NOT THERE
1080 P1=P:P=LK(P)
1090 IF NOT(NU(P)<>-1) THEN 1110 'WH
1100 P=LK(P):GOTO 1090
1110 P2=P:RETURN
1200 'LIST
1210 OD$="S":GOSUB 1400:RETURN
1300 'FILE
1310 OD$="F":GOSUB 1400:OD$="S":RETURN
1400 'PROC OUT TO OD$
1410 GOSUB 28000:GOSUB 1000:IF P1=0 THEN E=24:GOSUB 9990:RETURN
1430 L9$=TE$(P1):GOSUB 29400:P=LK(P1)
1440 IFNOT(NU(P)<>-1)THEN 1490'W
1450 L9$=STR$(NU(P))+"  "+TE$(P)
1480 GOSUB 29400:P=LK(P):GOTO 1440
1490 L9$="END ":GOSUB 29400:RETURN
1500 'ERASE
1510 GOSUB 28000:GOSUB 1000:IF P1=0 THEN E=24:GOSUB 9990:RETURN
1517 P=P1
1520 IF(P1=P5)AND(P2=P6)THEN P5=0:P6=0:GOTO 1535'ONLY1
1523 IF OP=0 THEN P5=LK(P2):GOTO 1535'FIRST
1527 IF P2=P6 THEN P6=OP:GOTO 1535'LAST
1530 LK(OP)=LK(P2)'MIDL
1535 X=LK(P):GOSUB 40450:P=X
1540 IFNOT(NU(P)<>-1)THEN 1560'W
1550 X=LK(P):GOSUB 40450:P=X:GOTO 1540
1560 GOSUB 40450:RETURN
2000 'EVAL 1 PROC CALL
2010 GOSUB 4300:IF W<>0 THEN GOSUB 4000:
     GOTO 2300'WAS BUILT IN ONE
2020 T1=P1:T2=P2:GOSUB 1000:IF P1=0 THEN E=24:GOSUB 9990:GOTO 2300
2025 PRINT SY$;" ";
2030 GOSUB 9700:IF W=0 THEN GOSUB 9300:GOSUB 9100:W=S1
2035 P1=T1:P2=T2
2040 S3=S3+2:NA(S3-1)=W:NA(S3)=N:GOSUB 28000
2050 IF NOT(NA(S3)>0) THEN 2080'W
2060  GOSUB 3000:NA(S3)=NA(S3)-1'EVAL ARGS,RECURSE
2070 GOTO 2050
2080 S3=S3-2:I=4:A=-NA(S3+1):GOSUB 9020:GOTO 2300
2300 RETURN'EVAL PROC END
3000 'EVAL 1 ARG
3010 IF TY$="NUM" THEN I=18:A=VAL(SY$):GOSUB 9020:GOSUB 28000:
     GOTO 3300
3020 IF TY$="WORD" THEN GOSUB 2000:GOTO 3300'IS A FUN CALL
3030 ' IT MUST BE A ;VAR
3040 IF SY$<>";" THEN E=1:GOSUB 9990:RETURN
3042 GOSUB 28000:IF TY$<>"WORD"THEN E=2:GOSUB 9990:RETURN
3044 GOSUB 9500
3050 I=5:A=W:GOSUB 9020:GOSUB 28000:GOTO 3300
3300 RETURN'EVAL ARG END
4000 'C. 1 BUILT-IN PROC
4010 IF SY$="PRINT" THEN GOSUB 4500:GOTO 4200
4020 IF SY$="IF"THEN GOSUB 4600:GOTO 4200
4030 IF SY$="WHILE"THEN GOSUB 4800:GOTO 4200
4040 IF SY$="MAKE"THEN GOSUB 4900:GOTO 4200
4050 IF SY$="RESULT"THEN GOSUB 28000:GOSUB 3000:I=19:
     GOSUB 9010:GOTO 4200
4055 IF SY$="FORWARD" THEN GOSUB 28000:GOSUB 3000:I=24:
     GOSUB 9010:GOTO 4200
4060 IF SY$="RIGHT" THEN GOSUB 28000:GOSUB 3000:
     I=25:GOSUB 9010:GOTO 4200
4065 IF SY$="REPEAT"THEN GOSUB 5000:GOTO 4200
4070 IF SY$="STOP"THEN I=3:GOSUB 9010:GOSUB 28000:GOTO 4200
4075 IF SY$="PENUP"THEN I=16:GOSUB 9010:GOSUB 28000:GOTO 4200
4080 IF SY$="PENDOWN"THEN I=17:GOSUB 9010:GOSUB 28000:GOTO 4200
4081 IF SY$="RND"THEN I=32:GOSUB 9010:GOSUB 28000:GOTO 4200
4083 IF SY$="INPUT" THEN I=29:GOSUB 9010:GOSUB 28000:GOTO 4200
4085 IF SY$="PEEK" THEN I=30:GOSUB 9010:GOSUB 28000:GOTO 4200
4087 IF SY$="POKE"THEN GOSUB 28000:GOSUB 3000:GOSUB 3000:I=31:
     GOSUB 9010:GOTO 4200
4100 IF(W<6)OR(W>15) THEN 4120
4110 X=W:GOSUB 10600:GOSUB 28000:GOSUB 3000:GOSUB 3000:
     GOSUB 10700: I=X:GOSUB 9010:GOTO 420
4120 REM
4200 RETURN'C. BUILT-IN END
4300 'SEARCH RES WORDS
4310 W=K8
4320 IF W=0 THEN RETURN
4330 IF SY$=R$(W) THEN RETURN
4340 W=W-1:GOTO 4320
4500 'C.PRINT
4510 GOSUB 28000:GOSUB 3000:I=1:GOSUB 9010:RETURN
4600 'C.IF
4610 GOSUB 28000:GOSUB 2000:I=20:A=0:GOSUB 9020:X=S4:GOSUB 10600
4620 IF SY$<>"THEN"THEN E=3:GOSUB 9990:RETURN
4630 GOSUB 28000:GOSUB 5100:IF SY$="ELSE" THEN GOSUB 28000:
     GOTO 4650
4640 GOSUB 10700:C(X)=S4+1:RETURN'NO ELSE
4650 I=22:A=0:GOSUB 9020:GOSUB 10700:C(X)=S4+1
4660 X=S4:GOSUB 10600:GOSUB 5100:GOSUB 10700:C(X)=S4+1:RETURN
4800 'C.WHILE
4810 X=S4+1:GOSUB 10600:GOSUB 28000:GOSUB 2000
4820 IF(SY$<>"THEN")AND(SY$<>"DO")THEN E=4:GOSUB 9990:RETURN
4830 I=20:A=0:GOSUB 9020:X=S4:GOSUB 10600:GOSUB 28000:GOSUB 5100
4840 I=22:A=0:GOSUB 9020:GOSUB 10700:C(X)=S4+1
4850 GOSUB 10700:C(S4)=X:RETURN
4900 'C.MAKE
4910 GOSUB 28000:IF SY$<>"'" THEN E=5:GOSUB 9990:RETURN
4920 GOSUB 28000:IF TY$<>"WORD"THEN E=6:GOSUB 9990:RETURN
4930 T1=P1:T2=P2:GOSUB 1000:IF P1<>0 THEN E=7:GOSUB 9990:RETURN
4940 P1=T1:P2=T2:GOSUB 4300:IF W<>0 THEN E=8:GOSUB 9990:RETURN
4950 GOSUB 9500:X=W:GOSUB 10600:GOSUB 28000:GOSUB 3000
4960 GOSUB 10700:A=X:I=23:GOSUB 9020:RETURN
5000 'C.REPEAT
5010 GOSUB 28000:GOSUB 3000:X=S4+1:GOSUB 10600
5020 I=21:A=0:GOSUB 9020:GOSUB 5100:I=22:A=0:GOSUB 9020
5030 GOSUB 10700:C(S4)=X:C(X+1)=S4+1:RETURN
5100 'C.BLOCK
5110 GOSUB 2000
5120 IF NOT(SY$="AND") THEN 5140'WH
5130 GOSUB 28000:GOSUB 2000:GOTO 5120
5140 RETURN
6000 'C. 1 DEF
6005 ID$="M":SY$="":GOSUB 29100
6010 PA(N1)=S4+1
6020 GOSUB 28000:GOSUB 28000:GOSUB 28000:S2=-1
6030 IF NOT(SY$="'") THEN 6050'WH
6040 GOSUB 28000:GOSUB 9500:GOSUB 28000:GOTO 6030
6050 I=2:A=S2+1:GOSUB 9020
6060 S2=S2+2:VN$(S2)="":VN$(S2-1)=""
6070 IF NOT((SY$<>"END")AND(EO=0))THEN 6090'WH
6080 GOSUB 2000:GOTO 6070
6090 I=3:GOSUB 9010:RETURN
7000 'C. ALL NEEDED FUNC DEFS
7010 CA$="N"
7020 IF NOT(CA$="N") THEN 7100'WH
7030 CA$="Y":N1=1
7040 IF NOT(N1<=S1) THEN 7090'WH
7050 IF PA(N1)<>0 THEN 7080
7060 SY$=PN$(N1):GOSUB 1000
```

```
7070 GOSUB 6000:CA$="N"
7080 N1=N1+1:GOTO 7040'EW
7090 GOTO 7020
7100 GOSUB 7200:RETURN
7200 'FIX UP CALL ADDRS
7210 FOR N=1 TO S4-1
7220  IF(C(N)=4)AND(C(N+1)<0)THEN C(N+1)=PA(-C(N+1))
7230 NEXT N:RETURN
9010 'GEN CODE I
9012 IF S4+1=K7 THEN E=11:GOSUB 9990:RETURN
9014 S4=S4+1:C(S4)=I:RETURN
9020 'GEN CODE I,A
9022 IF S4+3>K7 THEN E=11:GOSUB 9990:RETURN
9024 C(S4+1)=I:C(S4+2)=A:S4=S4+2:RETURN
9100 'NOTE CALLED PROC NAME,AND N ARGS
9110 S1=S1+1:PN$(S1)=SY$:CP(S1)=N:PA(S1)=0:RETURN
9300 'COUNT N ARGS OF A PROC
9305 N=0
9310 FOR X=1 TO LEN(TE$(P1))
9320 IF MID$(TE$(P1),X,1)="'" THEN N=N+1
9330 NEXT X
9340 RETURN
9400 'CHECK 'TO' LINE
9410 GOSUB 28000:IF TY$<>"WORD" THEN E=21:GOSUB 9990:RETURN
9415 GOSUB 1000:IF P1<>0 THEN E=20:GOSUB 9990:RETURN
9416 GOSUB 4300:IF W<>0 THEN E=20:GOSUB 9990:RETURN
9418 PRINT SY$
9420 IF NOT(EL$="N") THEN 9460'WH
9430 GOSUB 28000:IF SY$<>"'" THEN E=22:GOSUB 9990:RETURN
9440 GOSUB 28000:IF TY$<>"WORD"THEN E=23:GOSUB 9990:RETURN
9450 GOTO 9420
9460 RETURN
9500 'GET/MAKE VAR NUMB
9510 GOSUB 9800:IF W>=0 THEN RETURN
9520 S2=S2+1:VN$(S2)=SY$:W=S2:RETURN
9700 'SEARCH PROC TABLE
9710 W=S1
9720 IF W=0 THEN RETURN
9730 IF SY$=PN$(W) THEN RETURN
9740 W=W-1:GOTO 9720
9800 'SEARCH FOR A VAR
9810 W=S2
9820 IF W=-1 THEN RETURN
9830 IF SY$=VN$(W) THEN RETURN
9840 W=W-1:GOTO 9820
9990 'ERROR
9991 IF EO=1 THEN GOSUB 28000:RETURN
9992 EO=1:PRINT"ERROR NUMBER ";E;" NEAR ITEM ";SY$
9993 PRINT"IN LINE:":PRINT L9$:GOSUB 28000:RETURN
10000 'INIT
10010 S2=-1:S5=1
10040 P1=0:P2=0:P5=0:P6=0
10050 K8=33:DIM R$(K8):K9=100:DIM NU(K9),TE$(K9),LK(K9)
10060 K7=200:DIM C(K7):K6=20:DIM CS(K6),PK(10)
10090 R$(1)="PRINT":R$(2)="IF":R$(3)="THEN":R$(4)="ELSE"
10100 R$(5)="WHILE":R$(6)="SUM":R$(7)="DIFF":R$(8)="PROD"
10110 R$(9)="QUOT":R$(10)="GE":R$(11)="LE":R$(12)="GT"
10120 R$(13)="LT":R$(14)="EQ":R$(15)="NE"
10130 R$(16)="RESULT":R$(17)="AND":R$(17)="REPEAT":R$(18)="END"
10140 R$(19)="MAKE":R$(20)="FORWARD":R$(21)="RIGHT":R$(22)="STOP"
10150 R$(23)="PENUP":R$(24)="PENDOWN":R$(25)="INPUT":
      R$(26)="PEEK":R$(27)="POKE"
10160 R$(28)="TO":R$(29)="LIST":R$(30)="ERASE":R$(31)="FILE":
      R$(32)="FETCH"
10165 R$(33)="RND"
10200 RETURN
10600 'PUSH X
10610 IF S5>K6 THEN STOP
10620 CS(S5)=X:S5=S5+1:RETURN
10700 'POP X
10710 IF S5<=1 THEN STOP
10720 S5=S5-1:X=CS(S5):RETURN
20000 '*** INTERPRET ***
20005 CLS
20010 P=-1:S=S4+1:A=0:B=0:L=0:AN=0:X=30:Y=30:DR=3.142/180:PU=0
20020 P=P+1
20030 P=P+1
20040 I=C(P):A=C(P+1):IF I=0 THEN RETURN
20045 IF S+2>K7 THEN PRINT"TOO MANY PROC. CALLS!":RETURN
20050 IF I>6 THEN 20070
20060 ON I GOTO 21100,21200,21300,21400,21500,21600
20070 IF I>12 THEN 20090
20080 ON I-6 GOTO 21700,21800,21900,22000,22100,22200
20090 IF I>18 GOTO 20110
20100 ON I-12 GOTO 22300,22400,22500,22600,22700,22800
20110 IF I>24 THEN 20130
20120 ON I-18 GOTO 22900,23000,23100,23200,23300,23400
20130 ON I-24 GOTO 23500,23600,23700,23800,23900,24000,24100,24200
21099 '** INTERPRET INSTRUCS **
21100 PRINT C(S):S=S-1:GOTO 20030'PRN
21200 S=S+1:C(S)=L:L=S-1:S=S+1:C(S)=B:
      B=S-A-2:GOTO 20020'FUN HEADER
21300 S=B-1:B=C(L+2):P=C(L):L=C(L+1):GOTO 20040'RET
21400 S=S+1:C(S)=P+2:P=A:GOTO 20040'CALL
21500 S=S+1:C(S)=C(A+B):GOTO 20020'LLV
21600 S=S-1:C(S)=C(S)+C(S+1):GOTO 20030'SUM
21700 S=S-1:C(S)=C(S)-C(S+1):GOTO 20030'SUB
21800 S=S-1:C(S)=C(S)*C(S+1):GOTO 20030'MUL
21900 IF C(S)=0 THEN PRINT"ZERO DIVIDE !":RETURN
21910 S=S-1:C(S)=INT(C(S)/C(S+1)):GOTO 20030'DIV
22000 S=S-1:IF C(S)>=C(S+1) THEN C(S)=1:GOTO 20030'LE
22010 C(S)=0:GOTO 20030
22100 S=S-1:IF C(S)<=C(S+1) THEN C(S)=1:GOTO 20030'LE
22110 C(S)=0:GOTO 20030
22200 S=S-1:IF C(S)>C(S+1) THEN C(S)=1:GOTO 20030'GT
22210 C(S)=0:GOTO 20030
22300 S=S-1:IF C(S)<C(S+1) THEN C(S)=1:GOTO 20030'LT
22310 C(S)=0:GOTO 20030
22400 S=S-1:IF C(S)=C(S+1) THEN C(S)=1:GOTO 20030'EQ
22410 C(S)=0:GOTO 20030
22500 S=S-1:IF C(S)<>C(S+1) THEN C(S)=1:GOTO 20030'NE
22510 C(S)=0:GOTO 20030
22600 PU=1:GOTO 20030'PUP
22700 PU=0:GOTO 20030'PDOWN
22800 S=S+1:C(S)=A:GOTO 20020'LCN
22900 C(B)=C(S):S=B:B=C(L+2):P=C(L):L=C(L+1):GOTO 20040'RES
23000 S=S-1:IF C(S+1)=0 THEN P=A:GOTO 20040'JIF
23010 GOTO 20020
23100 C(S)=C(S)-1:IF C(S)<0 THEN S=S-1:P=A:GOTO 20040'TESTREP
23110 GOTO 20020
23200 P=A:GOTO 20040'JUN
23300 C(A+B)=C(S):S=S-1:GOTO 20020'STORE
23400 A=C(S):S=S-1:T1=COS(DR*AN):T2=SIN(DR*AN):N=1'FWARD
23410 IF NOT(N<=A)THEN 23460'W
23420 X=X+T1:Y=Y+T2
23430 IF PU=1 THEN 23450
23440 SET(INT(X+0.5),INT(Y+0.5))
23450 N=N+1:GOTO 23410
23460 X=INT(X+0.5):Y=INT(Y+0.5):GOTO 20030
23500 AN=AN-C(S):S=S-1'RIGHT
23510 IF NOT(AN<0) THEN 23530'WH
23520 AN=AN+360:GOTO 23510
23530 GOTO 20030
23900 INPUT"NUMBER ";N:S=S+1:C(S)=N:GOTO 20030
24000 C(S)=PK(C(S)):GOTO 20030'PEEK
24100 S=S-2:PK(C(S+2))=C(S+1):GOTO 20030'POKE
24200 S=S+1:C(S)=INT(10*RND(0)):GOTO 20030
28000 'GET SYM,TYPE
28005 IF(EL$="Y")AND(ID$="K")THEN SY$="":TY$="X":RETURN
28007 IF(SY$="END")AND(ID$="M")THEN RETURN
28010 SY$="":GOSUB 29300
28020 IF CC$<>"D" THEN 28060
28030 SY$=SY$+C$:GOSUB 29200
28040 IF CC$="D" THEN 28030
28050 TY$="NUM":RETURN
28060 IF CC$<>"L" THEN 28100
28070 SY$=SY$+C$:GOSUB 29200
28080 IF(CC$="L")OR(CC$="D")THEN 28070
28081 TY$="WORD":RETURN
28100 SY$=C$:TY$="X":GOSUB 29200:RETURN
29000 'READCHAR
29005 EL$="N"
29035 IF P9>LEN(L9$)THEN GOSUB 29100
29037 IF P9=LEN(L9$) THEN EL$="Y"
29040 C$=MID$(L9$,P9,1):P9=P9+1:RETURN
29100 'READLINE
29105 P9=1:EL$="N"
29110 IF ID$="K" THEN INPUT L9$:L9$=L9$+" ":RETURN
29115 IF ID$="F" THEN INPUT#-1,L9$:RETURN
29120 IF ID$="M" THEN L9$=TE$(P1):P1=LK(P1):RETURN
29130 RETURN
29200 'GETCHAR
29210 GOSUB 29000
29220 IF(C$>="0")AND(C$<="9")THEN CC$="D":RETURN
29230 IF(C$>="A")AND(C$<="Z")THEN CC$="L":RETURN
29240 CC$="X":RETURN
29300 'GET NON-SPACE
29310 IF C$<>" " THEN RETURN
29320 GOSUB 29200:GOTO 29310
29400 ' OUT L9$
29410 IF OD$="S"THEN PRINT L9$:RETURN
29420 IF OD$="F"THEN PRINT#-1,L9$:RETURN
40000 'LINE EDITOR
40100 'INIT FREE LIST
40120 FOR X=1 TO K9-1
40130  TE$(X)="":NU(X)=0:LK(X)=X+1
40140 NEXT X
40150 P3F=1:LK(K9)=0:RETURN
40200 'SEARCH FOR NL IN NU(),RESULT P
40210 OP=0
40235 P=P1H
40240 IF NOT(NL>NU(P)) THEN 40280'WH
40245 IF P=P2 THEN 40280
40250  OP=P:P=LK(P)
40270 GOTO 40240
40280 RETURN
40400 'GETFREE X
40410 IF P3F=0 THEN PRINT"OUT OF SPACE !!":STOP
40420 X=P3F:P3F=LK(P3F):LK(X)=0:RETURN
40450 'RETURN P TO FREE.
40460 TE$(P)="":NU(P)=0:LK(P)=P3F:P3F=P:RETURN
40500 'DO EDIT
40510 GOSUB 40200
40520 IF EL$="Y" THEN GOSUB 40800:RETURN 'DEL
40530 IF P=0 THEN GOSUB 41000:RETURN'MUST BE INSERT
40540 IF NU(P)=NL THEN GOSUB 40700:RETURN'REPL
40550 GOSUB 41000:RETURN'INSERT
40700 'REPL
40710 TE$(P)=TL$:RETURN
40800 'DEL
40810 IF P=0 THEN RETURN
40820 IF NU(P)<>NL THEN RETURN
40840 'FIRST,LAST,MIDDLE?
40850 IF P=P1H THEN P1H=LK(P1H):X=P:GOSUB 40450:RETURN
40860 IF P=P2T THEN P2T=OP:X=P:GOSUB 40450:RETURN
40870 LK(OP)=LK(P):GOSUB 40450:RETURN
41000 'INSERT
41030 GOSUB 40400:NU(X)=NL:TE$(X)=TL$:LK(X)=LK(OP):LK(OP)=X:RETURN
60000 CSAVE"1":CSAVE"2":CSAVE"3"
```

END

BEFORE YOU BUY YOUR MICRO!

COMPUTER, PRINTER, DISC DRIVES & ACCESSORIES

ALMOST EVERY MAKE OF POPULAR COMPUTER STOCKED
AT PRICES WELL BELOW RECOMMENDED RETAIL

GIVE US A RING ON 01-441 2922

AND SAVE £££'s WITH THE LOWEST PRICE GUARANTEE

All products carry a 1 year guarantee (parts & labour)
Pay an extra 10% for a 2 year guarantee

Shelves of Computer Books

Spares & repairs on all products, even if you didn't buy from Comp Shop

EXPRESS MAIL ORDER SERVICE

Many items over stocked on Sale Offer

New products arriving daily

'Phone your order to reserve

INSTANT CREDIT
just pay the deposit by Credit Card and take it away

SATISFYING PRICE CONCIOUS CUSTOMERS FOR NEARLY 5 YEARS

BARCLAYCARD VISA

DINERS CLUB INTERNATIONAL · AMERICAN EXPRESS · Access

P.S. Hopeless on Software

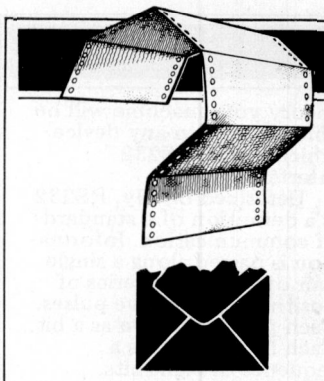
COMP SHOP LTD

"Europes Largest Discount Personal Computer Stores"

TELEPHONE SALES
OPEN 24 hrs. 7 days a week
01-449 6596

MAIL ORDER SHOP
14 Station Road, New Barnet,
Hertfordshire, EN5 1QW
(Close to New Barnet BR Station - Moorgate Line)
Telephone: 01-441 2922 (Sales) 01-449 6596
Telex: 298755 TELCOM G
OPEN (BARNET) - 10am - 7pm - Monday to Saturday

311 Edgware Road, London W2
Telephone: 01-262 0387
OPEN (LONDON) - 10am - 6pm - Monday to Saturday



COMPUTER ANSWERS

Send your queries to: Sheridan Williams, 35 St Julian's Road, St Albans, Herts. Please note that Sheridan can no longer answer questions on an individual basis, so please don't send an SAE with your query.

Give me your answer, do...

Would you be willing to forecast whether the price of the least expensive daisywheel printers will go down much? I am sure that there is a mass market for 'letter quality' printers. Will developments in printer technology meet this need? How do I choose a printer? I await your august opinion with bated breath.
R P Phillips, Milton Keynes

As you may have noticed I am not usually very outspoken, and also find it hard to make reliable predictions. However I would say, yes, printers will come down in price markedly as the demand increases. But choosing a printer is a very difficult task — there are so many that a shortlist needs to be drawn up. In order to compile a shortlist you must first ascertain answers or ranges of answers in the following areas: price, speed, print quality, reliability, paper size/type, graphics capability, paper feed mechanism.

For everything except 'print quality' a matrix printer is best, but the familiar 'dotty' looking characters tend to put people off. There are several matrix printers around now that have an 'enhanced' print option. This reduces the dottiness by printing every column of dots twice, the second time with the dots shifted slightly to fill the gaps. The result is a far more acceptable print quality but at half the printing speed. I would say that the quality is adequate for most letters. For the best in quality for letter-writing purposes, the daisywheel printer is hard to beat, though.

There are a couple of daisywheel printers on the market for around £500 and one of them even has a keyboard so it can be used as a typewriter, too. However they are incredibly slow (around 10 cps) and would take about 6 minutes to print this answer. However you can obtain for £1400 a 50 cps daisywheel that is maybe 10 times faster. It can manage that factor faster because the speed a printer operates is not determined just by how many characters per second it can print, but also by whether it prints bi-directionally, and has a logic seeking head. For example, try printing the alphabet down the centre of a page and see whether printers that all lay claim to being the same speed actually are. Bear in mind that matrix printers offer other advantages, such as enlarged and compressed print, or dot graphics, where a picture may be drawn using the individual pins of the matrix. Resolutions of over 1000 dots across the page can be obtained. Most matrix printers tend to slow down a lot when printing graphics because the matrix head gets extremely hot, and a delay is built in at the end of a certain amount of printing. The better daisywheels can also do limited dot graphics with 1/120th inch between dots.

Also coming on the market again (they have been around before) are the 'ink-jet' printers. These work on a similar principle to the matrix printer except that ink is sprayed out of a matrix of nozzles. The advantage here is twofold — the ink spreads slightly and thus fills the gap betweenthe dots, and secondly the heads do not get hot and thus wear out as quickly as impact matrix printers. Siemens make an ink jet printer but at the time of writing I haven't seen it on sale in Britain. Acorn is also bringing out such a printer for the Atom/BBC micro range.

Another favourite request from people is that the printer supports 'proportional spacing'.

This means that letters like 'i' and 'l' take up less space than 'm' or 'w'. Remember that this probably needs a word processor that can use this feature, and that several word processing packages do not support proportional spacing.

Consider also the mechanism for feeding the paper into the printer. You may require single sheets to be fed in automatically. Does the printer have single sheet (friction) feed. Does it have tractor feed for continuous stationery? Will it allow a variety of paper sizes?

Two printers that I would recommend are the Epson MX100 impact matrix printer for around £500, which has most of the features listed above; and the Commodore 8300P for around £1400, which is really the Diablo 630 daisywheel in Commodore clothing. The latter printer is really exceptional value for money in the Commodore guise. It supports all of the previously mentioned features and is the printer I use for the majority of my work now. You should also consider reliability and ruggedness, and it is in this area that money can be saved if you don't want a printer that can take being hammered for six hours a day, for example.
There are certainly cheaper printers but they tend to be quite frail. So, all in all, printers are tending to hold their price at present, but are gaining in facilities and sophistication. I suspect that they will start to drop in price over the next few years, but remember that a £500 printer that holds its price for a year is actually about £50 cheaper due to inflation! So don't expect too great a drop in price.
SW

Squashed

I have a dilemma and I am hoping that you can help. I have recently started a squash club. My membership lists are full. Several of my friends say that I should computerise my membership lists. There are several reasons why I think this would be a good idea: first and foremost because it is so time-consuming (and hence expensive) to do the mailing of renewals/circulars manually. However if I were to buy a computer it could be quite a large outlay, which is something that I can ill afford in the first year of the club's existence. Your advice would be most welcome.
J James, Birmingham

You are wise to be wary — many companies have bought computers and found out the expensive way that they are not always cost-effective. You could well find with further research that it is best to stick to the manual approach, perhaps using part-time labour to cope with the peak periods.

An alternative which should be investigated is to approach a computer 'Bureau'. Yellow Pages should list dozens, and your library should be able to help you locate some from their business index. Computer Bureaux exist to provide a wide variety of services, and can prove to be particularly cheap for some operations. From what I can gather from talking to people, few think of the 'Bureau' solution, although if you went to a proper computer consultant then a bureau should be offered as an alternative to buying or leasing a computer. Some of the reasons why companies should consider a bureau are: to gain data processing experience; to evaluate hardware and software; cost — you only pay for the service required; non-involvement; peak loads; advice; stand-by computer system.

The bureau could even install a terminal, so you could access the files yourself; this could prove rather expensive, though. Your application could almost certainly be processed in the 'batch' mode so a terminal is an unnecessary luxury.

I would consider the options that you have very carefully, as you would probably need to spend at least £3000 on the computer system. It would be possible to spend less, but you must take reliability, versatility and expandability into account.
SW

More dates

The answer headed 'Dates' in the June edition is one solution to the problem of simplifying entry into a particular Basic program. I wonder if you can supply the ultimate solution to run a Basic program under CP/M from cold boot without any operator intervention.
David Eno, Winchester

Many thanks for publishing my 'DATES.COM' program, however I should have stated that in the line labelled FCB: there must be *exactly* 5 spaces between the last $ sign and the next quote or it will not work.
J S Linfoot, Oxford

Thank you for pointing that out. I was aware of it but failed to make it clear in the answer.

The ultimate solution can be obtained in several ways (so I have been told). I have only discovered one and that is to fool the system into thinking that it is in the middle of a 'SUBMIT' sequence. To do this trickery you will need the utility SUBMIT.COM that is supplied on the CP/M system disk. Put this onto your working disk. Suppose that you want to run a Basic program called 'DATES.BAS'

under the MBasic interpreter. You must create a file called 'FRED.SUB' whose contents are:
MBASIC DATES
SUBMIT FRED
Having created this file (by using an editor or via Basic) you type whilst still in CP/M:
SUBMIT FRED

Now you have succeeded, because if you remove the disk, when you put it back, even from a cold start the system will start up by itself.

It all works because the 'SUBMIT' program creates a file called FRED.$$$ which contains the commands in FRED.SUB yet to be executed, and whenever the file FRED.SUB is just about to finish executing it re-creates itself because it has a 'SUBMIT.FRED' within the file 'SUBMIT.FRED'. Very confusing isn't it? There are a number of CP/M books on the market — the best one that I have found is by Osborne, and is available from 'Mine of Information' (St Albans 52801, mail order only). This book explains the SUBMIT program quite well, so start by reading that. If you want to break the chain and restore the disk to normality you will have to put the disk in drive B and an ordinary disk in drive A and type ERA B:FRED.$$$ or you can do this within Basic using KILL"FRED.$$$".
SW

Quicker printer

I have an Anadex DP8000 printer connected to my computer. I am very pleased with it but find it rather annoying that I have to wait for it to finish printing before I can get on with more data entry. I would have thought that the computer could make both the printer work *and* allow me to enter more data at the same time, as the computer is so much faster than my typing and the printer's printing. I have tried setting the baud rate to 9600 baud but it only seems to work at the the same speed at 1200 baud. Is it possible?
L Hill, Braintree.

I am afraid that you need a slightly different operating system to achieve what you want directly. However, I suggest that you extend the Anadex's buffer to its maximum of 4k. You should be able to buy the chips from the dealer who supplied you with the Anadex for not too much money. If you now work at 9600 baud and your output to the printer is not too rapid or too long, then there should not be too much of a hold-up. There will still be a noticeable delay, but it should not be prohibitive. Put it this way, you can be typing while the printer still has about one page (A4) of printing left to do. Expanding the printer's buffer is a solution that many people overlook in order to achieve faster throughput.
SW

Snap decision

We have seven photographic shops and a warehouse, and we are looking for a computer system which will tell us the stock position of an item in each of these places. There are approximately 5000 items and the changing of the data will only occur in the warehouse. We are searching for the software, floppy disk and computer. Please help as we have had no success as yet.
N Kramer, Wembley

You need a proper professional approach to solving your problem; there is no point in my even starting to help through these pages. Contact the Association of Professional Computer Consultants at 109 Baker Street, London (01-235 7292). They will charge for their services, but proper professional advice is extremely valuable. Let me know the outcome if you wish.
SW

Queue jumper

Where can I get a BBC micro without having to wait for untold weeks like I would if I ordered through the usual Kettering address?
R Dickson, London

Both the 'Comp Shop' and 'Microage Electronics' claim to be able to get you one in two to three weeks. I am testing out this claim and can tell you next month. Both these companies advertise in *PCW*, and both are in London.
SW

PET printer

I own a 3032 PET with dual disk drives, and now I wish to add a printer. After seeing the output from the CBM 4022 printer and noting the price I looked further afield. The output from the Epson MX80 F/T was a distinct improvement, but I was warned that the features which give a good typeface are lost when it is interfaced to the PET. Is this true? The Centronics 737 also has good output, but can the vertical line spacing be programmed as with the Epson, as this is vital for printed forms? Can you give your recommendations for under £500?
D V Ferrand, Bristol

The extra features of the MX80 are not lost when connected to the PET. This is purely dependent on software, so the extra facilities may not be available with many standard packages.

Remember that most printers also require an interface at extra cost to connect to the PET.

Most printers can be set to 8 or 6 lines per inch, which is suitable for most forms. It is normally possible to design the layout of pre-printed stationery for computer printers.

I personally like the Oki range of matrix printers.
Mark Wratten

PET upgrade

I am a PET 2001 'old ROM' owner and I would like to update my machine to either a 4000 series PET or a 'new ROM' PET. Which firm will do the update?
Richard Payton, Derby

It is certainly possible to upgrade your computer to version 2 Basic. However, only certain machines can be upgraded to Basic v4. The Basic language is contained in ROMs which can be removed and replaced with new ones. Usually the ROMs are not soldered in so it is a simple task to do this yourself.

You must determine which type of ROMs you have, as there are two kinds. The difference is the number of pins that the ROMs have. This can be either 40 or 24. If your machine has the latter, and dynamic RAMs (16 pin type 4018), then it can be upgraded to Basic v4. Any reputable Commodore dealer will be able to supply replacement chips, and advise on which to use.
Mark Wratten

Sharp talk

I wonder if you could give me some answers on the subject of interfaces. I have recently purchased a Sharp PC 1500 and CE 150 plotter. Sharp say that they will be soon bringing out an RS232 communications interface. But what does RS232 mean?
M Sargaison, Berkhamsted, Herts.

Communications interfaces are used by computers to enable them to talk or listen to external devices. RS232 is one particular type of communication. Many printers, VDUs, etc, have an RS232 interface, which will enable your computer to send/receive information to/from them. Therefore in theory your machine will be able to 'talk' to any device which has an RS232 interface.

Described briefly, RS232 is a definition of a standard of communication. Information is passed along a single pair of wires, as a series of positive and negative pulses. Each pulse is known as a bit. Each byte is sent as a sequence of eight bits, preceded by one or two stop bits. The data is transmitted at a predefined rate (bits per second) to which both devices must be set.
Mark Wratten

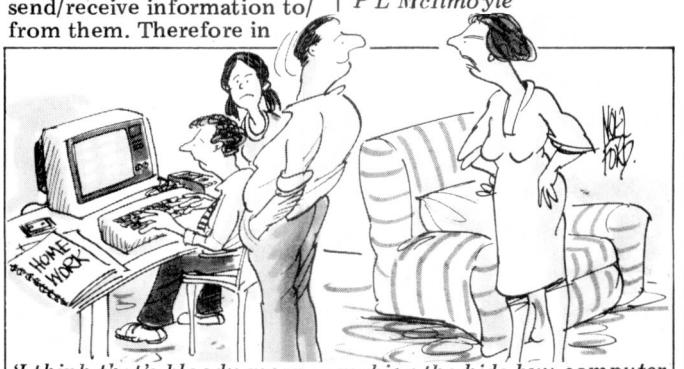
KWIC query

I have seen a book index produced by a Keyword-In-Context ('KWIC') program. Each main word was listed as part of the line of text in which it occurred and the whole index was ordered alphabetically according to the letters of the keyword. Each entry was numbered with the appropriate line number from the text.

Do you know of a KWIC program for a micro, or can you offer any hints on writing one in Basic or Pascal?
B Kat, Newcastle upon Tyne

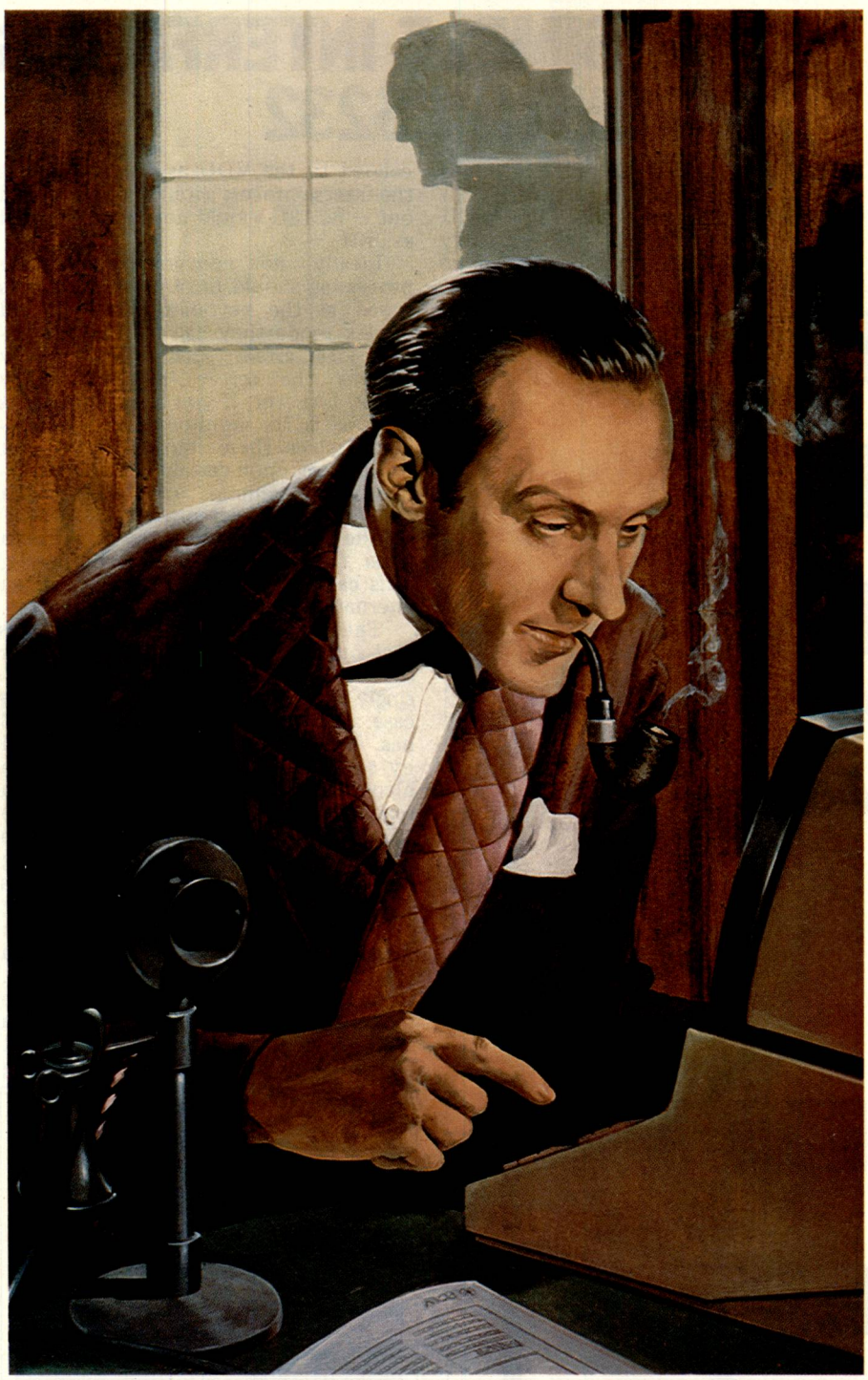
I had not personally come across such a program for a micro, but the National Computer Centre have suggested 'The Index' from TCL Software Ltd, of Theobalds Road, London WC1. Alternatively they suggest that if your documents are not too long you could consider 'Cardbox' from Caxton Software Publishing Company of 10-14 Bedford Street, Convent Garden, London WC2.

My own approach would be to make use of two word-processing programs. The first of these, 'The Word'. available from AIM Research of 20 Montague Road, Cambridge CB4 1BX, will compile an index from your source document. Microsoft's 'Microspell' will display (or print if the screen is directed to printer (Control P in CP/M)) misspelt words in context. So, if you removed all the words of interest for your index from Microspell's dictionary, it would generate your keywords in context!
P L McIlmoyle



'I think that's bloody mean — making the kids buy computer time out of their pocket money!'

THE PCW £5000 MANHUNT



Welcome to the Big One! This is the *PCW* competition to beat them all. For starters, the prize money is the biggest we've ever given away. The competition runs for four months and you have to get every part right to stand a chance of winning. And the object of the competition is to find a person, by telephone, and leave the answer as a message!

It's a sort of treasure hunt for the information age; let your fingers do the walking.

Don't expect it to be easy; £5,000 is near enough a year's salary so you're going to have to work for it.

Each month we will present a puzzle for you to solve, starting in this issue. In the December issue you'll get the final instalment and by combining the answers to all the puzzles in the right way you will be led to the name, rank and phone number of a person resident in the UK.

You will then phone this number and an answering machine will tell you if it's the right one. Then you leave a message consisting of one of the puzzle answers. The first person to get onto the answering machine tape with the right answer gets the loot. We'll give you more detailed instructions as we go along; right now let's get down to the first puzzle.

All you have to do this month is find the smallest palindromic integer whose square, when reduced by a million, gives a result which contains each of the digits 0 to 9 at least once.

For the uninitiated, a palindromic integer is a whole number which reads the same from left-to-right as it does from right-to-left, eg, 121, 3443, 12421.

When you have the number take its digital root — you'll need both for the final — by adding all the digits together repeatedly until you have a single digit. For instance the digital root of 987654 is three:—

9+8+7+6+5+4=39
3+9=12
1+2=3

Don't send in the answer as usual please; we're not interested until after the last puzzle. Just keep these two numbers safe and look out for the next puzzle next month. Best of luck.

JJ Clessa

ONE BIT AT A TIME

M Gonzales and D A Sinclair conclude their examination of the RS232 interface.

PART 2: SIMPLE INTERFACING WITH RS232

One possible reason for buying a microcomputer system is for use as a terminal to another computer such as a mainframe. The simplest requirement is for use as a cheap alternative to a VDU or teletype without any extra local intelligence — ie, a dumb terminal. A dumb terminal program (DTP) is quite simple to write. Figure 1 gives a flowchart for a DTP which operates in the full duplex mode. For half-duplex operation the flowchart should be modified to display the keyboard character on the screen after it is output to the UART.

This looks straightforward enough, but there are some pitfalls. For example, the mainframe which runs the British Library on-line literature searching service sends two control characters which turn the teletype motor off and on between lines of print. One of us had the job of writing a program to enable a Sorcerer micro to be used as a terminal to this computer. These control characters meant 'cursor home' and 'clear screen' to the Sorcerer, so it was impossible to read the mainframe's output on the screen. However, the problem was easily solved by a subroutine to filter out any awkward control codes from the received data.

A more sophisticated solution is to have a conversion table to convert received control codes to their local equivalent. So, if the mainframe thinks that 'clear screen' is 0H (ie, ASCII VT) whereas on the micro it is 13H (ASCII DC3), the table should have an entry saying that received 0BH should be echoed to the VDU as 13H. Of course the inverse process should not be carried out — ie, 13H should not be transmitted as 0BH.

Ideally no conversion or other processing should be done on characters typed at the keyboard, since in full duplex mode they can have no unpleasant local effect (such as accidentally clearing the screen). Problems may occur, however, if you use the routines provided in the monitor to read the keyboard, since these routines often look for and act upon certain control characters. For example, on the Research Machines 380Z, depressing Control-F on the keyboard causes the machine to enter the software front panel mode. This can be avoided only by writing an alternative keyboard input routine.

The flowchart in Figure 1 assumes that output to the VDU is much faster than I/O to the RS232 port. Surprisingly enough, this is not always the case. The Research Machines 380Z has a flicker-free display, achieved by scrolling only during the TV frame blanking, which occurs just 50 times a second. So writing a line feed to the VDU can take up to 20ms! Therefore characters will be lost at the beginning of each line for data rates over 50cps (550 baud). To solve this, a flickering display routine must be written — a difficult task on the 380Z as the screen memory is not one contiguous block. In our application (described below) we took the easy way out: we connected a spare VDU to the second serial output port. The main RS232 port was being

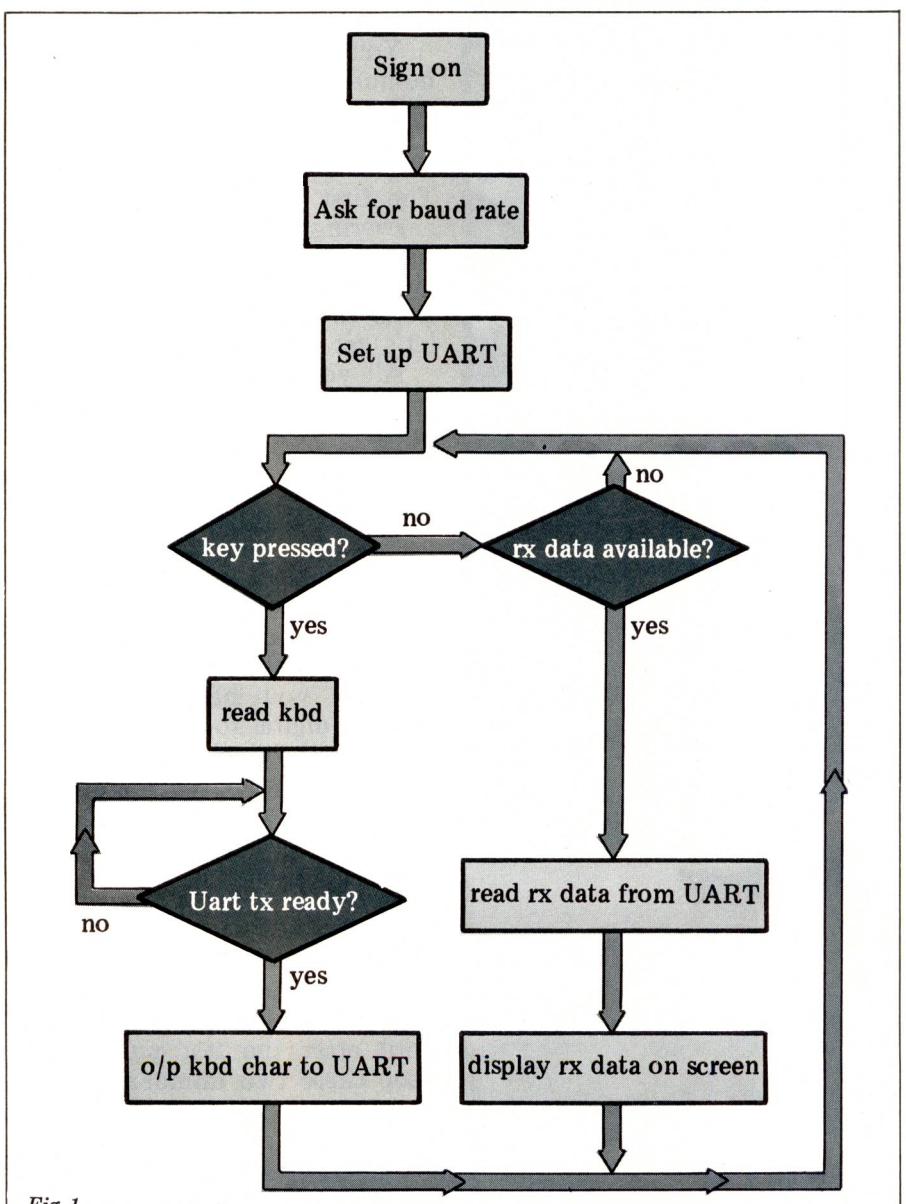


Fig 1

Signal name		Pin number
Protective ground		1
Signal ground		7
Transmitted data	TXD	2
Received data	RXD	3
Request to send	RTS	4
Clear to send	CTS	5
Data set ready	DSR	6
Data terminal ready	DTR	27
Carrier detect		8
Ring indicator		22

Table 2a Main RS232 signals

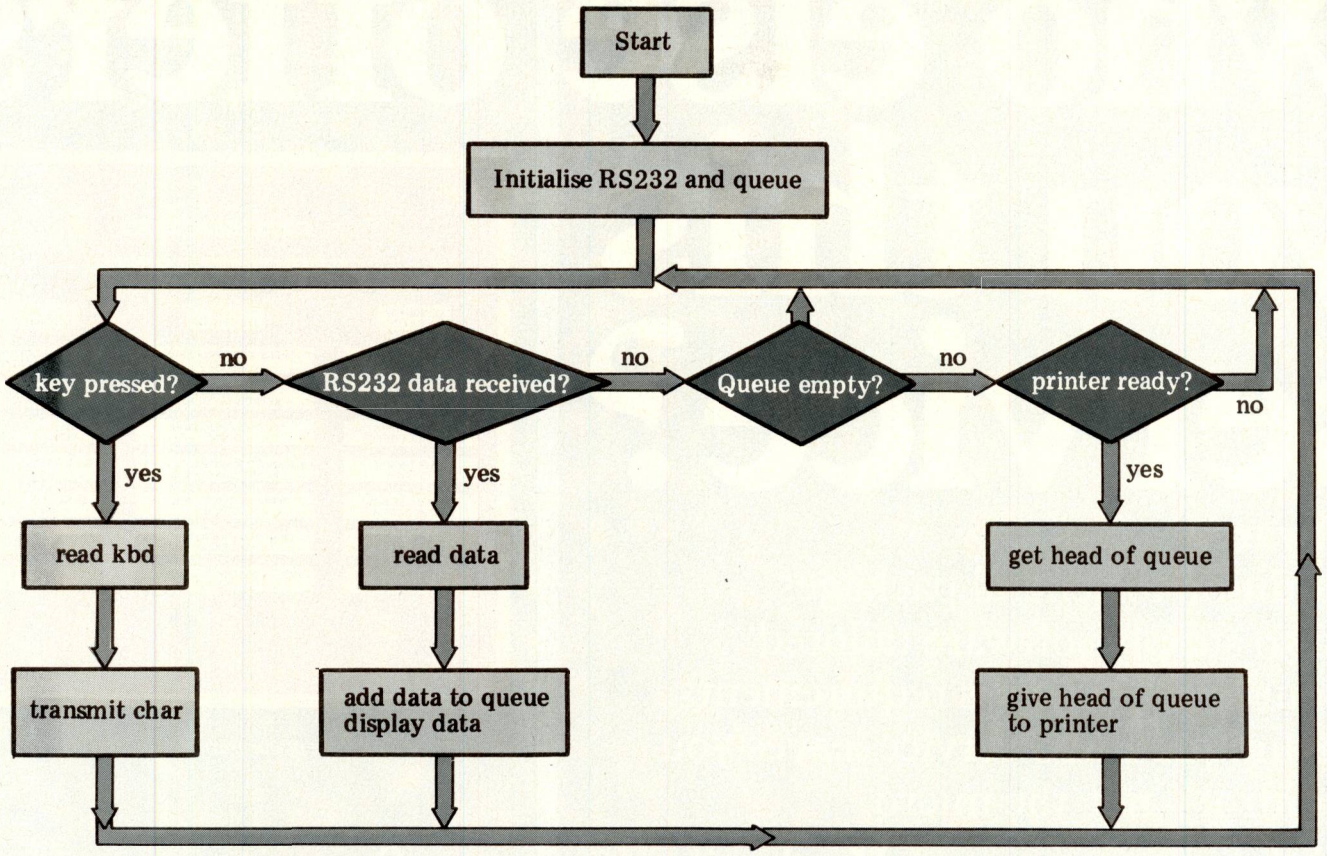


Fig 2

used at 1200 baud so we set the VDU port to 2400 baud; we found that output to the VDU was then sufficiently fast for us not to miss any incoming characters on the main RS232 port. This arrangement worked perfectly as long as one remembered to type on the 380Z keyboard while watching the VDU screen (the second serial port is not bidirectional).

It is possible to copy the dialogue between a mainframe and a microprocessor system to a printer even if the printer is much slower than the RS232 data rate between the microprocessor and the mainframe, always assuming that the printer status ('ready to print' or not) can be tested. To do this the full duplex system in Figure 1 is modified as in Figure 2. All characters received from the RS232 port are queued, and whenever the keyboard, RS232 and printer are not busy a character is taken from the front of the queue and printed. As characters are added and removed the queue will move up the memory buffer allocated to it. If the buffer length is a power of two then the buffer can very easily be made circular (by logically ANDing the 'position in the queue pointer' with 2^{n-1} for a buffer of length 2^n). This prevents the queue growing without limit and perhaps overwriting the program.

Intelligent terminals

We can now make a cheap VDU-cum-teletype from a micro, but we are still far from realising the full power of the micro as an intelligent terminal. In our application we wished to use the micro as an intelligent terminal that gathered data from various experimental sensors, buffered the results on disk, and at convenient intervals sent the data to a number-crunching mainframe for subsequent processing. We also needed to retrieve the results of the processing from the mainframe and store then on the intelligent terminal's disk for examination, plotting and analysis. This meant we wanted to be able to transmit and receive ASCII files over an RS232 line without making any changes in the software in the mainframe at the far end of

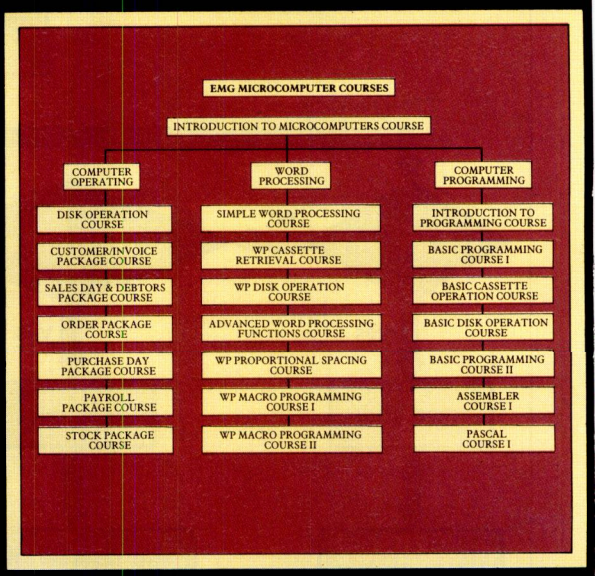
Information Transfer	Computer Industry	Telecommunications Industry
Both ways at the same time	Duplex	Duplex
Both ways but not at the same time	Half Duplex	Simplex
One way only	Simplex	Channel

Table 1. Nomenclature for various types of information exchange

Protective ground	is tied to the instrument power grounds and if connected to both the DTE and the DCE they should both have the same power line ground reference.
Signal ground	is the ground reference for interface signals.
Transmitted Data	is used to send serial data from the DTE to the DCE.
Received Data	is used to send serial data from the DCE to the DTE.
Clear to send	is a control signal that indicates that the DCE is ready to receive data on the TXD line.
Data Set Ready	is a control signal that indicates the DCE is connected and prepared to receive/transmit data.
Data Terminal Ready	is a control signal that indicates the DTE is connected and prepared to receive/transmit data.
Request to send	is a control signal sent from the DTE to the DCE that indicates the DTE wishes to send something to the DEC.
Carrier Detect	is a control signal in a modem system that indicates to the DTE that a data carrier is being received from the distant modem.
Ring Indicator	is a control signal in a modem system that indicates to the DTE that a ringing signal has been received by the modem.

Table 2b Major RS232 signals — signal definition

who else offers you this service?



A chart showing some of our training courses.

Software

In addition to general packages, we also supply software tailored to your exact business requirements. This unique EMG service leaves you in control – not the micro.

Training

We provide training at the computer, with full supervision before or after you buy your microcomputer system.

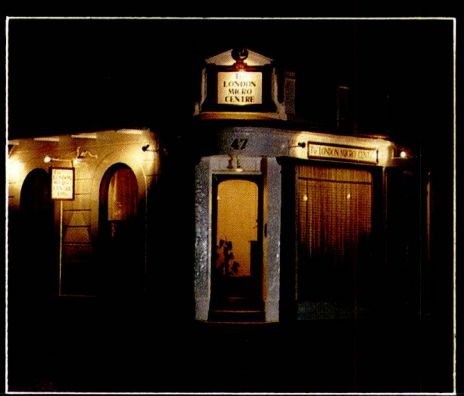
Hardware

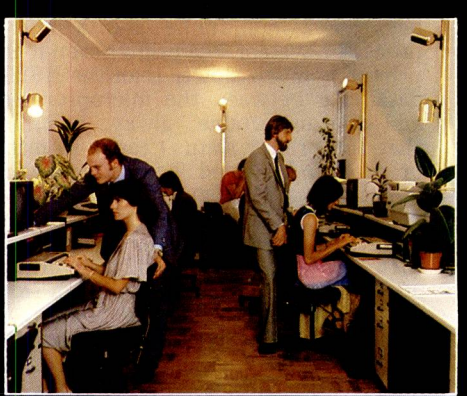
We supply the most suitable microsystem for your application and install it – with a full year's guarantee.

Support

We provide full support for both hardware and software and also supply ribbons, paper etc.







For more information send to
EMG NATIONAL MICRO CENTRES LTD
2 Fleming Way Industrial Centre
GATWICK, CRAWLEY, WEST SUSSEX.
Telephone (94) 519211 (10 lines)

Name _____

Address _____

_____

Company _____

EMG NATIONAL MICRO CENTRES

AN EMG NATIONAL COMPANY
BACKED BY THE BRITISH RAIL PENSION FUND

Visit us on stand 331 at Personal Computer World Show

ONE BIT AT A TIME

the line. Such a system has the additional advantages that source programs and data can then be readily exchanged with other similarly equipped microprocessor systems, and that local pre- and post-processing of the results could significantly reduce the amount of mainframe computing time required.

Transmitting a file from the microprocessor system to the mainframe is straightforward. The file is read off the disk a block at a time and sent down the line and, provided the mainframe can buffer up characters as fast as they are received, no problems are encountered. If the mainframe buffer tends to fill up too soon (or it is non-existent) then the intelligent terminal program (ITP) should, after transmitting the carriage return at the end of each line, wait for receipt of the corresponding line feed (supplied by the mainframe). After the arrival of the line feed the ITP can safely assume the mainframe is ready and able to receive the next line.

Receiving a file is much more complicated because writing a block of data (say, 128 characters) to the microprocessor disk takes much more time (2-3 seconds approx) than is needed to transmit a single character from the mainframe. So, unless the mainframe can be persuaded to stop talking at the right moments, data will be lost every time a block is written to disk. To get a mainframe to pause after exactly 128 characters requires non-trivial software to be written for it; this precludes file reception on an ad hoc basis by non-programmers. Also, if a character in a block is transmitted but not received the micro will wait for ever for the 128th character of the block.

The average end user wants to be able to say 'that looks interesting — I'll take a copy of that' and then do so without needing to write fancy programs for his mainframe. Therefore the ITP must be able to buffer up more than a 128-character disk block and must be able to write to the disk only when the mainframe is not transmitting.

It is obviously asking too much for a program to decide when a mainframe is going to pause for enough time to write several kbytes of buffered dialogue to disk and to be able to make this decision independent of which mainframe it is connected to. The ITP could transmit a character meaning 'pause terminal output' to the mainframe whenever the receiving buffer is almost full and then restart the printout when the buffer is written to disk. Unfortunately the 'pause' and 'restart terminal output' control characters are likely to be different for different mainframes. Also 'pause terminal output' may not be noticed immediately, so some characters will be received after it has been transmitted; this again leaves us with the problem of deciding when the mainframe has finally finished transmitting.

To avoid these problems we decided to let the mainframe send a variable number of characters. The user examines the output from the mainframe as it is displayed on the microscreen and decides when the mainframe has finished transmitting. The user then tells the ITP (by pressing a control key unused by the mainframe) that it is safe to write the buffer to the disk. The ITP then does so and replies with a message to the user that it is now safe to restart mainframe output. There will be an upper limit to the number of characters that the mainframe can transmit in one block, since there will only be a finite amount of space for buffer storage in the microprocessor memory.

Ideally we should give an error message when the ITP buffer is almost full. It is difficult to give a decent message such as 'The buffer is almost full' without either data loss or intermingling of received data and error message. A simpler solution is to carry on storing data in the buffer but to echo all received characters as 'bells' or '?'s.

To reduce development time we loosely based our program on a program in volume 25 of the CP/M user group library. Called '88-MODEM', this was written by Tim Pugh. It is intended for sophisticated American modems that include facilities such as auto-dialling, but it can be adapted to British conditions without too much rewriting. Communications programs such as those described above are not recommended for the novice programmer! It is often tricky to debug such programs, since if the program fails to work it may be difficult to decide what caused the fault — this is due to the complex interaction between the communications equipment and the computers at each end of the line. For this sort of program development it is often best to use a terminal or another microprocessor system in the same room to simulate the modem connection to the mainframe. This enables both sides of the dialogue to be seen simultaneously — so, for example, you can verify that characters transmitted at one end of the line are actually being received at the other end.

RS232 for fun and profit

After reading this far you should have enough information to write a user-friendly dumb or intelligent terminal program, based on the RS232 standard, for your microcomputer. In this section we suggest some answers to the questions of whether the RS232 is a good standard for inter-computer communications, and how useful an intelligent terminal program can be.

The standard has some drawbacks — chiefly because it is not being used for its intended purpose, so it cannot be followed to the letter. The use of DTR/DSR for handshaking is a good example of a necessary breach of the standard. More control lines are provided than are needed for computer serial I/O; this has the effect that manufacturers tend to select any six lines from 25.

However, RS232 is very widely used so it shouldn't take much more than a specially wired cable to connect two devices from different sources. Problems start to occur if handshaking is attempted — eg, DTR or DSR may be held permanently high even when the device is not ready to receive.

Another advantage of the RS232 interface is that it is cheap to implement, using widely available special purpose ICs such as the 8251 UART for the Z80, and it is usual for microprocessor systems to come ready equipped with one or two RS232 ports.

With an RS232 port and an inexpensive modem, programs and data can be very cheaply transferred from a micro to other micros or mainframes. In a three-minute phone call costing 5-10p, at a speed of 1200 baud, almost 20,000 characters (about 3500 words of English) can be transferred. To send 3500 words by mail would cost at least 15½p and the GPO will do its best to deliver within a day or so!

One possible concern of a user of a terminal-modem-computer link might be related to the security of the transmission system. He would be worried not only about the possibility of criminal interception and modification of his data, but also about possible corruption of his data by a noisy or faulty line. For instance, say, if data terminals between various branches of a bank and the head office computer were connected using RS232 modem-like links over the public telephone network there would be at least some potential doubt about the security of the data thus transferred. A solution to this problem might involve the use of secure, dedicated land lines. In addition, sophisticated error-checking and correction codes would (hopefully) be used to ensure that only valid transactions were performed.

In this article we have tried to describe the basic elements of the serial RS232 interface. In the computer world ideas and equipment often change radically in a few years. The RS232 interface and the concept of a serial interface are embedded in the basic techniques of the computer designer. Transplanted from its original role of modem-terminal interconnection the RS232 interface now appears on almost every computer and microprocessor back panel. It is frequently the method of communication between processors and printers, plotters and other slow and medium-speed peripherals. Its popularity is based on the availability of cheap custom chips like the UART that provide most of the hardware necessary for the interface, the simple nature of the software needed to drive the interface and the small number of wires (and hence the small expenditure on cabling) needed to interconnnect interfaces.

In the future we can expect to see many more interconnection standards appear (like the Cambridge ring and Ethernet and the RS432 standards, to mention a few). It is difficult to see how the basic effectiveness and simplicity of the RS232 interface can be improved upon for most routine applications. We expect to be typing our programs in via an RS232 port for quite a few years to come.

END

Superior Systems Ltd.

178 West St, Sheffield S1 4ET. Tel.(0742)755005

ACORN



Acorn Atom 8K rom, 5K ram, P.S.U. & colour board	156.48	E
Atom disk pack, 96K single disk drive	299.00	E
Atom Colour board	39.00	C
Word pack ROM	26.00	A
Business	10.00	A
Business Book	6.95	A
Desk diary	10.00	A
Database	10.00	A
Adventures	10.00	A
Atom chess	10.00	A
Floating point ROM	20.00	A
B.B.C. ROM pack	PHONE	
B.B.C. Basic programming book	5.95	B

VIC-20



Vic 20 computer	156.48	E
VIC cassette deck	39.09	D
VIC printer	200.00	E
Single disk drive	344.35	E
Programmers aid cartridge	30.39	B
machine code cartridge	30.39	B
3K RAM cartridge	26.04	B
8K RAM cartridge	39.09	B
16K RAM cartridge	65.17	B
VIC Revealed	10.00	B
Getting Aquainted with the VIC 20	9.95	B
VIC Programmers Reference Guide	14.95	B

CASSETTE SOFTWARE

Pack Man (high resolution)	7.50	A
Gunman (high resolution)	7.50	A
Sub Attack	7.50	A
Ant Raiders	7.50	A
Fly Snatcher	7.50	A
Six programs for the VIC 20	7.50	A

ACT SIRIUS ONE

Act Sirius one 16 bit computer including CP/M microsoft 86 basic & utilities.	2395.00	E
Memory upgrade to 256K	495.00	E
Memory upgrade to 512K	1495.00	E
Act 911 matrix printer	695.00	E
Act921 daisy wheel printer	1295.00	E

SIRIUS SOFTWARE

Pulsar accounting package	495.00	D
Pulsar database	295.00	D
Supercalc	150.00	D
Micromodeller	595.00	D
Wordstar	295.00	D

Tabs software now on demonstration

APPLE COMPUTERS

Apple II (84k) computer	670.00	E
Disk drive with controller	370.00	E
Disk drive without controller	290.00	E
12" B.M.C. green screen monitor	119.50	E
Epson MX80 F/T I printer	399.00	E
Epson-Apple interface card	85.00	D
Graphics table	480.00	E
14" colour monitor	250.00	E
D.M.S. colour card	90.00	D

APPLE II SOFTWARE

Viscalc	104.00	D
Micro modeller	420.00	D
Visidex	105.00	D
Visiplot	96.00	D
Visitrend/Visiplot	135.00	D
Visiterm	80.00	D
Apple writer	39.00	D

SPECIAL OFFER

Megastor 8" dual disk drives giving 1.2Mb of storage special price 135.00

SHARP

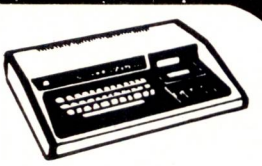


MZ80K (48k)	PHONE	
MZ80A (48K)	FOR BEST	
MZ80B (64k)	PRICE	
MZ80 P3 printer for MZ80K	360.00	E
MZ80 I/O interface unit MZ80K	95.00	E
MZ80 FB dual floppy disk unit	550.00	E
MZ80 EU interface unit for MZ80B	46.00	B
MZ80 P6 printer for MZ80B	409.00	E
PC 1211 pocket computer	69.50	D
PC 1500 pocket computer	139.00	D
CE 122 printer interface (pc1211)	60.83	D
CE 150 4 colour printer (pc1500)	125.00	

SOFTWARE

Wordpro word processor (tape)	39.50	B
Wordpro word processor (disk)	79.95	B
Apollo word processor (tape)	34.95	B
Database (cassette based)	29.50	B
MZ80 Calc II	34.50	B
Zen editor assembler	19.50	B
Zen Dos (editor assembler disk)	37.50	B
Zen dissasembler	10.50	A
MZ80K dust cover	5.00	A
P3 printer dust cover	5.00	A

VIDEO GENIE



Genie I computer	260.00	E
Genie II computer	260.00	E
EG3014 expansion unit	199.00	E
EG 3015/16 16K RAM card	91.50	C
EG 305/32 32K RAM card	128.80	E
EG 400 single disk drive	215.00	E
Colour board for Genie I/II	35.00	B
Dust cover for Genie I/II	5.00	B

SOFTWARE

Aquire business game	11.27	B
Adventures (various titles)	11.97 each	B
Adventure sampler	8.75	B
Asteroids	8.75	B
Accel II Basic compiler	39.95	C
Copysys program copier	11.25	B
Database	25.00	B
Editor assembler plus	21.70	B

NEC COMPUTERS

PC 8001 (32k computer)	PHONE	
PC 8011 32K expansion unit	489.00	E
PC 8012 32K expansion unit	399.00	E
PC 8023 dot matrix printer	399.00	E
PC 8031B dual disk drive	669.00	E
PC 8032B add on dual disk unit	569.00	E
PC8041 12" green/orange monitor	159.00	E
PC 8043 high res. colour monitor	579.00	E
PC 8045A light pen	199.00	E
CP/M disk & manual	64.00	D

ADLER COMPUTERS

SPECIAL ADLER PACKAGE

The Adler P2 computer, integral unit with twin disk drives, 12" green monitor, the Adler SE 1010 typewriter/printer, & the Lexicom II word processor

Special Package Price: 2900.00

Postage Rates

a.75p b.1.00 c.1.50 d.2.50 e.5.00

ALL PRICES EXCLUDE VAT

MAIL ORDER

Please Supply _____ £ _____

_____ £ _____

_____ £ _____

_____ £ _____

_____ £ _____

Access/Barclay/Cheque P&P+VAT £ _____

Card No. _____ Total £ _____

Name _____

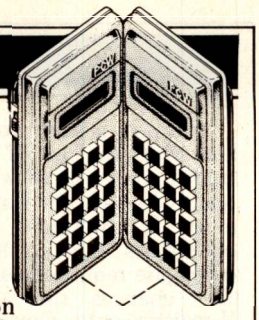
Address _____

_____

_____

_____

Code _____ Tel _____



By Dick Pountain

HP'S DEDICATED DUO

In the Dec 81 edition of this corner I reviewed the new Hewlett Packard 11C programmable calculator which, along with its sister the 120 financial calculator, I saw as HP's answer to Casio in terms of features and packaging, if not in price. It now transpires that these two machines were the advance guard of a whole new range of HP calculators designed for specific tasks. The two machines reviewed this month, the 15C and 16C, are the latest additions (don't ask me what happened to the 13 and 14; did I miss them?) and they are both far more exciting than the 11 in their different ways.

The 15C is mathematically oriented and has a range of operations never before offered on a programmable — nor for that matter on many micros that I know of. These include complex number arithmetic, matrix manipulation, numerical integration and equation solving/root finding, in addition to the normal maths and statistical functions.

The 16C is called the Computer Scientist and will be of interest to all terminal junkies rather than the regular readers of this column. It is aimed straight at that slot which the Texas Programmer has had to itself for some years now — machine code programmer's assistant. It has features that go well beyond what's offered by the ageing TI machine and will I suspect find its way into a lot of computer labs as well as the homes of well-equipped hobbyists.

Hardware

The 'TeenC' machines form a coherent range in that the physical packaging is identical; only the model numbers and the legends on the identically laid out keyboards differ. I will therefore refer you to the 11C review for the exact details and, to save space, will concentrate here on the internal differences. To recap briefly, though, both machines have constant memory and 10-digit LCD displays and are powered by three 'button' cells with a life of 60 hours' continuous use or 18 months' memory preservation. Both have built-in hardware diagnostic routines as well as the logic circuitry. It goes without saying that both use Reverse Polish arithmetic.

The 15C has 469 bytes of continuous memory and the 16C has 203; the way this memory is used and managed on the two machines, is very different however.

The 15C has manual memory management similar to that of the 41C — you decide what the highest numbered storage register is to be. There are two fixed storage registers so that only 448 bytes maximum can be allocated to program space. When the partition has been set any registers above the top one named are uncommitted; they are still available for data storage but are automatically converted to program steps when required. Some of this space is used by the 'advanced functions' — ie, matrix, complex, solve and integrate — when they are in use.

The 16C uses automatic memory management similar to that on the 11C; as you enter more program steps data storage space is converted, seven bytes at a time from the top down, into program space. Program space is protected once filled; ie, you can't overwrite program steps by accessing a nonexistent data register, but the reverse obviously cannot be true (ie, data is lost if its register is converted). I can't tell you how many data registers are available because one of the features of the 16C is variable word size. A data register is one word long and that could be anything from four to 64 bits! With a 16-bit (two-byte) word size you could have a maximum of 101 registers (203/2=101.5; the half is not usable for data but will be available for program steps).

On both machines one program line is usually one byte, sometimes two. Both use the same editing functions and numeric op-codes as the 11C.

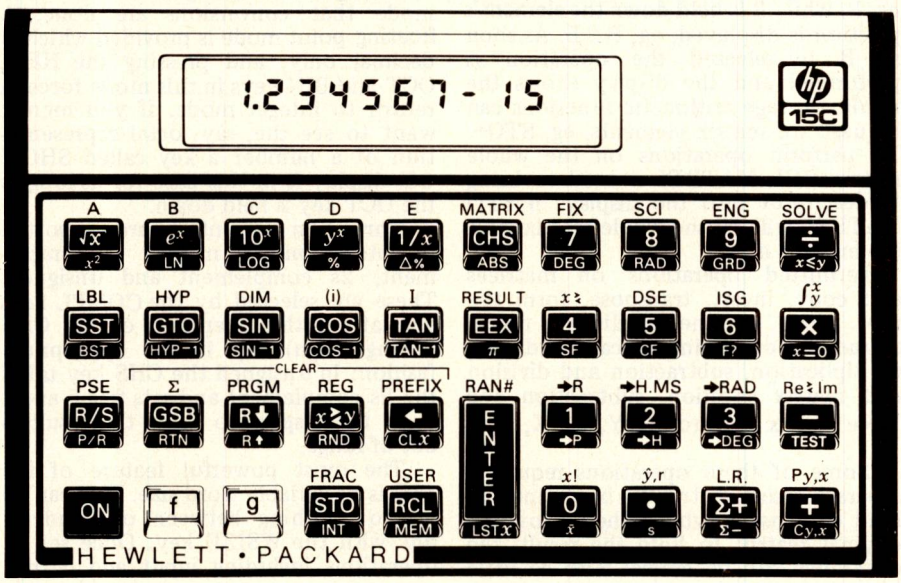
15C firmware

True to the new HP formula the 15C supports three numeric formats, FIX, SCI and ENG, while working internally with 10-digit mantissas. A nice touch, aimed at international markets, is that the digit separators for thousands and decimal point can be swapped to conform with usage in various countries — eg, 23.567.200,12 instead of 23,567,200.12. A very full range of functions is provided, including all the normal trig and logs, hyperbolics plus factorials and gamma functions, permutations, combinations, linear regression and full statistics routines. A random number generator is built in which can be seeded using the X-register contents.

The really interesting operations, however, are the four 'advanced functions'. Of these, solve and integrate have already been reviewed in my review of the HP-34C (*PCW* March 1981) so I shall concentrate here on the complex arithmetic and matrix-manipulation features which are completely new

The complex mode allows all those maths operations which are meaningful to be performed on imaginary and complex numbers as well as reals. This is achieved by creating a second stack, similar to the normal one, which holds the imaginary part of the numbers (critics of Reverse Polish should note the simplicity of this solution). The imaginary stack is actually formed from four uncommitted data registers and is created only when complex mode is entered.

To enter a complex number into the machine one merely types the real part followed by ENTER and the imaginary part followed by the 'I' key. This creates the complex stack and enters complex mode which is flagged by a C annunciator in the display; it also automatically transfers the imaginary part of your number into the imaginary stack. Arithmetic is then carried out as normal: since the display holds only one number it is necessary to exchange the X-registers of the two stacks to view the imaginary part using the 'Re⇆Im' key or to press the '(i)' key which displays the imaginary X-register only while held down. Complex mode remains set once selected and is cancelled only by clearing system flag 8. Real arithmetic is not affected at all by complex mode, as those operations which do not work on complex numbers simply ignore the imaginary stack. The only exception is the rectangular to polar coordinate conversion which operates somewhat differently in complex mode to allow the user of phasor notation. Operations which ignore imaginary numbers include some of the conditional branch tests and functions like factorial and INT. The memory operations STO and RCL work only on the real stack so that a complex number must be stored in two registers using Re⇆Im between the STOs.



It takes a while to become comfortable with the use of these two parallel stacks, only one of which is visible, but once you have the knack complex arithmetic is no harder than real. Certain operations like forming the complex conjugate require thought since the CHS key changes the sign of the real X-register only. Complex mode can be combined with both the solve and integrate routines to find complex roots and integrals; manipulation of complex matrices is rather different and will be discussed below.

Matrix operations

Though of necessity limited by the relatively small memory available, the matrix operations of the 15C are very comprehensive and ingeniously implemented.

A maximum of five matrices may be stored at one time and their combined number of elements is restricted to 64, so the largest possible is a single 8x8. Each matrix is named with a 'descriptor' consisting of one of the letters A-E and two numbers representing the dimensions. The letters are provided on five keys which also serve as branching labels and, in USER mode, to execute labelled programs. These descriptors behave like numbers in that they may be stored on the stack or in a single data-register and they are used to represent the matrix in arithmetic operations.

To create a matrix you must first allocate sufficient memory in the uncommitted area; each element needs one register. Then the matrix is dimensioned using the DIM and MATRIX keys.

A major obstacle to matrix manipulation on a calculator is that only one element can be displayed at a time. This problem has been solved by reserving a special function for the two registers R0 and R1; if the row and column numbers of a matrix element are stored in these registers then they are automatically incremented after any operation has been performed to give the next position to the left, wrapping round the end of rows and returning to 1,1 after the last element is reached. To store or recall elements it is sufficient to press STO or RCL and the matrix's name, eg, B. While B is held down the element's position is displayed, eg, B 2,5. As soon as B is released the operation is performed and the display shows the result. Storage arithmetic functions can be used on matrix elements, eg, STO+. To perform operations on the whole matrix RCL MATRIX is used to bring its descriptor into the display. n STO MATRIX will fill the whole matrix with the number n.

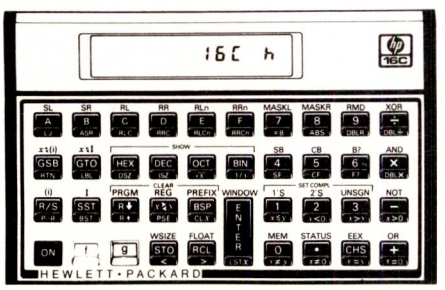
Permitted operations on matrices are: copy, invert, transpose, form the row norm or the Euclidean norm, extract the determinant, scalar addition, multiplication, subtraction and division and matrix addition, subtraction and three matrix products (XY, Y^T X, X^{-1} Y).

Some of these operations require a separate result matrix to be defined to hold the answer while others allow the original matrix to hold the result; the difference can be crucial with so little memory to play with. The operations are quite fast by calculator standards:

Invert 8x8 matrix	60 secs
Transpose 8x8 matrix	4 secs
Extract determinant 8x8 matrix	28 secs

Complex numbers may be stored in a matrix taking two elements each but complex mode will not support matrix calculations. Instead complex matrices are handled using a real representation which requires only one stack; several transformation routines are provided to allow entry of such matrices in an obvious form and then to turn them into a machine usable form.

Although limited by memory size, these matrix facilities are well designed and are highly suitable for applications such as the solution of simultaneous equations.



HP16C: The Computer Scientist

The 16C is a far more narrowly dedicated machine than the 15C; for instance, its arithmetic functions are limited to +, —, x, ÷ and square root.

It is, however, fully programmable with all the usual conditional tests and flags and an indirect register. Its intended use is as a 'toolkit' for the machine code programmer and it has some very sophisticated facilities for this purpose: it is much more than a hex-to-decimal calculator.

Numeric base conversion is nevertheless an important part of its job and to this end it has keys marked HEX, DEC, OCT and BIN whose functions should be clear. A nice touch is that when these keys are in use an alpha prompt at the right of the display tells you which base you're in. The normal operating mode is integer and it is in this mode that conversions are done. A floating point mode is provided which is decimal only, and pressing the HEX, OCT and BIN keys in this mode forces a return to integer mode. If you merely want to see the, say, octal representation of a number a key called SHOW will display it in this base for as long as the OCT key is held down.

Three sign conventions are supported in integer mode, namely 1s complement, 2s complement and unsigned. These are selected by the COMPL keys and affect the operation of the CHS (change sign) key in the appropriate fashion; in unsigned the CHS key takes the 2s complement and sets flag 5 and a G in the display to show the result is out of range.

The most powerful feature of the 16C is its variable word size. This can be set to anything between one and 64 bits with the WSIZE key. Once set all operations including input and output are performed in this word size; setting a 1-bit size renders the machine rather inarticulate! The smart kids at Corvallis fortunately made WSIZE 0 the same as 64 — without this you might never get out again. Since the displays holds only eight characters it's necessary to scroll it when showing binary in word sizes beyond eight. This can be done either character by character with the ⟨ and ⟩ keys or in eight character chunks with the WINDOW key. A displayed '.' at the right or left side tells you that there are undisplayed digits present at that side.

As well as the five function arithmetic (with carry and out-of-range flags) a full set of bitwise shifts, rotates and logical operators including XOR are provided. There are even MASKL and MASKR, which create left or right justified strings of one bits of chosen size for masking. Three double length operators, double multiply, double divide and double remainder return exact results of twice the current word size.

The #B key returns the sum of the bits in the display register and is handy for checksum calculations.

Given all these features it is possible to emulate virtually any processor ever devised, since even instructions such as complicated indirect jumps could be programmed as a subroutine and assigned to one of the A-E keys. It's quite nice to think that you might have a Cray 1 in your pocket even if its megaflop rate is rather disappointing! More seriously though I suspect that this machine will become almost indispensable to those poor wretches who will have to write for the 68000 or the new 32-bit chips which are threatened. Since it uses Reverse Polish it would be a nice toy for a Forth programmer to find in a Christmas stocking too (hint, hint).

Conclusions

These two machines are produced, packaged and documented up to the standard one has come to expect from Hewlett Packard. The prices are hardly bargain basement at £95.70 for the 15C and £106.34 for the 16C but if you need to do what they do it would be hard to do it any cheaper with such convenience. More interesting is the indication they give of the thinking at HP. For several years the trend was to ever more powerful general-purpose programmable calculators, culminating in the HP-41CV. You can do virtually everything these two machines do on a 41C given the time and ingenuity to write the programs and the patience to load them every time you need to use them. The point being that not everyone has all those requisites and so the dedicated **programmable** appears on the scene. Aimed at a specific profession with 90 percent of what you need hardwired in and sufficient programming flexibility for you to write the other 10 percent, this seems to me a shrewd choice of direction — and one which will sell a lot of calculators.

END

DON'T BUY AN ACCOUNTING SYSTEM BEFORE YOU'VE SEEN TABS VIDEO

For most businesses, purchasing a microcomputer accounting system can be a costly exercise especially if it isn't practicable.

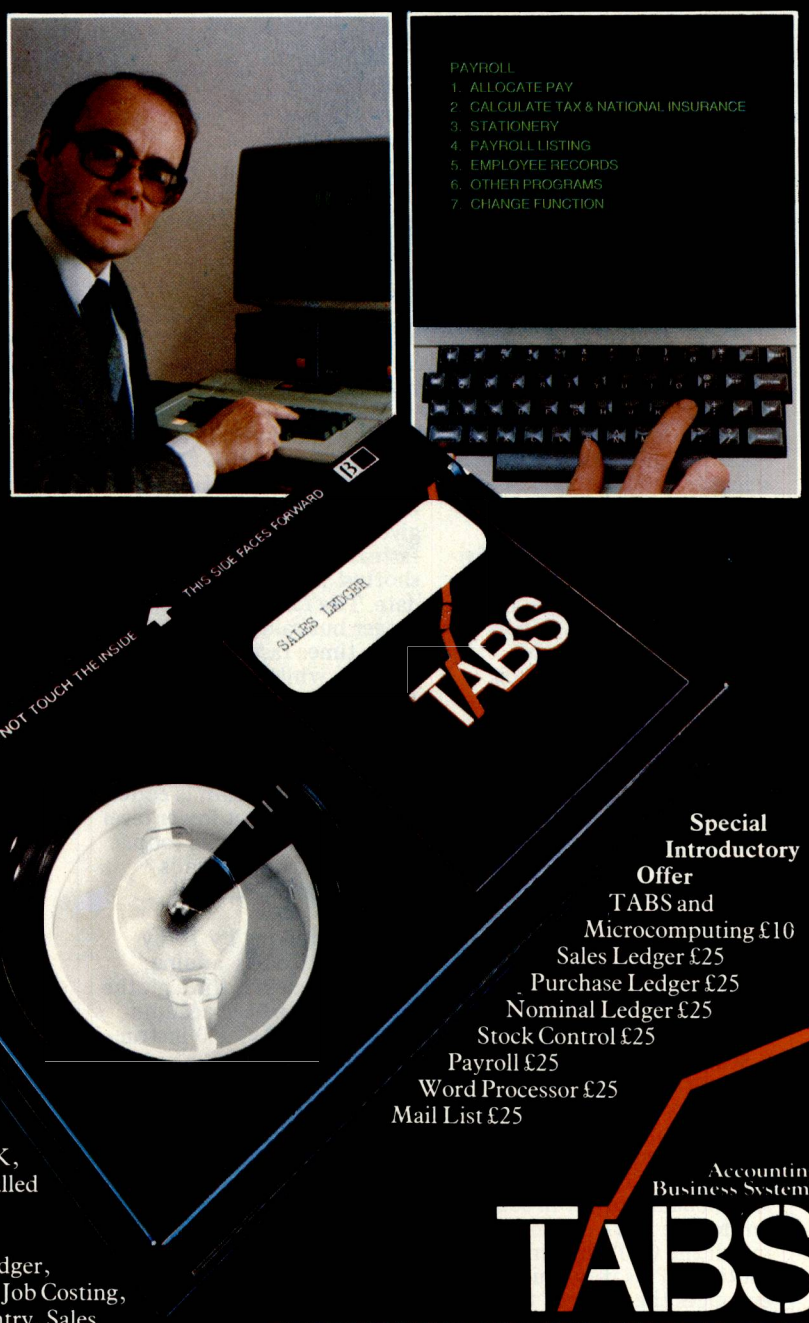
To help the potential end user, TABS have produced an introductory video tape to enable thorough evaluation of microcomputer accounting, and to help you understand how TABS fully integrated modular software could help you to run a really efficient accounting system.

In addition, we have produced video training tapes for Sales Ledger, Purchase Ledger, Nominal Ledger, Stock Control, Payroll, Word Processor and Mail List.

Each tape takes the viewer step by step through each option and using a special technique shows keyboard operation and resulting screen image simultaneously.

Video also allows the viewer to re-run any part of the tape that is not immediately understood and is an ideal low cost way to train or retrain personnel.

Why not return the coupon to us? We could save you a small fortune.



Special Introductory Offer

TABS and Microcomputing £10
Sales Ledger £25
Purchase Ledger £25
Nominal Ledger £25
Stock Control £25
Payroll £25
Word Processor £25
Mail List £25

TABS software is the biggest selling fully integrated, modular accounting software on the market. With well over 2,000 systems installed and over 14,000 modules running throughout the UK, we are confident that we have unrivalled experience in microcomputing applications and installation.

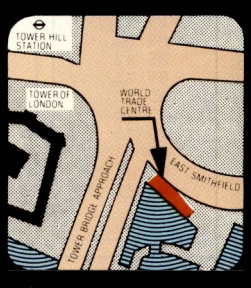
TABS modules include: Sales Ledger, Purchase Ledger, Nominal Ledger, Job Costing, Stock Control, Payroll, Fast Data Entry, Sales Order Processing, Management Accounts, Invoice Compiler, Mail List, Word Processor.

Free seminars and demonstrations are held in London at the World Trade Centre each Thursday, and at our resources centre in Andover each Friday, where our software can be seen running on many popular micros.

TABS also provide:

- Unbiased advice on complete systems and software from our Applications Desk.
- Comprehensive 4 day customer and dealer training courses. (We'll also treat you to lunch!)
- Hotline telephone support.

Free London Demonstrations and Seminars are held at the World Trade Centre within a few minutes walk of Tower Hill tube station.



Accounting Business Systems

TABS

Please send more details about TABS business systems and services PCW 9

- ☐ 32 page introductory booklet
- ☐ User book (please send £7.50 (inc. P & P))
- ☐ Details on Free Seminars and demonstrations
- ☐ Dealer plans
- ☐ Price List

Special Introductory Offer

- ☐ TABS and Microcomputing £10
- ☐ Sales Ledger £25
- ☐ Purchase Ledger £25
- ☐ Nominal Ledger £25
- ☐ Stock Control £25
- ☐ Payroll £25
- ☐ Word Processor £25
- ☐ Mail List £25

Name_____

Address_____

_____ Tel. No._____

I enclose cheque/postal order for £_____

Signature_____ **Andover (0264) 58933**

TABS Ltd, Sopers House, Chantry Way, Andover, Hants. SP10 1PE

PCW SUBSET

Alan Tootill presents more useful assembler-language subroutines. This is your *chance to help build a library of general-purpose routines, documented to the standards we have developed together in this series. You can contribute a Datasheet, improve or develop one already printed or translate the implementation of a good idea from one processor to another.* PCW *will pay for those contributions that achieve Datasheet status. Contributions (for any of the popular processors) should be sent to: Sub Set,* PCW, *62, Oxford Street, London W1A 2HG.*

6502 arithmetic

The original 6502 arithmetic routines were printed in February and April and I am pleased to see that some of you have been using them. All the routines work as specified but, as Len Parsons of Enfield was first to point out, they don't fit together as a complete package as well as they might.

Consider the use of SADB46 to convert an ASCII decimal string into a 32-bit signed binary number in M1 - M4, which will be moved to M6 - M9 as the dividend of the SDIV46 routine. If SADB46 is used again to convert a divisor, it will overwrite the dividend in M6 - M9. If the divisor is taken first and moved into MA - MD, it would have to be saved before a second use of SADB46 for the dividend, as it needs MA - MB to hold the address of the ASCII string.

This awkwardness can be eliminated by reallocating the zero page memory throughout all the routines, with the accumulator in M0 - M3, the secondary accumulator in M4 - M7, the tertiary accumulator in M8 - MB, MC - MD pointing to ASCII strings, ME holding the sign of the product of the secondary and tertiary accumulators and MF available as a temporary store.

Vincent Fojut of Altrincham has put in some impressive work on improving all the 6502 arithmetic routines. This very much enhances the value of the original contribution and the process needn't necessarily stop here. I am applying the zero page reallocation to Vincent's improvements, going back to the improved SNEG46 printed in July. This must now be altered to negate (2's complement) four bytes in zero page locations M0 - M3 (instead of M1 - M4) with the most significant byte now in M3.

Vincent's next improvement, which I give here before he changes it again, is to the SADB46 routine we have been considering. He gives two versions, one the fastest and the other the shortest he has achieved to date. The fastest is nine bytes longer but said to be six to seven times faster than the original, while the shortest is 16 bytes shorter and said to be still three to four times faster than the original routine.

The faster version is coded all in line, without lower level loops within the main loop. In both versions speed is gained over the original routine:
1) in multiplying by 10 by shifting as well as adding;
2) rippling carries through the higher bytes of the accumulator by the ADC = 0 instruction, and
3) adding and moving in one block of code, instead of moving the accumulator to the secondary accumulator in one block of code and adding the new digit in a second block of code.

In the short version, Vincent is now duly contrite about the unstructured handling of overflow but it saved two bytes and brevity was all.

Datasheet

