2/4/82

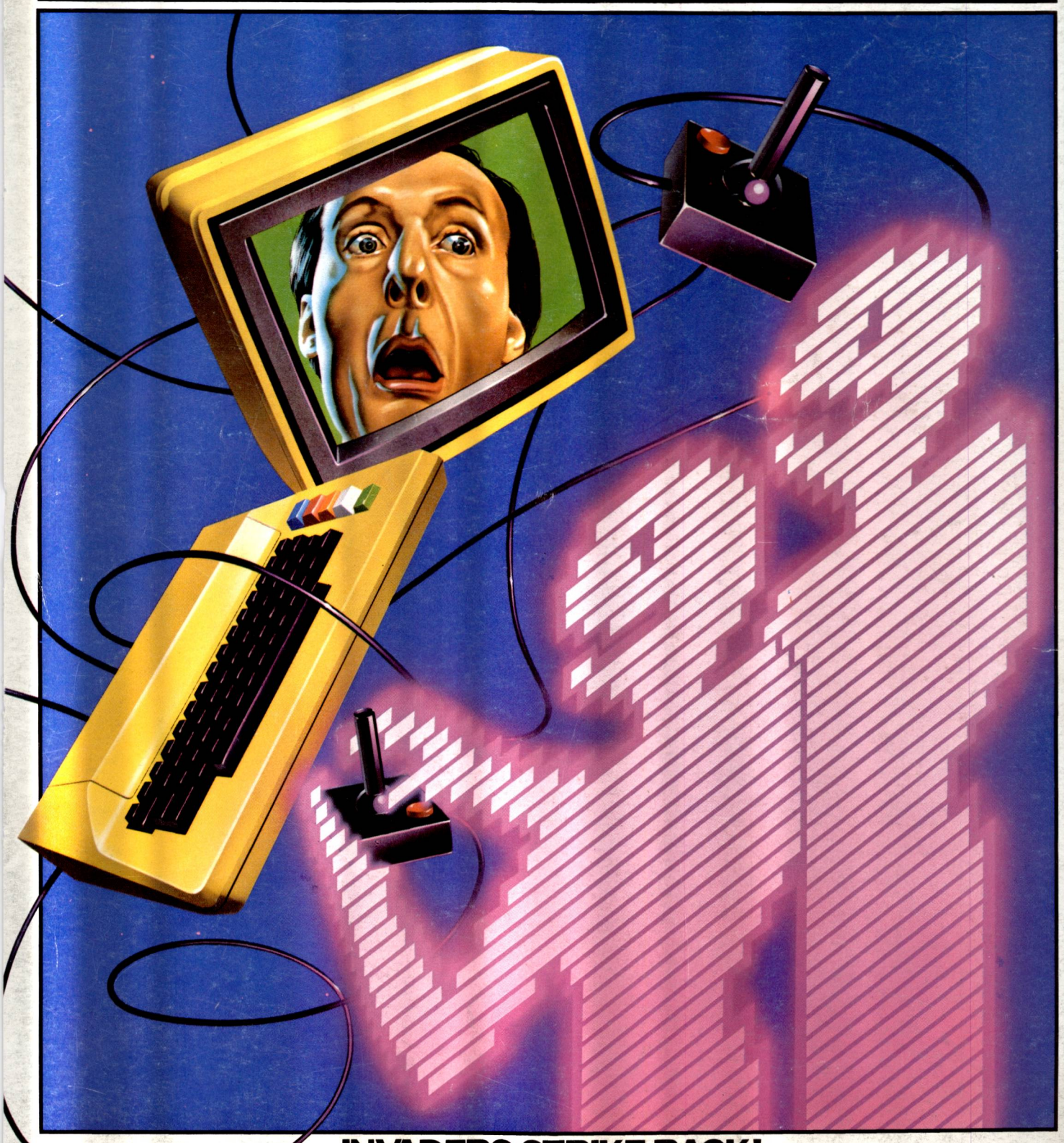
Personal Computer World

HP 125 AND TI 99/4A BENCHTESTED

Canada $2.75/US $2.00/FF 8.80/FL 4.00/SFr 7.20/IR £1.11/ BFr 87/SKr 13.55/DKr 21.00/Lire 3000/DM 5.50

March 1982 75p

BRITAIN'S LARGEST SELLING MICRO MAGAZINE



INVADERS STRIKE BACK!

New games series checks the state of play


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	☐ June 7	☐ Apr 19
Fundamentals of Programming in Basic	☐ June 8/9	☐ Apr 20/21
Improve your Basic	☐ June 10/11	☐ Apr 22/23
Wordstar Wordprocessing	☐ July 6	☐ May 11
Micro-Pro Software Tools	☐ July 7	☐ May 12
DataStar Information Management	☐ July 8	☐ May 13

Digitus

Company/address .....

.....

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

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

PCW

PCW

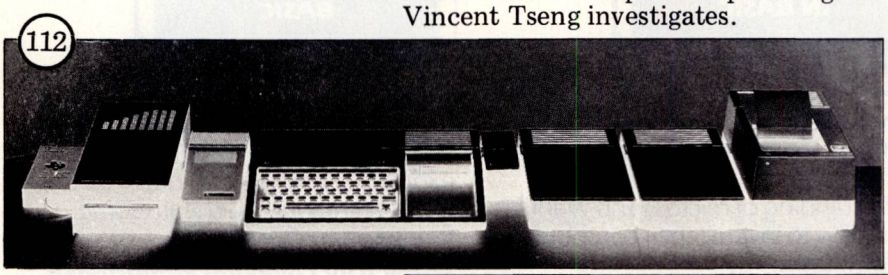
INSIDE PCW

BENCHTESTS

92 DATABASE BENCHTEST: DMS
Kathy Lang reviews Compsoft's DMS database package in its CP/M version.

108 HEWLETT-PACKARD HP-125
Dick Pountain tests HP's upmarket business micro and pronounces it very friendly.

112 TEXAS INSTRUMENTS 99/4A
TI has relaunched its home computer with some hardware improvements and a much more competitive price tag. Vincent Tseng investigates.





FEATURES AND SERIES

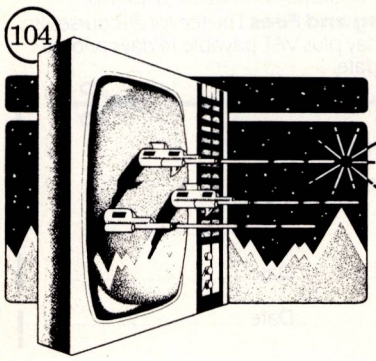
86 CHOOSING A DATABASE
As a prelude to our first package evaluation, Kathy Lang sets out the test criteria to be used in this series.

100 HIGH DENSITY VDU BOARD
Continuing last month's hardware construction feature with details of the driver software.

104 SCREEN PLAY
Dick Olney reviews games software for the TI99/4A. In future issues other popular home computers will be receiving the same attention.

123 FRAMES OF REFERENCE
Continuing Alan Wood's series which explains the facts of micro life to the DP fraternity. This month — how micros should be introduced into firms which already use mainframes, minis or timesharing.

155 PATTERNS
Alan Sutcliffe introduces a novel and powerful algorithm to solve the "hidden surfaces" problem in 3D graphics.





Founder Angelo Zgorelec; **Managing Editor** Dick Pountain; **Editor** Peter Rodwell; **Programs Editor** Maggie Burton; **Consultant Editor** David Tebbutt; **Sub Editor** Steve Mann; **Art Director** Paul Carpenter; **Art Editor** Phoebe Creswell-Evans; **Art Assistant** Nicky Reehal; **Art Production** Sava Kantretti; **Typesetting** Jane Hamnell, Patrick Dineen; **Advertisement Director** Stephen England; **Advertisement Manager** Patrick Dolan; **Assistant Advertisement Manager** Claire Fullerton; **Publicity/Press Relations** Penny Flood; **Production Manager** Stephen Rowe; **Advertisement Production** Vic Lime, Anna Williamson; **Advertisement Design** Kate Goode, Rick Gadsby.

Volume 5 No 3 March 1982



Cover illustration: Paul Allen

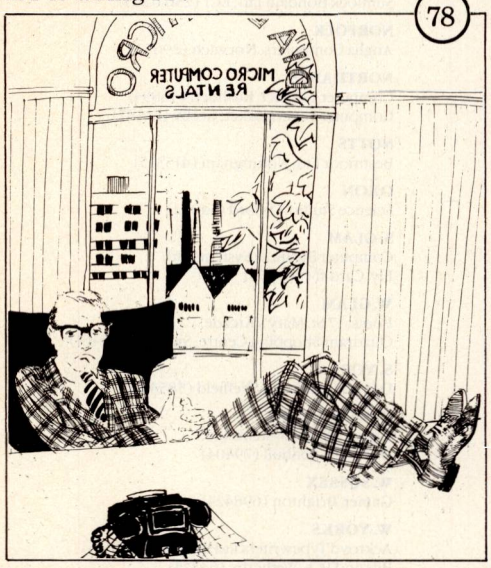
REGULARS

60 NEWSPRINT
All the micro computing news that's fit to print plus some that isn't; brought to you by Guy Kewney.

75 CTUK! NEWS
The latest news from Britain's own grass roots computer literacy movement — ComputerTown UK!

76 COMMUNICATIONS
Negative and positive feedback from *PCW*'s readers.

78 BANKS STATEMENT
Martin Banks muses on personal computer rental — why hasn't it taken off yet and what are the prospects for it doing so?



82 BOOKFARE
Malcom Peltu's round up of the latest computing books — climbing the DP career ladder, choosing a micro business system plus yet more beginners' guides to computing.

88 SUBSCRIPTIONS
How to get your *PCW* delivered to your door.

131 COMMONS REPORT
Ian Lloyd MP's occasional series on the politics of the microcomputer continues to discuss the implications of an electronic democracy.

133 CALCULATOR CORNER
Hewlett-Packard announces a new networking system for its programmable calculators and desktop computers, plus some powerful peripherals.

139 PCW SUBSET
More useful assembler subroutines for popular processors.

147 TJ's WORKSHOP
Terminal Junkies get their monthly hardware and software fixes here.

162 COMPUTER ANSWERS
Readers' queries answered by Sheridan Williams and his band of experts.

164 NEWCOMERS START HERE
Our quick intro for those new to computing.

165 DIRECT ACCESS
Packages, Transaction File, User Groups Index Update, Network News, Diary Data and CTUK! Centres.

177 LEISURE LINES
J J Clessa's latest brain teasers.

177 PROGRAMS
More readers' programs for popular machines.

191 BLUDNERS
Everyone makes mistakes but only *PCW* publicises them!

194 BACK ISSUES
Catch up with what you missed (if we haven't sold out of it).



255 CHIP CHAT
Industry gossip, slander, trivialities and other worthwhile activities.

Subscriptions Manager Alexandra James; **Subscription rates** UK: £10.00, Overseas: £17.00; **Address** 14 Rathbone Place, London W1P 1DE. Published by Sportscene Publishers (PCW) Ltd, 14 Rathbone Place, London W1P 1DE, England, Tel: 01-631 1433, (10am — 6pm); Telex: 8954139 BUNCH G London; Personal Computer World is published by Sportscene Publishers (PCW) Ltd. © 1982 Felden Productions. No material may be reproduced in whole or part without written consent from the copyright holders; Printed by Riverside Press, Whitstable. Distributed by Seymour Press, 334 Brixton Road, London SW9. Tel: 01-733 4444.

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

TRADER COMPUTERS

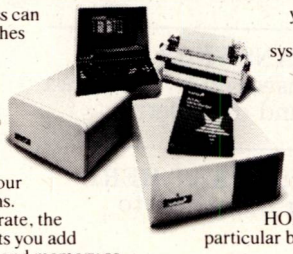
No business is too small for a NORTH STAR



The economical business computer that does it all.

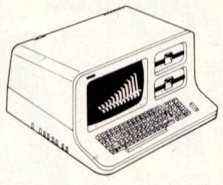
Even the smallest business can run into some big headaches when it comes to book-keeping, mailing lists, and word processing. That's why North Star developed the HORIZON® — the office computer system which offers the economical solution to your business systems problems.

Easy to install and operate, the North Star HORIZON lets you add programs, work stations, and memory as you need them. What's more, we back our systems with a worldwide sales and service network. Small wonder, then, that more than 28,000 HORIZONS are in operation around the world. To find out how the North Star HORIZON can meet your particular business systems needs, call us today.



HORIZON Computer	LIST PRICES
64k RAM 2-quad computer	£2000.00
2-double computer	£1897.44
64k 1-quad + 5Mb RMS	£3700.00
64k 1-quad + 10Mb RMS	£4100.00
64k 1-quad + 12Mb Rodime	£4000.00
4 x 64k + 18Mb HDS	£5128.21
32k dynamic RAM B/S board	£ 307.18
64k dynamic RAM B/S board	£ 563.39
4-serial I/O board	£ 178.97

ADVANTAGE: Integrated desk-top computer with 12 inch bit-mapped Graphics or character display, 64kb RAM, two quad-floppy disc drives and business graphics software.



	LIST PRICES
	£2050.77
	£ 153.33
	£ 153.33

1-port serial I/O board	£ 89.74
1-port parallel I/O board	£102.56
floating point board	£204.62

Trader Computers Ltd
65 Loudoun Road
London NW8 0DQ
Telephone 01-328 3484

HOME COMPUTER RETAILERS

BEDS
Computopia, Leighton Buzzard (376600)
Comserve, Bedford (216749)
Electron Systems (Sandy) Ltd, Sandy (81195)

BUCKS
Texas Instruments Ltd, Supply Division
Slough (75868)

CAMBRIDGESHIRE
Intelligent Artefacts
Orwell (0223 207689)

DERBY
Datron Micro Centre, Duckworth Square,
Derby DE1 1JZ, (0332 380085)

DEVON
JAD Ltd, Plymouth (29038)
Peter Scott (Exeter) Ltd, Exeter (9076842)

ESSEX
Boots, 177/185 High Road, Ilford (01-553-2116)
Maplin Electronic Suppliers,
Westcliff-on-Sea (554000)

HANTS
The Maths Box, Southampton (22958)
RDS, Portsmouth (812478)

HEREFORDSHIRE
Acoutape Sound, Bromyard (3280)

HERTS
Computer Centre (Watford) Ltd, Watford (40601)
Computer Plus, Watford (020449)

HUMBERSIDE
Radius Computers Ltd, Hull (227181)
Peter Tutty & Co, Hull (41458)

LEICS
Boots Company Ltd, Leicester (21641)

LONDON
Adda Computers Ltd, W8 (579-5845)
Eurocalc Ltd, EC2 (729-4555)
Landau Electronics Ltd, W1 (642-5986)
McDonald Stores, W1 (636-2877)
Mountaindene Ltd, NW11 (455-9823)
Selfridges, W1 (629-1234)
Sumlock Bondain Ltd, EC1 (250-0505)

NORFOLK
Anglia Computers, Norwich (29652)

NORTHANTS
Computer Contact, Rushden (56894)
Computer Supermarket, Corby (61587)

NOTTS
Bestmoor Ltd, Nottingham (415315)

OXON
Science Studio, Oxford (54022)

S. GLAM
Computer Business Systems Ltd,
Ely, Cardiff (562255)

W. GLAM
Boots, 17 St. Mary's Arcade,
Quadrant Shopping Centre, Swansea (43461)

S. YORKS
Datron Interform, Sheffield (585490)

W. MIDLANDS
Taylor Wilson Systems Ltd,
Dorridge, Solihull (79404)

W. SUSSEX
Gamer, Brighton (698424)

W. YORKS
Ackroyd Typewriters Ltd, Bradford (31835)
Bits and PCs, Wetherby (63744)

SCOTLAND
Esco, Glasgow (427-5497)
Robox Ltd, Glasgow (221-5401)
Texas Instruments Ltd, Supply Division,
Edinburgh (225-5132)

IRELAND
Texas Instruments Ltd,
Supply Division, Dublin (609222)

RUMBELOWS STORES STOCKING HOME COMPUTER

BEDS
Bedford (59339)
Dunstable (602618)
Arndale Centre, Luton (414480)

BUCKS
Bletchley (73505)
Central Milton Keynes (662120)

HERTS
Boreham Wood (953-1744)
Hatfield (64211)
Hemel Hempstead (53223)
Hitchin (59203)
Hoddesdon (66486)
Letchworth (71231)
Potters Bar (58804)
St Albans (532290)
Stevenage (54303)
Waltham Cross (22100)
Ware (2316)
Welwyn Garden City (27125)
Enfield, Middx. (363-7384)



The TI-99/4A The Home Computer worthy of the name.

Even if you're new to computers, you'll be using the TI-99/4A within minutes of plugging it into any standard TV set. Because the TI-99/4A is a true computer for the home. Immediately accessible to the whole family. All for around £340 or less.

Just snap in one of our wide selection of Solid State Software* Command Modules, touch a few keys, and you're ready to go. The 40 modules can sharpen your children's maths, teach you to win at chess or even help you with household financial decisions. And much more besides. In all, over 400 programs are available.

All enhanced by full music capability and 16-colour graphics.

Another development which sets the TI-99/4A apart from the rest, is our optional Solid State Speech* Synthesiser. Actually reproducing the human voice. With our new Emulator Command Module*, its vocabulary is unlimited.

For data input/output you can use an ordinary audio cassette recorder. And a full-size professional keyboard makes it easy to use.

The TI-99/4A comes with TI BASIC built in. Ideal for when you want to learn programming – and to get you started there's our "Beginner's Basic" course, free with each machine – yet powerful enough for even the most experienced programmer.

To help you get the most from the TI-99/4A you can join the independent users' club. And there's a special magazine ("99'er") available through dealers, or on subscription.

So, if you're looking for a home computer, you can't afford to miss the TI-99/4A for versatility, power and value for money.

- 16K RAM. Expandable to 48K.
- 26K ROM including 14K BASIC.
- Command Modules add up to 36K ROM.
- 13-digit floating point.
- Other languages soon – LOGO, UCSD PASCAL, TMS 9900 Assembler.
- Options – Speech Synthesiser, Thermal Printer, RS-232 Peripheral Adaptor, Disk Memory System.

To find your local dealer check the list on the left, or for more information write to Texas Instruments Ltd., (MS.24), Manton Lane, Bedford MK41 7PA.

TEXAS INSTRUMENTS
LIMITED

*Trademarks of Texas Instrum

ZX81 SOFTWARE FROM VIDEO SOFTWARE LTD 1K & 16K

16K SOFTWARE

VIDEO-PLAN (ZX81 only). Performs the functions of an analysis book. Arithmetic functions include addition, subtraction, multiplication. Printer optional.

VIDEO-AD. Rotating display of 16 pages of advertising material. Set-up your own pages and change them as and when required.

VIDEO-GRAPH. Planning and design aid. Create pictures/charts/graphs and store within the program. Save on cassette. Combine pictures like an 'identikit'.

VIDEO-VIEW. Do it yourself teletext. Create pages of data. Store them within the program. Save on cassette. View on demand.

VIDEO-MAP. (ZX81 only). Educational game based on maps. Navigate your plane to its destination. Bomb the target and return to base.

FORCE-FIELD. (ZX81 only). Animated bombardment game. You control the force-field which protects your city against hostile UFOs.

SPACE-RACE. (ZX81 only). Party game for eight players. Rockets race to build stations in space. Winners gradually take over losers until only one winner remains.

FOOTBALL-LEAGUE. Realistic simulation of an entire season. Every match played and results shown with progressive league table. You give teams ratings for skill, effort, etc.

TEST-MATCH. Realistic simulation of a test match series. Dynamic scoreboard. Give each player your own ratings for skills, technique, etc.

STOCK-MARKET. (ZX81 only). An exciting game of skill and judgement. Buy and sell stocks and shares as prices change in response to world events.

VIDEO-SKETCH. (ZX81 only). Move the cursor to any part of the screen. Draw or rub-out as you move it. Mix in text or graphics. Save picture in memory. Save picture sequence on cassette.