```
;=SADB46 - ASCII-decimal to 32-bit binary conversion
;/CLASS: 2
;/TIME CRITICAL? No
;/DESCRIPTION: Converts an ASCII-decimal string to a
;/             signed 32-bit integer
;/ACTION: Clear 32-bit accumulator
;/        If there's a sign, get it & increment
;/        character pointer
;/        Fetch digit & convert to binary
;/        Multiply accumulator by 10 & add digit
;/        Repeat until non-numeric character found
;/        Negate accumulator if sign was '-'
;/SUBr DEPENDENCE: SNEG46 &, for short code, local
;/                 TIM22
;/INTERFACES: An area of RAM, pointed to by MC - MD, holds
;/            the ASCII-decimal string
;/INPUT: MC - MD (with the most significant byte in MD)
;/       point to the first byte of the string to be
;/       converted, which may start with a plus or a
;/       minus and is terminated by the first character
;/       that is not an ASCII-decimal digit
;/OUTPUT: For a valid string: M0 - M3 contain the signed
;/        binary equivalent, with the least significant
;/        at M3.  MC-MD point to the start of the string.
;/        The carry is reset.  For overflow: carry is set,
;/        MC - MD point to start of string
;/REGs USED: A,X,Y,P,M0-M7, MC-MD
;/STACK USE: 2
;/LENGTH: 124 for fast conversion, 99 for short version
;/T-STATES: Min 203, max 1650 fast; min 351, max 2878
;/          short
;/PROCESSOR: 6502
;
; fast version
;
SADB64:   LDY £0        ; Zeroise                  A0 00
          STY M0        ;  accumulator             84 ZZ
          STY M1        ;                          84 ZZ
          STY M2        ;                          84 ZZ
          STY M3        ;                          84 ZZ
          LDA (MC),Y    ; Get first char           B1 ZZ
          TAX           ; Save it                  AA
          CMP £$2D      ; Minus sign?              C9 2D
          BEQ SDB2      ; Branch if so             F0 56
          CMP £$2B      ; Plus sign?               C9 2B
          BNE SDB3      ; No, check if valid digit D0 55
          BEQ SDB2      ; Yes, get next char       F0 50
SDB1:     ASL M0        ; Multiply                 06 ZZ
          ROL M1        ;  accumulator             26 ZZ
          ROL M2        ;  by 2                    26 ZZ
          ROL M3        ;                          26 ZZ
          BMI OVFW1     ; Check for overflow       30 59
          ADC M0        ; Add                      65 ZZ
          STA M4        ;  new                     85 ZZ
          LDA M1        ;  digit                   A5 ZZ
          ADC £0        ;  to                      69 00
          STA M5        ;  "*2" value              85 ZZ
          LDA M2        ;  and                     A5 ZZ
          ADC £0        ;  store                   69 00
          STA M6        ;  in                      85 ZZ
          LDA M3        ;  secondary               A5 ZZ
          ADC £0        ;  accumulator             69 00
          BMI OVFW1     ; Check for overflow       30 43
          STA M7        ;                          85 ZZ
          ASL M0        ; Multiply                 06 ZZ
          ROL M1        ;  accumulator             26 ZZ
          ROL M2        ;  by 2 again              26 ZZ
          ROL M3        ;  (= *4)                  26 ZZ
          BMI OVFW1     ; Check for overflow       30 37
          ASL M0        ; Multiply                 06 ZZ
          ROL M1        ;  accumulator             26 ZZ
          ROL M2        ;  by 2 again              26 ZZ
          ROL M3        ;  (= *8)                  26 ZZ
          BMI OVFW1     ; Check for overflow       30 2D
          LDA M0        ; Get                      A5 ZZ
          ADC M4        ;  (accumulator            65 ZZ
          STA M0        ;  *10) +                  85 ZZ
          LDA M1        ;  new digit               A5 ZZ
          ADC M5        ;  by adding               65 ZZ
          STA M1        ;  (acc *8)+               85 ZZ
          LDA M2        ;  (acc *2 + new           A5 ZZ
          ADC M6        ;  digit)                  65 ZZ
          STA M2        ; Store back               85 ZZ
          LDA M3        ;  in                      A5 ZZ
          ADC M7        ;  accumulator             65 ZZ
          BVS OVFW1     ; Check for overflow       70 15
          STA M3        ;                          85 ZZ
SDB2:     INY           ; Get next                 C8
          LDA (MC),Y    ;  character               B1 ZZ
SDB3:     SEC           ; Is it                    38
          SBC £$30      ;  an ASCII                E9 30
```

```
            CMP  £$10     ;  digit?                    C9 0A
            BCC  SDB1     ; Continue if so             90 A6
            CPX  £$2D     ; Was 1st char "-"?          E0 2D
            BNE  SDB4     ; Skip if not -ve            D0 03
            JSR  SNEG46   ;  else negate               20 XX XX
SDB4:       CLC           ; Clear carry to show OK     18
            RTS           ;                            60
OVFW1:      SEC           ; Set carry to show error    38
            RTS           ;                            60
;
; short version
;
SADB46:     LDY  £0       ; Zeroise                    A0 00
            LDX  £4       ;  accumulator               A2 04
SDB1:       STY  M0-1,X   ;                            94 ZZ
            DEX           ;                            CA
            BNE  SDB1     ;                            D0 FB
            LDA  (MC),Y   ; Get first char             B1 ZZ
            CMP  £$2D     ; Minus sign?                C9 2D
            PHP           ; Save test result           08
            BEQ  SDB5     ; Branch if true             F0 31
            CMP  £$2B     ; Plus sign?                 C9 2B
            BNE  SDB6     ; No, check valid digit      D0 30
            BEQ  SDB5     ; Yes, get next char         F0 2B
SDB2:       STA  M4       ; Save new digit             85 ZZ
            STX  M5       ; Zeroise rest               86 ZZ
            STX  M6       ;  of secondary              86 ZZ
            STX  M7       ;  accumulator               86 ZZ
            JSR  TIMZ2    ;  multiply acc by 2         20 XX XX
            LDX  £-4      ; Add acc *2                 A2 FC
SDB3:       LDA  M4+4,X   ;  to new digit              B5 ZZ
            ADC  M0+4,X   ; Store in                   75 ZZ
            STA  M4+4,X   ;  secondary                 95 ZZ
            INX           ;  accumulator               E8
            BNE  SDB3     ;                            D0 F7
            BVS  OVFW2    ; Check for overflow         70 27
            JSR  TIMZ2    ; Mult acc by 2 again        20 XX XX
                          ;  (= *4)
            JSR  TIMZ2    ; Mult acc by 2 again        20 XX XX
                          ;  (= *8)
            LDX  £-4      ; Get acc *10 +              A2 FC
SDB4:       LDA  M0+4,X   ;  new digit                 B5 ZZ
            ADC  M4+4,X   ;  by adding                 75 ZZ
            STA  M0+4,X   ;  (acc *8) to               95 ZZ
            INX           ;  (acc *2 +                 E8
            BNE  SDB4     ;  new digit)                D0 F7
            BVS  OVFW2    ; Check for overflow         70 14
SDB5:       INY           ; Get next                   C8
            LDA  (MC),Y   ;  character                 B1 ZZ
SDB6:       SEC           ; Is it                      38
            SBC  £$30     ;  an ASCII                  E9 30
            CMP  £$10     ;  digit?                    C9 0A
            BCC  SDB2     ; Branch if so               90 CB
            PLP           ; Was 1st char "-"?          28
            BNE  SDB7     ; Skip if not -ve            D0 03
            JSR  SNEG46   ;  else negate               20 XX XX
SDB7:       CLC           ; Clear carry to show OK     18
            RTS           ;                            60
OVFW1:      PLA           ; TIMZ2 overflow             68
            PLA           ; Discard return address     68
OVFW2:      PLP           ; Discard saved flags        28
            SEC           ; Set carry to show error    38
            RTS           ;                            60
TIMZ2:      ASL  M0       ; Multiply                   06 ZZ
            ROL  M1       ;  accumulator               26 ZZ
            ROL  M2       ;  by 2                      26 ZZ
            ROL  M3       ;                            26 ZZ
            BMI  OVFW1    ; Check for overflow         30 F1
            RTS           ;                            60
```

Random numbers for Z80

Readers who have been following the saga of pseudo-random number generation through the 'Sub Sets' for April, July, September. October and December 1981 and February and June 1982 will know what lead to the conclusion that 16-bit routines are not good enough for serious work and to the call for a 32-bit routine with a 2^{32} modulus.

As we saw, Ettrick Thomson of Aldeburgh has serious reservations about routines using a modulus which is a power of two, because of the non-random nature of the numbers they produce. He has therefore given us in our next Datasheet, RD31, a 31-bit routine, using the series $r_{i+1}\ (2^9 + 1)r_i \pmod{2^{31}-1}$. It will repeat after $2^{31}-2$ numbers, giving all possible combinations of 31 bits, except the all-zero and the all-one combinations. The primitive root comes from Werner Linger, 'on a method by D H Lehmer for the generation of pseudo-random numbers', *Numerische Mathematik*, Vol 3 pp265-270 (Oct 1961).

Ettrick does not have the facilities to check that 2^9+1 is a primitive root of 2^3-1, so we will be glad to hear from anyone who has been able to do this.

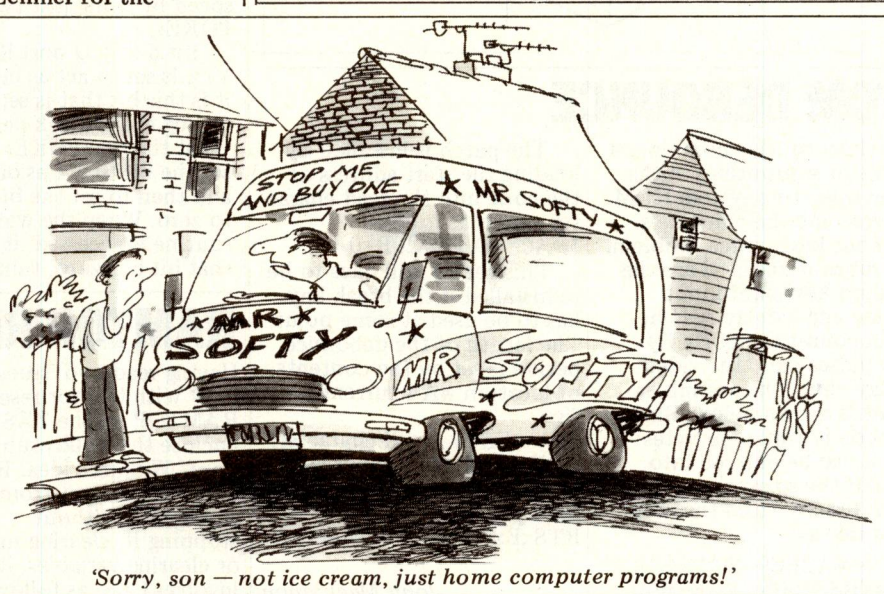
Of the various r_is Ettrick used in testing the routine, the two interesting ones are in Figure 1.

	RN	RN+1	RN+2	RN+3
r_i = 1389794485	181(B5H)	148(94H)	214(D6H)	82(52H)
r_{i+1} = 1	1(01H)	0(00H)	0(00H)	0(00H)
r_i = 2021376542	30(1EH)	194(C2H)	123(7BH)	120(78H)
r_{i+1}=1879048192	0(00H)	0(00H)	0(00H)	112(70H)

Fig 1

Datasheet

```
;= RD31 - 31-bit pseudo-random number generator
;/CLASS: 2 (not position independent)
;/TIME CRITICAL? No
;/DESCRIPTION: Generates a 31-bit pseudo-random
;/             number from the series r(i+1) = ur(i) (mod M)
;/             where M=2^31-1 (a Mersenne prime) and u=2^9+1,
;/             one of M's primitive roots
;/ACTION: Let r(i)=X+2^22Y where X is the 22-bit number
;/        consisting of bits 0-21 of r(i) and Y is the 9-bit
;/        number consisting of bits 22-30.  Form P, the 31-bit
;/        number Y+2^9X and Q, the 32-bit number P+r(i).  Then
;/        Q=ur(i)-YM so that r(i+1) = Q(mod M).  But, since
;/        (as can be shown) 0<Q<2M, r(i+1)=(if Q<M) then Q
;/        else Q-M; note also that if bit 31 of Q is zero,
;/        then Q<M but (since Q=M does not occur) if bit 31
;/        of Q is 1 then Q>M.
;/SUBr DEPENDENCE: None
;/INTERFACES: Four bytes of directly-addressable RAM; RN,
;/            RN+1, RN+2, RN+3 are used to store the
;/            previous number r(i)=(RN)+2^8(RN+1)+2^16(RN+2)
;/            +2^24(RN+3) or a selected seed, for which the
;/            most significant bit of RN+3 must be zero and
;/            the remaining 31 bits are arbitrary, except
;/            that they must not be all zeros or all ones.
;/INPUT: A seed or the previous random number
;/OUTPUT: The new random number r(i+1) is built up in RN,
;/        RN+1, RN+2, RN+3
;/REGs USED: AF,BC,DE,HL
;/STACK USE: None
;/LENGTH: 53
;/TIME STATES: 242 (average)
;/PROCESSOR: Z80
;
RD31: LD   HL,(RN+2)   ; Begin to form P=          2A XX XX
      RL   L           ;  BC+2^16DE                CB 15
      RL   H           ;                           CB 14
      RL   L           ;                           CB 15
      RL   H           ;                           CB 14
      LD   C,H         ; C=bits 22-29 of r(i)      4C
      LD   A,(RN)      ; Carry flag = bit 30       3A XX XX
      RLA              ; A=bits 30,0-6; carry=     17
      LD   B,A         ; bit 7;BC=bits 22-30,0-6   47
      LD   DE,(RN+1)   ;                           ED 5B XX XX
      RL   E           ;                           CB 13
      RL   D           ;                           CB 12
      RES  7,D         ;DE=bits 7-21;P now formed  CB BA
      LD   HL,(RN)     ; Begin to form Q in (RN)   2A XX XX
      ADD  HL,BC       ;  (RN+3)                   09
      LD   (RN),HL     ;                           22 XX XX
      LD   HL,(RN+2)   ;                           2A XX XX
      ADC  HL,DE       ;                           ED 5A
      RES  7,H         ; Reset bit 31 of Q (but    CB BC
      LD   (RN+2),HL   ;  its value is preserved   22 XX XX
                       ;  in the sign flag
      RET  P           ; Return if                 F0
      LD   HL,RN       ;  Q<M with r(i+1)=Q        21 XX XX
INC:  INC  HL          ;                           34
      RET  NZ          ; Return if Q>M with        C0
      INC  HL          ;  r(i+1)=Q-2^31+1          23
      JR   INC         ;                           18 FB
```



'Sorry, son — not ice cream, just home computer programs!'

TJ's WORKSHOP

Our monthly pot-pourri of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to: 'TJ's Workshop', *PCW*, 62, Oxford Street, London W1A 2HG. *Please keep your contributions as concise as possible. We will pay £5-£30 for any tips we publish.*

ZX81 REVERSE VIDEO

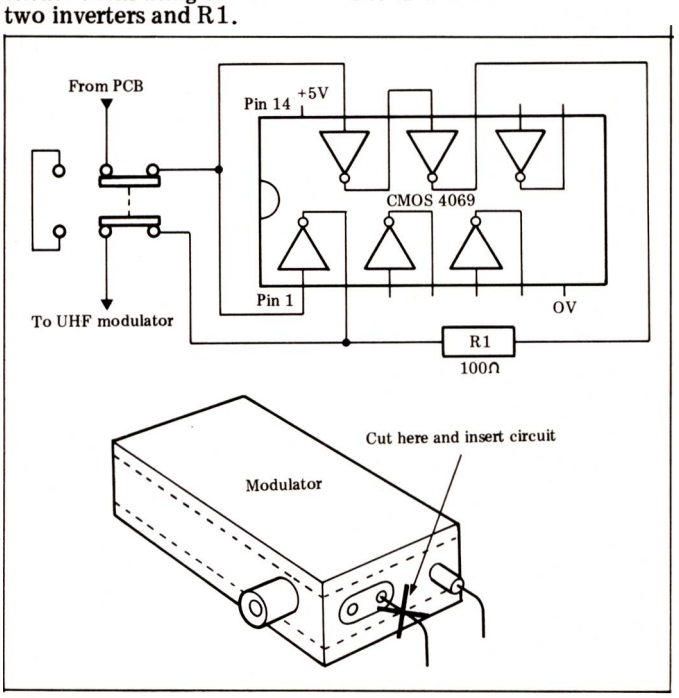
This is an idea to help all those ZX81 owners who are fed up with their black letters on a white background.

The circuit shown inverts the video signal, but, since it also inverts the TV sync signals, it is necessary to reconstitute them using the other two inverters and R1.

The UHF video input terminal (the one nearest the jack socket) has to be cut and the circuit inserted in the cut wire.

The +5V and OV power supplies can be obtained from the back plane.

Richard Wood



ATOM DEBOUNCE

This short routine combines a couple of subroutines in the Atom operating system ROM to overcome the machine's infamous keybounce problem. The subroutines used are the standard keyboard input routine and a delay routine which counts the 60Hz flyback pulses from the video display chip. The assembler source is shown below. Since the code is only nine bytes long it can be entered into some of the spare zero page RAM directly from the command line as:

```
!#A0=#A2FE9420;!#A4=
   #FB832005;?#A8=#60.
```

The patch is installed by loading the start address of the code into the read character vector as follows:

```
!#A0=#A0;?#20B=0
```

This vector will have to be re-installed if the break key has to be used at some point. The length of the debounce period is set by the contents of location #A4 currently five.

```
JSR #FE94 ;Read character.
LDX @ 5 ;Load flyback count.
JSR #FB83 ;Count the fly-
back pulses.
RTS ;Exit with character in A.
```

John Mackinnon

FASTER PET SCREEN

If you POKE to screen memory on an old PET, you'll notice a lot of flickering. To overcome this during screen display, the print character routine in ROM contains code which waits until the electron beam of the screen is returning from the bottom right hand corner of the screen to the top left hand corner. During this time the screen is inactive and so no flicker occurs. This is all very well, but this waiting slows down the screen handling a great deal.

Later on, Commodore improved the PET's hardware, so that unless the screen was accessed *very* rapidly, no flicker would ever occur. Unfortunately, these improvements came after Basic 3.0 was released, and so the wait routine is still there, even though it isn't needed. In Basic 4.0, however, the wait routine has gone, and the screen printing is much faster. If you have Basic 3.0 and you want the display speed of Basic 4.0, you could change a few bytes in the ROM, but there is a way of getting extra speed by using just two POKEs.

Bit 5 of I/O port B on the VIA is set to act as input, and it is this bit that is set to zero during the flyback period. What the two POKEs do is to set the bit to act as output, and then to set the bit itself to zero. When the wait routine is accessed, it sees that bit 5 is zero, thinks the beam is returning, and so waits no more.

Scrolling, however, is not speeded up and, if a lot of scrolling is involved, the increased speed will not be noticeable if only a few lines are involved. Under optimum conditions — that is, with no scrolling at all — printing is speeded up by about three and three-quarter times.

The two POKEs are:

```
POKE 59458,62:POKE
59456,223
```

It is important to do these two POKEs on one line, as the first defines bit 5 as output, and this bit may be set so that when the PET comes to print out READY, the computer will wait for this bit to go zero, which will never happen. The second poke ensures that this bit is set to zero before any more printing is done.

Finally, a word about monitors. I bought my PET new in January last year. It has the small keyboard and built-in cassette deck. It has only 8K (dynamic not static) but still has a monitor. Whether or not you have a monitor depends on which ROM you have and not, as many people think, on how much RAM you have. The rule is: if you switch on and see '***COMMODORE BASIC***', then you do not have a monitor as you have Basic 2.0, otherwise you *do* have a monitor.

J.D. Slodzik

RAMTOP REVISITED

Having read two issues of *PCW* with tips for resetting RAMTOP on the ZX81, I enclose the 'follow-up' to Geoff Wilkins's idea. RAMTOP can be reset from a program, without stopping it, clearing memory or clearing variables; it simply involves CLS, as follows:

To set RAMTOP to 30000;

```
10 POKE 16388,48
20 POKE 16389,117
30 CLS.
```

As from line 30, RAMTOP will be at 30000 (7530H). This routine does not have to be at the beginning of the program.

Tudor Costigan

TJ's WORKSHOP

NUMBER FORMATTING

I was interested in D Gayler's program in the June TJ's workshop to print numbers, including values less than 0.01, to three places of decimals. If you input some numbers greater than 1, the decimal points no longer fall in line. If you input numbers between 0.0095 and less than 0.01 the system fails altogether and prints .00:

The effect sought by D Gayler, with the additional benefits of showing a leading zero for quantities less than 1 and keeping the decimal points in line when some values are greater than 1, can be achieved using PRINT USING as shown in Program 1.

In some circumstances it could be desirable for the actual number entered to be printed without rounding. Program 2 prints out all the entered figures without rounding and with all trailing zeros supressed to avoid giving a false idea of accuracy.

These programs were run on a TRS80 Level II.

Peter Davy

```
10 LPRINT"NORMAL";TAB(15)"IMPROVED"
20 INPUT N
30 LPRINT N;
40 LPRINT TAB(15) USING"##.###";N
50 GOTO 20
```

```
NORMAL          IMPROVED
 12              12.000
 12.2375         12.238
 9.5E-03          0.010
 9.2E-03          0.009
 .543             0.543
 4.67             4.670
 5.786            5.786
 .2039            0.204
 9.87654          9.877
 8.87654          8.877
```

```
10 LPRINT"NORMAL";TAB(15)"IMPROVED"
20 INPUT N
30 IF N=INT(N) THEN A$="##":GOTO 60
40 IF INT(N)=0 THEN M=N+1 ELSE M=N
50 A$="##."+STRING$(LEN(STR$(M))
    -LEN(STR$(INT(M)))-1,"
60 LPRINT N;
70 LPRINT TAB(15) USING A$;N
80 GOTO 20
```

```
NORMAL          IMPROVED
 12              12
 12.2375         12.2375
 9.5E-03          0.0095
 9.2E-03          0.0092
 .543             0.543
 4.67             4.67
 5.786            5.786
 .2039            0.2039
 9.87654          9.87654
 8.87654          8.87654
```

ROUNDING

With reference to D Gayler's note about printing floating point numbers to three decimal places (*PCW* June) perhaps some of your readers do not know that B=INT (A*10 ↑ D+0.5)/10 ↑ D gives B the value of A rounded to D decimal places.

Peter Howard

TRS-80 EXIT

Here's a routine to deal with situations where your main program calls subroutine A, which then calls subroutine B, then subroutine B wishes to return straight back to the main program without going through subroutine A.

Some Extended Basics allow this, using a POP or EXIT command which deletes from the stack all information concerning the last GOSUB statement executed. So in our example a POP followed by a RETURN in subroutine B would go straight back to the main program.

Program listing 1 contains a short 12-line program to implement such a command on a 16k LII TRS-80.

If the program is typed in and executed it will reserve memory at the top of memory for a short machine code routine; it will also POKE the routine into memory and link the routine to the LINE command, which is only used if you have disks.

The routine poked into memory is only 10 bytes long, and all that it does it to clear all information concerning the last GOSUB from the stack before returning to the program.

Program listing 2 illustrates how the statement is used. If the LINE command in line 50 were not present then the RETURN in line 60 would return execution of the program to line 30, but the LINE command in line 50 clears all information about the GOSUB 50 in line 30 from the stack.

Once program listing 1 has been run the machine code routine will stay in memory until the computer is switched off or crashes — a NEW command will not delete the routine.

The program is short enough to load every time you have a session with your computer and you do not need to set the memory size as the program does it itself. It was written on a Model I, but it should work on a Model III or a Video Genie without any alterations.

Tim Pile

```
10 PRINT"LINE 10":GOSUB 30
20 PRINT"LINE 20":END
30 PRINT"LINE 30":GOSUB 50
40 PRINT"LINE 40":RETURN
50 PRINT"LINE 50":LINE
60 PRINT"LINE 60":RETURN

RUN
LINE 10
LINE 30
LINE 50
LINE 60
LINE 20
```

Listing 2

```
0  POKE 16562, 127: POKE 16561, 245  'SET TOP OF MEMORY
1  POKE 16545, 127: POKE 16544, 195  'SET STRING SPACE
2  CLEAR                             'REINITIALISE
3  FOR I = 32758 TO 32764            'THIS LOOP POKES
4  POKE I,51                         'SEVEN "INC SP"'S
5  NEXT I                            'INTO HIGH MEMORY
6  POKE 32765, 195                   'THIS POKES THE
7  POKE 32766, 30                    'CODE FOR
8  POKE 32767, 29                    ' JP 1D1EH
9  POKE 16803, 195                   'THIS LINKS THE
10 POKE 16804, 246                   'LINE STATEMENT
11 POKE 16805, 127                   'TO BASIC
```

Listing 1

MICROTAN IMPROVED USR

This routine greatly extends the USR(I) instruction of Microtan Basic, whilst using only six bytes of user RAM. It enables more than one machine-code subroutine to be called from Basic without repeatedly POKEing zero page.

To use, enter the following code using Tanbug's M command:
IFFA 20 F5 DF JSR$D5F5
1FFD 6C 33 00 JMP ($33)

Enter Basic, answering 8186 to the memory size prompt. To initialise the subroutine, POKE 34,31: POKE 35,250. This can be done as part of a program or directly. Convert the start address of the machine code into decimal, and use it as the argument of the USR instruction. For example, to call the keyboard scan routine of Tanbug, use J=USR(65018).

If this routine is to be incorporated into a home brew toolkit, then the only modification necessary is the start address poked into memory locations 34 and 35.

Clive Jones

100 FREE PROGRAMS

FROM SILICA SHOP — WITH EVERY PURCHASE OF AN

ATARI 400 800

ATARI®



ATARI PRICES REDUCED!

We at Silica Shop are pleased to announce some fantastic reductions in the prices of the Atari 400/800 personal computers. We believe that the Atari at its new price will become the U.K.'s most popular personal computer and have therefore set up the Silica Atari Users Club. This club already has a library of over 500 programs and with your purchase of a 400 or 800 computer we will give you the first 100 free of charge. There are also over 350 professionally written games and utility programs, some are listed below. Complete the reply coupon and we'll send you full details. Alternatively give us a ring on 01-301 1111 or 01-309 1111.

ATARI 400 with 16K	**£199**
ATARI 400 with 32K	**£248**
ATARI 800 with 16K	**£449**

400/800 SOFTWARE & PERIPHERALS

Don't buy a T.V. game! Buy an Atari 400 personal computer and a game cartridge and that's all you'll need. Later on you can buy the Basic Programming cartridge (£35) and try your hand at programming using the easy to learn BASIC language. Or if you are interested in business applications, you can buy the Atari 800 + Disk Drive + Printer together with a selection of business packages.

Silica Shop have put together a full catalogue and price list giving details of all the peripherals as well as the extensive range of software that is now available for the Atari 400/800. The Atari is now one of the best supported personal computers. Send NOW for Silica Shop's catalogue and price list as well as details on our users club.

THE FOLLOWING IS JUST A SMALL SELECTION FROM THE RANGE OF ITEMS AVAILABLE:

ACCESSORIES
Cables
Cassettes
Diskettes
Joysticks
Le Stick - Joystick
Misc Supplies
Paddles

ADVENTURE INT
Scott Adams Adv
No 1 Adventurelnd
No 2 Pirate Adv
No 3 Mission Imp
No 4 Voodoo Cast
No 5 The Count
No 6 Strange Ody
No 7 Mystery Fun
No 8 Pyramid of D
No 9 Ghost Town
No 10 Sav Island 1
No 11 Sav Island 2
No 12 Golden Voy
Angle Worms
Deflections
Galactic Empire
Galactic Trader
Lunar Lander
Mountain Shoot
Rearguard
Star Flite
Sunday Golf

AUTOMATED SIMULATIONS
Crush Crumble Cmp
Datestones of Ryn
Dragons Eye
Invasion Orion
Rescue at Rigel
Ricochet
Star Warrior
Temple of Apshai
Upper Reaches Aps

BOOKS
Basic Ref Manual
Compute Atari DOS
Compute Bk Atari
Compute Magazine
De Re Atari
DOS Utilities List
DOS2 Manual
Misc Atari Books
Op System Listing
Wiley Manual

BUSINESS
Calculator
Database Managemt
Decision Maker
Graph-It
Invoicing
Librarian
Mort & Loan Anal
Nominal Ledger
Payroll
Personal Finl Mgmt
Purchase Ledger
Sales Ledger
Statistics 1
Stock Control
Telelink 1
Visicalc
Weekly Planner
Word Processor

CRYSTALWARE
Beneath The Pyram
Fantasyland 2041
Galactic Quest
House Of Usher
Sands Of Mars
Waterloo
World War III

DYNACOMP
Alpha Fighter
Chompelo
Crystals
Forest Fire
Intruder Alert
Monarch
Moonprobe
Moving Maze
Nominoes Jigsaw
Rings of The Emp
Space Tilt
Space Trap
Stud Poker
Triple Blockade

EDUCATION from APX
Algicalc
Atlas of Canada
Cubbyholes
Elementary Biology
Frogmaster
Hickory Dickory
Inst Comptg Dem
Lemonade
Letterman
Mapware
Maths-Tac-Toe
Metric & Prob Solvg
Mugwump
Music Terms/Notatn
Musical Computer
My First Alphabet
Number Blast
Polycalc
Presidents Of U.S.
Quiz Master
Starware
Stereo 3D Graphics
Three R Math Sys
Video Math Flash
Wordmaker

EDUCATION from ATARI
Conv French
Conv German
Conv Italian
Conv Spanish
Energy Czar
European C & Caps
Hangman
Invit To Prog 1/2/3
Kingdom
Music Composer
Scram
States & Capitals
Touch Typing

EMI SOFTWARE
British Heritage
Cribbage/Dominoes
Darts
European Scene Jig
Hickory Dickory
Humpty Dumpty
Jumbo Jet Lander
Snooker & Billiards
Submarine Commdr
Super Cubes & Tilt
Tournament Pool

ENTERTAINMENT from APX
Alien Egg
Anthill
Attank
Avalanche
Babel
Blackjack Casino
Block Buster
Block 'Em
Bumper Pool
Castle
Centurion
Checker King
Chinese Puzzle
Codecracker
Comedy Diskette
Dice Poker
Dog Daze
Domination
Downhill
Eastern Front
Galahad & Holy Grl
Graphics/Sound
Jax-O
Jukebox
Lookahead
Memory Match
Midas Touch
Minotaur
Outlaw/Howitzer
Preschool Games
Pro Bowling
Pushover
Rabbotz
Reversi II
Salmon Run
747 Landing Simul
Seven Card Stud
Sleazy Adventure
Solitaire
Space Chase
Space Trek
Sultans Palace
Tact Trek
Terry
Wizards Gold
Wizards Revenge

ENTERTAINMENT from ATARI
Asteroids
Basketball
Blackjack
Centipede
Chess
Entertainment Kit
Missile Command
Pac Man
Space Invaders
Star Raiders
Super Breakout
Video Easel

ON LINE SYSTEMS
Crossfire
Frogger
Jawbreaker
Mission Asteroid
Mouskattack
Threshold
Ulysses/Golden Fl
Wizard & Princess

PERIPHERALS
Centronics Printers
Disk Drive
Epsom Printers
Program Recorder
RS232 Interface
Thermal Printer
16K Memory RAM
32K Memory RAM

PERSONAL INT from APX
Adv Music System
Banner Generator
Blackjack Tutor
Going To The Dogs
Keyboard Organ
Morse Code Tutor
Personal Fitness Prg
Player Piano
Sketchpad

PROGRAMMING AIDS from Atari
Assembler Editor
Dsembler (APX)
Microsoft Basic
Pascal (APX)
Pilot (Consumer)
Pilot (Educator)
Programming Kit

SANTA CRUZ
Basics of Animation
Bobs Business
Display Lists
Graphics Machine
Kids 1 & 2
Horizontal Scrolling
Master Memory Map
Mini Word Processor
Page Flipping
Player Missile Gr
Player Piano
Sounds
Vertical Scrolling

SILICA CLUB
Over 500 programs write for details

FOR FREE BROCHURES – TEL: 01-301 1111

FREE LITERATURE

I am interested in purchasing an Atari 400/800 computer and would like to receive copies of your brochures and test reports as well as your price list covering all of the available Hardware and Software:

Name .....

Address .....

.....

Postcode .....

SILICA SHOP

For free brochures and reviews on our range of electronic products, please telephone 01-301 1111. To order by telephone, just quote your name, address, credit card number, and order requirements and leave the rest to us. Post and packing is FREE OF CHARGE in the UK. Express 24 hour delivery available at an additional charge.

- SHOP DEMONSTRATION FACILITIES — we provide full facilities at our shop in Sidcup. Monday to Saturday 9am to 5.30pm (closing Thursday 1pm, Friday 8pm).
- MAIL ORDER — we are a specialist mail order company and are able to supply goods direct to your door.
- MONEY BACK UNDERTAKING — if you are totally unsatisfied with your purchase, you may return it to us within 15 days. On receipt of the goods in satisfactory condition we will give you a full refund.
- PART EXCHANGE SECOND HAND MACHINES — we offer a part exchange scheme to trade in many makes of T.V. game for personal computers.
- COMPETITIVE PRICES — our prices, offers and service are very competitive. We are never knowingly undersold, and will normally match any lower price quoted by our competitors.
- HELPFUL ADVICE — available on the suitability of various computers.
- AFTER SALES SERVICE — available on all computers out of guarantee.
- VAT — all prices quotes above include VAT at 15%.
- CREDIT FACILITIES — we offer credit over 12, 24 or 36 months, please ask for details.

SILICA SHOP LIMITED
Dept C&VG 0882, 1-4 The Mews, Hatherley Road, Sidcup, Kent DA14 4DX.
Telephone 01-301 1111 or 01-309 1111.

TJ's WORKSHOP

BLINKING CURSOR FOR ATOM

When editing text that includes several inverse characters, it is sometimes easy to 'mislay' the cursor on the Atom. This short program uses interrupts from the VIA to generate a blinking cursor. Never again will your cursor be lost!

The program operation is as follows:
Lines 5-10 set up the assembly of the two machine code routines contained in lines 80-240 and 250-280. Line 20 sets the zero page vectors such that an interrupt is handled by the routine at line 80. Lines 30-40 configure the VIA to generate interrupts (note that LK2 must have been fitted to the Atom board). Line 45 changes the vector for the RDCVEC routine, so that the modified version in lines 250-280 is used. Line 60 determines where in memory the machine code is assembled. This can be changed to any convenient address. Lines 80-80-90 count the interrupts, only blinking the cursor every 9 counts (set in line 100). Lines 110-120 save the X and Y registers. Lines 140-200 use an operating system routine to invert the cursor, pause briefly, and then invert the cursor once more. Lines 210-240 restore all registers, and return from the interrupt. Lines 250-280 are the modified 'read-character' routine. Interrupts are enabled, the standard Atom read character routine is called, and interrupts are disabled. This enables that the cursor blinks only while waiting for input — normal processing speed is not affected.

When the program is run, the cursor will commence to blink! It will continue to do so (irritating, isn't it?) until BREAK is pressed.

Russell Whitworth

```
  1 REM ************************
  2 REM *** BLINKING CURSOR ***
  3 REM ***  R.S.WHITWORTH  ***
  4 REM ************************
  5 DIM LL4
 10 FOR N=1 TO 2;GOSUB a;NEXT N
 20 ?#204=LL4%256;?#205=LL4/256
 30 B=#B800
 40 B?11=#40;B?6=#FF;B?7=#FF;B?5=#FF;B?14=#C0
 45 ?#20A=LL3%256;?#20B=LL3/256
 50 END
 60aP=#2800
 70[
 80:LL4 LDA #B804
 90 DEC #A8;BNE LL2
100 LDA @9;STA #A8
110 STY #AA
120 STX #A9
125 LDY #E0
130 JSR #FD44
140 LDX @#20
150:LL0 LDY @#FF
160:LL1 DEY
170 BNE LL1
180 DEX
190 BNE LL0
195 LDY #E0
200 JSR #FD44
210 LDY #AA
220 LDX #A9
230:LL2 PLA
240 RTI
250:LL3 CLI
260 JSR #FE94
270 SEI
280 RTS
290]
300 RETURN
```

BEEB LOAD

I have just been trying out the append routine in the June 82 TJ's Workshop. The routine works fine, but I would like to point out for the benefit of other readers that there is a misleading statement in the article text. It states that a LOAD statement cannot be put on one of the function keys. This is not so; try this:
*KEY9 "LOAD " " " "¦M"

In common with most other compilers, interpreters, and assemblers, BBC Basic allows you to indicate a quotation mark within quotation marks by the use of double quotation marks. I hope you can follow that.

Kam Ho

APPENDECTOMY

I was amazed to see that you dedicated a whole page to BBC APPEND in June's *PCW* when I can do it in two lines.

All you have to do is
1) Load first program
2) PRINT TOP -2
3) Then type *LOAD "SECONDPROGRAMNAME"

This has appended the second program to the first. Even if the line numbers of the second program are the same as the first program you can still RENUMBER it. But any GOTOs or GOSUBs in the second program will be mis-directed and an error will be created. If the line numbers of the second program had already been made larger than the first program's, there would be no problem.

R. Jewsbury

SHORT SHARP BACK-UP

In your June 82 issue Clinton Evans described a method for making a back-up copy of SP5025 Basic. This method can be shortened considerably thus:
1) Load Basic SP5025.
2) Type POKE 10167,1 (CR) — to knock off the PEEK protection in Sharp Basic.
3) Insert a blank cassette.
4) Type USR(33): USR (36) (CR).
5. Press RECORD & PLAY as prompted.

A copy will now be made that can be loaded from the monitor as usual.

The monitor calls USR(33):USR(36) may be used to make a back-up copy of any previously loaded program as long as the monitor pointers FILESIZE and FILESTART remain intact.

Peter Lawrence

UK101 EASY MUSIC

Here is an easy way to make your 101 make music. It could be adapted for use on another micro.

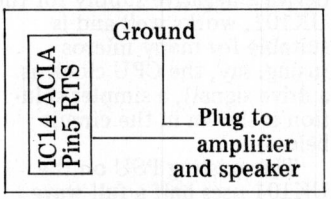
On the ACIA there is a line called the RTS which can be POKEd up or down. If this is done fast enough and it is connected to an amplifier and speaker, music is produced. If the speed of the POKEing up and down is changed the note is changed.

The connection on the ACIA is pin 5, the other is ground. The address to POKE is 61440, up is 64, down is 0. Here is an example program. As speed is important, the values are defined beforehand. To create lower notes the delay of making the computer convert the number into hex is used.

```
1 A=61440:B=64:C=0
2 FOR X=C TO B:POKE A,B:POKE A,C:NEXT
3 FOR X=C TO B: POKE A,B:POKE A,0:NEXT
4 FOR X=C TO B: POKE A,64:POKE A,C:NEXT
5 REM CONTINUE AS ABOVE
10 GOTO 1
```

The RGS line could be used to operate a relay, though the signal may have to be increased.

David Eastlake



TJ's WORKSHOP

BEEB INKEY TWEAK

The BBC still holds a lot of surprises. Here is one. At first glance the INKEY statement seems quite adequate for games and so on. However, it must be followed by a number, eg, INKEY (50). This number is the time in centi-seconds the BBC waits for, whilst checking to see if the key has been pressed.

Most games up to now have used INKEY (0) as an instantaneous check for a key, but there are complications. If you keep your finger on a key for a short while, the keyboard buffer soaks up the extra and so INKEY (0) may still return the value after you stop pressing the key. To get around this most people use *FX 11,1 and *FX12,1 at the beginning of a program to change auto-repeat delay and rate and return to normal with *FX 12,0. Fine, unless you ESCAPE in the middle of a program and try typing with a super-fast repeat and very small delay! Tricky.

Also the arrow keys (which are ideal for games) cannot be used. Again this can be got around by using *FX4,1 which sets the arrow keys to values &88 - &8B; *FX4,0 will restore them to normal use. Again, if you ESCAPE, the cursor keys won't work till you type *FX4,0. Even if you do all this, the INKEY (0) results aren't really satisfactory.

Of course there is a way. The number in INKEY statements need not be positive. For instance INKEY (-1) will return 0 until the SHIFT key is pressed, whereupon it will return -1. INKEY (-2) tests for CTRL key, 0 normally, -1 if pressed. All keys, including the cursor keys, can be tested, each one has its own INKEY number. This acts as a true INKEY statement — PEEK (151) to all PET people and PEEK (197) to VIC owners!

For example, ifyou wanted the F key to fire a laser, use

```
100 IF INKEY (-68) = -1
    THEN PROCLASER
```

Here is the complete list.

Simon Birrell

KEY	INKEY VALUE (all values in decimal)
A	-66
B	-101
C	-83
D	-51
E	-35
F	-68
G	-84
H	-85
I	-38
J	-70
K	-71
L	-87
M	-102
N	-86
O	-55
P	-56
Q	-17
R	-52
S	-82
Q	-17
R	-52
S	-82
T	-36
U	-54
V	-100
W	-34
X	-67
Y	-69
Z	-98
1	-49
2	-50
3	-18
4	-19
5	-20
6	-53
7	-37
8	-22
9	-39
0	-40
= _	-24
~ ^	-25
: [	-121
←	-26
→	-122
@	-72
{ [	-57
£	-41
↑	-58
↓	-42
+ ;	-88
* :	-73
}]	-89
	-74
< ,	-103
> .	-104
? /	-105
SHIFT	-1
DELETE	-90
COPY	-106
CTRL	-2
TAB	-97
f0	-33
f1	-114
f2	-115
f3	-116
f4	-21
f5	-117
f6	-118
f7	-23
f8	-119
f9	-120
CAPS LOCK	-65
SHIFT LOCK	-81
SPACE BAR	-99

SPECTRUM SCROLLING

Anyone who tries POKEing the screen of a Spectrum will soon find out that, although the columns are in a sensible order, the rows are not. This has several side effects: for instance, a scrolling program to move the screen to one side is far easier than one to move it up or down.

Another feature of the Spectrum is that the colour table is laid out conventionally but separately. A scroll program to move text or graphics will not move its colours with it!

Here is my solution to the problem. The program shown will load four separate machine code routines into REMs in lines 1-4. These can then be called in any combination you want.

USR 23760 calls the colour scrolling to the left routine,
USR 23798 calls the right colour scroll.
USR 23836 calls the 'Text left' routine.
USR 23874 calls the 'text right' one.

Please note: all four REM statements should be followed by 32 characters: do *not* enter any colour control codes in them, these count as two characters.

After entering and running the program, lines 5-8 and 100-420 can be deleted, although I would recommend leaving lines 10-13. The new routines can be MERGEd into existing programs, or used to write new ones. How about writing a 'Defender' type program?

For an example of the scrolling, enter these lines with the routines present:

```
20 CIRCLE PAPER6;128,87,80
30 FOR g=1 TO 10:
   RANDOMIZE USR 23760:
   NEXT g
40 FOR g=1 TO 10:
   RANDOMIZE USR 23798:
   NEXT g
50 FOR g=1 TO 10:
   RANDOMIZE USR 23836:
   NEXT g
60 FOR g=1 TO 10:
   RANDOMIZE USR 23874:
   NEXT g
```

I hope this will be of use to someone; I can't be the only one to have a ZX Spectrum, can I?

Bill Longley

```
      1 REM XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XX
      2 REM XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XX
      3 REM XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XX
      4 REM XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XX
      5 FOR g=0 TO 27: READ h: POKE 23760+g,h: NEXT g
      6 FOR g=0 TO 27: READ h: POKE 23798+g,h: NEXT g
      7 FOR g=0 TO 28: READ h: POKE 23798+38+g,h:
NEXT g
      8 FOR g=0 TO 28: READ h: POKE 23798+2*38+g,h:
NEXT g
     10 REM USR 23760 — LEFT COLOUR
     11 REM USR 23798 — RIGHT COLOUR
     12 REM USR 23836 — LEFT TEXT
     13 REM USR 23874 — RIGHT TEXT
    100 DATA 17,0,88,33,1,88,1,255,2
    110 DATA 237,176,33,31,88,14,24
    120 DATA 58,141,92,17,32,0,119,25
    130 DATA 13,200,24,250
    200 DATA 17,255,90,33,254,90,1,255,2
    210 DATA 237,184,33,0,88,14,24
    220 DATA 58,141,92,17,32,0,119,25
    230 DATA 13,200,24,250
    300 DATA 17,0,64,33,1,64,1,0,24
    310 DATA 237,176,33,31,64,17,32,0
    320 DATA 1,192,0,54,0,11,121,190,200,25,24,247
    400 DATA 17,255,87,33,254,87,1,0,24
    410 DATA 237,184,33,0,64,17,32,0
    420 DATA 1,192,0,54,0,11,121,190,200,25,24,247
```

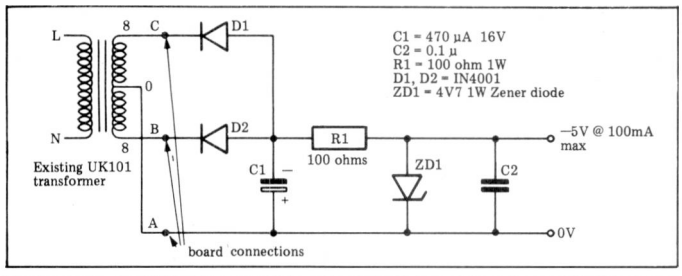
SIMPLER UK101 NEGATIVE SUPPLY

While the circuit shown in June's TJ's Workshop, to derive a negative supply for the UK101, works well and is suitable for many micros (using, say, the CPU clock as a drive signal), a simpler solution is shown in the circuit below.

The existing PSU on the UK101 uses half a full wave centre-tapped configuration, so with the addition of the extra diodes and capacitor the bridge circuit is completed and approximately —10V is supplied.

The resistor and Zener provide stabilisation for currents up to 100mA.

C R Faulkner



The OFFICE INFORMATION CENTRE

- Word Processing
- Accounting Systems
- Financial Planning

Model II is British Telecom Approved for Datel 200,600 and 2412 Services



Tandy®
COMPUTER CENTER

Availability - TRS-80™ Computers and accessories available at most of our 300 UK outlets. Some listed below.

Software - Tandy because TRS-80 has the biggest computer library of ready-to-run programs. No experience needed.

Expandability - Buy your ideal sized computer and never replace it. Simply expand it as your needs grow.

Systems From £2699
All Prices Include V.A.T.

Training • Classrooms • On-Site Servicing • Leasing

YOUR NEAREST TANDY COMPUTER CENTRE

BIRMINGHAM *021-643-5368/5362*
Edgbaston *021-455-9175*
BRADFORD *0274-28431/2*
BRISTOL *0272-214721/2*
CROYDON *01-680-1852*
EDINBURGH *031-225-9337/8854*
LIVERPOOL *051-708-0133*
LONDON
Centre Point *01-836-1327*
Buckingham Palace Road *01-828-1423*
Kingsway *01-242-9425*
Bishopsgate *01-626-6688/9*
Seacoal Lane *01-248-5313/4*
MANCHESTER *061-236-2122*
Deansgate *061-832-2242/9314*
ST. HELENS *0744-30774*
SOUTHAMPTON *0703-36492*

TANDY COMPUTER DEALERS

ABERGELE *0745-826020*
ASHFORD *07842-53024*
BRIXHAM *0845-6565*
CAMBRIDGE *0223-65334*
CORK *22954*
DUBLIN *0001-730698*
0001-776270
LONDON *01-388-5271*
RADSTOCK (Nr. Bath)
0761-32570
WINDSOR *075-35-58072*

Send For Your FREE 1982
TRS-80™ Computer Catalogue



Tandy
Tandy Corporation (UK Branch),
Tameway Tower, Bridge Street,
Walsall, West Midlands. WS1 1LA

Name _____

Address _____

_____

Postcode _____ Tel. No. _____ PCW1

BEEB COLOUR HI-RES

The BBC Computer is a goldmine for micro explorers, with many of its features still undocumented or undiscovered. Jeff Aughton reports on a way to create multicoloured user defined graphics in Mode 2

The comprehensive graphics facilities of the BBC micro are currently the subject of much discussion. In particular, the use of the VDU23 command which enables the user to create her (or his) own graphics characters has been thoroughly documented. This command is simple to use, requiring only an elementary understanding of binary numbers, but unfortunately the character so defined is a *text* character and as such may be displayed in two colours only — background and foreground. To create more exotic graphics shapes requires some knowledge of the screen format. Most programmers will use Mode 2 for video games since it allows the maximum of 16 colours to be displayed. In this mode, each memory location allocated to the screen is responsible for lighting up two dots (the screen is arranged as 160x256 dots) as shown in Figure 1.

We see that the top left-hand corner of the screen is HIMEM and that the following seven locations are allocated to the seven dot-pairs below that on the screen. HIMEM+8 is the top dot-pair of the second character cell, and so on. This process is repeated across the screen.

The first dot-pair on the second text line will be HIMEM+640... and the final dot-pair, at the bottom right hand corner, will be (if my maths is correct) HIMEM+20479.

Writing numbers into these locations will light up one or both dots, although the relationship between the numbers and the colours is rather strange.

Suppose we wish to light up the two dots at memory location LOC with magenta and yellow (in that order). We proceed as in Table 1.

Thus ?(LOC)=39 will produce the desired effect.

This merging process is very laborious and error-prone and so the utility program listed in Figure 2 has been written to assist with the calculations. It will generate the numbers required to

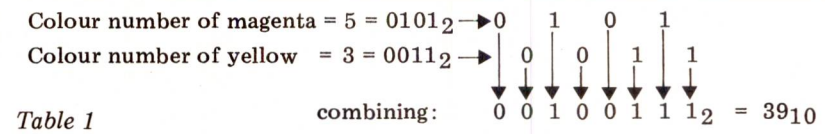


Table 1

```
.ALIEN   LDX#40          ;NO OF BYTES TO MOVE
.LOOP    LDA BASE,X      ;GET A BYTE
         DEX
         STA LOC,X       ;STORE IT
         BNE LOOP        ;GET NEXT
         RTS             ;ALL DONE
```

Fig 4 Machine code program to draw alien on screen

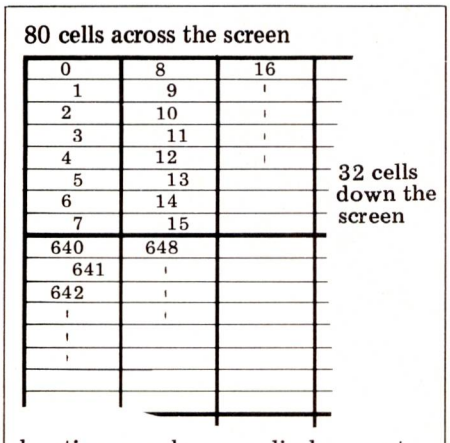


Fig 1 Screen organisation in Mode 2

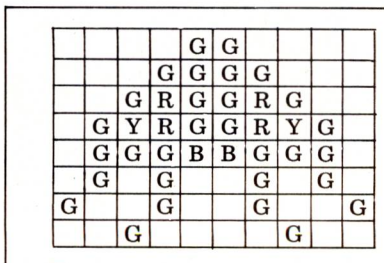


Fig 3 Typical pattern

```
 10 REM UTILITY FOR MODE 2 GRAPHICS
 20 MODE6:DIM A%(10,8),S%(20,8):W%=10
 30 PROCinfo
 40 PROCmenu
 50 ON M% GOSUB 70,90,140,340,410
 60 MODE6:GOTO40
 70 REM QUIT
 80 MODE7:END
 90 REM SET UP NEW PATTERN
100 FORI%=1TOW%:FORJ%=1TO8
110 S%(I%,J%)=0:NEXTJ%,I%
120 INPUT'"WIDTH (EVEN,2-20) "W%
130 IF(W%AND1)OR(W%<2)OR(W%>20)THEN120
140 REM EDIT OLD PATTERN
150 MODE3:PROCboard
160 ON ERROR GOTO 310
170 Y%=1:X%=1:*FX 4,1
180 @%=0:PRINTTAB(AC%+2*X%,8+Y%);"";
190 M%=GET:N%=M%+7*(M%>57)-48
200 IF M%>135 AND M%< 140 THEN 250
210 IFN%<0ORN%>15 THEN190
220 PRINTTAB(AC%+2*X%,8+Y%);CHR$(M%)
230 S%(X%,Y%)=N%
240 GOTO 180
250 M%=M%-135
260 IF M%>2 THEN 290 ELSE M%=M%*2-3
270 X%=X%+M%:IF X%<1 OR X%>W% THEN X%=X%-M%
280 GOTO 300
290 M%=M%*2-7:Y%=Y%-M%:IF Y%<1 OR Y%>8 THEN Y%=Y%+M%
300 GOTO 180
310 IF ERR<>17 THEN MODE7:PRINT"ERROR @ ";ERL:STOP
320 ON ERROR OFF:*FX4,0
330 GOTO60
340 REM VIEW SHAPE
350 MODE2:PROCmerge
360 PRINT"Here is your pattern"
370 FORI%=1TOW%/2:FORJ%=1TO8
380 ?(HIMEM+3479+8*I%+J%)=A%(I%,J%)
390 NEXTJ%,I%
400 PRINTTAB(0,10);:GOTO470
410 REM LIST DATA
420 MODE6:PRINT''"THE SEQUENCE OF NUMBERS YOU NEED IS:"''
430 @%=3:PROCmerge
440 FORI%=1TOW%/2:FORJ%=1TO8
450 PRINTA%(I%,J%);" ";:NEXTJ%
460 PRINT:NEXTI%
470 PRINT'"Press C to continue"
480 REPEATUNTILGET$="C"
490 RETURN
500 DEFPROCboard
510 PRINTTAB(22,4)"***  Press ESCAPE to recall menu ***"
520 AC%=(78-2*W%)DIV2
```