1K PARTY TRICKS (ZX81 only) NEW! NEW!

If you don't have a 16K RAM this set of programs is for you. Ten separate programs — some games, some more serious. All completely original, all ten programs included in the price.

SHOOT	Take the penalty and watch the goalie try to save.
SKETCH	Draw an almost full screen picture and save on cassette.
NAME THE DAY	Give the date, the ZX81 names the day of the week.
TRAIN	For the very young who would like to drive a train.
ONGER-WONGER	Watch the ZX81 draw its own pictures and yours.
WEATHER	An endless variety of completely inaccurate weather forecasts.
UFO	Shoot down the UFO before he gets you.
WHO SHOT JR	An intriguing test of your powers of detection.
FIELD-GUN	Can you hit the target.
FOLLOW THAT	Follow the path traced by the ZX81.

NOTE: These programs are not suitable for ZX80.

*** OUR NEW SOFTWARE SCHEME ***

SUPPORTED SOFTWARE. This is software written for the ZX81 by named authors and approved and marketed by ourselves. The main criterion for selection is that the quality of the program matches our existing products. These programs are fully supported by ourselves. Watch out for some very interesting products in the near future.

NEWS FOR USERS

Those of you who have already voted with your cheque books may be interested in our 'top ten'. These are the best sellers in November:

1. VIDEO-MAP
2. VIDEO-PLAN
3. VIDEO-VIEW
4. VIDEO-AD
5. VIDEO-GRAPH
6. FORCE-FIELD
7. STOCK-MARKET
8. PARTY TRICKS No. 1
9. FOOTBALL-LEAGUE
10. TEST-MATCH

Surprisingly some of the programs which we rate most highly are well down the list.

We expect our 1K programs to top this list soon. They are worth buying even if you have 16K.

PRICE LIST

ORDER CODE	*Manual*	*Std.*	*Lux*
SKETCH 81	—	7.95	9.95
PLAN 81	—	7.95	9.95
AD 81	—	7.95	9.95
GRAPH 81	—	5.95	7.95
VIEW 81	—	5.95	7.95
MAP 81	—	5.95	7.95
FORCE	—	3.95	5.95
SPACE	—	3.95	5.95
FOOT	—	3.95	5.95
TEST	—	3.95	5.95
STOCK	—	3.95	5.95
PARTY 1	1.95	4.95	6.95
PACK 1 (Plan + Ad)	—	—	17.95
PACK 2 (View + Graph)	—	—	13.95
GAMESET (Map + 5 Games)	—	—	19.95

Prices include VAT.
Mail order customers add £1.00 per order. (50p for manual only). Allow 28 days for delivery.

Std = cassette & manual. Lux = de luxe boxed sets.

STONE LANE, KINVER, STOURBRIDGE, WEST MIDLANDS, DY7 6EQ, ENGLAND.

Tel : KINVER 2462.
Std. 038-483-2462.

VIDEO SOFTWARE LIMITED

Directors : P. Smith, B.A., D. J. Smith *(Director and Secretary)*. Registered Number : 1085829 England. V.A.T. Reg. No. 278 0603 51

Personal callers welcome during office hours.
Send s.a.e. for further details.

Code	M/S/L	Qty.	Price	Total
P. & P.				

ORDER FORM

See above for codes

Your cheque no. .....

NAME .....

ADDRESS .....

.....

PCW/MARCH .....

MICROCOMPUTERS AT LASKYS

PRICES FEBRUARY/MARCH 1982

10 Shops Nationwide

OPEN 6 DAYS A WEEK 9 – 5.
THURSDAYS 9 – 6.

Birmingham

19/21 Corporation Street, Birmingham, B2 4LP.
Tel: 021-632 6303. Manager: Peter Stallard.
300 yards from Bullring Centre.

Manchester

12/14 St. Mary's Gate, Market Street,
Manchester, M1 1PX. Tel: 061-832 6087.
Manager: Lesly Jacobs. Corner of Deansgate.

Bristol

16/20 Penn Street, Bristol, BS1 3AN.
Tel: 0272 20421. Manager: Steve Heynes.
Between Holiday Inn and C & A.

Glasgow

22/24 West Nile Street, Glasgow, G7 2PF.
Tel: 041-226 3349. Manager: David Livingstone.
Between Buchannan Street and Central Station.

Chester

The Forum, Northgate Street, Chester, CH1 2BZ.
Tel: 0244 317667.
Manager: Jeremy Ashcroft. Next to the Town Hall.

Sheffield

58 Leopold Street, Sheffield, S1 2GZ.
Tel: 0742 750971. Manager: Justin Rowles.
Top of the Moor, opposite Town Hall.

Edinburgh

4 St. James Centre, Edinburgh, EH1 3SR.
Tel: 031-556 6217. Manager: Colin Draper.
East end of Princes Street, St. James Centre.

Liverpool

33 Dale Street, Liverpool, L2 2HF.
Tel: 051-236 2828. Manager: Mark Butler.
Between the Town Hall and Magistrates Courts.

Preston

1/4 Guildhall Arcade, Preston, PR1 1HR.
Tel: 0772 59264.
Manager: Jim Comisky. Directly under Guild Hall.

London

42 Tottenham Court Road, London, W1 9RD.
Tel: 01-636 0845.
Manager: Vass Demosthenis.

If we don't have a shop near you, contact our Head Office on 051-227 2535 for advice!

Terms & Conditions

Our Conditions of Business
In addition to cash we accept Access, Barclaycard, Stereo Club, American Express, Diners Club and cheques covered by a bankers card.
Official orders welcome – please contact your nearest Laskys store.
All previous **Laskys** Advertisements are superseded by this. Not all stores carry every advertised item.
Prices correct at time of going to press. E. & O.E.

A Better Guarantee
The products are warranted against defects in material and workmanship for a period of one year from the date of purchase, two years for Apple and Sharp products.
During the warranty period, the company will repair (or at its own option, replace) at no charge, components that prove defective. This is provided the product is returned, shipping prepaid, or by person, stating when it was bought and enclosing proof of purchase.
This warranty does not apply if, in the opinion of the company, the product has been damaged by accident, misuse or misapplication.

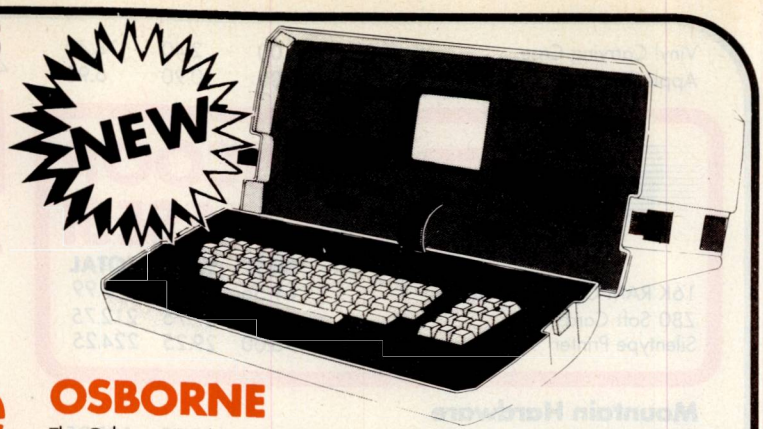
Laskys Stereoclub
– the handy way to buy, from Laskys. Multiply your monthly payment by 24 to find out your credit limit. For instance, for the minimum monthly payment of £5 you would get credit up to £120. In some cases you may be able to get instant credit by paying a deposit of 10% of a purchase price. Current Stereoclub interest rate is 2.75% monthly – equivalent to an APR of **38.5%.** Rates may vary.
If you pay by Bankers' Order, apart from the extra convenience, you'll enjoy a LOWER INTEREST RATE – currently 2.45% monthly, equivalent to an APR of **33.7%.**
As a Stereoclub member we'll send you regular news and literature from Laskys. Laskys Stereoclub is probably the best thing that's happened to Microcomputers since the invention of the chip!

Head Office
Accounts and administration are at:
Microcomputers at Laskys, 14 Castle Street, Liverpool L2 0TA. Telephone 051-227 2535.

BARCLAYCARD VISA · Access · LASKYS STEREOCLUB · AMERICAN EXPRESS · DINERS CLUB INTERNATIONAL · CRA

Laskys, the retail division of the Ladbroke Group of Companies

MICROCOMPUTERS AT LASKYS



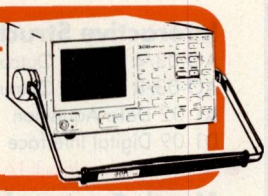
OSBORNE

The Osborne 1 is a new concept in microcomputing – selling at a price of £1,250. This includes £800 worth of software, comprising CP/M, MBASIC, CBASIC, Supercalc and Wordstar/Mailmerge. The machine itself is based on a Z80 microprocessor with 64 KBytes of RAM as standard. The twin built-in floppy disk drives afford 100K of storage each. RS232 and IEEE ports are both incorporated. The 5" screen acts as a window of 52 x 24 characters onto a background of 128 x 32. An external full size monitor may be plugged in.

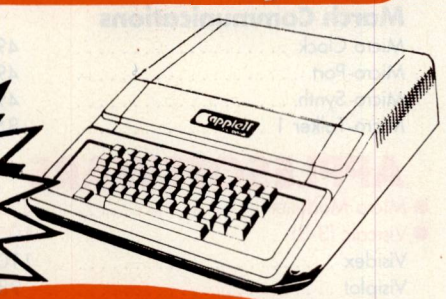
	NETT	V.A.T.	TOTAL
Osborne 1 Computer	1250.00	187.50	1437.50
Osborne 12" monitor	165.00	24.75	189.75

THE UNIQUE LASKYS SERVICE –

Faulty products can be returned to any Laskys store in the U.K., and be repaired by experienced technicians in one of our 6 Nationwide Service Centres.



2 year parts and labour guarantee on all Apple products supplied by LASKYS



Apple II + 48K
Nett 685.00 · V.A.T. 102.75 · Total 787.75

APPLE

	NETT	V.A.T.	TOTAL
Apple III Information Analyst.	2695.00	404.25	3099.25
Disk III	385.00	57.75	442.75
Silentype III	222.00	33.30	255.30
B/W Modulator	13.90	2.09	15.99
● Disk Drive Plus Controller (3.3)	375.00	56.25	431.25
● Disk Drive	295.00	44.25	339.2'
DOS 3.3 Upgrade	39.00	5.85	44.85
Autostart Rom Pack	33.00	4.95	37.95
Graphics Tablet	485.00	72.75	557.75
Apple Tel System	575.00	86.25	661.25
Pascal Language System	245.00	36.75	281.75
Applesoft Firmware Card	95.00	14.25	109.25
Integer Card	95.00	14.25	109.25
Language Card	97.50	14.63	112.13
Apple Pilot	79.00	11.85	90.85
Apple Fortran	105.00	15.75	120.75
Apple Prototype/Hobby Card	12.00	1.80	13.80
Vero Prototype/Hobby Card	10.00	1.50	11.50
Parallel Printer Interface Card	87.50	13.13	100.63
Communications Card	103.00	15.45	118.45
High Speed Serial Interface Card	94.75	14.21	108.96
Centronics Card	103.00	15.45	118.45
Controller Card	100.00	15.00	115.00
● Eurocolour Card	69.00	10.35	79.35
IEEE 488 Interface	230.00	34.50	264.50
Thermal Paper for Silentype	2.75	0.41	3.16

Vinyl Carrying Case	16.00	2.40	18.40
Apple Ties	6.00	0.90	6.90

apple® SCOOP PURCHASES!

	NETT	V.A.T.	TOTAL
16K RAM Card (48K-64K)	69.56	10.43	79.99
Z80 Soft Card	185.00	27.75	212.75
Silentype Printer	195.00	29.25	224.25

Mountain Hardware

Clock/Calendar	173.00	25.95	198.95
Supertalker	185.00	27.75	212.75
Romplus + Keyboard Filter	127.00	19.05	146.05
Rom Writer	105.00	15.75	120.75
Music System Complete	330.00	49.50	379.50
Copyplus Rom	34.00	5.10	39.10
AD + DA 16 Channel	210.00	31.50	241.50
● CPS Card	160.00	24.00	184.00

Other Items

● Omnivision	185.00	27.75	212.75

Interactive Structures

AO-03/4 Analog Output 4 Chan	195.00	29.25	224.25
AO-03/8 Analog Output 8 Chan	299.00	44.85	343.85
A1-02 Data Aquisition	210.00	31.50	241.50
D1-09 Digital Interface	235.00	32.25	270.25
● A1-13 Analog Input 16 Chan	395.00	59.25	454.25

March Communications

Micro Clock	49.95	7.49	57.44
Micro-Port	49.95	7.49	57.44
Micro-Synth.	49.95	7.49	57.44
Micro-Talker 1	85.00	12.75	97.75

APPLESOFTWARE

● Micro Modeller	425.00	63.75	488.75
● Visicalc (3-3)	105.00	15.75	120.75
Visidex	110.00	16.50	126.50
Visiplot	98.00	14.70	112.70
Visi Trend/Plot	140.00	21.00	161.00
Visi Term	82.00	12.30	94.30
Desktop Plan II	110.00	16.50	126.50
CCA Datamanagement	56.00	8.40	64.40
● D.B. Master V.2.4.	105.00	15.75	120.75

Word Processing

Apple Writer	39.00	5.85	44.85
Magic Window Text Editor	49.00	7.35	56.35
Easywriter (80 Col.)	155.00	23.25	178.25
Mailmerge (80 Col.)	68.50	10.28	78.78
Easywriter (40 Col.)	51.30	7.70	59.00
The Address Book	27.00	4.05	31.05

Games/Aids

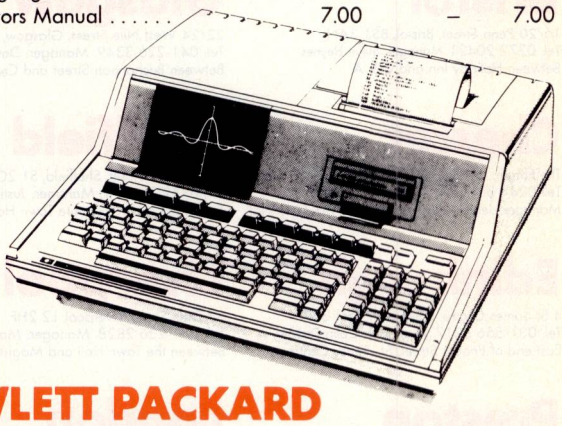
Animation Pac	31.00	4.65	35.65
Saturn Navigator	15.00	2.25	17.25
Higher Graphics II	20.50	3.08	23.58
Higher Text	20.50	3.08	23.58
3D Super Graphics	22.25	3.34	25.59
Apple World	33.00	4.95	37.95
Memory Management System	25.25	3.79	29.04
Alien Rain/Typhoon	15.43	2.32	17.75
Sneakers	16.30	2.45	18.75
● Gorgon	16.30	2.45	18.75
Galaxy Wars	14.28	2.14	16.42
Raster Blaster	16.30	2.45	18.75
A.B.M.	15.22	2.28	17.50
Falcons	16.30	2.45	18.75
Pegasus II	17.17	2.58	19.75
Space Raiders	16.30	2.45	18.75
Mychess	23.00	3.45	26.45

Laskys, the retail division of the Ladbroke Group of Companies

MICROCOMPUTERS AT LASKYS

APPLE BOOKS

	NETT	V.A.T.	TOTAL
Apple II Reference Manual	11.00	–	11.00
6502 Hardware Manual	9.00	–	9.00
6502 Software Manual	9.00	–	9.00
Apple II Basic Program Manual	6.00	–	6.00
Applesoft II Reference Manual	6.00	–	6.00
DOS 3.2 Manual	6.00	–	6.00
Apple II Basic Tutorial Manual	6.00	–	6.00
Pascal Reference Manual	8.50	–	8.50
Autostart ROM Manual	4.50	–	4.50
Fortran Reference Manual	12.00	–	12.00
Pascal Reference Manual	9.00	–	9.00
Pascal Operating Manual	11.50	–	11.50
Graphics Tablet Manual	5.00	–	5.00
Silentype Manual	3.00	–	3.00
DOS 3.3 Manual	5.00	–	5.00
Pilot Language Reference Manual	9.00	–	9.00
Pilot Editors Manual	7.00	–	7.00



HEWLETT PACKARD

HP-80 Series Mainframes

	NETT	V.A.T.	TOTAL
HP-83 Computer	1486.35	222.95	1709.30
HP-85 Computer	1816.52	272.48	2089.00
16K Memory Module	164.35	24.65	189.00
ROM Drawer	29.73	4.46	34.19

ROMS

Mass Storage ROM	98.19	14.73	112.92
Plotter/Printer ROM	98.19	14.73	112.92
Input/Output ROM	199.77	29.97	229.74
Matrix ROM	98.19	14.73	112.92
● New Advanced Programming ROM	98.19	14.73	112.92
Assembler ROM	199.77	29.97	229.74

Interfaces & Accessories

HP-IB	260.94	39.14	300.08
RS232 Serial Int.	260.94	39.14	300.08
GP-IO	335.21	50.28	385.49
BCD	335.21	50.28	385.49
Parallel Printer Int.	199.77	29.97	229.74
HP-IB 1/2 metre cable	47.00	7.05	54.05
HP-IB 1 metre cable	47.00	7.05	54.05
HP-IB 2 metre cable	50.00	7.50	57.50
HP-IB 4 metre cable	57.00	8.55	65.55

Plotter & Accessories

Plotter	1619.00	242.85	1861.85
Personality Module	496.00	74.40	570.40
Overhead Transp. Kit	83.00	12.45	95.45
Digitizing Sight	27.60	4.14	31.74
Vinyl Carrying Case	151.80	22.77	174.57
100 sheets Engl.	4.83	0.72	5.55

MICROCOMPUTERS AT LASKYS

MICROCOMPUTERS AT LASKYS

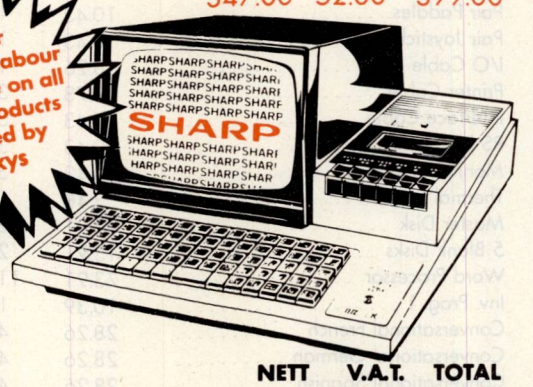
100 sheets Metric	4.83	0.72	5.55
50 sheets blank (E.F.)	2.76	0.41	3.17
50 sheets blank (A4)	2.76	0.41	3.17
4 Colour pen pack	4.49	0.67	5.16
5 red pens	4.49	0.67	5.16
5 blue pens	4.49	0.67	5.16
5 green pens	4.49	0.67	5.16
5 black pens	4.49	0.67	5.16
100 Transp. films	18.48	2.77	21.25
Transp. Solvent	2.76	0.41	3.17
Transp. Pens (B,R,B,G,)	5.87	0.88	6.75
Transp. Pens (B,O,B,V,)	5.87	0.88	6.75
Transp. Pens wide (B,R,B,G)	5.87	0.88	6.75
Transp. Pens wide (B,O,B,V)	5.87	0.88	6.75
Printers & Accessories			
Printer Impact	637.81	95.67	733.48
Printer Line	2611.00	391.65	3002.65
Printer Stand	227.00	34.05	261.05
Sound Abatement Cover	69.00	10.35	79.35
Wire Paper Basket	35.00	5.25	40.25
Printer Ribbon – Pack of 2	43.00	6.45	49.45
Printer Ribbon – Pack of 2	26.00	3.90	29.90
Print Head	37.50	5.63	43.13
Additional Accessories			
Tape Cartridge (Pack of 5)	64.50	9.68	74.18
Thermal Paper Blue (Box of 2)	20.32	3.05	23.37
Thermal Paper Black (Box of 6)	60.95	9.14	70.09
Cartridges and Manual holder	6.77	1.02	7.79
HP83/85 Carrying Case	81.26	12.19	93.45
3-ring lit. binder	6.77	1.02	7.79
Dust Cover	10.16	1.52	11.68
Manuals			
Owners Manual HP83/85	17.25	–	17.25
Pocket Guide	3.45	–	3.45
Mass Storage ROM Manual	6.90	–	6.90
Plotter/Printer ROM Manual	6.90	–	6.90
I/O ROM Manual	20.70	–	20.70
Matrix ROM Manual	6.90	–	6.90
Assembler ROM Manual	13.80	–	13.80
Flexible Disc Operating Manual	3.45	–	3.45
HP-IB	6.90	–	6.90
Serial Installation Manual	6.90	–	6.90
GP/IO Manual	6.90	–	6.90
B.C.D. Manual	6.90	–	6.90
Parallel Printer Manual	6.90	–	6.90
Application packs			
Standard Pack	64.33	9.65	73.98
Basic Training	64.33	9.65	73.98
General Statistics	64.33	9.65	73.98
Finance	64.33	9.65	73.98
Math	64.33	9.65	73.98
Circuit Analysis	64.33	9.65	73.98
Games	64.33	9.65	73.98
Linear Programming	64.33	9.65	73.98
Text Editing	64.33	9.65	73.98
Wave Form Analysis	64.33	9.65	73.98
Basic Stat. & Data	64.33	9.65	73.98
Regression Analysis	64.33	9.65	73.98
Graphics Presentation	135.44	20.31	155.75
VisiCalc Plus	135.44	20.31	155.75
Surveying	135.44	20.31	155.75
Flexible Disc Unit			
Dual Master (540K Bytes) 5¼ Disk	1693.00	253.95	1946.95
Dual Add-On (540K bytes) 5¼ Disk	1489.84	223.48	1713.32
Single Master (270K bytes) 5¼ Disk	1015.80	152.37	1168.17
Single Add-On (270K bytes) 5¼" Disk	858.78	128.82	987.60
Dual Master (2400K bytes) 8" Disk	4515.00	677.25	5192.25
Dual Add-On (2400K bytes) 8" Disk	3821.00	573.15	4394.15
Single Master (1200K bytes) 8" Disk	3299.00	494.85	3793.85
Single Add-On (1200K bytes) 8" Disk	2605.00	390.75	2995.75
Flexible Disk 5¼ (Pack of 10)	50.50	7.76	58.08
Flexible Disk 8" (Pack of 10)	71.50	10.73	82.23
Graphics Tablet	1355.00	203.25	1558.25

MZ-80K SPECIAL OFFER!

A proper full size microcomputer for less than the real cost of a toy microcomputer. The Sharp comes with **48k** of RAM and the screen and cassette are built in, instead of being expensive extras.

Nett	VAT	Total
347.00	52.00	399.00

2 year parts and labour guarantee on all Sharp products supplied by Laskys



SHARP

PC 1211	NETT	V.A.T.	TOTAL
● PC1211 Pocket Computer	69.52	10.43	79.95
CE121 Cassette Interface	11.00	1.65	12.65
CE122 Printer/Cassette Interface	60.86	9.13	69.99
CSR 700 Paper Rolls (40)	5.00	0.75	5.75
EA 800R Ink Ribbons	1.80	0.27	2.07
MZ 80K			
MZ 80K Computer 48K	347.00	52.00	399.00
MZ 80FD Dual Disks	560.00	84.00	644.00
MZ 80P3 Dot Matrix Printer	365.00	54.75	419.75
MZ 80F I/O Disk Interface	52.00	7.80	59.80
MZ 80 FMD Master Disk and Manual	20.00	3.00	23.00
MZ 80 F15 Disk Cable	8.00	1.20	9.20
MZ 80 FO5 Extra Disk Cable	7.00	1.05	8.05
MZ 80 I/O Expansion Box	96.00	14.40	110.40
MZ 80 BM Basic Manual	6.60	–	6.60
MZ 80 TIOB Basic Tape	9.50	1.43	10.93
MZ 80 T20C Machine Language	18.00	2.70	20.70
MZ 80 TU Assembler	36.00	5.40	41.40
MZ 80 I/O – 1 Universal Interface Card	40.00	6.00	46.00
MZ 8T70 AE FDOS for MZ 80K	67.00	10.05	77.05
MZ 8T70BE Basic Compiler for MZ80k	40.00	6.00	46.00
MZ 8T40E Pascal for MZ80K	40.00	6.00	46.00
MZ-80 DPK – Double precision Basic	38.00	5.70	43.70
MZ 80B			
MZ 80B Computer 64K	1095.00	164.25	1259.25
MZ 80 FD Dual Disks	560.00	84.00	644.00
MZ 80 P5 Dot Matrix Printer	387.00	58.05	445.05
MZ 80 P6 Dot Matrix Printer	440.00	66.00	506.00
MZ-8BP5I – P6 Interface	30.00	4.50	34.50
MZ-8BP5C – P6 Cable	24.00	3.60	27.60
MZ 80 FI Disk Interface	94.00	14.10	108.10
MZ 80 MDB Master Disk and Manual	30.00	4.50	34.50
MZ 80 F15 Disk Cable	8.00	1.20	9.20
MZ 80 F05 Extra Disk Cable	7.00	1.05	8.05
MZ 80 BJC Disk Cable Jointer	15.00	2.25	17.25
MZ 80 EU Expansion Box	47.00	7.05	54.05
MZ 80 GMK Graphics Option	112.00	16.80	128.80
MZ 80 I/O-2 Universal Interface Card	40.00	6.00	46.00
MZ 80 T10C K – B Converter	7.00	1.05	8.05
MZ 8 BD02 FDOS for MZ 80B	67.00	10.05	77.05
MZ 8 BT03 Basic Compiler for MZ80B	40.00	6.00	46.00
MZ 8 BT02 Pascal for MZ 80B	40.00	6.00	46.00
MZ-80 DPB – Double precision Basic	38.00	5.70	43.70

MICROCOMPUTERS AT LASKYS

MICROCOMPUTERS AT LASKYS



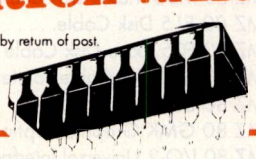
ATARI

400 16K Computer	300.00	45.00	345.00
800 16K Computer	560.87	84.13	645.00
410 Tape Recorder	43.48	6.52	50.00
810 Disk Drive	300.00	45.00	345.00
822 Thermal Printer	230.43	34.57	265.00
825 80 Column Printer	478.26	71.74	550.00
850 RS 232 Interface	117.39	17.61	135.00
16K RAM Upgrade	56.52	8.48	65.00
Light Pen	39.13	5.87	45.00
Pair Paddles	10.43	1.57	12.00
Pair Joysticks	10.43	1.57	12.00
I/O Cable	8.26	1.24	9.50
Printer Cable	24.78	3.72	28.50
Interface Cable	20.43	3.07	23.50
RS 232 Cable	20.43	3.07	23.50
Monitor Cable	20.43	3.07	23.50
Thermal Paper	3.48	0.52	4.00
Master Disk	13.91	2.09	16.00
5 Blank Disks	13.91	2.09	16.00
Word Processor	73.91	11.09	85.00
Inv. Prog. 1	10.39	1.56	11.95
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
Music Composer ROM	28.26	4.24	32.50
Touchtype	13.00	1.95	14.95
Calc/Tor	14.74	2.21	16.95
Graphit	10.39	1.56	11.95
Statistics	10.39	1.56	11.95
Eng. Czar	7.78	1.17	8.95
Hangman	7.78	1.17	8.95
Kingdom	7.78	1.17	8.95
States and Capitals	7.78	1.17	8.95
States Europe	7.78	1.17	8.95
Scram	11.26	1.69	12.95
Telelink ROM	13.00	1.95	14.95
Asteroids ROM	26.04	3.91	29.95
Bask/Ball ROM	21.30	3.20	24.50
Blackjack	7.78	1.17	8.95
Chess ROM	21.30	3.20	24.50
Missile Command ROM	26.04	3.91	29.95
Space Invaders ROM	21.30	3.20	24.50
Space Invaders	11.26	1.69	12.95
● Star Raiders ROM	26.04	3.91	29.95
Super Breakout ROM	21.30	3.20	24.50
Assembler Editor ROM	30.00	4.50	34.50
Pilot ROM	43.04	6.46	49.50
Microsoft Basic	43.04	6.46	49.50
Technical Notes	14.74	–	14.74
Operating System Lists	9.52	–	9.52
DOS Lists	2.61	–	2.61
DOS 2 Manual	6.04	–	6.04

The Memory PRICE WAR

Guaranteed quality – thousands already supplied. Any faulty chips should be returned to us within 12 months of purchase with proof of purchase for replacement by return of post.

4116 **66p + V.A.T.** 200 nanoseconds
2114 Low power 300 nanoseconds
100p + V.A.T.



PRINTERS

● **Microline 80**	270.00	40.50	310.50
● **New Microline 82A**	395.00	59.25	454.25
Microline 80 Tractor	45.00	6.75	51.75
Diplomat Card (Apple-Microline)	85.00	12.75	97.75
Microline Ribbons	2.25	0.34	2.59

Epson

MX80 T Newtype 2	415.00	62.25	477.25
MX80 FT/1	399.00	59.85	458.85
MX80 FT Newtype 2	465.00	69.75	534.75
MX100	575.00	86.25	661.25

Epson Interfaces

Epson/Sharp Cassette	65.00	9.75	74.75
Epson/Sharp Disk	120.00	18.00	138.00
Epson/Apple	85.00	12.75	97.75
Epson/TRS 80 Bus	59.00	8.85	67.85
Epson/TRS 80 Expansion	25.00	3.75	28.75
Epson Ribbons	7.00	1.05	8.05
Epson MX100 Ribbons	8.50	1.28	9.78

Seikosha

● **Seikosha GP80A**	195.00	29.25	224.25
● **Seikosha GP80D (for MZ-80)**	252.13	37.82	289.95

Seikosha Interfaces

Seiko/Apple	59.00	8.85	67.85
Seiko/Pet	59.00	8.85	67.85
Seiko/Video Genie (EG3016)	33.00	4.95	37.95
Seiko/RS232	79.00	11.85	90.85
Seiko/TTL Serial	43.00	6.45	49.45
Seiko/IEEE 488	59.00	8.85	67.85
Seiko/Sharp (Disk)	59.00	8.85	67.85
Seiko/Ribbons	4.00	0.60	4.60
Seiko Paper 8¼"x 11" 2000 Sheets	12.00	1.80	13.80
Paper Delivery	3.00	0.45	3.45

VIDEO MONITORS

New 12" Green Screen	125.00	18.75	143.75
● BM12E 12" Green	150.00	22.50	172.50
VM129 12" B/W	183.00	27.45	210.45
VM906 9" HI-RES B/W	150.00	22.50	172.50
VM910 9" B/W	125.00	18.75	143.75
9" B/W Monitor	85.00	12.75	97.75
Cables	5.00	0.75	5.75

Colour Monitors 14" New!

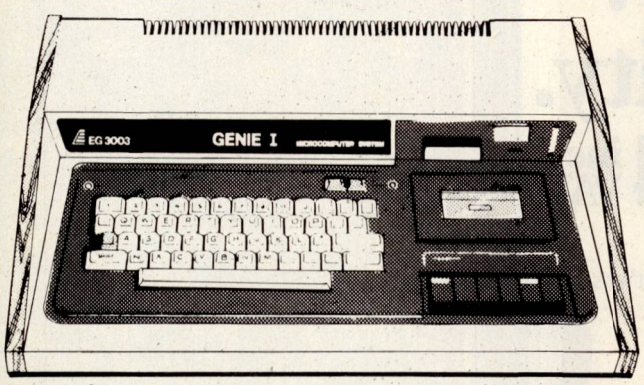
● MP 14N (NTSC) TTL, RGB	285.00	42.75	327.75
● MP 14P (PAL) TTL, RGB	285.00	42.75	327.75

SUNDRIES

QED Mains Suppressor 3 amp	12.80	1.92	14.72
QED Mains Suppressor 6 amp	17.30	2.60	19.90
Mini Floppy Head Cleaning Kit	19.50	2.93	22.43
C15 Cassette	0.80	0.12	0.92
C15 Cassettes Box 10	5.20	0.78	5.98
C15 Cassettes Box 50	25.00	3.75	28.75
C15 Cassettes box 100	45.00	6.75	51.75
● C15 Cassettes Box 1000	370.00	55.50	425.50
Mini Floppy SS/DD	2.50	0.38	2.88
Mini Floppy SS/DD x 10	20.00	3.00	23.00
Mini Floppy SS/DD x 50	87.50	13.13	100.63
Mini Floppy SS/DD x 100	150.00	22.50	172.50
Mini Floppy DS/DD	4.00	0.60	4.60
Mini Floppy DS/DD x 10	33.00	4.95	37.95
Mini Floppy DS/DD x 50	150.00	22.50	172.50
Mini Floppy DS/DD x 100	275.00	41.25	316.25
● 4116, 200 N.S.	0.66	0.10	0.76
● 2114, 300 N.S.	1.00	0.15	1.15
TI Programmer Calc.	45.00	6.75	51.75
Paper 8¼" x 11" 2000 Sheets	12.00	1.80	13.80
Paper 9½" x 11" 2000 Sheets	12.00	1.80	13.80
Paper Delivery	3.00	0.45	3.45

MICROCOMPUTERS AT LASKYS

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





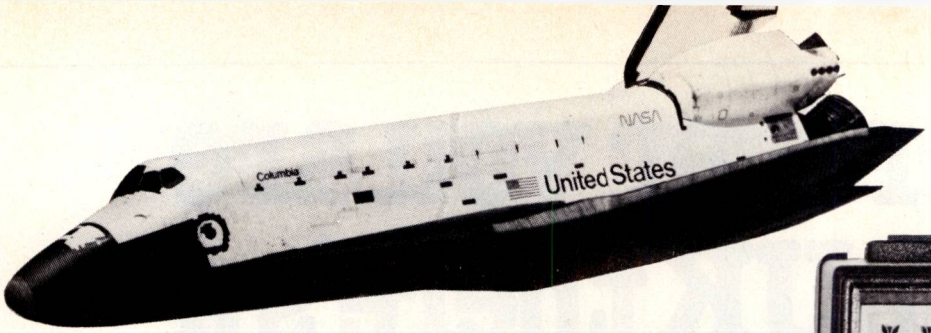
Genie I & II Approved Dealers

AVON Microstyle, Bath, 0225 334659/319705. **BEDFORD** Comserve, Bedford, 0234 216749. **BERKSHIRE** P.C.P., Reading, 0734 589249. **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, Crewe, 0270 211086. **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** Computer Shack, Cheltenham, 0242 584343. **HERTFORDSHIRE** Photo Acoustics, Watford, 0923 40698. Q Tek Systems, Stevenage, 0438 65385. **KENT** Swanley Electronics, Swanley, 0322 64851. **LANCASHIRE** Harden Microsystems, Blackpool, 0253 27590. Sound Service, Burnley, 0282 38481. Computercat, Leigh, 0942 605730. **LEICESTERSHIRE** Kram Electronics, Leicester, 0533 27556. **LONDON** City Microsystems, EC2, 01 588 7272/4. Wason Microchip, N18, 01 807 1757/2230. **NORTH EAST** Briers Computer Services, Middlesbrough, 0642 242017. General Northern Microcomputers, Hartelepool, 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. **SCOTLAND** Computer and Chips, St Andrews, 0334 72569. Scotbyte Computers, Edinburgh, 031 343 1005. Victor Morris and Co., Glasgow, 041 221 8958. **SHROPSHIRE** Tarrant Electronics, Newport, 0952 814275. **SOUTH WEST** West Devon Electronics, Yelverton, 082 285 3434. Bits and Bytes, Barnstaple, 0271 72789. **SUFFOLK** Elgelec Ltd., Ipswich, 0473 711164. **SURREY** 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. **YORKSHIRE** 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. **NORTHERN IRELAND** Business Electronic Equipment, Belfast, 0232 46161.

Sole Importers:

LOWE electronics

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



On the edge of the atmosphere, space shuttle Columbia was about to lose all contact with Earth: for 21 agonising minutes, touch-down would be touch-and-go.
As the world held its breath, the £4½ billion project relied on a £165 hand-held calculator, small enough to live in the pocket of Robert Crippen's flight suit.
The Hewlett-Packard HP-41C. Unmodified. Just as you buy it today...

Astronaut quality. Everyday simplicity. The HP-41C. £184 inc VAT*



Sooner or later, a basic calculator is too basic.

Suddenly you need to 'compute' – but with a 'computer' that's as simple and pocketable as a hand-held calculator. And, as NASA found, that means an HP-41C.

Today, a broad-ranging companion to an A-level course. Tomorrow, a fully-fledged, advanced programmable system for the businessman, analyst, researcher, technician, engineer or scientist.

Whatever your job, here's a calculator that will grow with you and your needs step-by-step into a complete calculating system – yet will always stay simple, manageable and portable.

The friendly calculator with power in reserve.

As a straightforward calculator, the HP-41C is a masterpiece of compact power.

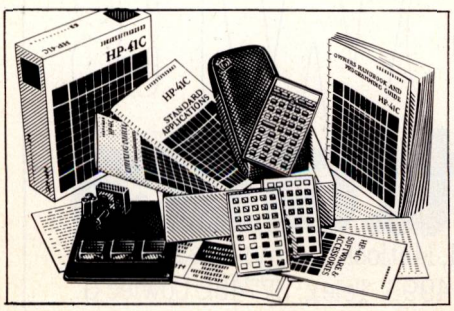
It gives you read-out in letters, as well as figures and symbols, so the display can talk to you in an easy, simple way.



Yet, inside, it has the effortless, problem-solving power normally associated with computers.

Among other things, that means the HP-41C is fully programmable. You can feed its built-in 400-line memory with ready-made programs or develop your own. Its friendly style makes it surprisingly easy. And, because the memory is continuous, what you put into it stays in – even when you switch off.

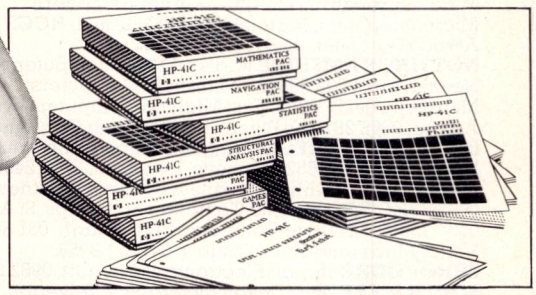
But that's not the end of the story by any means. Because, unlike any other advanced programmable calculator you are likely to see, the HP-41C has behind it a highly developed package of software support representing many years of heavy investment by Hewlett-Packard. So when you buy the HP-41C you don't just *own* a powerful system; you can put it powerfully to *work*.



The HP-41C hand-held 'computer' in a box. £184 brings you the calculator, a comprehensive 270-page manual, owner's handbook, and programming guide, a standard applications handbook, customising overlays. HP Users' Library membership reply card, free one year's subscription to HP's User's Newsletter, batteries, carrying pouch and 12 months' full guarantee.

Proven software support – at your fingertips.

Here, the HP-41C really comes into its own with an unrivalled range of software support.



17 Application Modules – miniature plug-in solutions: maths, electrical engineering, financial decisions, games...

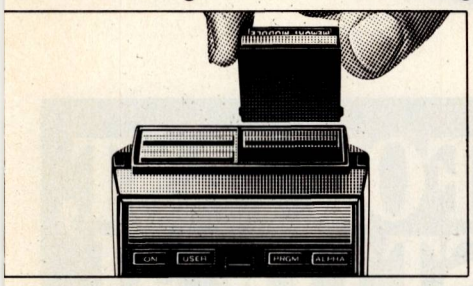
29 Solutions Books – each with up to 15 programs drawn from the best of 10,000 user-submitted programs. Each book provided with Bar Codes – for instant program entry with the HP wand.