```
530 PRINTTAB(AC%,8)" ";
540 FORI%=1TOW%:PRINT" ";CHR$(96+I%);:NEXT
550 FORJ%=1TO8:PRINT'TAB(AC%)CHR$(48+J%);
560 FORI%=1TOW%:M%=S%(I%,J%)
570 IFM%=0THENA$=" " ELSE A$=CHR$(48+M%-7*(M%>9))
580 PRINT" ";A$;
590 NEXTI%,J%
600 PRINTTAB(0,20)" 0=BLACK              4=BLUE";
610 PRINT"              8=BLACK/WHITE         C=BLUE/YELLOW"
620 PRINT" 1=RED                5=MAGENTA           ";
630 PRINT"9=RED/CYAN             D=MAGENTA/GREEN"
640 PRINT" 2=GREEN              6=CYAN              ";
650 PRINT"A=GREEN/MAGENTA        E=CYAN/RED"
660 PRINT" 3=YELLOW             7=WHITE             ";
670 PRINT"B=YELLOW/BLUE          F=WHITE/BLACK"
680 ENDPROC
690 DEFPROCmerge
700 FORI%=1TOW%-1STEP2:FORJ%=1TO8
710 M%=0:FORK%=0TO3
720 IFS%(I%,J%)AND2^K% THEN M%=M%+2^(2*K%+1)
730 IFS%(I%+1,J%)AND2^K% THEN M%=M%+2^(2*K%)
740 NEXTK%:A%((I%+1)DIV2,J%)=M%:NEXTJ%,I%
750 ENDPROC
760 DEFPROCinfo
770 PRINTTAB(14)"UTILITY 1.0"
780 PRINT'"This utility enables the creation of"
790 PRINT"high resolution colour graphics in MODE2"
800 PRINT"Facilities are available to set up,view"
810 PRINT"and edit the pattern which is formed in"
820 PRINT"an 8 x N matrix (where 2<=N<=20).Use the";
830 PRINT"selection menu to choose the required"'"facility."
840 ENDPROC
850 DEFPROCmenu
860 PRINT''" Options: 1) Quit program"
870 PRINT"           2) Set up new pattern"
880 PRINT"           3) Edit existing pattern"
890 PRINT"           4) View shape"
900 PRINT"           5) List numeric data"
910 INPUT'"Your choice "M%
920 IFM%<1ORM%>5THEN910
930 ENDPROC
```

create colour graphics patterns eight dots deep by up to 20 dots wide (the 20 limit is arbitrary and could be increased).

Obviously one major use of this program is to create SLABs (Sinister Looking Alien Beings) for space games and an example is given below.

To create the SLAB shown in Figure 3, run the program selecting width=10 and feed in the colour information shown in the figure. The program will generate the sequence of numbers:
0,0,0,4,4,4,8,0,0,4,9,11,12,4,4,8,12,
12,12,12,48,0,0,0,0,8,6,7,12,8,8,4,0,
0,0,0,8,8,8,4,0.

Writing these successively into HIMEM+8x,HIMEM+8x+1... HIMEM+8x+39 will draw the SLAB on the screen. For speed, this should be done in machine code and a simple program to do this is shown in Figure 4. Before calling the routine, the 40 numbers should be deposited in 40 safe consecutive memory locations, the first one being at BASE+1 and the last at BASE+40. LOC is assumed to contain a screen location which is divisible by eight. Notice that this program is not complete — it has to be assembled and both BASE and LOC need to be defined.

Obviously, this is a very simple example but it illustrates one possible approach to some sophisticated graphics effects.

Any shapes more than eight dots high would have to be produced by combining two or more such patterns but since they are being written to the screen in machine code speed problems are unlikely to arise.

END

Combine accurate flight characteristics with the best in animation graphics and you'll have SubLOGIC's

T80-FS1 Flight Simulator

for the TRS-80

SubLOGIC's T80-FS1 is the smooth, realistic simulator that gives you a real-time, 3-D, out-of-the-cockpit view of flight.

Thanks to fast animation and accurate representation of flight, the non-pilot can now learn basic flight control, including take-offs and landings! And experienced pilots will recognize how thoroughly they can explore the aircraft's characteristics.

Once you've acquired flight proficiency, you can engage in the exciting British Ace 3-D Aerial Battle Game included in the package. Destroy the enemy's fuel depot while evading enemy fighters.

Computer and aviation experts call the T80-FS1 a marvel of modern technology. *You'll* simply call it *fantastic!*

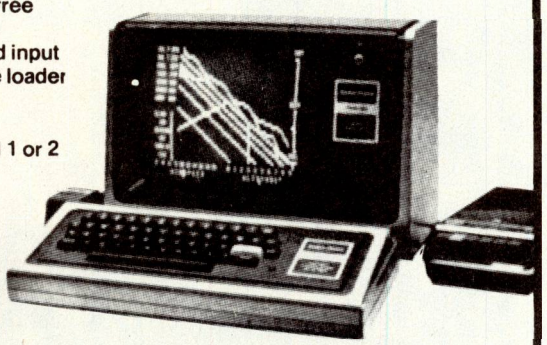
MODEL III VERSION ALSO AVAILABLE

Special Features:
- 3 frame-per-second flicker free animation
- Maximum transfer keyboard input
- Constant feedback cassette loader

Hardware Requirements:
- Radio Shack TRS-80, Level 1 or 2
- 16K memory
- *Nothing else!*

Only £20

INCLUDING VAT POST & PACKING OR SEND £1.00 FOR DESCRIPTIVE CATALOGUE OF OVER 200 TRS-80 PROGRAMS. (REFUNDABLE ON FIRST PURCHASE)



MICROCOMPUTER APPLICATIONS
41 QUEEN'S ROAD,
BLANDFORD FORUM,
DORSET DT11 7LA
TEL: (0258) 55100

The RP1600

FLOWRITER™

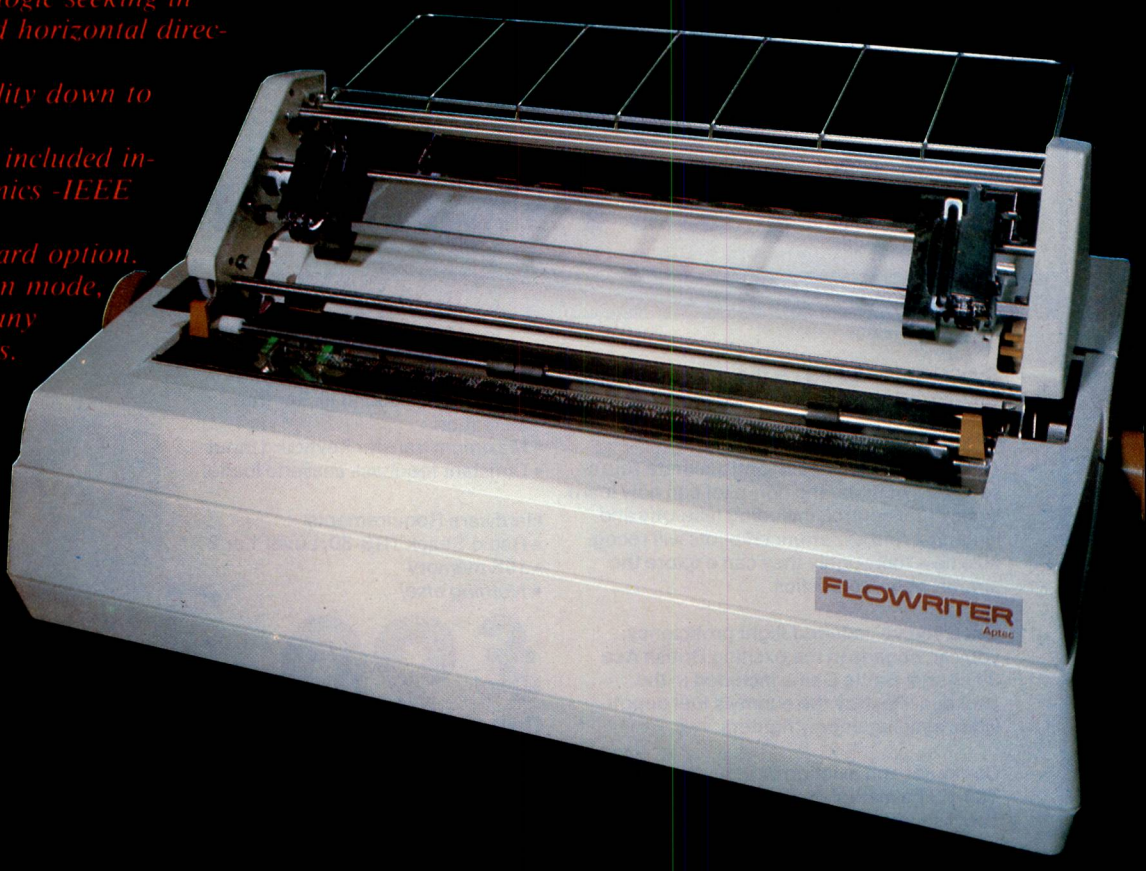
A Daisywheel Printer that thinks it's a computer !



The RICOH FLOWRITER is the most intelligent Daisy Wheel printer on the world market. Equipped with an internal micro computer and a large memory it will intelligently handle all printing and word processing operations; hence relieving the host computer for simultaneous use.
The Flowriter is fully compatible with software written for any intelligent printer and is plug compatible with all popular hardware.

Standard Features

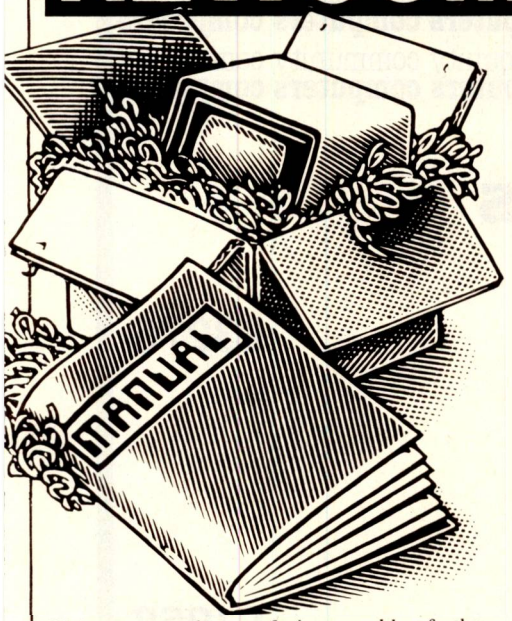
- *Prints up to 60 characters in 1 second.*
- *Compatible with QUME SPRINT, DIABLO and NEC Spinwriter standard and enhanced word processing commands including graphics.*
- *Proportional spacing tables programmed internally.*
- *Automatic margin justification even with proportional spacing.*
- *8K buffer under full program control.*
- *Auto bidirectional printing.*
- *Optimised auto logic seeking in both vertical and horizontal directions.*
- *Graphics capability down to 1/120".*
- *Three interfaces included internally: Centronics -IEEE 488 - RS232C.*
- *Detached keyboard option.*
- *External program mode, allows use of many more printwheels.*



APT APPROPRIATE TECHNOLOGY LIMITED
AEC 2-4 Canfield Place London NW6 3BT Tel: 01 625 5575/5134 Telex 264538 SSE G

The RP1600 FLOWRITER is only supplied by APTEC and their authorised dealers, backed by national and international service networks.
The FLOWRITER is designed and manufactured by APTEC U.K.

NEWCOMERS START HERE



This is our unique quick-reference guide, reprinted every month to help our readers pick their way through the most important pieces of (necessary) jargon found in PCW. *While it's in no way totally comprehensive, we trust you'll find it a useful introduction. Happy microcomputing!*

Welcome to the confusing world of the microcomputer. First of all, don't be fooled; there's nothing complicated about this business, it's just that we're surrounded by an immense amount of necessary jargon. Imagine if we had to continually say 'numbering system with a radix of 16 in which the letters A to F represent the values ten to 15' when instead we can simply say 'hex'. No doubt soon many of the words and phrases we are about to explain will eventually fall into common English usage. Until that time, **PCW** will be publishing this guide — every month.

We'll start by considering a microcomputer's functions and then examine the physical components necessary to implement these functions.

The microcomputer is capable of receiving information, **processing** it, storing the results or sending them somewhere else. All this information is called **data** and it comprises numbers, letters and special symbols which can be read by humans. Although the data is accepted and output by the computer in 'human' form, inside it's a different story — it must be held in the form of an electronic code. This code is called **binary** — a system of numbering which uses only 0s and 1s. Thus in most micros each character, number or symbol is represented by eight binary digits or **bits** as they are called, ranging from 00000000 to 11111111.

To simplify communication between computers, several standard coding systems exist, the most common being **ASCII** (American Standard Code for Information Interchange). As an example of this standard, the number five is represented as 00110101 — complicated for humans, but easy for the computer! This collection of eight bits is called a **byte** and computer freaks who spend a lot of time messing around with bits and bytes use a half-way human representation called **hex.** The hex equivalent of a byte is obtained by giving each half a single character code (0—9, A—F): 0 = 0000, 1 = 0001, 2 = 0010, 3 = 0011, 4 = 0100, 5 = 0101 . . . . E = 1110 and F = 1111. Our example of 5 is therefore 35 in hex. This makes it easier for humans to handle complicated collections of 0s and 1s. The machine detects these 0s and 1s by recognising different voltage levels.

The computer processes data by reshuffling, performing arithmetic on, or by comparing it with other data. It's the latter function that gives a computer its apparent 'intelligence' — the ability to make decisions and to act upon them. It has to be given a set of rules in order to do this and, once again, these rules are stored in **memory** as bytes. The rules are called **programs** and while they can be input in binary or hex (**machine code** programming), the usual method is to have a special program which translates English or near-English into machine code. This speeds programming considerably; the nearer the **programming language** is to English, the faster the programming time. On the other hand, program execution speed tends to be slower.

The most common microcomputer language is **Basic**. Program instructions are typed in at the keyboard, to be coded and stored in the computer's memory. To **run** such a program the computer uses an **interpreter** which picks up each English-type **instruction**, translates it into machine code and then feeds it into the **processor** for execution. It has to do this each time the same instruction has to be executed.

Two strange words you will hear in connection with Basic are **PEEK** and **POKE**. They give the programmer access to the memory of the machine. It's possible to read (PEEK) the contents of a byte in the computer and to modify a byte (POKE).

Moving on to **hardware**, this means the physical components of a computer system as opposed to **software** — the programs needed to make the system work.

At the heart of a microcomputer system is the central processing unit **(CPU)**, a single microprocessor chip with supporting devices such as **buffers**, which 'amplify' the CPU's signals for use by other components in the system. The packaged chips are either soldered directly to a printed circuit board **(PCB)** or are mounted in sockets.

In some microcomputers, the entire system is mounted on a single, large, PCB; in others a **bus system** is used, comprising a long PCB holding a number of interconnected sockets. Plugged into these are several smaller PCBs, each with a specific function — for instance, one card would hold the CPU and its support chips. The most widely-used bus system is called the **S100**.

The CPU needs memory in which to keep programs and data. Microcomputers generally have two types of memory, **RAM** (Random Access Memory) and **ROM** (Read Only Memory). The CPU can read information stored in RAM — and also put information into RAM. Two types of RAM exist — **static** and **dynamic**; all you really need know is that dynamic RAM uses less power and is less expensive than static, but it requires additional, complex, circuitry to make it work. Both types of RAM lose their contents when power is switched off, whereas ROM retains its contents permanently. Not surprisingly, manufacturers often store interpreters and the like in ROM. The CPU can only read the ROM's contents and cannot alter them in any way. You can buy special ROMs called **PROMs** (Programmable ROMs) and **EPROMs** (Eraseable PROMs) which can be programmed using a special device; EPROMs can be erased using ultra-violet light.

Because RAM loses its contents when power is switched off, **cassettes** and **floppy disks** are used to save programs and data for later use. Audio-type tape recorders are often used by converting data to a series of audio tones and recording them; later the computer can listen to these same tones and re-convert them into data. Various methods are used for this, so a cassette recorded by one make of computer won't necessarily work on another make. It takes a long time to record and play back information and it's difficult to locate one specific item among a whole mass of information on a cassette; therefore, to overcome these problems, **floppy disks** are used on more sophisticated systems.

A floppy disk is made of thin plastic, coated with a magnetic recording surface rather like that used on tape. The disk, in its protective envelope, is placed in a disk drive which rotates it and moves a **read/write head** across the disk's surface. The disk is divided into concentric rings called **tracks**, each of which is in turn subdivided into **sectors**. Using a program called a **disk operating system**, the computer keeps track of exactly where information is on the disk and it can get to any item of data by moving the head to the appropriate track and then waiting for the right sector to come round. Two methods are used to tell the computer where on a track each sector starts: **soft sectoring** where special signals are recorded on the surface and **hard sectoring** where holes are punched through the disk around the central hole, one per sector.

Half-way between cassettes and disks is the **stringy floppy** — a miniature continuous loop tape cartridge, faster than a cassette but cheaper than a disk system. **Hard disk** systems are also available for micro-computers; they store more information than floppy disks, are more reliable and information can be transferred to and from them much more quickly.

You, the user, must be able to communicate with the computer and the generally accepted minimum for this is the visual display unit **(VDU)**, which looks like a TV screen with a typewriter-style **keyboard**; sometimes these are built into the system, sometimes they're separate. If you want a written record **(hard copy)** of the computer's output, you'll need a **printer**.

The computer can send out and receive information in two forms — **parallel** and **serial**. Parallel input/output **(I/O)** requires a series of wires to connect the computer to another device, such as a printer, and it sends out data a byte at a time, with a separate wire carrying each bit. Serial I/O involves sending data one bit at a time along a single piece of wire, with extra bits added to tell the receiving device when a byte is about to start and when it has finished. The speed that data is transmitted is referred to as the **baud rate** and, very roughly, the baud rate divided by ten equals the number of bytes being sent per second.

To ensure that both receiver and transmitter link up without any electrical horrors, standards exist for serial interfaces; the most common is **RS232** (or **V24**) while, for parallel interfaces to printers, the **Centronics** standard is popular.

Finally, a **modem** connects a computer, via a serial interface, to the telephone sytem allowing two computers with modems to exchange information. A modem must be wired into the telephone system and you need British Telecom's permission; instead you could use an **acoustic coupler**, which has two obscene-looking rubber cups into which the handset fits, and which has no electrical connection with the phone system — British Telecom isn't so uppity about the use of these.

community community community community community community community
computers computers computers computers computers computers computers
community community community community community community community
computers computers computers computers computers computers computers

Word Processing Systems

64K Xerox 820 with twin 5¼" Floppies
Superb New Xerox Typewriter/Printer
SELECT Self-teach Word Processing Software **£3275**

Small Business Systems

64K NEC PC8000 complete with
12" Screen, NEC Printer, Twin 5¼" Floppies **£1958**

64K BASIS 108 Apple Compatible with
built in 5Mb Symbiotic Hard Disk 600KB
Floppy back-up.
NEC PC8023 Printer and Screen **£3595**

DataMac Integrated Software

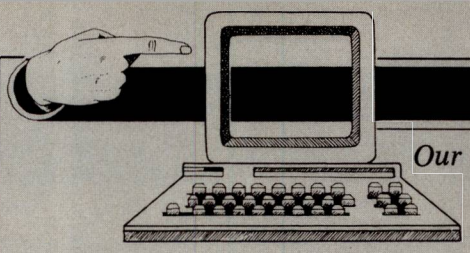
DATAMAC Integrated Software
Comprising Payroll, Wages, Purchase, Sales,
General Ledger, Stock and Job Costing
Easily tailored to suit individual requirements **from £770**

Prices exclusive of VAT

Many other equipment combinations available
Please contact us to discuss your requirements

PO Box 3 34 Dragon Street Petersfield Hampshire GU32 2ER
Telephone (0730) 87567

community community community community community community community
computers computers computers computers computers computers computers
community community community community community community community
computers computers computers computers computers computers computers



IN STORE

Our bi-monthly guide to microcomputer systems. Updates should be sent to: Dick Olney, PCW, 62 Oxford Street, London W1A 2HG

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
ABC 24 (£3195)	AI 09237-70578(19)	64k RAM: Z80A: dual 5¼'' F/D (600k): 12'', 24 x 80 VDU: 2 x RS232 ports: 3 x P/P	CP/M: *MP/M Basic: Cobol: Fortran: Pascal.*	ABC 26 with dual 8" F/D (2.3Mb) £4500. Options: 10Mb H/D £4000. BT 4/81 (S).
ABC 80 (£738)	Datormark Ltd: 97 44896	16-40k RAM: Z80A: C: 12'', 16 x 40 b&w VDU: 4680 bus: IEE 488: RS232 port.	DOS Basic (16k ROM: *Fortran: Pascal: A: Multi user Basic.*	Colour video graphics with UHF output. Viewdata compatible. Loudspeaker. Numeric keypad. Options: dual 5¼'' F/D (320k) £895: dual 8'' F/D (2 Mb). BT 1/80. (1)
ACT Sirius 1 (£2349)	ACT 021 454 8585 (50)	128-512k RAM: 8088: dual 5¼'' F/D (1.2M): 12'', 25 x 80 VDU: 2 x RS232 ports: 2 x P/P	CP/M 86: U: *Basic: Cobol: Fortran: Pascal*	High res graphics. Options: 10 Mb H/D: dual 5¼'' F/D (2.4 M) BT 2/82.(S)
Adler Alphatronic (£1895)	Adler 01-250 1717	48-64k RAM: 8085A: dual 5¼'' F/D (320k): 12'', 24 x 80 VDU: S/P: P/P	CP/M: *Basic: CBasic: Fortran: Cobol*	With 80 cps printer and dual F/D £2345 (inc CP/M). (S)
Alpha Micro (£5650)	Alpha Micro (UK) Ltd: 01-250 1616 (TBA)	64k — 1 Mb RAM: 16 bit: dual 8'' F/D 2.4 Mb): 6 S/P.	Multi-user OS: Basic: M/A: Pascal: U. *Fortran: Cobol*	Modular. Expands to 1200 Mb, 24 terminals or multiprocessor system. (E)
Altos ACS 800-2 £2995)	logitek: 02572 66803 (33)	64k RAM: Z80A: dual 8'' F/D (1 Mb): 2 x RS232 ports: 2 P/P.	CP/M: *Basic: CBasic: Cobol.*	Single user. Options: DMA. Floating point processor. Phototyping board.
Altos ACS 8000-10 (£6675)	As above.	280k RAM: Z80A: single 8'' F/D (500k): 10 Mb H/D: 6 x RS232 ports: P/P: network RS422 port: DMA	CP/M: *MP/M: Basic: Cobal: Fortran: APL: Pascal.*	Multi-user/multi tasking. Up to 4 users. Options: 10 Mb: mag tape backup (S + H).
APL Signet (£1750 or £130pm)	Micro APL: 01-834 2687	64k RAM: Z80A: dual 5¼'' F/D (380k): 2 x RS232 ports.	CP/M: APL: *Basic: U: Fortran: Cobol: Algol: Forth*	Desktop APL computer with self teaching course. (S)
Apple II (£695)	Apple (UK) 0442 48151 (200+)	16-48k, RAM: 6502: 8 I/O slots.	OS: Basic: *Pascal: Fortran: Cobol: Pilot*	280 x 192 high resolution graphics: Option: single 5¼'' F/D (116k) £349.
Apple II (£2496)	As above	128-256k RAM: 6502B: dual 5¼" F/D (286k): 12", 24x80 VDU: RS232 port: P/P.	SOS: *Basic: Pascal:*	Options: single 5¼" F/D (143k) £384: 5Mb H/D £2256. (E) BT 5/82
Atari 400 (£345-16k)	Ingersoll: 01-226 1200 (40)	16k RAM: 6502: C int: cartridge slot: 12 x 20 TV int: RS232C port: touchpad k/b: Opt: C £40	OS (10k ROM): Basic (8k ROM). *Pilot: Forth.*	High resolution colour graphics. 4-channel sound. Four games controller/light pen sockets. BT 10/80. (I/B).
Atari 800 (£645-16k)	As above.	16-48k RAM: 6502: C int: 4 x cartridge slots: 12 x 20 TV int: RS232C port. Opt: single 5¼'' F/D (90k) £345: 16k RAM £65.	As above.	As above. Software & RAM on cartridge modules. Up to 4 disk drives. BT 10/80. (I/B).
Athena 8285 (£5694)	Butel-Comco Ltd: 0703 39890 or 01-202 0262 (TBA)	64k RAM: 8085A: dual 5¼'' F/D (644k): 12'' 25 x 80 VDU: 150 cps printer: RS232 port.	AMOS: T/E: Basic: *Cobol: Fortran: Pascal: APL: M/A.*	Extended ASCII K/B with numeric pad: graphics. Options: dual 8'' F/D (2 Mb): up to 1200 Mb H/D.
Atom (£120)	Acorn: 0223 312772 (35)	2-12k RAM: 8-16k ROM 6502: Full K/B: C int: TV int: 20 I/O lines: 1 P/P. Options: 80 col printer £199, Prestel adaptor £120.	Basic in 8k ROM: A Cass O/S.	High resolution graphics on bigger model: colour monitor O/P. Loudspeaker. Note also, systems based on Acorn SBC. BT 7/80(B).
Attache 201 (£8000)	COLT 01-572 3784 (10)	64k RAM: Z80: dual 8'' F/D (2.4 Mb): 12'' 24 x 80 VDU: 180 cps printer.	Basic: *Fortran: Cobol.*	Upgradable to multiuser system with 18 Mb H/D. Full range of business packages included software dealers TBA. (S)
BASF 7120 (£4400)	BASF: 01-388 4200 (12)	88k RAM: 2xZ80A: 3 x 5¼'' F/D (480k): 12'', 24 x 80 VDU: RS232 port: P/P	DOS: (OASIS) *Ex Basic: Cobol U. A: CP/M*	H/D available soon. Also 7125 with *960k* F/D £4900 and 7130 with single F/D (430k) & 5Mb H/D £6300. Disk controller has own Z80A. BT 9/80
BBC Micro (£205)	BBC Micro Systems 14 Station Road Kettering Northants (no tel)	16-32k RAM: 6502: C int: TV int: RS423 port: P/P: Option: single 5¼'' F/D (100k) £230	MOS: Basic A	Video text & second processor int. 32k model with Econet and disk interface £3.95. BT 1/82 (I)
Billings BC-12 FD: (£3995)	Mitech: 04862 23131 (TBA)	64k RAM: Z80A: dual 5¼'' F/D (640k): 12'', 24 x 80 b&w (or b&g) VDU.	DOS: Basic: *Fortran: Cobol: A*	With dual 8'' F/D (2 Mb) £5995. Additional dual 8'' F/D £300 option: 50Mb H/D. (S).
Bonsai SM3000 (£2750)	Bonsai 01-580 0902	64k RAM: Z80: dual 5¼" F/D (700k): 12", 24x80 VDU: RS232 port: P/P	CP/M: *Basic: Cobol: Pascal: Fortran*	Many floppy and hard disk options. Applications software avail. from Bonsai.

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
C/09(£3500)	SWTP Ltd: 01-491 7507 7507 (16)	64k RAM: 6809: dual 5¼" F/D (700k) 9", 24 x 80 VDU: 2 S/P: 1 P/P.	TSC FLEX: *Basic: Fortran Pascal: A: Dis A: T/E: U.*	Expandable to S/09 UniFLEX *32 user system. (H)*
Canon BX-3 (£3000)	Canon 01-680-7700.	32k RAM: 6809: dual 5¼" F/D (640k): 28 char display: 80 cps printer: 3 x RS232 port: P/P.	OS: Basic: A. *Cobol: Pascal*	Fully integral unit. Extensive applications support offered on all Cannon Machines. Options: dual dual 5¼" F/D (640k) £1500.
Canon CX-1 (£2850)	As above.	32k RAM: 6809: dual 5¼" F/D (640k): 12", 24 x 80 VDU: 3 x V24 ports: P/P: light pen.	OS: Basic: A:	Price includes installation & training. Extensive application support offered. Options: dual 8" F/D (1Mb) £3300.(S)
Canon TX-25 (£1450)	As above.	16-32k RAM: 6809: C: 20 char display: 26 col, 2.4 lps printer. Option: 2 x RS232 port.	Basic: A	Fully integral unit. Cassette is Cannon's own design (8k). Can be used with communications. (S).
Challenger IP & C4P (£220 & £395)	CTS: 0706 79332 Millbank Computing: 01-549 7262. Mutek: 0225 743289. Watford Elec: Watford 40588 (18)	4.32k RAM: 6502: C int: RS232 port. Options: dual 5¼" F/D (160k) £550: for C4P dual 8" F/D (1.15 Mb) and 20MB H/D	O/S: Basic (8k ROM) *Ex Basic:* A.	D/A conv: colour capability. Runs OSI business software on 8" F/D Plato educational software avail soon. BT 4/80. (S).
Challenger 2 (£150)	As above	48k RAM: 6502: dual 8" F/D (0.5 Mb): RS232 port.	OS65U: Ex Basic: A.	Designed as low cost business system (S).
Challenger C3 (£2334)	As above	32-56k RAM: 6502: 6800: Z80: dual 8" F/D (1.15 Mb): 2-16 S/P.	OS65U: Basic: *CP/M: Fortran: Cobol*	Expandable to multi-user (8) system. Options: C3B & C3C H/D units, 74 Mb for about £8500. (S&H).
Clenlo Conqueror (£2475)	Clenlo Computing Systems Ltd: 01-670 4202 (TBA)	64k RAM: Z80: dual 8" F/D (1 Mb): 3 S/P: 2 P/P.	CP/M: CBasic-2: Pearl 1: *U Fortran: Cobol: Pascal*	With 2.4Mb F/D £2950. Also H/D systems with 10 Mb H/D & tape drive £5430.
Comart Communicator (£1995)	Comart 0480 215005 (25)	64k RAM: Z80A: dual 5¼" F/D (780k): 2 S/P: P/P.	CP/M: *Basic: Cobol: Fortran: Pascal*	With 1.5 Mb F/D £2295. With 4.8 Mb H/D & 790k F/D £3795. Option: 18 Mb H/D. £3395 (S).
CommodorePET 16k, & 32k (£550, £695)	Commodore: 0753 79292 (150)	16-32k RAM: 6502: C: 9" 25x40 VDU: IEEE-488 port: Options: dual 5¼" F/D (353k) £695; same but (950k) £895	O/S: Basic (in 8k ROM): *Forth: Pilot: Pascal: Comal: Lisp: A*	CBM 8032 with 80-col screen (32-96k) BT 12/80. £895 Field service avail. (1).
Commodore Vic 20 (£200)	Commodore: 0753 79292 (150)	5-32k RAM: 6502: Cint: 22 x 23 TV int: S/P: P/P: Games int.	Basic	Graphics 3 tone sound generator. Will interface to PET. Option: single 5¼" F/D (170k). BT 9/81(S).
Compucolor II (£1175)	Dyad Developments: 08446 729 (TBA)	16-32k RAM: 8080: 13" 32x64 8-colour VDU: single 5¼" F/D (5lk): RS232 port.	DOS (ROM): Ex-Basic (ROM): A. *M/A: T/E: Fortran: U*	32k version £1295. High resolution graphics. 6-month subscription to user magazine inclusive BT 9/79. (S).
Compucorp 625 (£6000)	Compucorp: 01-952 7860 (17)	48-60k RAM: Z80: dual 5¼" F/D (630k): 9". 16x80 VDU: 40 col printer: RS232 port, P/P.	Basic: A: *Fortran: Pascal:* U	IEEE-488 Controller and S100 int. Many applications packages avail. (E).
Compucorp 655/ 665/675/685 (from £5050)	As above	60k RAM:. Z80: Up to 4x5¼" F/D(160k-2.4 Mb): 9", 20x80 or 12" 20x80 or 20" 60x80 VDU: 40-col printer: RS232 port.	As above	Prices incl installation and training. Opt: 10-20 Mb H/D
Computermart 2000 DS (£1500)	Computermart: 0603 615089	32-256k RAM: 8085: dual 8" F/D (1-2 Mb): S/P: P/P.	CP/M: *Cis Cobol: Basic: Fortran*	Expandable to multi-user, multi-tasking,, multi-processor 96 Mb H/D system (around £15000).
Cromemco System Zero/DDF, System 2, System 3, System Z2H. (£2627/£2873/ £4893/£6118).	Datron: 0742 585490. Comart: 0480 215005 MicroCentre: 031-556 7354 (18)	64k RAM: Z80: dual 5¼" F/D (346k) on System Zero, System 2 & Z2H: dual 8" F/D (1.2 Mb) on Sys 3: 10 Mb H/D on Z2H: S/P: P/P.	CDOS: *Basic: Cobol: Fortran: RPG II: Lisp: A: W/P: Multi-user Basic. Cromix.*	System 2 & 3 expandable to Multi-user (max 7) £8373 System 2: £10252 Sytem 3. Options: dual 8" F/D (996k): 11.2Mb H/D. BT 10/79 (E).
DAI (£595)	Data Applications (UK): 0285 2588 (7)	48k RAM: 8080: C int: 24x60 VDU int: RS232 port: over 20 industrial ints. option: dual 5¼" F/D £595	Basic (ROM): U	Colour graphics up to 255 x 335: 3 notes & noise generator: PAL O/P to TV: Paddle int: H maths option. (1). BT 10/80.
Diablo 3000 (£6250)	Business Computers Ltd: 01-207 3344	32k RAM: 8085: dual 8" F/D (1.3 Mb): 12", 24x80 b&w VDU: 45 cps printer.	DOS: Basic: DACL: A: U.	Selection of business packages included (S).
Digital Micro-systems DSC-3 (£3530)	Modata: 0892 41555 (14)	64k RAM: Z80A: dual 8" F/D (1.14Mb): 4xRS232 ports: EIA port.	CP/M: CBasic: *Cobol: Fortran: Pascal: PL/I*	Expandable to multi-user system with 10-28 Mb H/D. Extensive software avail. (S).
Digital Micro-systems DSC-4 (£4395)	As above	128k RAM: Z80A: single 8" F/D (500k): 11 Mb H/D: 4x RS232 ports: 2 P/P.	CP/M: Basic-E: CBasic: *Cobol: Fortran: Pascal.*	Also DSC-3 with 64k RAM. Options: 128k RAM £1295: up to 4 Mb F/D and 20 Mb. H/D. (H).
Durango F-85 (£4995)	Comp Ancillaries: 0784 36455 (12)	64k RAM: 8085: dual 5¼" F/D (1 Mb): 9", 16x64 green VDU: 132 col 165 cps printer: N/P.	O/S: D Basic: *CP/M: CBasic: Micro Cobol.*	Up to 5 work stations: fully integrated system. Options: additional dual 5¼" F/D (1 Mb): 12-24 Mb H/D.(S).

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

DIRECT ACCESS

MEMO

To: Steven

From: CFJ

Date: 21 August 1982

This sounds more like the type of product and approach we're looking for – will you follow up at Stand 362 PCW Exhibition and we'll discuss on Monday 13 Sept.

Charles

First things first. Small business computer hardware or software – which comes first? At Peachtree we know that software has to come first.

It's all a very confusing business at the moment. The microcomputer is growing up, making computer power accessible to thousands of smaller businesses and to departments of larger organisations who couldn't justify it before. The trouble is, you are forced to choose a computer first (the hardware, like the tape recorder) and then find the programs (the software, like the music) to make it do what you want.

Peachtree has changed all that. There is no question now which comes first. It must be the software.

For the first time ever, the small computer user (like the large computer user) has the option of choosing a coherent complete and comprehensive set of *business software products*, all from the same company all designed to work together.

Peachtree Financial Management Tools Nominal Ledger and Budgeting, Financial Forecasting, Purchase Ledger, Sales Ledger, Inventory Management.

Peachtree Business Management Tools Sales Order Processing, Payroll Accounting, Name and Address Management.

Peachtree Office Management Tools Word Processing, Automatic Spelling Dictionary, Communications to other computers.

Until now either you, the user, or your computer supplier have had to cobble together a collection of products from different sources to meet some or all of these requirements.

Now – for the first time – your computer supplier can offer you the full set, (or the parts you need to start with) plus all the service you need, from one source.

This means that your software systems are easier to install and you get a quicker return on the investment you make in your computer.

It means that the systems all work

First things first.



the new IBM PC.

Now you can go and buy your computer. Ask for Peachtree business software products in the confidence that you will receive skilled and professional advice in their use from your computer supplier, backed up by Peachtree We work through local computer service companies because they are close to your office and your needs.

So, first things first: Send us the coupon or your business card or letterhead. We'll send you the name of your nearest supplier, along with a detailed description of Peachtree business software products and a full explanation of the importance of software. Or telephone Miss Susan Jane at Maidenhead (0628) 71011. Peachtree Software International, MSA House, 99 King Street, Maidenhead, Berkshire SL6 1YF.

I'd like to know more about PEACHTREE business software products.

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

PCW/6/82

..... TELEPHONE NUMBER.....

Please return to Susan Jane, Peachtree Software International, MSA House, 99 King Street, Maidenhead, Berkshire SL6 1YF. Telephone Maidenhead (0628) 71011 Telex: 847400 MSAUK G
MSA (Management Science America) Ltd is a subsidiary of Management Science America Inc.

PEACHTREE SOFTWARE™
AN MSA COMPANY

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Dynabyte 5000 Series (£1780)	Metrotech 0895 58111(35)	64k RAM:. Z80: S100 bus: 2 ser ports: 1 par port: any com of 5¼'' F/D (630k), dual 8'' F/D (1Mb), 9/27/45 Mb H/D, 32/64/96 Mb Cart Module Disk.	CP/M: MP/M: CP/Net, CBasic, MBasic Cobol, Fortran, Pascal, PL/1-80	All systems expandable to multi-user and net working: CP/M inc in base price for F/D system, MP/M for H/D systems.
Equinox 200 (£7500)	Equinox: 01-739 2387 (N/A)	64-512k RAM: Z80: 10 Mb-1200 Mb H/D: 6xS/P: 1 P/P.	CP/M: CBasic: *Cobol: Fortran.*	Multi-user MVT/FAMOS available in place of CP/M. 16-bit version (Equinox 300) £10,000. (S&H).
Exidy Sorcerer (£695)	Liveport Data Products: 0736 798157 (27)	48k RAM: Z80: RS232 port: 1 P/P: S100 connector: 30x64 VDU int. N/P.	O/S: Basic (ROM): *T/E: A: CP/M: Algol: Fortran: Basic: 80. Pascal: W/P.*	High-resolution graphics capability: user programmable character set, Option: single 5¼'' F/D (316k) £600
Gemini Multiboard (£500)	Micro Value 02403 28321(7)	64k RAM: Z80: 25 x 80 VDU int (with Z80): Option: dual 5¼'' F/D £690.	CP/M: *Basic Cobol: Pascal Fortran AP/L: Comal*	Modular system. Other options inc ROM board & EPROM programmer. BT 2/82 (H&S).
Gemini Galaxy 1 (£1450)	As above	64k RAM: Z80A: dual 5¼" F/D (800k): 12", 25x80 VDU: RS232 port: P/P: C int	CPM: *Basic: Comal: Pascal: AP/L: A*	Options: dual 5¼" FD (800k): dual 8" F/D (2.4Mb)
Gimix System 68 (£2000)	SEED: 05433 78151: Windrush 0692 505189	16-64k RAM: 6800/6809: dual 5¼'' F/D (500k): 2xRS232 ports.	OS-9: Flex *Basic: Pascal: A: Dis A: T/E:U*	With dual 8'' F/D (2 Mb) £2900. Designed as development system for industrial control. (H).
Haywood 3000 (£2121)	Haywood: 01-428 0111. (TBA)	64k RAM: Z80A: dual 5¼'' F/D (800k): RS232 port: P/P. Opt: 15'' 28x80 VDU £799.	CP/M: *Basic: Cobol: Fortran: Pascal: W/P.*	Also system 7000 with 8'' F/D (2.5 Mb) £3100. (S)
Haywood Hinet (£8000)	Haywood 01 428 0111	64k RAM: Z80A: dual 8" F/D (1Mb): 11Mb H/D: RS232 port: RS422 port: P/P.	CP/M: HiNet: *Basic: Cobol: Fortran: Pascal*	Local area network, up to 32 users. Range of H/D avail.
HP 85 (£1830)	Hewlett Packard Ltd: 0734 784774 (16)	16-32k RAM: C.P.U.: 5'', 16x32 VDU: C(200k): 64 cps printer: 4 P/P. Options: dual 5¼'' F/D (540k) £1408: fusl 8'' F/D (2.4 Mb) £3744.	Basic (ROM)	Full dot matrix graphics. Complete range of interfaces, peripherals and application packages avail. 16k RAM £222. (S).
IMS 5000 (£1500)	Equinox: 01-739 2387 (20)	16-56k RAM: Z80: dual 5¼'' F/D (320k): 2xS/P: 1 P/P:	CP/M: C/Basic: *Cobol, Fortran.*	3 drives option: (S&H).
IMS 8000 (£2500)	As above	64-256k RAM: Z80: dual 8'' F/D (1 Mb): 2xS/P: 1 P/P	CP/M: CBasic: *Cobol: Fortran: MicroCobol.*	Multi-user MVT/FAMOS available in place of CP/M. (S&H).
Intecolor 8000 (£2999)	Dyad Developments: 08446 729 (TBA)	8-32k RAM: 8080: 19'', 80x48 colour VDU: single 5¼'' F/D (90k): Option: up to 26 Mb H/D.	DOS(ROM): Ex-Basic: *A:M/A:T/E: Fortran: U*	High res graphics avail: Many options including size of F/D and VDU. (S).
ITT 2020 (£867)	ITT: 0268 3040 (15)	16-48k RAM: 6502	Monitor: A: ExBasic: Dis A.	360x192 high res graphics. Ex-Basic in 6k ROM: Options: single 5¼'' F/D (116k): £425: 16k RAM, £110: RS232 port, £96: 32k system, £931: 48k system £995: (B).
Ithaca DPS1 (£3995)	Ithaca: 01-341 2447 (10).	64k RAM: Z80: dual 8'' F/D (1 Mb): 2xRS232 ports: 4xP/P. Opt: H/D.	CP/M: *Basic: Cobol: Fortran: Pascal: A: U.*	Z8000 16-bit processor board avail. IEEE/S100 (8 or 16 bit) compatible. (E).
Kemitron K2000 E (£2300)	Kemitron 0244 21817 (3)	64k RAM: Z80A: single 5¼" F/D (150k): 12", 24x80 VDU: 2xS/P: P/P	CP/M: *Basic: Cobol: Fortran Pascal: A*	Extensive range of support cards and industrial interfaces.
Kemitron K3000 E (£3300)	As above	64k RAM: Z80A: dual 8" F/D (2Mb): 2xS/P: P/P	CP/M: MP/M: *Basic: Cobol: Fortran: Pascal: A*	Up to four screens and four printers can be attached. Options: 10Mb H/D.
LX-500 (£3500)	Logabax Ltd: 01-965 0061 (13)	32k RAM: Z80: dual 5¼'' F/D (180k): 12'' 25x80 b&w VDU: 100 cps printer.	DOS: Basic: A.	Other printers available. (S).
LSI M-One (£4200)	LSI Computers: 04862 23411 (20)	8-16k RAM: 8080: dual 8'' F/D (1.2 Mb): 12'', 24x80 b&w VDU	FMOS: A	Choice of standard business packages included in price. (S).
LSI M-Two (£6000)	As above	64-128k RAM: 8085A: dual 8'' F/D (1.2 Mb): 12'', 24x80 VDU: 60 cps printer	Elsie: *CP/M: Basic: Cobol Fortran: Pascal: A: U*	Max 8 VDUs and 4 printers. Many applications packages available. Option: 10 Mb H/D £2600. (S).
LSI M-Three (£2400)	As above	64k RAM: Z80A: dual 5¼" F/D (350k): 12", 24x80 VDU: RS232 port: P/P	CP/M: *Basic: Cobol: Fortran: Pascal: A*	Option: 10Mb H/D.
Macro 1 (£3950 or £294 pm).	Micro APL Ltd. 01-834 2687 (TBA)	64k RAM: Z80A: dual 8'' F/D (1 Mb): 4xRS232 ports.	CP/M: APL: U: *Basic: Fortain: Cobol: Word-2star Algo: Pascal: Forth.*	Designed as timesharing replacement. Macro 2 with 2 Mb F/D £4750 or £334 pm.
Marinchip M9900 (£4990)	Microprocessor Eng. 0703 775482	128k RAM: 9900: dual 8" F/D (2Mb): 4xRS232 ports.	NOS: Basic: Pascal: W/P: *SPL: Forth: Meta*	Multi-user/multi-tasking OS. Options: H/D up to 120 Mb.
Megamicro (£6080)	Bytronix: 0252 726814(5)	56k RAM: Z80: dual 8'' F/D (500k): 12'', 20x80 green VDU: 180 cps printer: 2 S/P: 2 P/P.	CP/M: U: *Basic: A: M/A.*	Range of bus. packages now avail. from Ludhouse of Streatham. (H&B).
Micro Trainer 1 (£650)	Hewart: 0625 22030 (N/A)	16-32k RAM: 6800/6809: 10'' 16x24 VDU: 2xC int: Opt: dual 5¼'' F/D (160k) £595: 8k RAM £17.	Basic: A: *Pascal: PL/M: W/P*	SS50-based system. Graphics avail. Int card with real time clock £17. (1).
Microtan 65 (£69)	Tangerine: 0223 60488(6)	1k RAM: 6502: 32x16 TV int: Exp up to 328k RAM.	2k TANBUG monitor: 2k A, disassembler, cassette firm ware: *10k Microsoft Ex. Basic.*	Options: bulk I/O modules, hi-def graphics, CP/M, system racking, ASCII keyboard. Prestel adaptor (S&H).

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Millbank Sys 10 (£2995)	Millbank: 01-788 1083(6).	65k RAM: Z80: dual 5¼'' F/D (700k): 12'', 24x80 VDU: 2x RS232 ports: RS4449 port: P/P.	CP/M: *Basic: Cobol: Fortran: Pascal: PLI: W/P.*	One high level lang. included. 12-month warranty. Main-frame comm. package. H/D avail. soon. (S&H)
MS5001 (£7450)	BMG Ltd: 0793 37813 (N/A)	64k RAM: 8085: dual 8'' F/D (1 Mb): 12'', 80x24 VDU: 80 cps printer: RS232.	CP/M: *Basic: Cobol: Fortran: MP/M.*	Price includes desk mounting and one computer. Hardware & software support. Leasing arrangements available. (E).
MSI 6816 (£1200)	Strumech: 05433 4321 (5)	16-56k RAM: 6800: dual 9'' 16x64 b&w VDU: C int: 1 S/P: 1 P/P.	Basic: A.	Graphics & PROM programmer available. (S&H).
MSI System 12 (£8000)	As above	56-184k RAM: 6800: 10 Mb H/D: single 8'' F/D (500k) 24x80 VDU: 1 S/P: 1 P/P.	SDOS: Basic: CBasic: U.	As above. Business packages avail. Up to four terminals. (H&S).
Munroe EC8800 (£2150)	Fi-Cord Int. 061 445 7716	128k RAM: Z80A: single 5¼" F/D (320k): 3xRS232 ports: P/P	Munroe Multitasking System: *CP/M: Basic: Cobol: Fortran: Pascal*	High res colour graphics. Option: single 5 ÷ " F/D. (320k). £495
Munroe OC8820 (£2990)	As above	128k RAM: Z80A: dual 5¼" F/D (640k): 9", 24x80 VDU: 3xRS232 ports: P/P	As above	5MB H/D avail soon. BT 4/82.
Nascom 3 (£416)	Lucas Logic 0926 497733	8-60k RAM: Z80: dual 5¼" F/D (700k): RS232 port: P/P.	Basic: *Pascal: A: CP/M: Cobol Fortran*	Options dual 5¼" F/D (700k) £685: 48k RAM £130.
NEC PC 8001 (£599)	IBR 0734 664111	32k RAM: Z80A: P/P Option: dual 5¼'' F/D (326k) £699	Basic N: (24k ROM) *CP/M: Fortran: Cobol: Pascal.*	Colour monitor £359 (low res) or £579 (high res) both 12'', 25x80 many expansion units avail. (E) BT 6/81
Newbrain MB (£199)	Grundy: 0223 350355 (TBA)	32k-2 Mb RAM: Z80A: Nat 420: 2xC int: TV int: 2xV24 ports.	CBasic (16k ROM): A.	Graphics. Battery or mains. Options: ½ Mb RAM £450 16 char display £30.(E).
North Star Horizon (£1975)	Comart: (25) 0480 215005. Interam 01 675 5325 (30): Trader Comp 01-328 3484 (21)	56-63k RAM: Z80A: dual 5¼'' F/D (360k): 15'', 24x80 VDU: 150 cps printer: 2 S/P: 1 P/P.	DOS: Basic: CP/M: *Cobol: Fortran: Pascal.*	Options: 3-26 Mb H/D, multi-user.
North Star Advantage (£2195)	As above	64k RAM: Z80A: dual 5¼'' F/D (720k): 12'', 24 x 80 VDU: S/P.	GDOS: CP/M: *CBasic: MBasic: Fortran: Cobol: Pascal*	Price includes business graphics & demo software. 6 slot expansion.
Oki if 800 (£3000)	Encotel. 01 686 9687	64k RAM: Z80A: 2k ROM: dual 5¼'' F/D (768k): 12'', 24x80 VDU: 80 col printer: loudspeaker: RS232 port: 20k ROM cartridge.	Basic: A: *CP/M Cobol: Fortran:*	Fully integral unit. Graphics. Options: dual 5¼'' F/D (560k): RS232 port: PP. (1). BT 10/81
Onyx C8000 (£6875)	Onyx Dist Ltd: 0734 664343 Colt 01-577 2150. (TBA)	64k RAM: Z80: 12 Mb Cartridge: 10 Mb H/D: 4 S/P: P/P	CP/M: *MP/M Oasis: Unix: Fortran: Pascal: W/P*	C8001 with 128k RAM £8220. Multi-user version avail. using Oasis.(E) BT 3/81.
Osborne 1 (£1250)	Osborne 0908 615274(30)	64k RAM: Z80A: dual 5¼" F/D (200k): 5", 24x52 VDU: RS232 port: P/P	CP/M: Basic: W/P: *Cobol Fortran: Pascal*	Integral system in weatherproof carrying case. Will run on battery pack. Option: dual 5¼" F/D (400k). BT11/81.
Oscar (£2560)	IDS Ltd: 0908 313997(30)	64k RAM: Z80: dual 5 ¼ F/D (800k): 12", 25x80 VDU: RS232 port: 1 P/P	CP/M: *Basic: Pascal Fortran: Cobol: W/P:A*	Also avail. with dual 5" F/D(1.6Mb) £2905 and 8'' F/D(2 Mb) £3380. Advanced video board. S&H).
Panasonic JD 800M, JD850M (£3300, £4350)	Panasonic Business Equipment: 0753 75841 (10 regional dist)	56k RAM: 8085A: 4k PROM: dual 8'' F/D JD800M (500k): JD850M (2.4 Mb): 3xRS323 ports. P/P	CP/M: Basic: A *Micro-Cobol.*	Option: 8.4 Mb H/D £2725 (up two). BT3/80(S).
Pascal Microengine (£2295)	Pronto Electronic Systems Ltd: 01-554 6222	64k RAM: MCP 1600: 2x RS232 ports: 2 P/P.	Pascal.	CPU instruction set is P-code: no interpreter needed. Avail-able with dual 8'' F/D (2 Mb) £3900.
Pasca 640 (£2500)	Westrex Ltd: 01-578 0957 (TBA)	64k RAM: Z80A: dual 8'' F/D (512k): 12'', 24x80 VDU: RS232 port: P/P	CP/M: *Basic: Cobol: Fortran: Pascal: A: W/P: U*	Maintenance contracts avail. Option: 5-20 Mb H/D. (S) BT 5/18
Periflex 630z564 (from £2250)	Sintrom: 0734 85464(5)	64k RAM: Z80: dual 5¼'' F/D(1.2 Mb): 2xRS232 ports. 1 P/P.	CP/M: *Basic: Fortran: Cobol:A*	One-day installation training on site included in price. Option: dual 5¼'' F/D(630k) £464, dual 8¼'' F/D(1 Mb) £1025. 35 Mb H/D. BT 6/80 (S&H).
Periflex 1024/64 (from £2750)	As above	64k RAM: Z80: dual 8'' F/D (1.2 Mb): 2xRS232 ports: 1 P/P.	As above	As above
Philips P2000 (£2444)	Philips Data	16-48k RAM: Z80: dual 5¼'' F/D (140k): 12'', 24x80 VDU: RS232 port.	PDOS: UCSD p-system: *Pascal: Basic Fortran:A.*	With 48k RAM, Pascal and Basic £3300: BT 12/81.(S).
Powerhouse 2 (£1125)	Powerhouse Micros: 0422 48422 (TBA)	32-64k RAM: Z80A: 5'' 29x96 VDU: RS232 port: external bus.	4k Monitor: *FDOS: Basic: ExBasic (14k EPROM)*	VDU has flexible screen logic. Options: FDOS & Basic £210: graphics card £200. (H).
Powerhouse 3 (£2600)	As above	32-64k RAM: Z80A: dual 5¼'' F/D (350k): 5'', 29x96 VDU: RS232 port: external bus.	As above	VDU as above. With 1.2 Mb F/D £3500. ExBasic & FDOS in 14k EPOMs £300. (H).
Prince (£3045)	Digico: 04626 78172 (50)	48-64k RAM: 2xZ80: dual 5¼'' F/D (800k): 2xRS232 port: 12'', 24x80 VDU	CP/M: *Basic: Pascal: Fortran: Cobol: W/P:A:* T/E:U	High res graphics. Options: single 5¼'' F/D (400k) £600: dual 8'' F/D(2 Mb) £2000 5-10Mb H/D. Rentals avail. (S).

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

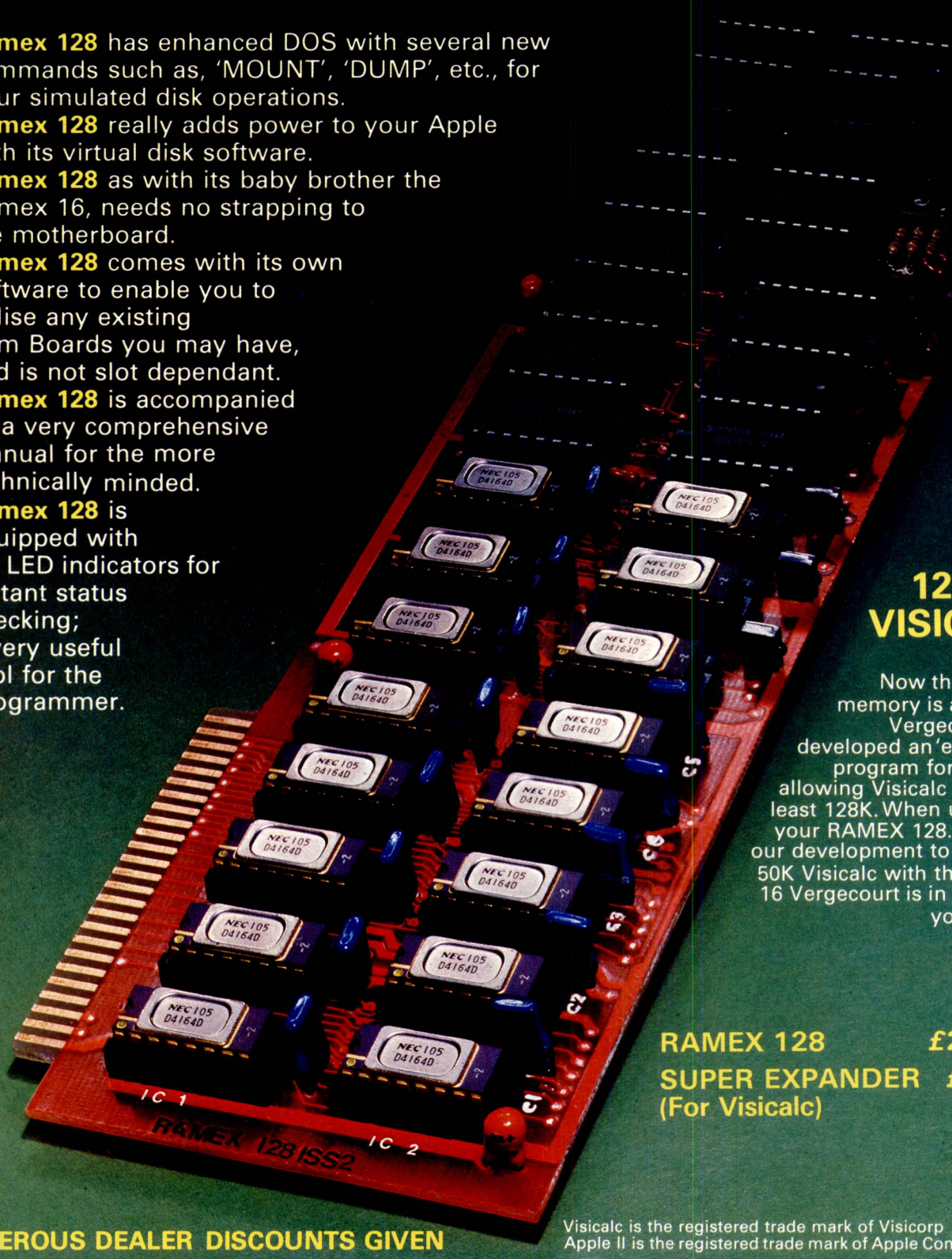
Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

The ultimate in expansion for your Apple II from the people that gave you the RAMEX 16. The first Ram Expansion Card to go strapless.

NEW

RAMEX 128©

- ★ **Ramex 128** has enhanced DOS with several new commands such as, 'MOUNT', 'DUMP', etc., for your simulated disk operations.
- ★ **Ramex 128** really adds power to your Apple with its virtual disk software.
- ★ **Ramex 128** as with its baby brother the Ramex 16, needs no strapping to the motherboard.
- ★ **Ramex 128** comes with its own software to enable you to utilise any existing Ram Boards you may have, and is not slot dependant.
- ★ **Ramex 128** is accompanied by a very comprehensive manual for the more technically minded.
- ★ **Ramex 128** is equipped with six LED indicators for instant status checking; a very useful tool for the programmer.



128K VISICALC

Now that all this memory is available, Vergecourt has developed an 'expander' program for Visicalc, allowing Visicalc to use at least 128K. When used with your RAMEX 128. Just like our development to give you 50K Visicalc with the Ramex 16 Vergecourt is in tune with your needs.

RAMEX 128 £295.00
SUPER EXPANDER £40.00
(For Visicalc)

GENEROUS DEALER DISCOUNTS GIVEN

Visicalc is the registered trade mark of Visicorp
Apple II is the registered trade mark of Apple Computers Inc.

VERGECOURT LTD

DDP RESEARCH & MARKETING

Reg Office: 17 Nobel Square, Basildon, Essex SS13 1LP.
Telephone: 0268 728484.
Telex: 995323

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Quantum 2000 (£2250)	Quantum Comp Sys 0532 458877	64k RAM: Z80A: dual 8" F/D (2.4Mb): 12", 24x80 VDU: C int: P/P	CP/M *Basic: Cobol: Fortran: Pascal: A*	Many expansion boards avail inc high res colour graphics. Option: 5-10Mb H/D.
Raannd SPI (£4500)	Raannd: 0506 33372 (TBA)	64k RAM: MCP 1600: dual 8" F/D (2 Mb): 12", 24x80 VDU: RS232 port: P/P	Pascal *ADA: Basic*	Based on Microengine (with integrated P-code). Up to 4 F/D drives. 64k RAM expansion avail. BT 12/80. (S).
Rair Black Box 3/30 (£3750)	Rair: 01-836 6921 (N/A)	64-512k RAM: 8085: dual 5¼" F/D (500k): 6 Mb H/D: 2xRS232 ports.	CP/M: Basic: Cobol: Fortran: M/A	64k RAM expansion £500. 256k RAM £1250. Up to 16 RS232 ports.
Research Machines 380Z (£1867)	Research Machines: 0865 49866 (N/A)	16-56k RAM: Z80A: dual 5¼" F/D (300k) RS232 port. P/P.	ExBasic: A: T/E: U: *CP/M: Fortran: Cobol: Algol: Pascal.*	High res colour graphics. Many possible systems. With 56k RAM & dual 8" 'FD (1 Mb) £3347.
Research Machines Link 480Z (£550)	As above	32-64k RAM: Z80A: C: 2xS/P: P/P	Basic: A: T/E	High res colour graphics. Network station.
S/09 (£7000)	SWTP Ltd: 01-491 7507(16)	128k RAM: 6809: dual 8" F/D (2 Mb): 12", 24x80 VDU: 2xS/P: 1 P/P.	UniFLEX: *Basic: Pascal: Fortran: A: Dis A: TIE:U.*	Expands to 32 users, 768k RAM, 90 Mb H/D, UNIX 'look alike'. (S&H).
Saracen (£1925)	Bytronix 0252 726814 (TBA)	32-64k RAM: Z80: dual 5¼" F/D (800k): 2xRS232 ports.	CP/M: *Basic: Cobol: Fortran: Pascal: A:*	Applications packages & maint. contracts avail. With dual 8" F/D (2 Mb) and 64k RAM, £2676. (E).
SBS 8000 (£1449)	Manhattan Skyline Ltd: 0801 3442: C Itoh 01-353 6090 (TBAz7	64k, RAM: Z80A: 12", 16 x 64 VDU: 1 P/P: RS232 port (extra £133)	ExBasic (24k ROM): *DOS*	Options disk control card £237: dual 5¼" F/D (368k) £795: dual 8" F/D (2 Mb) £1400. BT 11/80. (S)
SEED System 1 (£2000)	Strumech: 05433 78151 (5)	32-56k RAM: 6800: various disk options: 12", 24 x 80 VDU: RS232 port: P/P	DOS: Basic U: *Fortran: A: Pilot: Strubal: T/E*	Graphics. PROM programmer Also system 19 multi-user (£3000). (E)
Sharp MZ-80K (£460-34k)	Sharp Electronics (UK) Ltd: 061-205 2333 (22)	6-48k RAM: Z80: C: 10" 24 x 40 VDU: Option: dual 5¼" F/D (289k) £695	Basic, A. *CP/M: Pascal: Fortran: Forth*	Graphics: loudspeaker. BT 10/79 (B)
Sharp MZ-80B (£1095)	As above	64k RAM: Z80A: C: 9", 25 x 80 VDU: RS232 port: P/P.	Basic: *A: Pascal: FDOS*	High res graphics. Options: dual 5¼" F/D (560k) £800: 80 cps printer £415. (S)
Sharp PC3201 (£2995)	As above *CP/M: Cobol*	64k RAM: Z80A: dual 5¼" F/D (500k): C int: 12", 25 x 80 VDU: 70 1pm printer.	DOS: U: Basic: *CP/M: Cobol.*	Various expansion cards avail. BT 7/81 (I&B)
Sinclair ZX81 (£50-kit, £70-built-prices inc VAT).	Sinclair: 0276 66104 (100+)	1-16k RAM: Z80A: C int: TV inb: full K/B: 44-pin expansion port.	Basic (8k ROM).	Advanced 4-chip design. Printer now avail. soon BT 6/81
Sinclair ZX Spectrum (£125)	As above	16-48k RAM: Z80A: 16k ROM: T.V. int.	Basic	Options: 32k RAM £60. RS232 port and microdrive disks avail soon. BT 6/82
Signet 202 (£2295)	Interram 01-675-5325 (30)	64k RAM: Z80A: dual 5¼" F/D (400k): 12", 24 x 80 VDU: 2 x RS232 ports: 80 col printer.	CP/M: *Basic: Fortran*	Options: dual 5¼" F/D (800k): 3-12 Mb H/D, Multi user.
Smoke Signal Chieftan (£1800)	Windrush 0692 405189: Seed 05433 78151 (TBA)	32-64k RAM: 6800/6809: dual 5¼" F/D (500k): 2 x RS232 port.	DOS: *68/FLEX: Basic: Fortran: Cobol: A: Disc A: Pascal: U.*	With daul 8" F/D (2 Mb) £2600. Designed as development system for industrial control. (H).
Solitiare WP & BS200 (£6750 & £8200)	Solitaire KPG: 01-995 3573 (TBA)	64k RAM: 8085: 14" VDU (with own CPU): 45 cps printer: CPU port: dual 5¼" F/D (700k) 8" F/D (1.02 Mb) with BS200.	DOS: Basic	All solitaire systems are compatible: anmd can be upgraded to multi-user H/D system. (S)
Sord M100 ACE (£2339)	Midas Computer Services Ltd: 0903 814523 Exleigh Bus. Mach. 0735-66577.(10)	48k RAM: Z80: 8k ROM dual 5¼" F/D (245k): 24 x 64 green VDU: RS232 port: N/P	O/S: Basic: *A: Fortran: Pascal.*	Up to 3 drives possible. Colour graphics avail. Option S100 bus. (I)
Sord M223 Mk II-VI (£4078)	As above	64k RAM: Z80: 8k ROM: dual 5" F/D (700k): 12", 24 x 80 green VDU: RS232 ports: S100 bus: N/P	*O/S:* Ex Basic: *CBasic: Multi-User Basic: Fortran: Cobol*	Expandable to 4 Mb F/D. 32 Mb, H/D, 5 screens, 2 printers. M243 with 192k RAM & 1.4 Mb F/D £5087.
SPC/1 (£3770) (TBA)	Digital Data: 01-573 8854	64-1024k RAM: 8085 A-2: dual 5¼" F/D (90k): 12", 24 x 80 VDU: 2 x RS232 ports: Option: single 8" F/D (1 Mb) £1090:	Mikados, Comal: Pascal: A.	With 32k RAM and single F/D (Comal only) £1995. Expandable to multi-user system (8 users). BT 7/80 (S).
Superbrain (£1750)	Icarus: 01-485 5574 (45)	64k RAM: 2 x Z80: dual 5¼" F/D (320k): 12" 25 x 80 VDU: 2 x RS232 port.	CP/M: A: *Basic: Cobol: Fortran: APL: Pascal*	Limited graphis, Mainframe int avail. Full range of appliation packages avail. Also avail with 700k & 1.5 Mb F/D. BT 8/80. (S&H)
System 10 (£2995)	Millbank 01-788 1083 (TBA)	64k RAM: Z80: dual 5¼" F/D (700k): 12", 24 x 80 VDU: 2 x RS232 port: P/P	CP/M: *Basic: Fortran: Pascal: Cobol: PL/1: W/P*	12 month warranty. Maint. contracts. Applications packages avail. Choice of high level language in price. (E)
System 20 (£3500)	Extel: 01-739 2041 (TBA)	64-512k RAM: Z80A: dual 8" F/D (1 Mb): 12", 24 x 80 VDU: 3 x V2	CP/M:E Basic: *M Basic: Pascal: Cobol: Fortran*	Maintenance contracts avail (132 field service engineers). Expands to multi-user system. Options 13.7 Mb H/D £5799: 27.4 Mb H/D £6674. (S)
Tandberg EC10 (£3250)	Tandberg: 0532 774844 (N/A)	64k RAM: 8080 A: single 8" F/D (250k): 12" 25 x 80 VDU: 7 x RS232 ports: printer int.	CP/M: Ex Basic (24k) *Multi-user Basic: Pascal: Cobol:* A: U:	Up to 7 terminals. Includes V28 comms port. (S&H)

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

DIRECT ACCESS

EPISODE



A COMPACT STAND ALONE COMPUTER - JUST ADD TERMINALS

from **£995**
(inc. CP/M & SUPERVYZ)

STAND 117
PCW SHOW
Barbican Centre
9 - 12 Sept

EPISODE™

A new personal workstation computer. The EPISODE is a stand alone computer that gives you flexibility. Just use or add the visual display and printer of your choice. Small and compact the EPISODE takes up less space than a business letter and is available alone or with combination of floppies and Winchester drives. Through the inclusive standard CP/M operating system a wide variety of application packages can be used. The EPISODE can also communicate via networks & share data bases.

APPLICATION SOFTWARE

Both MicroPro & Lifeboat Associates software are available in EPISODE format.

SUPERVYZ™

The EPISODE comes complete with a unique software system called SUPERVYZ, **"the computer users best friend".** SUPERVYZ allows a non technical user to easily operate the computer and utilise the full capabilities of CP/M. A secretary can work the system and simply command the computer through a series of menus.

SPECIFICATION

Op.System: CP/M 2.2 with SUPERVYZ
RAM: 64K
Processor: Z80A, 4MHz
Floppy Disc: up to 1.6 M byte
Hard Disc: up to 10 M byte of Winchester
Interfaces: 2 Serial RS232 channels, 1 parallel centronics
Facility: Battery powered calendar clock

AND TERMINALS...

VDU's	ADDS DEC Lear Siegler
GRAPHIC	ADDS DEC Digital Engineering Lear Siegler Televideo Texas instruments
COLOUR	Datamedia
VOICE	Interstate
TOUCH	Sunflex
	A-J K & N

PRINTERS	Anadex CDC DEC Epson GE Lear Siegler Okidata Seikosha Star Teletype
KEYBOARD	GE DEC Teletype
LETTER	Diablo TEC

FROM

RIVA

RIVA TERMINALS LTD. Head Office: 9, Woking Business Park, Albert Drive, Woking, Surrey GU21 5JY PSA Member

Head Office: Tel: Woking (04862) 71001 Telex: 859502
Northern Office: Tel: Harrogate (0423) 509577
Scottish Office: Tel: Strathaven (0357) 22678
Dublin Office: Tel: 952316

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Tandy TRS-80 Model 1 (£252)	Tandy: 0922 648181 (200)	4-48k RAM: Z80: C: 12'', 16 x 64 VDU: RS232: P/P	Basic (4k ROM): A.	Fully expandable. Option: single 5¼'' F/D (175k) £320 (up to 4). Many extras available. 32k RAM £304. (I)
Tandy TRS-80 Model II (£2347)	As above	64k RAM: Z80: single 8'' F/D (500k) 12'' 24 x 80 VDU: 2 x RS232 port: P/P	Basic *M/A* *Fortran: Cobol*	Option: single 8'' F/D (500k) £782 (subsequent £391, up to 4).
Tandy TRS 80 Model 3 (£500-£1700)	As above	See Model I Levels I and II		Fully integral unit. Up to 2 integral and 2 external 5¼'' F/D. BT 8/81
Tandy TRS-80 Colour (£304)	As above	4-16k RAM: 6809: 8-16k ROM: C: 16 x 32 TV int: RS232 port.	Colour Basic.	With 16k RAM, 16k ROM & Extended Colour Basic £390 (I). BT 9/81.
TECS (£1200)	Technalogics Computing Ltd: 061-793 5293 B&B Computers Ltd: 0204 26644 (TBA)	4-56k RAM: 8k PROM: 6800/ 6809: 2xC: TV int: 2xRS232 ports: internal viewdata modem & printer port.	FLEX: Basci: *Pascal: TDOS: A: T/E: Pilot: Fortran: Cobol.*	Fully viewdata compatible. Options — dual 5¼'' F/D (320k) £850: dual 8'' F/D £120 £1200. (S&H).
Terodec PBM-1000 (£4020)	Terodec: 0734 664343 (40)	80k RAM: Z80A: single 5¼'' F/D (819k): 6Mb H/D:2xS/P: P/P	CP/M CP/Net CBasic: *Fortran: Pascal: Cobol*	System with Okidata 80 printer: TV1 910 VDU: W/P and various application packages £5995 (S&H)
Terodec Delta (£3770)	As above	64k RAM: Z80A: dual 8'' F/D (2 Mb): 2 S/P: 3 P/P. Options: 10 Mb H/D: Tape.	CP/M: *MP/M: CP/Net: CBasic: Fortran: Pascal: Cobol: Basic.*	2 user system with 10 Mb H/D £7750 4 user system with 40 Mb H/D & tape back up £12050. (S&H)
TI 99/4A (£299)	TI: 0234 67466 (TBA)	16-48k RAM: 26k ROM: 9900: 2 x C int: 24 x 32, 16 colour TV int: 3 tones & noise: P/P.	OS: Basic.	12 month guarantee. Options 32k RAM: 2 x RS232: 3 x 5¼'' F/D (92k each): Speech Synthesiser.
Tuscan CP/M Starter (£999)	Transam: 01-405 5240 (N/A)	24k RAM: Z80: single 5¼'' F/D (190k): Cint: TV int: RS232 port: P/P: N/P.	CP/M: *Basic: Fortran: Pascal: Cobol:*	Options: single 5¼'' F/D (190k) £155: single 5¼'' F/D (370k) £285: 16k RAM £162: 3 Mb H/D £1450: 20 Mb H/D £2970 (S&H)
Tuscan Starter Kit (£299)	As above	8k RAM: Z80: Cint: 56-key K/B Options: Case £110: 5 x S100 sockets £20: TV int £3.50	8k Basic	Fully assembled version £499 BT 1/81 (H&S)
Vector MZ (£2650)	Almarc: 0602 52657 (3)	56k RAM: Z80A: dual 5¼'' F/D (630k): 3 S/P: 2 P/P.	CP/M: Basic: *Algol: Cobol: Pascal: Fortran: Coral: CBasic: A.*	High resolution graphics. Also system B with video board & terminal £3450. (E)
Vector System 2800 (£4600)	As above	56k RAM: Z80A: dual 8'' F/D (2.4 Mb): 3 S/P: 2 P/P	As above	High-res graphics. Many Options. Fully expandable to 5005 multi-user system (max 5) £5400.
VIP (£2650)	Almarc 0602 52657 (3)	64k RAM: 3k ROM: Z80B: single 5¼'' F/D (630k): 12'', 24 x 80 VDU: RS232 port, 3 x P/P	CP/M: *Basic: fortran: Cobol: Pascal: A.*	Up to 3 additional F/D drives. Options: dual 8'' F/D (2 Mb) £1063, 32 Mb H/D (TBA). (H&S). BT2/81
Genie I (£299)	Lowe Electronics: 0629 2430 (N/A)	16k RAM: Z80: 500bps C: 16 x 64 TV int: extra C int: 1 P/P	Basic (12k ROM): *Pascal: A M/A: Fortran*	Options: single 5¼" F/D (184k) £220; dual 5¼" F/D (368k) £375 (I)
WH8 (£352)	Heath 0452 29451 (N/A).	16-64k RAM: 808A (or Z80): 4 S/P. Option: single 5¼'' F/D (102k) £241.	OS: HDOS: CP/M: *Fortran: Pascal: Basic*	Kit. 3 drives max. Colour graphics avail. (S&H) BT 2/80.
Xerox 820 (£1845)	Business Comp Sys 01 207 3344	64k RAM: Z80: single 5¼'' F/D (162k): 12'', 24 x 80 VDU: 2 x RS232 ports: P/P	Monitor: *CP/M: Basic: Cobol: Fortran: Pascal.*	With 8'' F/D (500k) £2250. CP/M £95. BT 1/82 (S + H)
Zentec (£4838)	Zygal Dynamics: 02405 75681 (TBA)	32-64k RAM: 2 x 8080: dual 5¼'' F/D (256k): 15'', 25 x 80 VDU: RS232 port.	OS/: A: U: *Basic:* Cis Cobol	User programmable character set. Option: dual 8'' F/D (1 Mb). (S)
Zenith WH-11A (£2673)	Heath Ltd: 0452 29451 & 01-636 7349 (N/A)	LSI 11: 16-32k RAM: 25 x 80 VDU: S/P: P/P.	*O/S: Basic, Fortran:* A: U.	PDP 11-compat. Option: 2 x 8'' F/D (1 Mb). £1717 (S&H).
Zenith Z89 £1570-£1710	As above	16-48k RAM: Z80: single 5¼'' F/D (102k): 12'' 24 x 80 b&g vdu: RS232.	*Basic: A: HDOS:* CP/M: *MBasic: CBasic: Fortran.*	3 x 5¼'' F/D possible. Options: dual 8'' F/D (1 Mb) £1717, 20 Mb H/D.
Zilog MCZ 1/05 (portable): MCZ 1/20A (£3250)	Thames Systems: 084421 5471 (N/A)	64k RAM: Z80: dual 8'' F/D (600k): RS232 port: MCZ1/20A only 1 P/P: Option: 10 Mb H/D £7100	RIO: O/S: *Cobol: Basic: Fortran: Pascal: M/A: U.*	Available desk top or rack mounted. Debug in 3k PROM. 1/20A runs multi-user Cobol, up to 5 terminals with 40 Mb H/D. (S&H).
Z-Plus (from £400)	Rostronics Ltd: 01-870 4805 (16)	64k RAM: Z80A: dual 8'' F/D (0.5/1Mb): 12'' 24 x 80 VDU: 4 S/P: 1 P/P	CP/M: MP/M: A: U: *Basic: Cobol: Fortran: Pascal: APL: PL/I: Algol.*	Complete with furniture. Various business packages avail. Option: 20 Mb H/D £4000. BT 12/79 (S&H)

SINGLE BOARDS

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Acorn System 1-5 (£65-£1600)	Acorn: 0223 312772 (35)	11/8k RAM: 6502: EPROM socket: Hex K/B: C int: 8-digit LED display: up to 16 ports. Options: Eurocard 64-way connector: VDU card: full K/B card.	½k monitor: *Basic. Pascal: Forth: DOS.*	Kit. Programmable address linking. On-board 5 V regulator. linking. On-board 5 V regulator. Can be expanded to disk-based system. (S&H)
AEX-09 (£750)	Micro Design 0908 663655	8k RAM: 32k PROM: 6809: 16 I/O lines: RS232 port: RS422 port.	OS-9: *(Basic: Pascal: Fortran avail soon)*	Full A/D & D/A conversion facilities. 4 x 8 but outputs. (H)
Aim 65C (£259)	Pelco: 0273 722155(7)	1-4k RAM: Full K/B 2 x C: 20 char LED: 20 char thermal printer: RS232 port.	A. Disc A: T/E: 8k monitor: *Basic (8k ROM): PL65. Forth*	Expandable using RM65 models to full disk systems. (E)

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	S	Software
BT	Bench Tested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	P/P	Parallel port	U	Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
BEX-09 (£850)	Micro Design 0908-663655	64k RAM: 6809: 64k PROM: 2xRS232 ports: P/P	1k Monitor	Multi-processor interfaces on board.
Bigboard (£450)	Maclin-Zand 01-837 1165 (N/A)	64k RAM: Z80, F/D controller: 24 x 80 VDU controller	2k monitor: *CP/M: Basic: Fortran: Cobol: Pascal: A.*	Many options. Will support up to four 8" F/D drives. BT 3/81. (E)
Biproc (£119)	B L Micros: 0494 44307. (TBA)	1k RAM: Z80: TV int: RS232 port. Opt: 4k RAM £8: K/B £30.	2k Monitor: A.	With 9980 instead of Z80 £155 as well as Z80 £180. Kit. (H)
Cromeco SC (£355)	Comart: 0480 215005 (25) Datron. 0742 585490.	1k RAM: Z80A: 8k EPROM sockets: RS232 port: 3 P/P. Option: S100 bus.	Monitor: *Basic.*	5 program interval timers. Can put own Basic program in EPROM. (E)
Elf II (£50)	Newtronics: 01-348 3325 (N/A)	¼-64k RAM: RCA 1802: Hex K/B: 2-digit LED: TV int: C int: RS232. Options: Full K/B: VDU card.	1k monitor: A: Dis A: T/E: Elf-bug *Tiny Basic: Basic,*	TTY N-line decoders. Low re-solution graphics (high res avail). Kits or built. Full range of peripherals. (H).
Explorer (£82)	As above	4-64k RAM: 8085: Full K/B. RS232 port: 6 x S100 bus: C int: 1k video RAM.	2k monitor: *Basic (8k) CP/M: Basic Fortran: Cobol.*	Supplied in kit or built. Full range of peripherals including F/D. (H)
Hewart 6800S (£299)	Hewart: 0625 22030 (N/A)	16k RAM: 6800: full K/B VDU int: 2 x C int: 1 S/P: 2 P/P: Option: 16k RAM £90	1k monitor: A: T/E.	Can be upgraded with 6809. (H)
Hewart 6800 Mk 111 (£152)	As above	1k RAM: 6800: VDU board	1k monitor.	Options: single 5¼" F/D (75k) £350: PROM programmer £32. (H)
Kemitron Z80 Starter (£240)	Kemitron 0244 21817 (3)	Z80A: 16k PROM: 2xS/P: 24 channel parallel I/O	ZEMON monitor: Basic	Expandable to 64k RAM and disks.
Microaxis 1 (£250)	Micro Design 0908 663655 (N/A)	1k RAM: 1-8k PROM: 6809: 8 channel A-D system: 12 optically isolated I/O lines.	1k monitor	Designed for industrial control. Can be expanded to F/D system. (H)
MPC 09 (£750)	As above	64k RAM: 48k PROM: 6089: RS232 port: 50 I/O lines: 4 timers: 1 W audio amplifier.	1k monitor: *Multi-tasking OS*	As above.
MPE 9900 (£385)	Microprocessor Eng 0703 775482	2-8k RAM: 9900: 4-32k EPROM: 2xRS232 ports: P/P	Basic: *Forth*	Designed as industrial controller.
MPE 6809 Graphics-A (£450)	Microprocessor Eng. 0703 775482	24k RAM: 8-16k EPROM: 6809: 2xRS232 ports: 2xP/P	GForth	320x256 Pixel graphics (8 colour). Applications packages may be placed in EPROM.
Microtan 65 (£69)	Tangerine: 0353 3633 (6)	2k RAM: 6502: 16 x 32 TV int: Options: 64 Pixel graphics £6.50	2k monitor, *Basic*	TANEX expansion kit with 7k RAM: 4k EPROM sockets: 14k Basic: 4 S/P: 32 P/P £145. (E)
Nascom 1 (£125)	Lucas Logic 0926 497733	4k RAM: Z80: Full K/B: TV int: 2 P/P: 1 S/P. Options: 16k RAM £140: single 5¼" F/D (250k) £240 (4 disk controller £127).	2k monitor: *B Basic: Tiny Basic: A: T/E: U.*	Kit. Built version £140. Also Nascom 2 with 8k Microsoft Basic in ROM £225 (no RAM). (S&H)
77/68 (£90)	Newbear: 0635 30505 (N/A)	4k RAM: 6800: LED: C int: VDU int.	1k monitor: *Basic*	Expandable to 64k RAM with F/D. (B)
79/09 (£65)	As above	1k RAM: 6809: P/P: S/P	2k Monitor.	Designed to upgrade 77/68. (H).
SBC 100 (£135)	Airamco: 0294 57755 (TBA)	1k RAM: Z80: 8k ROM: S100: 1 S/P: 1 P/P.	*1k monitor: DOS in ROM*	Kit. Available assembled £196. (E)
Superboard (£188)	(as Challenger)	4-8k RAM: 6502: 10k ROM: full K/B: VDU int: C int.	Basic (8k ROM)	Options: RS232 port: single 5¼" F/D (100k) £316: 8k RAM £188. (S&H)
Smoke Signal SCB 68 (£181)	Windrush 0692 405189 (TBA)	1k RAM: 6800/6809: 8k EPROM: 1 S/P.	2k monitor	Fully expandable to 64k RAM with F/D. (H)
SYM-1 (£160)	Newbear: 0635 30505 (N/A)	1-4k RAM: 6502: C int: VDU int: 2 x 6522 ports. Option: TV int.	4k monitor: *Basic A.*	Expandable to 64k RAM with F/D. (B).
Tuscan (£299)	Transam 01-405 5240 (N/A)	8k RAM: 8k ROM: Z80A: 5 x S100 slots: RS232 port: TV int: C int: 1 P/P.	*2k monitor: 8k Basic: CP/M: Pascal*	High res graphics available. Can be expanded to F/D system. BT 1.81. (S&H)
UK101 (£149)	Comp Shop: 01-441 2922 (4)	4k RAM: 6502: full K/B: 16 x 48 VDU or TV int: C int: RS232 port, Options: 4k RAM £16	2k monitor: 8k Basic: *Dis A: U.*	Graphics. Expansion & colour avail. Kit or fully assembled. (S&H)
Windrush 6801 (£175)	Windrush: 0692 405189	2k RAM: 6801/3/5: 12k EPROM: S/P: 3 P/P	2k Monitor	Designed for industrial control & dedicated small systems. (H)
ZCB (£260)	Almarc: 0602 625035 (3)	1k RAM: Z80A: 3 PROM sockets: RS232 port: 3 P/P	*Will take any 2708/ 16=32 software.*	S100 bus compatible. Expandable to full system. (E)

ACC NEWS

Rupert Steele presents his monthly round-up of news from the Amateur Computer Club

Congratulations, Uncle Clive! Sinclair has, with a single product, done to the computer market just what he did to the calculator market; he has turned the whole thing upside down. The Spectrum is not only a rather nice personal computer, but the price is such as to put personal computing (of a decent, rather than ZX81, variety) within the price range of the man/woman in the street.

Peter Whittle, the ACC Chairman, has now received his Spectrum and has been hard at work doing things with it; these are to be reported in *ACCumulator*. In the current issue, he gives details of a Spectrum expansion RAM, and the pin connections for the add-on RAM sockets. He remains chained to his desk and I hope to mention more goodies as soon as they are invented. . .

Of course, the ACC is not the only group of people interested in the Spectrum. Various competitors have been most interested and are now involved in a mad scramble to bring out similar machines within a few months, before the Sinclair becomes the *de facto* standard. We already have the Acorn Electron announced (presumably its successor will be the Quark, or possibly the Neutral K-meson) and Commodore is promising new products.

Also vying with the Spectrum in this market, and also proving that computer hobbyists are really just big children wanting better toys, is one of Britain's leading toy manufacturers, Mettoy, with the 'Dragon', a 6809 based 32k machine. It has 16 lines of 32 characters in its ASCII display, and 256x192 colour graphics. Software is the Microsoft

ACC NEWS

extended colour Basic, so we shouldn't have to learn Sinclairese to use this machine.

Since the Dragon is a 6809 beast, it should be of particular interest to those involved in the national 68XX group that I mentioned last month. If you are interested in 6800, 6809, 68000 and their systems, then write, describing your interest and/or hardware, to Jim Turner at 63 Millais Road, London E11 4HB or tel 01-558 3681. The 68XX group says that the majority of the interest is in 6809 (as in Dragon) at the moment, but Roger Bird, another of its members, asks what on earth has happened to all those 7768 users.

It's coming up to the *PCW* Show again. Montbuild, the organiser, has asked the ACC to organise the Club area, and Dr David Annal, our exhibition man, has been beavering away sorting out the stands. So if your club hasn't yet spoken to David about a stand at *PCW* this year, then it's probably tough luck and too late (but it might be worth dropping him a line to see). David is also organising another meeting of the national user group chairmen with the ACC committee, which will be held at the show. If your national user group wasn't represented at the last meeting, then get in touch with David and he'll tell you all the info. We can also deal with large scale regional user groups at this meeting, although we don't expect to be saying anything that would be of interest to local clubs. David Annal is the ACC Secretary and his address is 142 Windermere Road, London SW16 5HE.

Also at *PCW* will be the ACC stand, on which we expect to have a host of features. Firstly, we will have the customary ACC database (hopefully updated according to the information that comes flooding (??) in to Peter Whittle at 49 Bartlemas Road, Cowley Road, Oxford), which enables those attending the exhibition to be put in touch with the local clubs near them. Among other exhibits, we expect to have Prestel, Mailbox/Bulletin Board, general Data Communications and interfaces, along with the Spectrum and the Dragon. So there's going to be plenty to see, apart from the great joy of holding a conversation with Peter on the stand.

As far as other shows go, the ACC was at the Capital Radio adventure day at Battersea Park, where there was a computer club area in the usual way. Lots and lots and lots of people came and had a look, found that computers don't bite and that they could have quite a bit of fun playing with them. Peter Whittle tells me that Prince Charles was within 30 yards of approaching the ACC stand, but that the sign had disloyally fallen down so that the Royal Attention was not attracted. Never mind, Peter; you'll have to wait another year for that OBE.

I thought that I'd also point out that the ALCC (Association of London Computer Clubs) Computer-fair is going up in the world. It will be moving from the North London Poly (which really got somewhat overloaded) to Central Hall Westminster, where it will be part of the GLC's IT82 programme. I am slightly mystified by how IT82 can stretch into 1983, even for the GLC; perhaps this air of unreality has descended on Uncle Ken ever since the Tories did in his Fares Fair scheme.

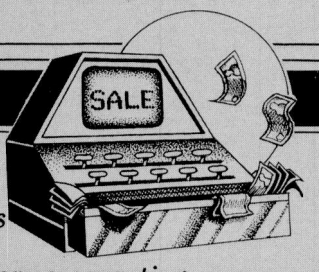
Do you have anything to do with running a computer club? If so why not write to me with some information for a mention in 'ACC News' — leave a good two clear months before any topical event. The only people who have requested a plug this month are OPeCC, and they had one last month, so they're not getting another — mind you their meeting on Prestel packed a punch. . .

Tony Sweet of BT Prestel came to OPeCC to discuss the future of Prestel and telesoftware, and gave a most convincing set of demonstrations. He loaded a video game into an Apple via the Aladdin's Cave telesoftware pages and successfully ran it (well, not that successfully — he didn't win). The telesoftware is in a compressed format designed by CET (the Council for Educational Technology) and requires an unpacking and checksum verifying program. He also went through an assortment of gateways onto other systems and explained how this could dramatically increase the power of Prestel, with possible use of gateways for telephone directories and the like. Some new gateways were on the way, but the details were still hush-hush What must have slightly upset Tony (apart from the 'Drop Dead' greetings card sent to him by Peter Whittle) was that, when demonstrating the ALCC pages, he came across a page written by Len Stuart, claiming that Prestel was inferior to another system, 'Scrapbook'. I don't think Tony will be putting that page up again in a talk.

While we are on OPeCC, Maj-Gen Len Phelps has threatened to send a Task Force after me if I don't point out that he is now the general contact (sorry!). The fact that he is the fourth different OPeCC contact in ACC news this year is nothing to do with the chairman. Honest. Len's address is Southport Cottage, Sutton Courtenay, Nr Abingdon, Oxon OX14 4AN.

Finally, I should report that Peter Whittle came staggering into my office a few days ago, with some lumps of conrete still stuck to his legs, saying something about computer communications with an Apple in Rome. Apparently a data transmission error had caused the most awful Italian insult to be displayed at the other end (a bit like 'I seem to be having this tremendous difficulty with my lifestyle'), and the 'boys' had been round. Apart from that, the international computer communication experiment seems to have been a success, and I'll have full details next month, including some discussion of the technicalities.

TRANSACTION FILE



Readers will be pleased to know that, due to our clever layout ideas, the Transaction File is up-to-date and waiting cut down considerably. Ads are accepted only on the form below for a flat fee of £2.50. Please don't specify issues as we can't oblige. Ads cannot be repeated unless separate forms are sent in. We will only accept entries from non-commercial readers. Thank you for co-operating.

✱VIC20 — boxed, unwanted gift. 7 months old, mint cond, hardly used. Accessories include TV, splitter, s/ware magazines, reasonable offers, buyer collects. Ring Adam after 5pm. Tel: Northwood 27733 (London).

✱DAI — personal computer, 48k, RAM, 24k, ROM are you interested in buying a computer, ring now for a free demonstration tel: 01-570 3844.

✱ZX81 — 16k RAM + I/O port, full size, qwerty kboard, smart wooden box, manual etc, 3 books, £50 s/ware, inc: 2 adventures, Mazogs, 3D defender, galaxians, worth £200. Asking £150 ono. Write: D Jewitt, 100B Townmead Rd, London SW6 2SG.

✱Acorn Atom — Games Asteroids, 747, Adventure space fighter, Polecat, Minefield, Earth warning, Lunar Lander, Astro, Birds, worth over £70 will accept £30. Tel: Middlesbrough (0642) 211573.

✱Acetronic — TV game, Hobby module, hardly used £35. Tel: 0553 671077, eve, B Peak.

✱ZX81 — as new, Sinc built, 1k, manual, leads, transformer, selection of progs, under guarantee. All for £55 ono. Phone Ivybridge, 2428 after 4.

✱ZX81 — +16k, RAM Sinc built, complete with all leads, only 3 months old. 2 Sinc cassettes + Quicksilva, Defender, etc. Still under guarantee, £87 book: PEEK, POKE, Byte + RAM. Tel: 061 624 1827, Kenneth.

✱UK101 — 8k RAM, new monitor, cased, inc leads and manual. As new. £165 ono. Tel: 021 350 4748.

✱Sharp MZ-80K — 48k, 6 months old, manual, books, 40 tapes, over £400 worth of s/ware. £360. Tel: Duddington (078-083) 284, between 10/11.30pm near Peterborough.

✱ZX81 — 16k RAM, Fuller MkII keyboard, complete with accessories + s/ware inc. Asteroids, Defender, invaders, centipede, catacombs, breakout + many more, costs only £105. Phone: Gerrards Cross (Bucks) 84764 w/ends and after 4.

✱Video genie — + Tandy green screen monitor, tiny Pascal, assembler, books on same. £300 or near offer, phone 01-575 5863 eve.

✱TRS80 — 48k LII, keyboard, expansion interface, single teac drive, operating system & misc disk s/ware. Offers! Genuine reason for sale. May split. Tel: Ware (0920) 821701 after 6.

✱ZX81 — +16k RAM, Sinc built, new kboard. All accessories, lots of good games, quick sale needed. £80. Can deliver immediately in London. Tel: Jason 01-328 6988 any reasonable time of day.

✱Tangerine Micron fully expanded — 8k RAM Tanbug V2.3 Basic (10k) Pixel graphics exc display on an ordinary domestic TV. All leads and manual supplied. Tel: (Brighton) 696285. Eve only: £300.

✱Sharp MZ-80K — 20k RAM, Basic tape + manual + applications tape + several games progs, 9 months old, per cond. original packing. £325 ono. Tel: Biggin Hill, 74185 after 6.

✱Acorn Atom — 12k RAM, 8k ROM, high-res graphics and assembler, some s/ware and books, pile of magazines, all leads and manuals, only £99, ring Kevin, Horsham 62635 (Sussex).

✱ZX81 Sinc built, hardly used, under guarantee, £55. Tel: 0642 723996.

✱Acorn Atom — 12k RAM, 48k ROM. All leads, manuals, some books and s/ware and pile of computer magazines, only £99. Phone Kevin Smith, Horsham 62635 (Sussex).

✱Complete PET system — for £995. 4022 printer, 2031 single disk — both hardly used. Plus 3016, new ROM, large keyboard PET and cassette unit. Phone 0484 718311, office hours.

✱Wanted Pet computer, new Rom, interested; disk drive/printer. (With manuals). Exchange for Yamaha organ (B-35N). Bought in error. 6 months old, vgc. Will deliver/collect within South-East. Tel: Hastings 430236

✱Wanted: TRS-80 48k with vdu & recorder (but might consider floppy tape). Must be as new. Detail & price to: R. Nubley, 66 Alderside Crescent, Lanchester, Co. Durham.

✱Wanted computer pen — friend. Commodore Pet 3016 requests corresponding with other addicts. Ideas inc software exchange hints & tips for programming games/business. Write J.W.D., 5 Harding Close, Kettering, Northants

✱Wanted: Sinclair ZX81 (Sinc. built) with accessories. Tele: Bolton (0204) 51973, after 6 pm.

✱Apple, Video-Genie, Pet, Vic, ZX81. Tired of that programme? Not what you wanted? Cash to 50% of current list for cassette, disc, Rampack, immaculate condition with full documentation Tel: 0424 220188.

✱Wanted: ZX81, home built or factory built + games. Svein Utne Kringsjaav. 51, N-7000 Trondheim, Norway.

✱Wanted — secondhand computer min 64k RAM twin disk drives or Winchester CPM compatible. Tel: Weymouth 03057 79881 day, 788562 eve.

✱Acorn Atom — 12k ROM, 13k RAM 5V supply + GP80A printer. All perfect bundle of s/ware and books bargain package £325 the lot. Tel: 01-552 1467 eve.

✱Superboard — 8k RAM, metal case and psu 48x32 display, Cegmon, Basic 1,3 and 4. 300/600/1200 baud, manuals, user group newsletters, £200. Tel: Bolton, 0204 34886 after 7.30.

✱ZX81 — 16k built, manual, leads, mains adaptor plus expanded keyboard and s/ware inc. chess, cassette one and two, QS defender & invaders, Adventure C, Monster maze, centipede and Galaine, £89. Tel: 01-455 5743.

✱TRS80 — LII, 16k, vdu, tape recorder, 6 months old, still boxed, manuals, lots of s/ware all

TRANSACTION FILE

Transaction File advertisement form

All Transaction File ads must be submitted by readers on this form or a photo-copy of this form. Maximum 30 words. Print one word per box, very clearly. Name, address and/or telephone number must be included in the 30 words. All ads must be accompanied by flat fee of £2.50. Make cheques or POs payable to Sportscene Publishers (PCW) Ltd. Ads accepted from private readers only. Ads cannot be repeated (unless sent in on another form) and we cannot guarantee to print an ad in any specific issue. Please help our typesetter to help you by printing your ad very clearly. Send form to: Transaction File PCW, *62, Oxford Street, London W1A 2HG.*

Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.

for £250. Tel: Shorne, Kent (0474) 82 2539.

✱ TRS80 — LII, 16k vdu cassette manuals, number of program games etc, worth over £600. £200 ono. Tel Worksop 483547.

✱ ZX81 — 16k, Sinc built, exc cond, psu and manual, two books, ZXAS and Taurus monitor for machine-code. Best offer over £100, phone 01-207 1223 5-9.

✱ Acorn Atom — fully expanded. Word pack ROM. 5v psu. s/ware, books. £195. Currah digital cassette recorder for Atom 6000 baud. Full s/ware control. Tapes, documentation. £200 ono. Tel: 0223 355957.

✱ ZX81 — 16k RAM, printer, Fuller FD extended keyboard+case (plenty of room inside), telesound 82 unit, new psu, all manuals + leads, 2 books, exc cond. only 4 months old. Bargain £145, ring W Peacock (01)591 6526.

✱ Atari Video Computer — + joysticks, paddles, steerers, keyboards. Cartridges inc Backgammon, basketball, bowling maze, asteroids, casino, dodgem, indy, checkers, invaders, many others cost £560 accept £350. Tel: 0924-277346 after 7.

✱ TI59 + PC100B — 96 step prog. cal, with printer. Complete with master module, leads, charger, wallets, manuals, coding sheets, over 60 prog cards, progs inc with boxes and instructions. Would cost £300+ quick sale a must for £195. Mr King 01-769 7255.

✱ UK101 — with 17k RAM, metal cased room for another 7k RAM on board, Mono2 Cegmon 300/600 baud 5V 5Amp supply s/ware and books £240, ovno, Harlow (0279) 26383 eve.

✱ TRS-80 — 16k LII, + numeric keypad, as new inc manuals and £150+ of s/ware (arcade games, assembler) £340, also Aculab, 9k baud, floppy tape: £125. Both: £450. Tel: Waterlooville, Hants, 61563 eve.

✱ Northstar Advantage — Epson, MX82 F/T with graphics option and serial interface, graphics Basic and all cables. Brand new, bargain at £1599. Contact Dave on Slough 74201 ext 55 during office hours.

✱ PET 8k — old ROM. integral cassette, recently overhauled, manuals and s/ware inc £220. Tel: 01-997 4193 eve and w/ends.

✱ UK101 — absolute basic machine, fully working and professionally tested. Hardly used; built for practice. All reasonable offers con (£90 ono). Tel: 01-670 0547.

✱ Aculab — floppy tape plus s/ware £150. Epson printer interface (connects to TRS80 kboard) £50. Tel: 01-427 1098 anytime.

✱ ZX81 — Sinc built + byg byte 16k RAM, all leads, manual, some programs, book (PEEK, POKE, Byte and RAM), psu, good cond. boxed £90. Tel: Clacton 422060 eve/w.ends.

✱ Acorn Atom — 8k ROM and 12k RAM, instruction manual, leads, magic book and brand new psu, exc cond. Phone Abergavenny 4534 with reasonable offers. Will sell to highest bidder.

✱ ZX81 — 16k RAM, Sinc built, manual psu, leads 3 games £80, Vic 20 cassette recorder, leads joystick, two games, three manuals, four months old, £200 ono. Thetford 2875 eve.

✱ Tangerine Rack System — Microtan 65, full-exp, Tanex — (8k RAM, extended microsoft Basic, X-Bug). System, psu, full ASCII keyboard, many progs. Would cost £350+. Bargain @ £100. Tel: Helsby (Cheshire) 092 82 3044 eve.

✱ Apple II+ — 48k, twin disks, parallel card, paper tiger printer, language card, Pascal, 12inch Hitachi monitor, Tasc compiler, 3.2.1 visicalc, DOS toolkit, applewriter, Dakins Aids, ple, etc. £1450. ono. Slough 41092.

✱ Softy Mk1 — Eprom programer and emulator for triple rail devices (can be upgraded for single rail as well). £70, power supply, if required, £18. Slough 41092.

✱ Hewlett Packard — 2100A computer 2600A terminal, 2748A tape reader 7900A disk drive system to swap for Sharp system MZ80K disks printer, accessories or offers, 8 Blackdown Avenue, Waterthorp, Sheffield S19 6NG Yorkshire.

✱ VIC20 — + cassette player. Two months old. £170 cash only. No offers. Brian 01-866 4515.

✱ Video Genie — 16k, LI with sound cover + many tapes inc. ZChess, Galaxian, Invaders, Star Trex III, etc. Total value £370. vgc. hardly used. £240 ono. Tel: Basildon 553325 after 6pm.

✱ ZX81 — 16k Sinc, RAM + 4k ROM, ZX80 + psu, manuals, ZX81 companion. All in good cond. £100 ono. Tel: Andy on 0272 683195 anytime.

✱ Casio fx702p — 1.68k RAM, flexible memory. Only one month old, comes with ten progs already in store. Need money for ZX Spectrum. Great value at £85. Tel: St Austell 0726 64345.

✱ 48k Sorcerer — all manuals, two Hitachi cassette recorders with moto-control cables, one Hitachi 9in monitor complete with cables various s/ware as new £499 ono. Tel: Cheltenham (0242) 37954.

✱ Video Genie — 16k, joysticks, games, manuals, books etc, perfect, upgrade forces sale. £260 ono. Also 2 synths £100 ono each. Tel: Ian, Great Leighs (Essex), 8138 after 7.

✱ Video Genie EG3003 — as new, box leads and manuals complete, also s/ware inc games etc. £250 ono. Tel: Ilkley (0943) 600851.

✱ TRS80 — L II, 16k, b/w, tv, manuals, books, magazines, 40 programs, cassette recorder, joystick, printer, interface, £450. GP80 Seikosha printer hardly used, £150. Tel: 0303 56266 eve.

✱ Teletype KSR33 — printer plus keyboard, RS232 interface, plus stand. Exc cond. £120. 01-950 0416.

✱ TRS80 32k — fitted with resolution graphics, flashing cursor, system load/save, lower case, single key entries, cassette VDU £500, line printer £150 plenty of s/ware inc Scripsit Chandlers Ford 2002.

✱ ZX81 — little used Sinc built, with mains adaptor, leads, manual and user books £50. Tel: Witnesham (near Ipswich) 047385 680.

✱ Sharp MZ-80K — 48k RAM 2-4 Meg board, assembler, toolkit, cristal Basic, space invaders, chess, forty other games, one year old, £500, phone after 4 Bursledon 4843.

✱ Texas TI99/4A — 6 months old, still in guarantee costs over £300, plus £150 accessories, inc joysticks, games, cassette lead, manuals etc. Genuine reason for sale. Only £350. Tel: 061 437 4530.

✱ PET 2001 — 8k old ROM, integral cassette deck + Pet/CBM computer book by Osborne and Donahue. Will deliver within 200 miles of Hull £240. Tel: 0482 645221.

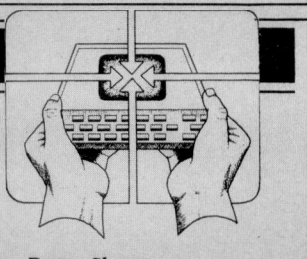
✱ ZX81 — 16k, Sinc built, inc. all leads and adaptor, original packing, manual and ZX81 companion, Sinc. games cassettes, exc cond, £90 ono. Phone Crawley (0293) 882927.

✱ Apple Videx — 80 col card, very little use £120. PET 3040 disk drive per cond. offers ? Phone Mike Days 01-387 0505.

✱ ZX81 — 16k RAM pack with books and tapes worth £150, nearly new, will accept £100. Contact Mark Sylvester, 30 Chatsworth Drive, Louth, Lincs LN11 0JA.

✱ ZX81 — +16k RAM, Sinc built, manual, leads, 2 games cassettes, 1 game & 2 m/c books all for £85. vgc. Contact Mark, 173 Mayfield Gardens, Brentwood, Essex. Tel: (0277) 232439.

CTUK! CONTACTS



For further information on ComputerTown UK! see 'CTUK News' or Prestel page 3574831

Ray Skinner,
62, Central Avenue,
Billingham,
Cleveland
TS23 1LN

Vernon Gifford,
111 Selhurst Road,
Croydon,
London SE25 6LH

John Stephen Bone,
2 Claremont Place,
Gateshead,
Tyne & Wear NE8 1TL

Alan Hooley,
21, Brammay Drive,
Tottington,
Bury BL8 3HS.

Vernon Quaintance,
50 Beatrice Avenue,
Norbury,
London SW16 4UN

Rex Shipton,
17, Woodlands Av,
Eastcote,
Middlesex.

Brian Taylor,
Tonbridge Area Library,
Avebury Avenue,
Tonbridge,
Kent

Robin Bradbeer,
Polytechnic of
North London,
Holloway Road,
London N7

B J Candy,
9 Oakwood Drive,
Gloucester GL3 3JF

Ted Broadhead,
27 Cardinal Road,
Leeds LS11 8EY

Andrew Holyer,
10 Masons Field,
Mannings Heath,
Horsham, Sussex
RH13 6JP

Brigitte Gorton,
18 Purbright Crescent,
New Addington,
Croydon CR0 0RT.

Richard Powell,
22 Downham Court,
South Shields,
Tyne & Wear

Pam Pollicot,
South Ruislip Library,
Victoria Rd,
South Ruislip,
Middx.

Alan Sutcliffe,
4 Binfield Road,
Wokingham,
Berks RG11 1SL

Tony Cartmell,
54 Foregate Street,
Worcester WR1 1DX

R L Saunders,
14 St Nicholas Mount,
Hemel Hempstead,
Herts.

Bill Gibbings,
3 Longholme Road,
Retford,
Notts DN22 6TU

Chris Cooper,
110, Church Rd,
Hanwell,
London W7.

Roger Shears,
18 Woodmill Lance,
Bitterne Park,
Southampton SO2 4PY

Derrick Daines,
18 Cuttings Avenue,
Sutton in Ashfield,
Notts

Peter J Kiff,
52 Stone Road,
Broadstairs,
Kent CT10 1DZ

Patrick Colley,
52 Queensway,
Caversham Park Village,
Reading,
Berks RG4 0SJ

CTUK! CONTACTS

Alan S Waring,
50 Drayton Gardens,
Winchmore Hill,
London N21 2NS

Andrew Stoneman,
135, Birchdale Avenue,
Newcastle-upon-Tyne,
Tyne & Wear

J.M.A. Kilburn,
Headmaster,
Shawfield Norden
Community Middle School,
Shawfield Lane,
Norden,
Rochdale
OL12 7QR

Paul Maddison,
Gardenways,
Chilworth Towers,
Chilworth,
Southampton,
SO1 7JH

Lyn Antill,
1 Defoe House,
Barbican,
London

Chris Woodford,
31 Hopley Road,
Anslow,
Burton-on-Trent,
Staffordshire

Ron Wright or Bill Phillips
Mountview Youth Centre,
Mountview School,
Fisher Road,
Harrow Weald,
Middlesex

Susan Kelly,
Head of Reference Services,
PO Box 4,
Civic Centre,
Harrow,
Middlesex.

Pete Shaw,
15 St Vincent Road,
Clacton-on-Sea,
Essex C015 1NA

Philip Joy,
130 Rush Green Road,
Romford,
Essex.

Alan S Waring,
Palmers Green & Guildhall,
Winchmore Hill,
London N21 2NS

Keith Taylor,
Carter Hydraulic Works,
Thornbury,
Bradford BD3 8HG

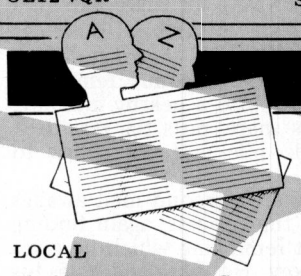
Derek Moody,
2 Victoria Terrace,
Dorchester,
Dorset DT1 1LS

Derek Knight or Bob Carter,
Rayners Lane Library,
Imperial Drive,
Rayners Lane,
Middlesex.

Peter Earthy,
46 High Street,
Church Stretton,
Shropshire.
SY6 6BX.

Christopher Bates,
Ashford Main Library,
Church Road,
Ashford, Kent

USER GROUPS INDEX



These are alterations and additions to the complete listing published in the August issue. The next full listing will appear in the February 1983 edition

LOCAL

Blackburn Computer Group. Meetings first Monday monthly. Newsletter planned. For details of venues, etc contact membership secretary Dave Walsh, 19 St Margaret's Way, Blackburn, Lancs. Tel: 0254 66 1518. Contributors welcome for newsletter.

Coastal Computer Club. Meets every Monday eve in the Physics laboratory of Wyndgate Upper School, Park Farm Rd, Folkestone at 7pm in term time. Contact: Dave Leath-Butler, Tel Hythe 60726. Membership fee £2, and weekly subscription 20p. Guest fee 30p. Seminars etc arranged.

Croydon Apple User Group, for serious users. Now meeting at 7pm on the 2nd Monday of every month. Venue: 60 Hawkhurst Way, West Wickham. Tel: Hon Sec Paul Vernon on 01-777 5478 for details.

Harlow Computer Club. Meetings 3rd Tuesday monthly at Harlow Advice Centre from 8pm until 10.30. Details from Bob Robson, Harlow 20730 (eve & w/ends).

OPeCC— Oxford Personal Computer Users Club. For information phone Len Phelps, Sutton Courenay 438 or Tim Fowler, Oxford 45172 (w) or Oxford 725313 (h).

Perth & District Amateur Computer Society. Meetings 3rd Tuesday monthly at Hunters Lodge Motel, Bankfoot. Meetings start at 7.30 and include a talk and demonstration. Contact: Alastair MacPherson, 154 Oakbank Rd, Perth PH1 1HA. Tel: 0738 29633.

West London TRS-80/Video Genie User Group. Meets first Sunday monthly at the central common room, The Residences, Northwick Park Hospital, Watford Rd, Harrow. Affiliated to National TRS80/Video Genie Users Group.

Yeovil MZ-80K User Group now publish a four monthly newsletter full of listings, ideas and projects. MZ-80A also supported. Software library now includes source code of most well-known programming languages. Address Sharp MZ-80K User Club, Yeovil College, Yeovil, Somerset BA21 4AE.

NETWORK NEWS

These are all the European networks of which we're aware. Most are free — but phone them for details.

Forum-80 Hull. . . (Forum-80 H,Q) Tel: 0482 859169, System operator Frederick Brown. International electronic mail, library for up/down loading software. Forum-80 Users Group, Pet Users section shopping list system hours, 7 days a week midnight to 8.00am, Tues/Thurs 7.00pm to 10.00pm Sat/Sun 1.00pm to 10.00pm.

Forum-80 London. . . Tel: 01-747 3191. System operator Leon Jay. Electric mail, library for downloading. System hours: Tues/Fri/Sun 7.00pm to 11.00 pm.

Forum-80 Milton. . . (TRS-80 Users Group 80-Net) Tel: 0908 566660. System Operators: Leon Heller and Brian Pain. Electronic mail, library, newsletter, TRS-80 information system hours: 7 days a week 7.00pm to 10.00 pm.

Forum-80 Holland. . . Operator: Nico Karssemeyer, tel 01 313 512 533. Facilities: electronic mail, program up/downloading, shopping list. Hours: Tues-Sat 1800-0700 nightly, continuous from 1800 Sat — 0700 Tues.

CBBS London. . . Operator: Peter Goldman, tel 01-399 2136. Facilities: electronic mail, program downloading. Hours: Wed 0700-0930 & 1900-2200, Fri 1900-2200, Sun 1600-2200.

Mailbox-80 Liverpool. . . 051-220 9733, System Operator: Peter Tootill, Electronic mail, downloading TRS-80 information.

ACC. . . members bulletin board, Peter Whittle (0908 44262)

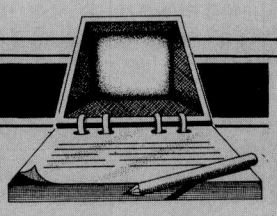
ABC-80. . . Stockholm, Sweden) Tel: 010 468 190522.

University Research Computer. . . Sweden. Tel: 010-468 23660, guests use password "66,66" for access.

Elfa. . . Sweden 010 468 7300 706

Tree Tradet. . . Sweden 010-468 190522.

DIARY DATA



Readers are strongly advised to check details with exhibition organisers before making arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

Manchester	(The University) Eurographics Exbn & Conf. Contact: Interbuild Exbns Ltd, 01-496 1951	8-10 Sept
London	(Barbican Centre) PCW Show. Contact: Interbuild Exbns Ltd, 01-486 1951	9-12 Sept
London	Computer Choice '82. Contact: James Brewster Assoc, 01-486 8686	20-22 Sept
USA	(Atlanta, Georgia) Computerised Office Equip Exbn. Contact: Cahners Exbn Group, 0483 38085	21-23 Sept
London	(Barbican Centre) London Business Show. Contact: BED Exbns Ltd, 01-647 1001	28 Sept-1 Oct
Wembley	(Conference Centre) Viewdata Exbn. Contact: Online Conferences Ltd, 09274 28211	12-14 Oct
Finland	(Helsinki) Business Machines & Equipment Exbn. Contact: ECL (Exbn Agencies) Ltd, 01-485 1951	12-16 Oct
London	(Bloomsbury Crest Hotel) Computer Graphics Exbn. Contact: Online Conferences Ltd, 0924 28211	19-21 Oct

MICROMART

GAMER

VIC 20	£152 +VAT
SHARP MZ80K (48K)	£327 + VAT
SHARP MZ80A	P.O.A.
ATARI 400 (16K)	£173 + VAT
ATARI 800 (16K)	£390 + VAT
TEXAS T199/4	£173 + VAT
VIDEO GENIE (16K)	£299 +VAT
ATOM (assembled)	£150 +VAT

+ software, books, chess computers
+ Intellivision + Ace TV games
+ SF, Fantasy & Wargames

BRIGHTON 24, GLOUCESTER TEL 0273 698424

Adventure
BBC + nascom

Adventure games are fascinating and addictive: you tell the computer what to do in English phrases, & it acts as a window to worlds of magic & mystery.

Each Level 9 adventure has over 200 individually described locations, and a game may take weeks to solve! Only combined code and data compression allows so much to be provided.

Colossal Adventure ..... 16K/32K ..... £8/£10

The original classic mainframe game "Adventure", with all of the treasures, creatures and rooms hinted at in computer magazines. And we have added 70 extra rooms to the end-game!

Adventure Quest ..... 16K/32K ..... £8/£10

From the great forest, up orc mountain, braving fire, marsh and illusion on a quest to rescue Middle Earth from Tyranny. Use swords, spells and subtlety to combat opponents from dogs to demons, ghouls to ghosts, and wizards to 200-foot worms.

FREE P&P. NO VAT. Money back if not happy. Supplied on high quality tapes. Send order, stating which computer, or SAE for details of all our games to:

LEVEL 9 COMPUTING
229 Hughenden Road, High Wycombe, Bucks. HP13 5PG
(Note: Nascom 1s will need Nas-Sys/Cottis B.)

SHARP MZ80K USERS
EXTRA MEMORY

No more waiting while your cassettes are loading. Keep all your programs on our 32K EPROM storage board for instant access. Auto load facility allows your program to be up and running after switch on. Add any number of boards to your system. Many other interface boards now available for MZ80K and MZ80A, including Centronics and RS232 printer boards. Send for details to:

PETERSON ELECTRONICS LTD,
Academy Street
Forfar
Angus DD8 2HA
Telephone Forfar (0307) 62591

ASHFORD COMPUTER CENTRE
many makes of Micros
and Accessories
supplied

Courses in Computer
Programming for the
Complete Novice

Ring for Prices . . .
BIG ADS DON'T ALWAYS
MEAN BIG SAVINGS

Clarendon Road,
ASHFORD, Midd'x.
Tel: ASHFORD 44955

LEISURE LINES

by J J Clessa

Almost 400 entries to the June Prize Puzzle highlighted an easy problem. Several people said that the quickie (the four times fives) was more difficult. Be that as it may, the winner of this month's prize, selected from many, was Michie (no indication of initials or sex) from Ashford in Middlesex. He (she, it) gave the answer we wanted of 78 tadpoles, 13 terrapins, 5 tortoises and 4 turtles. Actually there were also two other possible solutions which were also accepted for the prize draw. These were 77,13,10 and 0 or 79, 13,0 and 8 although they only involved purchase of three of the four creatures.

No quickie

In the maelstrom of moving from one office to another, Leisure Lines has suffered the sad loss of the only copy of September's Quickie. As we're all up in arms at the time of writing (far too late, we fear) a humble apology for this dreadful omission is all we could think of to fill up the space.

Prize puzzle

This month's Prize Puzzle is based on an old chestnut — or should I say coconut?

Six men are shipwrecked on a desert island. The only food on the island is coconuts. They therefore decide to collect all the coconuts and divide them equally among themselves.

They spend one complete day gathering all the coconuts into a single pile, and by the time sunset arrives they are so tired that they decide to postpone the share-out until the following day. They therefore all go to sleep.

During the night one man awakes and decides to take his share and hide it before the others awake. He divides the pile into six equal shares and finds that there is one coconut remaining which he throws to a nearby monkey. He hides his share, puts the rest back into a single pile and goes back to sleep.

A little later, a second man awakes and repeats the process, again finding one coconut remaining which he gives to the monkey. He takes and hides his share and goes back to sleep.

This performance is repeated by each man in turn during the night. Each time the coconuts are divided into six and each time there is one left which the monkey gets.

Next morning all six men awake and decide to share out the remaining coconuts. Again they divide them into six equal shares and again there is one left over which is given to the monkey. What is the least number of coconuts that there could have been in the beginning?

Answers, *on postcards please*, to: September Prize Puzzle, Personal Computer World, 62 Oxford Street, London W1, to arrive not later than 30 September 1982.

PROGRAMS

PCW is interested in Basic or Pascal programs for any popular micro — please tell us which one you wrote your program on and how much memory it uses. Make sure your programs are fully debugged before you send them in on cassette (although we will accept disks) with a clear listing on plain paper. Documentation would be welcome, and if you want it returned please label everything with your name and address and include an SAE. Send contributions to Maggie Burton, PCW Programs, 62 Oxford Street, London W1A 2HG

601P GAMES

TAPE 1	TAPE 2
LUNAR	SUBKILL
GAMBLE	ACEY-D
CHEMIST	CLICK
21	BOMBS-AWAY
TANK	CHUTE

These games for the Casio 600 range come complete with full listings and instructions. All orders despatched same day.

Mail order only please. Cheques or postal orders should be made payable to:
M. Jones, 90 Studley, Calne, Wiltshire.
Cash with order, dealership welcome.

£4 per tape - £7.50 both.

BBC MICRO USERS

Take advantage of your superb graphics capabilities using

COMPUTER GRAPHICS DESIGN SHEETS
Ideal for planning graphics, animations etc, user defined character blocks, free binary to hex conversion chart and worked examples. Price incl. VAT and P&P in pads of 100 sheets. 1-4 £4.95 each, 5-9 £4.50 each, 10+ £3.95 each.

NEW Matching decimal and Hex Scale Rule £7.95 each inc.

NEW TV Support Stand in re-inforced plastic allows your TV or monitor to sit above your BBC micro, cassette recorder etc. on any desk or table without damage. SIZE 750 x 300 x 150 mm high £29.50 each incl. VAT and P+P

SCHOOLS ETC. LESS 10%

DEALER ENQUIRIES WELCOME

DRACAL (NORTH WEST),
P.O. Box 130, Warrington WA1 4QB.
Tel: Padgate (0925) 815419.

PROGRAMS

Video Genie Extended Basic

by W Burgar

This program will add nine useful commands to Genie Basic, using the DOS commands to call routines from high memory. Because it works in this way, the top of memory needs to be set before the program can be loaded. When the machine has just been switched on, type 32680, return and then load the program.

The reserved words added by this program are: GET — waits for any key (excluding shift) to be pressed; NAME — works in the same way as GET except that the character pressed is printed in the cursor position; KILL — disables the break key; PUT — turns break key back on; CLOSE — turns off the video driver so that all print statements are suppressed; OPEN — turns video driver back on; LOAD — loads a program from tape straight after the current program so that the current program is not lost; MERGE — combines two programs after a LOAD. It is best here to renumber the second program with higher line numbers than the first program; FIELD — this is a graphics command which literally reverses the whole of the screen, turning black characters white and vice versa.

These additions use 88 bytes at the top of RAM. After typing the program in, save it before running as other wise it will be lost by NEWing itself out of memory.

```
  5 REM AFTER TYPING THIS PROGRAM IN, SAVE IT
  6 REM BEFORE RUNNING IT!
 10 CLS:PRINT"EXTENDED BASIC BY W J BURGAR* "
 20 PRINT"COMMANDS ARE: GET* NAME* KILL* PUT*
    CLOSE* OPEN* LOAD* MERGE* FIELD*"
 30 REM READ IN JUMP ADDRESSES TO DOS MEMORY
 40 FOR I=16761 TO 16788: READ C: POKE I,C:
    NEXT I
 50 REM READ IN MACHINE CODE TO TOP OF MEMORY
 60 FOR I=32680 TO 32751: READ C: POKE I,C:
    NEXT I
 70 NEW: REM FINISHED
 80 REM DATA FOR JUMP ADDRESSES IN ORDER
 81 REM OPEN, FIELD, GET, PUT, CLOSE, LOAD, MERGE,
    NAME, KILL
 90 DATA 195,168,127,195,174,127,195,73,0,195,192,
    127,195,198,127
100 DATA195,203,127,195,221,127,127,195,228,127,195,
    234,127,201
110 REM DATA FOR MACHINE CODE
120 DATA 62,7,50,29,64,201,1,0,4,17,0,60,26,47,203,
    255,18,19,11,120
130 DATA 177,32,245,201,62,201,50,12,64,201,175,50,29,
    64,201,58,249
140 DATA 64,214,2,50,164,64,58,250,64,50,165,64,205,31,
    44,201,33
150 DATA 233,66,34,164,64,201,205,73,0,195,51,0,62,7,50,
    12,64,201
160 REM DON'T WORRY ABOUT SN ERROR AFTER MERGE
 65 PRINT*"PRESS ANY KEY":GET
 66 REM THESE ARE 65&66; NOT 165&166!
```

(signifies '↓')*

MICROMART

PC1211 SOFTWARE

The Sword & The Ring £5
An adventure in eight linked programs. Totals over 8K. Find the Ring of Wisdom in a maze with monsters, spells & traps!

Programs For The PC1211 £4-50
Contains BANNER PRINTER, BINGO, MAZE, CALENDAR PRINTER, MOONSHOT, SUPERMIND, HANGMAN. Printer required.

Both supplied on cassette with manual. Add £1 p+p. Order both for £9 + £1-50 p+p. Send cheque/PO or sae for details to J. Wald, 178 Oaktree Rd, Bitterne Park, Southampton.

MICROPATH

Critical Path Analysis on your micro.

MICROPATH takes the tedious calculation work out of Critical Path Analysis. For networks of up to one hundred elements (forty on the 16K Spectrum) **MICROPATH** will calculate earliest and latest start, free float, total float and indicate the critical path. It will calculate project duration and even checks the logic of your network. Networks can be easily edited and stored on cassette. The TRS80 and Genie versions also support disk files. All versions allow the option of printed reports as well as screen output. **MICROPATH** is invaluable for project control or as a teaching aid.

MICROPATH – all the features of more expensive packages except the price!

Available now for – TRS80 Model 1 and 3
– Genie 1 and 2
– BBC Microcomputer Model A or B
– ZX Spectrum

Only £14.00 on cassette (inc. post and package)

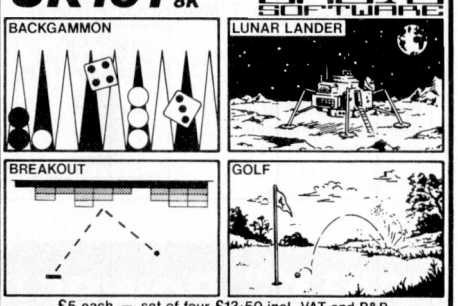
Access telephone orders welcome.

CSL MICRODATA

4 Greenbarn Way, Blackrod, Lancs, BL6 5TA.
(Tel. 0204 694265)

UK101 8K

OASIS SOFTWARE



£5 each – set of four £13·50 incl. VAT and P&P

Write or phone for program descriptions, alternatively send 95p (redeemable against order) for full catalogue & free listing (not from the above). Access orders taken by phone 24 hrs a day.

24hrs

Dealer enquiries welcome

Lower North St., Cheddar, Somerset.
Tel. Cheddar 743409

S.H SOFTWARE



MZ-80K

SCRAMBLE-Excellent version of the popular arcade game. Graphics/Sound. Written in machine code. £6
ROAD RACE — Run down the pedestrians but don't crash! Graphics. Written in machine code. £4
BREAKOUT — Graphics/Sound. Written in BASIC SP-5025. £4
PROGRESSIVE BREAKOUT — Bricks advance! Graphics/Sound Written in machine code and BASIC SP-5025. £5
OTHELLO — An excellent opponent. Written in BASIC SP-5025. £4
Graphics ROMS — Gives joined up pixels and Reverse Screen Graphics. £10
Graphics ROMS — Design your own. Send 140 8 by 8 character designs on graph paper. State if pixels joined or not. Full fitting instructions included. £12

All prices fully inclusive. Tel. (0926) 21968 from 6-10 pm. Or write: S.H. SOFTWARE, 8 Clarendon Crescent, Leamington Spa, Warwickshire, CV32 5NR.

MICROCOMPUTERS

Short intensive part time day and evening courses.

01-359 2465
Angel Islington Centre,
69 Upper St.
London N1

NASCOM 1&2

Compression Assembler .... NEW ... £12 (£27 in ROM)
The only one of its kind for the Nascom, this full Z80 assembler compresses source to 50% normal size. Thus bigger programs fit in memory & loading/saving takes half as long. As a bonus, assembly is very fast! It is 6K & includes a ZEAP conversion utility

Extension Basic ..... £15 (£25 in ROM)
Adds these keywords to ROM BASIC: IF..ELSE, REPEAT ..UNTIL, WHILE..WEND, AUTO, BREAK, CALL, CHECK, COPY, DEC, DELAY, DELETE, EDIT, FIND, GET, HEX, INKEY, INLIN, LINE, PLOT, PRINT @, PUT, RENUMBER, REDUCE, SPEED, TEST, TRACE, VDU, WRAP, XLIST & XREF. And EB allows you to add even more! It is only 4K.

Adventure Quest: a great new game .. 16K=£8, 32K=£10
Asteroids: fast action in space. Must be played! £8
Bomber: flatten your least favorite cities £5
Colossal Adventure: The Original ... 16K=£8, 32K=£10
Missile Defence: fast action nuclear defence ... £8
Nightmare Pork: battle the pigs and the puns ... £5

FREE P&P. NO VAT. Money back if not happy. Full documentation. (Nascom 1s need Nas-Sys/Cottis B.) Send order, or request for full details to:

LEVEL 9 COMPUTING
229 Hughenden Road, High Wycombe, Bucks. HP13 5PG

MICROMART

MICROCOMPUTER INSURANCE

Comprehensive cover at a reasonable premium:-

- All Risks Cover (incl. Transit)
  -up to £10,000 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 (24hrs)

micro-PROLOG the fifth generation language for micros

- micro–PROLOG is PROLOG for CP/M 2.xx Z80's.
- PROLOG is the European Artificial Intelligence language chosen by Japan as the core language for their Fifth Generation Computers.
- A PROLOG program comprises a set of facts and rules about one or more relations. It unifies:
  concepts from relational data bases,
  powerful list processing,
  pattern directed rule based programming,
  within a single framework of logic programming.
- Current applications: Expert Systems, Natural Language Understanding, Intelligent Data Bases.
- It is used to teach school children the logic of programming. Teaching material is available.
- micro-PROLOG is a full implementation of PROLOG with with significant extensions:-
  interactive editor, modules, random access files.

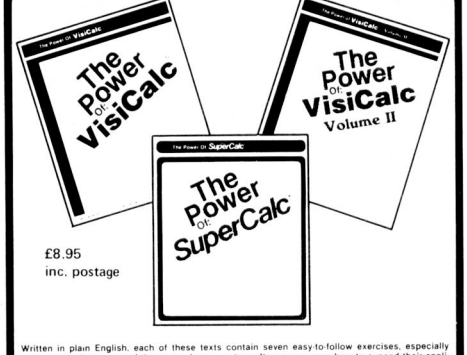
Current Distribution	Prices	
8" SS/SD IBM 3740	Software with	£185
5" format for:	Manual & Primer	
North Star		
RML 380Z (under	Manual	£8.50
CP/M 1.4)	Primer	£7.00
Zenith Z89		
Apple II with Z80 card	Prices include p&p.	
+ full lower case key-	Multi-computer licences	
board		

Need more info?
Sample the language by ordering the 130 page Primer. Price can be set against software.

LPA Ltd
36 Gorst Road
London SW11 6JE

CP/M™ Digital Research, Inc — Z80™ Zilog Corporation

"CALC" Power!



£8.95
inc. postage

Written in plain English, each of these texts contain seven easy-to-follow exercises, especially designed to show users of these popular computer software programs how to expand their applications usage. Specific examples are used to illustrate the logic of each step in designing an applications program.

All the reader has to do is follow step-by-step instructions in the text to acquire an understanding of the basic concepts behind function and command uses, and the ability to apply them to their own specific problems.

IF YOU OWN, OR ARE THINKING OF BUYING VISICALC OR SUPERCALC, YOU SHOULD OWN THIS BOOK !!

PCP
PROTOCOL COMPUTER PRODUCTS
Apartment 3
114 Widmore Road
Bromley, Kent BR1 3BE
Phone: 01-460 2580

PROGRAMS

ZX81 Alphabetising

by Ian Kingston

For any form of indexing this program should come in useful. It allows the user to compile an alphabetical index of up to 800 words of 15 characters maximum. The lengths of words accepted by the program can be altered by changing the values in lines 50, 105, 150, 155, 160, 230, 250 and 285 although this will affect capacity and running time. If a paper printout is required, line 285 should read LPRINT Q$(F,1 TO 15). The graphics symbol used in line 100 is a shifted graphics 'H' and the program needs 16k to run.

```
  10 REM "ALPHABETIZING"
  15 REM (C) 1982, I.KINGSTON
  20 PRINT TAB 5;"GIVE A GENEROU
S ESTIMATE"
  25 PRINT
  30 PRINT TAB6 ;"OF THE NUMBER
OF WORDS"
  35 PRINT
  40 PRINT TAB 8;"TO BE ALPHABET
IZED"
  45 INPUT Q
  50 DIM Q$(Q,15)
  55 CLS
  60 LET X$="----------------"
  65 LET Z$="                "
  70 LET N=1
  75 PRINT TAB 2;"TYPE IN EACH W
ORD SEPERATELY",,,
  80 PRINT "FOR A SPACE ENTER SH
IFTED EIGHT",,,
  85 PRINT " ENTER "" "" AT END
OF WORD LIST"
  90 LET NN=0
  95 PRINT AT 10,0;"WORD  ";N;TA
B 22;"MAX = ";Q
 100 PRINT AT 15,0;"
   "
 105 PRINT AT 16,15;"MAX 15 LETT
ERS"
 110 IF INKEY$ "" THEN GOTO 110
 115 LET C=CODE INKEY$
 120 IF C=118 THEN GOTO 165
 125 IF C=23 THEN GOTO 180
 130 LET NN=NN+1
 135 IF C=119 THEN LET NN=NN-2
 140 IF C=115 THEN LET Q$(N,NN)=
CHR$ 0
 145 IF C>28 AND C<64 THEN LET Q
$(N,NN)=CHR$ C
```

```
 150 IF N>=1 THEN PRINT AT 15,0;
Q$(N,1 TO NN);Z$(1 TO 15-NN)
 155 PRINT X$(1 TO NN);Z$(1 TO 1
5-NN)
 160 IF NN<15 THEN GOTO 110
 165 PRINT AT 15,0;Z$,,Z$
 170 LET N=N+1
 175 IF N<=Q THEN GOTO 90
 180 FAST
 185 CLS
 190 FOR F=1 TO N-1
 195 FOR M=1 TO N-1
 200 IF F=M THEN GOTO 215
 205 IF CODE Q$(F,1)>CODE Q$(M,1
) THEN GOTO 230
 210 IF CODE Q$(F,1)=CODE Q$(M,1
)THEN GOTO 250
 215 NEXT M
 220 NEXT F
 225 GOTO 275
 230 LET Z$=Q$(F, 1 TO 15)
 235 LET Q$(F,1 TO 15)=Q$(M,1 TO
 15)
 240 LET Q$(M,1 TO 15)=Z$
 245 GOTO 205
 250 FOR G=2 TO 15
 255 IF CODE Q$(F,G)>CODE Q$(M,G
) THEN GOTO 230
 260 IF CODE Q$(F,G)<CODE Q$(M,G
) THEN GOTO 215
 265 NEXT G
 270 GOTO 215
 275 SLOW
 280 FOR F=N-1 TO 1 STEP -1
 285 PRINT Q$(F,1 TO 15)
 290 NEXT F
 295 STOP
 300 SAVE "ALPHABETIZING"
 305 RUN
```

PET File Comparison

by Lionel Kremer

For those PET users who keep several versions of program under development at once, this program will be of help in keeping track of changes made. It will compare sequential program files line by line, prepare two output files which consist of the unmatched lines (or blank ones) and then list them on screen and printer if required. The listing feature of this program can also be used on its own to list and print out any sequential file, whether numbered or not.

Before loading and running the program, the files to be compared must be prepared. This is done using the follong sequence of commands: DOPEN#1, 'filename', W/CHD1/ LIST PRINT#1/CLOSE#1 'Compare' can then be loaded and run. Output files are assumed to be on drive 0 and can be specified for re-use by the @ prefix.

Absent-minded readers should be reminded that all programs to be compared must first be copied.

EX-DEMO APPLE 3 COMPUTER SYSTEM. AS NEW

Includes:— 128K Computer, 12" Video Monitor, Spare Disk, Silentype Printer, Visicalc III, Apple Writer III and all System Software.

Normal Retail Price £3321.00
Above System Price £1995.00

Prices do not include VAT.

Call:— DaVinci Computers Ltd.
65 High Street
Edgware
Middx. HA8 7DD.
01-952 0526

Da Vinci Computer Shop

PROGRAMS

'Compare' was tested on a 32k PET with Basic 4 and DOS2. It was, in fact written for the 8032 PET. 40 column users will find that pairs of lines appear truncated. This will not affect the usefulness of the program as the lines of interest (only) can be read in full from the files @TEMP1 and @TEMP2. Another 40 column complication is that the bottom of the display gets overwritten. This, again, can be solved by accessing the comparison files.