11 Application Pacs – pre-recorded magnetic cards covering over 2,000 programs, entered through the card reader.

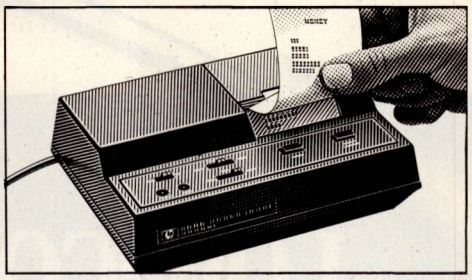
All software and peripherals are optional extras.

***Price correct at time of going to press.**

Two ways to make your system grow...

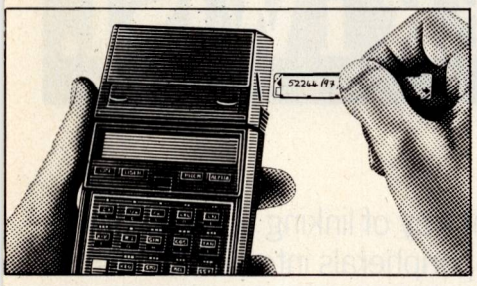


Snap-in more memory. *A single module will double the memory available. A quad module adds no fewer than 256 registers at once. Suddenly you've over 1800 lines of memory at your command.*

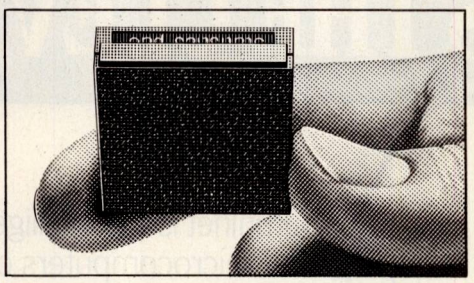


Plug-in a printer. *The HP-41C printer handles upper and lower case, in alpha, numeric and graph-plotting modes. Use it for final hard copy, or to follow program execution.*

Four ways to program your HP-41C...



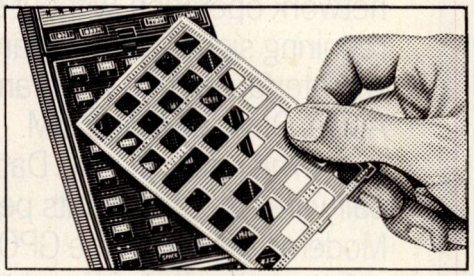
Card reader. *This reads pre-programmed magnetic cards. It can also record and read your own programs and data.*



Application modules. *These are plug-in modules each containing a whole range of ready-made programs on your chosen subject.*



Bar code reader. *A quad and easy way of loading any one of the software packages. The wand simply 'lifts' the coded program straight off the page of your HP-41C solution books.*



Keyboard customising. *Develop your own programs and enter them through the keyboard. You can assign any function or program to any key and mark them on your own customising overlay.*

Thousands of easy ways to solve problems.

Think of a problem! As an HP-41C owner you won't have far to look for the solution – or long to wait before it's locked in your system's memory. Any of HP's hundreds of pre-programmed solutions can be easily entered in any of the four ways we illustrate above. You'll certainly want to devise your own solutions, too. The guidance manual in your basic pack tells you how. If you develop an original one you could submit it to the HP-41C Users' Library. It already contains thousands of tested programs which 10,000 users world-wide are happy for you to share.

Quality from HP – the big computer manufacturer.

The HP-41C is made from the chip upwards by Hewlett-Packard, a world leader in computers. And you can tell! By the detail like the permanent inlaid key notations, tough ABS case, and gold-plated port contacts. By the elegant simplicity designed into the HP-41C's operating style. By the sort of software support only a computer giant would be capable of. By the utter reliability that is the HP hallmark throughout the world of computers.

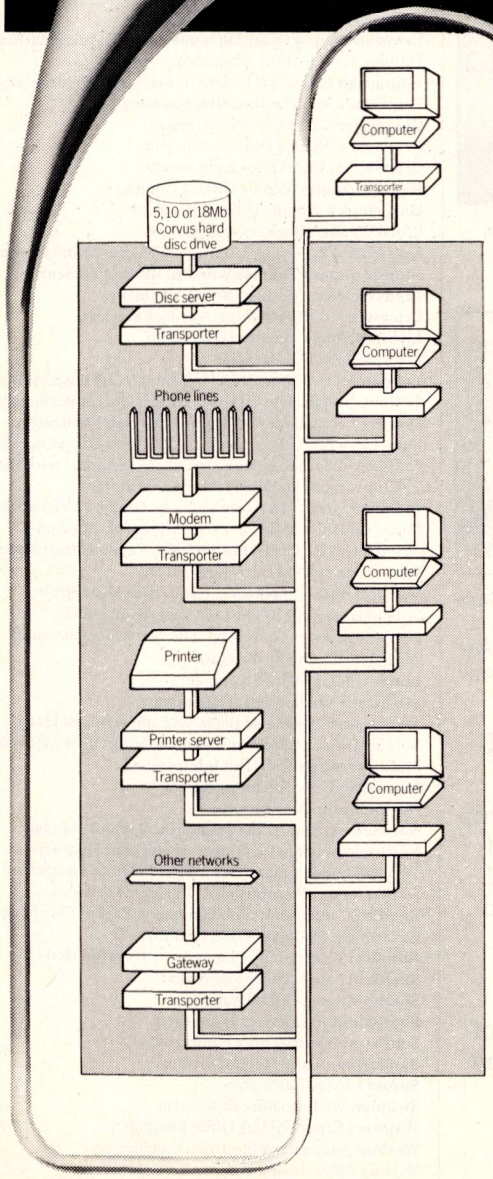
HEWLETT PACKARD

See the HP-41C at **Comet, Xerox Stores, Wilding, Sumlock-Bondain, Landau** or these other Appointed Dealers:

Aberdeen Tyseal Office Equipment.
Bath Wilding Office Equipment.
Belfast Cardiac Services Company.
Birmingham John Mabon Associates; Research Micro System.
Bolton Wilding Office Equipment.
Bournemouth South Coast Business Machines.
Brighton Office Machinery Engineering Co.
Bristol Decimal Business Machines; Wilding Office Equipment.
Bromley Wilding Office Equipment.
Cambridge W. Heffer & Sons; Wilding Office Equipment.
Canterbury R. E. Typewriters.
Cardiff Sigma Systems (Calculators).
Carlisle Thos. Hill International.
Colchester Wilding Office Equipment.
Croydon Wilding Office Equipment. **Derby** Office Machines.
Dundee Tayside Office Equipment.
Edinburgh Business & Electronic Machines; Holdene; Robox.
Folkestone R. E. Harding. **Glasgow** Robox.
Gloucester Wilding Office Equipment.
Gravesend Wilding Office Equipment.
Grimsby Teesdale Office Equipment.
High Wycombe Wilding Office Equipment.
Hornchurch Wilding Office Equipment.
Ilford Wilding Office Equipment.
Ipswich Anglia Business Machines; Wilding Office Equipment.
Kingston-upon-Thames Wilding Office Equipment.
Leeds Holdene; Wilding Office Equipment.
Leicester A. C. Barratt & Co.; Sumlock Services.
Lichfield Anglo American Computing.
Liverpool Rockliff Brothers.
London AEC – 2 Shoreditch High Street; City Business Machines – 57 Houndsditch, Bethnal Green Road; Concept Business Systems; Dixons Photographic – 123 Holborn, 64 New Bond Street; Euro-Calc – 128-132 Curtain Road, 224 Tottenham Court Road, 55 High Holborn; Landau Calculators – Bourne's Oxford Street, 227 Tottenham Court Road; McDonald Stores – 78 Oxford Street; Metyclean – 137 The Strand, 92 Victoria Street; Mountaindene – 22 Cowper Street; Sumlock-Bondain – 263-269 City Road, 360 Euston Road, Cannon Street Station; Wallace-Heaton – 127 New Bond Street; Wilding Office Equipment – 7 The Arcade Hoe Street, 21 Thomas Street, 120 The Broadway, Wimbledon; 199 Parrock Street, Gravesend. The Xerox Store Piccadilly – 76 High Holborn, 110 Moorgate.
Luton Wilding Office Equipment.
Maidstone Wilding Office Equipment.
Manchester Automated Business Equipment; Holdene; Wilding Office Equipment. **Matlock** Derby Office Machines.
Middlesbrough Thos. Hill International.
Newcastle Thos. Hill International.
Northampton A. C. Barratt & Co.
Norwich Leamons Office Machines; Sumlock-Bondain.
Nottingham Bennett's (Typewriter & Office Suppliers); Trent Office Equipment. **Oxford** Reid's Office Equipment; Science Studio. **Plymouth** JAD Integrated Services.
Reading Central Southern Equipment; Reid's Office Equipment; Caversham, 38 Market Place, Reading.
Romford Wilding Office Equipment. **Royston** Herts Electroplan.
Sheffield Butlers Office Equipment.
Slough Wilding Office Equipment.
Southampton Leicester Typewriters.
Southend Wilding Office Equipment.
Sunderland Thos. Hill International.
Sutton Landau Calculators.
Swindon Wilding Office Equipment.
Waltham Cross Wilding Office Equipment.
Watford Automatic & Electronic Calculators; Wilding Office Equipment.
Worthing Office Machinery Engineering Co.
CHANNEL ISLANDS: Guernsey A. E. S. Ltd.
Jersey A. E. S. Ltd. **EIRE: Dublin** Abacus Systems.

All UK Comet branches.

FOR FAST, LOW-COST LOCAL NETWORKS OMNINET PROVIDES THE CLEVER TWIST.



Omninet is the intelligent way of linking up to 64 different microcomputers or peripherals into a fast, low-cost local network. And the intelligence is in the microcomputer-based transporters. These manage the total network operation, without stealing processing power or requiring significant software support from the host – and will interface with a wide range of popular micros, including Apple, Onyx, DEC and IBM.

The rest is simple. Data is transmitted through twisted-pair wires at 1 million bits per second. Over 4,000 feet. Modems will link to the GPO telephone system and gateways to other networks will bring international communications to every office.

Other networks just can't match up to Omninet – on speed, price or ease of installation. Coaxial-linked systems are much more expensive. And jobs which have to be performed by the host computer in other networks – generating and receiving acknowledgements, retransmitting messages, and detecting duplicate messages – are all automatically performed by the Omninet transporter.

Sounds too good to be true? Check it out by phoning for more information today.

Nottingham 0602 412777
London 01-236 5682/3/4 or write to
Keen Computers, Marketing Dept.,
5 Giltspur Street, London EC1A 9DE

Keen Computers CRA

One of the building blocks of a good system . . .



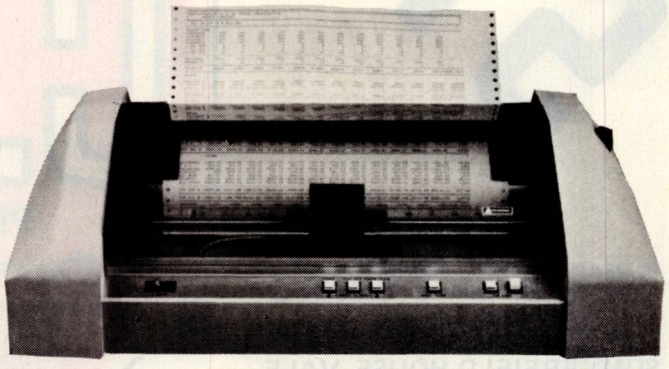
Anadex build rugged printers to meet the demanding requirements found in a wide range of applications, from industrial and commercial to the most advanced communications networks.

Printers like the DP-9000 and DP-9500 series with three interfaces as standard, designed to become an integral part of most mini and microcomputer systems.

Features include print speeds up to 200 cps, high quality graphics, a variety of print widths from 80 to 132 or 220 columns. All at a starting price of just £895.

Make your choice constructive. Specify Anadex.

. . . a rugged, reliable printer

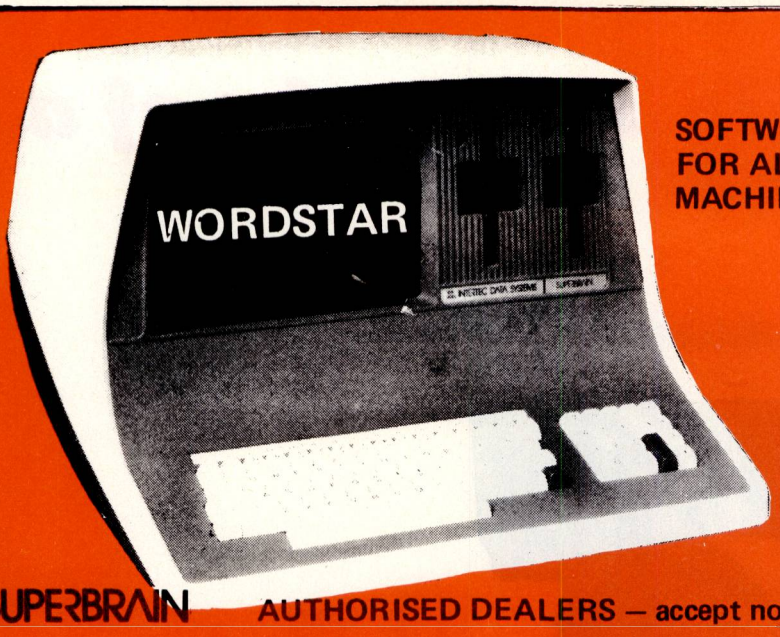


Anadex Ltd.

Details from Anadex Limited, Weaver House, Station Road, Hook, Basingstoke, Hants. Tel (025672) 3401 Telex 858762 Anadex G

A1 STOCKISTS

ENGLAND: AVON Wilkes Computing Ltd Tel: 0272 290651 **BERKSHIRE** Riva Terminals Ltd Tel: 03447 5193 **CAMBRIDGESHIRE** Comart Ltd Tel: 0480 215005
DERBYSHIRE Midlectron Ltd Tel: 077 382 6811 **HERTFORDSHIRE** Data Design Techniques Ltd Tel: 01 207 1717 Data Efficiency Tel: 0442 57137 **LANCASHIRE** Keytech Engineering Ltd Tel: 061 834 9244
Stack Computers Ltd Tel: 051 933 5511 **WILTSHIRE** Kode Services Ltd Tel: 0249 813771 **SCOTLAND: FIFE** C S Scotland Tel: 0592 773710 **MIDLOTHIAN** Microcentre Ltd Tel: 031 556 7354
STRATHCLYDE Robox Ltd Tel: 041 221 5402 **WALES: SOUTH GLAMORGAN** Datatype Terminals Ltd Tel: 063 33 65307



SOFTWARE FOR ALL MACHINES

SEE US ON STAND 83 AT MICROSYSTEMS 82 LONDON FEB 24-26



SUPERBRAIN AUTHORISED DEALERS – accept no less.

We also supply printers, plotters, monitors, media, hardware, software, computer workstations and more.

WORD PROCESSING SPECIAL OFFERS – RING NOW!

MASS MICROS

07073 – 31436 WELLSON HOUSE, BROWNFIELDS, WELWYN GARDEN CITY, HERTS AL7 1AR TELEX 298641

DEMODISK . . . now includes a free comprehensive BASIC language tutorial on the reverse side.

STOP!

STOP BUYING THOSE "CANNED" DATABASE PROGRAMS THAT TURN OUT TO BE COSTLY, INEFFECTIVE AND INCOMPLETE. NOW THERE IS ONE SYSTEM WITH THE POWER, THE VERSATILITY YOU NE D TO MAKE PROGRAMING FASTER, SIMPLER AND ERROR FREE. C.O.R.P. IS A PROGRAM GENERATOR THAT WRITES SOFTWARE. COMPLETE APPLESOFT PROGRAMS THAT EXECUTE INDEPENDENTLY AND MAY BE MODIFIED BY THE USER, BASED ON INFORMAT:ON SUPPLIED IN THE USERS OWN EVERYDAY LANGUAGE. WHAT'S MORE, COMPLETE PROGRAM GENERATION TAKES ONLY A FEW MINUTES.

C.O.R.P.™

PROGRAM GENERATOR

...the programs that write programs

C.O.R.P. CONSISTS OF 6 MAJOR SUBSYSTEMS: A DATA ENTRY PROGRAM GENERATOR, A SORT SUBSYSTEM, AN UPDATE SUBSYSTEM, A PRINT GENERATOR AND A COMPLETE UTILITIES & DIAGNOSTIC PACKAGE. TOGETHER THE 6 SUBSYSTEMS MAKE C.O.R.P. THE MOST ADVANCED, COMPLETE AND USEFUL TOOL AVAILABLE FOR YOUR APPLE II*. ALL FOR THE INCREDIBLY LOW PRICE OF £235.00. NO OTHER PROGRAM GENERATOR OFFERS SO MUCH VERSATILITY FOR SUCH A PRICE. TO PURCHASE C.O.R.P. BRING THIS AD. TO YOUR LOCAL DEALER OR ORDER FROM US DIRECTLY.

MICROSYSTEMS LIMITED

SUMMERFIELD HOUSE, VALE, GUERNSEY, EUROPE–G.B.
Telephone: 0481 47377
Telex: 4191130 (DYNMIC G)

*C.O.R.P. is a registered trademark of the MAROMATY & SCOTTO SOFTWARE CORP.

*APPLE is a registered trademark of APPLE COMPUTER INC.

CUMANA promise you absolutely reliable and compatible

FLOPPY DISK DRIVES

40 and 80 TRACK CASED UNITS

Dual Disk Units

2 x 40 Track single sided Drives	£399
2 x 80 Track single sided Drives	£539
2 x 80 Track double sided Drives	£799

Single Disk Units

1 x 40 Track single sided Drive	£219
1 x 80 Track single sided Drive	£285
1 x 80 Track double sided Drive	£429

Disk Drive Cables

2 Drive Cable	£15.00
4 Drive Cable	£25.00



Cumana Ltd., offer you a dependable flow of exceptionally high quality **DISK DRIVES** from **TEAC** of Tokyo featuring high reliability and compatibility. **Cumana** have an enviable reputation and aim to continue giving you the best service in the business. These main powered Disk Drive units are designed to interface to a wide range of computers such as **Genie I and II, SWTP, Heathkit, Superbrain, Nascom, Atom** and the **BBC Micro.**

Write or 'phone for Data Sheets

Call your nearest dealer for a demonstration:

RADIO SHACK LTD.,
188, Broadhurst Gardens.
London NW6.
Tel: 01-624-7174

COMPSHOP LTD.,
14, Station Road.
New Barnet. Herts.
Tel: 01-441-2922

COMPSHOP LTD.,
311, Edgware Road.
London W2.
Tel: 01-262-0387

COMPSHOP LTD.,
19, Herbert Street.
Dublin 2.
Tel: 604165

LONDON COMPUTER CENTRE, 43, Grafton Way, London W1.
Tel: 01-388-5721

N.I.C.
61, Broad Lane.
London N15.
Tel: 01-808-0377

CROYDON COMPUTER CENTRE, 29a, Brigstock Road, Thornton Heath.
Surrey.
Tel: 01-689-1280

P J EQUIPMENT LTD.,
3, Bridge Street.
Guildford.
Tel: 0483-504801

R.D.S. ELECTRICAL LTD., 157-161, Kingston Road, Portsmouth.
Tel: 0705-812478

TANDY HASTINGS LTD., 48, Queens Road.
Hastings.
Tel: 0424-431849

MICROWARE COMPUTING SERVICES, 57, Queen Charlotte Street, Bristol.
Tel: 0272-279560

BLANDFORD COMPUTERS, Higher Shaftsbury Road.
Blandford Forum.
Tel: 0258-53737

TAPE SHOP
32i Viaduct Road.
Brighton.
Tel: 0273-609099

PARWEST LTD.,
18, St. Mary Street.
Chippenham.
Tel: 0249-2131

COMPUTER SHACK
14, Pittville Street.
Cheltenham.
Tel: 0242-584343

TANDY GLOUCESTER,
13, Clarence Street.
Gloucester.
Tel: 0452-31323

COMSERVE,
98, Tavistock Street.
Bedford.
Tel: 0234-216749

CLEARTONE COMPUTERS, Prince of Wales Ind. Estate.
Abercarn, Gwent.
Tel: 0495-244555

EMPRISE LTD.,
58, East Street.
Colchester.
Tel: 0206-865926

MAGNUS MICRO-COMPUTERS,
139 The Moors.
Kidlington, Oxford.
Tel: 08675-6703

CAMBRIDGE COMPUTER STORE,
1, Emmanuel Street.
Cambridge.
Tel: 0223-65334

I.C. ELECTRONICS,
Flagstones.
Stede Quarter.
Biddenden, Kent.
Tel: 0580-291816

MICRO CHIP SHOP,
190, Lord Street.
Fleetwood, Lancs.
Tel: 03917-79511

HARDEN MICRO-SYSTEMS, 28-30, Back Lord Street, Blackpool.
Tel: 0253-27590

AMBASSADOR BUSINESS COMPUTERS LTD.,
Ashley Lane Works.
Shipley, W. Yorks.
Tel: 0274-595941

Q-TEK SYSTEMS LTD.,
2 Daltry Close, Old Town, Stevenage, Herts.
Tel: 0438-65385

COMPUTER & CHIPS,
Feddinch Mains House.
St. Andrews, Fife.
Scotland.
Tel: 0334-72569

HEWART MICRO-ELECTRONICS,
95, Blakelow Road.
Macclesfield.
Tel: 0625-22030

KARADAWN LTD.,
2 Forest Way.
Great Sankey.
Warrington.
Tel: 0925-572668

PHOTO-ELECTRICS,
459 London Road.
Sheffield.
Tel: 0742 53865

ARC ELECTRONICS,
54 Heron Drive, Sandal.
Nr. Wakefield.
W. Yorks WF2 6SL.
Tel: 0924-253145

VICTOR MORRIS LTD., 340 Argyle Street, Glasgow.
G2 8LY.
Tel: 041-221 8958

COMPRITE LTD.,
Thorite House.
Laisterdyke.
Bradford.
Tel: 0274-663471

GNOMIC LTD.,
46, Middle Street.
Blackhall.
Hartlepool.
Tel: 0783-863871

BRIERS COMPUTER SERVICES, 1, King Edward Square.
Middlesbrough.
Cleveland.
Tel: 0642-242017

3 LINE COMPUTING
36, Clough Road, Hull.
Tel: 0482-445496

H.C. COMPUTER SALES LTD., 182, Earlsway, Team Valley Trading Estate.
Gateshead.
Tel: 0632-874811

EWL COMPUTERS LTD.,
8, Royal Crescent.
Glasgow.
Tel: 041-332-7642

EVERYMAN COMPUTING,
14 Edward Street.
Westbury, Wilts.
Tel: 0373-864644

CUMANA LTD 35 Walnut Tree Close, Guildford, Surrey, GU1 4UN.
Telephone: (0483) 503121. Telex: 858306

Please add VAT to all prices.
Delivery at cost will be advised at time of order.

nascom



*** Housed in strong, stylish case with high quality QWERTY keyboard.**

*** 0.7Mbyte floppy disc system available in matching case.**

*** Full 8K RAM, expandable to 200K with page mode and RAM boards.**

*** Factory-built options plus additional range of Nascom-approved hardware and software.**

Think of Nascom3 as an advanced personal computer, built to professional standards and offering the total systems-versatility needed by enthusiasts whose imaginations are already ahead of the toy computer field.

Think of Nascom3 as the powerful heart of a truly versatile educational or business computer system, with added peripherals and an extensive range of firmware and software options.

Or think of Nascom3 as a custom-structured industrial control unit, well capable of cutting production costs in many key areas.

Nascom3; reliable, expandable, affordable – and backed by one of Britain's best known engineering groups. Think about it.

Lucas Logic

Nascom Microcomputers
Division of Lucas Logic Limited,
Warwick CV34 5PZ.

authorized stockists



semicomps
NORTHERN LIMITED
Semicomps Northern Ltd.,
East Bowmont Street,
Kelso, Roxburghshire. Tel: (0573) 24366

Eley Electronics
100-104 Beatrice Road (off Fosse Road North)
Leicester. Tel: (0533) 871522

MID-SHIRE'S COMPUTER CENTRE
68 Nantwich Road, Crewe, Cheshire
Tel: (0270) 211086

ELECTRICAL ELECTRONIC & MICROCOMPUTING
RETAIL & REPAIR
18 Station Road Lower Parkstone
Poole Dorset BH14 8UB
Tel: Parkstone (0202) 746555
PE PARKSTONE ELECTRICS

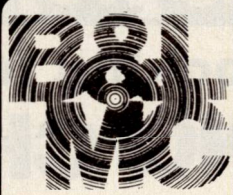
MICRO COMMS Amateur radio C.B. radio Electronics Computers
372-374 George Street Aberdeen
Telephone: 0224 633385

JPS
9 East Street, Colne,
Nr. Huntingdon, Cambs.
Tel: Ramsey (0487) 840710
Contact Paul Jephcott



SRS MICROSYSTEMS
161 Bramley Road, Oakwood,
London N14
Telephone: 01-363 8060

58 Battersea Rise,
Clapham Junction
London SW11 1HH
Tel: 01-674 1205
01-675 4557
OFF Records



In the heart of the Nascom country lies Business & Leisure
Business & Leisure Micro Computers
We specialise in tailoring systems to your specific requirements.
16 The Square, Kenilworth, CV8 1EB.
Tel: Kenilworth (0926) 512127

MAAS COMPUTER CONSULTANTS
Stationstraat,
6241 CL,
Bunde (L),
Netherlands.
Tel: 043 641147

OTHER NASCOM PRODUCTS

* Nascom 1 from £125 + VAT
* Nascom 2 from £225 + VAT
* Memory Extension Unit from £80 + VAT
* Disc systems from £375 + VAT
* Input/Output board from £37 + VAT

NEW

* Advanced video controller from £155 + VAT
* Enhanced BASIC from £40 + VAT
* Pascal compiler from £45 + VAT
* Compiled BASIC from £150 + VAT

SPECIAL OFFER
Imp Printers
£199 + VAT
including IMP PRINT

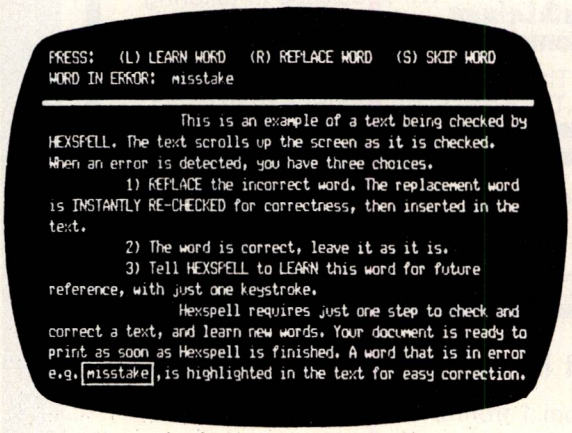
INNOVATIVE

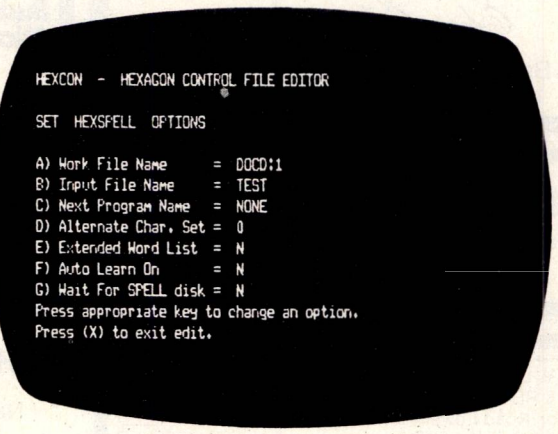
TRS 80-GENIE SOFTWARE

from the professionals

Looking for a

SPELLING CHECKER?





Get more than just a spelling checker —

HEXSPELL 2™

the EVERYTHING checker.

HEXSPELL CHECKS: product codes • zip codes • French words • engineering formulae • typesetting commands • German words • numbers • addresses • chemical formulae • Greek words • names • amounts • printer commands • Japanese words • acronyms • dimensions • mathematical formulae • values . . . and of course plain old English words.

Hexagon Systems is proud to announce another first in text checking — an everything checker. Hexspell 2 ckecks not only dictionary words, but learns and checks codes, formulae and numbers which are so essential in many commercial and technical documents. With Hexspell 2 you define which characters make up a "word", then teach Hexspell the new "words" it needs to check your text. This advanced system builds on the unique features of the original Hexspell (the first TRS-80 spelling checker).

When we introduced Hexspell nearly a year ago, it was the world's first adaptive learning spelling checker. Hexspell constantly adapts its wordlist to your usage. No complicated editing of the wordlist. Hexspell remembers words as long as you use them. If you never use a word again Hexspell will eventually forget it to make room for new words. Extending this feature in Hexspell 2 gives you a text checker that can learn to check everything that you write.

Hexspell 2 is the product of nearly three years research and experience. Unlike other microcomputer spelling checkers Hexagon Systems didn't simply rewrite the multi-step batch process found on large computers, we invented a simple one-step process that capitalizes on the interactive strengths of the personal computer. Hexspell's simple one-step process makes it practical for daily use on all your letters and documents.

HEXSPELL VERSION 1 USERS — GET THESE HEXSPELL 2 ENHANCEMENTS: Programmable character set - Disk error trapping - Extendable word list, up to 50,000 words - Speed control - Longer words, up to 40 characters - Auto learn function - User settable system options - Control file editor - Built in lower case driver.

Hexspell 2 ..... £52.00 + V.A.T. = **£59.80**

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 50p postage.

INNOVATIVE

TRS 80-GENIE SOFTWARE

from the professionals

LDOS

First there were the TRSDOS's, 2.0, 2.1, 2.2 and 2.3. Then came Newdos +, essentially a patched version of the TRSDOS's but with a number of very useful commands and utilities added. Then VTOS 3.0 and VTOS 4.0. These constituted a departure from the earlier DOS's and featured Device Independence so that devices such as the keyboard, printer, VDU and disk drives could interact directly together. Then came Newdos80 which is a rewrite of Newdos +, adding new utilities and new Basic commands, its main features being the ability to mix different capacity drives on the same cable and the ability to use variable length records. Now from LOBO International comes LDOS, the fifth generation disk operating system for the TRS-80 microcomputer. It combines most of the advantages of the preceding disk operating systems and unlike some of them, is accompanied by a complete and readable set of documentation, which includes a Technical Section containing relevant addresses.

It is impossible to describe all of the features of LDOS in an advertisement. For instance it includes no less than 35 library commands as follows:—

APPEND	COPY	DEVICE	DIR	DO	FILTER	KILL
LIB	LINK	LIST	LOAD	MEMORY	RENAME	RESET
ROUTE	RUN	SET	SPOOL	ATRIB	AUTO	BOOT
BUILD	CLOCK	CREATE	DATE	DEBUG	DUMP	FREE
PROT	PURGE	SYSTEM	TIME	TRACE	VERIFY	XFER

All of the useful abbreviations in Newdos are included and the System Commands in Basic (CMD) now number eleven. A program called LBASIC/FIX is included, with which the normal TRSDOS Disk Basic may be patched to include a number of new commands and features. A Job Control Language is included and in fact is one of the most powerful features of LDOS. It allows the user to compile a sequence of commands or key strokes for later execution as a chain, with or without user intervention. There are too many new features to list them herein, but examples are: The ability to provide an audible signal, output through the cassette port. To flash or blink a one line message on the video display. A WAIT feature is included so that the machine can be put into a "sleep" state until such time as the system clock matches the time specified. And so on!

Hard disks in addition to single/double density, single/double sided, 8" and 5¼" floppies are supported although they may, of course, require hardware modifications. Utilities included in the package are:

BACKUP	COMMAND FILE	FORMAT	LCOMM
PATCH	RS232	KEY STROKE/MULTIPLIER	PRINTER FILTER

A Basic Renumber facility is included, as is a Basic Cross Reference function. Both are similar to the ones in Newdos + and Newdos80. Most of the utilities are library commands which were existent in the previous DOS's, have been improved with the addition of new functions or facilities.

The prime development team of LDOS consisted of no less than 8 first rank programmers and they had the support and advice of six other well known programmers. They have done an excellent job to bring to the user what must be the best disk operating system so far produced for a microcomputer, which is destined to become the Standard DOS.

LDOS is totally upward compatible with TRSDOS, that is to say LDOS will be able to copy files and programs from TRSDOS disks onto LDOS formatted disks. As they are competitive disk operating systems, it is not suprising that the manual states that disks created under Newdos are not guaranteed to be compatible with LDOS, but we have not experienced any difficulty. We have done some work on investigating the compatibility of LDOS and the Video Genie and at the time of going to press we have found no incompatibilities. LDOS appears to run on the Video Genie without any problems at all. LDOS is compatible with either the Tandy or Electric Pencil lowercase modifications and Scripsit. LDOS is available for the Model I and Model III. A Model II version will be available shortly.

LDOS .....£85.00 **plus** VAT and £1.50 P&P.

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**

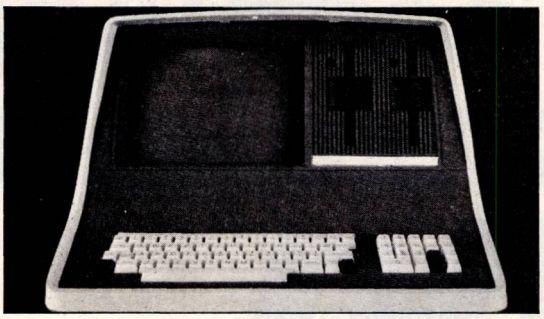
TRS-80 & VIDEO GENIE SOFTWARE CATALOGUE £1.00 [**refundable**] plus 50p postage.

AMERICAN EXPRESS Cards Welcome

BARCLAYCARD VISA Buy it with Access

GW Computers Ltd

COMPUSTAR™

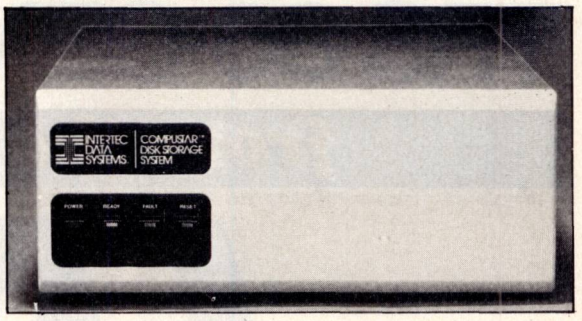


But the real beauty of the CompuStar is its 'shared logic' design concept. Each user station contains its own distinct microprocessor and RAM. The result is lightning fast program execution. Even when all 16 users are on-line. Even when all are performing different tasks! A special multiplexor circuit in the CompuStar ties all external users together to 'share' the system's disk resources so that no single user ever need wait on another. An incredibly exciting concept!

A remarkable breakthrough in price/performance, the CompuStar boasts nearly 1 megabyte of online mini-disk storage (almost 2 megabytes on CompuStar II) and can be easily expanded to 20, 36 or 96 megabytes of hard-disk in just seconds. And since each user station can accommodate up to 64k of RAM, a total of over one million bytes can be incorporated into the system to tackle even your most difficult programming tasks.

CompuStar user stations can be configured in a countless number of ways. A series of three intelligent-type terminals are offered. Each is a perfect cosmetic and electrical match to the system. The CompuStar 10 – a 32k programmable RAM-based terminal (expandable to 64k) is just right if your requirement is a data entry or enquiry/response application. And, if your terminal needs are more sophisticated, select either our CompuStar 20 or CompuStar 40 as user stations. Both units offer dual disk storage in addition to the disk system in the CompuStar. The Model 20 features 32k of RAM (expandable to 64k) and 350k of disk storage. The Model 40 comes equipped with 54k of RAM and over 700k of disk storage. But, most importantly, no matter what your investment in hardware, the possibility of obsolence or incompatability is completely eliminated since user stations can be configured in any fashion you like – whenever you want – at amazingly low cost!

COMPUSTAR™



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 controller 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 yoy 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

ALL YOU NEED FROM A COMPUTER SYSTEM

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

TWO TYPICAL PACKAGE DEALS	NORMALLY
01–SUPERBRAIN 64 K RAM 320 K	1995.00
02–EPSON MX 80 FT (OR SIMILAR)	475.00
03–CABLE	25.00
04–12 MONTH WARRANTY	235.00
05–DELIVERY IN U.K.	40.00
06–TRAINING SESSION	50.00
07–CPM HANDBOOK	8,75
08–50 BASIC EXERCISES	8.75
09–BOX PAPER (2000 SHEETS)	20.00
10–DBMS2 (DATABASE)	575.00
11–MAGIC WAND	190.00
12–MBASIC-80	150.00
13–SUPER CALC	150.00
14–40 MEMOREX DISKETTES	114.00
15–DOS+ AND DIAGNOSTICS	125.00
16–MSORT & DSORT	75.00
17–RECOVER+AUTOLOAD	25.00
18–INSTANT BASIC	9.00
NOT INC VAT)	4270.50
	OUR PRICE****2995.00****

	NORMALLY
01–SUPERBRAIN 64K RAM 700K	2495.00
02–NEC 5510 (OR SIMILAR)	1695.00
03–CABLE ADAPTOR	25.00
04–12 MONTH WARRANTY	410.00
05–DELIVERY IN U.K.	50.00
06–TRAINING SESSION	50.00
07–CPM HANDBOOK	8.75
08–50 BASIC EXERCISES	–.75
09–BOX PAPER (2000 SHEETS)	20.00
10–DBMS2 (DATABASE)	575.00
11–MAGIC WAND	190.00
12–MBASIC-80	150.00
13–SUPER CALC	150.00
14–25 DYSAN D/SIDE DISKETTES	150.00
15–DOS+ AND DIAGNOSTICS	125.00
16–MSORT & DSORT	75.00
17–RECOVER+ +AUTOLOAD	25.00
18–INSTANT BASIC	9.00
(NOT INC VAT)	6320.50
OUR PRICE****4995.00****	

(Note: Items 1 and 2 are more flexible)

EXTRA SPECIAL SUPERBRAIN PROGRAM MAIL ORDER OFFER OF THE 5 MAIN PROGRAMS DBMS2 + SORTS + MAGIC WAND+MBASIC 80+SUPER-CALC NORMALLY 1140 POUNDS

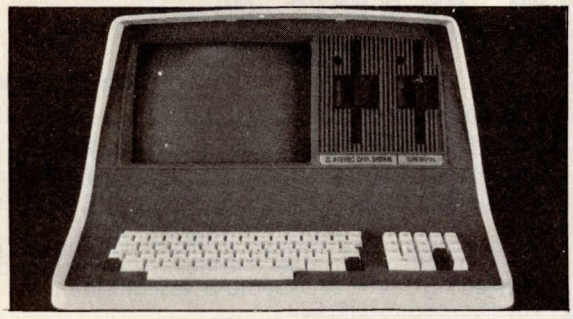
OUR PRICE********595.00**********+ VAT**

WARRANTY NOTE: WE HANDLE ALL REPAIRS OURSELVES.
WARRANTY COVERS FREE REPLACEMENT EQUIPMENT IF DEFECTIVE IN FIRST THREE WEEKS. THEREAFTER UP TO 12 MONTHS THE COVER PROVIDES INSURANCE ON ALL SPARE PARTS AND LABOUR COSTS (EXCLUDING CARRIAGE). CALL OUT MAINTENANCE IS ALSO AVAILABLE AT 25.00 MINIMUM (LONDON) 50.00 MINIMUM ELSEWHERE IN U.K. PLUS MILEAGE.