```
0 REM"S=DSAVE"@COMPARE
100 REM***** COMPARE SEQUENTIAL PROGRAM FILES *****************************
110 SY=PEEK(52)+PEEK(53)*256:MC=SY+255:REM SY$ AND M.C. ABOVE TOP OF MEMORY
120 IFPEEK(MC)+PEEK(MC+77)=287THEN150:REM M.C. INSTALLED
130 SY=SY-333:MC=SY+255:POKE53,INT(SY/256):POKE52,SY-PEEK(53)*256
140 GOSUB7000:CLR:GOTO110:REM LOWER TOP OF MEMORY AND INSTALL M.C.
150 SYSMC,0:REM INITIALISE SY$ AT TOP OF MEMORY
160 REM***** END OF M.C. AND SY$ INSTALLATION ****************************
1000 DIMF$(2):CR$=CHR$(13):OPEN15,8,15
1010 PRINT"■R■OMPARE OR ■IST ?";
1020 GETA$:IFA$<>"C"ANDA$<>"L"THEN1020
1030 PRINT"■"A$:IFA$="L"THEN3000
1040 INPUT"FIRST READ FILENAME";F$:INPUT"DRIVE■■■0■■■";D:D$=STR$(D):LF=1
1050 GOSUB4000:IFVAL(DE$)>0THEN1040
1060 INPUT"SECOND READ FILENAME";F$:INPUT"DRIVE■■■0■■■";D:D$=STR$(D):LF=2
1070 GOSUB4000:IFVAL(DE$)>0THEN1060
1080 INPUT"FIRST WRITE FILENAME■■■@TEMP1■■■■■■■■";F$:D$="0":LF=11
1090 GOSUB4000:IFVAL(DE$)>0THEN1080
1100 INPUT"SECOND WRITE FILENAME■■■@TEMP2■■■■■■■■";F$:D$="0":LF=12
1110 GOSUB4000:IFVAL(DE$)>0THEN1100
2000 REM***** START COMPARISON ***************************************
2010 M%=-1:PRINT"■■■■FILE 1          FILE 2          LINES■"
2020 IFE1%THEN2040:REM END OF FILE 1
2030 LF=1:GOSUB5000:L1$=SY$:N1=N:E1%=EF%:IFNOTM%THEN2060
2040 IFE2%THEN2300:REM END OF FILE 2
2050 LF=2:GOSUB5000:L2$=SY$:N2=N:E2%=EF%
2060 IFN1<>N2THEN2200:REM UNMATCHED LINE
2100 REM***** LINE NUMBERS MATCH **********
2110 M%=-1:IFL1$<>L2$THENGOSUB6000:PRINT#11,L1$:PRINT#12,L2$
2120 IFE1%ORE2%THEN2300
2130 GOTO2020:REM GET 2 MORE LINES
2200 REM***** UNMATCHED NUMBERS ***********
2210 M%=0:GOSUB6000:IFN1>N2THEN2230
2220 PRINT#11,L1$:PRINT#12,STR$(N1):GOTO2020:REM GET 1 MORE
2230 PRINT#12,L2$:PRINT#11,STR$(N2):GOTO2040:REM    DO.
2300 REM***** END OF A FILE ***************
2310 EF%=0:LF=1:IFE1%THENLF=2:GOTO2340
2320 IFEF%THEN2340
2330 GOSUB5000:GOSUB6000:PRINT#11,SY$:PRINT#12,STR$(N):GOTO2320
2340 IFE2%OREF%THENDCLOSE:OPEN15,8,15:GOTO3000
2350 GOSUB5000:GOSUB6000:PRINT#12,SY$:PRINT#11,STR$(N):GOTO2340
3000 REM***** LIST NEW FILES ***************************************
3010 F$=F$(1):REM 1ST O/P FILE
3020 PRINT"■■■■■■■■■■■■■■■■"F$:INPUT"■LOOK AT FILE";F$:D$="0":LF=3
3030 GOSUB4000:IFVAL(DE$)>0THEN3020
3040 PRINT"WITH PRINTOUT - Y/N ?"
3050 GETA$:IFA$<>"Y"ANDA$<>"N"THEN3050
3060 P%=A$="Y":IFP%THENOPEN4,4
3070 GOSUB5000:IFP%THENPRINT#4,SY$
3080 IFNOTEF%THEN3070:REM REPEAT UNLESS EOF
3090 CLOSE3:PRINT:IFP%THENCLOSE4
3100 IFF$=F$(1)THENF$=F$(2):GOTO3020
3110 F$="":GOTO3020:REM ANY MORE FILES?
4000 REM***** OPEN SEQ FILE - BASIC3 TRAPS MISMATCH ********************
4010 IFF$=""THENPRINT"■INVALID":DE$="1":RETURN
4020 IFLEFT$(F$,1)="@"THENF$=MID$(F$,2):D$="@"+D$
4030 FF$=D$+":"+F$+",SEQ":IFLF>3THENFF$=FF$+",WRITE":F$(LF-10)=F$
4040 OPENLF,8,LF+1,(FF$):INPUT#15,DE$,A$
4050 IFVAL(DE$)>0THENPRINT"■"F$" - "A$:CLOSELF
4060 RETURN
5000 REM***** ASSEMBLE LINE FROM INPUT FILE ***************************
5010 POKE158,0:IFPEEK(151)<>255THENFORI=1TO800:NEXTI:REM DELAY IF KEY DOWN
5020 IFLF<3THENPRINT"■■W"TAB((LF-1)*15+3)"*":PRINT"■■";
5030 SYSMC,LF:REM READ LINE FROM FILE LF INTO SY$
5040 EF%=ST=64:PRINT"■"SY$:IFLF=3THENRETURN
5050 N=VAL(SY$):IFN=0THEN5070:REM NON-NUMERIC
5060 PRINTTAB((LF-1)*15)"■■■"RIGHT$("    "+STR$(N),5):RETURN
5070 PRINTTAB((LF-1)*15)"■■■ ****":IFNOTEF%THEN5020:REM IGNORE UNLESS FINAL
5080 N=65535:RETURN:REM DUMMY FINAL LINE IF NON-NUMERIC
6000 REM***** COUNT LINES FOR NEW FILES ******************************
6010 C=C+1:PRINTTAB(30)"■"RIGHT$("    "+STR$(C),5):RETURN
7000 REM***** MACHINE CODE ***************************************
7010 FOR I=0 TO 77 :READ D:POKE MC+I,D:NEXT I:RETURN
7020 DATA 32,160,189,32,135,189,32,234,194,169,83,133,66,24,169,89
7030 DATA 105,128,133,67,32,135,193,166,98,208,11,160,2,185,51,0
7040 DATA 145,68,136,208,248,96,32,198,255,160,0,32,207,255,201,13
7050 DATA 240,20,145,52,200,208,244,32,204,255,169,15,133,210,32,224
```


DISCS . . . STATIONARY . . . PRINTERS . . . FROM CDP CONSULTANTS

Special offers on discs stationary and printers

FLOPPY DISKETTS IN BOXES OF 10:
5.25" SS.SD S. SECTORED — £15.00
8.00" — £20.70

Add £1 box for P&p plus VAT

CONTINUOUS STATIONARY/1,000 SHEETS
9.5" x 11" single part only £4.51
9.5" x 11' plain (½" margin) only £5.96
14.5 " x 11" lined or plained, single parts
(Includes delivery — excludes VAT) only £6.06

(Includes delivery — excludes VAT)
PRINTERS FROM NEWBURY LABS
Special introductory offer — Free box of 9.5 inch by 11 inch stationary with every Newbury Printer purchased (Ltd period only).

INTRODUCING . . . the 1550 and the 8510 low cost printers that have just about everything as standard. Print speed of 125 cps with serial/parallel interface and includes a 6ft table.
8510 (11" track) only £480.00
1550 (15" track) only £650.00

For full details of our producr please ring Clavering 079985-617

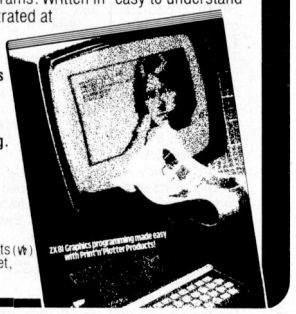
CDP Consultants Limited

MICROMART

"ZX GRAPHICS PROGRAMMING MADE EASY"

Full Colour A4 Manual, 24 pages packed with ZX Graphics Programming techniques and ideas for games and 'serious' Programs. Written in 'easy to understand' language and illustrated at every stage.

Ideas include:
Information Graphics
Sketch Pads.
Saving your 'Art'.
Making serious programs interesting.
Graphics Stringing.
ZX Printer Graphics



£1·50
(INCLUDING U.K. POSTAGE)
Print 'n' Plotter Products (W)
19 Borough High Street,
London SE1 9SE.

CAMEL MICROS
4 Penmaye Villas, Wadebridge, Cornwall.
Tel: (03057 70092)
TRS 80
software supplies

ELECTRONIC WORKSHOP
A menu driven program for design of standard circuits, for example colpitts, square, and saw-tooth oscillators, power supplies smoothing, feed-back amplifiers, networks, phase shifters, etc. Also for thermal and shot noise and other commonly used calculations.
16k level 2 tape. Price £6.90
Inclues VAT + postage

LOW PRICE PRINTERS
Limited number of the latest Epsom type III printers with usual warrenty at specially low prices. Centronics interface, sub and super-script, double density graphics and four different modes for quality printing.

Prices include VAT

MX 80 T3 £355
MX 80 FT3 £385
MX100 FT3 £470

Carriage £8

MAIL ORDERS TO:–
31 St Helens Road, Weymouth,
Dorset DT4 90Y.

AT LAST ! REAL COMPUTER INSURANCE.
(MARTIN BANKS PLEASE NOTE)

EQUIP VALUE UP TO	(1) ALL RISKS X/S £10	(2) BREAK-DOWN X/S £25	COMBINED (I + 2)
£1000	£12.50	£17.50	£25.00
£1500	£15.00	£37.50	£45.00
£2000	£17.50	£50.00	£60.00
£2500	£21.00	£62.50	£75.00

RATES FOR DOMESTIC AND HOBBY USE

PROFESSIONAL AND BUSINESS RATES ON APPLICATION COVERS C.P.U. *AND* PERIPHERALS.

DESIGNED FROM THE FLOOR UP FROM THE COMPUTER USER.

ALSO, PSECIAL SCHEME OBTAINABLE FROM US FOR REPAIR/COMPUTER ENGINEERS. SEND FOR DETAILS.

ALL OF THE ABOVE UNIQUE INSURANCE COVER, OBTAINABLE ONLY FROM US.

PETER DAVIES ASSOCIATES
INSURANCE PENSIONS FINANCE
29 DALTON STREET, CATHAYS, CARDIFF CF2 4HB (0222) 394277

MICROMART

HISOFT PASCAL 4
INCREDIBLE SPEED, INCREDIBLE PRICE!

Hisoft announces a new, disk-based Pascal compiler which is available for Z80 CP/M systems.*
The compiler produces Z80 object code directly, no P-codes, and this code executes faster than that produced by any other currently available micro-computer Pascal compiler.
All the major features of the Pascal language are supported including RECORDs, POiNTERs and FILEs (of CHAR).
Hisoft's policy is to continuously extend the capabilities of its software and further versions of the compiler will be supplied to purchasers of the current version at a minimal cost. Extensions to FILE handling will be available soon.
Hisoft Pascal 4 is a powerful and reliable piece of software and yet it requires a 32K system in which to run and costs:
an incredible £40
*Currently available for SUPERBRAIN, RML380Z, NASCOMs & GEMINI.
Hisoft also have available:

Hisoft Pascal 3	tape-based Pascal compiler for Nascom & SHARP MZ80K	£35
ZDEV	a Z80 Development System for GEMINI (G805 or G809) disk systems	£45
NASMON	a 4K NASCOM monitor	£25
NASGEN	assembler under NASMON	£15
NASNEM	disassembler under NASMON	£10
BAS12K	12K BASIC interpreter under NASMON	£20

All prices are fully inclusive.
Full details from:
HISOFT
60 Hallam Moor, Liden, Swindon, SN3 6LS
Tel. 0793 26616 ansaphone

MIDLANDS
COMMODORE PET SERVICE CENTRE
Phone Anne on 021-772 8181
about our:
1. *Workshop & Field Repairs*
2. *Business Software*
3. *Stationery & Supplies*

CBS CONSULTANTS
75 Watery Lane, Birmingham B9 4HW.
Telephone: 021-772 8181 (7 Lines)

PROBLEM WITH YOUR ZX81? CAN'T GET SERVICE FROM UNCLE CLIVE?
CALL THE SPECIALIST. FAST, EFFICIENT SERVICE ON ALL TYPES OF REPAIRS.
PHONE 01-703 5740 NOW.
MICRO Surgery
Available by mail. Please enclose machine together with PO/Cheque for £7.00 to include diagnosis, and return carriage, or call in 242 Old Kent Road, London SE1 5UB.

PROGRAMS

```
7060 DATA 242,162,176,76,207,179,152,160,0,145,68,76,204,255
9000 REM***** ALTERNATIVE LINES IF M.C. NOT REQUIRED **********************
9010 REM OMIT LINES 110-160, 7000-7060
9020 REM 5025 SY$="":REM NOT TO BE USED IN M.C.VERSION
9030 REM 5030 GET#LF,X$:IFX$<>CHR$(13)THENSY$=SY$+X$:GOTO5030
 READY.
```

BBC Music Player

by K Hussey

For those BBC users who are musically minded, this program will bring a little home-made melody into computing activities. It makes good use of Beebon's sound facilities although it doesn't use the 'ENVELOPE' command.

The program remembers and repeats a sequence of notes which the user enters in a notation which is almost conventional. Only single note sequences can be played (there are no chords) from a range of three octaves. A small sequence of notes can be automatically repeated which saves time when it needs to be used several times in succession.

A menu makes it easy to use and spurious notes such as Z or M are treated as pauses. It is only possible to change one note at a time and, unfortunately, no delete facility is included to deal with several notes at a time. Also lacking is the ability to store tunes on tape — perhaps some ideas could be offered on that one for future programs.

Finally, there is one small bug which should be borne in mind. Notes are entered as note and duration. If the duration is missed out or return is hit the program will reply with a continuous and rather gloomy bottom 'A' note. This is easily remedied by pressing 'escape' and using the 'change note' facility to replace the invalid input.

2k in mode 7 is the amount of memory used so Music Player would therefore run on either a model A or B.

```
   10 DIM a%(120),f%(120),m%(120),entry$(120)
   20 ON ERROR GOTO 390
   30 C$="AA#BCC#DD#EFF#GG#"
   40 D$="aa#bcc#dd#eff#gg#"
   50 E$="a'a'#b'c'c'#d'd'#e'f'f'#g'g'#"
   60 GOTO 390
   70 CLS
   80 PRINT'''TAB(4);"Press escape to return to menu."'"Enter r1-20 or R1-20 to
repeat notes"'"1 to 20 and add them to the tune."
   90 K=1:temp%=K:flag%=0
  100 PRINT,K;:INPUT N$
  110 entry$(K)=N$
  120 IF ASC(N$)=&52 OR ASC(N$)=&72 THEN PROCrpt:GOTO 100
  130 test%=ASC(MID$(N$,2,1)):IF test%<&39 THEN k%=2 ELSE k%=1
  140 m%(K)=VAL(MID$(N$,1,k%))
  150 M$=MID$(N$,1+k%,LEN(N$)-k%)
  160 l%=INSTR(C$,M$):IF l%<>0 THEN N=36:GOTO 210
  170 l%=INSTR(D$,M$):IF l%<>0 THEN N=84:GOTO 210
  180 l%=INSTR(E$,M$):IF l%<>0 THEN N=134:GOTO 240
  190 a%(K)=0:f%(K)=0:PROCtone
  200 K=K+1:temp%=K:GOTO 100
  210 a%(K)=-15:f%(K)=N+4*(l%+(l%>3)+(l%>7)+(l%>10)+(l%>14))
  220 PROCtone:IF flag%=0 THEN K=K+1:temp%=K ELSE K=temp%:flag%=0
  230 GOTO 100
  240 a%(K)=-15:f1%=l%+(l%>5)+(l%>12)+(l%>17)+(l%>24)
  250 f%(K)=N+4*(f1%/2)
  260 GOTO 220
  270 PROCplay:GOTO 390
  280 DEF PROCtone
  290 SOUND 1,a%(K),f%(K),m%(K)
  300 ENDPROC
  310 DEF PROCplay
  320 FOR q%=1 TO temp%-1
  330 SOUND 1,a%(q%),f%(q%),2*m%(q%)-1
  340 SOUND 1,0,0,1
  350 NEXT q%
  360 ENDPROC
  370 CLS:PRINT''''''''"Enter the note number of the change":INPUT K:CLS
  380 flag%=1:GOTO 100
  390 CLS:d$=CHR$(&8D):T$="MUSIC PLAYER"
  400 PRINT''TAB(8);d$;T$'TAB(8);d$;T$
  410 PRINT''"1)....Enter notes:16-Semibreve"'TAB(18);"8-Minim"'TAB(18);"4-Crotc
het"'TAB(18);"2-Quaver"'TAB(18);"1-Semiquaver"
  420 PRINT TAB(5);"For instance:4c# or 16A or 6d'#"'TAB(5);"Enter rests as 8r o
r 8R or 2r etc."
  430 PRINT'"2)....Play the phrase"'"3)....Change an entry"'"4)....Continue entr
ies"'"5)....List entries to specified point"'"6)....Leave the program"
  440 PRINT'STRING$(13,"@*@")
```

pet/vic printer.
For £79.90 (inc. VAT)
Put a ZX Printer (£59.95 from Sinclair) on your PET/VIC using the SOFTEX PRINTERBASE — costing only . . . . . £19.95 plus £1 p&p.
* *Very high-resolution graphics*
* *Full VIC/PET characters*
* *42 column printer with superb formatting facilities*
* *Use as normal PRINT/LIST syntax*
Send orders to SOFTEX COMPUTERS, 37 Wheaton Road, Bournemouth BH7 6LH
Telephone 0202 422028

COMPUTERS Bought & Sold
Contact the UK Specialist in Second user systems.
London Micro Systems
10 Victoria Crescent, London SW19
TEL: 01-947 5465.

```
450 PRINT'"Enter your choice and then RETURN"
460 INPUT choice:ON choice GOTO 70,270,370,580,630,470
470 END
480 DEFPROCrpt
490 pos%=INSTR(N$,"-")
500 r1%=VAL(MID$(N$,2,pos%-2))
510 r2%=VAL(MID$(N$,pos%+1,LEN(N$)-pos%))
520 REPEAT
530 entry$(K)=entry$(r1%)
540 m%(K)=m%(r1%):a%(K)=a%(r1%):f%(K)=f%(r1%)
550 PROCtone:K=K+1:temp%=temp%+1:r1%=r1%+1
560 UNTIL r1%=r2%+1
570 ENDPROC
580 K=temp%:CLS
590 FOR list%=K-5 TO K-1
600 PRINT list%;"?";entry$(list%)
610 NEXT list%
620 GOTO 100
630 CLS:INPUT''''''''"Listing required from note:"n1%
640 INPUT"to note:"n2%
650 FOR list%=n1% TO n2%
660 PRINT list%;"?";entry$(list%)
670 NEXT list%
680 K=n2%+1:GOTO 100
```

PET Virus

By Allan and Sue Vining

To carry on the tradition of finding and publishing programs with dubious themes and/or titles, here is a game called 'Virus', which will run on any PET in roughly 2k of RAM. I don't think readers will catch anything playing it, but it will certainly provide much in the way of entertainment. The idea is to control an antibody and trap viruses with it. Full instructions are in the program.

```
1 PRINT" CLS "
2 PRINT"                  VIRUS"
3 PRINT"                  ─────"
4 PRINT:PRINT"YOU CONTOL AN ANTIBODY (O) THAT MUST"
5 PRINT"TRAP A VIRUS. YOU START OFF WITH ONE AND"
6 PRINT"AS YOU ELIMINATE THEM THE STRAIN GROWS.
7 PRINT"CONTROLS ARE 8 UP  2DOWN  4LEFT  6RIGHT"
8 PRINT"       RVS PRESS SPACE TO START"
9 GETA$:IFA$=""THEN9
13 POKE59467,16:POKE59466,80:POKE59464,0:M=59464
14 M(4)=190:M(3)=205:M(2)=230:M(1)=255
15 N=N+1:IFN=5THEN720
16 PRINT"CLS":POKEM,0
17 Z=33268:Y(1)=32975:Y(2)=33404:Y(3)=32948:Y(4)=33330
18 FORI=1TO4:B(I)=INT(RND(1)*4+1):NEXT
19 B=40:C=1:D=32:X=INT(RND(1)*4+1)
20 IFX=1THENX=B
21 IFX=2THENX=-B
22 IFX=3THENX=C
23 IFX=4THENX=-C
24 PRINT"xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx"
30 FORI=1TO20:PRINT"x                                    x":NEXT
50 PRINT"xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx"
100 GETA:POKEM,178:IFA=0THEN200
120 ONAGOTO200,130,200,140,200,150,200,160
130 X=B:GOTO200
140 X=-C:GOTO200
150 X=C:GOTO200
160 X=-B
200 Z=Z+X
210 IFPEEK(Z)<>32THENGOTO700
220 POKEZ,81
225 FORT=1TON:IFB(T)=0THENU=U+1:NEXT
226 IFU=NTHENU=0:GOTO15
227 U=0
230 FORT=1TON:IFB(T)<>0THENGOSUB300
240 NEXT
250 GOTO100
300 POKEM,M(T)
305 IFPEEK(Y(T))=DTHEN500
310 ONTGOTO320,330,350,380
320 ONB(T)GOTO385,390,395,400
330 ONB(T)GOTO385,400,395,390
350 ONB(T)GOTO390,400,385,395
380 ONB(T)GOTO400,385,390,395
385 G=B:GOTO500
390 G=-C:GOTO500
395 G=-B:GOTO500
```


PRE PREST PRESTEL ESTEL TEL L

Calling all hobbyists, schools, software houses and budding programmers!

We would like to hear from program writers who would like to see their work published on Prestel for everyone to use. We'd like programs for most micros—Apple, BBC, Commodore, Tandy, Sinclair — to be included in our database, 'Aladdin's Cave.

If you are interested then please contact us at: Aladdin's Cave, Prestel Headquarters, Telephone House, Temple Ave, London EC4Y OHL.

Prestel and the Prestel symbol are trademarks of British Telecommunications.

MICROMART

EPSON TYPE 3 PRINTERS

Epson's superb Type 3 series replaces the Type 2 and offers:

* IMPROVED PERFORMANCE
* MANY NEW FEATURES
* LOWER PRICES

For free brochure and special Epson offer write, stating your computer, to:

Datatech Ltd, Dept PCW, FREEPOST, Altrincham, Cheshire, WA15 0BR

PROTEK **HP DESKTOP SPECIALISTS**

- High density **Memory** for HP9845 and HP9826
- 5MByte **Winchester discs** for HP Series 80, 125, 250, 1000L, 9826/36 and HP9845

Low cost-Immediate delivery

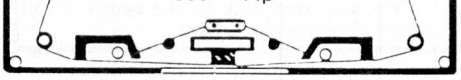
- Utility Software
- Security Systems
- Language enhancements
- Software Consultancy

22 Sussex Street, London SW1V 4RW
Tel: 01-834 3602

COMPUTER CASSETTES

High quality, screw assembled cassettes with library boxes. Any lengths available.

C5 — 35p C10 — 37p C12 — 38p
C15 — 39p C20 — 41p C25 — 45p
C30 — 44p



PRICES plus P. & P. (10% or min. £1-50)

SUBSTANTIAL TRADE DISCOUNTS

data-assette ®

Dept. PCW6
44 SHROTON STREET
LONDON NW1 6UG.
Tel: 01-258 0409

PLEASE NOTE NEW NUMBER TO ADVERTISE IN MICROMART RING JAN MARTIN ON 01-636-6890 ALL CORRESPONDANCE TO . PCW, EVELYN HOUSE 62 OXFORD STREET LONDON W1

MICROMART

Mid-season Clearance Sale

We currently have available the following items at greatly reduced prices:

ROSTRONICS Z Plus System 1 Computer, CPM, Twin 8" Drives, IBM Format and Double Density, S100 BUS, 15" Screen **£3,500.00**

QUME Sprint 5/55 Daisywheel Printer with Service Contract **£1,400.00**

LUXOR Colour Monitor **£250.00**

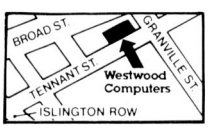
12" AMDEK Monitors. Green or Black and White **£99.00**

9" Black and White Monitors **£75.00**

All prices are exclusive of VAT.
This is a limited offer open while stocks last.
For further information telephone today. Or call in.

Westwood Computers

Westwood Computers Limited,
117-118, Tennant Street,
Five Ways,
Birmingham B15 1EY.
Tel (021) 632 5824.



VETS FOR PETS

Anita Electronic Services (London) Ltd. are specialists in the repair and service of Commodore Pets.
We offer a fast on-site service, or alternatively repairs can be carried out at our workshops should you wish to bring in your Pet.
Pet maintenance contracts are available at very competitive prices. Trade inquiries welcomed.

For further information, tel or write to:

John Meade
Anita Electronic Services
15 Clerkenwell Close, London EC1
01-253 2444

We also specialise in the repair of all makes of office equipment.

CRYSTAL RESEARCH LTD

FOR YOUR SHARP MZ80K CP/M 2.21 (XTAL)
BASIC CP/M FACILITIES INCLUDE:
• Dynamic file management • General purpose editor
• Fast assembler • Advanced debugging utility

YOUR SHARP CP/M 2.21 (XTAL) PACKAGE INCLUDES
• Hardware modification (if fitted by a SHARP dealer does NOT break the guarantee) • SHARP CP/M 2.21 (latest version) on disc • XTAL Monitor and Operating System • 7 Digital Research manuals • 12 months guarantee and up-dates (on all our products)

CP/M 2.21 (XTAL) FROM £150 + VAT
Ask your SHARP dealer for further details or contact
CRYSTAL RESEARCH LTD CP/M SOFTWARE HOUSES - XTAL CAN HELP YOU ESTABLISH YOUR SOFTWARE ON THE SHARP

XTAL BASIC (SHARP) for MZ80 (A, B & K)

Takes 5K less memory, has all the features of SHARP BASIC PLUS Multi dim strings, error trapping, logical operators, machine code monitor, more flexible peripheral handling, improved screen control, increased list control, auto run, if...then...else - and it doesn't stop there - it grows. You can extend the commands and functions at will - 10K, 12K, 16K, BASIC? SHARP TO XTAL BASIC conversion program is included. **£40 plus VAT.**

Bi-directional serial board for your SHARP RS232 compatible <150 Baud to >2400 Baud adjustable. 5,6,7,8 Bit words, plugs into MZ801/0 **£99.50 plus VAT.** Includes software for bi-directional use in XTAL BASIC software for using SHARP BASIC with serial printer and self-diagnostic software for testing Baud rate etc.

Open 0930-1200 1300-1730 except Saturday & Sunday
40 Magdalene Road, Torquay, Devon, England
Tel: 0803 22699 0803 27890
Access and Barclaycard
XTAL BASIC

PROGRAMS

```
400 G=C
500 Y(T)=Y(T)+G
510 IFPEEK(Y(T))<>D THENY(T)=Y(T)-G:B(T)=B(T)+1:IFB(T)=5THENB(T)=1:GOTO310
515 W=Y(T)
516 IFPEEK(W-B)<>DANDPEEK(W+B)<>DANDPEEK(W-C)<>DANDPEEK(W+C)<>DTHENGOSUB600
520 POKEM,0:POKEY(T),87:RETURN
600 B(T)=0:RETURN
700 FORI=1TO3:FORJ=80TO120:POKEM,J:NEXT:NEXT:FORI=50TO255:POKEM,I:NEXT
705 POKEM,0:PRINT"CLS 12CDOWN 11CRIGHTYOU CRASHED":FORQ=1TO1000:NEXT:RUN13
720 POKEM,0:PRINT"CLS 12CDOWN 14CRIGHTYOU WIN"
READY.
```

BBC Radar

by Stephen Smith and Matthew Jones

This games is laid out as a two-part program, the instructions being effectively a separate routine. This is necessary because of the memory used by BBC hi-res graphics. Level of play is passed from part one to part two.

Radar makes good use of 'ENVELOPE' and of colour and graphics. It will run on model A or B. Multiple line statements are used to save RAM and the listing looks, therefore, rather untidy. Radar is a game of quick thinking rather than reaction (which makes a change from the 'zap the zombies' type of real-time game). Rules for play can be read from the listing of part one.

Part 1

```
 5 TIME=0
 10REM          'RADAR'
 20REM
 30REM         written by
 40REM    MATTHEW 'BLACK' JONES
 50REM           and
 60REM STEPHEN 'I LOVE TRACY' SMITH
 90MODE7
 100PRINTTAB(15,2)"RADAR"
 105PRINT
 110PRINT"The game is played by displaying a radarscreen  with a sweeping arm,
which, whenit passes a ship  tells you the  bearingof that ship  and  indicates
it  on  thescreen.";
 120PRINT" A ping also indicates this."
 130PRINT"There are ten ships, only six  of  which appear at any one time. As y
ou hit the first four ships they are thus replaced."
 140PROCKEY:CLS:PRINT:PRINT
 150PRINT"To shoot at a ship press the 'S' key.   You cannot fire at a ship  be
fore the   radar has made one complete sweep.";
 160PRINT"The   computer will then ask you for the      bearing of the ship you
 wish to fire at,which was originally displayed on the   screen.";
 170PRINT" The computer will then tell you how far away the ship is, Either:-"
 180PRINT"     Very close,"
 190PRINT"     Near,"
 200PRINT"     Midrange,"
 210PRINT"     Far away,"
 220PRINT"     Very far away."
 230PROCKEY:CLS:PRINT:PRINT
 240PRINT"   You the have four goes at that ship. Each time you enter the angle
 of eleva- tion you want to fire at.";
 250PRINT"After each shotyour on  board computer  tells you how  close your  sh
ot was to the enemy ship, using the same scale as for the ranges."
 260PRINT"  The game finishes when all  ten ships have been sunk, or, until you
 have been sunk yourself."
 270PROCKEY:CLS:PRINT:PRINT
 280PRINT"The chances of you being hit are relatedto time, the greater  the tim
e  taken,  the greater the chance of you being hit;until eventually you run out
of time.   This time  is related  to the level  of play."
 290PRINT"  The level  of play  also affects  the accuracy required for your sh
ots."
 300PROCKEY:CLS:PRINT:PRINT
 310PRINT" What level of play do you wish to play at"
 320PRINT:PRINT"(Input a number between 1 & 5,level 1 is the hardest,5 is easie
st)"
 330A$=CHR$(11):PRINTA$;A$;A$;A$;
 340PRINTCHR$(9);CHR$(9);:INPUTL%:IFL%<1 OR L%>5 THENPRINTCHR$(30);CHR$(10);CHR
$(10);CHR$(10);:GOTO340
 350ENVELOPE1,1,0,0,0,0,0,0,126,-15,-1,60,126,100
 360ENVELOPE2,10,0,0,0,0,0,0,34,10,-20,-26,100,126
 370ENVELOPE3,3,1,1,1,10,10,10,126,0,0,-128,126,126:FORN=1 TO (TIME/100):AA=RND
(178):NEXT
 380ENVELOPE4,4,0,0,0,0,0,0,126,-5,-3,-1,126,110
 390CLS:PRINT:PRINT:PRINT"Now press the play button on your cassette":PROCKEY:C
HAIN""
 1000DEFPROCKEY:LOCALA$:PRINT:PRINT" PRESS ANY KEY WHEN READY.":REPEAT:UNTILINKE
Y$(0)="":A$=GET$:ENDPROC
```

QUODLIBET
ATOM BBC

New software and hardware
Program generators
Games
Utilities

For introductory cassette and catalogue send £1 (state which machine) to:

Quadlibet
2 Victoria Road
Dorchester
Dorset
DT1 1LS

ZX81 FLEXI SCREEN SUPERSCROLL

These two amazing machine code routines, called by USR, will greatly improve your display by allowing you to selectively process any area of screen — INSTANTLY!
Firstly, DEFINE WINDOW, which may range from any single Print position to the whole of the screen. Then, to process ONLY within your defined window, SELECT OPTION.
FLEXISCREEN allows you to work within your window on only the character set (ignoring graphics/spaces) or on everything and enables you to:—
* REVERSE — turns any character to its opposite video
* NORMAL — turns any inverse video into normal video
* INVERSE — turns any normal video into inverse video
* EDIT — remove or replace any character
This allows a total of eight options.
SUPERSCROLL allows you to scroll, up or down, ONLY the text within your defined window and can set the print position at the start of the blank line.
FLEXISCREEN and **SUPERSCROLL** are mutually compatible i.e. work within the same window or may be used independently. Absolute simplicity in use and a MUST for any ZX81 user (> 3½ RAM). Think of the possibilities — flash words/areas of screen, prompts highlights, games, scroll columns, underscroll headings etc. etc.
1K FLEXISCREEN — Don't be left out 1K owners! the 1K version allows all of the facilities of its big brother except the defined window and the 'all character' clear, i.e. seven options.
FLEXISCREEN and **SUPERSCROLL** — £3.75 both, £6.50 both.
1K FLEXISCREEN — £2.50

AUTOREM — a machine code program for machine code programs. Enter the number of spaces needed in your M/C REM and AUTO REM creates the zeros instantly. Works with any size memory — £3.75."

Make cheques/p.o.s payable to:— J. Towers, 381a Foxhill Road, Sheffield S6 1BG

PROGRAMS

Part 2

```
  10TIME=0:T=0:AR=10:DIMAR(10,2):FORI=1TO10:AR(I,1)=100+RND(900):AR(I,2)=RND(178
)*2:NEXT
  20FORII=1TO4:AR(II,2)=AR(II,2)+400:NEXT:X1=550:Y1=625:VDU23,228,129,12,60,255
,126,60,0,129:MODE5:IFL%=0THENL=1ELSEL=L%
  30COLOUR130:VDU19,130,2,0,0,0:CLS:COLOUR3:PRINTTAB(1,31)"PRESS 'S' TO SHOOT":
PLOT4,X1,Y1
  40FORI=0TO359STEP2:REPEAT:UNTIL INKEY$(0)="":X=FNsin(I):Y=FNcos(I):PLOT1,X,Y:
MOVEX1,Y1:X=FNsin(I-1):Y=FNcos(I-1):IF I<180 PLOT83,X,Y+5:PLOT4,X1,Y1 ELSE PLOT8
3,X,Y-5:PLOT4,X1,Y1
  50FORD=1TO10:IFI=AR(D,2)THENGOSUB220
  60NEXT:IFINKEY$(10)="S" THEN90
  70IF TIME>12000*L+6000THENX=-1:GOTO230
  80AA=RND(TIME):IF AA>24000 AND AA<(24000+(TIME/500))THENX=-1:GOTO230ELSE NEXT
:GOTO40
  90IFTIME<6390THENPRINTTAB(1,26)"NOT READY YET SIR.":SOUND0,-15,66,70:GOTO80
 100SOUND1,3,105,108:G=0:VDU28,0,31,19,26:VDU19,3,0,0,0,0:COLOUR3:CLS:PRINT" SE
LECT BEARING OF   TARGET (1-360°)";:INPUTA:U=1:A=A-1:IFA<0ORA>359THEN90
 110Z=FNshipdist(A):IFZ=-1THENCLS:PRINT"THERE IS NO SHIP AT THAT ANGLE.":PROCpa
use:GOTO210
 120PROChint(U,A):PROCpause:A1=(ACS(Z/1500))*180/PI
 130CLS:PRINT" WHAT ELEVATION DO  YOU WISH TO FIRE AT (1-89)";
 140INPUTE:IF E<1ORE>89THEN130ELSEIFE<45THENE=90-E
 150SOUND0,1,5,18:T=1500*COS(E/180*PI):IF(Z+(10*L))>T AND(Z-(10*L))<T THENCLS:S
OUND0,2,5,50:PRINT"YOUV'E HIT THE ENEMY SHIP!!":VDU26:COLOUR0:PROCship(A,230):GO
TO170
 160U=2:Q=20*ABS(A1-E):PROChint(U,Q):PROCpause:G=G+1:IFG>3THEN210ELSE130
 170FORN=1TO10:IFAR(N,2)=A OR AR(N,2)=A+1OR AR(N,2)=A-1THEN AR(N,2)=-9:N=11
 180NEXT:AR=AR-1:IFAR=0THENX=1:GOTO230
 190FORI=1TO10:IFAR(II,2)>360THENAR(II,2)=AR(II,2)-400:II=11
 200NEXT
 210VDU26:VDU19,3,7,0,0,0:COLOUR3:PLOT4,X1,Y1:GOTO80
 220VDU19,1,15,0,0,0:COLOUR1:PROCship(I,228):VDU19,130,2,0,0,0:COLOUR130:SOUND2
,4,150,25:PRINTTAB(0,26)"   SHIP AT ";I+1;"°                    ":D=11:RETURN
 230CLS:IFX=1THENPRINTTAB(5,8)"YOU WON!":L%=L%-1ELSE PRINTTAB(5,8)"YOU LOST!"L%
=L%+1
 240PRINT" ANY KEY TO REPLAY":A$=GET$:RUN
 250DEFPROCship(F,B):LOCALI,T,H:I=F/180*PI:IFF>20THENT=-SGN(COS(I))ELSET=0
 260IFF>179AND F<285 H=-2:T=2ELSEH=0
 270PRINTTAB(T+8+(3*SIN(I)),12-H-(3*COS(I)));CHR$(B):ENDPROC
 280DEFFNshipdist(A):LOCALI,Z:FORI=1TO10:IF AR(I,2)=A OR AR(I,2)=A+1OR AR(I,2)=
A-1 Z=AR(I,1):I=11ELSEZ=-1
 290NEXT:=Z
 300DEFPROChint(U,Q):CLS:IFU=1THENPRINT"THE SHIP IS ";:Q=Z ELSEPRINT"YOUR SHOT
IS ";
 310O=INT(Q/200):ONO+1GOTO360,330,340,350,320
 320PRINT"VERY FAR AWAY":ENDPROC
 330PRINT"NEAR":ENDPROC
 340PRINT"MIDRANGE":ENDPROC
 350PRINT"FAR AWAY":ENDPROC
 360PRINT"VERY CLOSE":ENDPROC
 370DEFPROCpause:LOCALI:FORI=1TO5000:NEXT:ENDPROC
 380DEFFNsin(I):LOCALX:X=300*SIN(I/180*PI):=X
 390DEFFNcos(I):LOCALY:Y=270*COS(I/180*PI):=Y
```

PET German Game

by Jeff Aughton

This is a board game for the 8k 'new ROM' PET. It's called 'the German Game' because it was discovered in a toy shop in Germany and the real name (which was probably very long) has subsequently been forgotten. It's a computer-player rather than a two-player game and the object is to surround your opponent's piece. The program includes full instructions.

```
 100 REM ** THE GERMAN GAME **
 110 REM * BY J.AUGHTON 4/82 *
 120 REM
 130 POKE53,31:B=826:P=7937
 140 READX:IFX<0THEN160
 150 POKEP,X:P=P+1:GOTO140
 160 REM
 500 REM SET UP STRINGS ETC.
 510 REM
 520 B$="                    "
 530 C$="▝▜▄▄▄
```

MICROMART

RAM BARGAINS

4116 — 200ns.	80p each.
100+	68p each.
4116 — 250ns.	70p each.
100+	55p each.
2114 low power	85p each.
100+	75p each.
2114 — 450ns.	80p each.
100+	70p each.
2114 low power 300ns.	95p each.
100+	83p each.
4816 — 100ns. (BBC RAM)	£3.20 each
4164 — 200ns.	£4.50 each
6116 — 150ns.	£4.40 each
2716 — 5v — 450ns.	£2.40 each.
2716 — 450ns. (unwashed)	£1.80 each
2732.	£3.95 each.
2532.	£4.30 each.
2764 — 450ns.	£9.00 each

Other IC's available.
Add 50p P & P and VAT at 15%.

ATHANA FLOPPIES

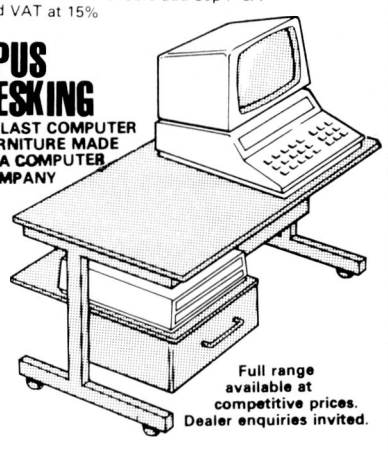
Minis with free plastic library case and hub rings.

S/S S/D.	£17.95 for 10.
S/S D/D.	£19.95 for 10.
D/S D/D.	£23.50 for 10.
S/S 77 TRACK.	£26.50 for 10.
8" Discs.	
S/S S/D	£15.50 for 10.
S/S D/D.	£24.50 for 10.
D/S D/D	£25.50 for 10.

All other discs available add 85p P & P and VAT at 15%

OPUS DESKING

AT LAST COMPUTER FURNITURE MADE BY A COMPUTER COMPANY



Full range available at competitive prices. Dealer enquiries invited.

24-HOUR TELEPHONE SERVICE
FOR CREDIT CARD USERS
QUANTITY DISCOUNTS AVAILABLE —
OFFICIAL ORDERS WELCOME

OPUS SUPPLIES

Access

10 BECKENHAM GROVE,
SHORTLANDS, KENT.
01-464 5040

VISA

PET PET PET PET PET PET

**** HI-RESOLUTION GRAPHICS ****

A high resolution graphics board that gives a 64,000 dot (320 x 200) resolution. Versions available for any dynamic ram Pet. BASIC 2,3,4. FAT40 & 80 columns. No soldering or track cutting required, supplied complete with fast GRAPHIX software in ROM and full fitting & operating instructions.
£149.00

**** SUPER ROM-SELECTOR ****

A high quality printed circuit board giving 64K of utility ROM space, software selectable!!! Allows 16 x 4K ROMs/EPROMs to reside in the expansion area of your PET. One 'POKE' enables any two ROMs at a time. Suitable for bank-switched software.
£75.00

**** PET UPGRADES ****

WHILE-U-WAIT service! (Dynamic ram pets only.)

Memory expansion:- 8K - 32K.	£59.90
16K - 32K. from	£48.70
8K - 16K.	£38.26
40 column (12" VDU only) to 80 column conversion.	
40 to 80 column	£89.00
40 to 80 column switchable (two machines in one!)	£105.00

Full keyboard functions:- i.e. TAB,ESC,REPEAT,SCROLL up/down, define WINDOW, lower case/graphics mode & DELETE from/tocursor. All available in direct or program mode.

**** REPAIRS AND SERVICING ****

Fast and efficient repairs to all Commodore computers at reasonable prices. WHILE-U-WAIT service whenever possible.

Please add VAT to the prices shown at the current rate.

Telephone Mick Bignell for more details at:-

MICROSERVE
7 Clydesdale Close,
Borehamwood, Herts. WD6 2SD.
Tel: 01-953-8385

PROGRAMS

```
580 Z$="   ■■■   "
600 FORP=BTOB+175
610 POKEP,9:NEXT
620 P=-1:GOSUB8000
1000 REM
1010 REM MAIN LOOP
1020 REM
1030 PRINT"■■DO YOU WANT TO START (Y/N)";
1040 INPUT"■■*■■■■";A$
1050 IFA$<>"Y"ANDA$<>"N"THEN1030
1060 C=-(A$="N")
1140 GOSUB5000
1150 FORI=2TO7:FORJ=2TO8
1160 POKEB+I+16*J,0
1170 NEXTJ,I
1200 X1=5:Y1=2:X=X1:Y=Y1
1210 P=1:A$=C$
1220 GOSUB7700
1230 X2=4:Y2=8:X=X2:Y=Y2
1240 P=2:A$=H$
1250 GOSUB7700
1260 IFCTHEN3000
1270 REM
2000 REM HUMAN MOVE
2010 REM
2020 GOSUB7200
2030 PRINT"■IT'S YOUR MOVE"
2040 GOSUB7300
2100 IFABS(X-X2)<=1ANDABS(Y-Y2)<=1THEN2170
2110 GOSUB7500
2120 PRINT"■YOU ARE TRYING"
2130 PRINT"■■■TO MOVE TOO FAR"
2140 PRINT"■■■■■■■TRY AGAIN!"
2150 GOSUB7600:GOTO2000
2170 IFPEEK(B+X+16*Y)=0THEN2240
2180 GOSUB7500
2190 PRINT"■THAT SQUARE IS"
2200 PRINT"■■■ALREADY OCCUPIED"
2210 PRINT"■■■■■■■TRY ANOTHER!"
2220 GOSUB7600:GOTO2000
2240 REM IT'S O.K.-HI TRISHA!!
2250 X3=X:Y3=Y:X=X2:Y=Y2
2260 P=0:A$=Z$
2270 GOSUB7700
2280 X2=X3:Y2=Y3:X=X2:Y=Y2
2290 P=2:A$=H$
2300 GOSUB7700
2310 GOSUB7200
2320 PRINT"■NOW PLACE A"
2330 PRINT"■■■NEUTRAL PIECE-"
2340 GOSUB7300
2350 IFPEEK(B+X+16*Y)=0THEN2420
2360 GOSUB7500
2370 PRINT"■YOU CAN'T MOVE"
2380 PRINT"■■■THERE - IT'S"
2390 PRINT"■■■ALREADY TAKEN"
2400 GOSUB7600:GOTO2310
2420 REM IT'S O.K.
2430 P=9:A$=N$
2440 GOSUB7700
2450 C=C+1
```


ZX81 (16k) SPECTRUM STARTREK

Features an 8x8 Galaxy, Klingons and Starbases, short and long range scans, torpedoes and phasers, computer etc. PLUS normal or hyperdrive: choose your speed but watch the energy level. Galaxy Map: keep track of where you have been and whether there are any Starbases or Klingons there. Visual display of Enterprise's position and movement, and of the path of torpedoes. Messages from crew members. A user friendly long range scan. Five levels of play. And much more. Cassette with full instructions.

ZX81 £4.95
SPECTRUM £5.95 (Colour and sound too)

Gemini Software
36 Badminton Road
LEICESTER LE4 7RQ
Tel: 0533 64915

ATOM 12K SOFTWARE

TEST MATCH: *Based on one-day international rules, a highly entertaining game involving all the emotions of the game of cricket.*

ANAGRAM: *Solve your anagrams the easy way using this unique programme. Handles words of 3,4,5, or 6 letters.*

Full instructions with each tape. Prices include p/p (no VAT). Recorded on high quality tapes and sent first class post. We pay 30% rayalties on all tapes published — confidential service.

Heather Software
55 Glan-Y-Mor Road, Penrhyn Bay,
Llandudno, Gwynedd

PROGRAMS

```
2460 REM
3000 REM COMPUTER MOVE
3010 REM
3020 GOSUB7200:MA=0:K=0
3030 PRINT"■IT'S MY TURN -"
3040 PRINT"■■■ LET ME SEE..."
3045 IFC<2THENGOSUB7100:GOTO3150
3050 FORI=X1-1TOX1+1:FORJ=Y1-1TOY1+1
3060 IFPEEK(B+I+16*J)=0THENGOSUB6000
3080 NEXTJ,I
3085 IFMATHEN3150
3090 IFKTHENGOSUB7000:GOTO3150
3100 GOSUB7600:GOSUB7200
3110 PRINT"■I CAN'T MOVE"
3120 PRINT"■■■■■YOU WIN"
3125 PRINT"■■■■IN";C;"MOVES"
3130 GOSUB7600:GOSUB7600
3140 GOTO4500
3150 REM I CAN MOVE
3160 GOSUB7200
3170 PRINT"■I WILL MOVE TO"
3180 PRINT"■■■■■■■■■■";CHR$(X3+63);Y3-1
3190 X=X1:Y=Y1
3200 P=0:A$=Z$
3210 GOSUB7700
3220 X1=X3:Y1=Y3:X=X1:Y=Y1
3230 P=1:A$=C$
3240 GOSUB7700:GOSUB7600
3250 GOSUB7200
3260 PRINT"■I WILL PLACE A"
3270 PRINT"■■■PIECE AT :"
3280 X=X4:Y=Y4
3290 PRINT"■■■■■■■■■■";CHR$(X+63);Y-1
3300 P=9:A$=N$
3310 GOSUB7700:GOSUB7600
3320 FORI=X2-1TOX2+1:FORJ=Y2-1TOY2+1
3330 IFPEEK(B+I+16*J)=0THENC=C+1:GOTO2000
3340 NEXTJ,I
3350 REM YOU LOSE
3360 GOSUB7200
3370 PRINT"■YOU CAN'T MOVE"
3380 PRINT"■■■■■■I WIN!!"
3385 PRINT"■■■■IN";C;"MOVES"
3390 REM
4000 REM GAME OVER
4010 GOSUB7600:GOSUB7600
4020 PRINT"■■■I WAS OBVIOUSLY TOO GOOD FOR YOU!!"
4030 PRINT"■■DO YOU WANT YOUR REVENGE(Y/N)?";
4040 GOTO4530
4500 REM YOU WIN (FLUKE!)
4510 PRINT"■■■AMAZINGLY,YOU WON-BUT I WASN'T TRYING!"
4520 PRINT"■CAN I HAVE ANOTHER CHANCE(Y/N)?";
4530 GETA$:IFA$="Y"THEN1000
4550 IFA$<>"N"THEN4530
4600 PRINT"■■":END
4700 REM THAT'S ALL FOLKS!!
4780 REM
5000 REM DRAW BOARD
5010 REM
5020 PRINT"■"SPC(21)"A  B  C  D  E  F"
5030 PRINT"■ THE GERMAN GAME          "
5040 FORI=1TO6
```


MICROMART

ZX81 16K

ZX-MC

ELIMINATE MACHINE CODE PROBLEMS with ZX-MC. (M/C debug/monitor)
ENTER, RUN & DEBUG machine code independently of Basic. With ZX-MC loaded you have 12½K of RAM to work with.
SAVE & LOAD your machine code programs **AT DOUBLE SPEED.** At last you are freed from storing M/C in arrays or REM lines.
REGISTERS DISPLAY & BREAKPOINTS to make de-bugging easier. PLUS many more useful commands.
A MUST FOR BEGINNERS & ADVANCED USERS – concentrate on your M/C programs, not on how and where to stop them.
ZX-MC is supplied on a high quality cassette, with a 36 page operating manual.

£7.50 Incl. VAT & P+P (CWO)

SCREEN KIT1

A suite of M/C routines for use in Basic programs, to enhance your screen display, and create DATA FILES on cassette.
DATA FILES – Save & Load, at double speed, just the Basic variables. Load different variables into your program, or swap data between programs.

- •DRAW A BORDER
- •KEYBOARD SCAN + FLASHING CURSOR
- •CLEAR PART OF SCREEN
- •LOAD ANY CHARACTER TO WHOLE SCREEN
- •INVERT VIDEO OR PART OF SCREEN
- •MEMORY LEFT
- •CLEAR SCREEN BY SCROLLING UP, DOWN, LEFT OR RIGHT

Supplied on cassette with instructions. £5.70 Incl. VAT & P+P (CWO)

PICTURESQUE
6 Corkscrew Hill, West Wickham, Kent BR4 9BB

Programs available mail order only. Please make cheques/PO payable to:
Send SAE for more details
Allow up to 14 days delivery.

SUPERSOFT

SWEET SIXTEEN!
Turn two ROM sockets into SIXTEEN with the latest expansion board from SUPERSOFT. Suitable for all PET/CBM models, the SUPER PAGER enables you to select any one chip from eight sharing he UD12 (or UD3) socket, and one from eight sharing the UD11 (or UD4) socket: Because the SUPER PAGER is software slectable (with a simple POKE command) you can switch from within a program. May be used with the SUPERSOFT range of graphics boards. At just £75 plus VAT the SUPER PAGER is a long-term solution to a perpetual problem!

DO-IT-YOURSELF
With the EP.1 you could program your own 2k and 4k EPROMs to fit into your spare ROM sockets (or your SUPER PAGE board!). It plugs directly onto the User Port and Cassette Port leaving the IEEE free, and is supplied with machine code software which includes the SUPER-MON extended monitor. Price £75 plus VAT.

*** SPECIAL OFFER *** BUY A SUPER PAGER AND AN EP.1 AND WE'LL SUPPLY A 4K EPROM CONTAINING THE EP.1 SOFTWARE AT NO EXTRA CHARGE.

PET/CBM GAMES
There is a ligher side to our range. At £8 we've got COSMIC ALIENS, ASTEROIDS, METEORITES, SPACE DEBRIS, SPACE RESCUE, SUPER GLOOPER and TANKS – all in fast machine code with sound. Adventure games for 32k machines include HITCH-HIKERS GUIDE and CRACKS OF DOOM at £16; other top selling games are PET CHESS (£25), HALLS OF DEATH (£14), and OTHELLO (£8). Add VAT to all these prices – and ask for our free catalogue when you order.

Winchester House, Canning Rd, Wealdstone, Harrow, Middlesex HA3 7SJ, England
Telephone: 01-861 1166

pet set 1 plus £ | pet set 2 plus £ | greek alphabet math set | electronic symbols and games set
french set | german set | russian set | hebrew set
apl set | medium density plotting set | printer matching sets | BBC RM380Z teletext keymatch set

4 DIFFERENT SETS OF CHARACTERS ON SCREEN TOGETHER
FOR 2-3-4-8000 PET/CBM COMPUTERS
ALPHA PLUS
Avon Computer Rentals
FREEPOST 23 THORNBURY BRISTOL BS12 1BR
TELEPHONE (0454) 415460

micro cover

The wait has been well worth while - it's a superb machine

the BBC MICRO

now protect it with an equally well designed, quality, polyester/cotton

-hand made
-perfect fit
-washable
-matching fawn colour

micro cover only £3.25 inclusive.

"micro cover" 2 Boston Close,Culcheth, Warrington,Cheshire. WA3 4LW

Come and see us at the PCW Show Stand 320A. Try out our wide range of very competetive software for the Commodore Pet (all models) or allow us to quote for a specialist system for any microcomputer.

Electronic Aids (Tewkesbury) Ltd

Mythe Crest, The Mythe, Tewkesbury, Glos., GL20 6EB
Tel: 0386 831020/ 0684 294003

PROGRAMS

```
5050 PRINTSPC(20)V$
5060 PRINTSPC(17)I;V$
5070 PRINTSPC(20)"├──┼──┼──┼──┼──┼──┤"
5080 NEXT
5090 PRINTSPC(20)V$
5100 PRINTSPC(17)I;V$
5110 PRINTSPC(20)"└──┴──┴──┴──┴──┴──┘"
5120 PRINTLEFT$(D$,17);"  MY  PIECE:"
5130 PRINTD$;" YOUR PIECE:"
5140 A$=C$:A=14:D=16:GOSUB7800
5150 A$=H$:D=22:GOSUB7800
5160 RETURN
5990 REM
6000 REM WISE MOVES
6010 REM
6020 POKEB+I+16*J,1
6025 POKEB+X1+16*Y1,0
6030 FORK=X2-2TOX2+2:FORL=Y2-2TOY2+2
6040 IFPEEK(B+K+16*L)THEN6300
6050 POKEB+K+16*L,9
6060 X=I:Y=J:GOSUB7920
6070 E=M+1
6075 X=X2:Y=Y2:GOSUB7920
6080 E=E/(M+1)
6090 IFE<MATHEN6200
6100 MA=E:X3=I:Y3=J:X4=K:Y4=L
6200 POKEB+K+16*L,0
6300 NEXTL,K
6310 POKEB+I+16*J,0
6315 POKEB+X1+16*Y1,1
6320 RETURN
6330 REM
6500 REM ASSORTED SUBROUTINES
6510 REM
7000 REM RANDOM MOVE(1)
7010 REM
7020 FORX3=X1-1TOX1+1:FORY3=Y1-1TOY1+1
7030 IFPEEK(B+X3+16*Y3)=0THEN7050
7040 NEXTY3,X3
7050 FORX4=2TO7:FORY4=2TO8
7060 IFPEEK(B+X4+16*Y4)=0THEN7080
7070 NEXTY4,X4
7080 RETURN
7090 REM
7100 REM RANDOM MOVE(2)
7110 REM
7120 X3=X1-2+INT(3*RND(1)+1):Y3=Y1+1
7130 IFPEEK(B+X3+16*Y3)THEN7120
7140 X4=INT(4*RND(1)+3)
7150 Y4=INT(2*RND(1)+5)
7160 IFPEEK(B+X4+16*Y4)THEN7140
7170 GOSUB7600
7180 RETURN
7190 REM
7200 REM CLEAR MESSAGE & PLACE CURSOR
7210 REM
7220 PRINT"■■■■■"
7230 FORI=1TO9
7240 PRINT" ■";B$
7250 NEXT
7260 PRINT"■■■■■■■■■";
```


MICROWARE
(London Ltd)

COMPLETE DISC DRIVE
SUB SYSTEMS
For Tandy; Video Genie; Nascom

BBC
AND ALL POPULAR MICROS
FROM ONLY **£175**

Includes PSU and attractive desk top cabinet
- Fully guaranteed CDC disc drives
- Cast aluminium chassis
- 5 mili sec track to track
- 250k; 500k or 1MB
- Industry compatible

Microware
(London Ltd)
637 Holloway Road,
London N19
Tel: 01-272 6237
01-272 6398

PET HI-RES!



£149 plus VAT brings you 320 by 200 dot resolution on your PET/CBM screen. No soldering is necessary – SUPERSOFT graphics boards just plug in!

Three models are available: for 80-column machines specify the HR-80 board; large screen 40 column machines need the HR-40B board; for other machines (except very earily PETs with no ROM sockets) order the HR-40 board. All three boards add 8k of RAM and include GRAPHIX machine code utility software in EPROM. Over 500 boards have been installed in the UK – by schools, colleges, hospitals, research estalishments, even home users – and hundreds more are being exported worldwide.

SUPERSOFT are COMMODORE specialists. We have a large range of software, accessories, and supplies for existing COMMODORE machines and will be supporting new machines as they are launched. Our 20-page catalogue is free to owners and users of PET/CBM machines – but here's a selection of products to whet your appetite! Add 15% VAT to all prices.

VISICALC	£148	VISICALC 96	£170
SIMPLICALC TAPE	£26	SIMPLICALC DISK	£32
COMMAND-O CHIP	£59.95	MICROSCRIPT DTL	£425
PAPERMATE PLUS	£45	COMPILER	£99.50

Winchester House, Canning Road, Wealdstone, Harrow, Middlesex, HA3 7SJ, England
Telephone 01-861 1166

SUPERSOFT

OSBORNE 1™
IN NORTHAMPTONSHIRE
WE DEMO AND DELIVER TODAY
0295.66555
4B COMPUTER SERVICES

VDU/PRINTER
LA34
Brand New and Boxed
Price £450 (2 only)
24x80 HAZELTINE VDU(Secondhand)
Price: £89.00
Prices do not include VAT or carriage
MICROSYS Ltd
58 High St Prescot L34 6HQ
051-426 7271

PRODUCTS TO SELL to the home/education microcomputer market ? or just looking for opportunities ?

Then Micro Aids can help you as
agent
distributor
adviser

Write to me personally Kevin Aldridge, Managing Director,
Micro Aids,2Boston Close,Culcheth, Warrington,Cheshire.WA34LW 092576 2804

micro aids
at home with the computer

Stand 257
PCW Show
9-12 Sept

PROGRAMS

```
7270 RETURN
7290 REM
7300 REM INPUT MOVE
7310 REM
7320 PRINT"■■■■■■LETTER ";
7330 MI=65:MA=70:GOSUB7400
7340 X=T-63
7350 PRINT"■■■■■■NUMBER ";
7360 MI=49:MA=55:GOSUB7400
7370 Y=T-47
7380 RETURN
7390 REM
7400 FORI=0TO9:GETA$:NEXT
7410 PRINT"■■■";
7420 FORI=0TO220:NEXT
7430 GETA$:IFA$=""THEN7450
7435 T=ASC(A$)
7440 IFT>=MIANDT<=MATHEN7480
7450 PRINT"■ ■■";
7460 FORI=0TO220:NEXT
7470 T=RND(1):GOTO7410
7480 PRINT"■";A$
7490 RETURN
7495 REM
7500 REM NAUGHTY MOVE
7510 REM
7520 PRINT"■■■**ILLEGAL MOVE**"
7530 GOSUB7600:GOSUB7200
7540 RETURN
7590 REM
7600 REM 2 SECOND DELAY
7610 REM
7620 FORI=0TO2000:NEXT
7630 RETURN
7690 REM
7700 REM CONVERT X,Y TO A,D
7710 REM
7720 A=3*X+16:D=3*Y-3
7730 REM
7800 REM PRINT A$ AT (A,D)
7810 REM
7820 PRINTLEFT$(D$,D+1);SPC(A-1)A$
7830 IFP<0THENRETURN
7840 POKEB+X+16*Y,P
7850 RETURN
7890 REM
7900 REM COUNT 'MOVES' FROM (X,Y)
7910 REM
7920 POKE35,X:POKE36,Y:POKE37,0
7930 SYS7937
7940 M=PEEK(37)
7950 RETURN
7995 REM
8000 REM RULES
8010 REM
8020 PRINT"■           THE GERMAN GAME■"
8030 PRINT"THIS IS A NEW BOARD GAME FOR TWO PLAYERS"
8040 PRINT"EACH PLAYER (YOU AND I) HAS ONE PIECE■"
8050 PRINT"AND THE OBJECT OF THE GAME IS TO PREVENT"
8060 PRINT"THE OPPONENT FROM MOVING. THE PLAY■"
8070 PRINT"CONSISTS OF ALTERNATE TURNS AND YOU MAY■"
```

MICROMART

MINI DISCS- BIG SAVINGS

VERBATIM DATALIFE 5 1/4"

MD 525 S/Sided 40 Track	*£16.45*
MD 550 D/sided 40 Track	*£22.45*
MD 577 S/sided 77 Track	*£24.45*
MD 557 D/sided 77 Track	*£32.45*

Prices are per ten pack, excluding VAT
All disks are factory fresh, soft-sectored, hub reinforced and certified 100% error-free.

Please include UK P&P at 95p per pack, then add 15% VAT to total.

Send cheque / P.O. now to:

DATATECH LTD.
Dept. PCW, Freepost, Altrincham, Cheshire, WA15 0BR

UK 101 SOFTWARE ON TAPE
from the guy who wrote "Le Passe Temps"

GALACTIC HITCHHIKER (8K). An adventure, all in machine code. A beauty! **(£7.00)**
SUPERTREK (8K). Sail boldly through the universe, zap-ping moving Klingons in real time. Superb graphics. **(£7.00)**
STARTREK (8K). The old favourite, beautifully presented. **(£6.00)**
LUNAR LANDER. A real challenge. You won't get down in less than 3 hours. **(£3.00)**
HANGMAN. Excellent graphics, P.E. said so! **(£3.00)**
BASIC TUTOR (8 x 4K). The only way to learn – at the keyboard. **(£12.00)**
LE PASSE-TEMPS. You NEED this, if you haven't already got it. **(£3.00)**
MAD MONK (8K). It's ready at last! A machine code adventure with some truly remarkable graphics, this programme is in a class by itself. **(£9.50)**
These ORIGINAL PROGRAMS are compatible all 2K Monitors and are available for 16 x 48 and 32 x 48 displays (including enhanced Superboards).

HARDWARE
These kits are complete in every way: – Full socketed high quality PCB, all components, switches etc, plus performed cable assembly for easy interconnection to J1, or our...
MOTHERBOARD SYSTEM. Now you can add on all those extras easily. Provides eight, yes EIGHT, fully buffered J1 type sockets. **(£19.50)**
8K STATIC RAM BOARD (£39.50)
HI-SPEED CASSETTE INTERFACE. At last, a system that works. COMPLETELY RELIABLE 4000 baud (8000 with reasonable cassette) plus software for named file handling. A delight to use. **(£19.50).** *For software in EPROM, add* **£6.00**
VIDEO ENHANCEMENT. Switch selectable 16 x 48 or 32 x 48 displays without butchering your computer. **(£19.50)**
Monitor EPROMS re-blown to suit for just **£2.50**
8K EPROM BOARD (£19.50). A 2K Extended Monitor is available in EPROM for **£12.00** plus, coming soon, TOOLKIT in EPROM and BASIC V.
MONITOR BOARD. Plug into Monitor socket to provide switch selection of up to 4 EPROMS. **(£9.50)**
AVAILABLE SHORTLY: EPROM Programmer. PIA/ Sound Board. Analogue Board and something rather nice on the graphics side.

All inclusive
Please add 15% V.A.T.
Write or phone for further details.
MERLIN (MICRO SYSTEMS) LTD.
93 High St.,
Eston,
Cleveland
Tel: (0642) 454883.

Library Case of 10 Wabash mini-mite 5¼" single sided floppy disks.
£16 plus VAT and £1 postage & packing per case.

VS Berridge
53 Edward Street
Anstey
LEICESTER
LE7 7DQ

UK101 SCRAMBLE

A new full speed machine code implementation of the famous game for the 32 x 48 (8k any monitor) UK101. Bomb the ground installations while navigating the tricky terraine and dodging or shooting the enemy fighters. Look out also for the rockets shot at you and the Ack-Ack fire. Destroy fuel dump to reserve fuel for the treacherous castle section.
Send £5.00 or an SAE for full details to:

ADVENTURE 10
43 Barleycroft Road,
WELWYN GARDEN CITY,
Hertfordshire, AL8 6JX

B B C UPGRADES

LOW PRICES
16K RAM <£30
Dealers Welcome

Avon Computer Rentals
FREEPOST 22 THORNBURY BRISTOL BS12 1BR
TELEPHONE (0454) 415460

MICROMART

SEARCHING FOR 'BEST PRICE'

FOUND 'BEST PRICE'. . . GOTO

PET		RRP
C2N	TAPE	£55
4016	16K	£550
4032	32K	£695
8032	32K	£895
8096	96K	£1195
DISK DRIVES		
2031	170K	£395
4040	343K	£695
8050	1M	£895
8250	2M	£1295
9060	5M	£1995
9090	7,5M	£2495
PRINTERS		
4022P	80COL	£395
8023	136COL	£895
8300	DAISY	£1395

Our own transport delivers nationwide weekly. All you need is our *Best Price* Quotation. Contact us Now! For Super Service.

VAT TO BE ADDED @ 15%
CARRIAGE – £5 PER ITEM
IF YOU KNOW WHAT YOU WANT WHY WAIT?
THESE ARE THE PRICES YOU NEED

ORCHARD COMPUTER SERVICES

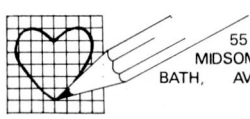
Orchard House, 21 St Martins St
Wallingford, Oxon
Tel: Wallingford (0491) 35529
Open 6 days per week



SPECTRUM
HI RES PLANNER

DESIGN USER DEFINED GRAPHICS AND HIGH RESOLUTION PICTURES EASILY.

The grid has been specially produced for the Sinclair Spectrum.
An A4 Pad of 50 sheets for only £2·50 plus 50p P and P.
(cheques payable to Xaviersine)



XAVIERSINE
55 HIGH STREET,
MIDSOMER NORTON,
BATH, AVON. BA3 2DQ

VIC-20

VICPENDIUM 1
4 BIG GAMES FOR THE UNEXPANDED VIC – *all on one cassette*
GORGON'S TOMB – *a micro adventure. Collect the treasure and escape the tomb before the evil Serpent catches you.* **THIS ONE ALONE IS WORTH THE PRICE OF THE CASSETTE!** *Very addictive.*
INVADERS – *The original version.*
DIGITMAN – *Hangman with numbers.*
OTHELLO – *Hours of fun playing this well-known game against the VIC.*
ALL THIS *for only £7.95 inc.*
SUPER VALUE FOR MONEY!
ENCOUNTER – *You've not seen this one yet! (unexpanded VIC). A giant alien space ship is requesting permission to land. Can you crack the lights and music landing code? 5 levels of play – super graphics and sound effects.*
£4.95 inc.
BOTH CASSETTES *for only £11.95.*

525/531 London Road
Westcliffe on Sea, Essex.
Tel: (0702) 42339

OPUS II SOFTWARE

PROGRAMS

```
8080 PRINT"CHOOSE WHO STARTS.TO MOVE,FIRST PLACE■"
8090 PRINT"YOUR PIECE     ON ANY ADJACENT EMPTY CELL"
8100 PRINT"AND THEN PLAY A NEUTRAL PIECE     ANY-■"
8110 PRINT"WHERE ON THE BOARD.I WILL PLAY LIKEWISE■"
8120 PRINT"AND THE WINNER IS THE LAST TO MOVE."
8130 A=12:D=13:A$=H$:GOSUB7800
8140 A=31:D=15:A$=N$:GOSUB7800
8150 PRINT"■■■":GOSUB8700
8160 PRINT"■REMEMBER THAT THE OBJECT IS TO TRAP MY■"
8170 PRINT"PIECE     (AND THAT I WILL TRY TO DO THE■"
8180 PRINT"SAME TO YOU).■"
8190 PRINT"NOTE THAT I DO NOT INSIST ON YOU PRESS-■"
8200 PRINT"ING ■ RETURN ■ WHEN YOU ENTER YOUR MOVE■"
8210 PRINT"OF COURSE YOU MAY DO SO IF YOU WISH BUT■"
8220 PRINT"I WILL PROBABLY IGNORE YOU.LET'S GO...."
8230 A=7:D=1:A$=C$:GOSUB7800
8240 PRINT"■■■■■■■■■■■■■■":GOSUB8700
8600 RETURN
8700 PRINT"■       PRESS ■ SPACE ■ TO CONTINUE"
8710 GETA$:IFA$<>" "THEN8710
8720 RETURN
9000 REM
 9010 DATA 169,42,141,30,31,162,48,165,36,10,10,10,10,24,101,35,125,70,31
 9020 DATA 168,185,58,3,208,22,230,37,202,224,42,240,21,152,24,125,70,31
 9030 DATA 168,185,58,3,208,240,230,37,208,234,202,202,202,202,202,202,232
 9040 DATA 202,208,1,96,173,30,31,56,233,6,141,30,31,76,8,31
 9050 DATA 1,1,240,240,15,239,0,31,1,1,239,240,16,16,1,1,239,241,0,242
 9060 DATA 16,16,239,255,0,238,16,16,241,1,1,1,16,16,239,15,0,223,1,1
 9070 DATA 15,16,255,255,16,16,241,17,-1
READY.
```

TRS-80 Card shuffler

By Russell Hutson

Here's a routine to add to your card playing programs which will act as something of a croupier. It takes up 3.93k but can be compressed to 2.95k by removing REMs and other trimmings.

It is designed to set up a pack of 52 cards, set up a copy of this pack and shuffle the deck. This process takes 14 seconds on average and an area is marked in the listing where the rest of a card game can be inserted, using the arrays set up by the routine. Output is in the form 'AS BLK 1 11' – A being rank, S suit, BLK colour and 1 11 being values (in this case either one or 11 for an ace). The program will run on its own, but it is not meant to do so. A list of variables at the end should serve as a useful guide when writing a full program using the shuffler.

It needs a TRS-80 Level II or Video Genie to run, but should be quite easy to convert for use on other micros.

```
0 REM////////////////////////////////////////////////////////////////
1 REM/////// PACK OF CARDS SUBROUTINE-DEC1981RHUTSON ////////
2 REM////////////////////////////////////////////////////////////////
10 CLS:CLEAR2048:S=1
20 DIM CL$(2),S$(4),N$(13),C$(4,13),V$(2,13),CP$(4,13),SP$(52),
   PC$(52),CC$(79)
30 PRINT" PLEASE WAIT WHILE I LOOK FOR THE PACK OF CARDS."
40 FORX=1TO2:READCL$(X):NEXT
50 FORX=1TO4:READS$(X):NEXT
60 FORX=1TO13:READN$(X):NEXT
70 FORX=1TO13:READV$(1,X):NEXT
80 FORX=1TO13:READV$(2,X):NEXT
90 PRINT"
I THOUGHT I PUT THEM IN THAT 1K NEXT TO THE CPU."
100 FORC=1TO4:FORX=1TO13
110 IFS$(S)="H"ORS$(S)="D"THENCL=1ELSECL=2
120 C$(C,X)=N$(X)+S$(S)+" "+CL$(CL)+" "+V$(1,X)+" "+V$(2,X)
130 NEXT:S=S+1:NEXT
140 PRINT"
```


ZX SAS Serious Application Software
● FOR YOUR 16k ZX81

INCOME TAX. Checks your PAYE Coding, calculates your next tax and NI deduction even if your PAYE code or salary changes. Check the taxman! A powerful program with plenty of practical advice included. Also calculates next month's net pay **(£6.50)**
BRIDGE. Simply enter contract bid/made, all Game/Rubber scores calculated and displayed incl. Overtricks, Slam points etc. Displays and prints updated scoresheets after each hand, record of deals and rubbers etc. An exceptional program. **(£6.50) Both for £10.**
* Similar programs purchased – send cassette for offer by return *

ZX SAS *42/45 New Broad St, London EC2 M1QY*
(s.a.e. for further details)

DAI SOFTWARE
FROM IQ SERVICES
8080A ASSEMBLER/EDITOR
IN BASIC

A two pass assembler allowing up to 255 lines of code to be assembled, edited, linked etc. Global and local symbols are allowed as is a special table facility.
Also included but available separately @ £3.50 each:
* DISSASSEMBLER
* TEXT EDITOR
* DATA STATEMENT WRITER
Full Package £15. Prices include VAT & P&P.
Full instructions supplied with each cassette.

CANAL HOUSE, ARDRISHAIG,
ARGYLL. TEL 0456 3212

PROGRAMS

```
 AH.... THERE THEY ARE! WHO PUT THEM IN THAT MEMORY LOCATION ?"
150 GOSUB170
160 PRINT"
 I'M GOING TO SHUFFLE NOW
 (I'M ALL FINGERS & RESISTORS AT THIS)":GOTO200
170 FORC=1TO4:FORX=1TO13
180 C$(C,X)=C$(C,X):NEXT
190 RETURN
200 REM ////// SHUFFLE ROUTINE //////
210 FORX=1TO52
220 C=RND(13):S=RND(4)
230 IFC$(S,C)=""THEN220
240 SP$(X)=C$(S,C):C$(S,C)=""
250 IFC=1ANDS=3THENPRINT"
 OOPS! DROPPED THAT ONE... DIDN'T SEE IT, DID YOU?"
260 NEXT
270 PRINT"
THEY'RE SHUFFLED ENOUGH. NOW COMES THE GAME"
300 REM
310 REM
320 REM ########################################################
330 REM ############# INSERT CARD PROGRAM HERE ################
340 REM ########################################################
350 REM
360 REM
940 END
950 DATA RED,BLK
960 DATA H,D,S,C
970 DATA A,2,3,4,5,6,7,8,9,10,J,Q,K
980 DATA 1,2,3,4,5,6,7,8,9,10,10,10,10
990 DATA 11,2,3,4,5,6,7,8,9,10,10,10,10:REMALTERNATIVE VALUES
65519 REM========== VARIABLES USED ===========
65520 CL$ - ARRAY HOLDING COLOURS (RED/BLK)
65521 S$  - ARRAY HOLDING SUIT (H/D/S/C)
65522 N$  - ARRAY HOLDING CARD NAME VALUE (ACE OF HEARTS ETC.)
65523 C$  - ARRAY HOLDING WHOLE PACK OF CARDS (C$(SUIT,VALUE))
65524 V$  -ARRAY HOLDING 2 CARD VALUES (1=NORM:2=PONTOON)
65525 CP$ - ARRAY HOLDING COPY OF PACK
65526 X/C - LOOP VARIABLES
65527 S   - SUIT
65528 CL  - COLOUR NUMBER (1=RED:2=BLACK)
```

'There's a hole in my Apple...'

Continued from page 151

normally as long as the end of program pointer ($AF,B0) is adjusted and from it the pointers to variables, arrays and strings are also reset. If the program is SAVEd, however, in its split form everything will be there on a subsequent LOADing but the program will only LIST up to the end of the first part and it will not run correctly. The reason is not hard to find: all the link addresses are correct except for those in this last line. Therefore a split program must POKE in the two 'wrong' link addresses when it begins to execute. There is another annoying thing about a split program saved to disk; it wastes disk space. In the case of a program split around on hi-res page 34 sectors are lost and a massive 68 are lost for two hi-res pages. It is true that this space can be used to keep a hi-res picture for either introducing the program or starting it off but generally I would rather save the disk space. Clearly it would be better to let the Basic program be split after LOADing and RUNning and also it should all be as automatic as possible. Hence was born the '&CLEAR... TO... utility.

There are two ways of using the utility. One is to let the Applesoft program listed assemble the machine

MICROMART

COLOUR and SOUND

FOR PET

'SIMPLY FILE' RECORDS SYSTEM (DBMS). Select by any key. Print alphabetic lists, mailing labels. Calculate, total, average columns. Fast, easy, robust and VERY versatile. DISK ONLY: £65

'SIMPLY WRITE' FAST WORD PROCESSOR. Some £300-£400 programs have no more facilities. Tape or disk, any printer, 40-80 column PET. Needs 16K. TAPE £40, DISK £45

GOTTA PET? ADDA VIC! High resolution graphics, programmable characters, colour and sound on your PET? All this PLUS a complete extra computer using your PET's drives, printer etc? Under £200 including VIC and our super PET-VIC LINK! (Available separately)

PRICES PLUS VAT BUT INCLUDING P&P. SEND FOR DETAILS, MORE UNUSUAL ITEMS. GET OUR FREE 'MICROMAIL' PET NEWSLETTERS.

SIMPLE SOFTWARE LTD.
15 HAVELOCK ROAD
BRIGHTON SUSSEX BN1 6GL
(0273) 504879

We welcome Access

PCS
PEDRO COMPUTER SERVICES

Programming Aids

UN-NEW: If you typed NEW and lost your program without saving, UN-NEW will let you recover it. Price: £10.00
DUMP: You just touch a single key and the entire screen is copied onto the printer. This can happen even while running a program. Price: £10.00
DISK UN-NEW 8050: Recover any scratched program on your 8050. Price: £12.00
ASSEMBLER: for the DR WATSON BOOK OF ASSEMBLY LANGUAGE PROGRAMMING. Price from £7.00
TINY BASIC COMPILER: A true compiler that turns your BASIC programs into fast machine code programs. For old/new/e.0 Roms. Price: £30.00
VIGIL: Exciting, new games interactive language. Easy to learn with 60+ powerful commands. For all PETs. Also available for VIC. Price £30.00

Hardware

CB2-Soundbox: de luxe Soundbox for Arcade games with programming manual. Price: £17.50
TV Interface: for both 40 and 80 col. PETs. Video out RF out for connection to home TV. Price: £35.00
Telephone Dialler: use your PET to dial your telephone. Stores 40 names and phone numbers. More than one screen page of names and numbers possible. 40 names and numbers per page. Price: £25.00
AD100: single board analogue to digital converter with on-board supply, 4-bit output port and drive program. Price: £55.00
AD200: 8-channel analogue to digital converter assembled and ready for use. Comes complete with drive program and well documented handbook. Features include 8-bit output port, precision reference voltage, and many others. Price: £55.00
PET ROM WRITER: now you can program DOS and other utilities into 2K and 4K EPROMs. Price £55.00

Books

THE DR. WATSON BOOK OF ASSEMBLY LANGUAGE PROGRAMMING for all PETs. Price: £10.00
THE DR. WATSON BOOK OF ASSEMBLY LANGUAGE PROGRAMMING for VIC, includes Assembler Cassette. Price: £17.00
PET MACHINE LANGUAGE GIDE. Price: £8.00
PET REVEALED. Price: £10.00
LIBRARY OF PET SUBROUTES. Price: £10.00
THE VIC REVEALED. Price: £10.00

VIC Programs

BIG FOUR: 4 games on one cassette. Price £5.00 (3.5K)
STARTREK: fighting in the galaxy. Price: £5.00 (3K & 8K)
DATABASE Retrieval System. Price: £7.00 (8K & above)
HI-RES CHARACTER GENERATOR. Price: £7.00 (8K & above)
THE CYBER MEN. Try to destroy them. Price: £7.00 (3.5K) (machine code)
VIC DEFENDER. Destroy fighter ships. Price: £7.00 (3.bK (machine code)

Please add 15% VAT (except books) + £0.50p&p (£1.50 hardware only) on all orders
Please add £1.50 if you require Programming Aids on disk. Specify 3040/4040 or 80 format.
We also stock floppy discs, printer ribbons & cassettes. Send s.a.e. for catalogue.

4 COWCROSS STREET, LONDON EC1.
TELEPHONE: 01-250 1481

PLEASE NOTE NEW NUMBER

TO ADVERTISE IN MICROMART RING JAN MARTIN ON 01-636-6890 ALL CORRESPONDANCE TO . PCW, EVELYN HOUSE 62 OXFORD STREET LONDON W1

BBC SOFTWARE

Programs that are guaranteed to run! Save hours of work and worry with these utilities and practical programs.
1). CASHBOOK3 Double entry Cashbook £3.95
2). MAILING Database for mailing list £3.95
3). CARDS Beat Bruce Forsyth at his own game. £2.95
4). SEARCHBAS PROC to search a BASIC program and alter it £1.95
5). PROCVAR Attach to any program and list all the variables used £1.95
6). FLUSH PROC to clean out memory right round the bend! £1.00
7). DEFCHR Define graphic characters. £2.95
8). DISTANCES Distance between any 2 places in the world. . £2.95
9). SORTMC Machine Code sort routine to handle up to 250 items in under one second. £1.00
10). SORTBAS Fastest short sort routines for bulk data £1.00
11). BANNER Print out large graphic text £2.95
12). UTILITY Items 4,5,6,7,9 & 10 . . . . . £4.95
All programs guaranteed on tape. Fully documentated.
EASTER HOLIDAY for computer freaks. Come and enjoy yourselves.
Send for lists in more detail or cheque or PO made out to MICRO–AID, 25 Fore St., Praze, Cambourne, Cornwall.
Tel: 0209-831274

Micro-Aid

INSURE YOUR COMPUTER

Impact damage, Fire & Theft Insurance for your Computer Equipment:
£1 to £1,500 cover . . . . . £8.00 p.a.
£10 (excess) x/s
£1,500 to £2,500 . . . . . £16.00 p.a.
£15 x/s.

For details:
KGJ Insurance Brokers,
6 Hagley Road, Stourbridge,
West Midlands, DY8 1QG
Tel (03843) 5333/2545

MICROMART

RADEC

ASCII Keyboards



- Upper & Lower Case plus Control
- Low Power Consumption
- Shift & Alpha Lock
- Autorepeat (Model 777)
- Parallel Data Output
- Metal Mounting Frame
- Suitable for Tuscan, Tangerine etc.

Model KB756A	56 key	£39.50
KB710	Numeric Pad	£ 7.50
KB771	72 key	£55.00
KB777	77 key	£62.50

Accessories available include:-

Metal Case	£14.95
Edge Connector	£ 1.95
DC to DC Convertor (for operation off single 5V supply)	£ 5.00

High Resolution Computer Monitor



- 12" Green P31 Phosphor
- MULLARD C.R.T.
- 80 Character Line Capability
- 22 MHz Video Bandwidth
- 240V AC Input
- Toroidal Transformer
- Composite Video Input
- Ideal for Apple, B.B.C. Micro, Gemini, Nascom, Tuscan etc.

MODEL 101
£95.00 + £9.50 Carriage

U.K. Orders add 15% VAT on order total
Orders under £15 add £1.50 p&p. plus VAT
Overseas orders add £2.50 p&p
FULL DATA SHEETS ON REQUEST

Citadel Products Ltd
Dept. PCW 50 High Street Edgware
Middlesex HA8 7EP Tel: 01-951 1848

'There's a hole in my Apple...'

code program for you in memory and then save it to disk; when used, the machine code program is merely BRUNned from within the Basic program. The second is to incorporate the listed Applesoft program within your own program and then CALL the machine code routine after it has been POKEd in.

After the routine is BRUNned or CALLed, the area of memory wished to be kept clear is merely passed to it as two decimal values. These need not be simple numbers; they can be expressions. For example, to clear the area of memory required for two hi-res pages a line of Basic such as:

```
1 PRINT CHR$(13)+CHR$(4)"BRUN
  CLEARSPLIT":&CLEAR
  2*16*256 TO 6*16*256
```

will accomplish the split as long as the binary file 'CLEARSPLIT' is on the disk.

As long as the lower area is cleared first a second or third area can also be cleared merely by invoking the appropriate &CLEAR. . .TO. . .line. The utility can also be used in the immediate mode as long as it BRUNned first. Thus a program can be split and saved in the split form if wished as long as a line of Basic is incorporated which will POKE in the two link addresses as explained above. (You will have to determine the exact values after incorporating the line by either going through the memory following the link addresses yourself or by using a small program as described above.)

The utility can also be used to completely relocate a program above the hi-res page as in Neil Konzen's &LOMEN: utility but without the worry of losing part of a long program. This is accomplished by using the lines:

```
1 PRINT CHR$(13)+CHR$(4)"BRUN
  CLEARSPLIT":&CLEAR 1024 TO
  16384
2 POKE 104,64 :REM for page one
```

Five points are worth noting when using the &CLEAR. . .TO. . .utility. The first is it must be used early in a program before any of your variables or strings are defined since it does a CLEAR before returning to the Basic; the second is that it does not protect itself by resetting HIMEM: so it will be overwritten by any STRING activity; the third is that the line number corresponding to the first line in the latter part will be displayed on the screen; the fourth is that an attempt to set an initial value not within the program will result in an error message as will the wrong syntax in the line, and the fifth is that after splitting, a program cannot be edited.

There are three ways round this problem. In the first you must develop the program exclusively above the hi-res pages by changing the start of program pointers and using smaller arrays, etc, until you are convinced it is perfect then add the &CLEAR. . .TO. . . line. In the second you must keep on disk a version of the program which incorporates any changes you make but which is SAVEd before RUNning and it is this version which is edited. In the third you must use another program which will close up a split program. This is also listed and is called 'CLOSESPLIT'. Its use is very simple. To edit a split program either BRUN 'CLOSESPLIT' or, if it is already in memory, just CALL 768. If after splitting a program you LIST it you will notice that 'CLEARSPLIT' has introduced a line of Basic which is a GOTO. 'CLOSESPLIT' will remove this, recombine the program, reset the end of program pointer, and do a CLEAR before returning you to Basic.

To save space, I have presented both programs only as Applesoft programs. Both of these will assemble the appropriate machine code programs in RAM and will then save them to the required destination disk. 'CLOSESPLIT' resides at $300 and so the relevant Applesoft program will merely form it and SAVE it. 'CLEARSPLIT' however, was originally assembled at $9400 for a 48k machine with DOS. So the relevant Applesoft program has been written so that it will determine the size of memory available (from the HIMEM: pointer at $73,74) for any machine and then assemble the program as appropriate. Tape users can easily modify these two to their advantage and use 'CLEARSPLIT' in the immediate mode, or by incorporating the program within their own program can use it in the deferred mode.

If anyone would like a source listing of the two assembly programs I will be happy to try to supply them if possible. Also, if anyone has difficulties with them I would very much like details of the problem to try to improve the both of them. I can be reached at The Department of Chemistry, University of Machnester Institute of Science and Technology, PO Box 88, Sackville Street, Manchester M60 1QD.

END

CENTRONICS®
Qualified dealers
LOW PRICE PRINTERS
Model 737 Letter Quality Printer
Parallel £339 RS232 £389
Model 739 plus high res graphics
(74x72 dots per inch
Parallel £439 RS232 £485
Add £7 carriage & 15% VAT
SAE for data sheets
SCREEN-SCENE
144 St George's Road, Cheltenham
Glos, Phone (0242) 28979

Access/Visa orders accepted

ZX81·16K
Football Pools Program
FACILITIES OF THE PROGRAM:
* Lists out the sixteen most likely score draws, in order of preference.
* Lists out the most likely homes, draws and aways.
* Picks out those matches that have been given over-generous odds on the fixed-odds coupons. Calculates your expected profit!
* Allows the user to feed in results as they occur to get really accurate current-form tables.

For a cassette of the program and an instruction leaflet giving a brief description of the theory, send £5.95 to
Hartland Software *(Dept P)*
8 PENZANCE PLACE, LONDON W11 4PA

● **AT LAST! GENERAL LEDGER**
FOR THE SINCLAIR ZX81-16K
£35.00 Price includes cassette, manual and registered air mail postage
A professional accounting system for your business. Includes double-entry accounting, automatic posting to 99 accounts, trial balance, report of specific account, automatic printout option, error-preventing features (balance of each entry, verification of name with number, correction option of entries). Send check and receive cassette and manual by return registered air mail.
Mandel Ltd.
HACHIKMA II
GANEI YEHUDA ISRAEL

OLIVETTI M20

Continued from page 109

phase. Troubleshooting is dealt with in the same style, using large flowcharts which end up in boxes with messages like 'contact Olivetti dealer/distributor'. PCOS commands and Basic keywords are dealt with exhaustively, with explanations of each of the field values and syntax diagrams (although not very many examples).

However, manuals have a dual function to perform. They have to get the user started on the system and then have to serve as reference material for filling in all the details, and the Olivetti manuals fall down somewhat here. Instead of an index, there is an exhaustive table of contents (five pages long in the PCOS manual). This references everything one could want to look up — but in page order rather than alphabetically, so it's quite hard to use. As we had only the PCOS and Basic manuals, hardware information was rather hard to come by and information about (say) the IEEE-488 interface was virtually nonexistent. Although there are 'pocket' reference manuals for PCOS, Basic and the interface (not supplied), there seems to be no hardware manual at all.

The manuals are very glossy and one gets the impression that considerable care has been taken in their production and translation into English. In the two volumes, only one sentence appeared to have wriggled through the translator's comprehension.

Prices

Olivetti has decided that its micro is going to be competitively priced with the current 8-bit systems. The review machine's configuration (standard system with 160k RAM, dual minifloppy disk drives and a monochrome display) costs £2395. To this must be added the printer (£738), the manuals (£50) and PCOS (£30). As there was no price for Basic, it must be included in the standard price.

Olivetti sells three configurations (all of which carry a one-year guarantee). The basic configuration comes with one disk only and 128k of RAM and sells for £1895. The review machine was the middle configuration, whereas the upmarket version comes with a colour display and costs £3262.

Upgrades and peripherals are not particularly inexpensive and as there are no technical specs for the hardware it is unlikely that second sources will appear. The dot matrix printers cost £550 for 100 cps and £1475 for 140 cps. A 32k memory upgrade costs £139, the IEEE interface £227 and the serial ports £225. Most of the Olivetti applications cost between £150 and £300, while the third-party software seems to be priced from £300 to £1000.

Conclusion

The Olivetti M20 represents a brave attempt by a large firm to make its way independently in the microcomputer market. (By way of comparison, Texas Instruments and Hewlett Packard tried it; IBM and DEC did not.) This independence reflects itself by the decision to base the hardware on an unpopular processor; this cuts Olivetti off from the mainstream of microcomputer software development, both at operating system and application levels. Olivetti seems to be fully aware of this step as it is making efforts to provide the requisite software, both in-house and by recruiting external software houses.

The system could appeal to scientific/commercial users who derive confidence from dealing with a big firm which offers some sensitivity in meeting software needs and which is willing to provide extensive and sound maintenance and support. **END**

BLUDNERS



What with the excitement of being sold and moving to new offices, we don't seem to have discovered any bludners worth reporting this month — and that's always a guarantee that at least a dozen readers will write in to point them out to us.

apple



ACORN
Atom & BBC

Your local Fruit and Nut

NORTHERN COMPUTERS
Churchfield Rd, Frodsham,
Warrington WA6 6RD.
0928 35110

THE PERSONAL COMPUTER BOOK

by Robin Bradbeer. New ed. just published.

Buying your own micro? Then you need Robin Bradbeer's Personal Computer Book. It includes an illustrated up-to-date survey of 60 micros available in the UK. Contains information on what you can do with micros, details of your nearest computer club and a survey of books and magazines. **Only £5.95.**

Available from W.H. Smith and leading booksellers, or direct from the publishers by sending £6.95 (including p&p) to Virginia Ayers, Dept. PCW, Gower Publishing Co Ltd, Gower House, Croft Road, Aldershot, Hants., GU11 3HR.

MICROMART

ELCOMP BOOKS and SOFTWARE

Dealers welcome!

For ATARI–PET–OSI–APPLE II–6502–VIC-20–Sinclair–Timex

ATARI ATARI ATARI ATARI

ATARI BASIC – Learning by Using
This new book is an "Action"-Book. You do more than read it. Learn the intricacy of ATARI-BASIC thorugh the short programs which are provided. The suggestions challenge you to change and write program routines. Yes, it's exciting – Many of the programs are appropriate for beginners as well as experienced computer users. (Screen Drawings, Special Sounds, Keys, Paddles + Joysticks. Specialized Screen Routines, Graphics and Sound, Peeks and Pokes and special stuff).
Order-No. 164 $9.95

ATARI Learning by Using – Book + cassette or disk
This package includes the book No. 164 plus a cassette or disk (please specify) containing a variety of the programs which are listet in the book.
Order No.: 7220 $39.95

Games for the ATARI-Computer
How to program your own games on the ATARI. Complete listings in BASIC and Machine Language of exciting games. Tricks and hints.
Order-No. 162 $7.95

GAME PACKAGE for the ATARI Book + cassette or disk
Includes the book No. 162 plus cassette or disk (please specify) containing a variety of the programs listed in the book.
Order No. 7221 $39.95

ATMONA-1
Machine Language Monitor for the ATARI 400/800.
This powerful monitor provides you with the firmware support that you need to get the most out of your powerful system. ATMONA-1 comes on a bootable cassette. No cartridges required. Disassemble, Memory Dump HEX + ASCII, (Change Memory Locations, Blocktransfer, fill memory block, save and load machine language programs, start mach. Lang. Progr. (Printer optional).
Comes with introductionary article on how to program the ATARI computer in machine language. (Available also in ROM)
Order-No. 7022 $19.95

ATMONA-2 Superstepper
A very powerful Tracer to explore the ATARI ROM/RAM area. Stop at previously selected address. Opcode or operand (cassette).
Order-No. 7049 $49.95

EDITOR/ASSEMBLER for ATARI 800, 32K or 48K RAM
Extremely fast and powerful Editor/Assembler. (8K Source-code in about 5 seconds) Includes ATMONA-1.
Order-No. 7098 $49.95

MACRO-Assembler
for ATARI 800, 48K RAM
Please specify your system: RAM, disc or cassette.
Order-No. 7099 $89.00
Add $39.00 for cartridge version

Gunfight – For ATAHI 400/800 16K RAM, needs two joysticks, animation and sound. (8K machine language).
Order-No. 7207 $19.95

Birth control with the ATARI (Knaus Ogino) Cass. or disk
Order No. 7222 $29.95

Astrology and Biorhythm for ATARI (cass. or disk)
Order No. 7223 $29.95

EPROM Cartridge KIT for ATARI Cartridge (bare board) with instructions (holds two 16K or two 32K EPROMs (2716,2532,2732)
Order No. 7224 $19.95
Order No. 7043 complete $29.95

Invoice Writing for small business with ATARI 400/800 16K RAM.
Order-No. 7022, cass. $29.85
Order-No. 7200, disc. $39.99

Mailing-List No. 7213 $24.95
Inventory Contr. No.7215 $24.95

NEW ! ATEXT-1
This new wordprocessor in machine language (8K) for all ATARI 400/800 computers offers the best price performance ever. 23 editor control commands, 17 formatting commands, dynamic formatting. Vertical and horizontal scrolling (up to 255 char. per line) Include command on disk!
Order No. 7210 cassette **$29.95**
Order No. 7211 disk **$39.95**
Order No. 7212 cartridge **$79.00**

Learn FORTH for the ATARI 400/800, cassette or disk
Order No. 7053 $19.95

ELCOMP FORTH – Enhanced FIG-FORTH on disk only.
Order No. 7055 $39.95

How to connect your EPSON-Printer to the ATARI 400/800. Construction article with printed circuit board and software. (Screenprint and variable characters per line).
Order-No. 7210 $19.95

OSI OSI OSI OSI OSI

The First Book of Ohio Scientific Introduction to OSI computers. Diagrams, hardware and software information not previously available in one compact source. 192 pages.
Order-No. 157 $7.95

The Second Book of OHIO
Order-No. 158 $7.95

The Third Book of OHIO
Order No. 159 $7.95

The Fourth Book of OHIO
Order-No. 160 $9.95

VIP Package – Above book plus a cassette with the programs.
Order-No. 160A $19.95

The Fifth Book of OHIO
Order-No. 161 $7.95

Invoice Writing Program for OSI-C1PMF, C4P. Disk and Cassette, 8K RAM.
Order-No. 8234 $29.80

Mailing List for C1PMF or C4PMF 24K RAM
250 addresses incl. phone number and parameters on one 5 1/4 disk)
Order-No. 8240 $29.80

8K Microsoft BASIC Ref. Man.
Order-No. 151 $9.95

Expansion Handbook for 6502 and 6802
Order-No. 152 $9.95

Microcomputer Appl. Notes
Order-No. 153 $9.95

Complex Sound Generation New revised applications manual for the Texas Instruments SN 76477 Complex Sound Generator.
Order-No. 154 $6.95

Small Business Programs
Complete listings for the business user. Inventory, Invoice Writing, Mailing List and much more. Introduction to Business Applications.
Order-No. 156 $14.90

Microcomputer Hardware Handbook (845 pages)
Descriptions, pinouts and specifications of the most popular microprocessor and support chips. A MUST for the hardware buff.
Order-No. 29 $14.95

Care and Feeding of the Commodore PET
Eight chapters exploring PET hardware. Includes repair and interfacing information. Programming tricks and schematics.
Order-No. 150 $9.95

Prototype-Expansion Board for VIC-20 (S-44-Bus).
Order-No. 4844 $18.95

Wordprocessor f. VIC-20, 8K RAM
Order No. 4870 $19.95
Mailing List for VIC-20, 16k RAM
Order No. 4883 $14.95
Tricks for VICs – The VIC-tory Programs, hints and expansion information for VC-20
Order No. 141 $9.95
TIC TAC VIC
Order No. 4880 $9.95
GAMEPACK I (3 Games)
Order No. 4881 $14.95
Dual Joystick Instruction
Order No. 4885 $9.95
INPUT/OUTPUT Programming with your VIC
Order No. 4886 $9.95

16K RAM/ROM board for S44-bus. Any combination of RAM and ROM on one board. (SY2128 or 2716)
Order-N0. 613 $39.95

Low cost expanison boards for your APPLE II. Bare board comes with extensive description and software.
6522 VIA–I/O Exp.
Order-No. 605 $39.00
2716 EPROM-Burner
Order-No. 607 $49,00
8K EPROM/RAM Card
Order-No. 609 $29.00

Software for SINCLAIR ZX-81 and TIMEX 1000
Machine Language Monitor
Order No. 2399 $9.95
Mailing List
Order No. 2398 $19.95
Programming in BASIC and machine language with the ZX-81(82) or TIMEX 1000.
Order No. 140 (book) $9.95

ELCOMP Publishing, Inc., 53 Redrock Lane
Pomona, CA 91766, Phone: (714) 623 8314

Payment: Check, Money Order, VISA, Mastercharge, Eurocheck. POSTPAID on PREPAID in USA. $5.00 handling fee for C.O.D. All orders outside USA: Add 15% shipping. CA add 6.5% sales tax. ATARI is a registered trademark of ATARI Inc. APPLE is a registered trademark of APPLE Inc. PET+VIC-20 is a trademark of Commodore.

LANSDOWNE

BUS CONNECTOR:– Connects up to 3 different computers together. Eg. Nascom-Pet-Tuscan. Available now. Basic model £110.00

ZX81 EPROM PROGRAMMER:– Software controlled for 2716/2732/2764/2516/2532/2564, and like single rain Eproms. 28 pin ZIF socket used. Built £40.00 : Kit £33.00.

ZX81 EPROM BOARDS:– Two styles, one with an edge connector, the other with a PCB tongue. Both types hold up to 8K of 2716s, which are switch selected and memory mapped. A Write line is provided to enable 6116 Cmos Rams to be fiteed. The PCB tongue type has battery back-up for the 616s. £11.50 each. Kits.

ZX81 SPECTRUM Peripheral Conversion Boards
ZX and SPECTRUM Edge Connectors
SAE details
2716 EPROMS £2.50
6116 CMOS RAMS 200MS £4.50
8255 PIA £3.40

ATOM:– now available-EPROM PROGRAMMER and MEMORY EXPANSION. Write for full details.

Z80 COMPUTER SYSTEM ON 3U EUROCARDS:
4 Meg CPU/ROM/RAM/I.O./DISK/TAPE/BACK-PLANE etc.
CPU CARD £55
C10 Cassettes 40p
P & P 50p on orders under £10
please add 15% VAT
SAE full list. Discounts for Schools/Clubs.

LANSDOWNE ELECTRONIC SYSTEMS
UNIT 21, BOROUGH RD INDUSTRIAL ESTATE, DARLINGTON, Co. DURHAM. Tel (0325)486000

SHARP MZ-80K

SPACE DEFENDER 11K MACHINE CODE £8.00

A fast arcade-type game. THREE waves of attackers – each totally different. The first wave consists of RAMSHIPS, the second wave drops bombs. If you beat these, the third wave attacks, each saucer behind its own barrier, armed with homing and fragmentation bombs and the dreaded EYES!! Super Sound and Graphic effects – High Score.

KEITH OWENS
10 WAYVILLE CLOSE, LIVERPOOL
Tel: 051-724 5563

STEMMOS
ANNOUNCES
AUTOCODE™

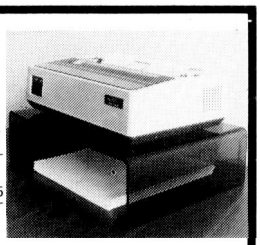
Automatic development of dBASE-II programs Code without any Programming.

* Automatic menus
* Automatic data entry screens
* Automatic data entry routines
* Automatic EDIT/Validation
* String, numeric, data and calculated fields
* Automatic multiple reports
* Automatic programs in dBASE code with interactive screens

Autocode I £12.00
dBASE-II & Autocode I £450.00

STEMMOS LTD.
344 Kensington High Street, London W14.
Tel: 01-602 6242

Printer Stand PSL PSS



* Handsomely crafted in 6mm tinted Perspex
* PSS model for Microline 80/82/83, Epson MX-80, Sheikosha GP100 etc. £15.95+VAT
* PSL for Microline 84, Epson MX82 etc. £17.95 +VAT

APPLE PADDLE
* Male connector to Apple slot with 12" colour coded cables for proto boards, external units etc. £5.95 incl.

CAMBRIDGE MICROELECTRONICS LTD
One Milton road Cambridge CB4 1UY
(0223) 314 814

PLEASE NOTE NEW NUMBER

TO ADVERTISE IN MICROMART RING JAN MARTIN ON 01-636-6890 ALL CORRESPONDANCE TO . PCW, EVELYN HOUSE 62 OXFORD STREET LONDON W1

ZX81

● CASSETTE 3 8 programs for 16K ZX81

STARSHIP 'TROJAN'
Repair your starship before disaster strikes. Hazards include asphyxiation, radiation, escaped biological specimens and plunging into a supernova.

STARTREK
With variable klingon mobility.

PRINCESS OF KRAAL
An adventure game.

BATTLE, KALABRIASZ, CUBE, SECRET MESSAGES, MARTIAN CRICKET,
(Martian cricket is fast m/c game)

● CASSETTE 4 8 games for 16K

ZS-SCRAMBLE (m/c) with 3 stages.

GUNFIGHT (m/c) invaders (m/c)
GALAXY INVADERS (m/c)
Snakebite (m/c)
LIFE (m/c) 3D Tic-Tac-Toe

7 of the 8 games are in machine code for extra speed.

These casettes cost £5 each.
Please write for Cassette 1&2 details.
On quality cassettes, by first class post from
Michael Orwin, 26 Brownlow Rd., Willesden, London NW10 9QL

PET and VIC Southampton

HIRE Commodore equipment by the week, all including manuals, cassette deck, media etc.
16K £20, 32K £25, Disk or Printer £25, VIC 20 £9
usually available: 32K from £355.

NOW LOWEST EVER PRICES FOR NEW PRODUCTS

4016N	12" screen	£425.00
4032N	12" screen	£525.00
8032N	80 columns	£795.00
4040	Dual Disk	£545.00
2031	Single Disk	£355.00
4022	Printer	£355.00
C2N	Cassette Deck	£ 44.95 (inc VAT)
VIC 20	Colour Computer	£179.95 (inc VAT)

Large range of software, books etc stocked.
TOOLKIT BASIC 4 £30.00
6550 RAMs £12.00
All prices are cash-and-carry and exclude VAT

OFFICIAL COMMODORE DEALER
SUPER-VISION
13 St James Road, Shirley, Southampton
Telephone (0703) 774023
After hours (0703) 554488

SHARP MZ80K PROGRAMS

PROBE. A powerful debugging program as well as an ideal tool for teaching or learning machine code. PROBE allows you to single step (or multi-step) through any machine code program, whether in ROM or RAM. After each step the status of all registers, the flags and the stack are neatly displayed. Also, the last step executed and the next step are disassembled and displayed. Registers modifiable between steps. Other options include Dissamble and Modify Memory, Find, Save, Load, Goto, Continue, Set Break points with a loop count. Easy to use £17.50

CHESS. Play against a chess program with an excellent high resolution chess board display, where the pieces really look like chessmen. Requires modified character generator (supplied) or high-resolution modification. Phone for details.

WORD PROCESSOR. Simple to use but quite comprehensive, 'Word Processor'. Cassette based. 48K. Excellent machine code text input routine with repeat on all keys £12.00

ZEN MODIFACATIONS. Modifies Zen to give full Cursor control (Insert, Delete, Cursor, Left/Right etc) when entering or modifying source code. Also allows any block of source code to be copied into other sections of the code £7.50

FULL INSTRUCTIONS WITH ALL PROGRAMS.
B. FROST, 2 KINGFISHERS, BASILDON, ESSEX.
TELEPHONE: 0268 26703.
EVENINGS & WEEKENDS

Recruitment

MICROCOMPUTER EXPERIENCE?

COMAC Systems Ltd. is a specialist Commodore Dealership with a national reputation for it's Engineering Management Systems. Demand has caused a move to new premises and has created the following opportunities.

SENIOR SYSTEMS PROGRAMMER (£8,000 – £10,000)

If you have substantial computing experience and the ability to develop a complex package from initial design through to error free coding, then this job is for you. You must be able to program in both BASIC and Assembler and, ideally, should be thoroughly familiar with CBM hardware. A knowledge of multi-user systems would be a definate asset.

PROGRAMMER

This vacancy is offered to someone with limited experience – perhaps a hobbiest looking for an opportunity to break into the business. You must have a knowledge of programming but experience is less important than potential. The salary is negotiable and depends upon qualifications and experience.

Our prestigious offices are situated close to Heathrow Airport within easy reach of the M4.

Interested?
— Then post your C.V. to —

Peter Antill (MD)
COMAC Systems Ltd.
The Hollies
Poyle Road
Colnbrook
Bucks.
SL3 0AA

Alternatively, call him on Colnbrook (02812) for an informal discussion.

Personal Computer World
SPECIAL ISSUES

TWO BOOKS YOU CAN'T AFFORD TO BE WITHOUT

SUCCESSFUL PROFESSIONAL AND BUSINESS MICROCOMPUTING

We live in an age of cheap computing power.

For the first time the cost of a computer is within the reach of the small businessman, the professional or the private citizen.

But will your desk top computer be a boon or a curse?

Will it increase your profits or disrupt your workplace?

Success in computer installation depends on taking a logical approach to your task—the Systems Approach; the side of the microcomputing revolution they didn't tell you about.

Desk Top Computing, from the publishers of *PCW*, Britain's largest-selling micro magazine, tells you.

Lyn Antill explains, in language plain enough for the most non-technical user, the secrets of Systems Analysis.

Step by step, this book tells you how to:

Define exactly what tasks you wish your computer to undertake.

Choose the right machine for your present and future needs.

Buy off-the-peg software.

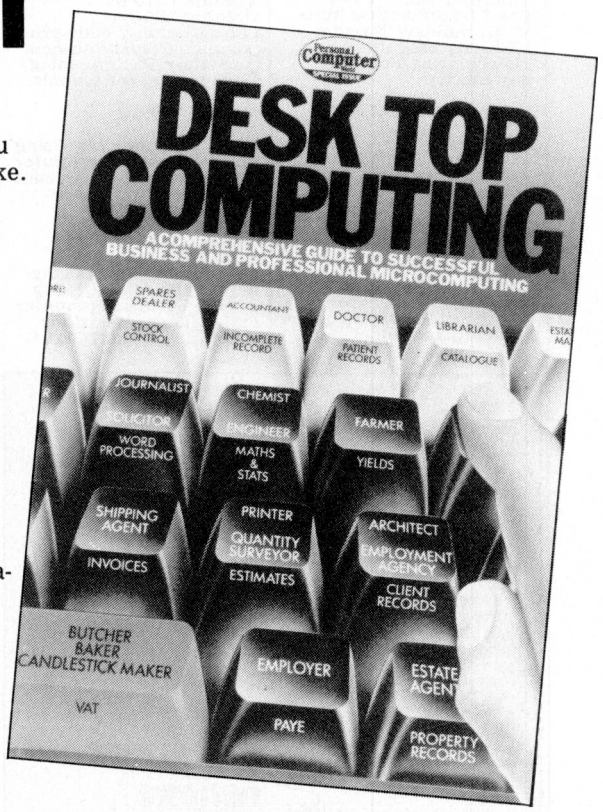
Hire and supervise a programmer when necessary.

Write program specifications tailored to *your* staff and working methods.

Test programs and introduce them into your business with minimal disruption.

Maintain and modify programs.

Also included are several case studies covering the installation of desk top computers in small businesses.

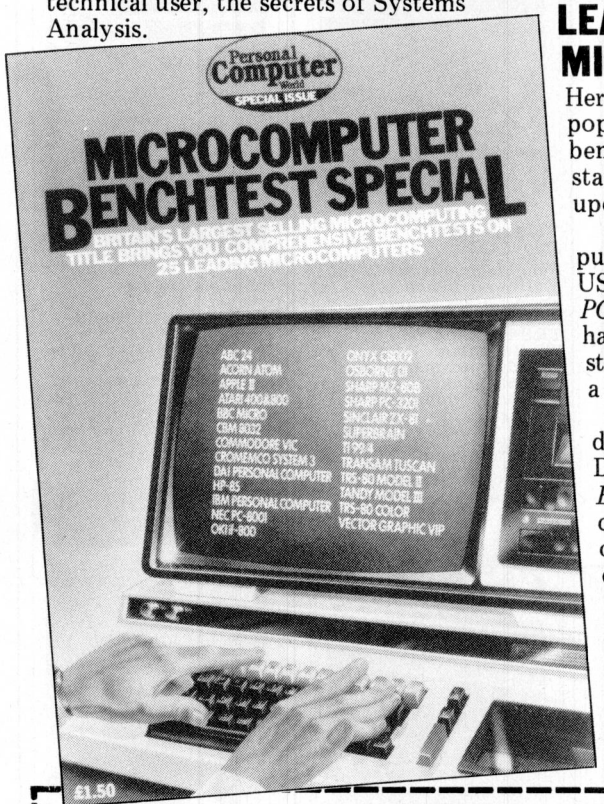


COMPREHENSIVE BENCHTESTS OF TWENTY-FIVE LEADING MICROCOMPUTERS

Here are twenty-five of the most popular micros in the world benchtested to the exacting standards that only *PCW* insists upon before going into print.

We believe that even rival publications here and in the USA will concede that *PCW*'s Benchtests have set an industry standard which is now a byword.

Completely updated and revised by Dick Olney, *Benchtest Special* contains 164 pages of fascinating and essential information covering hardware, software, speed of operation, potential, expansion, documentation and conclusions on each machine.



For just £1.50 you can obtain the results of hundreds of hours of Benchtesting by our skilled team of reviewers.

We are not exaggerating when we say that demand for this special issue has been enormous and we advise you to send off now, using the coupon below, before we go out of stock.

BENCHTEST SPECIAL
TEMPORARILY OUT OF STOCK

MACHINES TESTED INCLUDE:

ABC 24	NEC PC-3001
Acorn Atom	OKI if 800
Apple II	Onyx C8002
Atari 400 & 800	Osborne O1
BBC Computer	Sharp MZ-80B
CBM 8032	Sharp PC-3201
Commodore VIC	Sinclair ZX81
Cromemco System 3	Superbrain
DAI Personal Computer	T199/4
HP-85	Transam Tuscan
IBM Personal Computer	TRS-80 Model II
	Tandy Model III
	TRS-80 Color
	Vector Graphic VIP

Please send me. . . . . copies of *PCW's Desk Top Computing* @ £2.25 (inc postage)
and/or. . . . . copies of *Benchtest Special* @ £1.80 (inc postage).
I enclose a cheque for £. . . . . payable to *Personal Computer World*,
53/55 Frith Street, London W1A 2MG

Name. . . . . .
Address. . . . . .
. . . . . .
. . . . . .

BACK ISSUES SERVICE

Here is a complete guide to all available back issues of *PCW*. A quick guide to their contents is shown below. Check the coupon overleaf for the issues you require.

Volume 1 No 1, 1978
The 77-68/Practical hints on kit building/Nascom 1/Charity case study/Flowcharting/Pontoon flowchart.

Volume 1 No 2, 1978
Kit building Basic — first steps/Case study — a software house/PET 2001/Research machines 380Z/School computing/E78 — Europa Bus.

Volume 1 No 3, 1978
More efficient programs/Cosmac 1802/The PDP11 Part 1/Small business computing — an approach/The Z80/EPROM programmer construction.

Volume 1 No 6 October 1978
Pilot/Assembly code programming/Small business case study/PET preening/Time tabling for schools.

Volume 2 No 1 May 1979
Chess programming/Using a small business computer Part 1/Smart 1/In defence of PET/+d Noughts & crosses

Volume 2 No 2 June 1979
Different computer languages/(MSI) 6800/Using a small business computer Part II/Demonstrations using the Apple II Part I.

Volume 2 No 4
Apple medical application/North Star Horizon/Word processing/High speed cassette interface/Sorting/Buying a computer for a small business

Volume 3 No 12 December 1980
Benchtest: Microwriter/Printerfacing: Series — Part 1/Sharp PC-1211 speed-up/Programs: TRS-80 Tarot, PET Cat & Mouse, PET Rebound, MZ-80K Alligatow Swamp, PET Connect, UK101 Minefield, PET Simon Benchtest: Raannd SP1

Volume 4 No 1 January 1981
Benchtest: Transam Tuscan/Real-time control using trains — part 1/Recover from a data tape disaster/PET Music Multi-user systems — part 1/Programs: TRS80 Four in a row, TRS80 Target Practice, PET Convoy, PET Wire, PET Maze Chase, PET Android Attack, PET Anagram

Volume 4 No 3 March 1981
Benchtest: Onyx C8002/Benchtest: Bigboard/Micro music software package/ALC circuit/Commons report/HP 43C/Programs: TRS80 Show Jumping, PET Grand Prix, PET Aircraft landing, PET Bouncy.



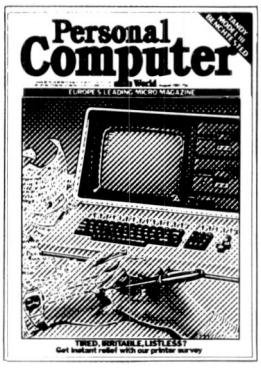
Volume 4 No 5 May 1981
Benchtest: Pascal 640/WP Benchtest: Magic Wand/PET colour/Low-cost digital tape system/Using calculator printers on micros/Apple music-making/Multi-user Benchtest: MVT-Famos/Programs: PET Grand Prix, PET Aircraft Landing, PET Bouncy.



Volume 4 No 6 June 1981
Benchtest: NEC PC-8001/Multi-user Benchtest: MP/M/Benchtest: Sinclair ZX81/West Coast Faire report/Radio Teletype/WP Benchtest: Wordpro 4 plus/Budget tape interface/Further Casio quirks/Programs: UK101 Zor, PET Chords.



Volume 4 No 7 July 1981
Benchtest: Sharp PC-3201/Multi-user Benchtest: Acorn Econet/Case study: Accident investigation on TRS-80/Zilog Z8 family/WP Benchtest: Format-80/Pascal Benchmarks: readers' letters/Quicker Casio computations/Programs: ZX80 Sliding Letters, UK101 Car Rally, TRS-80 Calendar, UK101 m/c code to Basic converter, PET Exam Questions, MZ-80K Designer, ZX91 Sketch Pad.



Volume 4 No 8 August 1981
Benchtest: TandyModel III/Viewdata update/WP Benchtest: Spellbinder/Printer survey/Microholism/Programs: ZX80 Othello; Easter Sunday; Apple Mondrian; MZ-80K Duck Shoot; PET Gomoku; MZ-80K Football.



Volume 4 No 9 September 1981
Benchtests: Tandy Color Computer, Commodore VIC/Checkouts: Hi-Tech Speakeasy, Tantel/Multi-user Benchtest: HMSOS/WP Benchtest: Memorite III/Word proc program for PET/Apple dealership run by spastics/Printer facing extra/Calc Corner: Casio fx602p review/Programs: PET Arithmetic test, ZX80 Eldorado, 380Z Memory test.



Volume 4 No 10 October 1981
Benchtest: OKI if-800/Checkouts: Heuristics speech link, Softy 2/Calc Corner: Texas TI51-111/Jeff Taylor on computer literacy projects/Introducing TJ's Workshop/Control your own Substation pt 1/Programs: TRS-80 Sailing.



Volume 4 No 11 November 1981
Benchtests: Osborne 01, IBM Personal Computer. Checkout: Sharp IQ3100 Microtranslator. Calc Corner: Casio fx702p. PCW Show report, Benchmark Summary, Euro Micro Chess Championship report. Programs: TRS-80 Sheepdog trial, ZX81 Sun and Planets.

BENCHTEST GUIDE

Here's a list of all the Benchtests and reviews (and the issues in which they were published) available from the Back Issues Centre

Benchtests

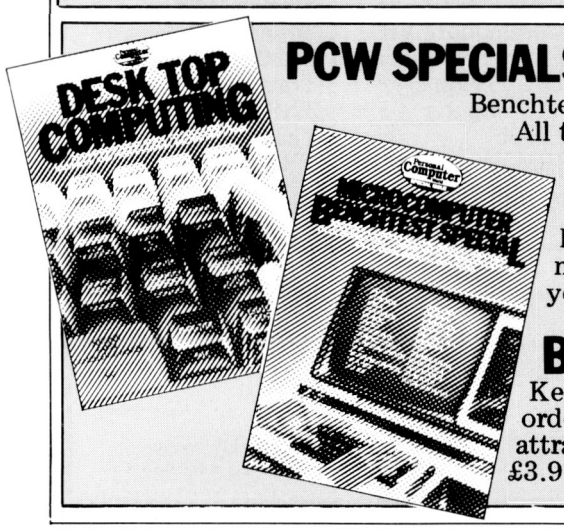
Acorn Econet (Multi-user)	4/7
Apple III	5/5
BBC Micro	5/1
Bigboard	4/3
Casio fx-9000p	5/2
Commodore VIC	4/9
Compucolor II	2/5
Cromemco Z2D	1/8
dBase II (DB)	5/5
FMS-80 (DB)	5/4
Format 80 (WP)	4/7
Gemini Multiboard	5/2
Hewlett-Packard 125	5/3
Hitachi Peach	5/5
HMSOS (Multi-user)	4/9
IBM Personal Computer	4/11
Magic Wand (WP)	4/5
Memorite III (WP)	4/9
Microwriter	3/12
Monroe OC8820	5/4
MP/M (Multi-user)	4/6
Nascom	1/1
NEC PC-8001	4/6
North Star Horizon	2/4
OKI if-800	4/10
Onyx C8002	4/3
Osborne 01	4/11
Pasca 640	4/5
PET 2001	1/2
Philips P2000	4/12
Scripsit 2.0 (WP)	5/2
Sharp MZ-80A	5/6
Sharp MZ-80B	4/12
Sharp PC-3201	4/7
Sirius-I	5/2
Sinclair ZX Spectrum	5/6
Sinclair ZX81	4/6
Sintrom Periflex 630/48	3/6
The Sorcerer	2/3
Spellbinder (WP)	4/8
Tandy Color Computer	4/9
Tandy Model III	4/8
Tandy TRS-80 Model II	3/6
Texas Instruments 99/4A	5/3
Transam Tuscan	4/1
Wordpro 4 Plus (WP)	4/6
WordStar (WP)	4/5
Xerox 820	5/1

Calculator reviews

Casio FP-10 printer	5/4
Casio fx602p	
Casio fx702p	4/11
Hewlett-Packard Interface Loop	5/3
HP14C review	4/12
HP 34C	4/3
Sharp PC-1500	5/6
Texas T151-111	4/10

Checkouts

Exatron Stingy Floppy	3/6
Heuristics speech lab	2/5
Heuristics speech link	4/10
Hi-Tech Speakeasy	4/9
Sharp IQ3100 Microtranslator	4/11
Sid	1/5/4
Soft Intelligent EPROM Programmer	3/6
Softy 2/4/10	
Tantel	4/9
Watanabe Plotter	5/2
ZX81 Printer	5/1



PCW SPECIALS

Benchtest Special £1.80. All the best of *PCW's* Benchtests of popular micros. Desktop computing £2.25. Comprehensive guide to using micros to help you in your Businesses.

BINDERS

Keep your copies in order with these strong, attractive yellow binders. £3.95 each (inc P&P)



Vol 4 No 12
December 1981
Benchtests: Sharp MZ-80B Philips P2000/School network/ BBC Micro inside story/ 'Turtle' Graphics for Apple/ Forth language/ Curve fitting/ Calc corner: HP14C review/ Programs: PET Fantasy, ZX81 Battleships and cruisers.

Vol 5 No 1 January 1982
Benchtests: BBC Micro, Xerox 820/Frames of Reference (new series)/ ZX81 Printer Checkout/ Digital Drummer for PET/ Calc Corner: Benchmarks/ Programs: MZ-80K Fortune, TRS-80 Reaction Timing, ZX80 Laybrinth, Apple Letters.





Vol 5 No 2 February 1982
Benchtests: Sirius-I, Casio fx-9000p, Gemini Multiboard/Word Processor Benchtest: Scripsit 2.0/ Plotter Checkout: Watanabe/Hardware feature: High Density VDU card project/Music system: FREQOUT/Calc Corner: Aerial Navigation/Programs: Pet Haemophilia, Pet Cheese, TRS-80 Extra, Sharp PC1211 Exam, Personality test.



Vol 5 No 3 March 1982
Benchtests: Texas Instruments 99/4A, Hewlett-Packard 125/Choosing a Database/Compsoft DMS reviewed/Screenplay (new series)/Calc Corner: Hewlett-Packard Interface Loop/Programs: TRS-80 Solitaire, TRS-80 Ducks, Nascom Business Documents, MZ-80K Race Chase, ZX81 Graphplot.



Volume 5 No 4
April 1982
Benchtest: Monroe OC8820/DB Benchtest: FMS-80/Checkout: Sid 1/ Generating screen forms/ Comal/Logo/Brain Dump-New series/Calc Corner: Casio FP-10 printer/ Programs: TRS-80 Maths & Trig, PET Boot the Cat, ZX81 Resistor & Res code.



Vol 5 no 5 — May 1982
Benchtests: Apple III, Hitachi Peach/Database Benchtest: dBase II/3D Graphics Made Easy/ Equation Solving/Calc Corner: fx 602 quirks/ Programs: PET Mini-Animate, MZ-80K Catch, Apple Maze, Atari Sums For Kids, ZX81 Book Index, PET Stockmarket, Microtan 3D Rotation, Extra for MZ-80K, UK101 Crossword Notepad.
With free Word Processing Supplement containing a summary of all *PCW*'s WP Benchtests.

Vol 5 No 6.
June 1982
Benchtests: Sharp MZ-80A/ ZX Spectrum/Database Benchtest: DBMS2/West Coast Faire Report/Lisp/ VIC 20 games/Calc Corner: Sharp PC1500/ Programs: RML Altered Basic/VIC-20 Large Characters/BBC Breakout/ VIC-20 Trailblazer/MZ-80K Next-to-Last-One/MZ-80K Tarot.





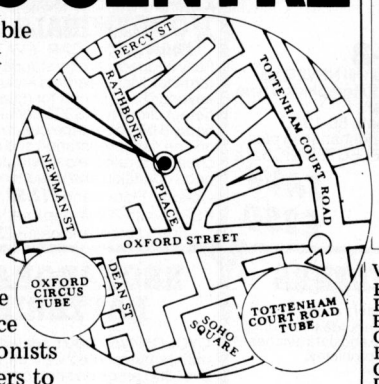
Vol 5 No 7
July 1982
Benchtests: Mimi 801/ Newbrain/Database Benchtest: Silicon Office/UCSD p-System/BBC Computer In-Depth/Apple II games/ Calc Corner: TI88/ Programs: ZX81 Hypocycloids/BBC Character Generator/TRS-80 Truth/ PET Doc/TRS-80 Screen Dump/UK101 Screen Converter/PET boxes/Atari Earth.



Vol 5 No 8
August 1982
Benchtests: Sord M23/ Dragon 32/Database Benchtest: Cardbox/ Preview: Sony SMC-70/ UCSD p-System/RS232 Interface/Sirius graphics/ NCC Show report/ZX81 Speech Checkout/Calc Corner: Casio fx602p/ Programs: TRS-80 Quadrangle/UK101 Conversion of units/PET Mopup/Apple Lifespan/Apple Trees/ Nascom Snail Racing/ UK101 Long Multiplication & addition.

BACK ISSUES CENTRE

We have a complete selection of all available *PCW* back numbers in our flashy new Back Issues Centre in the West End of London, just half a minute's walk from Oxford Street (close to Tottenham Court Road tube station). Of course, you could order them from our excellent mail order service using the coupon below, but by visiting in person you save on postage costs. The Back Issues Centre also often has back numbers of *PCW* on sale which we cannot offer through the mail order service because of shortage of stock. Our receptionists will also be happy to sell you a set of binders to take your subscription. And there's a range of interesting computer books on sale as well. Drop by next time you're in the West End. We're open Monday to Friday, 10am to 6pm. The address is 14 Rathbone Place, London W1P 1DE.





Come up and see us...
Mon – Fri
10am – 6pm
Saturday
11am – 6pm

Any one issue £1.50; all additional issues £1.00 each. Benchtest special £1.80. Desktop Computing £2.25. Binders £3.95 each. All prices include post and package. *Overseas orders requiring Air Mail postage add £1.00 per copy. Cheques/P.O. payable to Computing Publications Ltd, 53/55 Frith Street, London W1A 2HG Please allow up to 3 weeks for delivery and don't forget to state your name and full address with your order. Please send me the following copies of PCW. I enclose a cheque/P.O. for £... Please tick appropriate boxes.

Volume 1	Volume 2	Volume 3	Volume 4	Volume 5	
1☐ 2☐	1☐ 2☐	6☐	1☐ 3☐ 5☐ 6☐ 7☐	1☐ 2☐ 3☐ 7☐	Benchtest Special ☐
3☐ 6☐	4☐	12☐	8☐ 9☐ 10☐ 11☐ 12☐	4☐ 5☐ 6☐ 8☐	Desk Top Computing ☐
					Binder ☐

Name _____ Address _____

COMPUTER WAREHOUSE

THE 'ALLADINS' CAVE OF COMPUTER AND ELECTRONIC EQUIPMENT

HARD DISK DRIVES

Diablo/DRE Series 30 2.5 mb. fully refurbished DEC RK05 media and software compatable. Front load ***£550***.
Top load ***£295***.
PSU for 2 drives ***£125***.

Diablo -Dre 44A-4000A or 4000B 10 mb 5 +5 removable pack new and refurbished from ***£995***.

CDC 80 mb removable pack DEC RM03 media and software compatible brand new from ***£2,950***.

Honeywell 5+5 10 mb drives ***£450*** good s/h condition.
For more information on controllers, expansions and ready to go sub systems contact sales office.

DISTEL ©

The UK's **FIRST** free of charge, 24 hr. public access data base. Get information on **1000's** of stock items and order via your computer and credit card. On line now, 300 baud. CCITT tones, full duplex, fully interactive.

DON'T MISS THOSE BARGAINS CALL NOW, IT'S FREE!

01-683 1133 7 days per week 24 hrs. per day

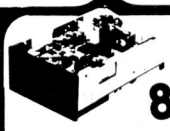
COMPUTER 'CAB'



All in one quality computer cabinet with integral switched mode PSU. Mains filtering and twin fan cooling. Originally made for the famous DEC PDP8 computer system costing 1000's of pounds, and designed to run 24 hours per day. The PSU is fully screened and will deliver a massive +5v DC at 17 amps, +15v DC at 1 amp and -15v DC at 5 amps. The unit is fully enclosed with removable top lid, twin fan cooling, mains filtering, trip switch, 'power on' and 'run' LED's, aluminium front panel and rear cable entrys. Give your system that professional finish for only ***£49.95*** + £9.50 carr. — Dim. 19" wide 16" deep 10.5" high. Usable area 16" w. 10.5" h. 11.5" d. Units are in good but used condition 240 or 110 v working — complete with data. Large stocks of PDP 8 spares — enquire.

COOLING FANS

Keep your "Hot Parts" cool and reliable with our range of professional fans.
ETRI 99XU01 Miniature equipment fan 240 vac working DIM 92 x 25 mm BRAND NEW complete with finger guard. Makers price £16 our price ***£9.95***
BUHLER 69.11.22 micro miniature 8-16 v DC reversible fan. Measures only 62 x 62 x 22 mm. Uses a brushless DC servo motor almost silent running ideal portable equipment, life in excess of 10,000 hours. BRAND NEW manufactures price £32.00 our price ***£12.95***
MUFFIN/CENTAUR cooling fans DIM 120 x 120 x 38 mm tested ex equipment 240v ***£6.25*** 115v ***£4.95*** + p&p £1.90
KOOLTRONICS Powerful snail type blower gives massive air movement with centrifugal rotor DIM as a cube 8" x 8" x 6" air aperture 2.5" x 2.5" with flange fixing. BRAND NEW 110v 50Hz ac working ONLY ***£9.95*** + £1.90 p&p



8" FLOPPY DISK DRIVES

Unbelievable value the DRE 7100 & 7200 8" disk drives utilise the finest technology to give you 100% bus compatability with most drives available today, the only difference being our PRICE and the superb manufacturing quality. The 7100 single sided & 7200 double sided drive accept hard or soft sectoring. IBM or ANSI standard giving a massive 0.8 MB (7100) & 1.6 MB (7200) of storage. Absolutely SHUGART, BASF, SIEMENS etc compatable. Supplied BRAND NEW with user manual and 90 day warranty.

7100 single sided ..... ***£225.00*** + 9.50 + vat
7200 double sided ..... ***£295.00*** + 9.50 carr + vat
full technical manual ***£20.00*** alone ***£9.00*** with drive, refund of difference on purchase of drive.
SHUGART s/h 800-2 8" Drive's 110v 50Hz motor ***£160*** + £9.50 carr.
Removed from working equipment but untested. SA120 Alignment disk's ***£9.95***

9" Monitors



DT10 Monitor a complete **MOTOROLA 9"** video monitor housed in an attractive metal case DIM approx. 10" deep 16" wide and 11" high. The monitor has a 75 ohm composite video input with a bandwidth of 18 mhz. A seperate internal PSU delivers 5v dc for external use and 12 v DC for video monitor. The case has sufficient room inside for mounting other units such as 5" disk drives etc. Internal pots give full control over all monitor functions. Supplied in a tested, as new or little used condition. 240v AC operation ***£55.00*** Carriage and Insurance £10.50
MOTOROLA 9" open chassis monitor. Standard 240 v AC with composite 75 ohm video input, bandwidth in excess of 18 mhz. Monitors are ex equipment and although unguaranteed they are all tested prior to despatch, and have no visible burns on the screens. Dim approx. 9" x 9" x 9". Supplied complete with mains and input lead. Ideal ZX81 etc or giving the tele back to the family!!
Black and White phosphor ***£35.00*** + £9.00 Carr.

SUPER SCOOP



CENTRONICS 739-2

The "Do everything Printer" at a price that will NEVER be repeated. Standard Centronics interface, full graphics, 4 type fonts with **high definition & proportional spacing for word processor applications,** 80-132 columns, single sheet, roll or sprocket paper handling plus much more. Available only from DISPLAY ELECTRONICS at a ridiculous price of only ***£299.00***
Options: carriage & insurance ***£10.00***
Interface Cable ***£10.00***
RS232 Converter ***£45.00***

SAVE £250

TELETYPE ASR33 I/O TERMINALS



FROM £195 + CAR. + VAT
Fully fledged industry standard ASR33 data terminal. Many features including ASCII keyboard and printer for data I/O auto data detect circuitry. RS232 serial interface. 110 baud, 8 bit paper tape punch and reader for off line data preparation and ridiculously cheap and reliable data storage. Supplied in good condition and in working order
Options: Floor stand ***£12.50*** + VAT
KSR33 with 20ma loop interface ***£125.00*** +
Sound proof enclosure ***£25.00*** + VAT

SEMICONDUCTOR 'GRAB BAGS'

Mixed Semis amazing value contents include transistors, digital, linear, I.C.'s triacs, diodes, bridge recs., etc. etc. All devices guaranteed brand new full spec with manufacturer's markings, fully guaranteed. 50+ ***£2.95*** 100+ ***£5.15***
TTL 74 Series A gigantic purchase of an "across the board" range of 74 TTL series I.C.'s enables us to offer 100+ mixed "mostly TTL" grab bags at a price which two or three chips in the bag would normally cost to buy. Fully guaranteed all I.C.'s full spec. 100+ ***£6.90*** 200+ ***£12.30*** 300+ ***£19.50***

SOFTY 2

The amazing SOFTY 2. The complete "toolkit" for the open heart software surgeon. Copies, Displays, Emulates ROM, RAM and EPROMS of the 2516, 2532 variety. Many other features include keyboard, UHF modulator. Cassette interface etc. Functions exceed capabilities of units costing 7 times the price! Only ***£169.00*** pp £1.95 *Data sheet on request*

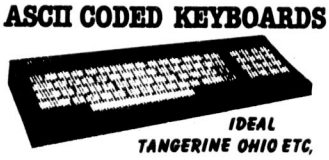
MAINS FILTERS

Professional type mains filters as used by "Main Frame" manufacturers. Ideal for curing those unnerving hang ups and data glitches — fit one now and cure your problems.
Suppression Devices SA5A
upto 5 amp load ***£5.95***
Corcom Inc F1886 up to 20 amp load ***£9.50***
Corcom Inc F1900 upto 30 amp load ***£12.25***

RECHARGEABLE BATTERIES

CYCLON type D001 sealed lead acid maintenance free 2v 2.5 ah. will deliver over 300 amps on short circuit!! Brand new at only ***£2.95***
SAFT VR2C size 'C' 1.2v 2 ah. nickel cadmium ***£1.50*** each 10 for ***£11.50***

RCA FULLY CASED ASCII CODED KEYBOARDS



IDEAL TANGERINE OHIO ETC,

Straight from the USA made by the world famous RCA Co., the VP600 Series of cased freestanding keyboards meet all requirements of the most exacting user, right down to the price! Utilising the latest in switch technology. Guaranteed in excess of 5 million operations. The keyboard has a host of other features including full **ASCII** 128 character set, user definable keys, upper/lower case, rollover protection, single 5V rail, keyboard impervious to liquids and dust, TTL or CMOS outputs, even an on-board tone generator for keypress feedback and a 1 year full RCA backed guarantee.
VP601 7 bit fully coded output with delayed strobe, etc. ***£43.95***
VP611 Same as VP601 with numeric pad ***£54.95***
VP506 Serial, RS232, 20MA and TTL output with 6 selectable Baud Rates ***£64.26***
VP616 Same as VP606, with numeric pad ***£84.34***
Plug and cable for VP601, VP611 £2.25
Plug for VP606, VP616 £2.10
Post, Packing and Insurance ***£1.95***
ORDER NOW OR SEND FOR DETAILS

D.C. POWER SUPPLY SPECIALS

Experimentors PSU Ex-GPO unit all silicon electronics. Outputs give +5v @ 2 amps. +12v @ 800 ma. -12v @ 800 ma. +24v @ 350 ma. 5v @ 50 ma. floating. Dim 160 x 120 x 350 mm. All outputs fully regulated and short circuit proof. Removed from working equipment, but untested. Complete with circuit. Transformer guaranteed. Only ***£14.50*** +£2.50 pp.
POWER ONE CP143 super compact unit giving continuous output of 5v @ 5 amps. dim. 215 x 67 x 80 mm. BRAND NEW and guaranteed Only ***£21.00*** + £1.50 pp.
CUSTOM POWER CO55 5v @ 3 amp. Very compact unit dim. approx 60 x 90 x 190 mm. Semi open chassis, full crowbar overvoltage protection. Tested Ex Equipment. ***£11.95*** + pp £1.25
MINI SYSTEM PSU Ex equipment unit ideal for the small micro. Outputs give 5v @ 3 amps. +12v @ 1 amp and -12v @ 300 ma. Crowbar overvoltage protection and current limit. Fully tested. Dim 70 x 165 x 320 mm. Complete with Circuit only ***£12.95*** + £2.00 pp.
PERIPHERAL SYSTEM SUPPLY. Fully cased unit supplied in a Brand new or little used condition. Outputs give 5v @ 11 amps, "+" 15-17v @ 8 amps. "-" 15-17v @ 8 amps and "+" 24v @ 4 amps. All outputs are crowbar protected and the 5 volt output is fully regulated. Fan cooled. Supplied tested, with circuit ***£55.00*** + £8.50 carr.
MAIN FRAME SUPPLY. A real beefy unit designed for MINI or MAINFRAME use outputs give 5 volts @ 50 amps. +12v @ 5 amps. -12v @ 10 amps. All output are fully regulated with crowbar overvoltage protection on the 5v output. Supplied with circuit and tested. Ex-Equip. 110v AC input. Only ***£49.95*** + carr. £10.50.

300 BAUD DATA MODEMS

Join the communications revolution with our standard EX GPO 2a/b data MODEMS. Modem operates on standard CCITT tones with full auto answer facilities. Will switch to ANSWER or ORIGINATE. Standard RS232 i/o connections. Ideal networks. DISTEL etc. Complete with data. Untested but good condition ***£55.00*** carr. £8.50.

1200 BAUD DATA PUMP MODEMS

Compact unit for use with private or "Dial up lines" Designed to work in pairs at any baud rate upto 1200 full duplex (4 wire circuit) or half duplex (2 wire circuit). Features include remote test facilities. RS232 i/o lines etc. Supplied with data in working order, but less case cover ***£65.00*** + £4.50 carr.

66% DISCOUNT ELECTRONIC COMPONENTS & EQUIPMENT

Due to our massive bulk purchasing programme which enables us to bring you the best possible bargains, we have thousands of I.C.'s, Transistors, Relays, Cap's., P.C.B.'s, Sub-assemblies, Switches, etc. etc. surlplus to our requirements. Because we don't have sufficient stocks of any one item to include in our ads., we are packing all these items into the *"BARGAIN PARCEL OF A LIFETIME"* Thousands of components at giveaway prices! Guaranteed to be worth at least *3 times* what you play plus we always include something from our ads. for unbeatable value!! Sold by weight.

2.5kls *£4.25* + pp £1.25 — **5kls *£5.90*** + pp £1.80
10kls *£10.25* + pp £2.25 — **20kls *£17.50*** + pp £4.75

OLIVETTI TE300



REDUCED TO CLEAR

Complete input output terminal with integral 8 hole paper tape punch and reader. Unit operates at 150 baud in standard ASCII. Ideal as a cheap printer for a MICRO etc. 120 columns, Serial data i/o. Supplied complete with data, untested, unguaranteed ***£65.00*** + £11.50 carr.

All prices quoted are for U.K. Mainland, paid cash with order in Pounds Stirling PLUS VAT. Minimum order value ***£2.00***, Minimum Credit Card order ***£10.00***. Minimum BONA FIDE account orders from Government depts., Schools, Universities and established companies ***£20.00*** Where post and packing not indicated please ADD **60p + VAT** Warehouse open Mon-Fri 9.30 — 5.30. Sat. 10.15 — 5.30. We reserve the right to change prices and specifications without notice. Trade, Bulk and Export enquiries welcome.

DISPLAY -ELECTRONICS-

64-66 Melfort Road, Thornton Heath, Near Croydon, Surrey
01-689 7702 — 01-689 6800 Telex 27924

BARCLAYCARD VISA

The '6809' centre

The FLEX 9 Operating System for '6809' Based Micro-Computers.

This disk operating system is now the standard single user system for machines using the powerful '6809' micro.

Having many advantages over similar operating systems for other micro-computers, this system can now be run on many different '6809' based machines.

Furthermore, the Configurable Version is available for implementation on custom '6809' computers.

Programs written to run with this operating system are almost completely machine independent, thus allowing the easy transfer of software.

There is a wide range of software available for this system, some of which is listed below. Please send for our full list.

'6809' HARDWARE, RUNNING FLEX9.	EX VAT	INC VAT
Convert your APPLE II to FLEX—with the new EXCEL—9 '6809' board. Complete with FLEX9 on 5¼" disk.	181.74	**209.00**
APPLE II, with EXCEL—9 Board, 48K RAM, 40 x 24 Video Output, two 5¼" disk drives, with 240 Kbyte capacity, with FLEX9	1549.57	**1782.00**
FUJITSU MICRO—8, with 64K RAM, colour graphics on 14" screen, two 5¼" disk drives with 656 Kbyte capacity, with FLEX9	2346.09	**2698.00**
SWTPC S/09, with 64K RAM, 12" intelligent terminal, two 5¼" disk drives with 740 Kbyte capacity, with FLEX9	3338.26	**3839.00**
STIRLING 77—68 KIT, based on 8" x 8" bare PCB's, now with 64K RAM, and Disk Controller for 5¼" or 8" Disks.		

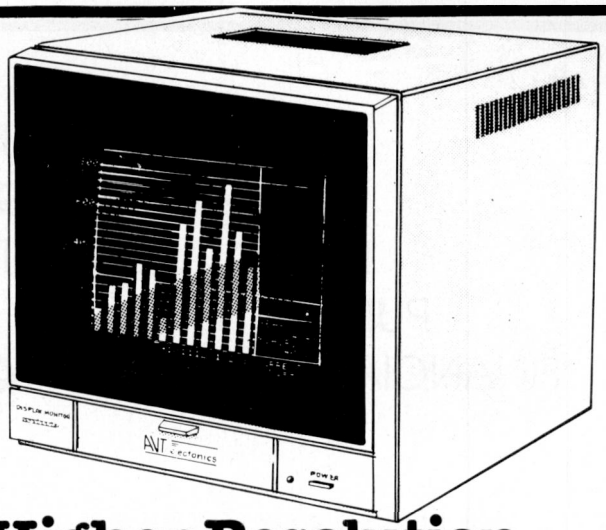
Send for further details on any of these systems, or their component parts.

SOFTWARE—6800 & 6809—on Cassette—300 Baud, CUTS, S1 Format.		
6800 Disassembler, with Move function,	10.00	**11.50**
6800 Text Editor, with Source Listing,	28.00	**32.20**
6800 Assembler, with Source Listing,	28.00	**32.50**
6800 Text Processor, with Source Listing,	28.00	**32.50**
6800 Relocator, with Source Listing,	16.09	**18.50**
6800 8K Basic Interpreter (V2.3),	15.22	**17.50**
6809 Text Editor, Cassette to Cassette,	32.61	**37.50**
6809 Macro Assembler, Memory to Cassette,	32.61	**37.50**
6809 10.5K Basic Interpreter,	48.70	**56.00**
FLEX9, 6809 Disk Software, on 5¼" or 8" Disks.		
Configurable FLEX, with Text Editor & Assembler	120.00	**138.00**
Sort/Merge Package, with File Editing Facilities	48.70	**56.00**
Debug Package, a complete 6809 Simulator	48.70	**56.00**
Disk Utilities, Additional Commands for FLEX	48.70	**56.00**
Text Processor, for Text Formatting	48.70	**56.00**
Text Editor & 6800/6809 Macro Assembler	69.57	**80.00**
Disk & Memory Diagnostics, Further FLEX Commands	48.70	**56.00**
Extended Basic, Advanced Business Basic for 6809	62.61	**72.00**
Extended Basic Pre-Compiler, for Extended Basic	32.61	**37.50**
Pascal, 6809 Machine Code Compiler	130.43	**150.00**
68000 Cross Assembler, runs on 6809 under FLEX	173.91	**200.00**
RMS, A Record Management System for 6809	145.22	**167.00**
Tabula Rasa, Financial Reporting Package	120.00	**138.00**
Stylograph, The Complete Word-Processing Package	173.04	**199.00**
Micro-Modeller, Now Available for FLEX9	694.78	**799.00**
DYNACALC, the Spreadsheet Program for FLEX	140.00	**161.00**
FULL RANGE OF APPLE II EQUIPMENT ALWAYS IN STOCK, RING FOR PRICES.		
MAIN LONDON DEALER FOR SHARP MZ-80A.	477.39	**549.00**

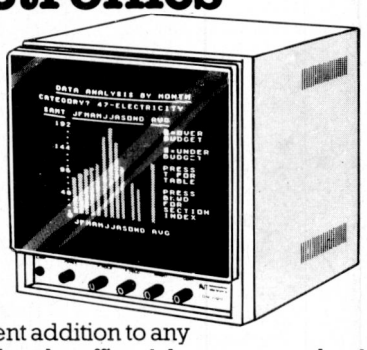
- Come and try any of our systems or make use of our mail order service.
- All prices include carriage charges within the mainland UK.
- All prices are correct at time of going to press and subject to availability.
- Send for our latest price list and catalogue covering our vast range.
- Further information is available on all the products listed, send for details.
- Store opening hours-9.30 to 5.30-Monday to Saturday-Access & Visa.
- STIRLING MICROSYSTEMS LTD
- THE '6809' HARDWARE & SOFTWARE STORE.

STIRLING MICROSYSTEMS

241 Baker Street, London NW1 6XE.
Telephone: 01-486 7671.



Higher Resolution and greater versatility . . . the New Computer Monitors from Lowe Electronics



Our new range of Computer Monitors – available in 9" or 12" screen – are an essential buy for the committed micro-enthusiast, who wishes to spend many happy hours with his computer without disturbing the family T.V. Viewing.

They also make an excellent addition to any professional system, in either the office, laboratory or school environment.

They are compatible with most popular makes of micro on the market (Apple, Acorn, Tandy, Sharp etc.) and will greatly enhance the display quality produced by these machines. There is a choice of Black and White, Green, or Amber tubes (not a standard tube with a coloured filter), making for superb definition of characters and graphics. The monitors are attractively finished, and very sturdily built in a metal casing. The screen is a particular feature, with a smoked, anti-glare display filter for easier viewing. High bandwidth and high resolution complete their superb, technical specification as well as easy-to-operate controls. The new Lowe Monitors must be the best value available today.

Prices from £70.00 + V.A.T.

Visit your local dealer or phone us for advice:

Please send me leaflets and price list for your 9"/12" Computer Monitors. I enclose 25p postage.

Name_____

Address_____

_____

Telephone_____ P.C.W.9.82

LOWE electronics

Chesterfield Road,
Matlock,
Derbyshire DE4 5LE.
Telephone: 0629 4995.
Telex: 377482 Lowlec G.
Trade enquiries welcome

WORD PROCESSING
SALES LEDGER
NOMINAL LEDGER
PURCHASE LEDGER
FINANCIAL MODELLING

BUSINESS COMPUTERS COMPUTERS COMPUTERS COMPUTERS COMPUTERS COMPUTERS

AUTOFILE offer the **SIRIUS 1**, the powerful 16-bit micro-computer

AUTOFILE supply a range of packaged software:

- MICRO-MODELLER — Financial Modelling
- PULSAR — Business Accounting
- SUPERCALC — Electronic Worksheet
- WORDSTAR — Word Processing
- SPELLSTAR — Spelling Check
- MAILMERGE — Direct Mailing

AUTOFILE has a team of programmers to cater for your individual requirements.

AUTOFILE will understand your needs and provide a solution to fit your application — and your pocket.

AUTOFILE with **SIRIUS 1** offer a new approach to micro-computers.

The price of the **SIRIUS 1** is £2395

AUTOFILE LIMITED
799 WESTON ROAD
SLOUGH
BERKSHIRE
SL1 4HR
SLOUGH (0753) 75772

AUTOFILE AUTOFILE AUTOFILE AUTOFILE AUTOFILE AUTOFILE AUTOFILE

THE EUROPEAN

COMPUTER TRADE FORUM

Helping you make money, not mistakes

You could be a distributor, a dealer, a software house, a systems integrator, a sales and service company, a retailer – even a DP man about to go into business on your own. You could know the DP/WP business backwards, or you could be coming into the ring for the first time.

But whatever your status, if you owe your livelihood to buying and reselling computers, software or peripherals, you owe it to yourself to visit ECTF at the NEC this Autumn.



ECTF means business

Because it has been specially created for you, it's the computer industry's own trade show. It has been designed to provide you with a wider range of real business opportunities – together under one roof.

ECTF is there to help you plan the most profitable product line, to get the best hardware and software and to negotiate the most advantageous trade deals. Quite simply, your visit could be crucial to your *future* business success.

Seeing, hearing...and comparing

Wang, DEC, Sony, Olivetti, ICL, Hewlett-Packard, Toshiba – a host of household names will be there, plus many names you may not know: new companies in the market with new products that could be next year's big money makers.

They all need to meet you. They'll want to talk trade terms, marketing support, dealerships, discounts – and how their products can mean bigger profits for you.

And you need to meet them to see, discuss and compare the whole spectrum of WP and DP products. In fact that's the key to ECTF. By knowing what's available, you'll be in a better position to make money... and avoid mistakes.

For trade and trade alone

The general public are not invited to ECTF. The emphasis is on business. And for you it's free.

It takes place at the National Exhibition Centre Birmingham, easily reached by car or train. It will be open for just four days – 28 September to 1 October. Fill in the coupon and send it to ECTF. 232 Acton Lane, London W4 5DL – or telephone 01-747 3131 and we'll mail you FREE tickets for you and your business colleagues.

PLEASE FILL OUT AND USE CAPITAL LETTERS

Please send me__ Free Entrance Tickets for my colleagues and myself.

Name_____

Company_____

Address_____

_____

Telephone_____ Telex_____

(No one under 18 will be admitted)

☐ I would like to receive information on exhibiting at ECTF. Phone me on_____

PCW/13/8

Buy our £475* Electronic Typewriter and you have a Daisy Wheel Printer for your computer absolutely FREE



The T/Printer 35 is a superb portable typewriter that also doubles as a computer printer. It's the first electronic typewriter that's truly portable (it weighs only 17 pounds and is supplied with an ABS carrying case) and has all the features you'd expect of an electronic office typewriter. Except price.

Features include self-correction, dual function 100 character keyboard, triple pitch (10, 12 and 15 characters per inch), up to 12 in. wide paper—all with excellent print quality. And with Olivetti reliability.

Best of all, when you're finished using it as a typewriter, it's all set to go to work as a word processing quality computer output printer.

That makes the T/Printer 35 about the most versatile and cost effective piece of equipment you can buy. You get all the advantages of having a daisy wheel printer *and* electronic typewriter in a compact unit. And at one low price of £475*, including carrying case.

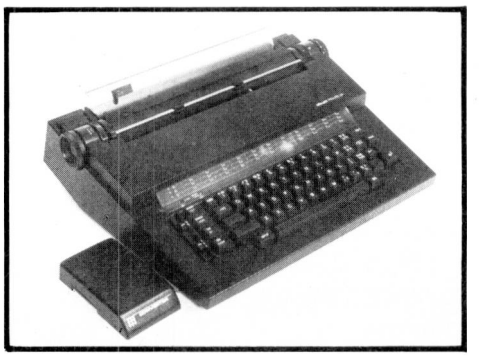
**The T/Printer 35 costs £475 with Centronics compatible parallel interface. With RS-232C interface it costs £535. Prices listed are exclusive of VAT.*

DATARITE

Datarite Terminals Ltd
Caldare House
144-146 High Road
Chadwell Heath, Essex RM6 6NT

Tel: 01-590 1155

Buy our £475* Daisy Wheel Printer for your computer and you have an Electronic Typewriter absolutely FREE



The T/Printer 35 is the lightest weight and lowest cost daisy wheel printer you can buy for your computer. So it will fit within your budget and you can carry it wherever you take your micro. Yet it is tough enough to give years of reliable service. Interchangeable typefaces (standard Olivetti 100 character daisy wheels), variable pitch, multiple copies—all the features you would expect of more expensive word processing printers.

Yet the T/Printer 35 costs only £475 with parallel interface. Operating speed under computer control is approximately 120 words per minute of letter perfect output. What typist can equal that?

Then when you're finished using it as a computer printer, the T/Printer 35 is ready to go right on working as an electronic typewriter.

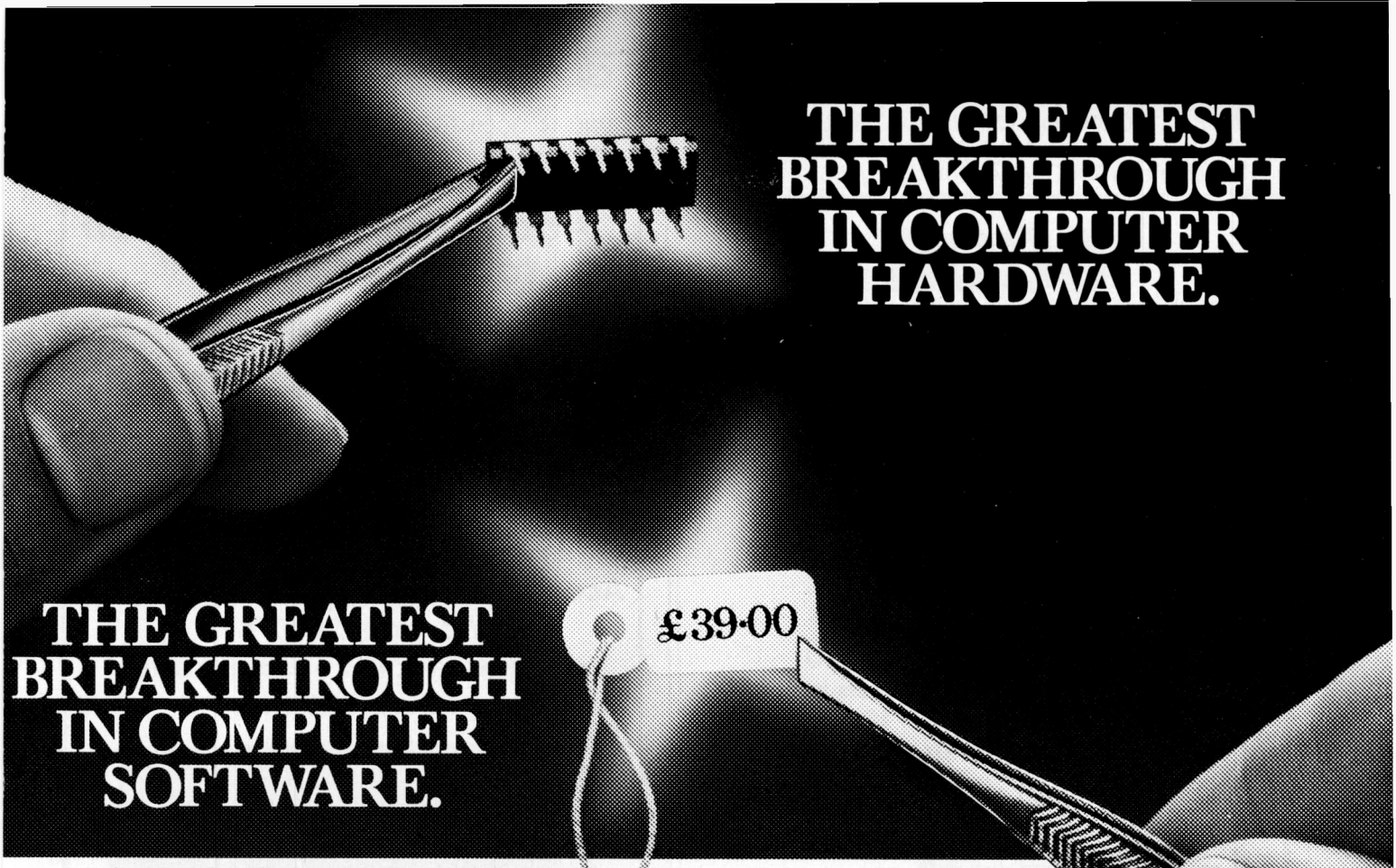
That's the dual-purpose T/Printer 35—the versatile computer printer that fits your budget.

Orders are shipped within the UK carriage-free. To order or for more information about the T/Printer 35:

DATARITE

Datarite Terminals Ltd
Caldare House
144-146 High Road
Chadwell Heath, Essex RM6 6NT

Tel: 01-590 1155



THE GREATEST BREAKTHROUGH IN COMPUTER HARDWARE.

THE GREATEST BREAKTHROUGH IN COMPUTER SOFTWARE.

We don't need to tell you what the micro chip has done for computer hardware.

Without it we'd still be in the world of Flash Gordon and mad professors.

Luckily, we have got the micro chip and the computer is now an everyday part of business life.

So, it seems odd that we should have to wait until now for a similar breakthrough in the world of computer software.

Still, it's been worth the wait.

PlannerCalc, the new *CP/M spreadsheet business planner from Comshare, is the first in a series of powerful packages that are going to put all others in the shade.

And, what's more, at £39.00 (plus VAT and p.&p.) it makes other people's price tags look a little extravagant.

PlannerCalc can handle the kind of business planning applications that fit into the spreadsheet format.

And unlike all other 'calc' products it allows you to enter calculation rules in English.

It uses the popular 'spreadsheet' approach, with a window that can be rolled in all directions.

Which means you can enter new figures or rules and immediately see their effects on everything else in the model.

PlannerCalc also incorporates some very mainframe-like features – for example, you don't need to number the models rows in the correct logical sequence as it can sort the rows itself as it calculates.

It comes with the best manual on the market and it's suitable for most micros with CP/M operating systems, at least 64K of memory and a minimum width screen of 80 characters and 2 floppy disc drives. (It'll even run on the new IBM personal computer.)

But if PlannerCalc is this good, how can we afford to sell it at such a low price?

Simple.

Because we know just how good it is.

And because we know it's going to sell in thousands. (In the U.S.A. we sold 5000 copies in the first month alone.)

As your needs and demands grow you can move on to other more powerful packages like MasterPlanner, the next step up in the Comshare range.

Which is good news for both of us.

Because when you do make that move you won't have to reprogram.