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, 01-631-8210, TELEX 892031 TW6G.

*** BUS *** WIDELY USED IN UK/FRANCE/USA AND ENGLISH SPEAKING COUNTRIES FOR ITS (BUSINESS EFFICIENCY) OVERALL FLEXIBILITY AS A COMPLETE BUSINESS PACKAGE.

Includes Inventory, Database, Management, Invoicing, Mailing Addresses, Statements, Sales/Purchase Ledger with or without Auto Stock Update and Double Entry Journals including Nominal Ledger; plus A'C Receivable and Payable making Auto Bank entries.

01 = Address section	07 = Bank update	13 = Print customer statements	18 = Change vocabulary
02 = Stock control	18 = User database area	14 = Print supplier statements	19 = Nominal analysis
03 = A/C receivables	09 = Invoice creation	15 = Print agent statements	20 = Aged debtor analysis
04 = Sales ledger	10 = Order files	16 = Print tax statements	21 = Disk directories
05 = A/C payables	11 = 30/60/90 day age analysis	17 = Run separate programs	22 = File management
06 = Purchase ledgers	12 = Arithmetic section	24 = Disk swap/exit system	23 = Sorts

+++++++ SUPER – BUS +++++++ A NEW HIGHER LEVEL OF THE ABOVE PACKAGE. . . . HAS BEEN REDUCED IN SIZE BY 50 PER CENT TO A SINGLE 15K BASIC PROGRAM, MAKING ALL FILE RETRIEVALS A MATTER OF NANOSECONDS. WORKS UNDER M/PM AND COMPUSTAR FOR COMMON DATA RETRIEVAL LEVEL 10.00 . . . . ***** 1475.00 *****

DBMS (DATABASE) HAS 01=;02=;04=;06=;07=;08=;17=;18=;21=;24=. PRICE 475.00

DATABASE FEATURES ARE: . . . . . FOR ANY SIZE RECORD UP TO TWENTY FOUR FIELDS FILE ARCHITECTURES CAN BE DESIGNED WITH COMPLETE FREEDOM OVER THE LINGUISTIC CONVENTIONS ASSIGNED TO EACH FIELD. THE FILE THEN CAN STORE 32000 RECORDS WHICH CAN BE SEARCHED BY THE RANDOM ACCESS NUMBER (RETRIEVED IN LESS THAN ONE SECOND) OR 'KEY' RANDOM ACCESS ON SPECIFIED FIELD OR SEQUENTIALLY COMPARING FOR LEFT FIELD PARTS, FIELD-INKEYS, OR PARTS OF RECORD, AND THEN CHANGED, PRINTED, DELETED, SKIPPED.

GRAMA (WINTER) LTD/G.W. COMPUTERS LTD. ARE THE PRODUCERS OF THIS PACKAGE WHICH IS UNEQUALLED FOR ITS LEVEL OF TOTAL INTEGRATION, LINGUISTIC FLEXIBILITY AND MAXIMISED DISK/MEMORY CONSERVATION.
AUTHOR TONY WINTER (M.D.,B.A.LIT;B.A.HON.PHIL;AND LECTURER)

24 HOUR ANSWER PHONE — LEAVE ADDRESS FOR STANDARD INFORMATION PACK

SuperBrain	Corvus DSK
64K + 320 K DISK	1995.00
64K + 700 K DISK	2495.00
64K + 1.5 M DISK	2995.00
64K + 6.3 M DISK	4595.00
N'Star & Graphics	2395.00
5.7 MG CORVUS DSK	2250.00
10 MEG CORVUS	3250.00
20 MEG Corvus DSK	4250.00
Corvus Multiplex	695.00
Corvus Mirror	695.00
Advantage N/Star	2395.00
SYSTEM 1	**2395.00**
64K + 750 K DISK	
CRT and Graphics CP/M	
IN 1 "N/Star' Unit	
MBASIC 80	150.00
CIS COBOL	420.00
MAIL MERGE	55.00
DATA STAR	190.00
DBMS (DATABASE)	475.00
DBMS (EXTENDED)	575.00
MSORT & DSORT	75.00

North Star	CompuStar
64K MDL 10 VPU	1695.00
64K MDL 20 VPU	2495.00
64K MDL 30 VPU	2795.00
64K MDL 40 VPU	3195.00
10 MEG INTERTEC	3250.00
BUS VER 8.00	875.00
BUS MANUAL	25.00
DMBS2	575.00
N'Star QD & CPM	2395.00
DRE 8820 PRNTR	1275.00
OKI Micro 80	295.00
System 2	**4595.00**
64K + 5.6 MEGABYTE CORVUS	
MICRO-WINCHESTER & CRT	
IN 1 SUPERBRAIN UNIT	
FORTRAN-80	200.00
PASCAL UCSD	475.00
SUPER SORT	120.00
BASCOMPILER	190.00
SUPER CALC (CPM)	155.00
BUS VER 8.00	975.00
LETTERIGHT	100.00

Printer	Printer
OKI MICRO-82A	575.00
OKI MICRO-83	795.00
OKI MICRO-83A	850.00
EPSON MX80F/T	475.00
EPSON MX100	575.00
TEXAS 810	1395.00
NEC 5510	1695.00
NEC 5525	1895.00
QUME 9/45	1695.00
QUME 5/55	1950.00
DRE 8830	1675.00
System 3	**5200.00**
64K + 6.4 MEG	
CRT AND TWIN 5"	
IN COMPUSTAR UNIT	
COBOL-80	320.00
WORD-STAR	250.00
CBASIC	75.00
MAGIC WAND	190.00
T/MAKER	150.00
BUS VER 9.00	1075.00
UTILITIES	75.00

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 *****

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.

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.

IMPORTANT!!! NO HARDWARE IS ANY VALUE WITHOUT THE SOFTWARE, AND OUR SOFTWARE IS UNEQUALLED. BUY A COMPLETE SYSTEM AND GET 10% OF THE HARDWARE COST IN FREE SOFTWARE.

MicroValue MONEY SAVERS

with the exclusive MicroValue 12 Months Warranty*

MicroValue Exclusive

MV1 - a Z80 computer

SAVE £107.50

The MV1 computer kit uses the ubiquitous Nascom 1 Pcb and the Z80 CPU. Interfaces are included for television, printer and cassette. 2K memory, Gemini power supply (drives up to 3 extra boards). Cherry full ASCII keyboard and Quantum Graphics are also included. Available with either an ASCII version of the Nas-Sys 3 monitor, or a Tiny BASIC. MV1 is expandable to Gemini 80-BUS specification.

MicroValue price
£105 + VAT

MicroValue Exclusive

MicroValue's 'Nascom Special'

SAVE OVER £65

We've put together a microcomputer kit containing the Nascom 2, Nas-Sys 3, Graphics ROM, Bits & P.C.'s programmers aid, Gemini 3 APSU, 16K RAM Board and mini motherboard. The result is a powerful micro using market proven boards and components.

RRP OVER £405 + VAT

£340 + VAT

MicroValue Exclusive

SHARP MZ80K with Super Graphics

SAVE £200!

The 48K RAM System is offered at a rock bottom price with the Quantum Micros Hi Res Graphics which gives resolution down to a single dot and high res. plotting. Characters are user definable and the pixel characters actually *join*. Five free games packages are included too!

RRP £645 + VAT
MicroValue price
£445 + VAT

SHARP

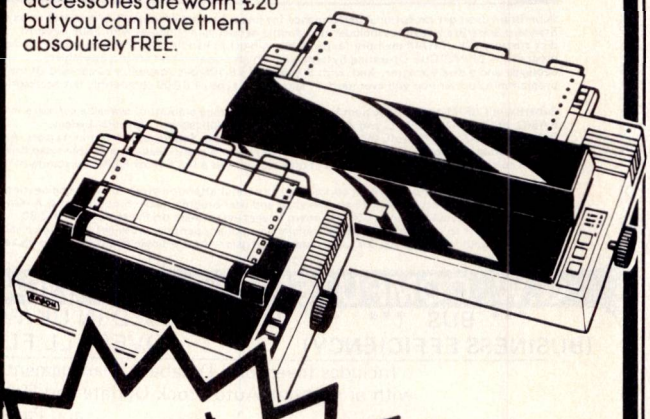


48K MZ 80K
RRP £460 + VAT
MicroValue price £345 + VAT

£20 worth of accessories FREE with every Epson Printer

	MicroValue price
Epson MX80T	£359 + VAT
Epson MX80FT1	£399 + VAT
Epson MX80FT2	£465 + VAT
Epson MX100	£575 + VAT

Buy one of the above Epsons from MicroValue and we'll give you a Pack of Fanfold paper, Interfacing Document and Connecting Cord for Multiboard or Nascom. The accessories are worth £20 but you can have them absolutely FREE.



Cheapest Printer in the UK!

Nascom IMP + Graphics Only £199 + VAT

SAVE £156

MicroValue has slashed the price of the 80cps, 80 column IMP dot matrix printer. And added Imprint's high res. graphics and double width character option. IMP has bi-directional printing and friction/tractor feed.

RRP £355 + VAT
MicroValue price
£199 + VAT

Subject to only 6 months' warranty.

NASBUS Compatible DOUBLE DENSITY Disk System - Available Ex Stock

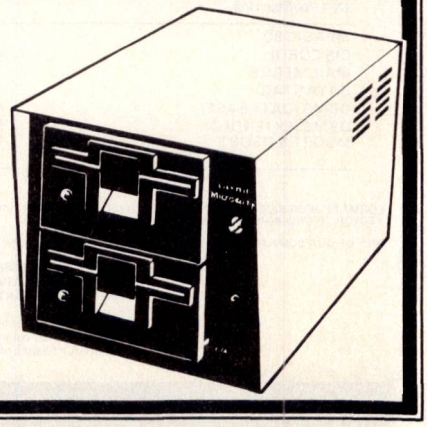
With hundreds in daily use the Gemini Disk system is now the standard for Nascom and Gemini Multiboard systems. Single or twin drive configurations are available, giving 350K storage per drive. The CP/M 2.2 package supplied supports on-screen editing with either the normal Nascom or Gemini IVC screens, parallel or serial printers, and auto single-double density selection. An optional alternative to CP/M is available for Nascom owners wishing to support existing software. Called POLYDOS 2 it includes an editor and assembler and extends the Nascom BASIC to include disk commands.

Single drive system (G809, G815/1)
£450 + VAT

Double drive system (G809, G815/2)
£675 + VAT

CP/M 2.2 package (G513)
£100 + VAT

Polydos 2
£90 + VAT



GEMINI GALAXY

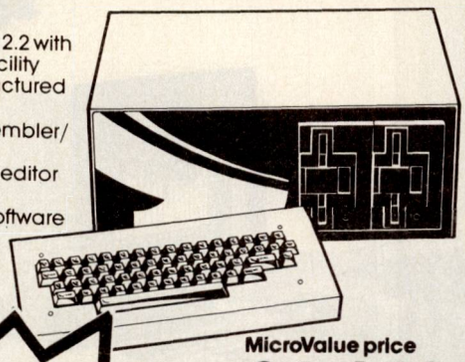
A new CP/M system based on Multiboard

HARDWARE

- Twin Z80A CP/M System
- 64K Dynamic RAM
- 700K Disk Storage (Formatted)
- 80 x 25 Screen Format
- Inverse Video
- Prog. Character Generator
- 160 x 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



MicroValue Exclusive

MicroValue price **£1,450** +VAT

80 × 25 Video for Nascom

Nascom owners can now have a professional 80 × 25 Video display by using the Gemini G812 Intelligent Video Card with onboard Z80A. This card does not occupy system memory space and provides over 50 user controllable functions including prog character set, fully compatible with Gemini G805 and G815/809 Disk Systems. Built and tested.

MicroValue Exclusive

£140 + VAT

New Software for Nascom Systems

POLYDOS 1 A disk operating system for use with Nascom 1 or 2 and Gemini G805 Disk Systems. An incomparable and extremely well presented DOS that includes an editor and assembler and adds disk commands to the Nascom BASIC. MicroValue price **£90** + VAT

MATHSPAK Double precision maths package on tape. MicroValue price **£13** + VAT

MATHSPAK Handler Used in conjunction with MATHSPAK. MicroValue price **£9.95** + VAT

Command Extender For use with MATHSPAK it extends BASIC's reserve word list. MicroValue price **£9.95** + VAT

Logic Soft Relocater An integrated assembler and disassembler package which allows disassembly and reassembly from anywhere on the memory map. MicroValue price **£13** + VAT

SAVE MORE MONEY

Standard Firmware for Nascom at Reduced prices

NASPEN	RRP £30 + VAT	**MicroValue price £20 + VAT**
Nas-Sys 3	RRP £25 + VAT	**MicroValue price £20 + VAT**
NasDis + D-Bug (EPROM)	RRP £50 + VAT	**MicroValue price £30 + VAT**
NasDis + D-Bug (TAPE)	RRP £40 + VAT	**MicroValue price £20 + VAT**
Imprint	RRP £30 + VAT	**MicroValue price £20 + VAT**
Bits & PCs Prog. Aid	£28 + VAT	**MicroValue price £20 + VAT**

MicroValue MONEY SAVERS

with the exclusive MicroValue 12 Months Warranty*

MicroValue Exclusive

NEW I/O Board for Nascom & Gemini Multiboard Systems

Quantum I/O

The new Quantum Micros I/O board takes a unique approach to the problems of interfacing your Nascom or Gemini Multi-board to external devices. This 80 Bus and Nasbus compatible card is supplied fully built, populated and tested and includes three Z80 PIOs, a CTC and a Real Time Clock with battery back-up. In addition, a range of "daughter" boards that attach straight to the I/O board are under development catering for a wide variety of interfacing requirements.

Quantum I/O board
MicroValue price – £140 + VAT

Prototyping daughter board
MicroValue price – £20 + VAT

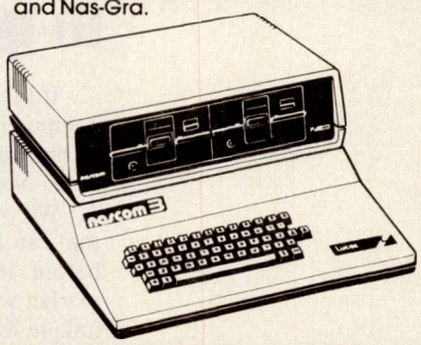
IEEE-488

The EV Computers' IEEE-488 card is an 80 Bus and Nasbus compatible card designed to fully implement all IEEE-488 interface functions. This built and tested card gives the user a very cost effective and versatile method of controlling any equipment fitted with a standard IEEE-488 or GPIB interface.

MicroValue introductory price £140 + VAT

Nascom 3 available from MicroValue

Based around the successful Nascom 2 computer, this new system can be built up into a complete disk based system. Supplied built and tested complete with PSU, Nas-Sys 3 and Nas-Gra.



8K system
MicroValue price – £416 + VAT

16K system
MicroValue price – £476 + VAT

Dual floppy disk unit (0.7 MB storage)
MicroValue price – £685 + VAT

CP/M 2.2
MicroValue price – £100 + VAT

*MicroValue Warranty

All products, except kits and Nascom Imp, sold by MicroValue dealers are supplied with 12 months warranty and will be replaced or repaired by any dealer (even if you didn't buy it from him) in the group in the event of faulty manufacture.

YOUR LOCAL MICROVALUE DEALER

All the products on these two pages are available while stocks last from the MicroValue dealers listed on right. (Mail order enquiries should telephone for delivery dates and post and packing costs.) Access and Barclaycard welcome.

INTERFACE COMPONENTS LTD.
Oakfield Corner, Sycamore Road, Amersham, Bucks.
Tel: (02403) 22307. Tlx: 837788.

COMPUTER INTERFACING & EQUIPMENT LTD.,
The MICRO-SPARES Shop,
19 Roseburn Terrace,
Edinburgh EH12 5NG
Tel: (031) 337 5611

ELECTROVALUE LTD.
700 Burnage Lane, Burnage,
Manchester M19 1NA.
Tel: (061) 431 4866.

28 St Judes, Englefield Green,
Egham, Surrey TW20 0HB.
Tel: (0784) 33603. Tlx: 264475.

SKYTRONICS,
2 North Road, The Park,
Nottingham.
Tel: (0602) 45053/45215

TARGET ELECTRONICS
16 Cherry Lane, Bristol BS1 3NG.
Tel: (0272) 421196.

BITS & PC'S
4 Westgate, Wetherby, W.Yorks.
Tel: (0937) 63774.

HENRY'S RADIO
404 Edgware Road, London W2.
Tel: (01) 402 6822.
Tlx: 262284 (quote ref: 1400).

LEEDS COMPUTER CENTRE,
62 The Balcony,
Merrion Centre, Leeds.
Tel: (0532) 458877



NEC PC-8000 Personal Computer.

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

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

Plain talk.

You should be able to talk to your computer in simple, everyday language. It should talk to you in the same language. Yours.



Through Vector Graphic products the right system can be found for you and your company. We can provide a package specifically designed to help your business including solicitors packages, accounts, stock control, payroll, job costing, estimating, planning, printers job costing, manufacturing and a host of scientific and technical systems.

All Vector systems are based on the Industry Standard S-100 Bus Configuration and CP/M operating system.

Give Almarc a ring today and we'll arrange a demonstration. It couldn't be simpler than that.

APPROVED ALMARC DEALERS

BALDOCK	Modus Systems	(0462) 894848
BIRMINGHAM	Taylor Micro Systems Ltd.	(021) 358 2436
DONCASTER	Reed Computing	(0709) 67087
HIGH WYCOMBE	Common Sense Business Systems	(0494) 40116
HARROGATE	Business Microsystems	(0423) 68224
KETTERING	Shuttleworth Business Systems	(0536) 511357
LEEDS	A. C. Barratts	(0532) 456944
LONDON	Micro Systems Consultants	(01) 979 4098
LOUTH	Computa-Crop	(0507) 604271/2
MACCLESFIELD	Resolux Ltd.	(0625) 28220
NOTTINGHAM	Bestmoor Limited	(0602) 415315
SWANSEA	Business Microsystems	(0792) 474082
TYNE & WEAR	H.P. Micros	(0632) 859923
YEOVIL	Dale Computers	(0935) 72000

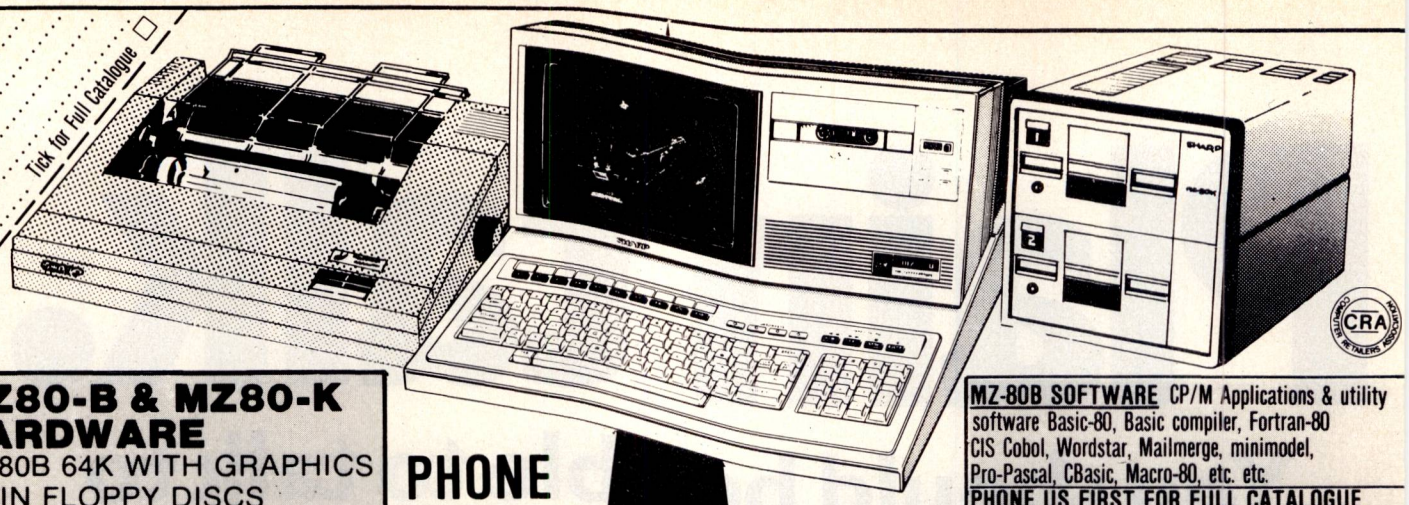
Almarc Data Systems Limited,
Great Freeman Street,
Nottingham NG3 1FR. Tel: (0602) 52657.
Telex: 37407 Almarc/G.