Masterplanner is totally integrated with Planner-Calc and you simply carry on where you left off.

But first you'll need to get hold of PlannerCalc.

To order, clip the coupon and enclose your cheque or credit details (but, please, no small change) or ring Teledata on 01-200 0200 and we'll send you PlannerCalc, the manual and list of Comshare's other business software.

COMSHARE

Making the computer make sense.

*CP/M is the registered trade mark of Digital Research Inc.

Comshare Ltd, 32/34 Great Peter Street, London SW1P 2DB. Telephone 01-222 5665.

To: **PCW 9** Comshare Limited, 32/34 Great Peter Street, London SW1P 2DB.

Please send me_____ copies of PlannerCalc at £46.05 inc. VAT and p.&p. per copy, I enclose a cheque/postal order for £_____ made payable to Comshare Limited.

Please debit my Access Card No:_____ for £_____

Barclaycard No:_____ for £_____

Signature:_____

Name:_____

Address:_____

_____

_____ Tel No:_____

IMPORTANT: Please fill in the following particulars:-

Type of micro_____ Memory size_____ K

Floppy Disc size: 5¼" ☐ Single Sided ☐ Single Density ☐

8" ☐ Double Sided ☐ Double Density ☐

Please allow 28 days for delivery. VAT No:238418649 Registered No:980406

PCW20/8

Comshare reserves the right not to accept any order, any acceptance will be subject to Comshare's Terms and Conditions of Use.

G.M. MICROTRONICS LTD

UNIT 14, GODINTON WAY INDUSTRIAL ESTATE,
GODINTON ROAD, ASHFORD, KENT TN23 1JB
Telephone: ASHFORD (0233) 38671/38672

6808 COMPUTER

The 6808 computer comprises of separate double eurocards as outlined below:-

●

CPU Card

Comprises of 6802/6808 C.P.U.
8K of on Board Ram (+ 128 Bytes in 6802)
Up to 4K of Rom ie 2 x 2716 Eproms.
and address decoding for other boards.

●

IO Card

Comprises of 2 x 6821 P.I. A. I.C.S.
1 x 6840 P.T.M.
2 x 6850 A.C.I.A. with RS232 outputs.
and two on Board Baud Generators to set up any Baud rate required

●

VDG

Gives 6K of Memory Mapped Graphics + Alpha Display using 6847 I.C. also has on Board Sound generator.

●

Backplane

Backplane Accommodates up to 11 x 80 pin edge connectors power requirements ±5V, ±12V

●

Available Shortly
6809 Computer system with twin disk drives (8" double sided double density) 65K user Ram, 14" colour monitor.
Ideal for small business accounts and word processing
ex. Works price £4200.00 Plus VAT
Business Package software available

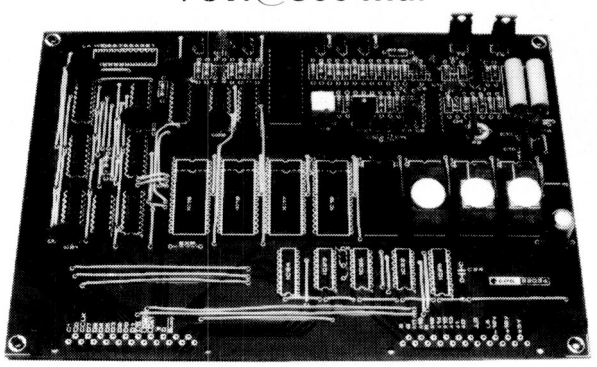
G.M. MICROTRONICS LTD.

UNIT 14, GODINTON WAY INDUSTRIAL ESTATE,
GODINTON ROAD, ASHFORD, KENT TN23 1JB
Telephone: ASHFORD (0233) 38671/38672

"Add the power of speech to your computer"

TMS 5100 TALKING BOARD as featured in ELEKTOR

Features 170 word vocabulary in 3 Eproms
Easily interfaced to any computer (via Bus or Parallel port) ie: Acorn, Atom, Apple , Atari, Pet, Vic, and ZX80/81.
Requires ±12v @50 ma and +5v.@300 ma.



GM510 Talking Board Kit (with interface IC's)	£82.95p
GM511 Power supply Kit to Power above	£16.10p
GM5100 Ready Built with power supply and cased	£144-00p
Design notes (inc in above) if bought separately	£1.00p

SOFTY II NOW IN STOCK @ £182.00 inc VAT

ALSO AVAILABLE SHORTLY

6808/6809 6u Board Expandable Computer System

Send for further details and specification

Please send the following items:
√ Box
☐ Softy II
☐ GM510 Talking Board Kit
☐ GM511 P.S.U. Kit
☐ GM5100 Ready Built Cased Unit
☐ Further Details
☐ Design Notes
☐ 6808/9 Details

I enclose cheque P/O for value of £..... please add £2.00 p&p. All prices inc. VAT.

Name .....
Address .....
..... Post Code .....

VISICALC 80 COLUMN DISPLAY on an APPLE II !

Yes, now its possible for all VISICALC users to obtain Screen Display in 80 COLUMNS, and to have additional memory available for VISICALC applications !!

Install one Saturn 128K Board and get 145K for Visicalc

Install one Saturn 32K Board and get 49K for Visicalc

Install one Saturn 128K Board plus one 32K Board = 177K for Visicalc

SEE US AT THE SHOW !!



VC EXPAND 80 TO GIVE ADDITIONAL MEMORY AND 80 COLUMN DISPLAY – £69.00

VC EXPAND WITHOUT 80 COLUMN DISPLAY – £55.00

VIDEX VISICALC 80 COLUMN SOFTWARE (No Memory Expansion) – £29.95

SATURN 128K BOARD – £359 SATURN 32K BOARD – £149

VIDEX VIDEO TERM – £195 VIDEX 40/80 Col Software Controlled Switch – £19.95

NEW PACKAGING From VISICORP

*	VISICALC	£139.00
*	VISIFILE	£169.00
*	VISITERM	£79.00
*	DESKTOP/PLAN	£139.00
*	VISIDEX	£139.00
*	VISIPLOT	£99.00
*	VISITREND/PLOT	£169.00
*	VISISCHEDULE	£189.00
*	VISISCHEDULE III	£189.00
*	DESKTOP/PLAN III	£189.00

NEW **VISICALC BUSINESS FORECASTING MODEL**

An easy to use VisiCalc application package for financial analysis and forecasting, containing 7 ready to use worksheets

£75.00

TRIPLE YOUR DISK ACCESS SPEED

No hardware modification required.

FastDOS

Fast Disk operating system for APPLE][computers

Completely compatible with DOS disks

Loads and saves standard DOS files

Completely compatible with all DOS/APPLESOFT programs that access DOS through standard hooks, including FID and MUFFIN

Executes all standard DOS commands

Comparative timings:	DOS	FDOS
Bloading integer basic	13 sec	3 sec
Cataloging a 12 file disk	2 sec	1 sec
Saving a 10 sector program	6 sec	2 sec
Saving a 100 sector program	34 sec	7 sec
Loading a 100 sector program	24 sec	7 sec

Requires 48K

Recommended Retail Price £19.95

UTILITIES

BACK IT UP BIT COPIER	£39.95
SUPER DISK COPY III	£17.95
DISK RECOVERY	£17.95
DISK ORGANISER II	£17.95
MULTI DISK CATALOG III	£15.95
DOS PLUS	£15.95
QUICKLOADER	£15.95
APPLESOFT PROGRAM OPTIMISER	£13.95
MACRO SCREEN EDITOR	£29.95
MON & DISK	£21.95
ACE (Applesoft Command Editor)	£21.95
LIST MASTER	£22.95
DAKIN 5 PROGRAMMING AIDS 3.3	£49.95
HIGHER TEXT II	£21.95
HIGHER GRAPHICS II	£18.95
HIGHER FONTS I	£8.95
PROGRAM LINE EDITOR	£21.95
MICROSOFT A.L.D.S.	£79.00
MICROSOFT TASC - The APPLE Compiler	£109.00
MICROSOFT APPLE Z80 - Basic Compiler	£209.95

NEW **BAG OF TRICKS**

From the authors of Beneath Apple DOS

Includes many "hand holding" tutorials that assist you in repairing damaged diskettes and allow you to change sector ordering, reconstruct blown catalogs, etc.

£21.95

SYNERGIZER with FREE SUPERCALC contains

Z-Card Z-80 Processor Card
C/PM OP System and Licence
Rodney Zaks C/PM manual from Sybex
16K ADD RAM Ramcard
Smarterm 80 col card with enhanced CHR set and integral soft switch together with free Supercalc

SUMMER SPECIAL ! *£399.00*
* *Without 16K CARD* *£335.00*

Z-CARD WITH SUPERCALC and CP/M

SPECIAL PRICE £199.00

Pete & Pam Computers

BARCLAYCARD VISA

Mail Order & Distribution:
Waingate Lodge, Waingate Close,
Rossendale, BB4 7SQ
Phone: (0706) 227011
Telex: 635740 Petpam G

London Retail:
103-5 Blegborough Road,
London, SW16 6DL
Phones: 01-769 1022/3/4

Norwegian Agent:
The Norwegian Software House
Address Okernveien 145
Oslo 5
Telephone (02) 22 89 78

BOOKS (No VAT)

VISICALC Home & Office Companion	*£11.50*
APPLE BASIC : Data File Programming	*£8.95*
What's Where in the APPLE?	*£8.95*
Science & Engineering Programs APPLEII	*£11.50*
A Guide to Programming in APPLE SOFT	*£11.00*
APPLE Pascal Games	*£11.45*
PASCAL PROGRAMMING for APPLE	*£10.45*
APPLE Pascal - a hands-on approach	*£10.50*
Osborne CP/M User Guide	*£9.95*

MACHINE COVERS - only the best material used

Apple only	£5.95
Single Disk	£2.95
2 Stacked Disks	£4.45
Apple, 2 Disks + 9" Monitor or Apple + 12" Monitor	£8.95
Apple + 2 Disks	£7.95
Epson MX 70/80	£5.45
Paper Tiger 445 - 460	£5.45
9" Monitor	£4.95
Apple, 2 Disks + 12" Monitor	£9.50
Hitachi 12" Cover	£7.50
Qume Sprint 5 Cover	£10.95
Apple III Cover inc. Monitor III	£12.95
Sirius Machine and Monitor Cover	£12.95
Sirius Keyboard Cover	£4.45
Epson MX 100	£7.45
NEC 12" Monitor	£7.50

THIS MONTH'S SPECIALS

CALCSTAR For APPLE WORDSTAR SYSTEMS	**£59.00**
OSBORNE C/PM USER GUIDE (Book – No VAT)	**£9.95**
BATTLE OF SHILOH	**£24.95**
MATHEMAGIC	**£49.95**
EXPEDITER II	**£39.95**
UZ80 Processor Card	**£69.00**
DIGITEK Colour Card	**£89.00**
16K RAM CARD	**£65.00**

A BIG HIT AT APPLE'82

timekit

The amazingly compact MICROWATCH real time clockcard and ELECTRONIC DIARY software for your APPLE II computer

£59.00

Prices do not include VAT please add 15% to your remittance Postage and Packing FREE

MEET US AT
THE NEC BIRMINGHAM COMPUTER
TRADE EXHIBITION **SEPT 28th - OCT 1st**

The new Transtec BC2.



A total business computer package under £1,500.

The Transtec BC2 is a brand new business computer with a 64K capacity and double sided double density disk-500K per drive. It utilises the CP/M operating system giving the user access to a huge range of already proven software packages. Alternatively, the BC2 also operates on the UCSD Pascal system. The stylish console incorporates a 12" non-glare green screen and comes with separate matching keyboard. And the BC2 is totally expandable so it can grow as you do! Find out more by clipping the coupon and mailing it to your nearest Transtec office.

WANTED NOW . . .Go-ahead Dealers with a solid successful track record to handle the exciting new Transtec range of Business Computers and supporting software.

I'd like to know all about Transtec.

Name

Company

Address

transtec computers

13A Small Street, Bristol W.1. Tel: 0272-277462
35 Lisburn Road, Belfast. Tel: 24009
IDA Complex, 22 Macken Street, Dublin 2.
Tel: 713049/715954

CAMBRIDGE LEARNING
SELF-INSTRUCTION COURSES



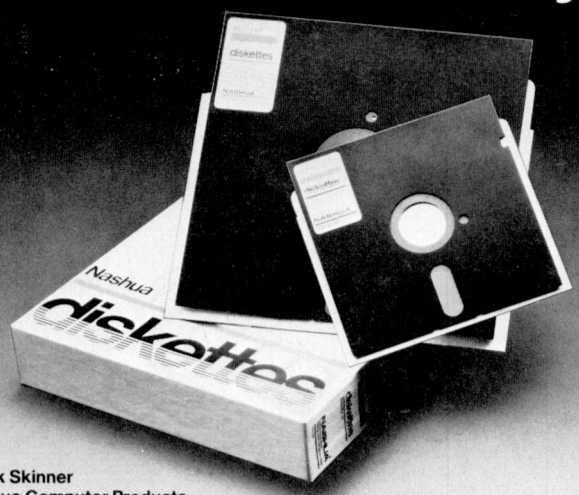
COMPUTER PROGRAMMING IN BASIC £11.50 (CPB)
Microcomputers are here – teach yourself to program! Learn BASIC, the easiest and most widespread language for the small computer. 60 illustrated lessons teach the essentials of good programming: problem definition, coding, flow-charting, debugging and clear documentation. And you don't even need a computer!

ZX81 SUPPLEMENT
£1.10 alone, £0.65p with CPB
When used in conjunction with the above course, it enables you to apply your knowledge to the Sinclair ZX81 microcomputer. It includes some amusing programs to help get you started.

THE ALGORITHM WRITER'S GUIDE £4.40
explains how to define questions, put them in the best order and draw the flow chart, with numerous examples. A must for programmers.

Cheque/PO with order to: **Cambridge Learning Ltd.**, Unit 78, Rivermill Site, FREEPOST, St. Ives, Cambs, PE17 4BR.
Or phone your credit card details to 0480 67446 (24-hour service).

NASHUA QUALITY DISKETTES
What more is there to say?



Frank Skinner
Nashua Computer Products,
Cory House, Bracknell, Berkshire RG12 1ET
Tel: Bracknell (0344) 52711 Telex: 848821

NASHUA

ADDISON-WESLEY COMPUTING

micro books

PASCAL FROM BASIC
Peter J Brown, University of Kent
If you're fluent in BASIC and want to go on to Pascal without starting again from scratch, this is the book for you.
192 pages fully illustrated £5.95

REAL TIME PROGRAMMING: Neglected Topics
Caxton C Foster
Fun programming experiments involving a lunar lander, a barbershop quartet of computers, and electric guitar distorters.
190 pages fully illustrated £6.95

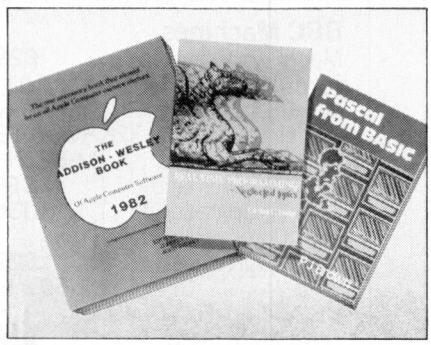
THE ADDISON-WESLEY BOOK OF APPLE COMPUTER SOFTWARE 1982
Edited by Jeffrey Stanton and John Dickey
The one book every Apple II owner needs – a complete consumers' guide to available software for the Apple II.
400 pages fully illustrated £12.95

MICROCOMPUTER GRAPHICS
Roy E Myers
This book will help you make the most of your micro's graphics capabilities, with sample program written in Apple II BASIC.
192 pages fully illustrated £6.95

THE S6800 FAMILY: Hardware Fundamentals
Mitchell Goozé
For owners and users of microcomputers in the S6800 family, this book combines all the technical information needed for use of the AMI S6800.
224 pages fully illustrated £6.95

Plus the most comprehensive graphics book available ...

FUNDAMENTALS OF INTERACTIVE COMPUTER GRAPHICS
James D Foley and Andries van Dam
If you're seriously involved with graphics, this is THE book for you. With nearly 500 illustrations, many in full colour, it covers every aspect of interactive graphics.
"The best book on computer graphics I've seen" – Brian Reffin Smith
960 pages fully illustrated £15.95



Available through your local bookshop or computer store, or send the order form below with your remittance direct to Addison- Wesley.

Addison-Wesley Publishers Limited
53 Bedford Square London WC1B 3DZ

Please send me the following books. I enclose my cheque or postal order for £ .....
OR Please debit my Access/Barclaycard/Visa/American Express/ Diners Club
Account No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐

☐	Brown/Pascal from BASIC	201 13789 5	£ 5.95
☐	Foster/Real Time Programming	201 01937 X	£ 6.95
☐	Stanton/The Addison-Wesley Book of Apple Computer Software 1982	201 10279 X	£12.95
☐	Myers/Microcomputer Graphics	201 05092 7	£ 6.95
☐	Goozé/The S6800 Family	201 03399 2	£ 6.95
☐	Foley/Fundamentals of Interactive Computer Graphics	201 14468 9	£15.95

Name _____
_____
Address _____
_____
_____
_____
Signature _____
Date _____
Addison-Wesley Publishers Limited
53 Bedford Square London WC1B 3DZ

MICROAGE ELECTRONICS

BBC Microcomputer System A's in stock now!

It's a Winner!

Look



We've got the BBC Microcomputer Model A's in stock – ready for immediate sale. Call in, try them out. Official orders taken for Local Authorities, Schools and Businesses

BBC Machines

Model 'A'	£299
16K RAM 32K ROM. Full colour, high-resolution graphics	(+£7 p+p)
Model 'B' 32K RAM 32K ROM	£399
16 Colour graphics	(+£7 p+p)
BBC Disk Interface	£69*
BBC 'B' Upgrade kit	£130*
BBC Compatible Single Disk Drive 100K bytes	£235 (+£2.50 p+p)
BBC Compatible Dual Disk Drive 200K bytes	£389 (+£2.50 p+p)
14" RGB Colour Monitor (as used in the BBC Computer programme)	£279 (+£9.50 courier)
12" Green Monitor	£95 (+£6.50 courier)
Cassette Player. Includes DIN to DIN lead	£28
Battery mains option	(+£2 p+p)
BBC Joystick	£13 p. pair (+£1 p+p)

*These prices include fitting – send or bring in your machine for upgrading.

BBC Software

The first of the software from Acornsoft. Snapper, Defender, Monster, Creative Graphics. Come and review it!

Printers

Acorn GP 80A Printer	£199
Lowest ever price!	(+£4.50 p+p)
Acorn GP100A Printer	£228 (+£4.50 p+p)
Epson MX80 FT111 Printer New model, dot matrix, high res. graphics 80 or 132 char's per line	£431 (+£4.50 p+p)

All with free interface cable

Atoms

Atom kit	£135 (+£3.50 p+p)
Colour Atom	£199
Complete with 4 software cassettes	(+£3 p+p)
Atom Disk Pack	£335 (+£2.50 p+p)

Atom Software

All the latest Acornsoft software in stock. Atomcalc, electronic spread sheet. FORTH, LISP, Adventure etc.

Accessories for BBC Computers

Listing paper, 2000 sheets	£14 (+ £4 p+p)
Cassettes per 10	£4 (+ £1 p+p)
Disks, Dysan, top quality 5¼" per 10	£28.75 (+ £1 p+p)
GP80 and GP100 ribbon	£4.75 (+ £1 p+p)
Printer Cable (parallel)	£15 (+ £1 p+p)
6522 buffers	£4.75 (+ £1 p+p)
DIN to DIN cassette leads	£3.50 (+ £1 p+p)
BBC Machine dust covers	£5.75 (+ £1 p+p)

Books

BBC 30 hour BASIC	£5.50 (+£1 p+p)
Practical Programs for Atom & BBC	£5.95 (+ £1 p+p)
BASIC Programming on the BBC Micro	£5.95 (+ £1 p+p)
Programming the 6502	£11.75 (+ £1 p+p)

All the products are the official versions, beware of imitations, they will invalidate your guarantee.

ALL PRICES INCLUDE VAT. FOR FURTHER DETAILS AND MAIL ORDER LIST SEND LARGE S.A.E.

Open Mon-Sat 9am-6pm. Thurs 9am-1pm

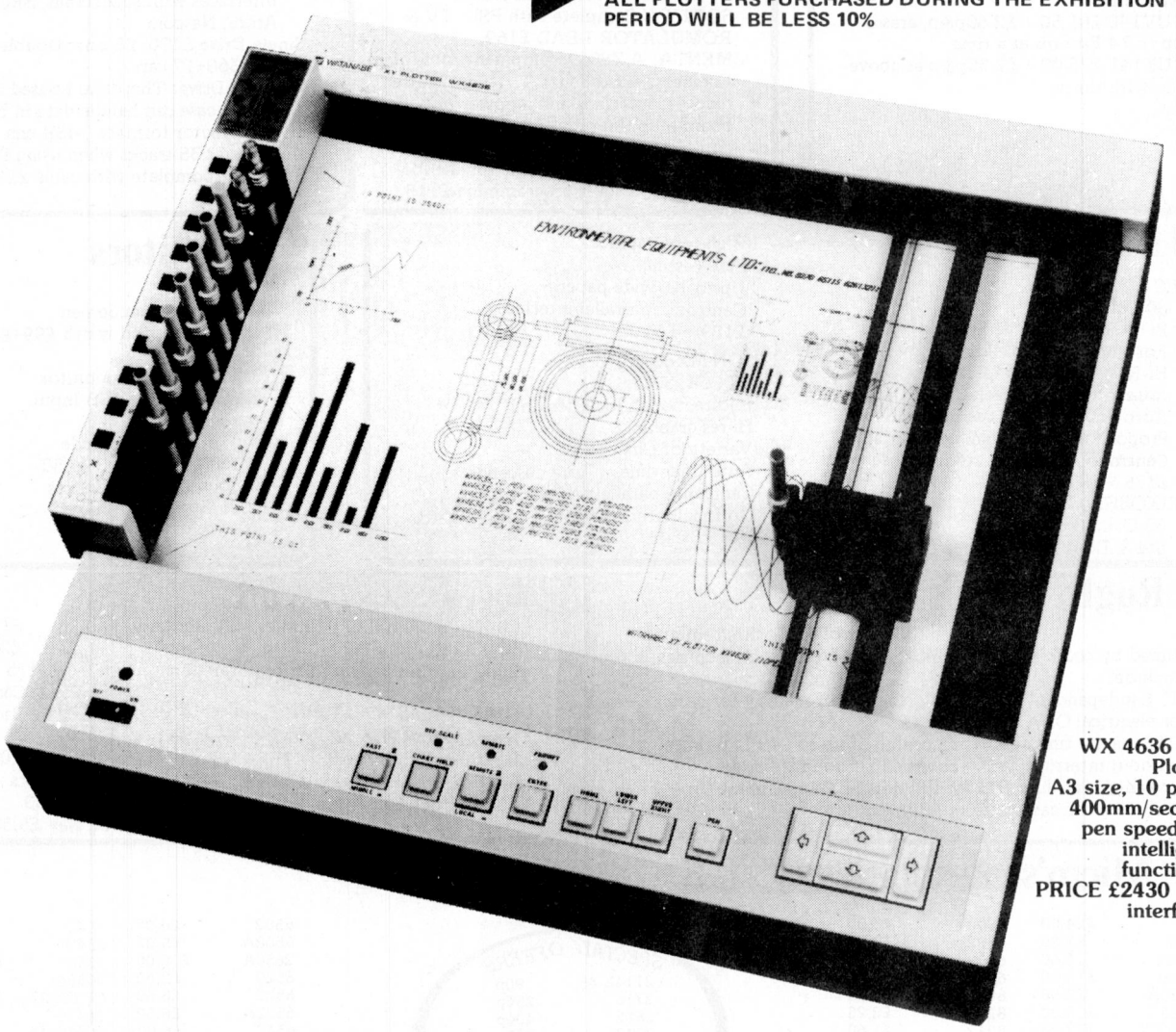
MICROAGE ELECTRONICS
135 HALE LANE EDGWARE MIDDLESEX HA8 9QP
TEL: 01-959 7119 TELEX 881 3241

N° 1
FOR DIGITAL X-Y PLOTTERS

If you are looking for a high quality X-Y Plotter, then look no further, we will almost certainly have one from our large range to suit your requirements (we have **16** different models in A3 size alone). Our Watanabe Plotters are available in sizes from A3 to A0, flatbed or drum type, with a choice of 1 up to 10 pens. With parallel, RS232 or IEEE interfaces.

Our prices must make these Plotters the best value for money available with A3 Plotters starting at £892.50 (1 pen, 12 intelligent functions, parallel interface) and at the top of the range in A3 size our 10 pen high speed Plotter with 42 intelligent functions (including digitizing) is only £2,430 plus interface.

SEE US AT
STAND 321 AT THE PCW SHOW
ALL PLOTTERS PURCHASED DURING THE EXHIBITION PERIOD WILL BE LESS 10%



WX 4636 X-Y Plotter
A3 size, 10 pens, 400mm/second pen speed, 42 intelligent functions.
PRICE £2430 plus interface.

Why not contact us on (0270) 625115, 626132, we will be pleased to send you further information or arrange a demonstration.

Environmental Equipments (Northern) Limited
Tel.: Nantwich (0270) 65115 - 626132

ENVIRON HOUSE, 64 WELSH ROW, NANTWICH, CHESHIRE CW5 5ES

TECHNOMATIC LTD.

BBC Micro

Model A £299 Model B £399
(VAT Inc Carr £6)
Upgrade kit model A–B £60
Single Disk Drive £235 + £4 Carr
Dual Disk Drive £389 + £8 Carr
Full range of Connectors in stock.
Send for our BEEB list

ACORN ATOM

Basic Built 8K + 2K £135: 12K + 12K £175
8K +5K + Colour Card £170 (p&p £3/ unit)
Atom PSU £7 + 70p p&p: 3A 5V Regulated PSU £26 + £2 p&p
FP ROM £19.50: 1K RAM £2: Word Pack ROM £26:
Tool box ROM £24.50
ATOM DISC PACK: 5¼" Drive complete with PSU, connector cable utilities dis, 4k DOS ROM & Manual £299 + £6 carr.
ATOM Upgrade to BBC Basic: 20k ROM + 2K RAM ap. £44.00
New Monitor ROM: allows direct entry of machine code £17.00
Full range of software & connectors in stock.

UV Erasers

A range of 4 erasers to meet all requirements. All erasers fitted with mains on/off switch and indicators. Built-in safety interlocks ensure no accidental exposure to the UV rays.
*UV1B £47.50 + £2p&p, erases up to 6 Eproms at a time
*UV1T £60.00 + £2p&p as above but with timer
*UV140 £61.50 + £2.50p&p, erases up to 14 Eproms at a time
*UK141 £78.00 + £2.50p&p as above but with timer.

SOFTY

* All ideal software development tool
* Programs can be developed, debugged and verified and used in host computer or committed to an EPROM
* Powerful editing facilities include insertions, deletions, block shifts, find etc.
* will burn most +5v EPROMs

SOFTY // Complete with PSU, TV & ROMULATOR LEAD £169
MENTA: A Z80 Development tool for Engineers & Students. TV and cassette recorder interface and a powerful key-board assembler make MENTA a complete system. Direct mnemonic entry and positive feedback make for quicker and surer programming £115

Floppy Disc Drives

TEAC FD 50A 5¼" 40 track drive housed in an attractive case with PSU
* Unformated single density capacity 125K
* Capable of double density recording
* Compatible with Shugart SA400 and interfaces directly with TRS80 expansion box
* Interfaces with superbrain, BBC, Atom, Nascom

Single Drive £190+£5 carr, Double Drive £360+£7 carr.
Apple II Drive: This drive housed in an attractive case can handle data in both 13 & 16 sector formats. 143K can be stored over 35 tracks when using DOS 3.3. Drive complete with cable £270 + £5 carr.

Printers

NEC PC 8023 BE-C
* 80 Cols 100 Caps
* Bi-directional Logic Seeking
* Forward & Reverse line feed
* Hi-Res & Block Graphics
* International & Greek Char Sets
* Auto underline – True descenders
* Proportional spacing & prog variants
* Centronix parallel as std interface

£375 + £9 carr.
SEIKOSHA GP100A
* 80 Col. 30 CPS
* Std & Double width char
* High res Graphics
* Self Testing
* Up to 10' wide paper
* Centronix parrallel interface

£189 + £6 carr

EPSON MX80 F/T 3
* 80 Cols. 80CPS
* Bi-directional, logic seeking
* Hi-res graphics
* Variety of Char. sets
* Auto underline – True descenders
* Centronix parallel as std interface
* Optional interfaces: IEEE, RS232 etc.

£360 + £8 carr.

Monitors

12" BMC Green Screen
18 MHz Band width £99+£4 Carr
14" BMC Colour Monitor
18MHz BW. RGB Input
£240 + £6 carr
Sanyo Computer Grade Cassette Recorder £24.50
Microcomputer Cassettes £2.25/5

Rugby Atomic Clock

Z80 controlled clock/calendar timed by coded data from MSF Rugby. The clock facilities include:
1. 8 independent alarms with a choice of melody for each or electrical ON/OFF operation.
2. Separate timer allows recording of up to 240 Lap times without interrupting the count expansion facilities provided. See July ETI for full details. Complete kit including the cases £120 + £2p&p.

Miscellaneous

10 XLTRON SSDD Diskettes + Plastic Case	£19
10 XLTRON DSDD " + " "	£24
2000 Fanfold papers with perforated margins	£15 + £3.50 Carr
500 Fanfold " " " "	£5+£1 Carr

Ribbons for Printers
GP100A £6.50 EPSON MX80 £8. NEC PC8035 £9.00
MAINS OPERATED UV TUBE £11.50 + £1.40 p&p
Amphenol Connectors
1EEE 24 way £5.50
Centronix 36 way £5.50

Micro's*Memories*TTLS*Interface devices

Z8	£24.00	6800	£3.00
Z80	£3.20	6802	£3.b0
Z80A	£3.60	6809	£8.50
Z80B	£15.00	6809E	£15.00
8085A	£3.50	68B09	£14
8088	£18.00	8205	£2.25
Z80CTC	£12.00	8212	£1.60
Z80ACTC	£3.00	8216	£1.00
Z80DMA	£10.00	8224	£2.00
Z80ADMA	£12.00	8228	£2.50
Z80ADART	£8.00	8251	£2.80
Z80 PIO	£2.80	8255	£3.00
Z80A PIO	£3.00	8279	£5.50
Z80 S10-0/1/2	£9.00		

SPECIAL OFFERS

2114L-45	90p
2716	250p
2532	400p
2732	375p
4116-2	90p
6116-3	450p

ASK FOR QTY DISCOUNT

6502	£4.00	6545	£9.50
6502A	£5.00	6847	£8.75
2650A	£12.00	9365	£60.00
6520	£2.80	96364	£8.00
6522	£3.50	CRT5027	£18.00
6522A	£6.50	14411	£7.00
6532	£6.00	COM8116	£7.00
6821	£1.20	4702B	£7.50
6845	£7.00	COM8017	£3.00
6850	£1.40	IM6402	£4.50
68B50	£2.20	RO-3-2513	£7.50
6852	£2.50	AY-5-2376	£7.00
6875	£4.00	DAC80	£20.00
6551	£5.50	DP8304	£4.50

SEND FOR OUR DETAILED PRICE LIST

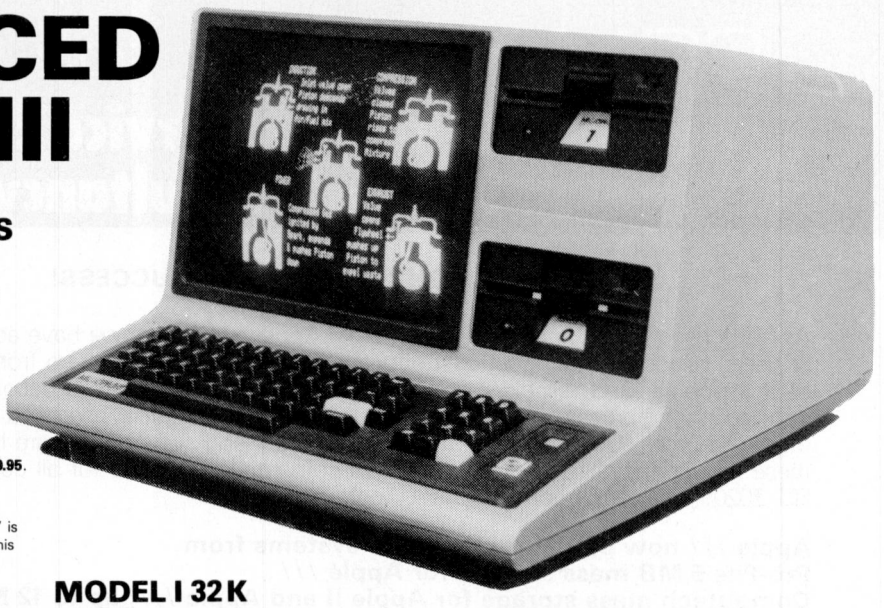
ALL PRICES UNLESS STATED EXCLUDE P&P + VAT. PSE ADD 40p P&P + 15% VAT

TECHNOMATIC LTD.

17 BURNLEY ROAD, LONDON NW10 1ED
Tel: 01-452 1500/450 6597 Tlx 922800
Retail shops: 15 Burnley Rd, London NW10 305 Edgeware Rd, London W2

ORDERS FROM GOVT. ESTALISHMENTS, COLLEGES etc WELCOME

ENHANCED MODEL III



MODEL III HIGH RESOLUTION GRAPHICS

128 user definable characters which effectively give a resolution of 512 × 192.
No external wires or connections, everything is fitted within the case.
Graphic characters optionally software selectable.
Comes complete with demonstration and setup programmes on diskette and cassette.
Fully documented user manual.
Comprehensive fitting instructions (Kit only).

SPECIAL INTRODUCTORY OFFER 1.

KIT PRICE including PandP, VAT and insurance. **£129.95**.
Fully installed, tested and guaranteed. **£169.95**.
Installation includes collection and delivery charges.

The machine language plotting programme "SETXY" is included "FREE" for those people purchasing from this advert.

SPECIAL INTRODUCTORY OFFER 2.

If you purchase any Model III from us we will install the graphics for you at kit price.

THE MICROFIRM TURBO M III

The TRS-80 Model III including:
48K RAM.
14k ROM.
64 × 16 VDU.
4 megahertz clock speed up.
Dual TEAC 80 track disc drives (737,280 bytes total).
RS232C interface.
NEWDOS or LDOS operating system.
MX80 F/T3 lineprinter.
MICROFIRM mailing system (up to 2600 addresses online).
Fully insured, carriage and VAT included. **£2295.95**.
(Note for 6 megahertz clock speed up add. **£80.00**.

MODEL III 4 MEGAHERTZ SPEED UP (KIT)

Increase your Model III speed from 2.02 megahertz to 4 megahertz with the MICROFIRM 4 meg module.
Software switchable 2 or 4 meg.
Software switchable to 2 meg disk access for those without appropriate operating system (ie NEWDOS/LDOS).
Includes full fitting instructions.
Carriage and VAT inclusive. **£69.95**.

MODEL III 6 MEGAHERTZ CLOCK SPEED UP (KIT)

Increase your Model III speed from 2.02 megahertz to 6 megahertz with the MICROFIRM 6 meg module.
Software switchable 2 or 6 meg.
Software switchable to 2 meg disk access for those without appropriate operating system.
Includes full fitting instructions and 48K of high speed RAM
Carriage and VAT inclusive. **£150.00**.

MODEL III DISK DRIVES

CS40 One 40 track single-sided TEAC FD-50A 5.25 inch floppy drive in an alloy frame with switched mode power supply. Disk controller board plus all cables, connectors, screws and mounting instructions. **£481.00**.

CS80 One 80 track single-sided TEAC FD-50E 5.25 inch floppy drive in an alloy frame with switched mode power supply. Disk controller board plus all cables, connectors, screws and mounting instructions. **£523.00**.

CD40 Two 40 track single-sided TEAC FD-50A 5.25 inch floppy drive in an alloy frame with switched mode power supply. Disk controller board plus all cables, connectors, screws and mounting instructions. **£678.00**.

CD80 Two 80 track single-sided TEAC FD-50E 5.25 inch floppy drive in an alloy frame with switched mode power supply. Disk controller board plus all cables, connectors, screws and mounting instructions. **£764.00**.

FD-50A Single 40 track disk drive add-on for CS40. **£178.00**.

FD-50E Single 80 track disk drive add-on for CD80. **£251.00**.

MODEL I 32K MEMORY EXPANSION BOX

This unit is designed to sit underneath the video monitor.
It provides:
32K of dynamic memory.
A standard parallel printer port.
A full 40 way bus extension.

It has its own integral power supply needing only a standard 240 volts AC mains connection. All units are fitted with an onboard connector to facilitate disk controller expansion. Up to 4 - 5.25 inch drives can be supported by this expansion.

This unit is ideal for the tape or floppy tape user.
PRICE **£149.95** including VAT.

FLOPPY DISK CONTROLLER EXTENSION

This unit is available to complement and fit within the 32K expansion box.

External data separation has been provided as standard to increase data transfer reliability. A 25ms heartbeat interrupt provides timing for "clock" facilities supported by most disk operating systems.

PRICE **£99.95** including VAT.

SAVE MONEY Purchase the expansion box and FDC extension. **£239.95** including VAT.

MORE SAVING either, a further 5% off memory expansion box plus FDC extension if you purchase a single disk drive on the same order, **or**

a further 10% off memory expansion box plus FDC extension if you purchase a twin disk drive on the same order.

MODEL I DISK DRIVES AND CABLES

CS50A One 40 track single-sided TEAC FD-50A 5.25 inch floppy drive in a cabinet with 220-240 volt mains pow supply. **£228.00**.

CS50E One 80 track single-sided TEAC FD-50E 5.25 inch floppy drive in a cabinet with 220-240 volt mains power supply. **£304.00**.

CD50A Two 40 track single-sided TEAC FD-50A 5.25 inch floppy drive in a cabinet with 220-240 volt mains powei supply. **£424.00**.

CD50E Two 80 track single-sided TEAC FD-50E 5.25 inch floppy drive in a cabinet with 220-240 volt mains power supply. **£569.00**.

2 Drive cable **£17.25**
4 Drive cable **£28.50**

PRINTERS

Epson MX80T Type 3	**£401.00**
Epson MX80F/T Type 3	**£447.00**
Epson MX82	**£424.00**
Epson MX82F/T	**£470.00**
Epson MX100 Type 3	**£573.00**
Keyboard printer interface cable	**£39.95**
Printer cable	**£17.25**

DISKETTES

Box of 10 5.25 inch SS/SD disks including case	**£23.00**
Box of 10 5.25 inch DS/DD disks including case	**£28.00**
Box of 10 8 inch SS/DD disks including case	**£29.00**

DISK MAILING SYSTEM

Realise the power of our random access disk mailing system.

Important programme features:

1. Over 2,000,000,000 unique selection codes available.
2. Optional sort on printout by any field.
3. Parameter table for unusual print formats.
4. Blank address lines suppressed on labels print.
5. More than one list may be on the same data disk.
6. Utilises Southern Software Accel 3 compiler for speed.

System configuration:

TRS-80 Model I 48k, 2 disk drives, line printer.

or TRS-80 Model III 48k, 2 disk drives, line printer.

or Video Genie 48k, 2 disk drives, line printer.

(Model II version similar to above specifications available soon).

Price **£49.95** including VAT and postage (UK)

ALL PRICES ARE INCLUSIVE OF VAT AND CARRIAGE (UK MAINLAND ONLY). SUBJECT TO CHANGE

TRS-80 is a trademark of Tandy Corporation (UK).

ENQUIRIES: TELEPHONE BRISTOL (0272) 279560

PLEASE SEND ME MORE INFORMATION ON:

- HIGH RES GRAPHICS ☐
- HIGH RES MODEL I ☐
- HIGH RES MODEL III ☐
- PRINTERS, DISK DRIVES ☐
- SOFTWARE ☐
- EXPANSION BOX'S ☐

NAME _____

COMPANY _____

ADDRESS _____

_____

_____

_____

TEL _____

(PLEASE SEND LARGE SAE)

MICROFIRM COMPUTING SERVICES (BRISTOL) LTD. 57 QUEEN CHARLOTTE STREET BRISTOL BS1 4HQ

COMPUTECH for apple

Authorised dealer, service centre and system consultancy

SUCCESS BREEDS SUCCESS!

As authorised dealer and service centre for Apple computers we have acquired extensive experience of users' needs and the most cost effective means of satisfying them from the considerable resources of this popular and reliable machine. Over 1,000 of our financial accounting packages have been installed. In the process we have have detected areas of special need and opportunities for enhancing these resources. Our own manufactured hardware and system software have been produced to meet these requirements. As a result we have compatible products for all configurations of Apple II and ITT 2020 installations - and the new Apple /// !

Apple /// now on demonstration - systems from	**£1,645**
Pro-File 5 MB mass storage for Apple ///	**£2,256**
Computech mass storage for Apple II and Apple ///, up to 12 MB, from	**£1,950**

COMPUTECH SOFTWARE AND HARDWARE INCLUDES:

Payroll for 350 employees, 100 departments, all pay periods, printed payslips, approved year end documents, very quick and easy to use, **£375. Sales, Purchases** and **General Ledgers £295** each, detailed statements. **Job Costing** and **Group Consolidation** are amongst many and various applications of the **General Ledger** package, which supports values to totals of one thousand million accurate to a penny! Our **Utilities Disk** available like other packages in 13 sector or 16 sector format, is widely used for reliable, error checking, copying, including single drive, and the renowned **DPATCH** program beloved of programmers for **£20.** We have developed a **Terminal Utilities** package which enables Apple to Apple and Apple to mainframe communications with local processing and storage as well as Apple to host communications from the amazingly low price of **£130.** Our **Graphics Utilities** program for use with the **Microline** and **Epson** families of printers enable the plain paper production on low cost printers of high resolution screen pictures, graphs etc. - free with **Microlines** or **£30** separately. **Keyboard Driver** enables the use of our **Lower Case** adaptor with BASIC programs and **Applewriter Patches** supplied **FREE** with our character generator package (total cost **£50**) is separately available on disk with documents for **£10.** At the same price **CAI** (convert Apple pictures for ITT) makes binary high resolution picture files display properly on the ITT 2020. We sell the famous **Visicalc** for **£111** and have delivered systems using it to do amazing things like production control, shipping accounts and stocks and shares valuations! The versatile **Applewriter** word-processing package at only **£39,** especially employed with our **Lower Case Character Generator** is widely used by people who cannot type to produce word-perfect copy! Experience with Apple systems has led to the design and manufacture of compatible products with enhanced features at very favourable prices to satisfy users' needs. These include the **Diplomat Serial Interface** which has handshaking capability and switchable options (**£80**), the **Diplomat Parallel Interface** which enables the direct use of text and graphics with the **Microline** and **Epson** printers and is a complete 'plug in and go' item with gold-plated edge-connector at **£80** and has optional direct connection for **Centronics 730/737** printers. Our new **Diplomat Communications Card** at **£95** is a sophisticated peripheral especially suitable for Apple to mainframe communications at high speeds in full duplex mode with switch selectable bit rates and other options. The **Lower Case** adaptor is available for Apples (revision 7 and earlier) as well as ITT 2020, complete with diskette software for **£50**. It offers true descenders on screen and the £ sign. We also have an **Optional Character Generator** for the ever popular **Microline M80** at **£15**. This provides £ sign and improved digits and lower case characters with USASCII special symbols. Our price for the **Microline M80**, with graphics, 40, 80 and 132 characters per line, friction, sprocket and teleprinter feed, is only **£230** amazing for this small, quiet reliable 'look alike' printer. Tractor option is **£40** and **Serial Adaptor £80**. The **Microline M82A** bidirectional printer with both parallel and serial input is only **£345** it can have an optional 2K buffer, while the **Microline M83A** full width adjustable tractor 120 cps printer with similar specification is only **£495** Then for all computer users there is the unique **Micromux** which from **£800** provides up to 16 ports for simultaneous independent serial asynchronous communications! Telephone for data sheets or to arrange a demonstration or for the address of our nearest dealer. Please hurry - the demand for our products has been such that some have been temporarily out of stock. We offer the effective low cost solutions you need. **Prices exclude V.A.T., carriage and packing.**

COMPUTECH SYSTEMS

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

AGENTS THROUGHOUT THE UK AND OVERSEAS

LONDON COMPUTER CENTRE



TOMORROW'S COMPUTING TODAY

ACT sirius 1 £2395

8088 Processor
128K RAM
1.2 Mb Disk Storage

Now available
Z 80 CP/M Add-on board to run all CP/M 8 bit or 16 bit software **£299**

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

TELE-VIDEO SINGLE-USER TO MULTI-USER

NOW UPGRADED NO EXTRA CHARGE



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

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

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

Prices above based on exchange rate $2 = £

800 64 K user station **£1025**



Save £300 on this LCC Software Starter Pack

Wordstar	**£250**
Wordstar Trainer Manual	**£ 25**
Dbase II	**£350**
Supercalc	**£175**
~~£800~~	
Special Package Deal Saving £300	**£500**

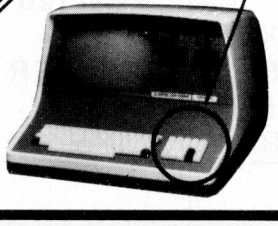
NEW



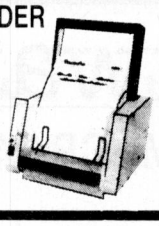
Epson Type 3
MX 80/FT
MX 100

NEW

New Superbrain 2 from £1595
Dedicated Wordstar Keypad



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



AUTHORISED TANDY DEALERS

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



DAISY WHEEL PRINTERS LETTER QUALITY PRINTING

* FLOWRITER RP 1600. 60 CPS The most intelligent Daisy. Proportional spacing with Right Justification on WORDSTAR, WORDPRO, APPLE WRITER SCRIPSIT etc. **£1500**
* TEC 40. 40 CPS. JAPANESE DIABLO 630 uses Diablo Daisy Wheel & Ribbons. **£1135**
* DAISY WHEEL II 60 CPS. RICOH 1600 Daisywheel **£1050**

HARD DISKS

for Superbrain, TRS 80 Model II, Apple

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



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

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

Computer Enterprises

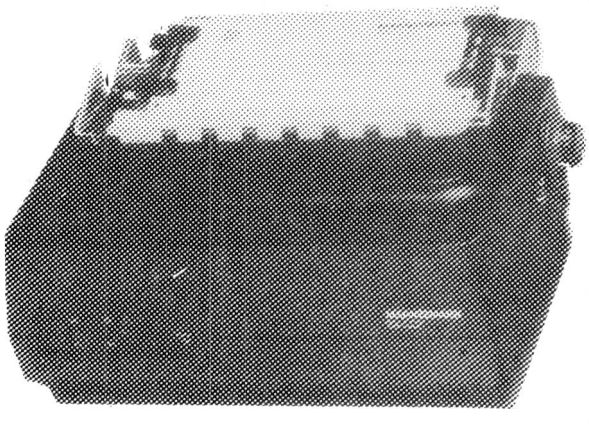


ACT Sirius 1

128k RAM, 1.2MByte Disk Storage
CP/M-86 or MSDOS
800*400 Pixels
Choose your language & software
Up to 21 Mbyte hard disk.
Up to 1 Mbyte RAM

Printers

SEIKOSA GP100A	30 cps	199 + VAT
EPSON MX100 F/t	80cps	499 + VAT
MANNESMANN TALLY MT120	160cps	440 + VAT
CX-80 (Colour)	125cps	795 + VAT
TEC STARWRITER	25-40cps	990 + VAT
OLIVETTI DY311	32cps	1100 + VAT
PRISM 132 (Colour)	200cps	1130 + VAT



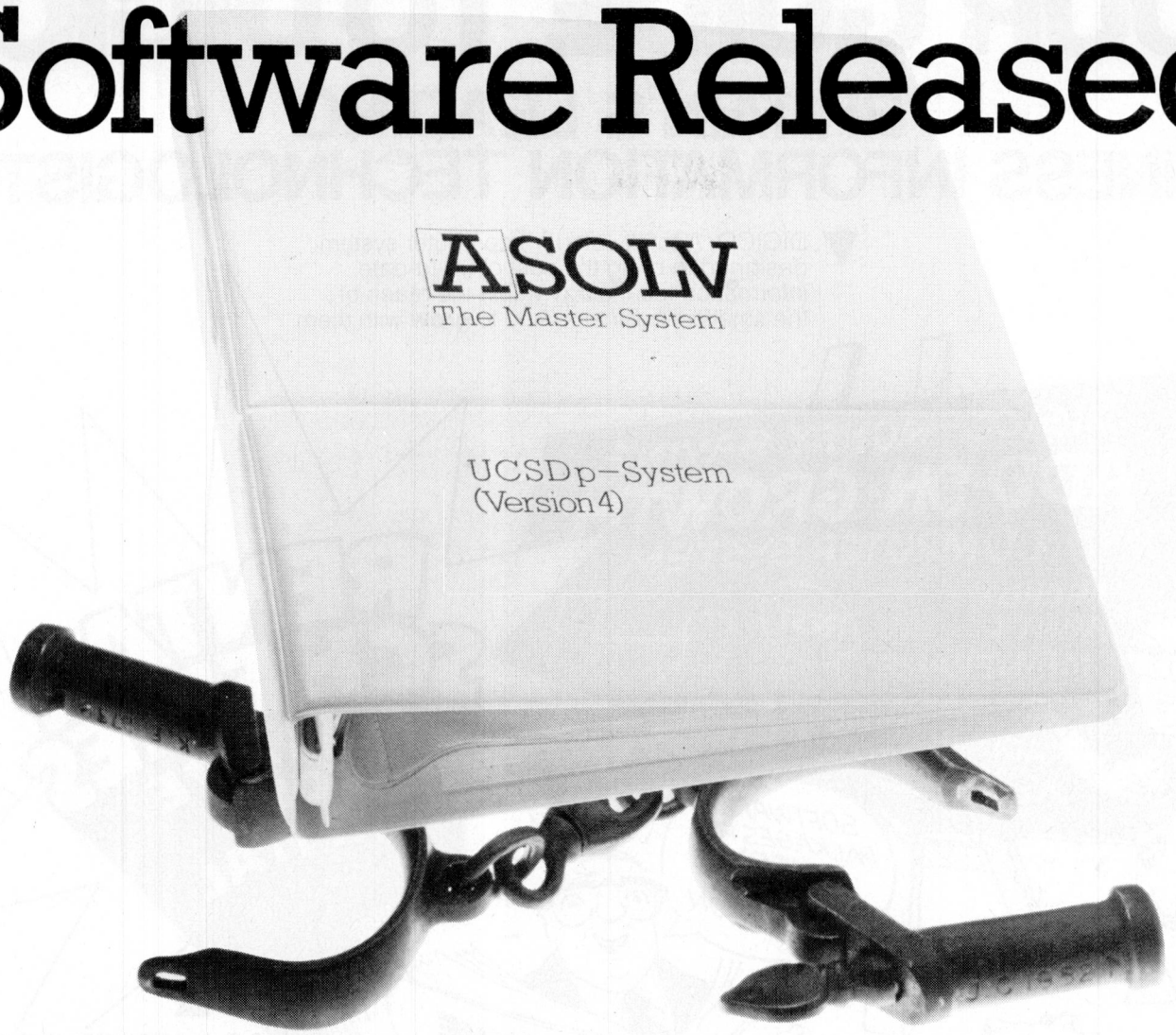
Software

Contact us to choose you software (CP/M, CP/M-86, MSDOS) or we tailor it for you.

*Offers strictly ends at the end of this month.
*Insurance, maintenance, after sale support, Training available.
*Write for a catalogue of other products & prices.

SHOWROOM: 618, Kingston Road Raynes Park SW20
Tel: 01-543 4729
MAIL ORDERS: 5, Farnham Grdns. LONDON SW20 0UE.
Tel: 01-947 8837

Software Released



The Hardware Barrier

Whatever microcomputer you own or use its capability has been limited by the availability of software as this is generally designed to run on a specific type of machine. And all too often that important software package has been unavailable on your machine. This restriction has necessitated the benefits of hardware being traded off against software availability with consequent loss in efficiency. Now there's the Master System.

The Key to Freedom – The Master System

The Master System removes the language barrier imposed by a machine giving you total freedom of choice in both software and hardware. So that you can select the software best suited to your needs to run on the machine you prefer. It also means that you can write a program in your choice of languages, confident that it can run on **any** microcomputer upgraded to the Master System **without change or amendment.** As a result software can be made more versatile and with a far broader application.

The Master System – Powerful and Comprehensive

The Master System – the UCSD p-System (Version 4) software is the operating system of the future. It comprises a powerful suite of languages including Pascal, Basic, Modula 2 and Fortran and corresponding compilers. Cobol will be available shortly.

Choose your Language

Different computer languages offer different benefits to the user. Such is the Master System's versatility that even a program having modules written in different languages can be run and executed. This allows you to capitalise on the advantages of particular languages avoiding their weaknesses.

An Investment for the Future

With advances in microcomputer technology happening so fast, your major concern is whether your investment in today's technology will be protected in the future. The Master System is designed to give your needs that protection. Software and Hardware houses such as IBM, Apple and ACT Sirius 1 have already adopted the Master System and it is gaining rapid worldwide acceptance. More than 30,000 users have chosen it. Increasingly the Master System will enable you to take advantage of the latest software releases. As your computing needs grow you may outgrow the capacity of your microcomputer, the Master system ensures that your investment in software programs and important data is protected without restricting your future hardware options.

Complete Documentation

The Master System is currently available as a software package comprising a diskette and comprehensive documentation. The Master System is also being built to accommodate Winchester based systems.

For Most Micros

The Master System is available for all 8080/8085 and z80 based microcomputers with the CP/M operating system; including Apple II, ACT Sirius 1, Pet and IBM personal computers.

Please send me further details of the Master System and Master Software.

☐ I am a dealer

☐ I use a ..... microcomputer

Name .....

Address .....

.....

Tel. No. .....

BLOCK CAPITALS PLEASE

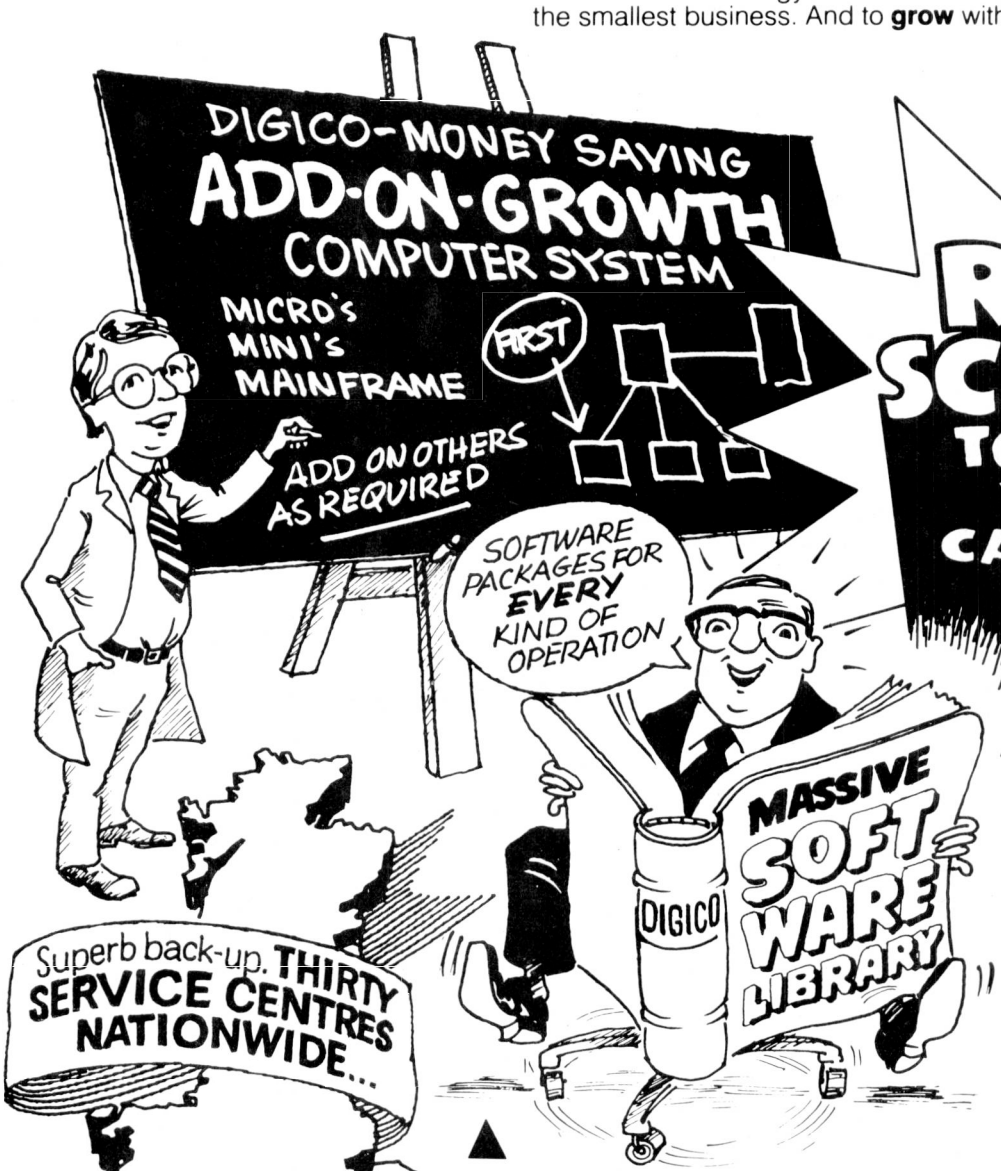
ASOLV The Master System

Asolv Ltd, The Master System, 12-14 Church St., Basingstoke, Hants. RG21 1QH. Tel: (0256) 795746.

YOUR GUIDE TO DIGICO

BRITAIN'S LEADING BUSINESS INFORMATION TECHNOLOGISTS ?

▼ DIGICO. A totally modern computer system designed to bring the cost of up-to-date information technology within the reach of the smallest business. And to **grow** with them.



RENTAL SCHEMES TO SAVE YOUR CAPITAL

▲ e.g. A complete word processor for £41 per week. Rental on even the smallest business system includes maintenance.

Superb back-up. **THIRTY SERVICE CENTRES NATIONWIDE...**

. . . for expert advice and help. And you're never far from a DIGICO engineer.

DESIGNED IN BRITAIN

15 years of British Technology at work

DIGICO have been designing, manufacturing ar installing computer system since 196

Legal, Accounting
Word Processing
Transport, Medical,
Production Control
Stock Control, Payroll
Telecommunications
Dentistry, Printing

Builders Merchants
Incomplete records
Publishing, Holidays
Bookshops, Betting
Warehousing, Mailings
Maintenance, Teaching
Research.

VERY start small and grow large with digico



7-YEAR GUARANTEE

Your computer has a SEVEN year guarantee of maintenance provided there is a maintenance contract continuously from new.

PLUS

MINIMUM INTERRUPTION PLAN. If your micro breaks down, we'll swop it over to keep you going.



Full information (no obligation) from

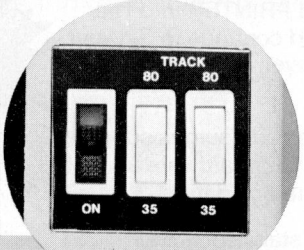
DIGICO COMPUTERS

46 BROADWAY LETCHWORTH, HERTS.
Tel: LETCHWORTH 78172
32 YORK RD, LEEDS. Tel: LEEDS 486688

Better trade with Cumana and get the choice of a whole range of Top Quality Disk Drives



A BIG PLUS! includes SWITCH UNIT for 80 or 35 track use



£745

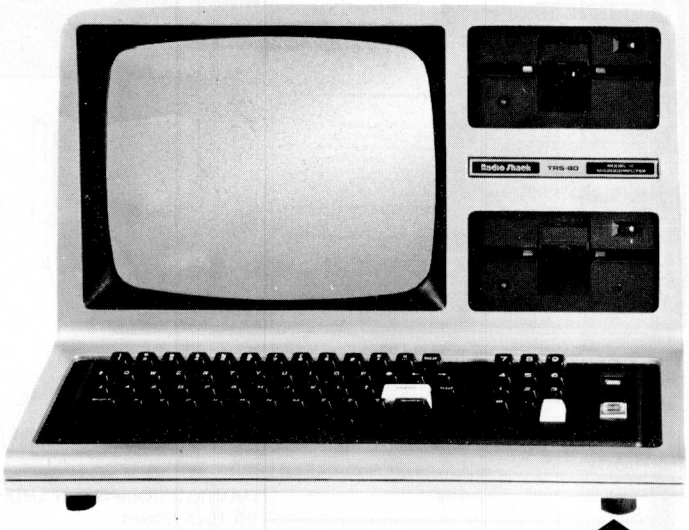
For business systems the 8035. This Unit has the capacity of 4½ Apple drives and can also read all 35 track Apple Software.

A low cost Apple compatible disk drive – quiet and reliable operation.

£219

We offer a wide range of high quality disk drives for **Apple**, **TRS-80** and many other popular computers including the **BBC Micro (Model B)**, **NASCOM**, **Genie** and **Superbrain**. Our continued high reputation depends on supplying professional users with top quality trouble-free products, completely dependable and quiet in operation. And, **Cumana** make you a promise that when there are better products we will be supplying them; and at prices to keep our Dealers ordering!

DEALER and OEM ENQUIRIES WELCOMED



Cased 40 track and 80 track dual drives with internal power supply units.

£199

£369

Cased 40 track and 80 track single drives with internal power supply unit.

TRIDATA integrated business package now available on Cumana 40 and 80 Track Model III Drives. Contact **TRIDATA:** Tel. 021 622 6085.

Internal Drive Kits for the TRS 80 Model III 40/80 Track Double Sided

No hassle 12 MONTH WARRANTY

CUMANA LTD 35 Walnut Tree Close, Guildford, Surrey GU1 4UN.
Telephone: (0483) 503121 Telex: 858306

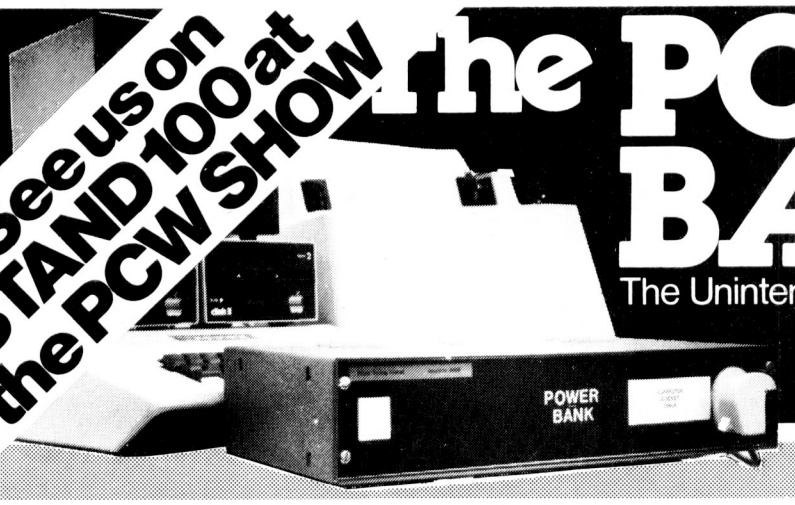
Apple is the Registered Trade Mark of Apple Inc.

See us on STAND 100 at the PCW SHOW

the POWER BANK

The Uninterruptable Power Supply that will run ANY Micro-Computer System . . .

A VITAL PIECE OF EQUIPMENT FOR RUNNING BUSINESS SYSTEMS



THE COMPLETE ANSWER TO YOUR POWER SUPPLY PROBLEMS!

Just plug your Micro-Computer, Video, Disc Drives and PRINTER into The Power Bank and continue to run your system in the event of a mains supply failure.

Electrical spikes and surges suppressed which protects your hardware as well as your programme and data.

Output voltage stabilised for all conditions of input voltage.

System compatible sine wave output. Built-in 'sealed for life' batteries

The Power Bank illustrated is rated continuously at 120 VA output. A typical load being a micro-computer, 2 floppy disc drives, v.d.u. display and a 9.5 inch dot matrix printer.

250 VA SYSTEMS ARE ALSO AVAILABLE.

Depending upon the load, your system will continue to operate for up to one hour from the internal batteries with the electrical supply off, while an audible alarm warns of a loss of the mains supply. The batteries are monitored when the mains supply is off.

120 VA unit at: **£320** One off price

250 VA unit at: **£450** One off price.

Power Testing (Sales) Ltd.

137a High Street, Brentwood, Essex. CM14 4RX Telephone: Brentwood 220617. Telex 24224586

REGISTERED REFERRAL CENTRE FOR THE BBC PROJECT

BEEBUG FOR THE BBC MICRO

INDEPENDENT NATIONAL USER GROUP FOR THE BBC MICRO

IF YOU OWN A BBC MACHINE, OR HAVE ORDERED ONE, OR ARE JUST THINKING ABOUT GETTING ONE, THEN YOU NEED BEEBUG.

BEEBUG runs a regular magazine devoted exclusively to the BBC Micro (10 issues per year).

Latest news on the BBC project. What you should know before you order a machine. Members' discount scheme on books and hardware. New program listings, regular advice clinic, and hints and tips pages in each issue.

April Issue: 3D Noughts and Crosses, Moon Lander, Ellipse and 3D Surface.
Plus articles on Upgrading to Model B, Making Sounds, and Operating System Calls.

May Issue: Careers, Bomber, Chords, Spiral and more.
Plus articles on Graphics, Writing Games Programs, and using the Assembler.

June issue: Mazetrap, Mini Text Editor, Polygon; plus articles on Upgrading, The User Port, TV set and Monitor Review, Graphics part II, more Assembler Hints, Structuring in BBC Basic, plus BBC Bugs.

July Issue: Invaders and Patchwork Programs. Fix for BBC cassette bugs, Mode 7 explored, User defined keys, Software Review, High res graphics printout.

Send £1.00 and A4 SAE for sample

Make cheques to BEEBUG and send to BEEBUG, Dept PCW, 374 Wandsworth Rd., London SW8 4TE

Membership 6 months £4.90, 1 year £8.90

Overseas: add £1.00 for 6 months, £1.50 for 1 year

Members software library — very low price programs for members including: Starfire, Splat the Rat, Mindbender, Shape-match, Moon Lander, Beeb Disassembler with printout and paging, and Character Define Graphics Aid.

BEEB UG

SPECIAL OFFERS

PETS (Locally Approved Commodore Dealer)

Please phone for latest prices.

We offer some of the best deals around!

CBM 4016 — 16K 12" Screen 40 Col. Computer
CBM 4032 — 32K 12" Screen 40 Col. Computer
CBM 2031 — 170K Single Drive Floppy Disk
CBM 4040 — 340K Twin Floppy Disk Drive
CBM 4022 — 80 Col. 65cps Tractor Printer
CBM 8032 — 32K 80 Col. 12" Screen Computer
CBM 8096 — 96K 80 Col. 12" Screen Computer
CBM 8050 — 1 Meg. Twin Floppy Disk Drive
CBM 8422 — 22 Meg. Winchester Disk Drive

APPLES

All Apple related products available. Please call for prices.

Apple II — 48K Computer
Apple III — 128K Computer
Video Monitors — Colour and Blakc & White
Disk Drives
Silentype Printer

apple

PRINTERS

We will quote for any type or make of printer available.

Epson MX80FT — 80/132 Col. Friction/Tractor. Auto Bi-Directional. 9x9 Head True Descenders
Ricoh RP 600 — 164 Col. 60cps Daisy Printer.
Scripta — 17cps Daisy Printer at low prices.

SOFTWARE

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

VIC

Low price computer. New accessories coming in all the time. Call fix latest news and prices.

VIC20 — Computer. Words with your colour TV
VIC1530 — Cassette Unit
VIC1540 — Single Floppy Disk Drive
VIC1515 — Printer
Expansion Memory, Games Cartridges, Progammers Aids & Tutorials.

NEW DRAGON COMPUTER

9 colour 32k full size keyboard, full expansion capabilities
£199.50 inc VAT.

BOOKS

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

ACCESSORIES

All types of accessories and stationery supplied

Floppy Disks, Storage Boxes, Printe Ribbons, Tractor Feeds, Cassettes, Maintenance, Stationery, Continuous Labels, Daisy Wheels, Auto Sheet Feeders, Dust Covers, Inst llation & Training

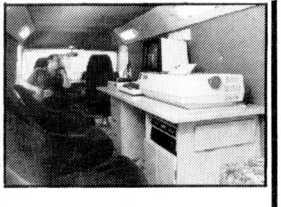
2'ND HAND

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

Da Vinci Computer Shop

DEMONSTRATIONS AT YOUR PLACE

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







DAVINCI COMPUTER SHOP
65 High Street
Edgware. Middx. HA8 7DD
Open Mon-Fri. 9.00—5.30
Sat. 9.30—5.00
TELEPHONE 01-952 0526

Da Vinci Computer Shop

Probably the fastest microcomputer in the universe

the **JUPITER ACE** only £89.95.



All inclusive Price

For £89.95 you receive your Jupiter Ace, a mains adaptor, all the leads needed to connect to most cassette recorders and T.V.s (colour or black and white), a software catalogue and a manual.

The manual is a complete introduction to the world of personal computing and a course in FORTH programming on the Ace.

Even if you are a complete newcomer to computers, the manual will guide you step by step from first principles to confident programming.

The price includes postage packing and V.A.T.

Key Features

- Revolutionary microcomputer language FORTH.
- Full-size moving-key keyboard.
- User-defined high-resolution graphics.
- Programmable sound generator.
- Floating point arithmetic.
- Fast cassette interface.
- Upper and lower case ascii character set.
- 24 x 32 character flicker-free display.

The Jupiter Ace uses FORTH

The Ace is set apart from all other personal computers on the market by its use of a revolutionary language called 'FORTH'. Some computer languages are easy for humans to understand, others are easy for computers; FORTH is most unusual in being both. Its underlying principles are so simple that it takes even a newcomer to computers only a few minutes to learn how to do calculations on the Ace, yet the very same principles are powerful enough to allow you to invent your own extensions to the language itself.

At the same time, the memory-saving coded form used to store your programs inside the Ace allows it to obey them very fast — typically in less than a tenth of the time it would take to do the same thing using a different language. Amongst other things, this makes the Ace ideal for games.

FORTH's unique combination of speed, versatility and ease of programming has already made it a prime choice for professional applications as diverse as pub games and radio telescopes, and gained it an enthusiastic national user group. Now the Jupiter Ace can bring this addictive language into your own home.

Designed by Jupiter Cantab

Leading computer Designers Richard Altwasser and Steven Vickers have a reputation for pushing technology forwards. After playing the major role in creating the ZX Spectrum they formed Jupiter Cantab to develop their latest brainchild the Jupiter Ace.

Technical Specification

Hardware

Processor/Memory
Z80A running at 3.25 MHz.
8K bytes ROM 3K bytes RAM.

Input
40 moving-key keyboard with auto-repeat on every key.

Output
Memory-mapped 32 x 24 character display with high resolution user graphics. Output to drive normal UHF TV set on channel 36.

Sound
Provided by internal loudspeaker.

Cassette
Load Save & Verify at 1500 baud, separate data storage.

Software, FORTH

Data Structures
Integer, Floating point and String data may be held as constants, variables or arrays with multiple dimensions and mixed data types.

Control Stuctures
IF-THEN-ELSE, DO-LOOP, BEGIN-WHILE-REPEAT, BEGIN-UNTIL, all may be mixed and nested to any depth.

Operators
Mathematical +, —, X, ÷.
Logical AND, OR, NOT, XOR.
Comparison <, >, =.

Program Editing
FORTH words may be listed, edited and redefined. Comments are preserved when words are compiled.

Order Form

The **Jupiter Ace** is available only by mail order. Please allow up to 28 days for delivery.

Send cheque or postal order with the form to:—

JUPITER CANTAB, 22 FOXHOLLOW, BAR HILL, CAMBRIDGE CB3 8EP

Please send me:—

☐ JUPITER ACE MICROCOMPUTER(S) @ £89.95.

Name. Mr/Mrs/Miss

Address

E

Together we're unbeatable!

RAVEN COMPUTERS
AN UNRIVALLED RANGE OF SOFTWARE & SERVICE

ACT SIRIUS 1
BRITAIN'S BEST SELLING 16 BIT COMPUTER

ACT Sirius 1.
Available from stock with either 1.2 or 2.4 Mb diskette storage, hard disks available to order. We also supply a complete range of printers for the Sirius including those capable of reproducing the advanced graphics facilities.

FMS 80.
The worlds best selling database and application generator, available exclusively from Raven Computers. Utilises standard CP/M data files and links to Wordstar and our range of accounting packages. Imposes virtually no limit on the number of data fields, indexes or data files.

Sirius 80
Dual-mode processor card allows software written for any 8 bit CP/M Micro to run unchanged on the Sirius. Does not interfere with any of the advanced features of the Sirius such as hi-resolution graphics and 132 column mode. Data files are totally interchangeable between 8 and 16 bit mode.

Multi-User Hard Disk Network
Utilises Sirius 80 to link up to 64 Sirius computers to a 5, 10, or 20 Mb Hard Disc, sharing files between users. Or use as a powerful stand alone system.

M.A.R.S.
The leading corporate and financial modelling package. Takes over where spreadsheets leave off. Has full consolidation and report generation facilities.

Mainframe Communications
Allows the Sirius to talk to IBM, DEC, BURROUGHS, ICL etc. Allowing full utilisation of your Sirius.

Proven Packages for Sirius In Stock.
Sales Purchase and Nominal Ledgers. Order processing Stock Control, Job Costing, Bill of Materials, Project Planning Financial Modelling, Fixed Assets and Payroll SUPERCALC, WORD-STAR. MICROMODELLER.

Sirius Dataflow
The New Simple to operate information storage system. Perfect for mailing lists, customer records, price lists etc. Contains a report generator and full record selection facilities.



RAVEN COMPUTERS
153 Sunbridge Rd
Bradford BD1 2NU
Tel: 0274 306966/309386

SINCLAIR COMPUTERS
We are the leading world-wide Sinclair export specialist including Norway, Sweden, Finland and Denmark. Write for our surprisingly low prices.

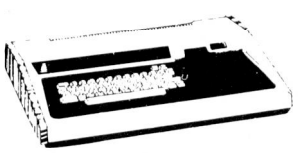
PRINTERS


Buy any of the below and get a free interface kit and word processor program for UK101 or Superboard. Seikosha GP100A £210 : OKI Microline 80 £275 : OKI Microline 82A £399 Epson MX70T £259 : Epson MX80T/3 £319 : Epson MX80 F/T3 £349 : Epson MX100/3 £429

VIC 20 COMPUTER


Two special offers: If it is bought with the Vic20 we can supply the cassette recorder for £30-43. Alternatively, we will supply a free kit with each VIC20 to allow the use of an ordinary cassette recorder. Vic20 cassette £165. Ordinary cassette conversion kit £6. Vic20 cassette recorder £36.50. High resolution cartridge £27.95. Machine code monitor £27.95. Vic printer £189. Floppy disc drive £309. Ram cartridges: 3k £24, 8k £35, 16k £57. Game cartridges: Sargon II £19, all others £15 each. Jostick £6.52. Intro to Basic Part1 £13. New low cost memory board, no need for a mother-board, comes with 3K ram on board + socket for a rom + sockets for another 24k of low current Nmos ram (Just plug in chips to expand memory) £49. 27K version £109. Extra memory chips £6 per 2K.

UK 101 AND SUPERBOARD
32x48 display expansion kits UK101 £9, Series 1 Superboard £14. Guard band kit for Superboard only £10. The below accessories suit both the UK101 and Superboard:- Extra RAM £2-10 per K. Cegmon £22-50. Wemon £14-95. Word processor program £10. Centronics interface kit £10. 610 expansion board £179. Cased mini-floppy disc drives with DOS single £275, dual £415.

NEW GENIE 1 £299


Genie 1 16k £299, 48k £330. EG3014 expander box 16k £179, 32k £189. Minifloppy disc drives single £199, dual £369. Double density convertor £72. Parallel printer interface £36. High resolution graphics unit £82.

SHARP COMPUTERS
We can supply any Epson MX80 printer to run direct from the MZ80K (I/O box not needed) for £39 plus printer price. We also specialise in interfacing printers to the MZ80K, MZ80A and MZ80B both with and without the I/O box.

5V POWER KITS
Fully stabilised 5V computer and TTL power kits. Short circuit and over-voltage protection 1.5A £7.83, 3A £12.17, 6A £20.87

Postage £3.50 on computers, £4.50 on printers and 50p on other orders. Please add VAT to all prices. Official credit and overseas orders welcome.

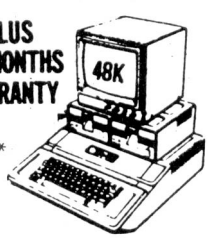
SWANLEY ELECTRONICS
Dept PCW, 32 Goldsel Rd, Swanley, Kent BR8 8EZ
Tel Swanley (0322) 64851

FREE! WORD PROCESSING SYSTEM VALUE £92.00

With every purchase of latest models of

apple II & TWIN DISC DRIVE SYSTEMS

PLUS 12 MONTHS WARRANTY



COMPLETE BUSINESS ACCOUNTING SYSTEMS
PRINTERS * ACCESORIES * STATIONERY *

*ACORN ASSEMBLED
2K RAM 8K ROM £172.50
ALL ACORNSOFT CASSETTES £11.50
*VIC 20 COLOUR COMPUTER PLUS
FREE GAMES AND PROGRAMMING BOOK

* ATARI 400 16K + FREE GAMES	FROM £199.95*
* ATARI 800 16K + FREE GAMES	FROM £449.95*
16K RAM BOARDS for the Atari	44.95
32K RAM BOARDS for the Atari	89.95

FREE £75.00 OF SOFTWARE WITH SHARP MZ80A 48K
SHARP MZ80K-48K PC 1211 £74.75 PC 1500 £169.95
NASCOM SPECIAL EDITION £494.44

ATARI SOFTWARE
ADD £2.00 p&p PER ORDER

SCOTT ADAMS ADVENTURES 1 – 12	16.50	DATESTONES OF RYN	13.80
PACMAN	29.95	RESCUE AT RIGEL	20.75
GALACTIC CHASE	15.95	STAR WARRIOR	27.60
JAW BREAKER	19.95	KRAZY SHOOTOUT	29.95
TEMPLE OF APSHAI	27.60	REAR GUARD	16.45
CRUSH CRUMBLE CHOMP	19.95	AIRSTRIKE	15.95
INVASION OF ORION	17.25	ACTION QUEST	19.95
		CRYPTS OF TERROR	20.45
		GHOST HUNTER	19.95

GODFREYS COMPUTER CENTRE
28/32 EAST WALK BASILDON 289379

Could Your Business Profit From Another Financial Director?

☐ Our one works - not only twenty times faster - but doesn't make any mistakes.

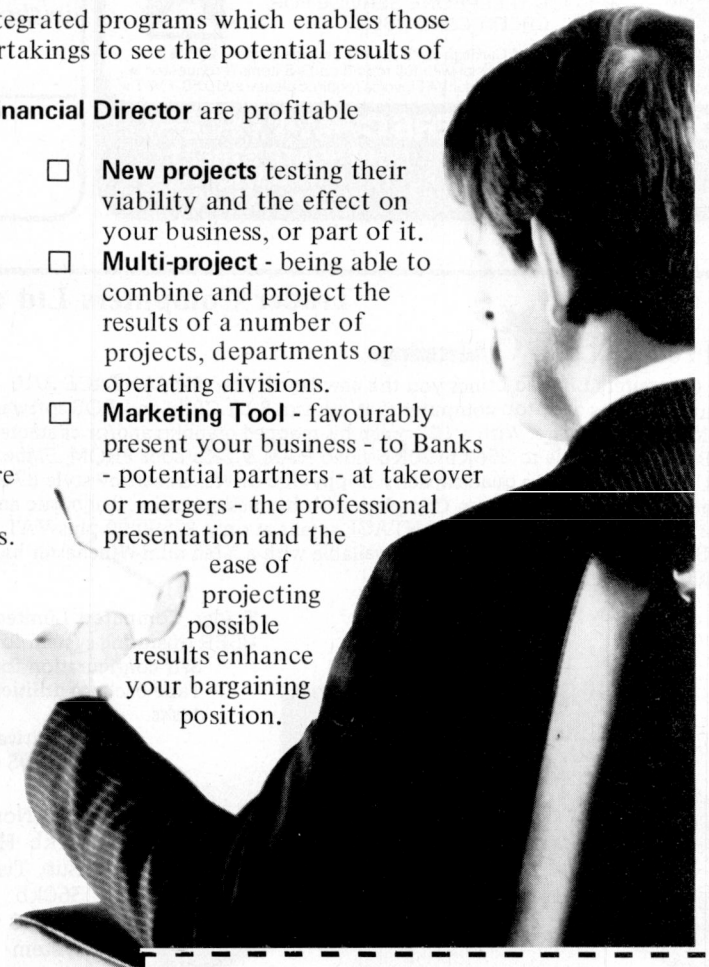
☐ His salary is NIL; doesn't run a car and receives no holiday, sickness or pension contributions.

The role of a financial director covers many areas of financial control, planning and strategy. It also encompasses a vast amount of information preparation - cash flows - projected balance sheets - profit & loss accounts - budgets and plans. This vital information is needed for sound policy and strategic decisions.

The **Financial Director** is a suite of integrated programs which enables those responsible for a company's financial undertakings to see the potential results of their decisions instantly.

Easy to use, the applications of the **Financial Director** are profitable and include:

- ☐ **The fast production** of Cash Flows, Balance Sheets and Profit and Loss accounts for different eventualities.
- ☐ **Strategy and Financial Planning** - the ability to see immediately the results and best timing of given financial tactics. e.g. price increases - by item: dropping services or products: fresh capital introduction: effects on loans and interest: tax planning - capital allowances: effects of purchases on pre and after tax profits.
- ☐ **Anticipate** cash surpluses or short falls.
- ☐ **New projects** testing their viability and the effect on your business, or part of it.
- ☐ **Multi-project** - being able to combine and project the results of a number of projects, departments or operating divisions.
- ☐ **Marketing Tool** - favourably present your business - to Banks - potential partners - at takeover or mergers - the professional presentation and the ease of projecting possible results enhance your bargaining position.



This software program runs on the Commodore Business Micro Computer. A typical complete system which includes software costs less than £4,000.

This very practical tool can be used by any businessman.

The question one most often hears being asked of those having the financial director responsibility is *"What happens to our bottom line when we ...?"*

Ring or write to: **Sid Newman**
General Manager, Dataview Ltd.,
Portreeves House, East Bay,
Colchester, Essex. CO1 2XB.
Telephone: (0206) 865835 for your nearest stockist.
Only available from Approved Dealers

Name _____ PCW2

Title _____

Company _____

Address _____

_____

Tel: _____ Telex: _____

We have got a Commodore Micro Computer – Yes/No

MIDWICH COMPUTERS Co

MAIL ORDER SPECIALISTS

Lowest Prices — Fastest Delivery

MEMORIES ●NEW LOWER PRICES

2114	Low Power 200ns	0.80	4116	200ns	0.70
2708	450ns	2.79	4116	150ns	0.84
2716	450ns (5V)	2.25	4118	150ns	3.38
2716	350ns (5V)	3.59	4164/4516	100ns	3.25
2716	450ns (3 rail)	5.95	5516	200ns	9.38
2732	450ns	3.90	6116P3	150ns	4.30
2732	350ns	4.40	6116LP3	150ns	5.75
2532	450ns	3.90			

BBC Micro UPGRADE KITS

●NEW LOWER PRICES

As some parts are still in short supply please check availability before ordering.

BBC1	4516/4816 X 8 100ns	25.50	BBC21	Printer cable complete	13.00
BBC2	Printer/User I/O kit (IC69,70 + PL9,10)	8.45	BBC22	Connector for user port with 36" cable	2.15
BBC4	Analogue input kit (IC73, 77 + SK6)	6.75	BBC44	Analogue input plug with Cover	2.25
BBC5	Serial I/O and RGB kit (IC74, 75 + KK3, 4)	11.45	BBC55	5 and 6 pin DIN plugs for Serial I/O and RGB input	0.99
BBC6	Expansion bus and tube kit (IC71, 72, 76 + PL11, 12)	6.25	BBC66	Connector for Bus post	3.50

Data available on asterisked components. Please telephone for prices.

VISA

24 HOUR TELEPHONE SERVICE FOR CREDIT CARD USERS

Access

★ All prices exclude VAT and Carriage (0.75 + VAT) on orders under £10 ★
★ All orders despatched on day of receipt with full refund on O/S items if requested ★
★ Order receipted & returned with goods. If full VAT invoice required please add 0.50 + VAT ★

MIDWICH COMPUTERS Co (MAIL ORDER)
DEPT PCW, HEWITT HOUSE, NORTHGATE STREET, BURY ST. EDMUNDS, SUFFOLK IP33 1HQ
TELEPHONE: (0284) 701321 TELEX: 817670

Knights Unbeatable Sharp & Atari Deals

SHARP

Sharp MZ-80A + 20 programs	£419
MZ-80A with PASCAL + 28 programs	£429
MZ-80A with PASCAL, FORTH, MACHINE CODE and 32 Programs	£449
MZ-80B with BASIC, MACHINE CODE + ASSEMBLER	£899

ATARI

ATARI 400 with 25 programs	£217
ATARI 800 with 25 programs	£429
ATARI disk unit + 25 programs	£259

We guaranteee to supply Sharp and Atari at unbeatable prices. Prices exclude VAT but include Securicor delivery — note we accept credit cards without making surcharges.

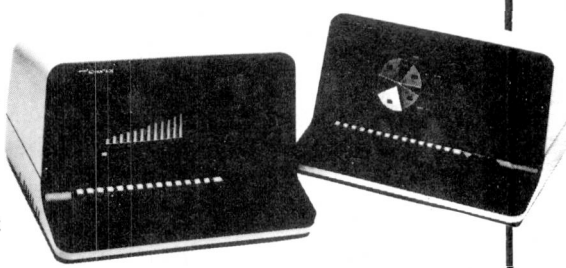
Knights T.V. & COMPUTERS

108 ROSEMOUNT PLACE ABERDEEN
Telephone 0224 630526 Telex 739169

Trader Computers Ltd 65 Loudoun Road London NW8 0DQ

16-bit NorthStar™ Advantage

Trader Computers Limited brings you the new North Star ADVANTAGE 8/16 – an integrated graphics desk-top computer that can run 8-bit CP/M and DOS software and 16-bit MS/DOS software. With a 12" green bit-mapped graphics and/or character display 64Kb RAM expandable to 256Kb, 20Kb video RAM & 2Kb boot PROM, 5Mhz Intel 8088 & 4Mhz Z80-A, two quad-capacity floppy disc drives, Selectric° style 87-key keyboard with 15 function keys. Complete with business graphics, diagnostic and demonstration software, this ADVANTAGE retails at only £2590.00 plus VAT. The North Star ADVANTAGE 8/16 is also available with a %Mb mini-Winchester hard disc at £3490.00 plus VAT.





Trader Computers Limited brings you HMSOS – the sophisticated all-British MULTI-USER operating system for Z80-based micro computers. HMSOS features include:

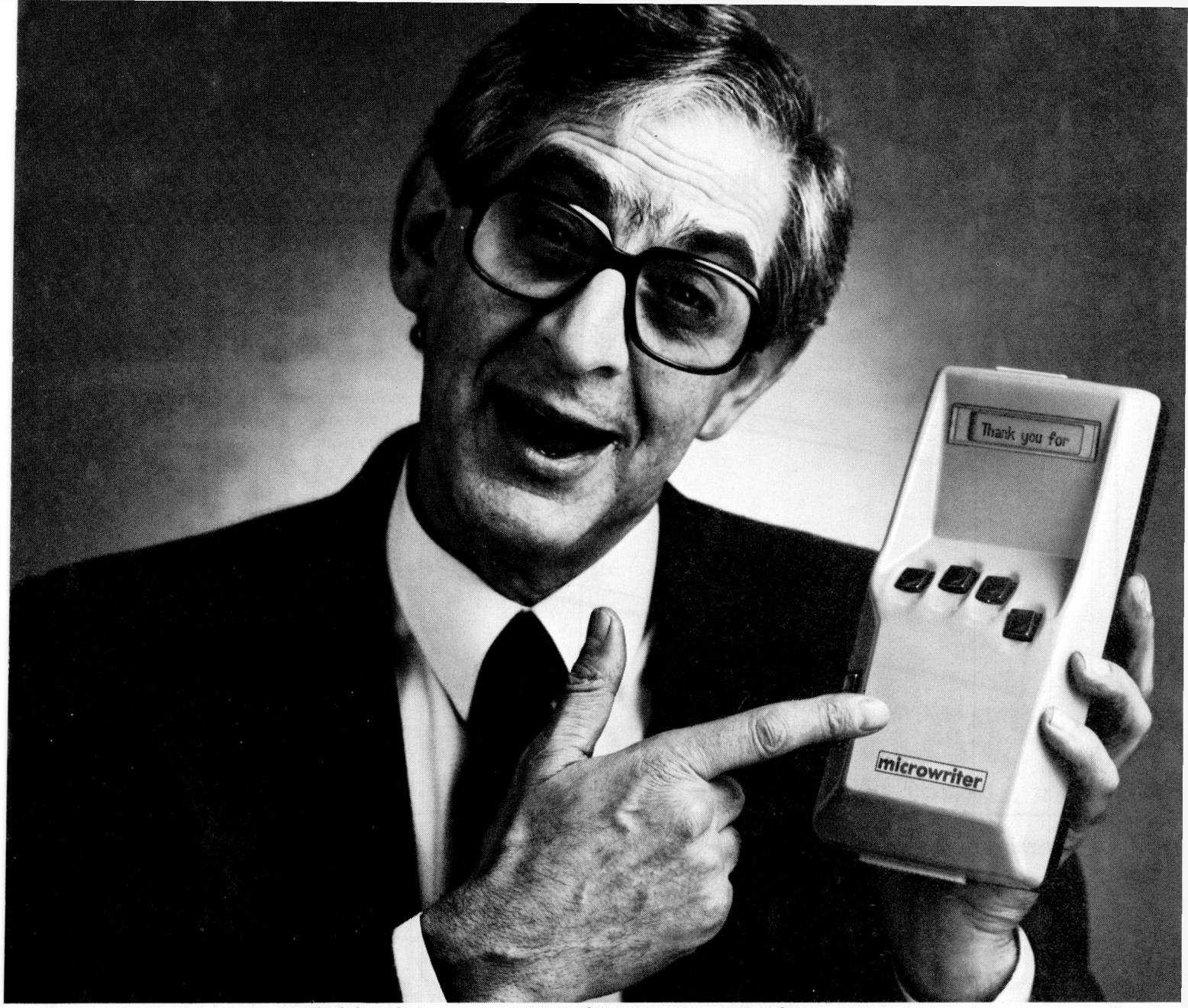
Self-configuration for number of users o File locking in BASIC
Tape back-up utilities for Winchester drives o Pseudo-keyboards for background tasks
Interrupt-driven printer spooler o Disc handling out-performs CP/M
HMSOS costs only £150.00

The North Star Horizon: A high-speed 4 Mhz Z80-A CPU, 64kb High-Speed Dynamic RAM, optional PROM, S-100 Bus, Two Serial Ports, one Parallel port, and two integrated 360kb 5¼inch quad-capacity Floppy Disc Drives. With 30,000 in use throughout the world you know it's a proven system

Horizon 64k 2 quad	£1995.00
Horizon 64k 1 quad + 5Mb Shugart	£2995.00
Horizon 64k 1 quad 12 Mb Rodime	£3895.00

DEALERS! TELEPHONE US NOW FOR UNBEATABLE TRADE PRICES.

Trader Computers Ltd 65 Loudoun Road London NW8 0DQ
Telephone 01-328 3484



"I'll show you how to take on word processing single handed."

Scriptwriter Denis Norden has never been happy with dictation and readily admits to being no typist. Now he's even given up longhand because he's found a far more efficient way of getting his thoughts on to paper – fast and in perfectly typed form.

It's called the Microwriter – faster than writing longhand, it's easy to learn and easy to do. You enter your words into the Microwriter with the fingers of one hand, where they are stored in a 1600 word memory. You can then check your text on the Microwriter's moving display and alter it if your wish. The finished text can be immaculately turned into type by simply plugging into a printer or an electronic typewriter. You can even transfer your text to and from your microcomputer or word-processor.

Because it is completely portable the Microwriter can deal with your letters, reports and documents whenever it suits you without the need for dictation, longhand or typing and it eliminates the frustrations of endless redrafting.

The Microwriter with its built-in microprocessor, and using the brilliantly simple microwriting technique, makes this a unique, powerful office product for anyone who has to get his thoughts on to paper. It brings word-processing power to the fingers of one hand, without the need for any specialised training.

As Denis Norden says: "I am to technology what Marconi was to hairdressing but the Microwriter is amazingly easy to use. The makers say that the average user picks up the technique in less than an hour. I am proud to say that I turned out to be very average after I bought my Microwriter."

The Microwriter helps people "write into type" in companies such as Courage, Unilever, British Telecom, hundreds of smaller businesses and, of course, Denis Norden.

To find out more, contact your nearest Microwriting Centre or post the coupon today.

If you need to write – you need a Microwriter.

For the technically-minded

The Microwriter portable word processor features:	Powerful PROM WP software contains:
☐ The new 5-finger keyboard	☐ Processing of full ASCII set
☐ 8K RAM	☐ Comprehensive formatting/ editing controls
☐ 16 character LCD	☐ Communications software
☐ RS232C communications	☐ Cassette software
☐ Mains/battery power	

The Microwriter costs £485 (plus VAT) including carrying case, charger, cassette interface and self-learn guide. TV interface optional extra.

Write into type with the Microwriter

To Microwriter Ltd., 31 Southampton Row, London WC1B 5HJ.

I would like to know more about the Microwriter.

Name_____

Position_____

Company_____

Address_____

_____

Telephone_____

PCW 9/82

microwriter 31 Southampton Row, London WC1B 5HJ. Telephone: 01-831 6801.

An associate company of the Hambro Life Group of Companies.

Approved Microwriting Centres are:

Scotland
Edinburgh 031-225 2774
North East
Chester-le-Street 0385-881551
North West
Manchester 061-834 3448
North Wales & Merseyside
Chester 0244-379666
N. Midlands
Chester 0244-379666
W. Midlands
Kidderminster 0562-745451
E. Midlands
Northampton 0604-46431
Peterborough 0733-61641
Loughborough 0509 37281
S. Midlands
Banbury 0295 66555
E. Anglia
Cambridge 0223-316363
Ipswich 0473-212629
Norwich 0603-615936
S.West
Plymouth 0752-665236
South
Burgess Hill 044-46 5670
Brighton
0273-24953
London & Home Counties
Merstham, Surrey 2635/2727
Stevenage 0438 61451
Luton 0582 33711
London, EC1 01-253 7256
London, EC2 01-628 3040
London, WC1 01-387 0195

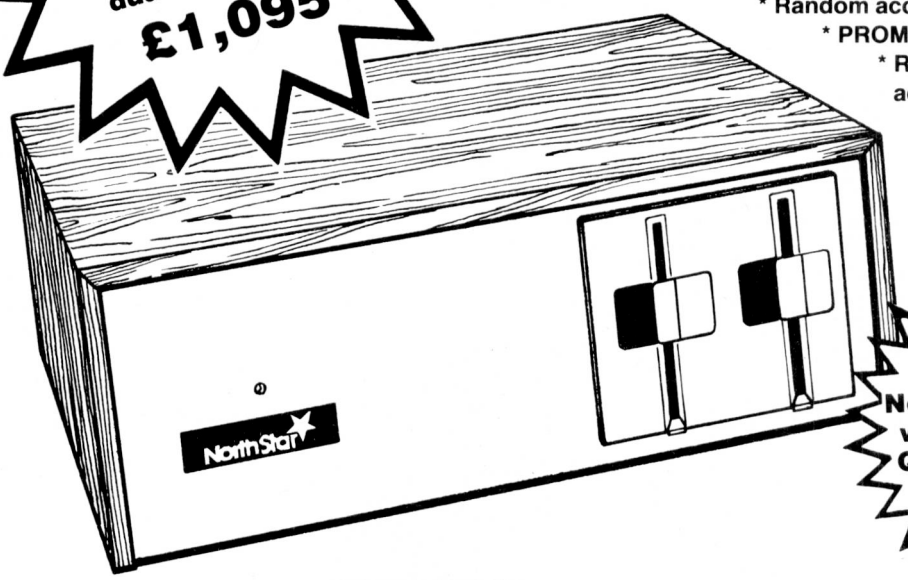
"Get your hands on a Microwriter on Stand No 131 Hall A Personal Computer World Exhibition"

EXTEND YOUR HORIZON

SPECIAL OFFER!
North Star Advantage with dual d/s floppies
£1,095

Upgrade your NorthStar

* 12 M.byte 5¼" Winchester disk £2,100
* DOS driver for Winchester disk £300
* Random access NS BASIC file handler £500
* PROM at FCØØ. 63K addressing CP/M £50
* RAMSWITCH board. 71K addressing for DOS £250
* Overlay facility for NS BASIC £500
* Bisynch 3780 communications driver £500
* Local network driver (9600 baud polled) £500



SPECIAL OFFER!
North Star Horizon with 12 M.byte + Quad disk and all upgrades
£5,585

TANTUS MICROSYSTEMS LTD.

91 SHEEN ROAD, RICHMOND, TW9 IYJ. Tel: 01-940 7299

ATTENTION: **SOFTWARE AUTHORS**

YOU DO WHAT YOU DO BEST, WE'LL DO THE REST

CLIO has been in the field of serious publishing for some twenty years. Now, we are seriously entering the field of software publishing for personal computers. We are seeking good programmes for all popular computers in all areas, i.e. games, education, home and business.
We can offer you, the software author, professional publishing at its very best - generous royalty arrangements, copyright policing, worldwide marketing and distribution, we have agents and offices around the world.

If you are good at developing software for personal computers, we can bring you the means to excell.

Simply complete the tear-off section below and return it to the address given. It would help us, but it is not essential, if you include a separate sheet giving fuller details on the programme, especially things about it you consider to be unique. Cassettes should only be sent if accompanied by a print-out of the programme/s and a stamped, self-addressed envelope.

Clio Software Publishers

Type of programme (game, education etc.)_____
Name of programme _____
Your computer manufacturer _____
Model _____
RAM required for programme _____
Are you sending further details ☐
Are you sending cassette and print-out ☐

Name _____
Address _____
_____
Telephone (Daytime) _____

Please return to; **Clio Press Limited**, Dept. JD, Woodside House, Hinksey Hill, Oxford OX1 5BE

CBS SUPPLIES LTD.

SAY YES!

Computer & Business Supplies

TELE SALES HOT LINE 'PHONE 23745/6/7
Phone your order through today ask for Julie, Mary or Bob!!!!

CBS Says Yes to Stocking the Products you require.

High Quality Dysan Disks
High Quality Flexette Disks
Disk Storage Fan Files
Disk Storage Library Cases
Disk Storage Locking Boxes
Disk Cleaning Products
Anti Static Spray
Anti Static Foam Cleaner
V.D.U. Screen Cleaner
Pressurised Air Dusters
Listing Paper All Sizes
Ribbons Full Range Includes:-
Commodore, Qume, Diablo
Cassette Tapes
Digital Tapes
Large Reel Tapes
Turntables
Anti Glare Screens
Copy Holders
Anti Static Mats
Disk Racks
Fire Safes
Fire Extinguishers
Work Stations
Micro Desks
Ergonomic Furniture
DP Binders
DP Storage Units
Computer Labels
Word Processing Labels
Dust Covers
Computer Books

CBS Says Yes to the Best in Mail Order Specials!!!

Scotch C.10 Box 10	52p each
Scotch C.30 Box 10	69p each
5¼" Disk Storage Box (40 Capacity Lockable)	£14.95 each
5¼" Dysan High Quality Disks From	£2.50 each
8" Dysan Disks From	£3.50 each
Computer Fire Extinguishers	£12.00 each

Cleaning Products

Anti Static Foam Cleaner	£1.62 can
Anti Static Spray	£3.12 can
Disk Cleaning Fluid	£2.36
Disk Drive Cleaning Kits	£21.50

Dust Covers

PET 8000	£9.99
Disk Drive	£9.99
4022 Printer	£9.99
Qume Printer	£9.99
Diablo printer	£9.99

Computer & Business Supplies Ltd,
Bowmaker House,
21, Etruria Road,
Hanley,
Stoke-on-Trent.

All Prices Exclusive of V.A.T.
All Mail Orders – Cheque, Postal Order or Official Company Order.

S.B.D. Software is proud to announce their distribution agreement with the most up to date APPLE-only magazine in America.

CALL A.P.P.L.E. MAGAZINE

In today's fast changing world of the APPLE you just can't afford to stay behind, so don't settle for anything less than the best APPLE-only magazine in America.

Now you can purchase this outstanding magazine for the low price of £1.75 per issue.

Your subscription for 12 or 24 magazines may start from any month in 1981.

Single back issues are available at £2.25 per issue including postage and packing.

A bound volume of the issues in 1980, 1979, 1978 are available for £20.00, £15.00 and £10.00 respectively, including postage and packaging.
(Please note that in 1980 & 1981 there were only 9 issues published but in 1982 there will be 12 issues.)

☐ 12 issues @ £21.00 ☐ 24 issues @ £40.00

Europe Air Mail postage, add £6 per 12 issues

NAME .....

ADDRESS .....

TOWN ..... POSTCODE .....

Please start my subscription .....
Month Year

.....
Barclaycard/Access Number Expiry Date

Please make cheques payable to CALL APPLE (UK)

Send to:- CALL APPLE (UK), c/o SBD Software,
FREEPOST, RICHMOND, SURREY TW9 1BR
(No postage stamp required)
Telephone: 01-940 5194

The Famous Book
"ALL ABOUT APPLESOFT"
Now available @ £9.50 incl. P. & P.

Better Deals on Discs!

Look at our floppy prices . . . Costs are for packs of ten 5¼" discs from famous manufacturers such as:

	1-4	5-9	10+
BASF			
SSSD	£15	£14	£13.40
SSDD	£20	£19	£18.30
DSDD	£23.35	£22	£21.20
ACCUTRACK			
SSDD	£16	£15	£14.50
DSDD	£26	£25	£24.20
VERBATIM			
SSSD	£17	£16	£15.50
SSDD	£23.80	£22.50	£21.75
DSDD	£34.60	£33.50	£32.60

Clean and neat and tidy

Plastic library cases for 10 floppies
The 5¼" disc case costs £1.90
The 8" disc case costs £2.20

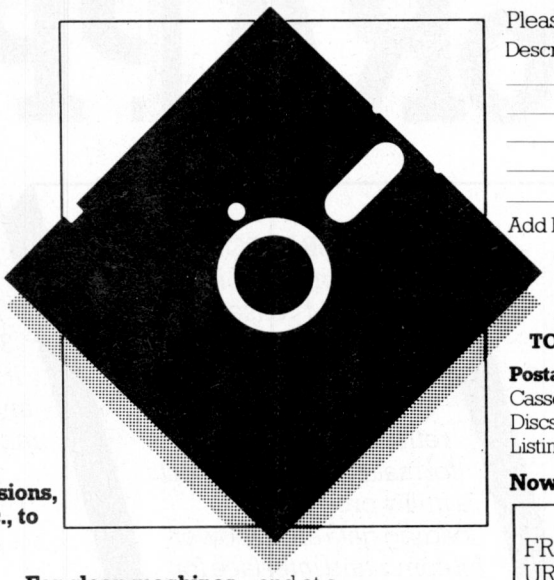
All the old jokes about lasting impressions, striking while the iron is hot, etc. etc., to push our ridiculous ribbon prices . . .

■ For you wordsmiths, with your dancing daisywheels:

NEC Multistrike	£3.35
Ricoh Fabric	£3.35
Ricoh Multistrike	£3.35
Qume Nylon	£2.57
Qume Multistrike	£2.57
Diablo Multistrike	£3.60

■ And for you dotty matrix masters, look here:-

Epson MX80 cartridge	£5.85
Commodore 4022	£5.85
Commodore 3022	£2.00
Microline 82A	£2.00
Centronics 703/704	£4.20



For clean machines – and at a never-to-be repeated price!
Electrolube 5¼" disc drive head cleaning kit . . . only £15.00.

Now here's a handy way of keeping your printout bound and gagged!
ConSup's special computer printout folders, for 11 x 9½ listing paper, cost just £2.26 each. Buy two, buy three, buy five!

CONSUP

Please send me the following:

Description	Price Each	No.	Total Price

Add Postage and packing (see rates) .....
Sub Total .....
Add 15% VAT to the sub total .....
And attach your cheque for the **TOTAL** made payable to ConSup .....

Postage and Packing Rates:
Cassettes/Ribbons/Library Boxes: 35p
Discs: 75p Cleaning Kits/Labels: £1.30
Listing Paper: £3.50

Now, fill in this return address label

FRAGILE:
URGENT COMPUTER SUPPLIES.
To: .....

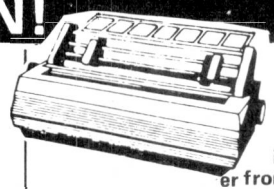
From: ConSup, 62 Tritton Road, London SE21

And, finally, send your order, and cheque, to ConSup, Unit M2, 62 Tritton Road, London SE21

Any questions? ring Consup on 01-670 4411

TEACH YOURSELF COMPUTING AND HAVE FUN!





APPLE	
PACKAGE SYSTEMS	
Apple Executive System	1950.00
Apple Top Secretary System	2150.00
Apple Education System	1425.00
APPLE HARDWARE	
Apple 48K Video Output only	625.00
16K Add on	45.00
Disk Drive with Controller (16 sec)	345.00
Disk Drive without Controller	275.00
INTERFACE CARDS	
Language Card	95.00
Controller Card	95.00
Eurocolour Card	65.00
1EEE - 48 Card	200.00
16K RAM Card (48K to 64K)	60.00
ATARI	
400 16K Computer	250.00
800 16K Computer	500.00
410 Tape Recorder	42.61
810 Disk Drive	260.00
822 Thermal Printer	200.00
825 80 Column Printer	400.00
850 RS 232 Interface	110.00
16K Ram Upgrade	52.13

Goodf fully guaranteed. Prices exclude VAT and P+P.
Company hospital and Government orders accepted by 'phone.
Diners/Barclaycard/Access/Visa accepted by phone.

TEXAS	
TI-99/4A	173.00
PERIPHERALS	
Speech Synthesiser	86.00
Disk Memory System :–	
Disk Controller	173.00
Disk Drive	346.00
Thermal Printer	233.00
RAM Expansion	260.00
RS232 Peripheral Adaptor	129.00
ACCESSORIES	
Cassette Cable	10.90
Cassette Teach Yourself Basic	26.00
SHARP	
MZ 80K Computer 48K	340.00
MZ 80FD Dual Disks	560.00
MZ 80P3 Dot Matrix Printer	365.00
MZ 80F I/O Disk interface	52.00
MZ 80 FMD Master Disk and Manual	20.00
MZ 80 F15 Disk Cable	8.00
MZ 80 I/0 Expansion box	96.00
MZ 80 TIOB Basic Tape	9.50
MZ 80 T20C Machine Language	18.00
MZ 80 TU Assembler	36.00
MZ 80 I/O-1 Universal Interface Card	40.00
MZ 8T70 AE FDOS for MZ 80K	67.00
MZ 8T70BE Basic Compiler for MZ80K	40.00
MZ 8T40E Pascal for MZ80K	40.00
MZ-80 DPK – Double precision Basic	38.00

EPSON

The unbelievable quality printer from the world's largest print head manufacturers. A whole stable of machines to suit a wide variety of applications:

MX80	270.00
MX80 (FT/2)	390.00
MX80 (FT/1)	345.00
MX82 (FT)	385.00

OKI

Small, light, quiet, dot matrix printer, 40, 80 or 132 columns, 6 or 8 lines per inch, 96 ASCII characters plus 64 graphics characters, Centronics int.

QUME·SPRINT 9

The Daisywheel Printing Terminal series that sets a new standard for print quality, reliability and serviceability. Unbeatable performance at a realistic price.

RICOH 1600S

60cps, with superb print quality from unique dual character plastic daisywheel giving up to 6 copies + original. Choice of interfaces, and feeder options.

EPSON INTERFACES	
Epson/Sharp Cassette	65.00
Epson/Sharp Disk	120.00
Epson/Apple	85.00
Epson/TRS 80 bus	59.00
Epson/TRS 80 Expansion	25.00

PHONE 01–455 9823 FOR MAIL ORDER DELIVERY OR ADVICE

MOUNTAINDENE 22 Cowper Street London EC2

MicroRAPPORT

The Relational Database System for Micro Computers

MicroRAPPORT *is a proven Relational DBMS for CP/M* based microcomputers. It has an easy to use Interactive Query Language for retrieving data and formatting simple reports, a utility program for loading data and a powerful command interface for use within Fortran programs. It is a derivative of* RAPPORT, *the popular DBMS for mini and mainframe computers.*

MicroRAPPORT *can handle 16 data-base files holding up to 30 Megabytes of data. It is powerful, very efficient and proven on a wide range of machines.*

For more information or to order your copies of MicroRAPPORT *just contact: Peter Barnes, Database Products Group, Logica Limited, 64 Newman Street, London W1A 4SE Telephone: 01-637 9111*

logica

**CP/M is a trademark of Digital Research.*

SENSIBLE SOFTWARE SPECIALS!!

10% Discount on the purchase of three or more utilities

SUPER DISK COPY III **£17.95**

Apple II or Apple II Plus with 48K and 1 or more Disk II drive(s)

Practically a "mini-DOS" in itself, SUPER DISK COPY III is destined to become the standard for APPLE disk utilities. SDC is a menu-driven program that allows manipulation of all types of files under DOS 3.1, 3.2 and DOS 3.3.

SDC is the only disk utility available for the APPLE that combines these features: 1) COPY single files (Integer, Applesoft, Binary, or Text), 2) COPY DOS, 3) COPY entire disk, 4) UNDELETE deleted files, 5) Optional "INIT" of copy disk (with optimized "skew" factors for 13 sector disks), 6) REPLACE illegal characters in filenames, 7) FIX filesizes, 8) Use of DOS and directory sectors for up to 13K additional storage, 9) ALPHABETIZE filenames in diskette catalog 10) LOCK or UNLOCK files, 11) PLOT of disk usage, and 12) Optional rearrangement of files so.

DOS PLUS **£15.95**

Apple II or Apple II Plus with 32K and 1 or more Disk II drive(s)

DOS PLUS is the software solution for living with both 13-sector (DOS 3.1, DOS 3.2, DOS 3.2.1) and 16-sector (DOS 3.3) APPLE diskettes.

DOS PLUS adds 8 new commands to APPLE DOS. Three of these are built-in and the remaining five are user definable. IT IS EVEN POSSIBLE TO CHANGE DOS VERSIONS WHILE A PROGRAM IS RUNNING!

If you have a language card, DOS PLUS will quickly load it with the "missing" language. A "B" BLOAD-analysis command is also provided to display the starting address and length of the last binary file loaded.

DOS PLUS also includes a DOS COMMAND CHANGER program to allow easy customization of APPLE DOS commands to suit individual tastes.

APPLESOFT PROGRAM OPTIMIZERS (AOPT)

Apple II or Apple II Plus with 16K **£15.95**

AOPT is a 2.2K machine-language utility that will substantially reduce the size of an Applesoft program without affecting the operation of the program. AOPT automatically shortens variable names, removes remarks, removes unreferenced lines, appends short lines together, removes extra colons, and renumbers line numbers. AOPT will convert a verbose, well-documented, development version of a program into a memory-efficient, more-secure, production version of the same program.

APPLESOFT-PLUS STRUCTURED BASIC (APLUS)

Apple II or Apple II Plus with 16K **£15.95**

APLUS is a 4K machine-language utility that adds the following structured-programming commands to Applesoft basic: WHEN . . . ELSE . . . FIN, UNTIL, WHILE, UNLESS, CASE, SELECT (variable), and (OTHERWISE). Multi-line IF . . . FIN statements are also supported. APLUS also allows the use of "named" subroutines or "procedures". A programmer can now instruct a program to "DO CURVE-FIT", without worrying about the location of the "TO CURVE-FIT" subroutine. APLUS automatically indents "&LIST"ed programs to clarify the logic flow. The APLUS "&CONVERT" command replaces the above structured-progamming commands with "GOTO"'s and "GOSUB"'s to provide a STANDARD Applesoft program as output.

New progams can now be written using "GOTO"-less logic. Existing Applesoft programs can be maintained using APLUS without special conversion.

PROTECTOR III **£60.00**

Apple II or Apple II Plus with 48K, and 2 or more Disk II drives

The PROTECTOR III is designed to make "protected" copies of a "master" DOS 3.3 disk containing Applesoft programs. The resulting "protected" disks can not be copied by presently available commercial copy programs (the APPLE COPY program, SUPER DISK COPY, the Lawrence copy program, etc.). Applesoft programs on the "protected" disks will "auto run", preventing end purchasers from "LIST"ing or "SAVE"ing programs off a "protected" disk. A USERBACKUP program is provided that can be distributed to enable end users to make unexecutable backup copies of protected disks.

DISC RECOVERY **£17.95**

Apple II or Apple II Plus with 48K and 1 or more Disk II drive(s)

This utility will help keep you out of trouble with its BAD BLOCK SCAN option and if you do get into trouble with a "messed up" disk, DISK RECOVERY may "save the day" with its REDO VTOC option.

The REDO VTOC option examines every file on the diskette to detect and correct the following types of errors in the disk VTOC: 1) two files trying to use the same disk sector, 2) part of a file not protected by a "sector-in-use" bit in the VTOC, and 3) "sector-in-use" bits in the VTOC that really aren't being used by any files.

MULTI-DISK CATALOG III **£15.95**

Apple II or Apple II Plus with 48K and a Disk II drive

MDC III is a very fast, machine-language database program designed specifically for keeping track of the contents of your APPLE diskette library. MDC III requires only seconds to read FILENAMES, FILETYPES, FILESIZES, numbers of free sectors remaining on diskette, and actual volume number from each of your diskettes. Both sides of a diskette can be loaded and assigned to the same DISK ID No. MDC III supports use of a two-character CLASSIFICATION field that can be used to group games, utilities, and other types of related files together. MDC III supports a fast Shell-Metzner. A "FLIP DOS" command allows MDC III to read directories from DOS 3.1, 3.2 and 3.3 disks and to store the resulting database on either a 13 or 16 sectored disk.

Write or Ring us for a full software catalogue. All prices plus VAT, postage and packing free. Dealers enquiries are welcome.

SBD SOFTWARE

15 Jocelyn Road, Richmond, TW9 2TJ
Telephone: 01-948 0461 Telex 22861

THE ADMINISTRATOR

SHE'S GOT WHAT YOU NEED . . .
. . . A HISTORY

THE **ONLY** TRANSACTIONAL INFORMATION SYSTEM

- ★ "Set up is simple" Accepting information for processing in one hour
- ★ Desk top equipment CBM8000 series
- ★ Transactional processing provides unlimited history records
- ★ Finding information by single or multiple selection
- ★ Statistics & report by user definition
- ★ Calculation within records & report
- ★ Service and support from the first established CBM software producers



Recommended by COMMODORE

For details or to arrange a demonstration without obligation contact S.O.S. today.

STAGE ONE SOFTWARE LTD

STAGE ONE COMPUTERS, 300 ASHLEY ROAD, PARKSTONE, POOLE, DORSET. UNITED KINGDOM. **Tel: 735656 Code 0202**

ORBORCROFT

Micro Computer Mobile Work Stations

High quality 'lo glare' melamine finished work surface with post formed long edges. Reinforced polyester coated steel support frames and large twin wheeled castors for ease of movement. Keep your micro off the dining room table and always available.

Choice of 3 models from £98.85 plus VAT. (Access).
Money back guarantee.
Allow 21 days delivery.
Business enquiries welcomed.
Phone or send for detailed brochure and order form.



Arborcraft Limited, 137 Watling Street, Radlett, Herts WD7 7NQ
Telephone Radlett (09276) 3126. 24 hour answering service.

Please send me your illustrated brochure and order form for the Arborcraft Micro Computer Mobile Work Stations.

Name

Address

Post code

io research ltd.

"PLUTO" COLOUR GRAPHICS PROCESSOR

Pluto is a self-contained colour display processor on an 8" x 8" NASBUS and 80-BUS compatible card featuring:

- Own 16 bit microprocessor
- 192 Kbytes of dual-ported display memory for fast flicker-free screen updates. (Outside of the host address space).
- 640(H) x 288(V) x 3 planes (8 colours) – 2 screenfulls
  OR
  640(H) x 576(V) x 3 planes (optional extra)
- Fast parallel I/O interface usable with ALMOST ANY MICRO. Only single +5v supply required.

Pluto executes on-board firmware providing high level functions such as:

- Fast vector draw – over 100,000 pixels/sec. Lines can be drawn using REPLACE, XOR, AND, OR functions
- User-definable characters or symbols
- Spare display memory with memory management facilities for allocating symbol storage space or workspace
- Rectangle Fill and copy using REPLACE, XOR, AND, OR plus 5 other functions
- Fast access to single pixels
- Write protect memory planes during copy
- Double-buffered screen memory for animated displays
- Complex polygon colour fill

Pluto is expandable. An expansion board will be available later this year to give Pluto up to 8 memory planes with no loss of resolution. S100 Interface now available.

AVAILABLE NOW. ONLY £399 + VAT (p&p free)

Dealer and OEM enquiries invited.

6 Laleham Avenue, Mill Hill, London NW7 3HL
Tel: 01-959 0106

io research ltd.

BABY PLUTO

320(H) x 288 (V) x 8 COLOUR DISPLAY

The power and performance of Pluto but with 96 Kbytes of memory and half the resolution. An ideal match for low cost colour monitors. INCREDIBLE VALUE AT ONLY £299 + VAT.

A/D BOARD FOR NASCOM

- 8 input channels
- 30 microsec conversion
- Over voltage protection
- Prototyping area
- 8 bit resolution
- Sample and hold
- Full flag/interrupt control
- NASBUS compatible

Price £120 + 15% VAT (post free)

EPROM PROGRAMMER

- Programs 3 rail: 2708/2716
  Single rail: 2508/2758, 2516/2716, 2532/2732
- Software supplied for Read/Program/Verify
- Can be used with other machines with 2 parallel ports

Price £63 + 15% VAT (post free)

6 Laleham Avenue, Mill Hill, London NW7 3HL
Tel: 01-959 0106

EDUCATIONAL COMPUTING on the ZX81

Suit children ages 5-11

No comparable collection offers so much for so little

THE LITTLE PROGRAMMES WHICH ARE BIG EDUCATORS

Here at last. A set of programmes to turn your Sinclair ZX81 into a powerful educational tool. And you don't even need to know programming. There are clear instructions and plenty of tips & advice. Designed to go beyond drill & practice the promote learning through interaction & discovery.

All programmes fit 1K

Creative use of graphics

Many innovative ideas

Fully documented

Includes many games

Educare's **50** 1K PROGRAMMES for PRIMARY EDUCATION

Includes:-

TORTOISE A simplified version of the famous Turtle programme

CODED MISSILE Combines the fun of arcade games with learning

£4.95 only incl. p & p

Graph-plotter ● Histogram ● Simon-spell ● Sketchboard ● Times-table ● Sets Series-quiz ● XY-coordinates ● Count ● Equations ● Areas ● Guess-a-Volume Angles ● Upstairs-Downstairs ● Music-notes ● See-saw ● Wipe-out ● Spell Temperature ● Clock ● Money ● Snake Mastermind ● Number-shoot ● +26 more **EDUCARE**

To: EDUCARE, 139a Sloane St., London SW1X 9AY

Please send me.....copies Educare's 50.
I enclose cheque/postal order for £.....
Name.....
Address.....
.....

Let your child benefit early. Send now.

If that Apple is just out of Reach....

Rent One!

Whether your requirement for a microcomputer system is from three days to three years and whether for evaluation, training or just hands-on experience – come to Atlanta Data. We're the experts!

Our terms? The best available, featuring no deposit*, no capital expenditure, full maintenance & low, low charges.

PLUS the bonus of guranteed inflation busting – the charge stays the same right through the rental contract!

We know computers & we know renting – for everything Apple – come to the experts!

Atlanta Data Systems
350/356 Old Street, London, EC1V 9DT. **01-739 5889**
* Business purposes only

PRINTER INTERFACE ONLY £10

Yes. A printer interface for APPLE, PET, BBC, TRS80 SHARP MZ80, SIRUS 1 and many more when you purchase one of the new EPSON TYPE III Printers.

Epson MX100 Type 111

This best selling printer with a 15" carriage has now been up-graded to 100 cps. Further new features include improved graphics, sub and superscripts auto underlining and enhanced aesthetics. Last but not least. All these improvements and the price is **LOWER.**

NOW £499.00

Epson MX 80T Type 111
FT Type 111

These ever popular 80 column printers have also improved graphics, sub and superscripts and auto underlining. Also these have dropped.

MX80 T/III NOW £349.00
MX80FT/III NOW £389.00

Above prices exclude delivery of £10 and VAT @ 15%



To order your new Type III EPSON printer send your cheque in full payment to

Pinewood Computers

Mail Order Dept.
17 Adelphi Crescent
Hayes Park, Hayes, Middx. Tel 01-841 1507
Quoting clearly which micro you require STANDARD interface.

MICRO-80

UK Subscription Dept.
24 Woodhill Park Pembury Tunbridge Wells Kent TN2 4NW

LOOK what you get when you subscribe to MICRO-80 the monthly magazine for TRS-80 and Video Genie. Now in the 3rd year of publication!
All new subscribers (and existing ones when they renew) receive free of charge a Software Cassette complete with 62 page user manual featuring

★ **Level I in Level II** - Convert your Level II TRS-80 to operate as a Level I machine.
★ **Copier** - Copies Level II System tapes, irrespective of where they load in memory.
★ **Z80 MON** - A low memory, machine language monitor.
★ **Improved Household Accounts** - Powerful enough to be used by a small business.
★ **80 Composer** - A music generating program.
★ **Plus Two Games** - Poker and Cube (a version of the Rubiks cube for Disk users).

Order just the magazine or take it each month complete with the published programs ready-to-load on cassette or disk.

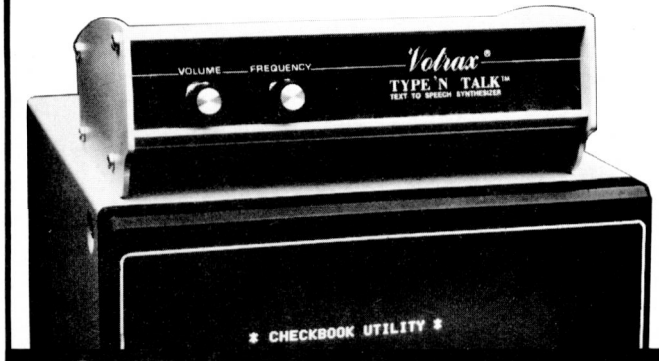
Please enrol me for an annual subscription and send me my FREE cassette program. I enclose £16.00 ☐ (magazine only) or £43.60 ☐ (magazine and cassette edition) or £75.00 ☐ (magazine and disk edition).
(Enclose your cheque/P.O. made payable to MICRO-80 and send to the above address.)
Software offer, and prices apply to U.K. residents only. Overseas subscription rates on application.

Name .....
BLOCK CAPITALS PLEASE

Address .....

.....

PCW/9/82



VOTRAX TYPE'N'TALK

- Unlimited Vocabulary
- Built-in microprocessor with text-to-speech algorithm
- RS232C interface—connects in same circuit as any terminal or runs on its own.
- Speaks any plain English text that is sent to the terminal
- Built-in audio amplifier (no speaker)
- 750 character buffer
- Band rates to 9600
- Data echo
- De-selectable and addressable
- Phoneme access modes

educational & quantity discounts

PRICE **£275** +VAT

U.K. Distributor: **INTELLIGENT ARTEFACTS**
Cambridge Road, Orwell, Royston, Herts.
Tel: Cambridge (0223) 207689

CHRISALID

As we GROW, our prices SHRINK!!!!!
VALUE UNBEATABLE ANYWHERE IN UK

Epson MX80, t	£315.00
Epson MX80, ft 1	£355.00
Epson MX80, ft 2	£355.00
Seikosha GP100	£189,00
CUMANA dual disk	£369.00
CUMANA single disk	£199.00
11"x9½" fanfold	£ 16.50/2000
	£ 10.00/1000
GENIE 1 & 2	£289.00
Vic20	£173.00
9", 12MHz+ Monitor	£ 99.00 green
	£ 95.00 b/w
GENIE LE19 Rom Unit	£24.50
ROM EP1	£12.00
Nascom 2, kit	£220.00
Nasom 2, built	£280.00
Verbatim Discs 40t	£ 19.85/10
80t	£ 28.50/10

ALL VIC ACCESSORIES ALL NASCOM OPTIONS
ALL EXPANSION
prices exclude VAT but delivery free in 50 mile rad.
BOOKS — COMPONENTS — HELP — ADVICE

BARCLAYCARD/ACCESS Welcome. Orders taken by telephone and dispatch from stock same day.

CHRISALID
13 High Street, Berkhamsted, Herts
TELEPHONE (04427) 74569 or 5704

Open 9am to 5.30 weekdays (lunch 1–2)
9am to 1.15pm Saturdays.
(Answerphone service outside hours)

EVERYONE WANTS TO USE TIM...



He's powerful, versatile and so easy to use.

He remembers all your clients', customers' or patients' details. He can tell you who owes you money. He keeps all your employees' records. He generates and summarises business reports, files and mailing lists fast. And he can even tell you the full name and address of "a Mr Mac somebody or other" ..... in seconds!

Yet a secretary can handle him with one finger.

Who is this superworker?

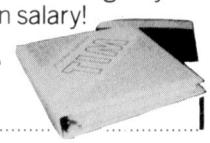
His full name is Total Information Management – TIM III™ for short.

TIM III is the non-programmers Data Base Management programme for CP/M™* or IBM personal computers. And TIM III interfaces with Wordstar™ and Magic Wand™ word processing packages so he can merge data from a TIM file into personal letters making him ideal for all mailing list work.

*CP/M is a Trademark of Digital Research.

Well proven in the USA, TIM III is now available from Juniper Business Systems. TIM III costs £390 + VAT and once he's working for you we guarantee he'll never ask for longer holidays or a rise in salary!

Return the coupon for full details and brochure.



I would like to know more about TIM III.

Name .....

Address .....

TIM III ..... Tel. No. ..... PC

You'll wonder how you managed without him.

distributed by JUNIPER Business Systems
30 Alexandra Crescent, Bromley, Kent BR1 4EU
Tel: 01-464 6783

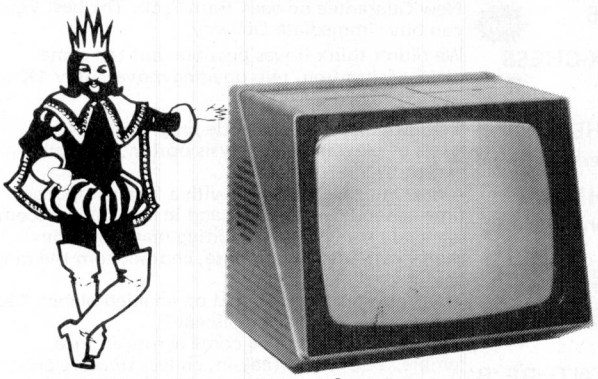
OPEN FRAME MONITORS AVAILABLE FOR OEM'S

The 'PRINCE' of Monitors

offers better Monitoring.

24MHz Bandwidth~ensures a clear crisp display.

Available with P4 White P31 Green AND L1 ORANGE



Scan: 625 lines/50 Hz. Deflection: 110°. Active raster: 240 x 172mm. Bandwidth (3dB): 10 Hz-24 MHz (at 3dB points). Character display: 80 characters x 24 lines. Horizontal frequency: 15625 Hz ±0,5 KHz. Vertical frequency: 50 Hz. Horizontal linearity: ± 3%. Vertical linearity: ± 2%. Geometric distortion: ± 1.5%. EHT (at zero beam current): 13kV ± 0.5kV. Power drain: 30 Watt approx. Voltage supply: 110V A.C. 50 Hz/220V A.C. – 50 Hz/240V A.C., 50Hz/ ± 10% upon request. Video input: 2 x BNC – or CINCH – or PL 259, (composite video) negative sync, input 0.5–4V p.p. across 75 Ohms. X-Ray radiation: conforms to I.E.C. Spec. No. 65. Overall dimensions: 320 x 270 x 265 mm. Weight: 7 Kg. approx. Ambient temperature: 0–45°C.

OTHER CROFTON PRODUCTS INCLUDE: Computer peripheral equipment, Frame grabber, Floppy disk drives, Floppy disks, Computer power supplies, C.C.T.V. monitors, Uncased monitors, Monitor P.C.B's., Cathode ray tubes, VHF/UHF modulators, Video switchers, Video distribution amplifiers, Camera housings, Pan and tilt units, Camera lens, Camera tubes, Printed circuit board service.

CROFTON ELECTRONICS LTD

35, Grosvenor Road, Twickenham, Middx, TW1 4AD.
Telephone: 01-891 1923/1513 Telex: 295093 CROFTN G

BBC MICRO

MEMORY UPGRADE KITS Model A
Now only £26.00 + VAT

Upgrade the Model A to 32k RAM. Simple to fit - no soldering. Supplied with step by step instructions.

SNAKE Model B **£7.80 + VAT**

This colourful arcade type game makes full use of the amazing graphics (Mode 2) and sound facilities of the BBC Micro. A highly addictive game that will give you hours of fun.

CHARACTERS Model A/B **£5.80 + VAT**

Forget about clumsy binary or Hex notation when re-defining character shapes. This utility program could not make it any simpler.

CUBE Model B **£7.80 + VAT**

A simulation of the famous Rubik Cube. Full colour 3 dimensional view of all sides of the cubes. Choose how jumbled you want the cube and then try to solve it.

FRUIT MACHINE
Model A/B **£5.80 + VAT**

Another game that shows off the superb graphics and sound effects possible on the BBC Micro. Features Nudges, holds, gamble etc.

CASH or ROYALTIES waiting for any interesting software (not just games) for the BBC Micro. The better the program the more we will pay.

Send an SAE to get the latest details of our software.

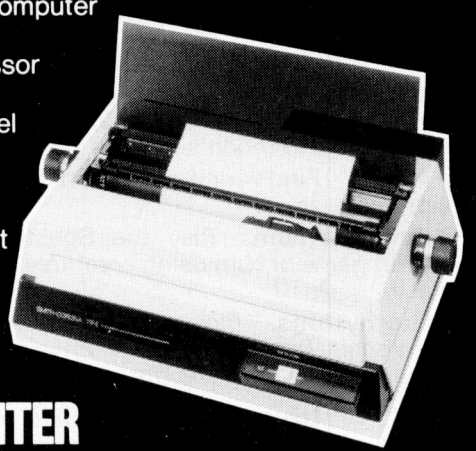
COMPUTER CONCEPTS **Dept PW5** 16 Wayside
Chipperfield Herts WD4 9JJ
Tel: (04277) 62955

COST CONSCIOUS!

Heralding the beginning of a new age of low cost Word Processing Computer Systems

SMITH CORONA TP-1

- Dedicated Computer Printer
- Microprocessor Controller
- Serial, Parallel or IEEE Interface
- Lowest cost purpose-built Daisywheel



£485 + VAT

BYTEWRITER

- Keyboard Printer
- Lift off facility
- Built-in self test
- Rigid carrying case



£485 + VAT

DISCOM TRADING COMPANY
Dresden House, 51 High Street
Evesham, Worcs. WR11 4DA
Telephone (0386) 3591

Further Information Please

Name _____

Address _____

_____

_____

_____

Telephone _____

discom

ZX Spectrum
20 Programs £6.95

The ZX Spectrum has brought advanced computing power into your home, The Cambridge Colour Collection, a book of 20 programs, is all you need to make it come alive.

No experience required. Simply enter the programs from the book or load them from tape (£2.95 extra) and run.

Amazing effects. All programs are fully animated using hi-res graphics, colour and sound wherever possible.

Entirely original. None of these programs has ever been published before.

Proven Quality. The author already has 30,000 satisfied purchasers of his book of ZX81 programs.

Hours of entertainment

- **Lunar Landing.** Control the angle of descent and jet thrust to steer the lunar module to a safe landing on the moon's surface.
- **Maze.** Find your way out from the centre of a random maze.
- **Android Nim.** Play the Spectrum at the ancient game of Nim using creatures from outer-space.
- **Biorhythms.** Plot the cycles of your Emotional, Intellectual and Physical activity. Some would say this is not a game at all.

Improve your mind

- **Morse.** A complete morse-code training kit. This program will take a complete beginner to R.A.E. proficiency.
- **Maths.** Adjustable to various levels, this program is an invaluable aid to anyone trying to improve their arithmetic.

Run your life more efficiently

- **Home Accounts.** Keeping track of your finances with this easy-to-use program will enable you to see at a glance where the money goes and plan your spending more effectively.
- **Telephone Address Pad.** Instant access to many pages of information.
- **Calendar.** Displays a 3 month calendar past or future, ideal for planning or tracing past events.

ORDER FORM:

Send Cheque or P.O. with order to:–
Dept. B., Richard Francis Altwasser, 22 Foxhollow, Bar Hill, Cambridge CB3 8EP

Please send me

☐ Copies Cambridge Colour Collection Book only £6.95 each.
☐ Copies Cambridge Colour Collection Book & Cassette £9.90 each

Name: _____

Address: _____

_____

ARTIC COMPUTING

MOVING AHEAD WITH ZX SOFTWARE

ZX CHESS & ADVENTURES

ZX-FORTH NEW — Full implementation of Forth for the ZX 10-26 time faster than Basic. 'Simplicity of Basic with the Speed of Machine Code.'

16K RAM PACKS £31.95 NEW — BYG BYTE RAM PACK, no wobble problems. New Guarantee on each Ram Pack. The best you can buy. Immediate Delivery.

1K ZX-CHESS £2.95 NEW — We didn't think it was possible, but the game plays against you, two opening moves, only 1K of memory needed!

ZX CHESS I reduced to £6.50 — Very popular machine code program, with six levels of play and an analysis option. Unbeaten except by:

ZX CHESS II now only: £9.95 — A new improved version, with a faster response time, seven levels of play, and in addition a recommended move option. Exciting machine code games with instant response, choose from the range below.

ADVENTURES

ADVENTURE 'A' £6.00 — You find yourself stranded on an alien planet. Can you reach your ship and escape?

ADVENTURE 'B' £7.00 — In a jungle clearing you come across an Inca temple. You must break in, collect treasure and escape. Beware. Includes a cassette save routine.

ADVENTURE 'C' £8.00 — You are unfortunate enough to be drawn to an alien cruiser. Can you reach the control room and frre yourself or will they get you first? Includes a cassette save routine.

GALAXIANS — All the features of the arcade game in a fast machine code program. Swooping attackers, explosions and personalised scoring. **£3.95**

ZXBUG — A 30 in 1 machine code tool and disassembler, allows access to registers and to search through, and modify memory; with cassette routines. **£7.00**

BARCLAYCARD VISA

ARTIC COMPUTING
DEPT SP
396 James Reckitt Avenue
Hull, HU8 0JA

The only thing we discount is the price.

- CREDIT FACILITIES (SAME DAY POSSIBLE)
- AFTER SALES SERVICE
- MAIL ORDER
- EXPORT

M. O'BRIEN
MICROCOMPUTER DISCOUNTS

95 High Street
Wimbledon Village
London S.W.19
93 Bus route
Open 9.00 am 5.30 pm
Tuesday/Saturday
Closed all day Monday

Prices exclude VAT and are correct at time of publication but subject to manufac. alterations.

01 946 1528/0331

---

apple computer

APPLE II 48K £669
DISK II (WITH CONTROLLER) £314
DISK II (W/O CONTROLLER) £285

APPLE III £2150

Computer plus Video Monitor /// and information Analyst Software Package comprising of: VisiCalc™ ///, The Apple Sophisticated Operating System (SOS) and Apple Business BASIC Language.

Additional Disk Drive ///$\frac{1}{4}$319

Accounting Business Systems
TABS

Software	
Foundation Module	£82
Sales Ledger	£165
Purchase Ledger Module	£165
Nominal Ledger Module	£165
Stock Control Module	£165

PERSONAL SOFTWARE

APPLE VISICALC	£107
APPLE VISIDEX	£107
APPLE VISIPLOT	£97
APPLE VISITREND/PLOT	£137
APPLE VISITERM	£80
APPLE VISIFILE	£137

VIC-20

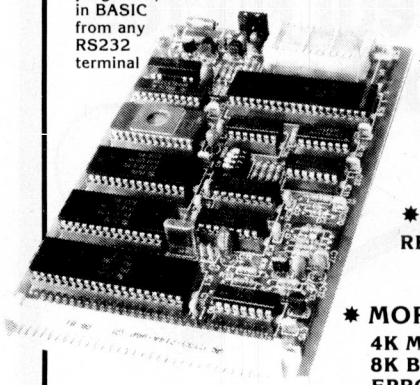
ONE FREE GAMES CARTRIDGE WITH EVERY VIC-20 CPU

VIC 20 CPU	£173.90	VIC 8K RAM Cartridge	£39.09	'Super Slot' ROM Cartridge	£17.35
VIC C2N Cassette Unit	£39.09	VIC 16K RAM Cartridge	£65.17	'Jelly Monsters' ROM Cartridge	£17.35
VIC Printer	£200.00	VIC Programmers Aid Cartridge	£30.39	'Alien' ROM Cartridge	£17.35
VIC Single Drive Floppy	£344.35	'Avenger' ROM Cartridge	£17.35	'Super Lander' ROM Cartridge	£17.35
VIC 3K RAM Cartridge	£26.04	'Star Battle' ROM Cartridge	£17.35	'Road Race' ROM Cartridge	£17.35

ALL PRICES EXCLUSIVE OF VAT

AMBIT's Z8--TBDS
A COMMERCIAL ADVANTAGE:

A complete SBC in Eurocard format, simply understood and programmable in BASIC from any RS232 terminal



*** MORE SPEED**
ZILOG Z8 - BASIC/DEBUG CPU FOR SPEEDY PROGRAMME DEVELOPMENT

*** MORE VERSATILITY**
RS232, 24 I/O LINES
2 COUNTER TIMERS
6 LEVEL INTERRUPT CAPABILITY

*** MORE SUPPORT**
REGULAR FEATURES IN R&EW

*** MORE FOR YOUR MONEY**
4K MONITOR/UTILITY SOFTWARE
8K BYTE QUASI STATIC RAM
EPROM PROGRAMMER

£160 built
£140 kit
£ 33 PSU cassette I/F built
plus 15% VAT and 50p P/P.

*** MORE SCOPE** *** MORE APPLICATIONS**
MINIMAL CHIP CONFIGURATION CPU/LATCH/ROM EXECUTES BASIC CODE FROM POWER-UP.

NEED WE SAY MORE?

Oh yes, and it's off the shelf, designed and made in England.

AMBIT INTERNATIONAL, 200 North Service Road, Brentwood, Essex CM14 4SG.
Telephone No: (0277) 230909 Telex: 995194

nascom
BRITISH AND BEST

SYSTEMS		ADD-ONS	
48K NASCOM 3.	£499.00	Castle Tape Interface.	£17.50
8K NASCOM Micro Ed.	£399.00	Milham A/D Converter.	£49.50
NASCOM Single Drive.	£470.00	Screen Weave Eliminator.	£8.75
NASCOM Dual Drive.	£685.00	Screen Flash Eliminator.	£14.75
NASDOS Disc Operating System.	£45.00	Programmer's Aid.	£28.00
CP/M Disc Operating System.	£100.00	Arfon Speech Board.	£85.00
Hitachi Tape Recorder.	£25.00	W.S. Big Ears.	£45.00
12" Green Screen Plastic Monitor.	£99.00	PMG Soundbox.	£40.50
12" Green Screen Metal Monitor.	£125.00	CMOS 2K Ramboard.	£95.00
Epson MX80 F/T2 Printer.	£399.00	CMOS 32K Ramboard.	£185.00
TEC 1550 Printer.	£699.00	I.O. Systems Pluto high res. Graphics Board.	£399.00
		Colourgraphics NASCOM AVC On Demonstration Now.	£155.00
		RAM B 64K Upgrade	£30.00

All Prices exc. VAT.

NASCOM
Networking up to 32 Machines on one master.

SOFTWARE
Over 100 items in stock covering business, educational games.

NAS-SYS/NAS-DOS
Suppliers:- NASCOM – applications packages.
Dove Computer Services – polished system, software.
Program Power – superb games and utilities.
Mike York – extensions to BASIC.

Business & Leisure Micro Computers

16, The Square, Kenilworth, Warwickshire CV8 1EB.
Telephone: (0926) 512127.

VISIT OUR GREATLY EXPANDED SHOW ROOM

THE FINEST PRINTER/TYPEWRITER MONEY CAN BUY.

THE CROWN RANIER
ONLY £795 + VAT



We offer a heavy duty daisy wheel printer/typewriter at the flick of a switch. This machine has the very latest linear motor – no cables or belts to break, stretch or wear. Beware of light weight, low cost machines, these can never give long term reliable service. THIS MACHINE WILL!!
Centronics or IEEE interface. Interchangeable daisy wheels – variable pitch – whole line memory. Uses standard type IBM ribbons and lift off correctors. Perfection as a typewriter (used by local authorities). Perfection as a printer.

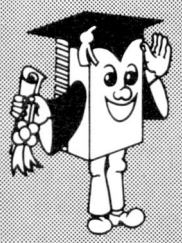
Ask your local computer or office equipment dealer for furthyer information. EXSTOCK DELIVERY

SOLE UK AGENT. TRADE ENQUIRIES INVITED.

CROWN BUSINESS CENTRE
EASTBOURNE, 56-58 SOUTH ST.,
SUSSEX. (0323) 639983.

Microcomputer Training Courses in Guernsey

free software with your holiday course



EXAMPLE:
Write your own turnkey stock control program in 1½ hours then take it home with you FREE!

Your chance to gain an insight into the ultra-modern world of the self-programming microcomputer in the fascinating Channel Island of Guernsey.

Call or write NOW for details of our VAT free comprehensive, high-speed 'do-it-yourself' courses. We have something for everyone whatever your age or background. Using VISICALC and CORP or CODEWRITER program generators we interface you right away with Apples or Pets... one machine per student. Learning is entertaining! After a few hours you will be writing professional suites of programs with our amazing new program generators now selling worldwide. Part time courses are available day or evening for business, scientific, educational and hobbyist applications. Accommodation and travel arranged as required at reasonable rates.

The 5th Personal Computer World Show STAND 456

Book now with BARCLAYCARD VISA
Further details from:-

DYNATECH MICROSOFTWARE LTD.
Microcomputer Training Centre,
Summerfield House, Vale, Guernsey,
Channel Islands.
Tel: 0481 47377, Telex: 4191130.

Cambridge Computer Store

Two Great Micros in stock now!

BBC Computer





Sinclair ZX81

Price includes VAT

Cambridge Computer Store

1 Emmanuel Street, Cambridge CB1 1NE
Phone (0223) 358264/65334

Also in our 'Budget Micros' Dept: Commodore VIC-20

TIRED OF SELLING MICROS, STUCK IN A RUT?
Sharp enough to join Marian Electronics and earn up to £18,000, p.a.?

Marian Electronics is a fast growing subsidiary of a major group of companies, and is involved with the manufacture of gaming machines.
Through internal reorganisation and imminent expansion, the company has a vacancy for two

CUSTOMER LIAISON EXECUTIVES.

BUT WAIT!—The person we want is going to be difficult to find. He or she must have:—

● Proven Sales Ability. ● Proven Sales Management Ability. ● Knowledge of Telephone Sales.

In addition he or she must be:—

● An excellent administrator. ● Enthusiastic. ● Creative & Innovative. ● Hard working and dedicated. ●28+

The basic salary is good and coupled with a bonus structure, earnings can easily exceed **£15,000**, with hard work and determination.

If you think you are the person, send full career history to:—

TONY REYNOLDS, MANAGING DIRECTOR, MARIAN ELECTRONICS LTD., 22 CHALFORD INDUSTRIAL ESTATE, CHALFORD, STROUD, GLOS. GL6 8NT.

(Mark envelope private & confidential ref AER/COMP)

THE REMARKABLE NEW OLIVETTI M20 PERSONAL COMPUTER IS AVAILABLE FROM JOHN RICHARD & COMPANY.

21 North High St., MUSSELBURGH, Midlothian EH21 6JA.
Or 'phone 031-665 8282 and ask for Bill Marshall or Rod Taylor.

Osborne! Byte! McGraw-Hill Books!

For the best in computer books come and see us at Stand 126

Look out for these new bestsellers

* Your Atari Computer £10.95
* VisiCalc: Home and Office Companion £11.50
* Apple Logo £11.50
* PET Personal Computer Guide £10.95
* CBM Professional Computer Guide £10.95
* Microcomputer Disk Techniques £11.50

Also available through your local bookshop or computer retailer, or, in case of difficulty send cheque/P.O. direct to the publisher below. No postage or packing charge if your remittance is included.

McGraw-Hill Book Company (UK) Ltd.,
Shoppenhangers Road, Maidenhead,
Berkshire. SL6 2QL.



The Atom Magic Book

By Mike Lord. A wealth of games and other programs: storing speech in your ATOM, converting programs written in other BASICs, tape recording hints, and many more useful software and hardware tips. £5.50

Getting Acquainted with your Acorn Atom

By Tim Hartnell and Trevor Sharples. 80 programs including Draughts! 184 pages. £7.95

Practical Programs for the BBC Computer & Acorn Atom

By David Johnson-Davies £5.95

The Memory for your Atom

(Or other 1MHz 6502/6800/6809 machine)

16 or 32K BYTE VERSIONS. Expand your ATOM to 28 or 38K RAM Ideal for Word Processing, Chess programs and Business Software.

Fully Compatible with other Acorn ATOM software and hardware, including the Acorn disc drive.

Versions available to fit inside the ATOM while still leaving room for other extensions such as the Acorn ATOM colour encoder board. Eurocard rack mounting types also available.

NEW!! Versions of the above boards designed to run from a single +5V supply. s.a.e. for details.

ATOM Cassettes.

We stock a selection of the best ones available, including:

CAAD:	Muncher + Mancala + Target + Life 7K	£6
CAAE:	Galaxian 12K	£8
CAAF:	Chess 12K	£9
CAAG:	Invaders 12K	£8
CAAH:	747 12K	£8
CAAI:	Backgammon 7K	£7
CAAJ:	Labyrinth 12K + FP	£7

(CAAE-J from Bug-Byte)

THE EXPLORER'S GUIDE To The ZX81

The Book for the ZX81 Enthusiast.

By Mike Lord, 120 pages.

Programs for 1K RAM, and programs for 16K RAM. Games, Business and Engineering Applications. RAM & I/O Circuits. Useful ROM Routines. Hints and Tips.

£4.95

What Can I Do with 1K?

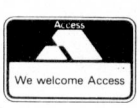
By Roger Valentine. A fresh and original book containing 40 programs and routines for the unexpanded ZX81. £4.95

The ZX80 Magic Book

With 8K ROM/ZX81 Supplement £4.75

Mastering Machine Code on your ZX81

By Toni Baker. 180 pages of immense value to beginner and expert alike. £7.50





ALL PRICES INCLUDE U.K. P & P AND 15% VAT WHERE APPLICABLE. OVERSEAS CUSTOMERS ADD £1.50 CARRIAGE PER ORDER.

TIMEDATA LTD Dept C 57 Swallowdale, Basildon, Essex SS16 5JG Tel: (0268) 411125 (MON-FRI)

timedata

GAMES PACK

Beat this for value! Five 16K programs Plus two 1K programs

3-D Battle (M/code - 1K)
City Bomb (M/code - 1K)
Warp Wars (Basic & M/code - 16K)
Snake (Basic 16K)
Sweet Tooth (Basic & M/code - 16K)
Slalom (Basic 16K)
Black Holes (Basic 16K)

ALL ON ONE CASSETTE FOR ONLY £4.95 ($9.90)

NEW

GRAPHICS TOOLKIT

(another masterpiece by Paul Holmes)

22 exciting MACHINE CODE routines that give you control over your screen as never before!

(ZX81 - 16K RAM ONLY)

Draw/Undraw draws or deletes your multi-character shape which is defined in a REM statement.
Foreground On/Off use this to 'protect' existing characters on your screen.
Border/Unborder draws a border round the edges of your screen area. Edit lines can be used if required.
Fill fills any number of lines you specify, starting at any line you specify, by your chosen character.
Reverse converts all characters to their inverse video, control as in FILL.
Print Position Controls UP, DOWN, LEFT, RIGHT. Alter your next PRINT position in the direction indicated.
Editprint moves next PRINT position to first edit line.
Scroll Facilities UPSCROLL, DOWNSCROLL, RIGHTSCROLL, LEFTSCROLL. Scroll your screen in the direction indicated.
Onscreen/Offscreen turns your screen on or off.
Background On/Off fills your screen by your specified character.
Search and Replace will search the screen for every occurrence of the character you specify and replace it with your new character.
Square draws a square or rectangle from your specified co-ordinates.

All these routines are in machine code for SUPER-FAST response! GRAPHICS TOOLKIT uses only 2K of your RAM and that includes space to load the programmers TOOLKIT described above.

ALL FOR ONLY £5.95 ($11.90)

This includes a cassette with 2 copies of the program, 2 copies of a demonstration program plus a comprehensive instruction booklet with examples.

All prices are fully inclusive.

An ESSENTIAL addition to your 16K RAM ZX81

TOOLKIT

(written by Paul Holmes)

Provides the following additional facilities:-

Line renumber - you state starting number and increment value. GOTO's and GOSUB's included in line renumber.
Search and List - searches for and lists every line containing specified character.
Search and replace - changes every occurance of a character as you require.
Free space - tells you how many free bytes you have left.

SPECIAL GRAPHICS ROUTINES

Hyper graphics mode - graphics never seen on a ZX81 before.
Fill - fills your screen instantly with your specified character.
Reverse - changes each character on your screen to its inverse video.
TAPE ROUTINE - provides a system WAIT condition until a signal is received in the cassette ear jack.

All these routines are written in machine code and together take up only 1K of your precious RAM -an incredible achievement!!

FOR 16K *ONLY £4.95 ($9.90)*

NEW

BATTLESHIPS & CRUISERS GAME

(16K - ZX81)

First computer version of this popular game of strategy and tactics. Both grids on view together. Establish the position of your fleet then locate and destroy the computer's fleet. Visual display shows hits and misses made and gives running score.

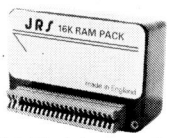
ONLY £4.95 ($9.90)

As reviewed in 'Your Computer' March 1982

16K RAM PACK

ONLY £26.50 ($49.95)

Quite simply the best available plus FREE 'Alien Attack' (7K-M/code) on cassette - Value £5.75 ($11.00).



Fully built tested and guaranteed. Uses existing power supply (min. 600 m.a.)
Compatible with printer.
No wobble problems.
Gold plated edge connector for perfect contact with your ZX81.
Normally despatched within 10 days of receipt of your order.

With advances in microtechnology we are now able to offer the **64K RAM PACK.** Same quality as the 16K but giving massive memory to your ZX81, with external dimensions no larger than the 16K Ram Pack (above).

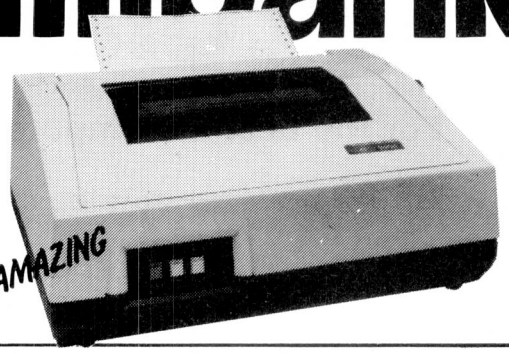
ONLY £62.95 ($119.95).

OVERSEAS CUSTOMERS PLEASE NOTE: ALL PRICES ARE APPLICABLE FOR EXPORT, INCLUDING AIRMAIL POSTAGE. PAYMENT MAY BE MADE IN STERLING (MONEY ORDER AVAILABLE AT YOUR BANK) OR YOUR OWN U.S. $ CHEQUE, MADE PAYABLE TO *JRS SOFTWARE*. DESPATCH NORMALLY 7 DAYS FROM RECEIPT OF ORDER.

JRS SOFTWARE

19 WAYSIDE AVENUE, WORTHING, SUSSEX. BN13 3JU Telephone: (0903) 65691

New from Millbank!



WALTERS 120

The new Dot Matrix printer which proves there has never been a better time to buy British.

☐ 120 cps. 80/132 columns. ☐ 9 x 9 dot matrix. True descenders. ☐ Bi-directional/logic seeking.
☐ Choice of plug-in interfaces.
☐ High resolution/ block graphics.

£395.00 (ex VAT) *(with centronics interface).*

MILLBANK COMPUTERS LIMITED
Millbank House · Amyand Park Road · Twickenham Midd. TW1 3HN
Telephone: 01-891 4691

Don't forget there will be plenty of special money saving offers in Tandy and Video Genie software on the Kansas Stand at the Barbican PCW Show—so see us first!

Our exhibitions this year include Computer Fair—Earls Court. Micro City—Bristol. Micro Fair—Manchester. PCW—Barbican Centre. Breadboard—London.

Extending our service to customers

If you can't make it to the exhibitions, write or ring (use our after hours answering service if you wish) for our fully descriptive catalogue of Tandy TRS-80 and Video Genie software. We operate the fastest software service in the country! Full credit card facilities.

Kansas

Kansas City Systems, Unit 3, Sutton Springs Wood, Chesterfield, S44 5XF. Tel. 0246 850357

PRO PASCAL –THE MODERN WAY TO PROGRAM

Pascal provides means of structuring both data and code. Pro Pascal is a true compiler, generating programs which make full use of the Z80's registers and instructions.

Fast, compact object code – see published benchmarks

Separate compilation facility allows large programs to be subdivided into manageable segments

For business applications:
– nine-digit integers (32 bits)
– string handling
– sequential and random access to files

For scientific users:
– single (32-bit) and double (64-bit) precision real values
– input/output and all math functions available in both precisions

For system programmers:
– object code is reentrant and ROMable for non-CP/M applications
– assembler-coded modules can be incorporated in object programs

Pro Pascal runs on any Z80 micro with CP/M and at least 52K RAM, for instance:
– Apple + Softcard
– Clenlo Conqueror
– Cromemco (with CP/M or CDOS)
– Digico Prince
– Nascom/Gemini
– NEC PC8000
– North Star Horizon & Advantage
– Pet + Softbox
– Research Machines 380Z
– Sharp MZ-80B
– Superbrain
– Televideo
– Vector MZ
– Xerox 820
– Zilog MCZ

Pro Pascal is developed and supported in the UK. The single-user price is £190 plus VAT. The software package includes disc-to-disc linker and cross-reference generator.

Prospero

PROGRAMMING LANGUAGE SPECIALISTS

Prospero Software, 37 Gwendolen Avenue, London SW15 6EP Tel: 01-785 6848

BBC

SERVICE CENTRE
OFFICIAL STOCKISTS

We can upgrade your Model A to Model B

Large range of software in stock

ACORN
OFFICIAL STOCKISTS

In stock – wide range of software

VIC-20

BANKRUPT STOCK!

VIC-20: £170 incl VAT

ALSO SOME MEMORY PERIPHERALS & SOFTWARE

Few items only – first come, first served!

SPECIAL PRICES!

EPSON FT/2: ONLY £400 incl VAT

Micro Tantel
Turns your TV into a Prestel receiver – or download software form Prestel with your Apple
ONLY £160 incl VAT
Alpha Numeric Tantel
ONLY £200 incl VAT

Tantel

TWICKENHAM COMPUTER CENTRE LTD

72 Heath Rd Twickenham Middx TW1 4BW (01-892 7896/01-891 1612)

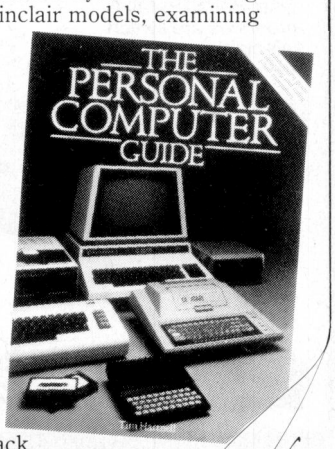
THE PERSONAL COMPUTER GUIDE

TIM HARTNELL

The Complete Handbook to Selecting and Using Small Computers

A unique introduction to the exciting world of personal computers, including:

★ An explanation of how they work and what they can do for you
★ A detailed analysis of the available systems including the BBC, Commodore and Sinclair models, examining specifications, commands, software and other vital information
★ How to get the most out of your computer
★ A step-by-step guide to programming
★ A complete set of over 40 programmes
★ Written by Tim Hartnell, the U.K.'s leading authority on small computers



Packed with ideas and fully illustrated with photographs, line drawings and information panels. **ONLY £5.95**

A large format quality paperback
Available from all good bookshops

Virgin

ATTENTION!

UNDER NORMAL CIRCUMSTANCES YOU WOULD POSSIBLY PASS OVER THIS ADVERT WITHOUT READING IT!

HOWEVER, IF YOU CAN SPARE 30 SECONDS PLEASE READ ON ...

Are any of the following products of interest?

ELECTRONIC PRODUCTS
* Prototype wiring system
* Prototype Eurocards & S100 boards
* 19'' Subracks
* DIN 41612 Connectors
* DIP Sockets
* Soldering Irons
* Tools etc.

COMPUTER AND W.P. PRODUCTS
* Microcomputer systems
* Printers
* Printer supplies & accessories
* Acoustic hoods
* Diskettes & accessories
* Printer, telex, photocopier & typewriter consumables

FROM LARGE STOCKS WE CAN ENSURE 'SAME-DAY' SERVICE ON MOST ITEMS.

Offering a combination of competitive pricing and excellent service we are working hard at customer satisfaction.

FOR FURTHER DETAILS CALL US ON 0428 53850.

Please come and discuss your requirements by visiting our stand at

'B' Hall Lower
STAND 320

The 5th Personal Computer World Show

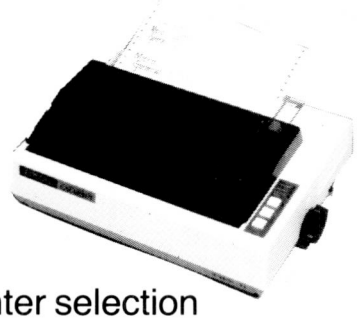
Roadrunner Electronic Products Ltd.
116 BLACKDOWN RURAL INDUSTRIES
HASTE HILL, HASLEMERE,
SURREY GU27 3AY
TEL: 0428 53850 TELEX: 858485 DEVCOM G

Our priority is 'Customer Satisfaction'.

Road Runner®

'Electronic manufacturers and distributors'

Micro General



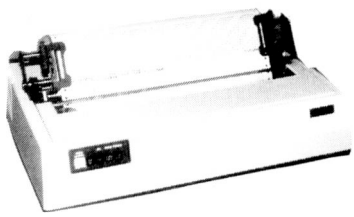
MATRIX PRINTERS. . .

Please contact us for advice on printer selection

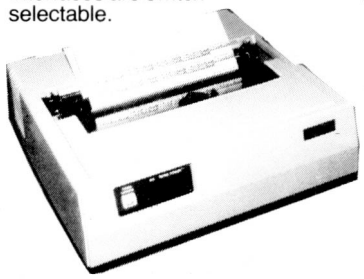
EPSON MX-80F/T TYPE III
£389+VAT
The Type III printers now have Auto-underline, Super-script and Sub-scripts.

EPSON MX-100 TYPE III
£499+VAT
Fantasic Value. 100 cps.

MICROLINE 82A
£350+VAT
Fast 120 cps model having true descenders on lower case. Serial/Parallel Interfaces are switch selectable.



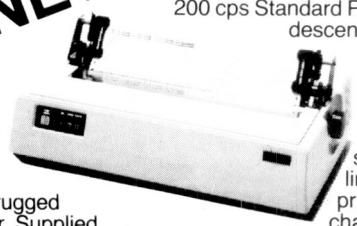
TEC STARWRITER DAISYWHEEL PRINTER
Very reliable 132 column
40 & 55 cps models.
1 Year warranty.
From £1285+VAT



MICROLINE 83A
£499+VAT
Full width printer with descenders on lower case. Prints at 120 cps and could replace larger printers giving lower costs. Serial/Parallel Interfaces are switch selectable.

NEW!

MICROLINE 84
£950+VAT
200 cps Standard Printing with descenders 136 Columns. Proportional Print (Near letter quality 18×18 Matrix). Pin-addressable graphics. Sub-script, super-script, under-lining. Emphasised print, Down-line loadable character set.



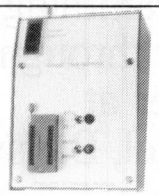
BARCLAYCARD VISA
Buy it with Access

MICROLINE 80
£235+VAT
Special low price for this rugged and reliable 80 cps printer. Supplied complete with Roll Paper Holder.

MICRO GENERAL 6 The Birchwoods, Tilehurst, Reading, Berks. Tel: 0734 25226

EPROM PROGRAMMERS

FOR ALL PET VIC NEW ACORN COMPUTERS



- All programmers can read/programme 2716 (ZK) 2516 (2K) 2532 (4) EPROMS and compatable ROMS.
- All you will ever need to make hard copies of your machine code programmes.
- Independently powered
- Read
- Programme
- Verify
- Copy
- Check Eprom is erased
- Full software tape supplied.

£62.00 inc P&P for UK

2716 EPROMS £4.50 inc P & P
2532 EPROMS £8.50 for UK.

- Pet owners Free programme for making your own character generator

PET Superboard 32

SELECT UP TO 8 ROM/EPROMS FROM ONE LOCATION

- No wires, switches or soldering
- Plugs onto the expansion port
- Expansion port still available
- Select up to 8 Rom/Eproms under programme control
- Plugs into any spare Rom socket
- Possible to run a 3KK programme from one Rom Location.
- Plugs into the character generator to select & character generator sets.
- Uses 2516, 2716(2K) 2532(4K) EPROM/ROMS.
- Run Toolkit, Visical, etc. from one location

£62.00 inc P&P for UK

A must for all programmers.

NEW Acorn Monitor Chip

Please state which location you wish the chip to reside ie: A000 or D000.