Also at: Green Street, High Wycombe,
Bucks. HP11 2RF. Tel: (0494) 23804.

Almarc

DATA SYSTEMS

Name .....
Address .....
Interest .....
Tick for Full Catalogue ☐



MZ80-B & MZ80-K HARDWARE

MZ80B 64K WITH GRAPHICS
TWIN FLOPPY DISCS
P5 PRINTER
CPM
EXPANSION UNIT
UNIVERSAL 1/0 CARD

MZ80-K 48K COMPUTER
MZ80-K-FO DUAL DISC UNIT
MZ80-K-P3 PRINTER
MZ80-K 5 SLOT 1/0 BOX
BI-DIRECT V24/RS232 CARD
UNIVERSAL 1/0 CARD

PHONE NOW FOR LATEST KUMA PRICES

Please add VAT to all prices

MZ-80B SOFTWARE CP/M Applications & utility software Basic-80, Basic compiler, Fortran-80 CIS Cobol, Wordstar, Mailmerge, minimodel, Pro-Pascal, CBasic, Macro-80, etc. etc.

PHONE US FIRST FOR FULL CATALOGUE

UTILITY PACKAGES FOR MZ-80K

APPOLLO WORD PROCESSOR	£24.95
MEMORY TEST	£5.50
CASSETTE DATABASE	£29.50
BASIC EXTENSIONS	£13.00
ARDENSOFT TOOLKIT	£35.00
CP/M KIT	£150.00
ZEN EDITOR/ASSEMBLER	£19.50
SHARP EDITOR/ASSEMBLER	£45.00
ZEN-DOS DISSASSEMBLER	£37.50
SHARP MACHINE CODE TAPE & MANUAL	£22.50
CRYSTAL BASIC	£40.00
SUPER COPY	£10.50
PROGRAMME FILING INDEX	£5.50
MUSIC COMPOSER-EDITOR	£10.50
DOUBLE PRECISION BASIC FOR THE MZ80K DISC SYSTEM	£40.00
PASCAL (CASSETTE)	£50.00
MZ80-K CALC CII (FINANCIAL MODELLING)	£34.50

MZ80-K MANUALS & ACCESSORIES

MZ80-K DUST COVER	£9.95
BASIC 5025 MANUAL	£7.00
SERVICE MANUALS	
MZ80-K	£7.50
MZ80-I/O	£5.00
MZ80-P3	£7.50
MZ80-FD	£10.00

Software authors contact us

NEW PROGRAMMES PLUS MZ80K BOOKS

The Point of this Ad. is SHARP

GAMES FOR THE MZ-80K

ANIMATE	£5.50	LUNAR LANDER	£5.50
BLOCKADE	£5.50	MAP OF ENGLAND	£5.50
BOMBER	£5.50	MASTERMIND	£5.50
BREAKOUT	£5.50	MIZ MAZE	£5.50
CAMELOT	£5.50	MONKEY CLIMB	£5.50
CAROLS	£5.50	MORTAR ATTACK	£5.50
CATCH 2000/INVADER	£5.50	PATIENCE	£5.50
CHESS	£10.50	POKER	£5.50
COMBAT	£5.50	PONTOON	£5.50
CONCENTRATION	£5.50	PRINCESS MAZE	£5.50
COSMIAD	£8.00	3D	£5.50
CRIBBAGE	£10.50	QUADRAX	£5.50
DONKEY DERBY	£5.50	RACING	£5.50
ELECTRONIC ORGAN	£5.50	RACETRACK	£5.50
ENIGMA	£5.50	RAIDER	£5.50
EVASION	£5.50	REACTOR	£5.50
EXECUTIVE	£8.00	ROAD HUNTER	£8.00
EXPLORING AFRICA	£5.50	RHYMES	£5.50
FALL OUT	£5.50	SHAPEMATCH	£5.50
FIREBALLS	£5.50	SHARP DEMO (GRAPHICS)	£5.50
4 IN A ROW	£5.50	SHOW JUMPING	£5.50
FRUIT MACHINE	£5.50	SNAKES & LADDERS	£5.50
GRAPHICS/ MUSIC PACK	£5.50	SPACE BATTLE	£5.50
TYCOON	£5.50	SPACE INVADERS	£5.50
GUESS WORD	£5.50	SPACE PURSUIT	£5.50
GUN	£5.50	STAR TREK	£5.50
HANGMAN	£5.50	STOMPER	£5.50
HEAD ON	£5.50	SUBMARINE	£5.50
HOME BUDGET	£5.50	SUPER FIRE	£5.50
HUNTER KILLER	£5.50	SUPER SIMON	£5.50
INTRUDER	£5.50	SWORDMAN	£8.00
J.S. LINE 4	£5.50	TANK WARP/WALL	£5.50
LARGE DISP'Y	£5.50	TEN PIN BOWLING	£5.50
LIFE	£8.00	TRADER SMITH	£8.00
LUNAR	£5.50	U.F.O.	£5.50

EDUCATIONAL PACKAGES

MUSIC COMPOSER EDITOR	£10.50
TIMETABLING AID	£19.50
CHILDRENS' MATHS	£5.50
ELECTRONS	£10.50
WAVES	£10.50
CESIL	£14.95
FRONT PANEL	£ t.b.a.
AS THE CROW FLIES	£ t.b.a.
BROWNIAN MOTION	£10.50

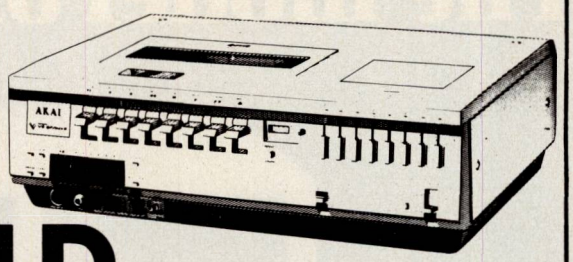
AND MUCH MORE COMING!

Trade enquiries welcome

Kuma Computers

Kuma computers: 11 York Road, Maidenhead Berks.
phone: Maidenhead (0628) 71778/9 Telex: 849462 TEL FAC.KUM





1982 SHEFFIELD PERSONAL COMPUTER HI-FI & VIDEO EXHIBITION

COMPUTERS BY-

ACORN
ADLER
APPLE
VIDEO GENIE
COMMODORE VIC
SHARP
CORVUS HARD DISK NETWORK



VIDEO RECORDERS BY-

SHARP
AKAI
FERGUSON
JVC
NATIONAL PANASONIC

ACCESSORIES BY-

WESTRA
B.F.I.
OPUS
MOLIMERX
ACORN SOFT

ADMISSION FREE

Hallam Tower Hotel
Broomhill, Sheffield 10
(on A57 Manchester Rd. 1 Mile from city centre).

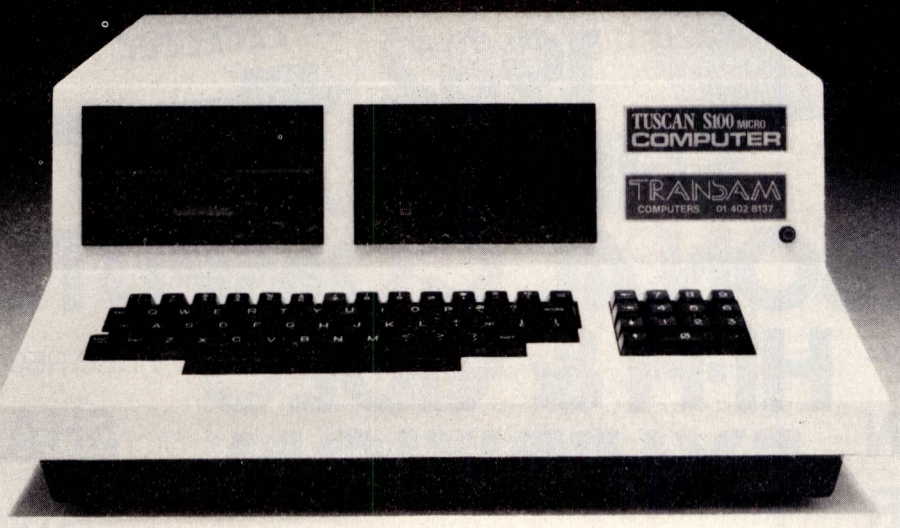
Fri. 19th March.....12noon~9pm
Sat. 20th March.....10am~8pm
Sun. 21st March.....10am~4pm

Superior Systems Ltd

VISA

178 West Street, Sheffield S1 4ET. Tel. (0742) 755005.

The model of good business.



Tuscan – the all-British microcomputer

With a proven record of steady development behind it, the Tuscan S100 now goes a step forward, solving the problem of effective backup storage.

The Tuscan S100, Britain's first S100 computer on a single board, is now available with designed-in mini-Winchester drive for better performance, shorter access time and higher transfer rate. All this from Britain's own home-grown micro manufacturer.

Systems with printer, screen and CP/M start at £2125 with twin floppies, and at £3625 with one floppy and one 5-meg. mini-Winchester.

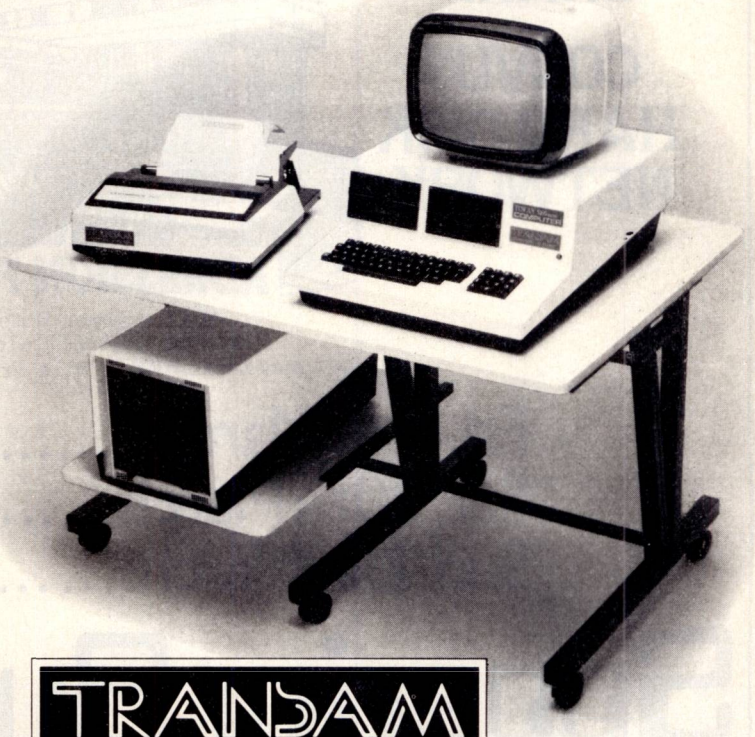
SOFTWARE. Business accounts packages start at £800 when purchased with the Tuscan system. Word processing packages start at £315; Database packages start at £100.

HARDWARE. Flexibility is the key feature of all Tuscan systems. A choice of storage capacity, video format and graphics is available. The Tuscan S100 can read and write in sixteen different disk formats, with a choice of 5¼"or 8"drives.

SUPPORT. The Tuscan S100, designed and built in Britain, is backed by Transam's substantial experience in electronics plus a dedicated hardware and software team. National third party maintenance is available at ten per cent of hardware costs.

BUSINESS SYSTEM DEALERS. Business Equipment Centre, 10 Edge Lane, Liverpool. Tel: 263 5783. Contact: Rod Crofts.
Purley Computers, 21 Bartholomew Street, Newbury, Berkshire. Tel: 41784. Contact: Ron Smith.

FURTHER INFORMATION. Two new catalogues covering "systems and peripherals" and "CP/M Software" are available, giving details of our systems and services. Call or write for yours.



TRANSAM

TRANSAM COMPONENTS LIMITED
59/61 THEOBALD'S ROAD, LONDON WC1
Tel: 01-405 5240/2113. Telex: 24224 (Ref. 1422)

NASCOM USERS

Take a look at the NASCOM APPROVED HS-IN STORAGE SYSTEM. Where else can you get features like these , , ,

A full on screen instant display of the catalogue
Auto vertification of each file as it is written.
CRC error checking.
Link selectable 2Mhz or 4Mhz option.
Fast data transfer rate of 6000 bps.
Powered from NASBUS.
8" sq NASBUS compatible PCB.
Far more reliable than any floppy disk system.
112K on-line storage with 2 drive system.

The HS-IN has a Command Set which makes it a floppy-disk "look-alike". It can load an 8K program in under 11 seconds and can store up to 56K (28 files) on each side of tape. Why spend £700 on a floppy disk system when the less expensive HS-IN system has a command set like this . . .

BRIDGE THE GAP BETWEEN EXPENSIVE FLOPPY DISK SYSTEMS AND UNRELIABLE CASSETTES.

B – Write a Basic file
C – Instant display of catalogue.
D – Delete file.
J – Jump to Basic.
N – Jump to NAS-SYS.
Q – Warm start to NASPEN text editor.
R – Read a file.
T – Transfer file to another drive.
W – Write a file.
X – Exit and rewind cassettes.
Z – Warm start to Basic.

This Mini-Cassette Storage System is technologically far ahead of anything like it on the market and is extremely reliable into the bargain. AND THE COST?

Single Drive System built and tested **£199**

Double Drive System built and tested **£279**

Carriage **£3.50.**

OFFER NO 1
ALL RAM B boards supplied until April 30th come with an **EXTRA 32K FREE** on board.

OFFER NO 2
NASCOM 2 built, 48K RAM B board built, 3A PSU
ONLY £360 + VAT. **SAVE £37.50** SEE OFFER 1

OFFER NO 3
NASCOM 2 built, 48K RAM B board built, 3A PSU, HS-IN SINGLE DRIVE SYSTEM
ONLY £530 + VAT. **SAVE £66.50** SEE OFFER 1

ALL OFFERS END APRIL 30TH 1982

OFFER NO 4
NASCOM 2 built, 48K RAM B board built, 3A PSU, HS-IN single drive system, EPSON MX80FT-1, NASPEN & ALL CABLES **ONLY £900** + VAT. **SAVE £125.50**
SEE OFFER 1

OFFER NO 5
NASCOM 3, 48K RAM B built, Gemini Intelligent Video Card (IVC)
ONLY £540 + VAT. **SAVE £65** SEE OFFER 1

OFFER NO 6
SHARP MZ80K WITH SUPER GRAPHICS +5 GAMES, EPSON MX80FT-1 WITH PAPER.
ONLY £825 + VAT. **SAVE £229**

MICRO-SPARES JOIN MICROVALUE GROUP

MICRO-SPARES have now become the MICROVALUE GROUP member supplying Scotland and now add super new products like the Gemini, Sharp & Epson to the MICRO-SPARES range. SEE MICROVALUE AD IN THIS MAG. On pages 24 & 25

QUALITY MEMORIES

AT PRICES THAT CANNOT BE BEATEN IN THE U.K. MICRO-SPARES can supply these memories in quantities from 1 to 10,000+. Parts delivery is fast – orders received by 4.30pm are shipped same day.

All memories are guaranteed for 1 year from date of purchase. Memories supplied are good quality but should you have a faulty part a replacement will be sent as soon as the part is received – without question.

Thousands of memories have already been supplied to Manufacturers Computer Traders, Government Bodies and Individuals all over the U.K. and the continent. If you are buying in large quantities please telephone for price. Official orders are welcome!

		1–49	50–249
2114L	(200ns & 300ns) low power Suitable for Acorn Atoms	**96p**	**93p**
2114N	(200ns & 300ns)	**96p**	**93p**
4116	(250ns)	**63p**	**63p**
	(200ns)	**65p**	**63p**
	(150ns)	**75p**	**73p**
2708	(450ns)	**1.40p**	**1.34p**
2716		**2.05p**	**1.92p**

Buy an EPSON PRINTER – Get a COMPUTER FREE!

YES – YOU WILL RECEIVE A FREE SINCLAIR ZX81 WITH EVERY ONE OF THE MODELS BELOW. EVEN THOUGH THE PRICE IS GOOD – BUT HURRY – THIS OFFER LASTS AS LONG AS THE ZX81's ARE IN STOCK

EPSON MX80T	**£359 + VAT**
EPSON MX80FT1	**£399 + VAT**
EPSON MX80FT2 (new type)	**£465 + VAT**
EPSON MX100	**£575 + VAT**

PAYMENT AND DELIVERY
Payment is by Cheque, Postal Order, ACCESS, VISA etc. PLEASE add postage and VAT. Postage on component orders under £30 is 50p. All in stock items sent same day. All none Kit items have a 1 year guarantee. Official orders welcome. Discount on large orders by arrangement.

SUPPLIERS TO TRADE
LOCAL GOVERNMENT
EDUCATION
INDIVIDUALS
INDUSTRY

EDINBURGH

Micro-Spares

19 Roseburn Terrace, Edinburgh EH12 5NG.
Tel: 031-337 5611.

BARCLAYCARD VISA

SCOTLAND

COMPUTERS
PERIPHERALS
COMPONENTS
& NATIONWIDE
MAINTENANCE

Pete & Pam Computers

VISICALC 3.3 **Our Price £105.00**
At last – Visicalc on 16 sector DOS 3.3 with 12 additional commands. Enhanced Manual is included.

VISIDEX £105.00
New from Personal Softcard – type in whatever key words, phase dates or numbers you want the info to be associated with and store away.

VISITERM £79.00
Allows your computer to communicate with larger computers or other personal computers. Link your personal computer with your company's mainframe.

VISIPLOT £85.00
Automatically creates high resolution graphs and charts. Visualise data in six different formats and 6 different colours. Data can be directly entered or data files loaded from VISICALC 3.3.

VISITREND £129.00
Allows you to perform sophisticated math operations on a time series data such as stock prices or production figures. Includes multi-line regress cumulative total percent charge lead/lag moving averages, smoothing and various transformations which let you create new time series. This package also includes VISIPLOT.

VISIPAK £325.00
A Visicalc 3.3, Visitrend/Plot and Visifile all in one pack.

VISICALC UTILITIES VUno3 £39.95
From Progressive Software – add to Visicalc's capabilities.

VISIPLUS + Allows you to consolidate Visicalc models. £19.95

PASCAL JOB CONTROL SYSTEM – from High Technology £195.00
A fast sophisticated job control/costing system able to control costs on 400 jobs providing useful reports and maintaining 50 cost centres.

DB MASTER £129.95
The data base with 100 fields operating on multi-diskette files for large capacity.

DB MASTER Utility Pack No.1 £60.00
Links DB Master with Apple text tiles and VISICALC 3.3 add delete or change existing DB Master fields and more.

DB MASTER for Corvus – available soon £295.00

INFORMATION MASTER – Date Base £79.00
A dream to use has advanced facilities such as global change and calculator mode of entering figures. A system that a novice can use with ease.

DATA MASTER £55.00
A utility for use with INFORMATION MASTER allows the splitting of data base system selectivity change of field types and transfer of print formats.

TRANSIT £29.00
A utility that enables you to link INFORMATION MASTER to many files including those created by VISICALC. With 500 sub cost centres. Worth its weight in gold!