```
PC   NMI  SR  AC  YR  YR  RP
1000 A000 30  A9  04  G0  F0

:M 1000: 1010
:1000 A9 FF 20 20 D2 FF D2 FF
:1008 4C 08 A0 00 G0 00 00 00
:1010     flashing cursor
```

ENTER MACHINE CODE FROM SCREEN
R: Display registers as shown.
M: Display memory
G: Executive run address.
T: Move data from A to B
V: Verify any tape programmes.
Also repeat. Insert. Delete etc.

£29.50 inc P&P

A powerful tool for Machine Code Programmers

VIC user port connectors and covers.
PET user/I EEE connectors and covers. £6.50 inc P & P
All official orders welcome. SAE for further details.

PLEASE STATE TYPE AND MODEL OF YOUR COMPUTER WHEN ORDERING

COMPUTER INTERFACE DESIGNS
4 Albert Road. Margate. Kent. CT9 5AN. Tel(0843) 294648

WARD ELECTRONICS

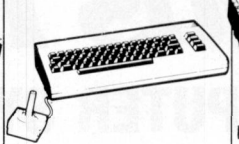
BIRMINGHAM 021-554 0708



APPLE SYTEMS AND APPLE SOFTWARE GOOD SELECTION IN STOCK INCLUDING GAMES AND USEFUL UTILITIES

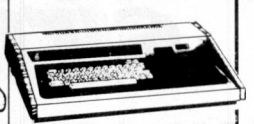
EPSON MX80 F/T PRINTERS
IDEAL FOR HOME AND BUSINESS MICROS

VIC-20



COMMODORE VIC20
£165.17 + VAT
= £189.95
VIC JOYSTICK £6.52
8K RAM £39.09
Software on Tape and in ROM and many add-on expansion facilities available, including Commodores own Books and Programming Courses.

GENIE COMPUTERS



Prices start at £270 also
GENIE EXPANSION BOXES AND DISK DRIVES
(MAY ALSO BE USED ON TRS80.)

MOLIMERX SOFTWARE FOR GENIE/TRS80

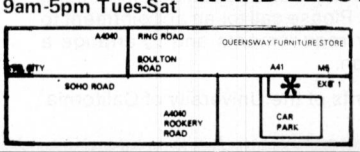
12" GREEN SCREEN MONITORS – SUIT APPLE, GENIE ETC. £78

C12 Cassettes 50p | DISKS £24.00 (Box of 10)

COMPUTER BOOKS FOR APPLE, VIC, GENIE/TRS80
WIDE RANGE OF TITLES TO COVER
ALL ASPECTS OF COMPUTING.

ADD VAT WHERE APPLICABLE

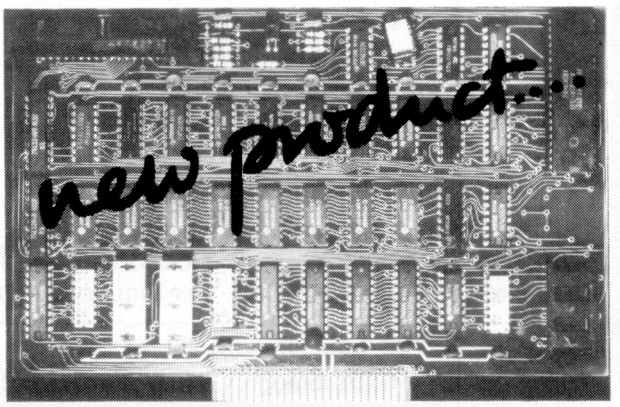
9am-5pm Tues-Sat **WARD ELECTRONICS** **Closed Mondays.**



First Floor
Soho House
362-364 Soho Road,
Handsworth,
Birmingham B21 9QL.
Tel: 021-554 0708

SIRIUS 80 CARD

CP/M 80 for the Sirius 1



- Allows all standard CP/M 80 2.2 software to run without modification.
- The card simply plugs into any one of the four internal expansion slots and comes complete with a disk containing all the usual CP/M utilities.
- By typing a single command, the system can alternate between CP/M 80 and CP/M 86. Files generated under either CP/M are identical in structure, providing file compatibility between operating systems.
- The card also has a Corvus hard disk interface allowing the CORVUS range of Winchester drives to plug directly into the SIRIUS.
- Z80 4 or 6 MHz with no wait states.
- 64K RAM
- Corvus hard disk interface.
- Multi-user with hard disk:-
- Up to 64 Sirii can share 1 hard disk

Sirius 80 card (4 MHz)..... £299.00
Sirius 80 card (6 MHz)..... £335.00



ACCESS VISA

All prices are ex VAT

small systems engineering limited

2-4 Canfield Place, London NW6 3BT. Telephone: 328 7145 Telex 264538

THE ZX 81 COMPANION

by Bob Maunder. ISBN 0 907211 01 1

If you have a Sinclair ZX81 and want to use it to its full potential then, as the experts have all agreed, this is the book for you. It contains detailed guidelines and documented programs in the areas of gaming, information retrieval and education, as well as a unique listing of the 8K ROM for machine code applications.

'Far and away the best . . . once again Linsac has produced the book for the serious end of the market'. — *Your Computer, November 1981.*

'The ZX81 Companion is a most professional product . . . with many good illustrative programs, tips and warnings'. — *Education Equipment, October 1981.*

'Bob Maunder's attempt to show meaningful uses of the machine is brilliantly successful . . . thoughtfully written, detailed and illustrated with meaningful programs . . . To conclude — the book is definitely an outstandingly useful second step for the ZX81 user'. — *Educational ZX80/81 Users' Group Newsletter, September 1981.*

Send cheque for ~~£7.95~~ to: Now only **£4.95** (P&P INCLUDED IN U.K.)

LINSAC (PCW) 68 Barker Road, Linthorpe, Middlesbrough, Co. Cleveland TS5 5ES

Two day courses in computer programming held September through to November at The Post House Hotel, Bayswater

Poste-haste to the Post House

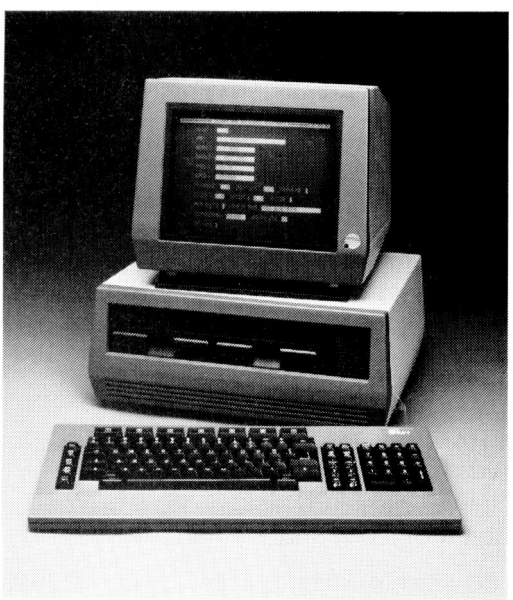
Introduction to BASIC
REF. NO. IB 31 – SEPT 27-28/NOV 22-23

Structures in Programming
REF. NO. SP 33 – OCT 28-29

The fee includes course manuals and lunch, upon receipt of fee a course timetable is issued. Registration is at 9.30 am.

Meares Training Limited
500 Gresham House, 150 Regent St., London W1R 5FA
Tel: 01-450 1380

£172.50 INC. VAT



THE *ACT Sirius 1* FROM LOGIC COMPUTER SYSTEMS

POWER	16 bit 8088 processor. 128-896K memory. 1.2-10M byte disk capacity CP/M-86 & MS-DOS operating systems
PASCAL	UCSD p-System ™ IV is available NOW. Also Basic, Fortran and Cobol
PACKAGES	Accounting, Word processing, Data base and Financial Planning
PRICE	From £2395 ex VAT

The only serious choice for business

LOGIC COMPUTER SYSTEMS
31 PALMER STREET, LONDON SW1H 0PR

(01) 222 1122/5492

The Company specializes in the application of Microcomputers for business. Services include systems development, installation, training and support. Please call for an appointment to discuss your requirements and to arrange a demonstration.

™ The Regents of the University of California

SOUND TRAINING

CP.SOUND TRAINING: 1 The Elms, Tillington, Hereford, England (0432 279404)

WE'VE GOT IT TAPED. . !Step-by-Step AUDIO TRAINING. . . Designed, tested and produced by training professionals.

Learn on YOUR OWN MICRO. . . in YOUR OWN OFFICE. . . and at YOUR OWN SPEED.

Two standard AUDIO CASSETTES, talk you through WORDSTAR. . . Backed up by a TRAINING MANUAL for quick reference and revision. . . A set of JOB AID CARDS and a set of CHECKLIST CARDS to prompt and guide you as you build your confidence. The COMPLETE SOUND TRAINING.

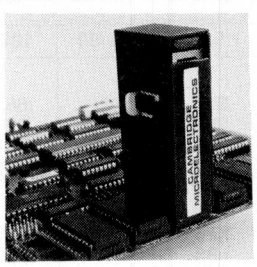
WORD PROCESSING WITH **WORDSTAR**©

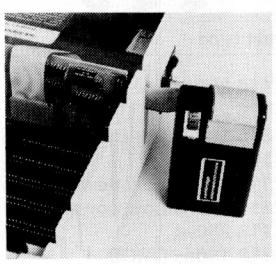
Our INTRODUCTOR PRICE £65 (plus £11.32 VAT and P&P) (Payment with order please)

Distributor enquiries welcomed.

© Wordstar. . a trademark of Micropro International Corp', San Rafael, California.

MEMIC T1618 L1424 — 2 kilobyte CMOS RAM with battery backup





T1618 1.42" x 2.92" x 0.8" L1424 2.4" x 4.0" x 1.02"

MEMIC is a family of CMOS memory units with integral batteries, making them directly pluggable into most EPROM/ROM and byte wide RAM sockets. Data can be written into MEMIC even when plugged into a ROM/EPROM socket by using the fly-lead R/W connector provided. Two versions cater for either restricted board space or restricted height situations. No hardware or software changes are required.

- 2K x 8 Organisation
- Towerblock model (T1618) for minimum board space
- Low-Profile model (L1424) for stacked daughter boards
- Replaces most popular 24 pin ROMs, EPROMs & byte-wide RAMs
- Fast, Static RAM. Better than 200nSec access time
- No special signals or software required to save memory
- TTL compatible Inputs & Outputs
- Lithium primary battery (L1424) or Rechargeable NiCd, battery back-up
- Low Operating Power Dissipation
- Very low power standby gives months of non-volatility
- Battery ON-OFF switch (L1424)
- Hi-K, Lo-K, 2K switch selectable
- Switchable CS for taking into Standby
- Low Cost, Low Power, Small Size
- Supplied with Clear User Instructions
- One year parts warranty

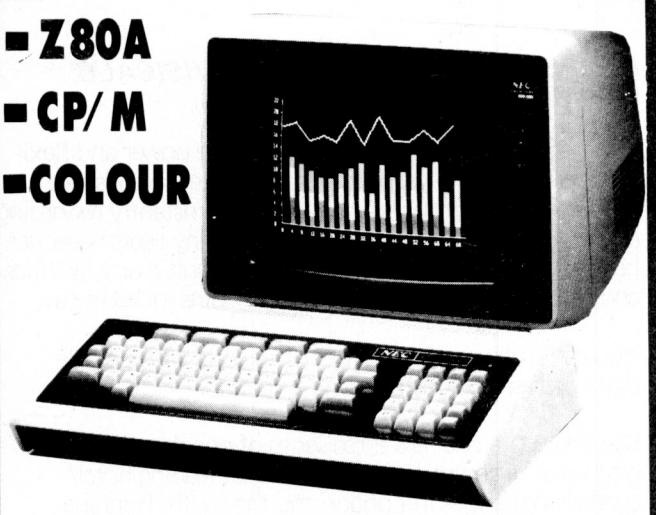
£29.95 incl.

CAMFI PRODUCTS

CAMBRIDGE MICROELECTRONICS LTD
One Milton road Cambridge CB4 1UY
(0223) 314 814

NEC PC-8000!

- Z80A
- CP/M
- COLOUR



"Superb value for money" - PCW June 1981

KEYBOARD UNIT: * Z80A processor (4 Mhz).

* 32k RAM + 24k ROM MICROSOFT EXTENDED DISK BASIC. Screen editor, resident monitor, 8k ROM slot.
* 83 key querty keyboard with N-KEY ROLLOVER for fast typists. Auto repeat on all keys.
* 8 colours or 8 monochrome intensities.
* VECTOR, PLOT, and SCREEN ARRAY graphics.
* 36 to 80 character screen width, 20 or 25 lines. SCROLLING AREA control, function key display.
* SINGLE or DOUBLE PRECISION variables (16 significant figures), INTEGER, HEX. Maths character set.
* TERMINAL OPTION with built-in RS232 INTERFACE
* 15 character string FUNCTION KEYS, numeric keypad.
* 8 bit parallel output for CENTRONICS printer.
* RS232 up to 4800 baud. 600 baud cassette I/O.

JAPANESE QUALITY AND RELIABILITY **£599** (+VAT)

EXTRAS: * Expansion to 64k, 96k, 128k, 192k RAM.

* CP/M 2.2 — the universal disk operating system. £64
* Dual 5 inch floppy disks, £550. HARD DISK £1995.
* Superb colour or green monochrome monitor screens.
* Expansion boxes for extra RAM, IEEE 488, multiple I/O, prototyping, sound, joysticks etc * Light pen.
* 100 cps bi-directional logic seeking matrix printer:-
* 120 cps, 15 inch carriage version £599
  14 styles inc. proportional & graphics (£399)
* 35 cps SPINWRITER, also by NEC. £1450
* 55 cps PARALLEL SPINWRITER £1575

Brighton Computer Centre

130 LEWES ROAD
BRIGHTON BN2 3LG
(0273) 688946
MON-SAT 10AM-6PM

MICROMARK

PROFESSIONAL TRAINING IN VISICALC DECISION SYSTEMS

Thousands have found for themselves the power and flexibility of Visicalc and other microcomputer spreadsheet programs. But self-tuition has a snag. So instantly rewarding and productive are these systems that many users never get beyond their first understanding. As a result many facilities and much of the power of Visicalc remains locked away.

You can make much more out of Visicalc with a single day's professional instruction.

Starting September are three series of one-day seminars, pitched at different awareness levels, at leading hotel/conference centres in London and the south. Running consecutively, these offer the choice of one, two or three days of intensive training according to your present ability.

We use individual Apple workstations for fast, exciting 'hands-on' instruction. But your usual machine may be Pet, Tandy, Sirius, Hewlett Packard or the new IBM Personal — the same principles apply.

Day 1: Learn Visicalc! Beginners start here.

Day 2: Advanced Visicalc. Discussion datagrams, /PF files and advanced logic functions with leading Visicalc author and lecturer Nick Levy.

Day 3 Beyond Visicalc. Plotting graphics, trend analysis, database, computer communications.

WHO SHOULD ATTEND

*Company directors and senior managers who specify the facts & figures they need. *Managers and executive who present the figures. *Small businessmen, professionals, accountants, sales, production, personnel, training, advertising & market research executives, planners and financial managers.

IN-HOUSE

Ask also for details (with references) of company in-house training programmes.

See us at PCW Show

APPLY NOW FOR COURSE PROSPECTUS

Complete and return to Micromark Training Division, Ravenscroft Road, Henley on Thames, Oxon RG9 2DH. Telephone 049-12 777926 or 77085.

Name_____

Firm _____

Address_____

_____

Telephone_____

256K RAM CARD

FOR NASBUS / GEMINI 80 SYSTEMS

NEW (MAP 80 SYSTEMS)

8x8 CARD WITH MEMORY ARRANGED IN FOUR 64K BLOCKS.

VERSATILE PAGE MODE OPTIONS OR MORE EXTENSIVE MEMORY MAPPING FACILITIES

GUARANTEED OPERATION AT 4MHZ WITHOUT WAIT STATES.

SOFTWARE SUPPORT AVAILABLE FOR CP/M VIRTUAL DISK.

MEMORY PROVIDED IN FOUR SIZES WITH UP TO 256K BYTES ON EACH CARD.

THE PRICE FOR THE MINIMUM CONFIGURATION CARD OF 64K IS £150 + carr. + vat. INCLUDING ALL NECESSARY DECODING FOR FURTHER EXPANSION.

MAP 80 SYSTEMS
333, Garratt Lane, London SW18
Tel: 01 - 874 2691

Happy Memories

Part type	1 Off	25-99	100 up
4116 200ns	.83	.72	.66
4116 250ns	.75	.65	.60
4816 100ns For BBC comp	2.95	2.70	2.50
4164 200ns	6.15	5.25	4.65
2114 200ns Low power	1.15	1.00	.90
2114 450ns Low power	.95	.85	.80
4118 250ns	3.25	2.85	2.65
6116 150ns CMOS	3.95	3.45	3.25
2708 450ns	2.60	2.25	2.10
2716 450ns 5 volt	2.60	2.25	2.10
2716 450ns three rail	5.75	5.00	4.65
2732 450ns Intel type	3.95	3.45	3.25
2532 450ns Texas type	3.95	3.45	3.25

Z80A-CPU £4.35 **Z80A-P10 £3.25** **Z80A-CTC £3.25**
6522 PIA £3.98 **7805 res £ .50** **7812 res £ .50**

Low profile IC sockets:

Pins	8	14	16	18	20	22	24	28	40
Pence	9	10	11	14	15	18	19	25	33

Soft-sectored floppy discs per 10 in plastic library case:

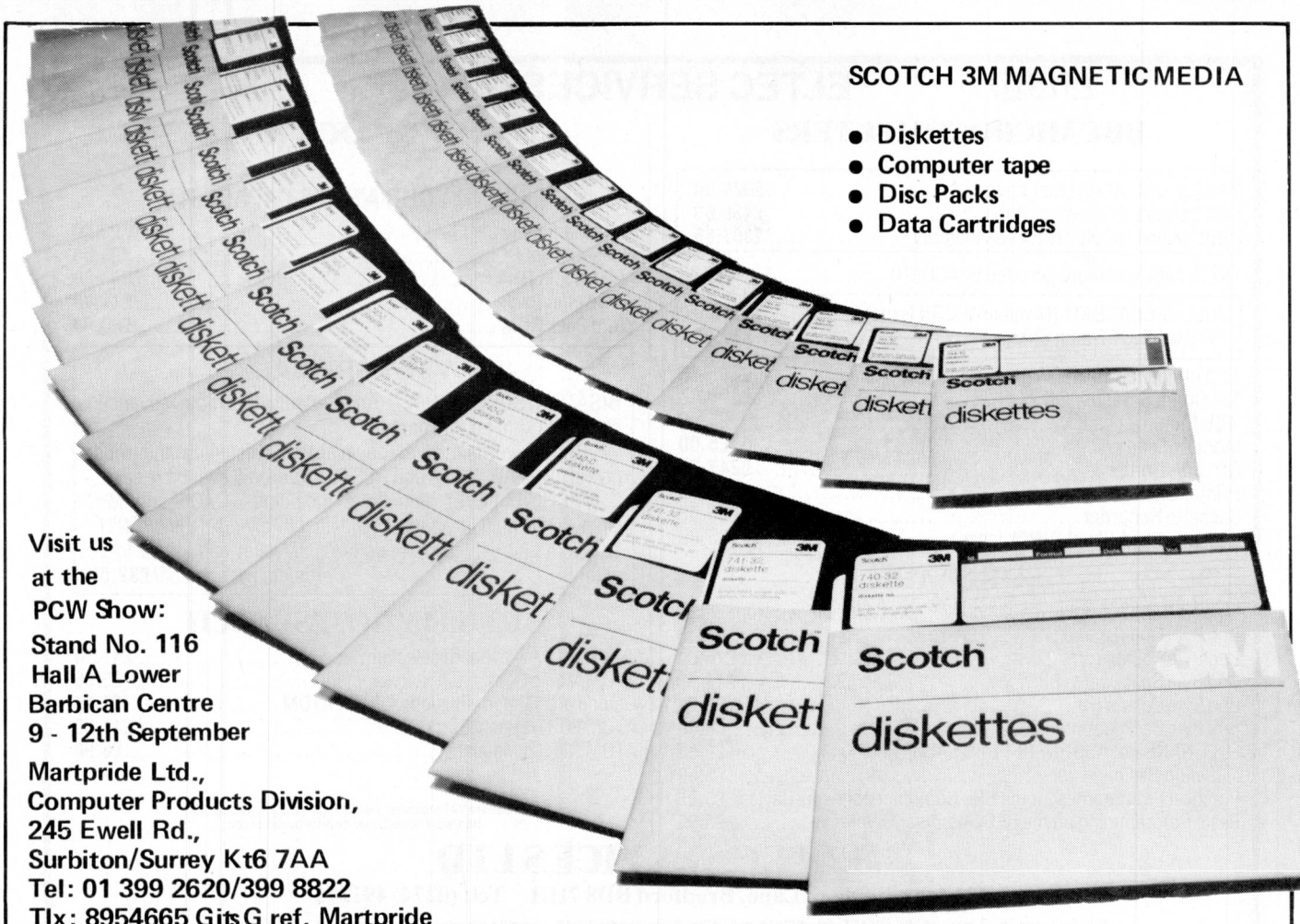
5 inch SSSD £17.00 **5 inch DSDD £21.00**
8 inch SSSD £19.25 **8 inch SSDD £23.65**
5 inch SSDD £19.25 **8 inch DSDD £25.50**

74LS series TTL, large stocks at low prices with DIY discounts starting at a mix of just 25 pieces. Write or 'phone for list.

Please add 30p post & packing to orders under £15 and VAT @ 15%.
Access & Barclaycard welcome. 24hr service on (054 422) 618.
Government & Educational orders welcome, £15 minimum. Trade accounts operated, phone or write for details.
Prices are still tending to drop, 'phone for a quote before you buy.

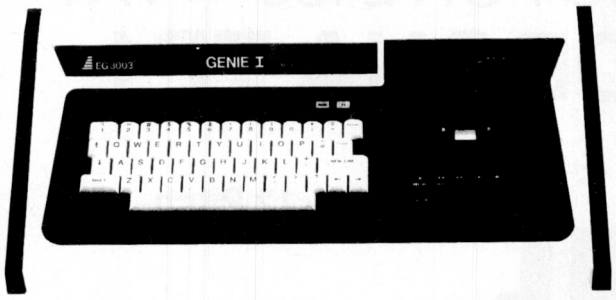


Happy Memories (PCW),
Gladestry, Kington, Herefordshire,
HR5 3NY
Tel: (054 422) 618 or 628

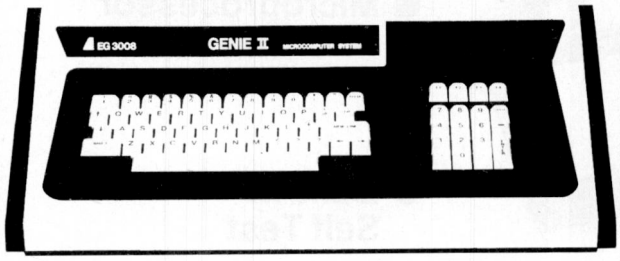


Visit us
at the
PCW Show:
Stand No. 116
Hall A Lower
Barbican Centre
9 - 12th September

Martpride Ltd.,
Computer Products Division,
245 Ewell Rd.,
Surbiton/Surrey Kt6 7AA
Tel: 01 399 2620/399 8822
Tlx: 8954665 Gits G ref. Martpride
Diskettes. . . Computer Tapes. . . Disc Packs. . . Storage Boxes. . . Datasafes. . . Binders. . .



Genie I and II



GENIE 1	16K	£279.00 + VAT
GENIE 11	16K	£299.00 + VAT
COLOUR GENIE	16K	£173.00 + VAT
	32K	£214.00 + VAT

3 MONTH WARRANTY
For further information ring (084 421) 5369

Offices and Registered Office:
12 Jefferson Way
Thame Industrial Estate
Thame, Oxfordshire
OX9 3UP

Companies Registry, England No. 1287367

pebbleglow limited

(084 421) 5368

24 hr service on 5369

Floppy Disk Interface for ZX81

NOW AVAILABLE – 21 DAYS DELIVERY

The disk interface system uses Hard Sectored (10) DISKETS, Supports random access data files and is compatible with the ZX printer and 16L R.A.M pack.

The floppy interface is powered from the ZX81 and can load a 12K programme from disk in 15 seconds.

Disk interface card (with cable and connections for attachment to drive)	£79.95
Mother Board (if required)	£15.95
Cased 5¼ inch (40 track disk drive with power supply)	£159.00
	All plus VAT

supplied with user manual
-- All items Post and Packaging free:—

If you intend to use your own drive (Shugarth SA 400 or compatible unit) please state 35 or 40 track requirements when ordering.

Remittance with order, cheques, Access or Visa.

Macronics Sytems

26 SPIERS CLOSE
KNOWLE
SOLIHULL
WEST MIDLANDS
B939 ES
Tel: 05645 - 3693

Stand 241 PCW Show

BBC

ELTEC SERVICES LTD

ACORN COMPUTER

BBC MICROCOMPUTERS

BBC Model "A" (in stock now)	£326.00
BBC Model "B" (in stock now)	£435.00
BBC Model "A" plus extra 16K memory	£367.86
16K HITACHI memory (as fitted by ACORN)	£41.86
FULL UPGRADE KIT (Genuine ACORN issue)	£100.00
UPGRADE KIT Fitting Charge	£10.00
14" Full colour MONITOR (Used in BBC Computer programmes)	£309.35
12" Green Screen MONITOR	£126.00
RGB Monitor Lead	£5.00
Monitor Lead	£5.00
GP100A Printer	£247.25
Printer Cable	£18.00
Cassette Recorder	£26.00
Cassette Lead (7 pin DIN/3 Jacks)	£5.00

SOFTWARE

Sinclair (IJK) Software Cassettes 1-7	from £3.95
Bug Byte Golf (B)	£7.00
Bug Byte Multifile	£25.00
Bug Byte Spacewarp (B)	£11.50
Bug Byte Polaris (B)	£8.00
Bug Byte Backgammon	£8.00
FULL RANGE of ACORNSOFT BBC CASSETTES	all £9.95
NEC 30hr Basic	£5.50
Practical Programmes for the BBC Computer Johnson-Davies	£5.95
Basic Programming on the BBC Computer Cryer	£5.95

ATOM MICROCOMPUTER

EXPAND YOUR ATOMS CAPABILITY

Extra Memory (2114L)	per K £2.50
Floating point ROM	£23.00
ACORN 96K Disk Pack	£343.00
Disk Buffer Pack	£11.75
Word Pack ROM	£30.00

VERY SPECIAL

DISATOM SUPER ROM – undoubtedly the most advanced chip of its kind on the market!
27 BASIC words are made available, including the most powerful READ, DATA and RESTORE you will ever have seen.
5 MACHINE LEVEL Functions including TRACE and M/C DEVELOP which make the ATOM absolutely TRANSPARENT!
This is a chip which no serious ATOM user can afford to be without. *Complete with manual* £32.50

UTILITY ROM SWITCH

Up to 4 ROMs keyboard selection	£41.79
ATOM Magic Book	£5.50
Getting acquainted with your ACORN ATOM	£7.95
ATOM FORTH Cassette	£11.50
ATOM FORTH Manual	£6.00

Prices are VAT inclusive. P&P 50p Books, cassettes, chips.
Hardware items £3.00 delivery by Securicor

ELTEC SERVICES LTD

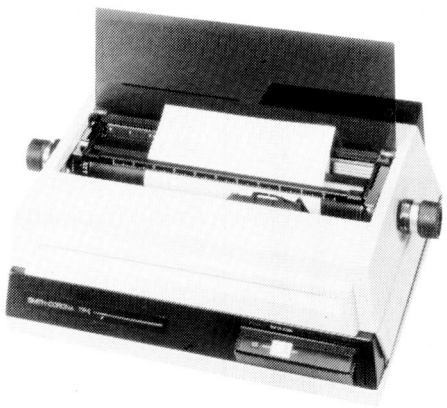
231 Manningham Lane, Bradford BD8 7HH Tel: (0274) 491372

P.S. Come and see us in the ACORN ARCADE at the PCW show Barbican Centre London Sept 9-12; we'll have lots of exciting offers and products.

DAISYWHEEL PRINTING FOR £485 + VAT

THE SMITH CORONA TP1

- Serial Parallel IEEE
- Dedicated Computer Printer
- Lowest Cost Purpose Built Daisywheel



- 10 & 12 Pitch
- Microprocessor Controller
- Built-in Self Test

Computer Peripheral Supplies
2/10 Whitchurch Road
Pangbourne
Berkshire
Tel: 07357 2721 / 4378

CPS

Further information please

Name .....

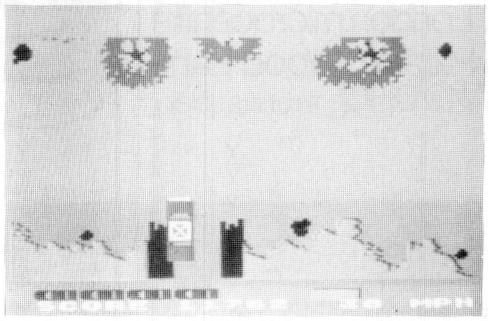
Address .....

.....

.....

Tel. No. .....

more for ** ATARI



"HAZARD RUN"

If you've wanted to join those good old country boys and drive the General Lee through Hazard County. . .

NOWS YOUR CHANCE

In HAZARD RUN, you must make the treacherous run through Crooked Canyon, past Bryan's Pond to the jump at Hazard Creek and safety.

For 24K Atari 400 & 800. Needs a joystick. On cassette.

Also still available BETA FIGHTER. A1 or 2 player game set on a realistic 3D Martian Landscape. For 16K Atari 400/800.

Joysticks required. On cassette at £15.50 (inc VAT).

Available from:

ALLRIAN DATA SERVICES
1000a, Uxbridge Road,
Hayes, Middx.
UB4 0RL.

£21.50 (INC VAT)
P&P Free

AN Artworx PRODUCT

MICROCOMPUTER INSURANCE

All Risks Cover (incl. Transit)
– up to £10,000 for £20

Increased Cost of Working – to reinstate lost data

Breakdown & Derangement – alternative to maintenance agreement

Special schemes arranged for manufacturers

Comprehensive cover at a reasonable premium:–

SEE US ON STAND 128 PCW SHOW

Write with details of equipment to:

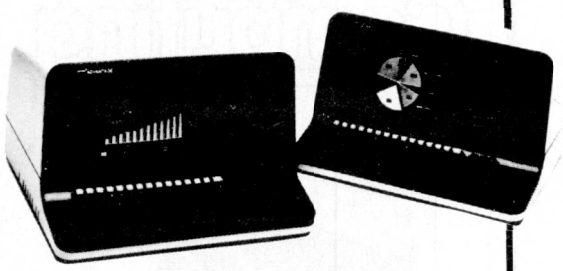
Geoffrey Hoodless & Associates
Freepost (no stamp required)
Woking, Surrey GU21 3BR

Tel: Woking (04862) 61082 Answering Service.

Trader Computers Ltd 65 Loudoun Road London NW8 0DQ

16-bit NorthStar Advantage

Trader Computers Limited brings you the new North Star ADVANTAGE 8/16 – an integrated graphics desk-top computer that can run 8-bit CP/M and DOS software and 16-bit MS/DOS software. With a 12" green bit-mapped graphics and/or character display 64Kb RAM expandable to 256Kb, 20Kb video RAM & 2Kb boot PROM, 5Mhz Intel 8088 & 4Mhz Z80-A, two quad-capacity floppy disc drives, Selectric© style 87-key keyboard with 15 function keys. Complete with business graphics, diagnostic and demonstration software, this ADVANTAGE retails at only £2590.00 plus VAT. The North Star ADVANTAGE 8/16 is also available with a %Mb mini-Winchester hard disc at £3490.00 plus VAT.





Trader Computers Limited brings you HMSOS – the sophisticated all-British MULTI-USER operating system for Z80-based micro computers. HMSOS features include:
Self-configuration for number of users o File locking in BASIC
Tape back-up utilities for Winchester drives o Pseudo-keyboards for background tasks
Interrupt-driven printer spooler o Disc handling out-performs CP/M
HMSOS costs only £150.00

The North Star Horizon: A high-speed 4 Mhz Z80-A CPU, 64kb High-Speed Dynamic RAM, optional PROM, S-100 Bus, Two Serial Ports, one Parallel port, and two integrated 360kb 5¼inch quad-capacity Floppy Disc Drives. With 30,000 in use throughout the world you know it's a proven system

Horizon 64k 2 quad £1995.00
Horizon 64k 1 quad + 5Mb Shugart £2995.00
Horizon 64k 1 quad 12 Mb Rodime £3895.00

DEALERS! TELEPHONE US NOW FOR UNBEATABLE TRADE PRICES.

Trader Computers Ltd 65 Loudoun Road London NW8 0DQ
Telephone 01-328 3484

village computer services

We stock Software for the following machines – **IBM PC, APPLE, SIRIUS and ATARI**

The West London microcentre
6 Pavilion Parade Wood Lane
London W12 0HQ Tel 01 743 9000

NAME	IBM	APPLE	SIRIUS	ATARI
BUSINESS				
Wordstar	Y	Y	Y	
Mail Merge	Y	Y	Y	
Visicalc	Y	Y		Y
Desktop Plan	Y	Y		
Visidek	Y	Y		
Visifile	Y	Y		
Zardax		Y		
AppleWriter II		Y		
Videx 80 Column Card		Y		
Videx/Visicalc 80 Column Disk		Y		
Z80 Card	Y	Y		
Systematics International Ledger Systems	Y	Y	Y	
Vlasak Orbit Ledger Systems	Y			
Ram expansion Cards	Y	Y		
GAMES				
Zork	Y	Y		Y
Zork II	Y	Y		Y
Pool 1.5		Y		Y
Temple of Apshai	Y	Y		Y
Raster Blaster		Y		Y
Bug Attack		Y		Y
Curse of Ra	Y	Y		Y
Crush Crumble & Chomp		Y		Y
Ultima 1	Y			Y
Ultima 2	Y			Y
Threshfold	Y			
Choplifter	Y			
Locksmith 4.1	Y			
Air Flight Simulator	Y			
Softporn Adventure	Y			Y
Tigers in the Snow	Y			Y
Wizardry 1 & 2	Y			
Apple Panic	Y			Y
Sargon II	Y			

MONITORS

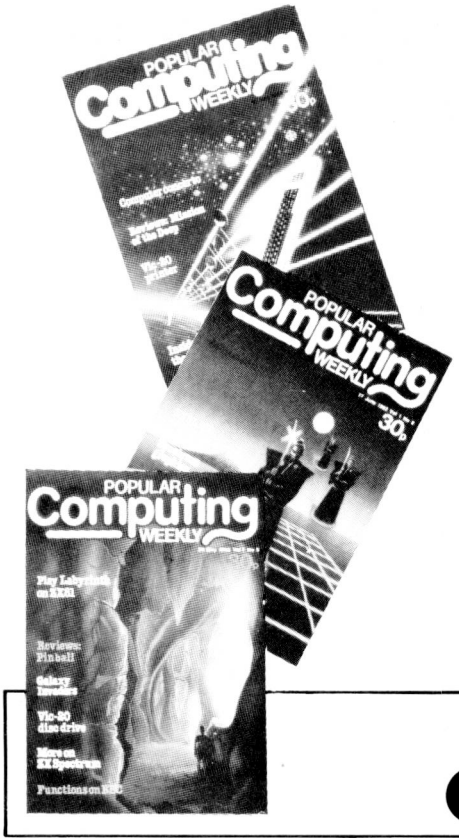
Phillips 12" Amber Monitor £130.00
BMC 12" Green Monitor £120.00
Zenith 12" Green Monitor £105.00

PRINTERS

IDS Prism 80 . . . . . £650.00
IDS Prism 132 . . . . . £840.00
Epson MX80 III F/T £375.00
Epson MX100 III £475.00
OKI . . . . . P.O.A.
Olivetti ET121 . . . . . £730 00
Centronics . . . . . P.O.A.
Plus Interface Cards and Buffer Cards

This is just a sample of what we have in stock – please ring or write for price list and further details.
We are Consultants for small businesses.
Postage and packing FREE – please add 15% VAT to your order. We stock the full range of Apple related books.

POPULAR Computing WEEKLY



WHIZZ-KID '82

Could it be you? You need to be a software writer who wants to escape the treadmill of merely submitting programs to magazines in the hope they get published.

We're looking for the amateur who can turn professional. . . someone who can create ideas which sell!

If you think your work is worth a lot, then enter our prestige award scheme.

The winner gets

- ☐ £2000 worth of free advertising space in Popular Computing Weekly
- ☐ Free advice on how to market and sell the software
- ☐ A new Dragon 32 home computer

For full details buy any of the issues of *Popular Computing Weekly* published during September.

***Popular Computing Weekly* – place a regular order at your local newsagent.**

Portable Computers + Free Software

SHARP COLOUR GENIUS



ONE OF THE MOST POWERFUL POCKET COMPUTERS ON EARTH

PC-1500 Up to 11.5K user memory (3.5K internal + add-on 4K CE-151 or 8K CE-155) maintained during power-off and battery change.
16K Extended BASIC language (PLUS CE-150 8K Graphics BASIC).
CE-150 FOUR colour high resolution (500 x 200) printer/plotter with 9 type sizes and 4 print directions.
Two cassette control, for bulk data & program storage, with remote control. Full range of science and math functions (statistics with **MiCROL** software).
Up to **thirty-six separate** programs immediately accessible.
Twenty-six character LCD display doubles as 1092 point mini-graphic display with BASIC program control).
Tone generator with BASIC repetition, frequency and duration control.
Built-in alarm clock and calender functions, usable in BASIC program.
One and two dimensional arrays (numeric and text).
Full range of text manipulation (LEFT, RIGHT, LEN, VAL, MID, CHR, etc). Qwerty typewriter-style keyboard with separate numeric keypad.
'Advanced' programming capabilities with PEEK, POKE, CALL etc.
350+ page User Manuals
Sixty-way system expansion socket for optional add-ons (see below).
Three-way power option (with CE-150) — standard HP7 batteries for PC-1500, or EA-150 mains adaptor. CE-150 contains rechargeable batteries and is supplied with EA-150 adaptor.

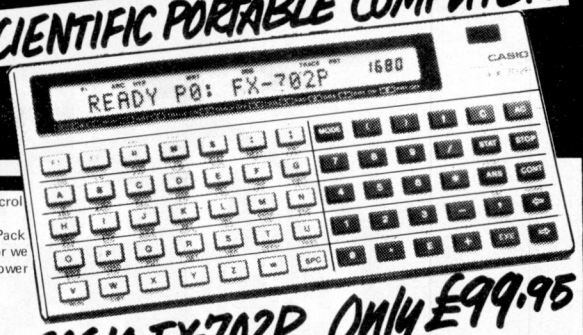
Optional add-ons include: CE-150 printer/plotter/cassette adaptor, CE-151 4K memory module, CE-155 8K memory module, CE-153 140-key custom keyboard (summer 82), RS232C communications interface (Autumn 82), CE-152 custom cassette recorder (Autumn 82), custom system briefcase (Autumn 82)
Dimensions
PC-1500: 195W x 25.55H x 86Dmm (7.11/16 x 1 x 3 3/8¾") Wt 375g (0.83lb).
CE-150: 330W x 50H x 115Dmm (13 x 2 x 4½"). Wt 900g (1.98lb).

COLOUR BROCHURE ON REQUEST

PRICES, Including VAT:
PC-1500 COMPUTER £169.95 plus FREE £20 software voucher
CE-150 PRINTER £149.95 plus FREE £20 software voucher
CE-151 4K RAM MODULE £49.95 plus FREE £10 software voucher
CE-155 RAM MODULE £79.95 plus FREE £10 software voucher
Vouchers on request with order.
CSR-150. 20 x paper rolls £5.84
EA-850B. Set of balck pens £3.09
EA-850C. Set of colour pens £3.09

IF YOU SEE A BETTER OFFER, WE WILL BEAT IT

THE SCIENTIFIC PORTABLE COMPUTER



Plus **FREE** Microl Professional Programming Pack (RRP £9.95) or we will beat any lower price by 5%

CASIO FX-702P Only £99.95

The widest range of math, science and statistics (55 in all, including Regression and Correlation). BASIC programming. Up to 1,680 program memory steps, up to 226 data memories. Subroutines; 10 levels. FOR/NEXT looping; 8 levels. Edit, debug and trace modes. 240 hours lithium battery life. Dimensions: 17 x 165 x 82mm. Weight 176kg.

MICROL 702 PROCOS
Professional computing colutions on tape. Save up to 90% of programming time with this electronic equivalent of pen and paper. 'Visicalc-type' system answers 'what if. . .' questions and analyses trends **£24.95.**

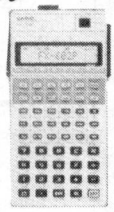
Peripherals for the FX-702P, 602P, 601P and 502/501P
FA-2 Remote controls cassette interface **£19.95**
FP-10 Permanent hard copy printer, mains or battery powered **£44.95**

702 PACKAGE DEALS
PACK A: FX-702P + MICROL PPP **£99.95**
PACK B: FX-702P + FA-2 + MICROL PPP + MICROL PROCOS **£129.90**
PACK C: FX-702P + FP-10 + FA-2 + MICROL PPP + MICROL PROCOS **£164.85**

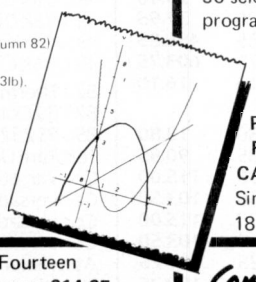
The World's fastest Programmable?

With **FREE** MICROL Professional Pack (RRP £9.95)
Or we will beat any lower price by 5%
50 scientific functions. Up to 512 program steps, up to 88 memories, all protected when switched off. 10 programs, P0 to P9. GOTO, up to 10 pairs. Up to 9 subroutines, nestable up to 9 levels. 33 parentheses at 11 levels.

Only £74.95



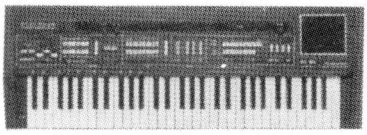
Peripherals **FA-2** Interface **£19.95**
FP-10 Printer **£44.95**
CASIO FX-601P **Now only £39.95**
Similar to the FX-602P but with 128 program steps; 11 memories; 18 (), up to 6 levels; up to 9 subroutines, nestable up to 4 levels.



PC-1500 Professional Software on tape

SHARP CE-15A Fourteen Applications Programs **£14.95.**
MiCROL 1500 PROCOS
Procos enables you to create powerful, reliable programs to solve all kinds of number-based problems, in just minutes, even if you have never programmed a computer before. Handling up to 256 items of data simultaneously, 'Visicalc-type' features help you examine the effects of changes in data, analyse trends and answer 'what if. . .' questions **£34.95**
MICROL 1500 I.M.S. (Information Management System)
Professional management of data, coupled with the simplicity of one-touch commands, to store, inspect, update, select and print information to your exact requirements **£34.95**
MICROL STATIX Brings the advantages of statistics to the1500.Automatic calculation of mean, standard deviation and linear regression. **£9.95**
BC SOFTWARE 1500 PROPAK 1 A set of easy-to-use routines for programs development, with:- RENUMBER, REORGANISE, DELETE, ANALYSE and INVERT SCREEN **£9.95** **BROCHURE ON REQUEST**

Computerised Programmable Keyboard/Organ Casiotone CT-701



Only £495

Program the 345 melody steps and the 201 chord steps (max) with music specially scored in bar code and read by a light pen, or enter your own chords and melody via the keyboard, with full editing and repeat facilities. **3-way replay:** Automatic; One Key Play; Melody Guide (lights above the keyboard indicate the next note to play). Split keyboard; 20 superb rythm accompaniments; fingered or auto chords with walking bass and arpeggio; fill in and effect buttons. 37¾ x 13-7/16 x 5". Weight 12.5kg (27.6lb).
CT-601. As 701 but without programming functions £395

All Casiotones available. Details on request



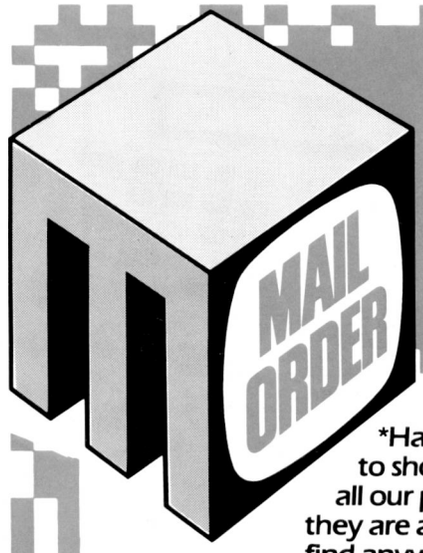
TEMPUS MiCROL

THE THOUGHT PROCESSOR

Prices include VAT, P&P. Send cheques, P/O, or phone your credit card number. Delivery by return.

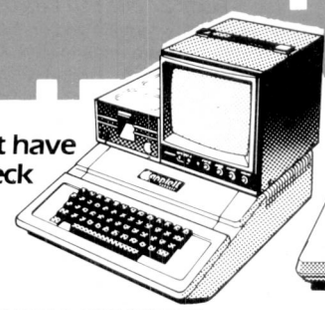
Please send me details . . . . . .
Please send me (list products required) . . . . . .
. . . . . .
Name . . . . . .
Address . . . . . .
. . . . . .
. . . . . .

Dept. PCW, 38 Burleigh Street, Cambridge CB1 1DG
Telephone (0223) 312866



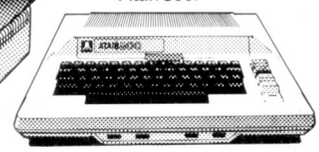
Apple, Atari and NEC at hard-checked prices*

*Hardware or software, you don't have to shop around. We continually check all our prices and we're certain they are as competitive as you will find anywhere.



Apple VDU Disk Drives and Processor

Atari 800.



PACKAGE SYSTEMS	NET	VAT	TOTAL
Apple Executive System	1899.00	284.85	2183.85
Apple Top Secretary System	2099.00	314.85	2413.85
Apple Education System	1399.00	209.85	1608.85
APPLE HARDWARE			
Apple II 48K	599.00	89.85	688.85
16K Add on	45.00	6.75	51.75
Disk Drive with Controller (16 sec)	345.00	51.75	396.75
Disk Drive without Controller	275.99	41.25	316.25
ACCESSORIES			
Programmers Aid 1	25.00	3.90	**29.90**
Auto Start ROM Pack	33.00	4.95	**37.95**
Graphics Tablet	399.00	59.85	**458.85**
Appletel System	525.00	78.75	**603.75**
TV Modulator	14.00	2.10	**16.10**
INTERFACE CARDS			
Prototype/Hobby Card	12.00	1.80	**13.80**
Parallel Printer Card	79.00	11.85	**90.85**
Communications Card	100.00	15.00	**115.00**
High Speed Serial Card	90.00	13.50	**103.50**
Centronics Card	100.00	15.00	**115.00**
Integer Card	90.00	13.50	**103.50**
Language Card	95.00	14.25	**109.25**
Controller Card	95.00	14.25	**109.25**
Eurocolour Card	65.00	9.75	**74.75**
1EEE – 48 Card	200.00	30.00	**230.00**
16K RAM Card (48K to 64K)	60.00	9.00	**69.00**
SOFTWARE			
Disk Utility Pack	12.00	1.80	**13.80**
Apple Post Program	27.00	4.05	**31.05**
The Shell Games	15.00	2.25	**17.25**
Elementary My Dear Apple	16.00	2.40	**18.40**
Apple Bowl Diskette	13.00	1.95	**14.95**
3.3 Operating System	34.00	5.10	**39.10**
DOS 3.3 Tool Kit	41.00	6.15	**47.15**
Apple Writer 1.1	34.00	5.10	**39.10**
Stellar Invader	13.00	1.95	**14.95**
Apple Plot	34.00	5.10	**39.10**
Apple Adventure	19.00	2.85	**21.85**
APPLE DISTRIBUTED SOFTWARE			
The Go Between (Centronics)	26.50	3.98	30.48
Micro Modeller	375.00	56.25	431.25
Visicalc 3.3	100.00	15.00	115.00
VisiFile	135.00	20.25	155.25
VisiPilot	90.00	13.50	103.50
VisiTrend/VisiPilot	130.00	19.50	149.50
VisiTerm	78.00	11.70	89.70
VisiDex	100.00	15.00	115.00
Desktop Plan II	100.00	15.00	115.00
LANGUAGES			
Pascal Language System	225.00	33.75	**258.75**
Apple Pilot	75.00	11.25	**86.25**
Apple Fortran	95.00	14.25	**109.25**
CIS Cobol with Forms -2	410.00	61.50	**471.50**

PRINTER & ACCESSORIES	NET	VAT	TOTAL
Silentype Printer	170.00	25.50	**195.50**
10 Rolls Thermal Paper	28.00	4.20	**32.20**
VIDEO MONITORS			
BMC 12" Green Screen	120.00	18.00	**138.00**
9" Black & White Monitor	100.00	15.00	**115.00**
Cables	5.00	0.75	**5.75**
OTHER ITEMS	**NET**	**VAT**	**TOTAL**
Z80 Softcard	170.00	25.50	**195.50**
ATARI			
400 16K Computer	173.87	26.08	**199.95**
400 16K Computer (with BASIC)	217.30	32.60	**249.90**
800 16K Computer	391.26	58.69	**449.95**
800 16K Computer (with BASIC)	434.70	65.20	**499.90**
822 Thermal Printer	195.00	29.25	**224.25**
825 80 Column Printer	375.00	56.25	**431.25**
850 RS 232 Interface	110.00	16.50	**126.50**
16K Ram Upgrade	52.13	7.82	**59.95**
Conversational French	28.26	4.24	**32.50**
Conversational German	28.26	4.24	**32.50**
Conversational Spanish	28.26	4.24	**32.50**
Conversational Italian	28.26	4.24	**32.50**
Assembler Editor Rom	30.39	4.56	**34.95**
Visicalc	105.00	15.75	**120.75**
Word Processor	78.22	11.73	**89.95**
Video Computer System	**69.56**	**10.43**	**79.99**
NEW — N.E.C. PC 8000 SERIES			
PC 8001 Keyboard	500.00	75.00	**575.00**
PC 8011 Expansion Unit	407.83	61.17	**469.00**
PC 8012 1/0 Unit	346.96	52.04	**399.00**
PC 8023 Dot Matrix Printer	326.08	48.91	**375.00**
PC 8031 Floppy Disc Drive	543.48	81.52	**625.00**
PC 8041 12" Green or Amber Monitor	129.57	19.43	**149.00**
PC 8043 12" High Resolution CRT Colour Monitor	477.39	71.61	**549.00**

HARDWARE GUARANTEE

All advertised products are guaranteed one year from date of purchase against defects in materials and workmanship.

During the guarantee period, Metrotech will repair or replace, at no extra charge, components that prove defective – providing that the product is returned, shipping or postage prepaid, stating when bought and enclosing proof of purchase.

This guarantee does not apply if, in the opinion of the Company, the product has been damaged by accident, misuse or misapplication.

CONDITIONS OF BUSINESS.

We accept cheques or Access, Barclaycard, American Express and Diners Club Cards. All prices, specifications and terms are subject to change without notice at the discretion of the management. All offers subject to availability.

Prices correct at time of going to press. E. & O.E.

Hardware Post and packaging subject to confirmation.



New CP/M software at hard to beat prices



DIGITAL RESEARCH

C BASIC II
Commercial Disk Extended Basic **£75/£30**

NEW CB 80. Ultra fast Basic compiler. All the features of C Basic plus the speed and versatility of a compiler. 32K Byte strings, external multiple line functions, run time error trapping and extended file handling capabilities. **£275/£30**

NEW PL/1-80. A standard structured commercial applications programming language. Saves design time. Minimises debugging and maintenance problems. Designs high quality output with picture specifications. Includes the compiler, run-time library, lineage editor and relocating macro-assembler. **£275/£30**

MICROPRO INC.

WORDSTAR 3XX. New features: column move capabilities, horizontal scrolling up to 240 columns and even clearer menus. **£195/£30**

MAILMERGE 3XX (optional) **£55/£10**

DATASTAR Powerful data entry, retrieval and up-date system. **£150/£30**

SUPERSORT 1. Combines high performance and operational flexibility to perform sorting, merging and record selection functions. **£105/£20**

WORDMASTER Superior text editor. **£105/£20**

NEW CALCSTAR. This sophisticated but easy to use calculating and planning tool is Micropro's new spread sheet and financial modelling program. **£120/£30**

COMPSOFT

NEW COMPSOFT DMS. Ideal for office records. Personnel, stock, client's and account's records are more easily stored and updated. Features include: Comprehensive calculation ● Full sorting facilities ● Record selection on updates and reports ● Wordstar interface for selective mailing. **£345/£25**

MICROSOFT INC.

BASIC 80 Interpreter **£155/£25**
BASIC 80 Compiler **£195/£25**
FORTRAN 80 **£215/£25**
COBOL 80 **£315/£25**

MICROPLAN

NEW MICROPLAN. A program designed to cope easily with advanced financial analysis, Microplan helps you to perform all the calculations you presently solve with pen, paper and calculator. Microplan will perform most types of calculations working on rows and columns. **£245/£20**

SUPERCALC

NEW SUPERCALC. Accountants, Planners, Engineers, and Business owners have found Supercalc invaluable for day to day "what if?" and "what now?" questions. Answers for the time when the unexpected occurs. Simple to use advanced financial planning. **£190**

BCPL

NEW BCPL. BCPL CINTCODE is a full and extended implementation of the popular systems' programming language. BCPL CINTCODE gives a dramatic reduction in programme storage space, requiring about one third of a fully compiled Z80 code. **£250/£35**

DATA MANAGEMENT

SELECTOR III—C2. An easy to use information management system, requires C Basic II. **£185/£30**

SELECTOR IV. An advanced information management system requires C Basic II. **£275/£35**

S. BASIC VERSION 5.4. A high level language that combines the flexibility of Basic with the power of advanced structured techniques. A compiling language that is hard to match. **£175/£30**

METROTECH

MET/TWAM. An index sequential file access in C Basic II designed to increase the flexibility of C Basic. **£55/£20**

CAXTON SOFTWARE

NEW OPTIMISER. A linear programming system for finding the best practical solution to resource allocation and planning problems. Easy to learn. Easy to use. Immediately available. Please ring for more details. **£295**

NEW CARDBOX. Described simply, Cardbox is an electronic card index system. Choose your own format for cards, and categorise the information to your own specification. Cardbox provides an immensely powerful method of handling large amounts of information. **£155**

COMMUNICATIONS

BISYNC-80/3780 and BISYNC-80/3270 are full function IBM 2780, 3780 and 3270 emulators for micro computers. BISYNC-80/3780 gives you a Remote Job Entry terminal for the price of a micro! BISYNC-80/3270 combines the local processing power of a micro with a sophisticated screen capability. Make your dumb terminal smart! MET/TTY will connect your micro to a Timesharing service in simple teletype emulation.

BISYNC-80/3780 **£445/£20**
BISYNC-80/3270 **£445/£20**
MET/TTY **£145/£20**

FINANCIAL REPORTING

REPORT WRITER You input the values. Report Writer will perform your calculations and produce a report with your headings, totals and summaries. **£70/£10**

GLECTOR General Ledger option in Selector III, requires Selector III and C BASIC II. **£125/£30**

NEWLY RELEASED SOFTWARE

INFO STAR from MICROPRO **TBA**

POINTS TO REMEMBER

● All software is Ex-Stock and available on standard 8" disks or 5" disks for Vector MZ, Superbrain, Dynabyte and NEC PC 8000.
● Prices shown as Software with manual/manual only.
● tml WORD-STAR is a trademark of Micropro.

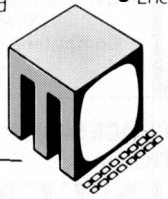
HOW TO ORDER

● State disk type and size ● Add 15% VAT
● Include £2 per Software item for Postage and Packing
● Enclose cheque/PO's payable to METROTECH

Mail to METROTECH MAIL ORDER, WATERLOO ROAD, UXBRIDGE, MIDDLESEX UB8 2YW

CREDIT CARDS - Telephone orders welcome: Tel: UXBRIDGE (0895) 57048/9

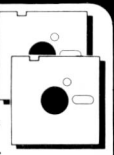
TRADE ENQUIRIES WELCOMED



METROTECH

A MEMBER OF THE GRAND METROPOLITAN GROUP

DISKS & TAPES



5¼" SSSD BASF **£17.95** + VAT
5¼" SSDD BASF **£21.45** + VAT
5¼" DSDD BASF **£25.95** + VAT
5¼" Cleaning Set **£16.50** + VAT
5¼" Library Case **£1.90** + VAT

Cassettes (C20) 65p All storage media is top quality—No High St. rubbish.

Add £1.50 p. & p. per box.
28 Disk protection folder £10.49 + VAT

Micro-Spares

SUPPLIERS TO TRADE
LOCAL GOVERNMENT
EDUCATION
INDIVIDUALS
INDUSTRY

VALUE

COMPUTERS
PERIPHERALS
COMPONENTS
& NATIONWIDE
MAINTENANCE

19 ROSEBURN TERRACE, EDINBURGH EH12 5NG
031-337 5611

PAYMENT AND DELIVERY
Payment is by Cheque, Postal Order, ACCESS, VISA etc. PLEASE add postage and VAT. All in stock items sent same day. All non Kit items have a 1 year guarantee.
ALL PRICES APPLY TO END SEPTEMBER 1982

COMPONENTS
MEMS

4116 (200nS)	73p
2708	£1.50
2716 (5V RAIL)	£2.11
2114L	95p

CONNECTORS

25W plug	£1.50
25W socket	£1.89
Covers	£1.20

NEW! Only £155 + VAT.

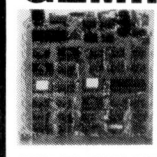
IN STOCK

The new colour board from Lucas **nascom**

now

Micro-Spares VALUE

GEMINI



The Gemini MultiBoard concept is the logical route to virtually any microcomputer system you care to name. Whether you require a business system, an educational system, a process control system or any other system, there is a combination of MultiBoards to fulfil that function.

This concept ensures maximum flexibility and minimal obsolescence. Maintenance and expansion is greatly enhanced by the modular board design. MultiBoard is based on the 80-BUS structure, which is finding increasing acceptance among other British manufacturers; thus broadening the product base.

HARDWARE (BUILT & TESTED)

GM802	64K RAM card	£140	GM813	Z80 CPU/64K RAM card	£225
GM803	EPROM ROM card	£65	EV814	IEEE 488 card	£140
GM807	3A PSU	£40	GM815-1	Single drive disk unit with PSU (350K)	£325
GM808K*	EPROM programmer	£29.50			
GM809	FDC card	£125	GM815-2	Double drive disk unit with PSU (700K)	£550
GM810K	5A PSU 8 slot motherboard	£69.50	GM816	Multi I/O board	£140
GM811	Z80 CPU card	£125	AM819	Speech board	£85
GM812	Z80 IVC card	£140	AM820	Light Pen	£35
(*Kit)			GM821	ASC II keyboard	£57.50

SOFTWARE

GM512	CP/M 2/2 for Multiboard	£90	GM524	Gem Dis disassembler/ debugger tape	£30
GM517	Gem-Zap edit/asm tape	£45	GM525	Gem Dis disassembler/ debugger disk	£30
GM518	Gem-Zap edit/asm disk	£45	GM526	Comal-80 tape	£100
GM519	Gem Pen editor text formatter tape	£45	GM527	Comal-80 disk	£100
GM520	Gem Pen editor text formatter EPROM	£45	GM528	APL disk	£200
GM521	Gem Pen editor text formatter disk	£45			

nascom PRODUCTS

KITS	
Nascom 1, with NAS-SYS 1 less P10	£112.50
Nascom 2, no user RAM	£202.50
BOARD LEVEL	
Nascom 1, with NAS—SYS 1 less P10	£126.00
Nascom 2, no user RAM	£238.50
CASED SYSTEMS	
Nascom 3, no user RAM	£338.40
8K user RAM	£36.00
16K user RAM	£90.50
32K user RAM	£103.50
48K user RAM	£117.00
POWER SUPPLY	
Kit form	£29.95
MEMORY CARDS	
RAM B memory card with 16K RAM—kit	£72.00
RAM B memory card with 16K RAM board	£90.00
Additional 16K RAM	£13.50
Additional 32K RAM	£27.00
I/O BOARDS	
I/O boards for 3 × P10 1 × CTC, 1 × UART (kit) ex P10	£40.50
P10 for above I/O	£10.80
CTC for above I/O	£12.60
UART for above I/O	£14.40

SHARP MZ80K



48K Computers
unbeatable prices
£315 + VAT

High Resolution Graphics for MZ80K
£110 + VAT

DISC SYSTEMS	
Nascom single disc drive (350KB) incl. FDC card	£423.00
Nascom dual disc drive (350KB each) incl. FDC card	£616.50
NAS DOS disc op system	£40.50
SOFTWARE	
NAS-SYS 1 ROM	£10.80
NAS-SYS 3 EPROM	£18.00
ZEAP 2.1 for NAS SYS in 4 × EPROM	£26.30
ZEAP 2.1 for NAS SYS on tape	£22.50
BK microsoft basic in ROM	£18.00

TOP VALUE PRINTERS TOP VALUE

Anadex DP8000 B & O Matrix	£300 + VAT
Tec 45 & 55 Cps Daisy Wheel	£995 + VAT
Silver Reed Typewriter/Printer RS232	£500 + VAT
RICOH RP1600	£1149 + VAT
Triumph-Adler Stylist	£595

from £307

EPSON PRINTERS PRINTERS

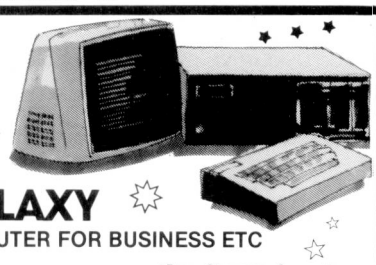


MX80FT—I	£307 + VAT
MX80FT—II	£315 + VAT
MX80FT—III	£327 + VAT
MX100 Type III	£439 + VAT
MX82FT	£330 + VAT

TERMINALS/MONITORS

BMC 12v Green Screen Monitor	£119 + VAT
Televideo 910 Terminal	£425
Televideo 925 Terminal	525
Televideo 950 Terminal	£615

1 YEAR GUARANTEE ON ALL NON KIT ITEMS



THE **GALAXY**
COMPUTER FOR BUSINESS ETC

Hardware
*Twin Z80A CP/M System
*64K Dynamic RAM
*800K Disk Storage (Formatted)
*80 × 255 Screen Format
*Inverse Video
*Prog. Character Generator
*160 × 75 Pixel Graphics
*Centronics Parallel I/O
*RS232 I/O
*Light pen interface
*59-Key ASCII Keyboard

Software
*Full 64K CP/M 2.2 with screen edit facility
*Comal-80 structured BASIC
*GEM-ZAP Assembler/ Editor
*GEM-PEN Text editor
*GEM-DE BUG debugging software

Galaxy System £1450 + VAT
Green Screen Monitor £117 + VAT

INTEREST FREE CREDIT AVAILABLE

CITY MICROSYSTEMS LIMITED

65 LONDON WALL, LONDON EC2M 5TU

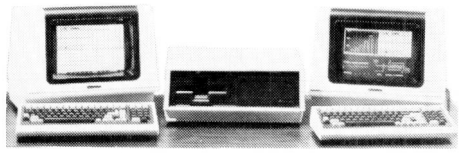
01-588 7272/3/4

ACT sirius 1



The NEW Generation Microcomputer
1Mb Disc Capacity 128K RAM
CP/M-80 compatibility available.

TELEVIDEO



Stand Alone and Multi-User, Multi-Task, Multi-Processor Systems.
Televideo reliability with complete expandability, one to sixteen users.

BRITISH MICRO



MINI 802 now available. 700K disk drives, CP/M operating system
Computer & monitor £1440 + VAT

COMPLETE BUSINESS ACCOUNTING SYSTEMS FROM £2400 WORD PROCESSORS FROM £2400
PROGRAMME PACKAGES FOR MOST APPLICATIONS

ADVICE, TRAINING AND MAINTENANCE

ALL YOUR COMPUTER REQUIREMENT READILY AVAILABLE

IN THE CENTRE OF THE CITY- LONDON EC2

VISITORS TO OUR OFFICES MOST WELCOME

LOOKING FOR 5¼" WINCHESTERS?



Now with Backup

Our new Micro Winchester gives you from 5 to 20 M.bytes of hard disc storage from as little as £1425.00 for a complete ready-to-go, plug-in system with software.
Our new drives pack enough data to run serious business or technical applications software into a mini-floppy size 5¼" unit and your data is protected in the sealed enclosure.

'Controllerbility'
Our controller comes with a range of adaptors to plug on to most popular micros. Real time and multi-tasking applications benefit from the controller's interrupt capability and macro level command structure and the OEM version features a simple software interface and CP/M 2.2 BIOS with extensive development aids. The software comes on either 5¼" or 8" diskettes together with Boot PROMs.

Service and Support
If you are impressed with the specifications so far, there is more to come. Our packaged sub-systems are assembled in-house and they carry a full one year parts and labour warranty. Our controllers are built completely from TTL logic — there are no fancy chips — so we can fix them if they ever break down. Dozens of floppy disc drives go through our workshops every month and we are well known within the industry both for our training courses and our heavy investment in computer based disc test equipment. If your Winchester ever stops working you can depend on us to fix it.



HAL Computers Limited
Invincible Road, Farnborough
Hants. GU14 7QU
Telephone 0252 517171

HAL

For: SUPERBRAIN, S-100, APPLE II, HEATH H89, TRS-80.

DISKWISE COMPUTER CENTRES

The business System Specialists

apple



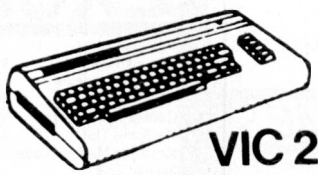
Apple II £2418
Apple II £549
Disk Drive W/C £317
Disk Drive WO/C £249

ACT sirius 1



ACT SIRIUS 1 - 128K Ram, Twin Floppies 1.2 MB to 2.4 MB . . . £2395

ALL PRICES EXCLUDE VAT.



VIC 20

Vic 20 Computer £169
VIC Cassette deck £39
& a full range of accessories

NEW! NEW! NEW!
EG2000 GENIE COLOUR COMPUTER 16K RAM, COLOUR, SOUND £170
NEW! NEW! NEW!
Computer £179
& a full range of accessories.

SOUTH WEST
DEPTFORD PLACE
NORTH HILL
PLYMOUTH
Tel: 0270 267000

WE ARE ACCREDITED DEALERS FOR THE FOLLOWING ACCOUNTS SOFTWARE:- TABS, SYSTEMATICS, VLASAK ORBIT. OUR OWN PACKAGES INCLUDE:- HOTEL MANAGEMENT, TV RENTAL, VIDEO LIBRARY etc.

NORTH WEST
68-70 LOWER HILLGATE
STOCKPORT
CHESHIRE
Tel: 061-477-5931

DEANS of Kensington

Apple ● Atari ● Casio ● Commodore (Vic 20) ● Sharp

apple

FREE
1yr parts and labour gaurantee on Apple II & III

Apple III System	18.95
Apple II Basic System	9.56
Apple III	1785.00
Disk Drive	365.00
12" Monitor System Software	126.00
Visicalc III	140.00
Pascal III	POA
Apple II 48K	540.00
Disk Drive	220.00
Visicalc (3.3)	98.95
Visiplot	95.00
Visidex	119.00
Apple World	29.95
Desk Top Plan	99.95
Apple Writer II	69.95
WordStar	200.00
Beneath Apple DOS	11.95
Bags of Tricks	DOA
INTERFACES CARDS	
Eurocolour Card	64.95
Integar Card	95.00
Language Card	95.00
Parallel I/Card	84.00
Communication Card	95.00
Centronic Card	95.00
Serial Card	95.00
CP/M System	179.95
16k RAM card	70.00
MONITORS	
12" Green	99.95
12" b/w	99.95
12" Amber	99.95
14" Microvetic	299.00
20" Sony RGB	381.95
PRINTERS	
Silentype II	194.95
Paper Tiger 445	489.00
Epson MX80T III	325.00
Epson MX80F/T III	349.00
EPSON MX100F/T	POA
Centronic	POA
Olivetti	POA
PRINTERS INTERFACES	
Dust Cover	9.95
Furniture	POA

ATARI

400 16K	165.25
800 16K	417.95
410 Tape Recorder	41.75
810 Disk Drive	247.95
822 Thermal Printer	165.25
850 RS232 Interface	117.40
16k RAM Upgrade	56.50
Word Processor	POA
French lang	30.40
German Lang	30.40
Spanish	30.40
Italian	30.40
Space Invaders	24.32
Blackjack	POA
Bask/Ball ROM	POA
Star Raiders	POA
Pack man	24.32
Super Breakout	21.70

SHARP

PE1500 (new)	139.95
CE150	121.95
CE151	42.95
PC1211	59.95
CE122	54.95
CE121	10.95
Pape Roll (10)	7.50
CE155	69.b5
MZ80A New!	POA
MZ80A 48K	
MZ80F8 Drive	579.95
MZ80SFB Drive	389.95
MZ8AFI Card	89.95
MZ80AMD	28.95
MA80P5 Printer	335.95
MA8AEU I/Unit	93.95
MZ80B	995.00
MZ80 FD Disks	539.95
MZ80 P3 Printer	349.95
MZ80 I/O	89.95
MZ80MDB	28.95
MZ8080 M/Language	17.95
MZ80 TU	34.95
MZ 8T70 FDOS	74.95

VIC-20

VIC20 CPU	164.95
VIC C2N Cassette	39.05
VIC Printer	189.95
VIC 3k RAM	26.04
VIC 8k RAM	39.09
VIC 16k RAM	65.17
VIC S/Drive	199.95
SOFTWARE	
Introduction to Basic	11.95
Avenger ROM	16.95
Star Battle	16.95
Super Slot	16.95
Alien	16.95
Super Lander	16.95
Road Race	16.96

BOOKS

SEND STAMPED ADRESSED ENVELOPE FOR FREE CATALOGUE

Apple Pascal Games	11.45
Basic Progs for Scientists & Engineering	11.50
CP/M Handbook	11.b0
6502 Application Books	10.25
6502 Games	10.25
Apple Interfacing	7.65
Apple Pascal	10.b0
Applesoft Language	7.65
Basic Comp Progs for the Home	9.50
CP/M User's Guide	11.30
Micro Interfacing H'book	6.35
ZX80 Interfacing Book	19.05
6502 Ass Lang Prog	11.95
6800 Ass Lang Prog	11.95
Advanced 6502 Interfacing	10.45
Graphic Software for Micros	15.95
Pascal for Himan Beings	4.95
BBC Computer Revealed	7.b0
Your Attari Comp 400/800	10.95
30 Hour Basic (BBC)	5.b0
Atari Sound & Graphics	6.75

ZX81

Byteing Deeper into your ZX81	4.95
Gateway Guide to ZX80/81	6.45
Getting Acquainted	5.95
Hints and Tips	4.25
Mastering Machine Code	7.50
Sinclair ZX81 ROM Part A	7.00
Stretching your ZX81 to its Limits	6.95
30 Hour Basic	5.b0
34 Amazing games	4.95
49 Explosive "	5.95
ZX81 Companion	7.95
ZX81 Pocket Book	5.95

GAMES

Send stamped addressed envelope for free catalogue

CASIO

FX702P	86.95
FX360P	19.95
FX601P	44.95
FX602P	60.95
FA2	17.35
FP10	39.10

Tel 01-937 7896 Ext 20
Opening hours Mon to Sat 9.30–6.30pm
Prices are subject to change without Prior Notice
Add 15% VAT
**Postage and packing free on books and software*
**Send orders with cheque to DEANS at*
191 Kensington High Street, London W8

DIRECT DATA MARKETING LTD

22 WARLEY HILL, BRENTWOOD, ESSEX CM14 5HA
Tel: BRENTWOOD (0277) 229379/214168/230480

NEW SHOWROOM NOW OPEN AT 86-87 WILTON ROAD, LONDON SW1V 1DN TEL: (01) 834 5096/5016

– KEY DEALERS FOR COMMODORE – LEVEL 1 DEALERS FOR APPLE – MAJOR SUPPLIERS OF SUPERBRAIN

★ Objective Systems Advice ★ A wealth of proven software ★ Whatever the requirement, consult the professionals ★ Reliable Technical and Engineering Support ★ Experienced in the needs of both Small Businesses and Multinationals ★ Specialists in the Market Leaders

INFORMATION TECHNOLOGY 82

We have the systems You have the choice

Data Base Management
Communications Stock Control
Budgeting Production Monitoring
Word Processing Forecasting Accounts

LEARNING AT HOME IS FUN!

WITH A.S.K. SOFTWARE

Believe it or not, learning at home can be enjoyable with the A.S.K. range of educational software, written by our team of experienced teachers. The programs are all fun to use with colourful and exciting screen displays. The instructions are easy to follow, so that they really can be operated by children!

Children (three to twelve year olds), will be happily occupied for hours at a time. And all the time they will be learning – improving their multiplication or estimating skills, or expanding their vocabulary and spelling.

The programs currently run on the VIC 20. Versions for the BBC Micro and Spectrum will be available soon.

They can now be seen at selected Commodore Dealers, or at the Personal Computer World Show at the Barbican in September. They may also be purchased direct from:

A.S.K. Limited
London House, 42 Upper Richmond Road West
London SW14 8DD. Tel: 01-876 0102

The best diskette for your system

* All IBM formats
* AES/Lanier
* Apple II
* Atari
* CPT 8000
* Diamond



Dysan

* Nexos 2200
* P2000
* P5002/Micom
* Wang
* Zenith
* — among others

DISKETTES — AND DISC PACKS

We keep stocks of 30,000 for immediate delivery to dp and wp users

FOR YOUR RECORDS THE DYSAN HOTLINE IS: 0252 517171

HAL Computers Limited
Invincible Road, Farnborough
Hants. GU14 7QU
Telephone 0252 517171

HAL

VIDEO GENIE and TRS80

THE ROM–VIDEO GENIE & TRS 80 (3 ROM Models)

Are you fed up of loading a lower case drive every time you switch on? — Want your name inside your computer — Better loading (TRS80) — Sick of bouncy keyboards-s!

You need our new ROM—simply remove old—plug in new.

1) Firmware driver for lower case
2) Security code displays–(your name & post code?)–up to 21 characters
3) Improved tape loading
4) Alleviates repeating characters (key-bounce)
5) Checks for feature ROMS

£14.95 + VAT + P&P (80p)

FEATURE ROMS £18.95 + VAT + P&P (80p)
A series of ROMS starting with FEATURE 'A'

1) Single keystroke commands e.g. Shift A = Auto etc.
2) Flashing cursor (can be toggled on/off)
3) Repeating characters–with delay–(toggle)
4) Machine code monitor and editor
5) System load and save for backing up those system Programs –uses no RAM and so can deal with a FULL 16K program

NEW

FEATURE 'B'–extended basic

1) Merge–two basic programs to one
2) Renumber
3) Screen print
4) Various basic tools PLUS

Access and Barclaycard accepted.

Plug on for feature ROMS
Now you can simply plug on the back of your computer, insert ROM and away you go.
VG £29.95 inc. ROM A OR B + **VAT** + **P&P TRS80 £34.50 + VAT + P&P (80p)**

48K RAM–internal
TRS80 & VG £43.50 + **VAT + P&P (80p)**
Plug in our modules. Connect three wires (VG) or five (TRS80). You are not required to piggyback chips. Keep your old RAM (or sell it!). Compatible with expansion.

LOWER CASE HARDWARE (VG & TRS80)
Unplug two IC's, plug in two modules, connect three wires–EASY! £19.00 + VAT + P&P

BOOKS
"Disassembled Handbook for TRS80"–A Self Teach–Series of Books–Written by Bob Richardson of New York. Very well received by U.S. Reviewers, **Essential** Reading for TRS80, Video Genie & Radio Hams.
Vol. 1 Decoding the ROM & Calls, etc. **£6.45**
Vol. 2 Using Calls, to shorten programs, etc. **£8.75**
Vol. 3 D/A–AD, Spooling, etc. **£10.50**
Vol. 4 Teletype, Morse Techniques **14.50**
Vol. 5 Voice Systems **TBA**
+ Much else in each volume.
Various Books–Lists on application.
+ VG–Expansion–Disk Drives–Printers, etc. Details on application.

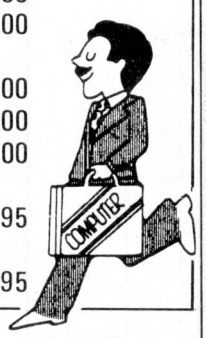
EPSON PRINTERS
MX80T Type III
£285 + CARR. + VAT (Cash/Chq. only)
M x 80 FT II
£315 + CARR. + VAT (Cash/Chq. only)

WABATH
5,Z5 SSS1) Floppy Disks
including FREE library case
£16.00 per ten + V.A.T. + 80p P&P

General Northern Microcomputers [GNOMIC]
46 Middle Street, Blackhall, Hartlepool, Cleveland. Tel. Peterlee (0783) 863871

SPECIAL OFFERS · CASH WITH ORDER

FLOPPY DISKETTES:		
5¼ SINGLE SIDED	£ 19.50	10
5¼ DOUBLE SIDED	£ 29.50	10
8" DOUBLE SIDED	£ 39.50	10
C 10 CASSETTES (SCOTCH)	£ 5.50	10
APPLE II 64K	**£595.00**	
APPLE II DISK DRIVES: WITH CONTROLLER CARD		
DOS 3.3	£299.00	
WITHOUT CONTROLLER CARD	£239.00	
SILENTYPE PRINTER (80 COL)	£159.00	
EPSOM MX80FT (2)	£359.00	
BMC MONITORS (12" GREEN)	£125.00	
APPLE HARD CARRYING CASE FOR CONSUL AND 2 DRIVES	£ 29.95	
DISKETTE CARRYING CASE (LOCKABLE)	£ 19.95	



Let us quote you for your Apple Maintenance

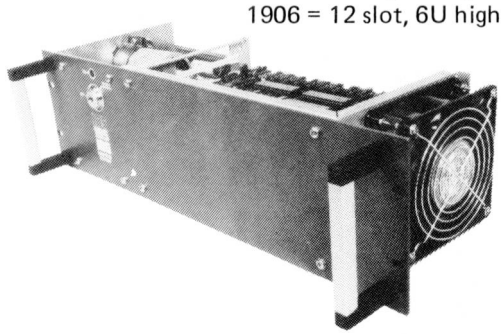
THE COMPUTERIST

London Road, Westcliffe-on-Sea, Essex SS0 9HW
Tel: Southend (0702) 353522

NEW PRODUCTS FROM I.B.S. Ltd.

S100 INDUSTRIAL 19" RACKING SUB SYSTEM

TWO SIZES	1903 = 6 slot, 3U high	275.00
	1906 = 12 slot, 6U high	399.00



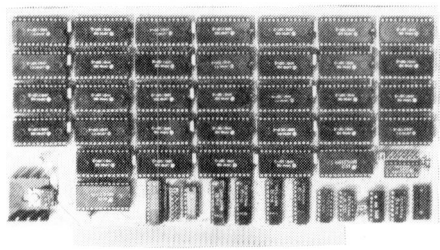
* Supplied assembled complete with Power supply.
* Key operated ON/OFF/RESET for maximum security.
* IEC mains connector, filter, fuse tap change switch on rear panel.
* IEEE (696) motherboard, card guides, and cooling fans.
* Carrying handles.
* Heavy duty painted front panel.
* Designed originally for the Electricity Generating Board.

OTHER PRODUCTS INCLUDE

6/12 Slut mother Boards
Card Cages
S100 Sockets
Disk Drives

S100 64K STATIC RAM/PROM CARD ONLY £299.00

A superior Quality Ram/Prom board will accept either H6116-3 (2K x 8) Ram chips or 2716 EProms.



* S100 IEEE (696) Compatible
* 24 Bit Addressing
* Can be used with any CPU
* Runs at 6Mhz with standard Rams
* Wait state generation for Proms
* Phantomable * Low power
* Prom/Ram selectable on 2K boundary
* Prom/Ram can be disabled to suit popular memory mapped devices

Irvine Business Systems Ltd
1 Montgomery Place
Irvine
Ayrshire KA12 8PN Tel: 0294 75000/218888

BRITISH MADE S100 PRODUCTS MANUFACTURED BY I.B.S. Ltd. IN IRVINE SCOTLAND

The IBM Personal Computer

FOR THE PRICE OF

A SIRIUS 1 — £2,395*

(NEXT 50 machines only)

OFFICE EFFICIENCY MACHINES

Call us at our West London office on 837 7741
OEM — the best Micro's at the best prices (volume discounts available)

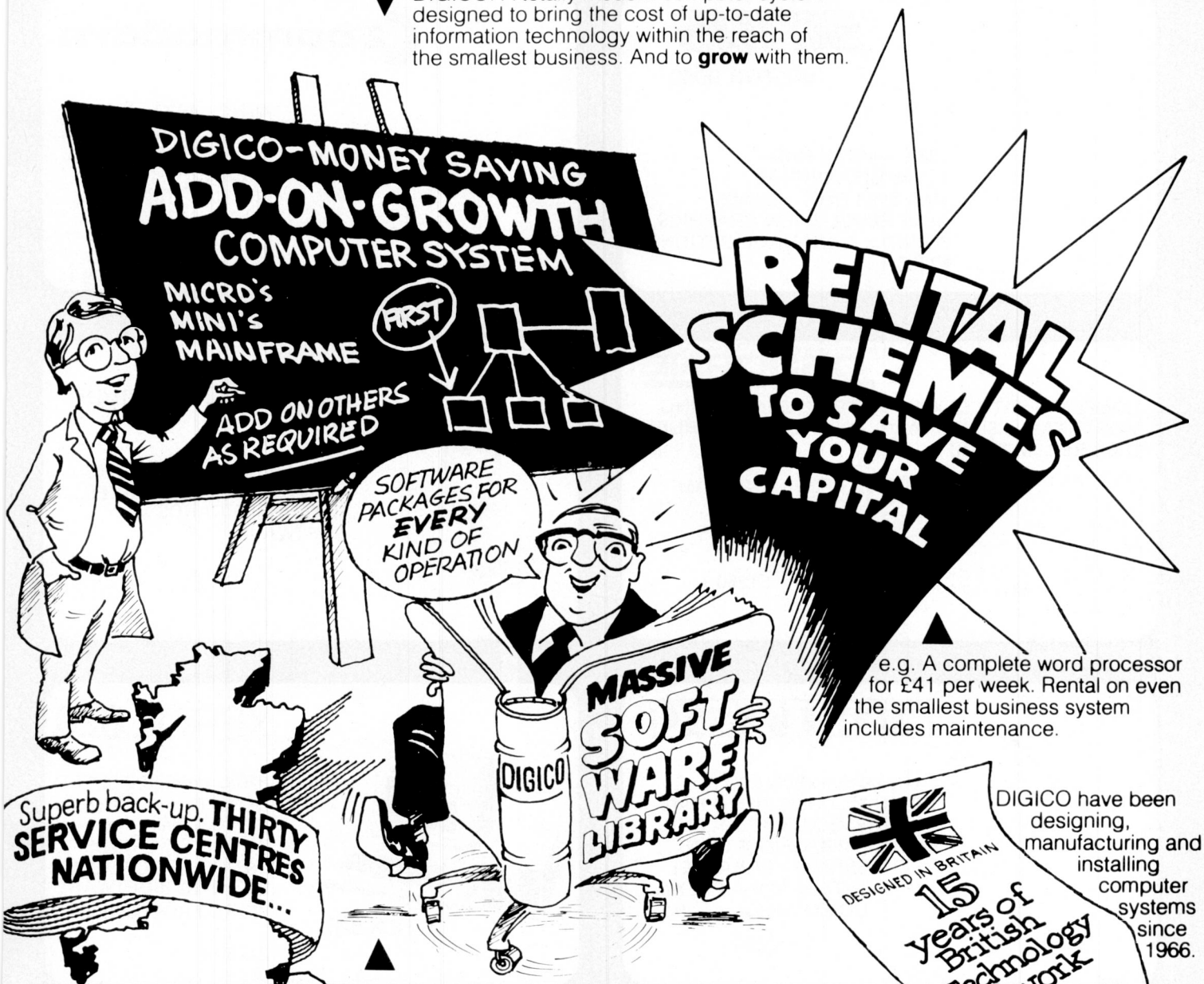
SIRIUS 1 IBM OSBORNE

(Price includes system unit, 64K memory, 2 disk drives (320K), Keyboard and Monitor)

YOUR GUIDE TO DIGICO

BRITAIN'S LEADING BUSINESS INFORMATION TECHNOLOGISTS ?

▼ DIGICO. A totally modern computer system designed to bring the cost of up-to-date information technology within the reach of the smallest business. And to **grow** with them.



▲ e.g. A complete word processor for £41 per week. Rental on even the smallest business system includes maintenance.

Superb back-up. THIRTY SERVICE CENTRES NATIONWIDE...

. . . for expert advice and help. And you're never far from a DIGICO engineer.

DESIGNED IN BRITAIN 15 years of British Technology at work

DIGICO have been designing, manufacturing and installing computer systems since 1966.

Legal, Accounting
Word Processing
Transport, Medical,
Production Control
Stock Control, Payroll
Telecommunications
Dentistry, Printing

Builders Merchants
Incomplete records
Publishing, Holidays
Bookshops, Betting
Warehousing, Mailings
Maintenance, Teaching
Research.

VERY start small and grow large with digico



7-YEAR GUARANTEE

Your computer has a SEVEN year guarantee of maintenance provided there is a maintenance contract continuously from new.

PLUS

MINIMUM INTERRUPTION PLAN. If your micro breaks down, we'll swop it over to keep you going.



Full information (no obligation) from

DIGICO COMPUTERS

46 BROADWAY LETCHWORTH, HERTS.
Tel: LETCHWORTH 78172
32 YORK RD, LEEDS. Tel: LEEDS 486688

WITH OUR EXTENSIVE RANGE **Minichip Limited**

OFFER YOU THE BEST HARDWARE AND SOFTWARE FROM STOCK AT THE RIGHT PRICE.....

SIRIUS

VICTOR 9000

128K – 1024K RAM
1.2 mb DISK DRIVES
16bit 8088 GPO.....cp/m86
HIGH RESOLUTION GRAPHICS.....
SOUND.....LANGUAGE OPTIONS
£2395 +

commodore

4016.....4032.....8032.....
4040.....8050.....4022.....
8024.....8026.....C2N.....
VIC20.....
VIC CARTRIDGES.....
FULL CBM RANGE
PRICES START
FROM VIC AT £173 +

OSBORNE

COMPLETE WITH £800 OF SOFTWARE INCLUDING
WORDSTAR.....SUPERCALC.....CP/M.....MAILMERGE.....
C BASIC.....M BASIC

Z 80A CPU –– 64K RAM
TWIN DISK DRIVES.....VDU
RS232 + IEEE Interface

£1250 +

apple® II/III



DISK DRIVES.....MONITORS.....
PRINTERS.....ACCESSORIES.....
INTERFACE CARDS.....
SOFTWARE

£640 +

FUJITSU

TWIN 6809 + Z80A CPU'S
64K RAM .....48K VIDEO RAM
HIGH RESOLUTION COLOUR.....
BUBBLE MEMORY OPTION.....
SERIAL + PARALLEL
INTERFACE – FLEX.....
UCSD PASCAL.....F BASIC

£895 +

XEROX 820



XEROX 820

820/5 and 820/8 SUPER
DENSITY 64K CP/M
UP TO 1.6mb
TWIN DISK DRIVES
LANGUAGE OPTIONS
BUSINESS SOFTWARE
WORD PROCESSING

£1750 +

DRAGON 32

9 COLOURS .....5 RESOLUTIONS
32K – 64K RAM .....
6809E CPU.....EXTENDED
MICROSOFT COLOUR BASIC
PROFESSIONAL KEYBOARD
PARALLEL OUTPUT.....AUDIO
INTERFACE.....UHF OUTPUT

£173 +

PRINTERS.....

EPSON
MX80T/3.....£349
MX80FT/3.....£389
MX100/3.....£499
MX82.....£369
MX82FT.....£409
TEC
FIO/40P/R.....£1285
FIO/55P/R.....£1675
DIABLO
630..... £1680
63KSR.....£1950

SOFTWARE.....

MICRO PRO (ANY FORMAT)
WORDSTAR, MAILMERGE
DATASTAR, SUPERSORT
CALCSTAR

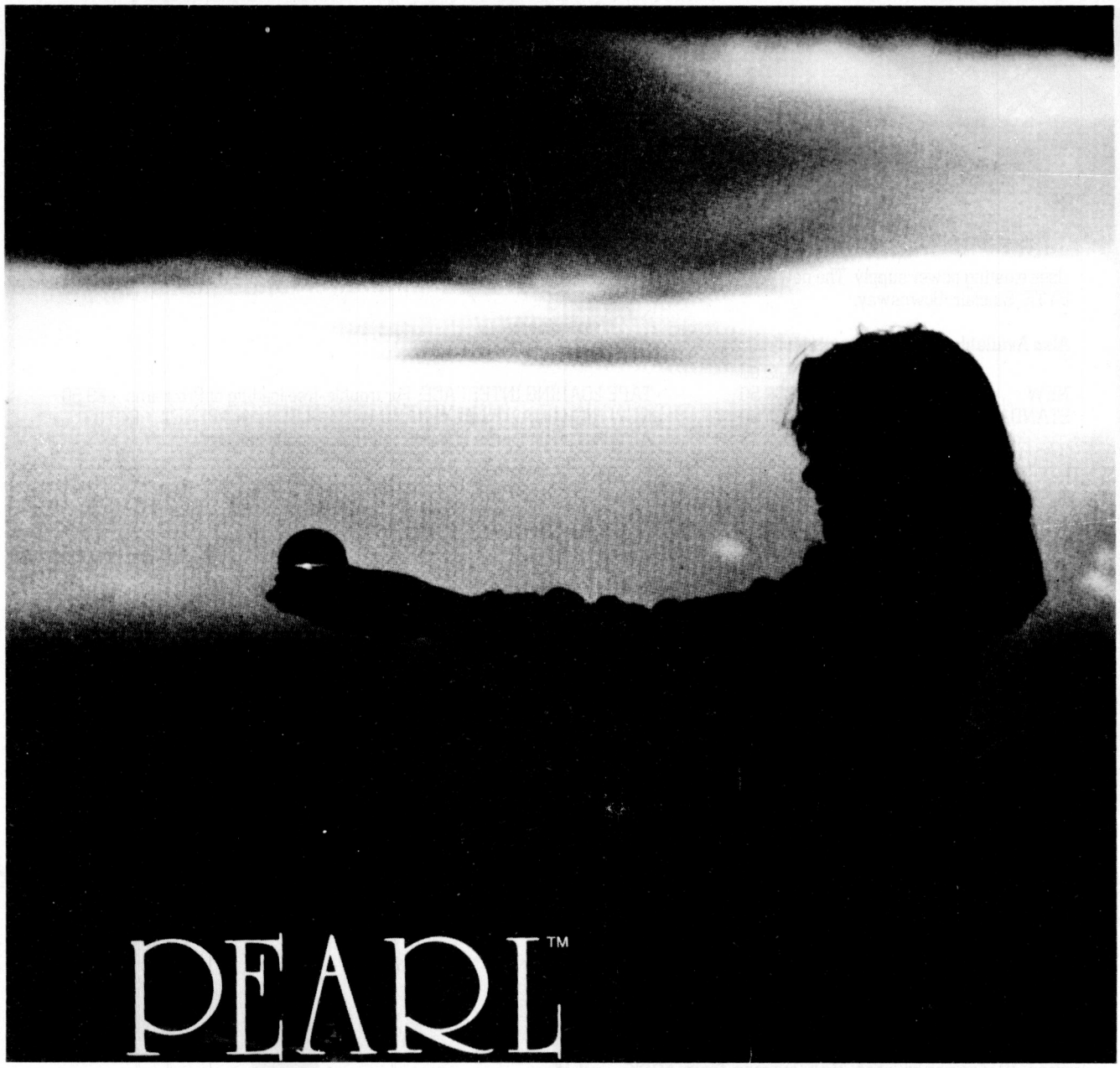
PADMEDE (ALL FORMATS)
SALES, PURCHASE, GENERAL
LEDGERS,STOCK, INVOICING

Minichip Limited

THE COMPUTER CENTRE – ENTERPRISE HOUSE
TERRACE ROAD – WALTON ON THAMES SURREY

Tel (09322) 42777 3 LINES

MON TO SAT 9. to 6pm –FREE PARKING OUTSIDE THE DOOR
ALL PRICES EXCLUDE VAT BUT INCLUDE FREE UK DEL IF YOU PREFER TO ORDER BY MAIL OR TELEPHONE



1980 MARKED THE BEGINNING OF A NEW ERA IN MICROCOMPUTER PROGRAMMING.

PEARL.™ was announced.

PEARL ushered in the era where programmers could free themselves from boring, routine and repetitive tasks. Because PEARL handles 60-70% of programming details, which permits programmers to spend their time more creatively, and more productively.

But that was two years ago.

Today, there's Personal PEARL – introduced at the Computer Fair. And it goes a giant step further. Personal PEARL makes the capabilities of the computer available to virtually anyone.

For under £200 in price, even people without technical backgrounds can use it to visually create their own applications and reports on any computer.

So the ad you're reading now is announcing an even more important breakthrough in computer and personal productivity

Just think about the possibilities.

Then contact our Personal PEARL Product Manager.

PEARL SOFTWARE INT (UK) LTD
P.O. BOX 34, POOLE, DORSET BH14 8AR
(0202) 741 275

CPU International is the former name of Relational Systems International. PEARL (Producing Error-Free Automatic Rapid Logic)

NEW FOR ZX81 USERS

EVEN MORE MEMORY
WITH OUR BYGER BYTE 32K+ RAM PACK

Why put aside your 16K RAM PACK when you can use it together with the new BYGER BYTE 32K+ RAM PACK, to give you 48K OF MEMORY.

No trailing leads or wires – all you need do is plug the existing 16K RAM PACK into the back of the new BYGER BYTE 32K+ RAM PACK and bingo! 48K OF MEMORY.

Uses existing power supply. The new 32K+ RAM PACK is tested and guaranteed with the following 16K RAM PACKS: BYG BYTE, Sinclair, Downsway.

Also Available

	16K RAM PACK	£22.00
NEW	32K+ RAM PACK	£39.50
STANDARD	32K RAM PACK	£35.00
	64K RAM PACK	£53.95

TAPE LOADING INTERFACE. For trouble-free loading of Programs £9.50
NEW HIGH QUALITY KEYBOARD WITH BLEEP AND RESET £49.95
All prices are inclusive of V.A.T. + FREE postage and packing

PHOENIX MARKETING SERVICES
Oaklands House, Solartron Road, Farnborough, Hants. GU14 9QL.
Tel. (0252) 514990

NAME .....

ADDRESS .....

.....

Make cheques payable to Phoenix Marketing
I enclose my cheque for £.....
Please debit my Access/Barclaycard

Signed.....

Date .....

Please send me

☐ 16K Ram Pack	£22.00
☐ 32K+ Ram Pack	£39.50
☐ 32K Ram Pack	£35.00
☐ 64K Ram Pack	£53.95
☐ Tape Loading Interface	£9.50
☐ Fully Cased Keyboard	£49.95

COMPUTERS WITH CP/M FROM MICROTEK

The SHARP PC-3201 is a versatile Business Computer which handles everything from Business to Technical computation. It features sophisticated screen performance with disk storage from 600K to 2 Megs, the software available includes CP/M accounting functions, Payrolls and specialised programs. Full system £2850 +VAT.
The SHARP MZ-80A is a new compact personal computer that we modify to give an 80 column screen. The CPT, keyboard and cassette based data storage are incorporated in one complete system. Ideal as a CP/M Business system. From £475 + VAT.
The NORTH STAR ADVANTAGE is a powerful integrated graphics computer with two 360k floppy drives 96k, 280 CPU, 8Key selectric-style keyboard and CP/M, al within its case. From £2095 + VAT.

We write programs for particular purposes to order. Our own CP/M packages include several for solicitors time recording, client data base, local government, estimating, accounting etc.



For further details write or ring:

MICROTEK
15 Lower Brook St. Ipswich Suffolk IP4 1AQ
tel. Ipswich (0473) 50152/52466
where software meets hardware

The New Range of Software

designed for management
assessment development and
training

stand 302

Ulster Management Centre

VIC-20 USERS



DEALER ENQUIRIES WELCOME.

The new Seikosha GP-100VC graphics printer for around £235. EX. VAT.

Offering big printer performance at a fraction of the cost, the latest addition to the famous range of Seikosha micro-printers is the 100VC. The precise match for the VIC 20.

Featuring all the VIC 20 characters, symbols and graphics as standard, the Seikosha 100VC includes full graphics capability. It enables graphic, character and double width character modes to be intermixed on a single line as well as repeating graphics data, as you want, with a single command.

Many other advanced features, plus Seikosha's proven reliability and the nationwide support of DRG's distributor network make the 100VC the natural choice for the VIC-20 user.

DIMENSIONS:

Depth – 9¼" (234mm)

Width – 17¼" (420mm)

Height – 5¼" (136mm)

OPTIONS:

Interfacing for most other systems available on the GP100A model.

FEATURES INCLUDE:

- 80 col. 30 cps.
- Dot Matrix unihammer action.
- 154 characters (inc graphics)
- VIC-20 8-BIT CODE
- Full graphics.
- Double width printing.
- Automatic printing
- Up to 10" paper width.
- Original + 2 copies.
- Tractor feed.
- Self testing.

DRG BUSINESS MACHINES

Telephone the number below and we'll tell you where your nearest distributor is located. See the remarkable Seikosha GP100VC in action at the PCW Show.

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

THE FINEST WORLDWIDE SUPPORTED NATIONWIDE.

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

MAGNETIC MEDIA

14 – 20 GEORGE ST'
BALSALL HEATH
BIRMINGHAM
B12 9RG

TELEPHONE
021-440-83

For TRS 80 owners

As an intrductory offer Magnetic Media Co. are offering these well known programs at ridiculously low prices. If this seems an attempt to gain good will while launching our company into the software business, so be it. But the prices must be tempting. And it will be our policy to keep them so.

OTHER MACHINE OWNERS DON'T DESPAIR YOUR TURN WILL COME VERY SOON

SPECIAL PACKS	INDIVIDUAL PRICE CASS	INDIVIDUAL PRICE DISC	PACK PRICE CASS	PACK PRICE DISC
BIG AVE.				
High Score Display	£6.95	£7.95		
Super Nova	£6.95	£7.95		
Attack Force	£6.95	£7.95	£27.00	£29.00
Meteor Mission 2	£6.95	£7.95		
Robot Attack	£6.95	£7.95		
WAR GAMES				
Tigers in the Snow	£9.95	£10.95	£13.75	£15.00
The Battle of Shillah	£10.75	£11.75		
SPACE GAMES				
Star Flight (Star (Trek 3.5)	£12.00	£13.00		
Tossed in Space	£29.50	£10.50		
Lunar Lander	£19.50	£10.50	£30.00	£32.00
Eliminator	£10.75	£11.75		
ADVENTURE GAMES				
Escape from Traam	£ –	£10.50	£ –	£18.00
Stone of Sisyphus	£ –	£12.30		
INDIVIDUAL GAMES				
Olympic Deathlon	£13.75	£17.50	––	
Battle Trek	£12.00	£13.00	––	
Glactic Triology	£25.00	£27.00	––	
Flight Simulator	£11.95	£12.95	––	

ALL PRICES INCLUDE V.AT./P&P.

PLEASE SEND ME: *NAME:* . . . . . .
ADDRESS: . . . . . .
. . . . . .
. . . . . .
. . . . . .

PACKS
. . . . . @ £
. . . . . .

GAMES
. . . . . @ £

I ENCLOSE PAYMENT FOR £

30+PROGRAMS FOR THE BBC MICRO

This book contains program listings, with explanations & tips on using the BBC Micro

GAMES UTILITIES GRAPHICS & MUSIC
'Astro Run' 'Fastfinder' '3D Graphics'

Most programs will run on Model's A & B. Edited by C.J. Evans, various Authors.

ISBN 0 946190 00 3 £5.00 inclusive of p&p

CASSETTE LEADS

The BBC Micro comes with an incomplete lead

7 pin Din to 2x3.5mm & 1x2.5mm minijacks	£4.65 (a)
7 pin Din to 5 pin Din & 2.5mm minijack	£4.65 (a)
7 pin Din to 7 pin Din	£4.65 (a)
7 pin Din to 2x3.5mm minijacks (see XX)	£1.50 (a)
7 pin Din to 5 pin Din (see XX)	£1.50 (a)
7 Pin Din PLUGS	Two for £0.65 (a)
6 pin Din PLUGS (for RGB socket)	Two for £0.65 (a)
5 pin Din PLUGS (360 deg for RS232)	Two for £0.65 (a)

XX These leads allow you to load & save but have no remote facility

PRINTERS

STAR DP8480 From £228.85 inc VAT

80 CPS : 80/96/132 Cols
BI–DIRECTIONAL LOGIC SEEKING

	Centronics	RS232
Friction Feed	£199.00 + £29.85 VAT =£228.85	£213.00 + £31.96 VAT = £245.00
Tractor with Friction Feed	£217.39 + £32.61 VAT =£250.00	£246.09 + £36.91 VAT = £283.00

(24 hour Securicor delivery for printers £6.00)

Printer cable BBC to 36 way Centronics type connector	£17.50 (f)
Printer cable BBC to 25 way D type (for use with RS232)	£9.50 (f)

RAM CHIPS

4816 (100ns) As used in the BBC, 8 chips gives 16K	£4.00 each (b)
Special offer 8 x 4816 for £29.00 p&p free	
2114 As used in the Acorn Atom 20 Chips gives 10K	£1.20 each (b)

Programs & Hardware designs for the BBC Micro wanted.

A RANGE OF SOFTWARE CASSETTES AVAILABLE SHORTLY
Send SAE for full price list.
. . . . . VAT Included where applicable . . . . . .
Postage (a) 35p (b) 50p (f) & book free
Orders over £10.00 post free (Not applicable to printers)

C. J. E. Microcomputers

25 HENRY AVENUE, RUSTINGTON, WEST SUSSEX BN16 2PA

(09062) 6647

from disk to print...



If you're preparing large text files on your microcomputer – for directories, books, price lists or whatever – we can typeset direct from your disk, ready for paste-up or camera-ready for the printer.

Our Anvil service is available for most popular machines (but *not* the Commodore family), with special software support for ***Wordstar, Spellbinder, Applewriter*** and many other programs.

The total cost? Typically around £ 75.00 for 100K (About £ 4.00 per 1000 words).

For more details, fill in the coupon below, or ring the Typesetting Section on (0458) 45359

Name _____ Position _____

Company _____

Address _____

_____

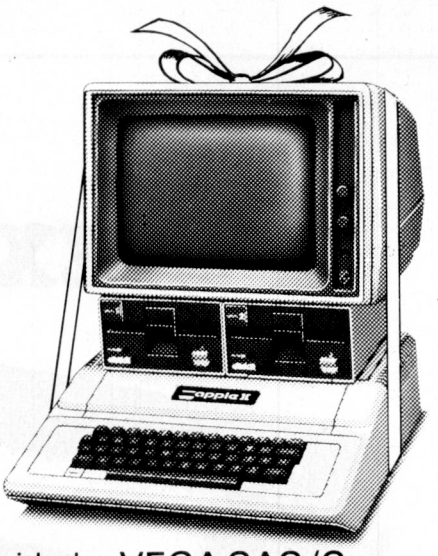
Tel. No. _____ System _____

wordsmiths West End, Street, Somerset BA16 0LQ
Tel: Street (0458) 45359. Telex: 46401

5MB HARD DISK ACCOUNTING SYSTEM

INSTALLED and WORKING for £500!

Balance of £3495 on acceptance within 14 days or by Lease Rental (approximately £18 per week)



At last the businessman's dream has come true.

Ever since the introduction of the Micro-computer, businessmen have been searching for a complete, powerful and fast Business System ready to run from the moment it is delivered. Now the dream has come true with the VEGA SAS (Super Apple System).

The **VEGA Super Apple System** is a unique combination of proven hardware and software supplied by a company which specialises in end-user support. This guarantees a price performance ratio superior to any comparable system. Within minutes of the System being delivered, your accounts can be loaded and run and make you money.

For the future, the **Super Apple System** allows you to take advantage of the wealth of proven Apple software.

The dream is a reality. It's a gift no businessman can afford to refuse.

SPECIFICATION

48K Apple System
12" High Resolution Green Screen
5 Megabyte Winchester Hard Disk
5¼" Floppy Disk Drive
120cps Bi-directional Buffered Matrix Printer
Open-Item Sales Ledger for over 900 Accounts

Total Package Cost £3995 plus VAT

apple computer
Authorized Dealer

Full Audit Trails, Sales Analysis, Age Debts, Controls, Statements, etc
Complete internal and external security against data loss
Personalised Software
All Stationery, Disks and Consumables
Delivery and on-site instruction

Optional Extra Software:

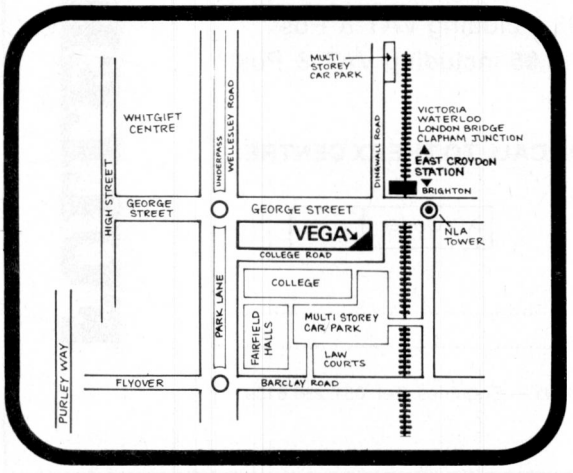
Interactive Invoicing
Interactive Stock Recording
Open-Item Purchase Ledger
Monthly and Weekly Payroll
General Ledger

Optional Support:

3 months unlimited on-site support
Comprehensive Maintenance Contract

Please complete the coupon below for a full demonstration.

Vega Computers Limited 10 Essex House George Street Croydon CRO 1PH Tel. 01-680 4484 Telex 943763



NAME _____

POSITION _____

COMPANY _____

ADDRESS _____

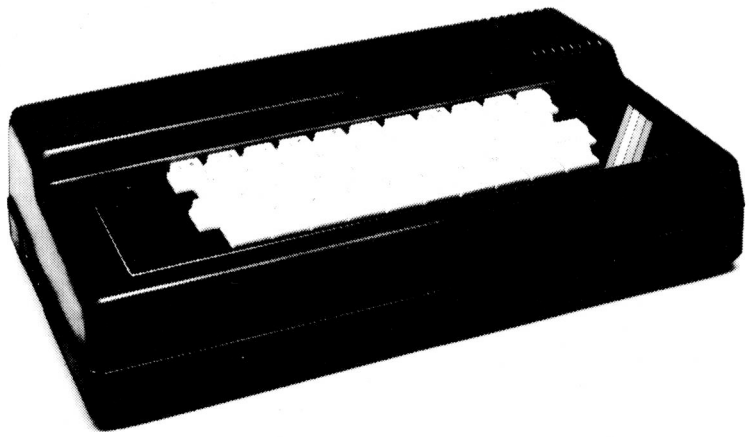
_____

_____ TELEPHONE _____

New From Fuller

FD System for the

ZX SPECTRUM



£39.95

+ £2.50 p & p.

Professional Keyboard & Case —

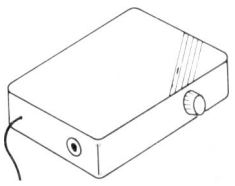
This unit has the same high standard as our ZX81 unit.
Tough A.B.S. Plastic case encloses our Keyboard, the Spectrum Printed Circuit Board and the Power Supply.
Our own Power supply is available:- 9 volts DC at 2 amps.
Mains either 110v or 240v AC at £5.95 + 80p. p & p.

The Keyboard has 42 keys with all the spectrum functions printed onto them, the full travel key switches have gold plated contacts and a guaranteed life of 10^6 operations.
INSTALLATION - Simply unscrew the ZX printed circuit board from its case and screw it into the FD case, plug in the keyboard and that's it. No technical know how or soldering required, the built unit is tested and comes with a money back guarantee.
Spectrum Keyboard and Case Kit £33.95

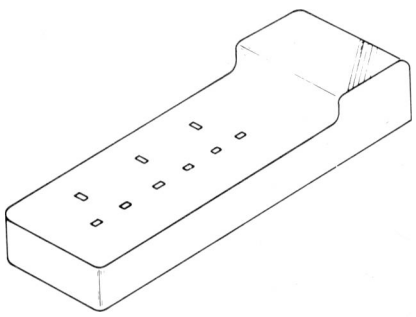
Our Mother Board for the spectrum has 2 slots at £15.95 or 3 slots at £19.95, this unit also fixes inside the case. p & p 80p.

SPECTRUM SOUND AMPLIFIER £5.95 + 80p p & p.

Complete with leads, volume control and loud speaker in tough ABS Plastic case measuring 5" x 3" x 1" just plugs into your spectrum MIC input.



SPECTRUM PLUG PLANNER — £18.95 + £1.00 p & p



Complete with 3 metres of cable, three 13 amp sockets for TV, Tape etc AND 9 volt at 2 amp power supply with power jack to fit Spectrum or ZX81

The ever popular FD42 Keyboard and case for ZX81 **£39.93** including VAT & Post
FD42 as a kit **£33.95** including VAT & Post
FD42 Built only **£24.95** including VAT & Post
FD42 Keyboard Kit **£18.95** including VAT & Post

GUARANTEED 14 DAYS DELIVERY FROM RECEIPT OF ORDER, OR CALL TO THE ZX CENTRE.

Mail to **FULLER MICRO SYSTEMS,**
The ZX Centre, Sweeting Street, Liverpool 2. England, U.K.

AD Code	

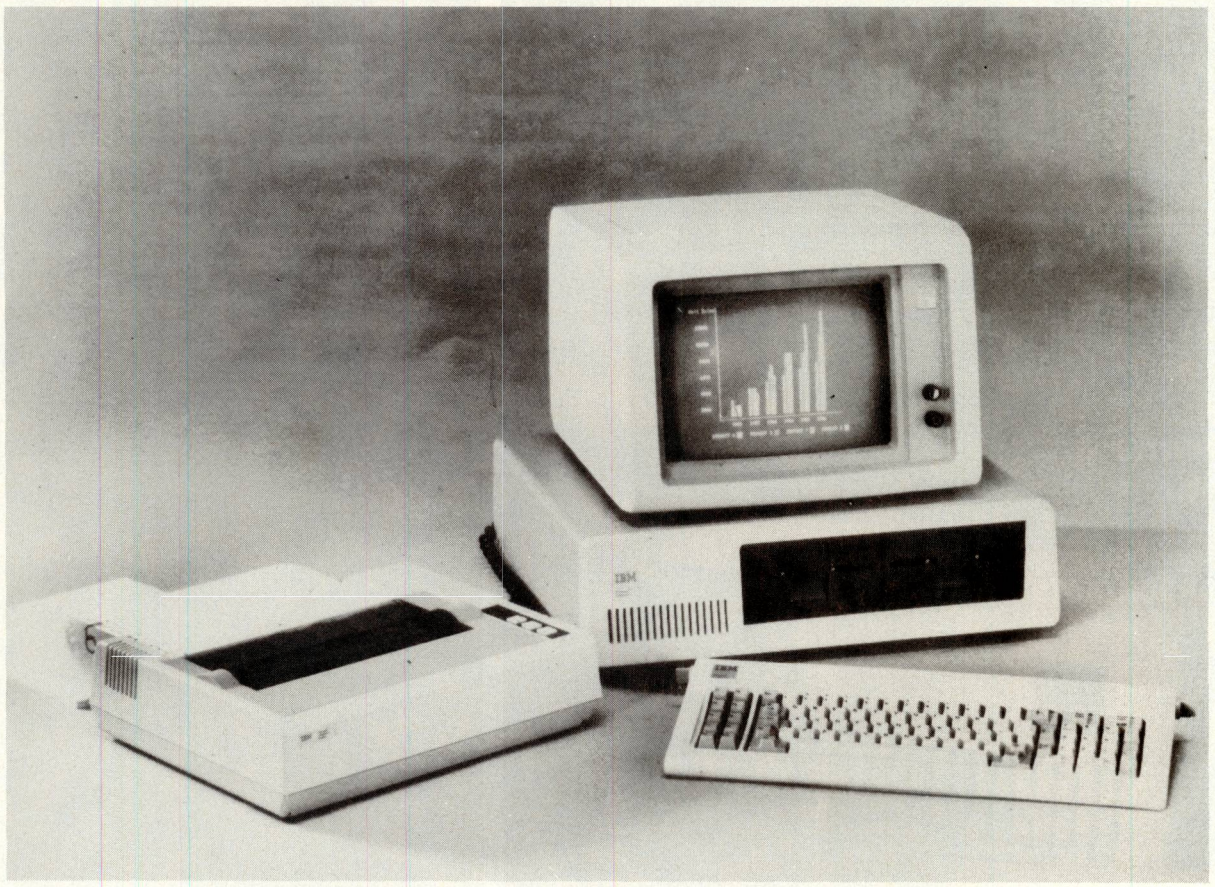
Please Supply:-
Name .....
Address .....

SAE for more details — Enquiries: Tel. 051-236 6109

FULLER FD SYSTEM

village computer services

We are very proud to announce that we are now dealers for the superb IBM PERSONAL COMPUTER.



At £2,950 it now comes as standard with 64K Ram (expandable to 512K), 40K Rom, Twin 320K Disk Drives, PC-DOS, Basic, and Parallel Interface. We also sell Visicalc (256K version), Wordstar, Mailmerge and the SYSTEMATICS INTERNATIONAL Integrated Ledger System for the IBM PC. Please call Jeremy Ensor for a demonstration but hurry!

The West London Microcentre,
6 Pavilion Parade, Wood Lane, London W12 0HQ.
Telephone: (01)-743 9000

The small Business Compute



ɔy the Biggest in the Business

The IBM Personal Computer is available NOW throughout the United Kingdom from EOS Dealers. With its crystal clear display, detachable keyboard with built-in calculator pad, colour graphic options PLUS compatibility with the widest range of software options to keep in line with your development needs, the IBM Personal is today's investment in tomorrow's technology.
Heart of the IBM Personal is the powerful INTEL 8088 giving performance excellence normally associated with mini-computers.
Its 64k standard memory is expandable internally to 768k.
EOS Dealers can also provide IMMEDIATELY a complete range of IBM plug compatible memory boards, 320k disc drives, a selection of winchester hard discs, local area networking and the unique EOS 7000 three-in-one printer.

THEY WILL ALSO PROVIDE FULL FIELD MAINTENANCE AND SERVICE THROUGHOUT THE U.K.

The IBM Personal Computer

Specifications and Technical Summary

User memory: 16K – 768K
Permanent memory (ROM): 40K bytes*
Microprocessor: High speed 8088*
Video buffer: Separate from user's memory, contained on video adapters (16K bytes colour/graphics, 4K bytes monochrome)
Auxiliary memory: 2 optional internal diskette drives 5¼", 160K/320K bytes per diskette

Keyboard: 83 keys, 6ft cord attaches to main cabinet*. 10 function keys* 10-key numeric pad*, tactile feedback
Monochrome display: High-resolution (720h x 350v)*. 80 characters x 25 lines, upper and lower case, green phosphor screen*.
Colour/Graphic: *Text mode* – 16 colours*, 256 characters and symbols in ROM*

Graphics mode – 4-colour 320h x 200v resolution*, black-and-white 640h x 200v resolution*
Languages: BASIC Pascal , Cobol, Fortran
Communications: RS-232-C, asynchronous (start/stop) protocol, up to 9,600 bps
Diagnostics: Power-on self testing*, parity checking*

*Advanced features for personal computers

from your local EOS Dealer.....

A1 Computers,
56 Grove Road,
Sutton, Surrey
Tel: 01 661 0095

Amplicon Microsystems Ltd,
Richmond Road,
Brighton,
East Sussex BN2 3RL
Tel: 0273 608331

Business Office Links Ltd,
73, Albany Road,
Coventry CV5 6JR
Tel: 0203 78651

Clacton Computer Centre,
29/31 Pier Avenue,
Clacton-on-Sea,
Essex
Tel: 0255 422644

Computacenter Limited,
Theatre Square,
Swindon SN1 1QN
Tel: 0793 612341

Datum Ltd,
Church Road,
Great Yeldham,
Halstead, Essex
Tel: 0787 237008

Estate Computer Systems,
29/30 Carre Street,
Sleaford,
Lincs NG34 7TR
Tel: 0529 305637

Inverness Computers Ltd,
Dewar House, Avoch,
Ross Shire, Scotland
Tel: 0381 20276

Knowledge Ltd,
15 North Burns,
Chester-Le-Street,
County Durham, DH3 3TF
Tel: 0385 884782

Lux Computer Services,
108, The Parade,
Watford, Herts
Tel: 92 29513

M. J. & P. Bradley,
24, Lansdowne Terrace,
Gosforth,
Newcastle-upon-Tyne
Tel: 0632 846291

Open Computer Services Ltd,
24/25 Old Steine,
Brighton BN1 1EL
Tel: 0273 671666

Pettitts Rural Industries Ltd,
Camp Hill, Reedham,
Norwich, Norfolk
Tel: 0493 700243

Professional Data Systems,
Carne House,
Markland Hill, Chorley New Road,
Bolton, Lancs BL1 5AP
Tel: 0204 493816

Strathand Computers Ltd,
44 St. Andrews Sq.,
Glasgow G1 5PL
Tel: 041 552 6731

Vega Computers Ltd,
10, Essex House,
George Street,
Croydon, Surrey
Tel: 01 680 4484

Zak Computers,
Warwick House,
17, Warwick Road,
Manchester M16 0PJ
Tel: 061 872-8991

Plus sixty further Locations.

This coupon will be forwarded to your local EOS Dealer

Please send me further information about the IBM Personal Computer.
Please tick Dealer ☐ End User ☐
Name _____
Company _____
Address _____
_____
_____ Phone _____

Electronic Office Services (U.K.) Ltd.
29/31 Fleet Lane London EC4M 4YA
Tel: 01-248 6971 Telex: 886750 UNIHORG

Distributed by
ELECTRONIC OFFICE SERVICES
Electronic Office Services (U.K.) Ltd. 29/31 Fleet Lane London EC4M 4YA
Tel: 01-248 6971 Telex: 886750 UNIHORG

Tomorrow's Office Technology Today

Electronics Office Services (UK) Ltd. and the above named companies are not agents of IBM Inc.

PERSONAL COMPUTER WORLD BINDERS



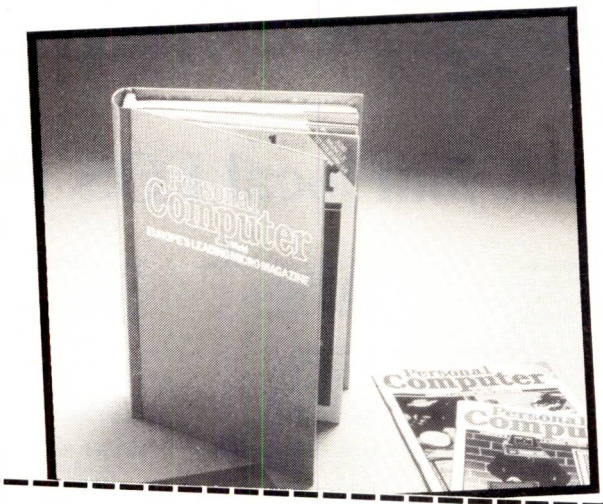
AN EXPANDING BUSINESS!

We heard you!! The size of *Personal Computer World* has been growing at such a rate that our Mark II binders just couldn't keep pace. Twelve issues used to fit very comfortably into a binder, but now it's too much of a squeeze.

Enter our Mark III binder. Bigger and stronger. We've widened the spine to allow twelve issues room to breathe. We've added strength to the back of the binder to carry the additional weight. And we've done it without resorting to the metal rod system of binding magazines . . . a system which causes problems if the rods bend.

PCW Mk. III binders are still attractively bound with the logos of the magazine printed in gold on the front and spine. They keep your back issues of *PCW* in pristine condition and discourage other persons from 'borrowing' your copies. They lie completely flat, even when full, to allow ease of reading and reference. And they come mailed to you in a specially designed protective pack to guard against any over-enthusiasm on the part of the Post Office delivery system.

All in all, they represent exceptional value at £3.95. (A price below that charged by many competing magazines. Indeed, we know of several organisations who keep *all* their back issues of computing magazines in *PCW* binders because of their sturdy construction and their value for money. This is not a practise we can formally condone, but it's flattering nonetheless.) The price covers all postage, VAT and handling. Use the coupon below, or if you do not wish to deface your copy of *PCW*, send your order with remittance clearly written to the address indicated.



Please rush me..... *PCW* Mk III binders at £3.95 each. I enclose a cheque/ PO for £.....

Name.....

Address.....

.....

.....

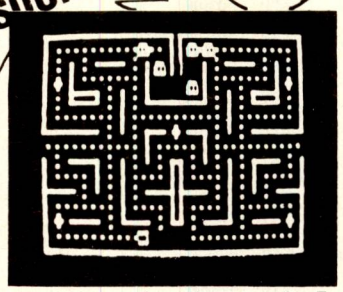
Cheques should be made payable to *Personal Computer World*. Send this coupon to *Personal Computer World*, 53/55 Frith Street, London W1A 2MG

GHOST GOBBLERS! YUGDAB FIGHTERS!

2 GREAT NEW ARCADE GAMES FOR YOU

NEW! From Cornsoft

Scarfman WITH SOUND!!



America's latest Arcade craze. Its Eat or be Eaten. You control SCARFMAN around the maze, gobbling up everything in your path. You attempt to eat it all before the monsters devour you.

Available from your local dealer or **£11.95**

BOTH GAMES CAN BE PLAYED WITH OR WITHOUT THE MICRODEAL JOYSTICK

SEND FOR DETAILS

Both Games Tandy Model 1 or 3 Level 2 and Video Genie Cassette 16K

SPECIAL OFFER

Both Games for Just £22

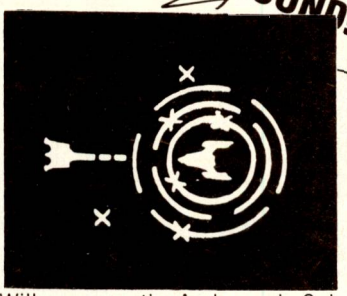
Both Games + Microdeal Joystick £40

Prices include V.A.T. & Postage

See us at the PCW show on Stand 280

NEW! From Cornsoft

Space Castle WITH SOUND!!



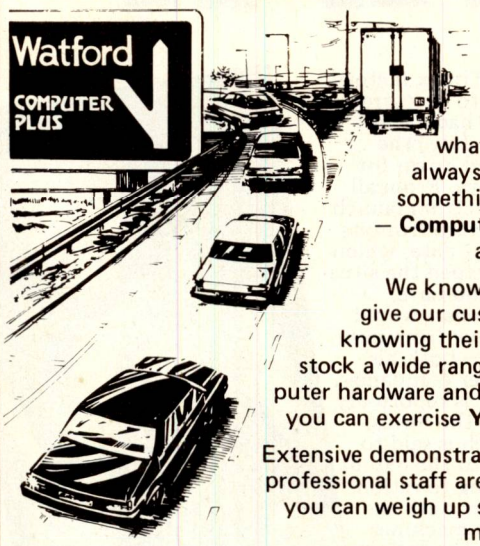
Will you save the Andromeda Galaxy by destroying the space castle or will the evil warlord Yugdab continue to rule unmolested? Locked in battle with Yugdab your main defence is your ability to skillfully handle your ship. **£11.95**

MICRODEAL

DEAL HOUSE, BRIDGES, BODMIN
CORNWALL PL30 5EF TEL: 0726 850821
DEALER ENQUIRES WELCOME

Access WE WELCOME ACCESS

Turn to Computer Plus



If you're used to the kind of dealer who rarely has exactly what you need, but is always ready to sell you something nearly as good — **Computer Plus** will make a pleasant change.

We know our business and give our customers credit for knowing theirs. That's why we stock a wide range of leading computer hardware and software, so that you can exercise **YOUR** judgement.

Extensive demonstration facilities and professional staff are on hand, so that you can weigh up specifications and make comparisons.

We have excellent sales back up service and credit facilities for our customers.

When you turn to **Computer Plus** you can be sure you have taken a turn in the right direction.

COMPUTER PLUS, 47 QUEENS ROAD, WATFORD
TELEPHONE: WATFORD 33927

EVERYTHING SPECTRUM OFFER ON PAGES 4/5... PLUS

SHARP

We have in stock the full range listed by Spectrum.

PLUS The MZ 80B and a full range of peripherals.

APPLE

Apple II and III Computer Systems in stock and we are an authorised Service Centre for Apple.

PLUS We are an appointed dealer for Jarman Business Systems.

NASCOM

	EXC VAT	INC VAT
Nascom 2 (kit) No user RAM	£225.00	**£258.75**
Nascom 2 (built) No user RAM	£285.00	**£327.75**
Nascom Power Supply (kit)	£35.00	**£40.25**
Nascom Micro-ed 8K Computer	£399.00	**£458.85**
Nascom "Special Edition" 8K Computer	£429.95	**£494.44**
Nascom 3 48K Computer	£499.00	**£573.85**
Nascom RAM B 16K Board (kit)	£80.00	**£92.00**
Nascom RAM B 16K Board (built)	£100.00	**£115.00**
Additional 16K RAM	£15.00	**£17.25**
Additional 32K RAM	£30.00	**£34.50**
48K Add-on Memory Board for "Special Edition"	£130.00	**£149.50**
I/O Board (kit)	£45.00	**£51.75**
PIO Option	£12.00	**£13.80**
CTC Option	£14.00	**£16.10**
UART Option	£16.00	**£18.40**
Nascom Single Disk Drive inc FDC Card	£470.00	**£540.50**

STOP PRESS!

Scoop purchase of manufacturers final stock.

NASCOM IMP Printer complete with 'IMPRINT' ROM.

Previously £325 plus VAT.

Now £199.95 exc. VAT.

£229.95 inc. VAT.

SRS THE SYMBOL OF VALUE

SRS MICROSYSTEMS

94 The Parade, High Street, Watford, Herts.
Telephone (0923) 26602.

YOU'LL VALUE OUR EXPERIENCE, YOU'LL VALUE OUR PRICES. FREE SECURICOR DELIVERY OR POST ON ORDERS OVER £50

Keen prices and knowledgeable staff have created a need for bigger and better new premises in Watford. Access & Barclaycard welcome. Hire purchase and part exchange available. E. & O.E.

NEW LARGER PREMISES

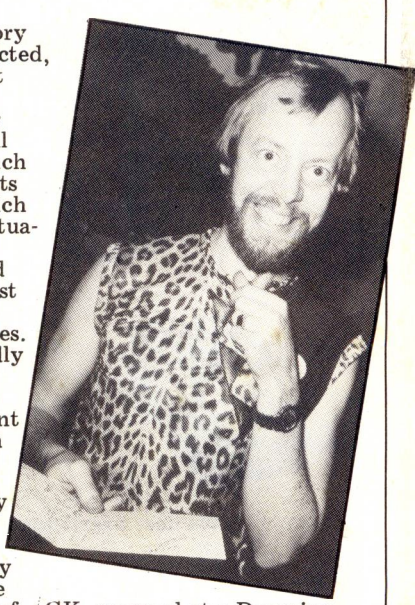
ADVERTISERS INDEX

ACT	39,56,57	Computex Cases	63	Jupiter	239	Pebbleglow	263
Acorn	55,122	Comshare	223	Kansas	256	Personal Computers	OBC
Acornsoft	73	Consup	245	Keen	20	Pete & Pam	43,225
Adda	38	Crisalid	250	Kempston	132	Phoenix	278
Addison Wesley	227	Crofton	251	Knights TV	242	Pinewood	249
Algray	145	Crown	252	Kuma	25	Pinner Wordpro	144
Allrian	144	Cumana	237	L&J	134	Popular Comp Weekly	266
Almarc	34	DDP Research	190	LSI	6,7	Power Testing	238
Ambit	253	DRG Business Machines	279	Leicester Comp Centre	138	Prentice Hall	60
Anglo American	29	Data Efficiency	67,69,88	Lifeboat	31	Prospero Software	257
Apple Orchard	136	Datalink	28	Linsac	260	Rabbit Software	22
Applied Systems Knowledge	272	Datarite	222	Lion TV	134	Raven Computers	240
Appropriate Technology	182	Dataview	241	Logic	260	Riva Terminals	192
Arborcraft	247	Davinci	238	Logica	246	roadrunner	258
Artic	252	Deans	271	London Comp Centre	233	SBD	245,247
Asolv	235	Digico	236	Lowe	27,42,46,47,219	SRS	286
Atari	33	Digitek	79	MPI	61	Sharp	74,75
Atlanta	248	Digitus	1	McGraw Hill	255	Wilica Shop	176
Audio Computers	IBC	Direct Data Marketing	272	Macronics	263	Sinclair	8,9
Autofile	220	Discom	251	Magnetic Media	280	Sirton	21
BFI	72	Diskwise	272	Map 80	262	Small Systems	259
B&H	128	Display	218	Maplin	44,45	Soft Option	140
Beebug	238	Dragon Data	40,41	Marian Electronics	254	Software Rental Bank	119
Binary Computers	275	Dyntech	254	Martpride	263	Sound Training	261
Brighton	138,261	EMG	166	Mass Micros	144	Spectrum	4,5
British Micros	70,71	EOS	284,285	Meares Training	260	Stage One	247
British Olivetti	48,49,254	Educare	248	Metrotech	268,269	Startech	24
Broadside	26	Eltec	264	Microage	228	Stirling	219
Bug-Byte	10,127	Envionrmental Equipment	229	Microcentre	IFC	Superiror Systems	168
Business &Leisure	253	Richard Francis	252	Microcomputer Applications	181	Swanley	240
Byte Shop	92	Fuller Micros	282	Microcomputers at Laskys	12,13	TDI Systems	62
CJE Micros	280	GB Computers	152	Micro 80	249	Tabs	171
CW/P	37	GM Microtronics	224	Microdeal	286	Tandy	179
Cambridge Comp Store	254	GW Computers	18,19	Microfirm	231	Tantus	244
Cambridge Learning	227	Gemini Marketing	32	Microgeneral	258	Technomatic	230
Cambridge Micros	261	Gemini Micros	97	Microl	14,15,15,17	Tempus	267
Cam-puters	114	General Northern	273	Micromark	262	Timedata	255
Caxton	86	Godfreys	240	Micro-Spares	270	Trader	242
Chromasonic	130	Grundy	76,77	Microtek	278	Transam	81
City Micros	270	Guestel	80	Micro Traffic	25	Transtec	226
Clio Press	244	HAL	271,273	Microvalue	66	Twickenham	257
Comart	111	Happy Memories	262	Microwriter	243	Ulster Management Centre	278
Commodore	11	Geoffrey Hoodless	265	Midwich	242	Vega Computers	281
Community	184	ICL	35	Millbank	256	Village Computers	266,283
Compshop	160	IO Research	248	Mini-Chips Ltd	276	Vincelord	30
Compsoft	103	IO Technology	112,113	Molimerx	52,53,54	Virgin Books	257
Computech	232	Inchico	36	Mountaindene	246	Ward Electronics	259
Computer Ancillaries	64,65	Independent Comp Eng	73	NEC	78	John Wiley	59
Computer Business Supplies	245	Intelligent Artefacts	250	NCC	94	Wordsmith	280
computer Concepts	251	Interface	46	Nashua Comp Products	227	X-Data	23
Computer Enterprises	234	Intertext	134	North Star	50	Xitan	58
The Computerist	273	Irvine	274	O'Brien	252		
Computer Interface Design	259	JRS Micros	256	Office Efficiency Machines	274		
Computer Peripherals	264	Jarman	114	Open Comp Services	90		
Computer Plus	286	Jarogatye	51	Padmede	68		
Computer Trade Forum	221	Juniper	250	Peachtree Software	187		

CHIP CHAT

CHIP CHAT CHIP CHAT CHIP CHAT CHIP CHAT CHIP CHAT CHIP CHAT

Heard about the ACT dealers who received packs of Sirius software from ACT itself? Nobody could read the disks — all they got were operating system error messages. When queried, ACT replied that the Post Office in Birmingham was using some machinery which demagnetised the disks. 'Not possible!' said some of the dealers. 'We called in and picked up ours personally.' 'Ah,' said ACT, 'you must have left them lying next to a telephone and let it ring for more than 12 rings — that would corrupt them.' It was then that a red-faced minion at ACT reported the real reason: somebody had sent out blank disks by mistake. . . How's this for a little co-incidence: Bonsai uses a media buying agency to fix up all its advertising space; the chap in charge of the Bonsai account is — Clive Sinclaire. Bet that causes some confusion. . . As most of you will by now have heard, *PCW* has been sold for the second time in its history. After turning down over two dozen offers in the last two years or so, publisher Felix Dennis finally made a deal with VNU (publishers of *Computing, Datalink* and *MicroIndecision*) and we've now all moved into vast and (comparatively) luxurious offices in Oxford Street, just around the corner from our old place. Meanwhile, the whole publishing industry is bursting with curiosity to find out just how much VNU paid for us — it's been kept a closely guarded secret. Now we hear that someone is offering an Osborne computer to the first person to name the exact price. Guesses in excess of £300 million are thought to stand little chance of winning. . . While the disgraceful situation over the BBC Model B computer continues (people still waiting after eight months, apparent lack of interest in providing customers with real information on the part of Acorn, BL Marketing and the BBC), another order backlog situation is rapidly developing with the Sinclair Spectrim. First the original batch had to be returned to the Timex factory for a small fault to be corrected, then the factory had a short strike, now (late July) the factory has closed down for its annual holidays. From all accounts the Spectrum launch was brought forward from its originally planned date, which wouldn't have helped the situation, but we would have thought that Sinclair would have learnt by now from past backlog horrors — both his and those of other companies. Another backlog is reportedly building up with the Sirius, demand for which is said to be phenomenal, to the extent that ACT is having to ration supplies to dealers until the rate at which the machines are shipped from the factory can be stepped up. . . For our photo treat this month we thought we'd destroy any fond illusions you may have concerning the appearance of our very own newshound Guy Kewney. The picture of him which appears at the top of 'Newsprint' is, in fact, of 'Bumper' Harris and the person you see here is the real



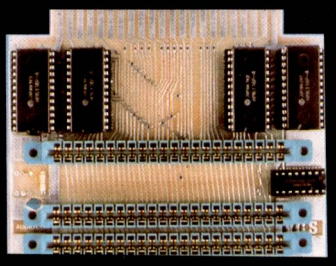
GK, snapped at a Downing Street 'Think Tank' session at which he was asked to advise on whether or not 'Uncle' Clive should receive a life peerage in the last New Year's Honours List.

MORE MEMORY FOR MICROS !

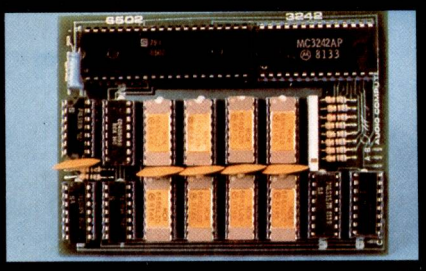
look at what we can offer :



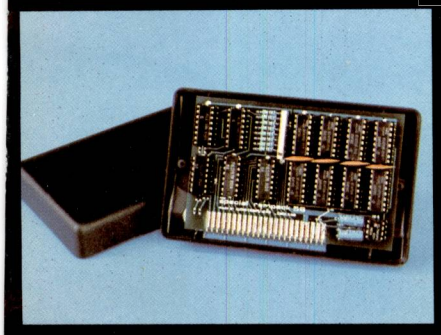
RAMPACKS
for SINCLAIR ZX81



VCS 8K for VIC
8k RAM + 3 slots **£44**

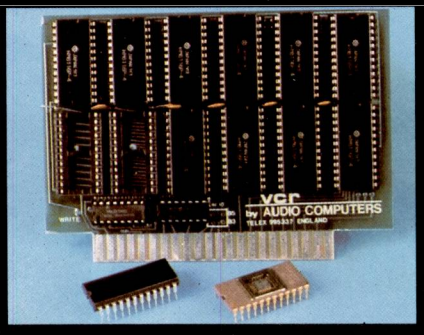


DUO1 for ATOM
64k RAM only **£70**



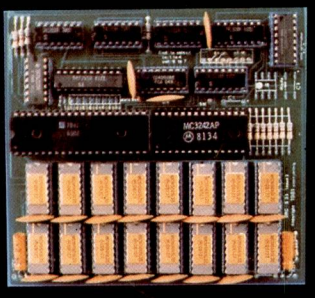
16K - the only upgradable to 56k on the market -

OUT OF STOCK

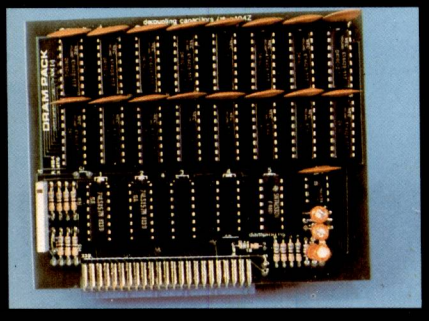


add up to 20k RAM + 16k ROM

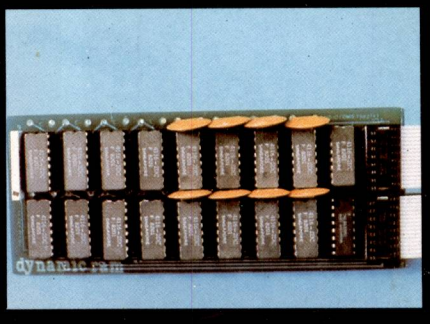
VCR 20 for VIC
4K - £24, 2k increment - £5



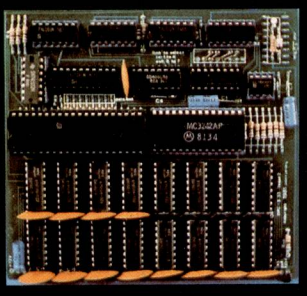
DRC for PET
64K - £80 128K - £130



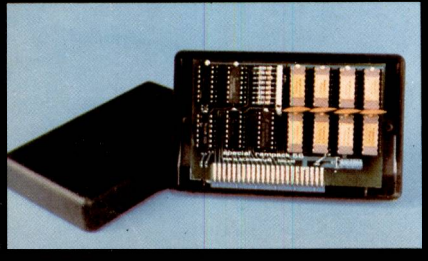
32K bytes - £29



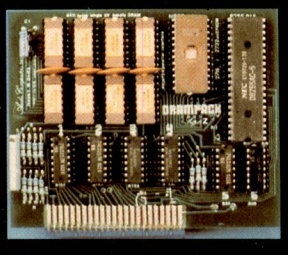
TRS80 - V.GENIE
32K add on RAM £46



UK101:
32K add on RAM **£69**



56K - exceptional low power consumption - **£44.90**



64K + Eprom programmer & user port - only £79

FOR A FREE BROCHURE, RING LINDA OR SUE ON SOUTHEND (0702) 613081
FOR CREDIT CARD ORDERS, RING JACKIE OR PAM ON SOUTHEND (0702) 618144

CHEQUES AND P.O.'s TO :

AUDIO-COMPUTERS

87 BOURNEMOUTH PARK ROAD,
SOUTHEND ON SEA - ESSEX SS5 2JJ

ALL PRICES INCLUDE V.A.T. AND POSTAGE

TELEX 995337 G AUDCOM

A TRADEMARK OF SOLIDISK LTD.

Our best add-ons come with a smile



The reason that Personal Computers Limit is the first and most professional comput company is not just the fact that we supply t best equipment and software around but v excel in technical support!

We believe that to use your system successfully certa intangibles are essential such as correct advice, helpf suggestions and perhaps most importantly, user suppor

Our highly trained staff will always be available to he you make your system work well for you . . . and alwa with a smile!!



Here are a few of our best complete personal computer systems;

- **BUSINESS ACCOUNTING SYSTEMS** including invoicing, sales, purchase and general ledger systems.
- **FINANCIAL PLANNING SYSTEMS** using the wel known Visicalc and Micromodeller programs.
- **WORD PROCESSING** – the Format 80 system is one of the cleverest programs available.
- **GRAPHICS SYSTEMS** – for producing pie charts, histograms and line charts – in full colour if necessary.
- **COMMUNICATIONS** – facilities allow Apple personal computers to communicate with Prestel, Dow Jones, other Apples and mini and mainframe computers.
- **PERSONAL COMPUTER NETWORKS** – A flexible distributed computer system allowing for the sharing of Data, Printers, Programs and storage.

Contact our offices now learn more about how a personal computer can work hard for you. Alternatively why not visit our showrooms at 218 & 220/226 Bishopsgate, London EC2M 4JS

Personal Computers

218 & 220/226 Bishopsgate, London EC2M 4JS Tel. 01 377 1200

LEASING & RENTAL TERMS AVAILABLE.