DATA FACTORY (88 fields) £99.95

PFS PERSONAL FILING SYSTEM £55.00
PFS REPORT £55.00

VISIFILE £139.00
New date base from Personal Software.

WORDSTAR for Apple £169.00
If you want the best in word processing for Apple then WORDSTAR is the answer. Very well documented and great to use. Requires the installation of a Z-80 Softcard.

MAILMERGE £69.00
Allows you to maintain name and address lists and merge fields into text to form letters etc.

SUPERSORT £105.00
For use with Wordstar and Mailmerge.

DATASTAR now available on Apple £169.00

CALCSTAR – The very latest from Micropro £99.00
An electronic speed sheet ala Visicalc with the capability of moving information into Wordstar for improved presentation and ease of use. A must for every Wordstar user.

DATASTAR £99.00
The very latest from Micropro, Calcstar, an electronic spread sheet ala Visicalc with the capability of moving information into Wordstar for improved presentation and ease of use. A must for every Wordstar user.

LETTER PERFECT £99.00
A WP system that will work with both 40 and 80 column system configurations.

APPLE PIE £99.00
A separate package is available for use either 40 col. Double Vision, Videx, Smarterm or Suprterm 80 col boards.

SUPER TEXT II £85.00
A WP system that has added arithmetic functions to WP power.

SUPER TEXT FORM LETTER £55.95

SUPER TEXT ADDRESS BOOK £29.95

All three SUPER TEXT together £150.00

MAGIC WINDOW £55.95
A complete letter writing system – much advertised.

BASIC MAILER £39.95

SOFTKEY £99.00
(Basic or pascal version available) A 15 key programmable keypad.

Patch for WORDSTAR and SOFTKEY to permit use of programmable pad with WORDSTAR. £29.95

SUP-R-TERMINAL £195.00
WIZARD 80 £195.00
A new 80 column board with both switchplate and softswitch.

VIDEX VIDEOTERM £185.00

40/80 Column switchplate £12.95
Video softswitch £21.95
Character Eproms: French, German, Katakana, Spanish, Inverse, Math and Greek symbols, Super and subscript, Line draw graph £17.95
Videoterm Utilities disk £22.95

NEW! – VIDEX KEYBOARD ENHANCER II £89.00
The very latest from Videx – uses 6504 microprocessor to provide typewriter like keyboard, adds ability to store macro instructions, remembering words and phrases. Can remember what you typed whilst your Apple was busy talking to disk or doing other things. Can auto-repeat any key held down. Replaces the existing keyboard encoder for easy installation.

PASCAL TUTOR £79.00
If you want to learn Pascal this is the package to use – complete with two disks.

APPLE MUSIC THEORY £29.95
Apple Inc's own program designed to teach the fundamentals of music.

APPLE HOW TO £29.95
Lessons in integer programming.

APPLE SHELL GAMES £14.95
An interesting shell in which to place your children to learn in the best way.

TYPING TUTOR £12.95

Programs from eduware
Algebra 1 – Compumath: Fractions – Compumath: Decimals – **Spelling Bee** **Each £20.95**
Arithmetic skills £26.95
Compuread £12.95
Perception £10.95
Counting Bee £15.95
Edu-pac 1 £22.95

CHEMISTRY LAB SIMULATIONS £55.00
No. 1 – Acid-base titration, Avrogadro's number – No.2 Ideal Gas law and entropy – No.3 Calorimetry experiments, Hass' law – Thermodynamics of an Equalibrium reaction and heat of Vaporisation –

AIDS TO O' LEVEL COMPUTER STUDIES £60.00
5 disks by Pedagog Aids.

MOUNTAIN MUSIC SYSTEM £239.00
A 16 voice digital synthesizer for Apple, now much reduced price.

Crae 2.0 – Mcat – Applesoft Program Optimiser **Each £13.95**

Applesoft structured BASIC – DOS Plus – Multi-Disk Catalog II – Quickloader – Applesoft Utility Programs **Each £15.95**

Disk Organizer II – Disk Recovery – The Directory Manager – Graphic Writer for Tiger 445/460/560 – Higher Graphics II **Each £17.95**

Program Line Editor – Higher Text II – Applesoft Command Editor – Macro Screen Editor – Graphic Dump Programs for 445/460/560 Tiger, Anadex 9501, Spinwriter, in both PASCAL and BASIC **Each £20.95**

Apple Doc – Program Line Editor in ROM – Applesoft Extended Editor (AXE) **Each £24.95**

DAKIN 5 Programming Aids 3.3 (12 utilities in one pack) £49.95

APPLE DOS TOOL KIT £36.95
Animation, programming and assembling all in one pack from Apple Inc.

PASCAL PROGRAMMER £79.00
The pascal programmer's dream – all the utilities you wanted to use but never had time to write.

DOS SOURCE 3.3 £24.95
A disassembled listing of DOS on 4 sides of 2 disks – Limited Edition.

SENSIBLE SOFTWARE UTILITIES
Applesoft Programme Optimiser £12.95
Multi Disk III £14.95
Super Disk Copy III £17.95
DOS Plus £17.95
Disk Organiser II £17.95
Disk Recovery £17.95
Applesoft Plus Structured Basic £14.95

GRAPHIC UTILITIES
Apple World £34.95
3D Supergraphics £21.95
Animation Pack £39.95
Animation Pack Editor £17.95
Graphic Enhancement £15.95

Saturn Navigator (needs animat. pack) £15.95
Micropainter £20.95
PASCAL Graphics Editor (Sirius) £59.95

VERSAWRITER £149.95
Superb graphics tablet from Versa Computing – you don't have to go to the expense of an Apple Graphics Tablet for graphics capability.

VERSA EXPANSION SOFTWARE £20.95
Auxiliary pack for the VERSAWRITER includes the ability to draw in fine detail using magnification mode.

BOOKS
Beneath Apple DOS £11.95
HYDE – Assembly Language Programming £11.95
INMAN – Assembly Language Programming £11.95

MACHINE COVERS – only the best material used
Apple only £5.95
Single Disk £2.95
2 stacked disks £4.45
Apple, 2 disks and 9" monitor or Apple and 12" monitor £8.95
Apple and 2 disk £7.95
Epson MX 70/80 £5.45
Paper Tiger 445 · 460 £5.45

Apple, 2 disks and 12in monitor £9.95
12in monitor cover £7.95
9in monitor cover £5.45

BASF DISKS (for 10) £18.50
DYSAN DISKS (for 10) £25.00
Kassette disk boxes 5.25 in £2.45

Z80 SOFTCARD £195.00
A Z-80 microprocessor for Apple comes with CP/M operating system and Microsoft Basic 5.

COBOL 80 £299.00
FORTRAN 80 £109.95
BASIC COMPILER £199.00
ASSEMBLY LANGUAGE DEVELOPMENT (6502, 8080 and Z80) £79.00
MYCHESS £20.95
A chess game for Apple with a Z80 Softcard installed – beats Sargon II.

Z TERM £59.00
Software that allows you to emulate the terminal of your choice whilst using Apple with a Z-80 Softcard.

THE MILL – A 6809 plug in board for Apple £249.95
Can run at full speed whilst the 6502 runs at 20%. Comes with either a Pascal speed up kit to increase the speed of execution of Apple's U65D Pascal or a 6809 assembler. Also available a debugging utility. Coming Soon – OS9 Operating System.

64 RAM CARDS
Here at last! Can be used in pairs to emulate a disk drive
2 cards and card emulating software £499.00
Single board £225.00

VISTA 8 INCH CONTROLLER CARD £349.00
Works with 8 inch double sided double density drives to give autoboot capability in Applesoft, CIPM, and Pascal on Apple.

REMOTE OPERATING SYSTEM – ROS £499.00
Provides multiple Apple II users with the capability of utilising the disk storage available from one control Apple, up to 127 remote computers may be connected to one central Apple containing up to 8 floppy disk drives starter system (1 central + remote boards) with software and cables.

APPLE OS9 – STELLATION TWO'S MILL 6809 £399.00
Now available with OS9 and BASIC 09.
BASIC 09 allows simultaneous running of separate programs. It has to be seen to be believed. (OS9 is modelled along the lines of UNIX).

Single board £124.00

EPSON MX-80 T £349.00
9 × 9 matrix printer with friction and tractor feed.

EPSON MX-80 T £349.00
Tractor feed only.

INTERFACE AND CABLE £65.00
For the above (non-graphic).

GRAPPLER from Orange Micro £99.00
An interface for the Epson MX 80 and 100 that obeys Apple protocols and has a graphics dump programme in ROM producing 2 sizes of picture and 360 degrees rotation with positive or negative image.

AIO Parallel / Serial Interface from SSM £119.95

MOUNTAIN CPS – Multi-function Card £135.00
A bi-directional serial interface – parallel port and clock/calendar card – all on one board. Can be made to use phantom slots.

RAMCARD £99.95
A 16K Expansion card for your Apple. It will provide additional memory for Visicalc load integer from a System Master and is fully compatable with Apple's Pascal System. The only board with Neon Read/Write indicators. The only card with data bus lines for faster data retrieval.

RAMEX 16 £89.95
UK entrant to the expansion card market – does not need to be ribboned to the memory area.

THE MANAGER £19.95
A utility that moves DOS onto a 16K expansion card – freeing motherboard Ram space for larger programs.

TG PRODUCTS
JOYSTICK – Self-centering, adjustable pots £34.95
PADDLES – Top quality controllers £20.95

VERSA EXPANDER PORT £12.95
An expansion cable ZIP socket for the Apple game I/O socket allows zero insertion force of peripherals requiring connection to game socket.

★ ★ **SPECIAL OFFER** ★ ★
EXPEDITER II **only £49.00**
An Applesoft Compiler from On-Line Systems.

TASC – THE APPLESOFT COMPILER £99.00
A two pass compiler from Microsoft – the Applesoft authors. Comes with extensive documentation and copyable disk. Compiles to disk so can compile any length of programme. From 2 to 20 times improvement in speed.

NEC GREEN SCREEN MONITOR £139.00

ABT NUMERICAL KEYPAD £74.95

APPLE HOW TO £29.95
Requires Int Basic or 16K Expansion Card – teaches calculating and programming.

APPLE MUSIC THEORY £29.95

ELEMENTRY MY DEAR APPLE £19.95
Tuition for children.

ECHO II SPEECH SYNTHESIZER £139.95
Based on TMS 5200 chip from TI – type in speech direct from keyboard.

EXPANSION CHASSIS £399.00
Long awaited – here at last – More slots for your Apple.

GAMES

Apple Galaxian – Galaxy Wars – Head-On – Galactic Revolution – Galactic Trader – Galactic Empire – Mystery House – Bridge Partner – Checker King – Gammon Gambler – Roulette – Craps – Apple 21 – Puckman – Global War – Space Warrior – Apple Typhoon – Sneekers – Galactic Attack – Olympic Decathlon – Cribbage – Star Dance – Asteroid Field – Anti Ballistic Missile **All at £12.95**

Microsoft Adventure – ABM – Dog Fight – Phantoms Five – Orbitron – Pulsar – Microchess 2 – Odyessy – LA Land Monopoly – Morloc's Tower – Rescue at Rigel – Space Eggs – Trilogy of Games – The Prisoner – Raster Blaster – Autobahn – Space Raiders – Tawala's Last Redoubt – Gamma Goblins – Apple Panic – Red Alert – Firebird – Genetic Drift – Mad Venture – Space Quarks – Castle Wolfenstein – Appleoids – Pegasus II – Softporn Adventure – Cross-Fire – Jaw-Breaker – Zork II – Crush-Crumble and Chomp – Dragon's Eye – Dark Forest – Star Thief – Bug Attack – Outpost – Borg – Sneakers – Hi Res Soccer **All at £14.95**

Cyborg – 00-Topos – David's Midnight Magic – Akalabeth – Pool 1.5 – Beer Run – Epoch – Hadron – Russki – Duck – Ulysses – Wizzard and the Princess **All at £17.95**

Computer Conflict – Computer Quarterback – Cartels and Cutthroats – Space Album – Bill Budge 3D Graphics Tutor – Cyber Strike – 3 Mile Island – Adventure 789 – Temples of Apshar – Hellfire Warrior – Zork – Computer Baseball – President Elect – The Battle of Shiloh – Tigers in the Snow – Warp Factor – Computer Conflict – Gorgon – Flight Simulator – Ultima – Trick Shot – Robot War – The Best of Muse – Cops and Robbers – Southern Command **All at £20.95**

Computer Air Combat – Computer Ambush – Computer Bismark – Operation Apocalypse – Torpedo Fire – Dragon Fire – Napoleon's Campaigns **All at £29.95**

Authorised Apple Sales and Service

LONDON RETAIL, 98 Moyser Road, London SW16 6SH
Tel: 01-677 2052/7341

MAIL ORDER AND DISTRIBUTION, Waingate Lodge, Waingate Close. Rossendale Lanc BB4 7SO.
Tel: Rossendale (0706) 227011

Access
BARCLAYCARD VISA

Prices do not include VAT
Please add 15% VAT to your remittance
Postage and packing FREE

Telex No. 635740 Orders welcome by phone or telex PETPAM G

turbo apple

'ADD A TURBO TO YOUR APPLE - SYSTEM'

One of the most annoying things when working with microcomputers is to wait for the print-outs. This becomes a real irritation in interactive situations such as wordprocessing, generating invoices etc.
There are two ways of solving the problem:

1 *Buy a very fast printer. Cost app. £1500 – £2000.*

2 *Buy a buffered printer-interface card for your APPLE. Cost £199.*

The buffered parallel printer-interface card B.PPI-103, from Torsby Microprocessor, has its own microprocessor and 6K of RAM.
The characters to be printed are transfered into the RAM of the card at machine-language speed. The control of the APPLE is almost immediately returned to the program or key-board, provided you do not exceed the buffer capacity (5,5K).
The buffer-card transmits the characters as soon as the printer is ready to accept more data.

The Turbo-card increases your system-speed with up to 30% depending on the application.

The Turbo-cardis the first buffered interface card that provide on-board firmware for dumping APPLE Hires-grafics to a printer. The firmware resides in an EPROM. At the moment EPROMs are available for EPSON MX-70, 80, 100, Anadex, IDS Paper Tiger and Centronics 739.

You can use the Turbo-card in just the same way as any other parallel-printer interface card. Just plug it in and go.

Specification

Size: 230x77x10mm.
System interface
Internal: APPLE slots 1 – 7

Processor: 6504
Program memory: 4k EPROM
Other:

Weight: 130 grams
External: Centronics parallel 8 bits, AKN, STROBE
Memory: 6K static RAM CMOS

Glass-Epoxy PC-board. Solder-resist on both sides of board, Component Silkscreen, Goldplated edge-connectors. 1.5M cable including connectors.
Burnt-in more than 10 hours.
Works from Monitor, Basic, Pascal, I/O 1.1 and CP/M.

Developed, manufactured and tested in SWEDEN.

Warranty 1 year on parts and labour

PRICE only **£199** inc cable

EXCL VAT

Distributor in UK
COMPUTOPIA
30 Lake Street,
Leighton Buzzard
Bedfordshire
Tel: 0523/376600

CompUtopia

TRADEMARKS: APPLE is a registered trademark of APPLE Computer Inc. Microsoft is a registered trademark of Microsoft Inc. CP/M is a registered trademark of Digital Research Inc.

tmp

TORSBY MICROPROSESSOR AB PL 2317 S 685 00 TORSBY SWEDEN

THE TRANSTEC 1200 VIDEO MONITOR.



At last, a top quality green screen 12" video monitor at a really competitive price.

The Transtec 1200 has a composite video input, compatible with all micro computers and the screen gives a crisp read-out of a full 80 columns.

The unit is housed in a durable plastic cabinet with controls neatly concealed behind a hinged front-access panel.

Why pay more? Send the coupon today for full specification or better still, call us direct in Bristol.

transtec

13A Small Street, Bristol W.1.
Tel. 0272-277462.

35 Lisburn Road, Belfast.
Tel. 24009.

IDA Complex,
22 Macken Street
Dublin-2
Tel. 713049.

SEND £115 (VAT CARRIAGE INCL.) FOR IMMED. DELIVERY.

I like the Transtec 1200 price — send me more data — fast.

Name

Company

Position

DEALER ENQUIRES WELCOME
PRIVATE LABELLING AVAILABLE
ALSO AVAILABLE UNCASED

JUST £99 COMPLETE.*

* Vat, postage and packing not included.

LONDON COMPUTER CENTRE

NEW! from Tele Video
EMPEROR 11 £2,150



made under licence for Micro Video Ltd., world wide distributors of the Emperor range of micro computer Business Systems.

* Expandable to multi-user system and hard disks.
* Superbrain compatability
* CPM operating systems 64K Ram. Real Time Clock
* Detachable keyboard with 12 function keys (Wordstar option)
* Green screen — true decenders
* Built in 1 Mbyte dual disk drives
* Full graphic capabilities

* OPTIONS
* 10m byte Hard disk £1995
* Expandable up to 6 users, multi-tasking system with Emperor 20 (10m byte hard disk) 64K processor, back-up floppy disk £4500
* Plus each user terminal with 64K Ram, only £1050

DEALER ENQUIRIES INVITED. DEMONSTRATIONS ON ALL MODELS.

43 GRAFTON WAY, LONDON W1P 5LA (Opposite Maples)
OPENING HOURS: 11 7 MON-FRI 12-4 SA1 Tel: 388 6991/2
24 hour answer phone: 01-388 5721

LONDON COMPUTER CENTRE

PET! APPLE! TRS80! HORIZON! OWNERS!

Let LCC the BIG COMPUTER CENTRE put you a cable's length away from **Letter Quality Printing** with 6-Star Printers.

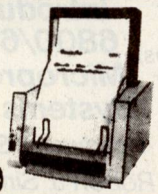
OLIVETTI ET 121. 20 CPS. Proportional Spacing. Doubles as Typewriter. **£795**
TEC 40. 40 CPS. 2K Buffer. Bi-Directional Printing, uses Diablo Daisywheels and ribbons. **£1235**
DAISYWHEEL II. 60 CPS. Ricoh 1600 Daisywheel. **£995**
FLOWRITER RP1600. 60 CPS. The most intelligent Daisy. 8K Buffer. /Directional/Printing X On/Off. Repeat Built-in **£1500**

QUME SPRINT 5. 45 CPS. **£1300**
NEC. 55 CPS. **£1650**
FUJITSU. 80 CPS. Plastic/Metal Wheels **£1695**

DEMONSTRATIONS ON ALL MODELS



New! 12" wide Automatic Sheet Feeder fits all above £580

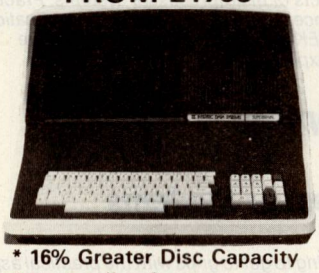


EPSON DUAL MODE PRINTERS
LETTER QUALITY & STANDARD DOT MATRIX IN ONE LOW COST UNIT

MX-80 F/T List £425 £ PHONE
LETTER LIKE PRINT QUALITY
3 WAY PAPER HANDLING
1. Leterheads or A4
2. Fanfold
3. Paper Rolls
LOW NOISE
132 COLUMNS PER LINE
JAPANESE RELIABILITY
MX-80 F/T2 List £440 £ PHONE
MX-100 F/T List £575 £ PHONE



SUPERBRAIN WITH NEW EXTRA FEATURES FROM £1795*

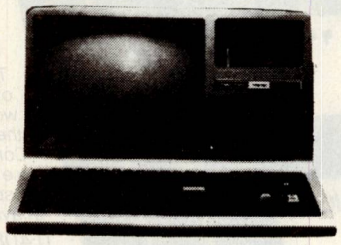


*** 16% Greater Disc Capacity**
*** Faster disc Access**
*** Auto Repeat on all Keys**
*** 18 Programmable Keys**
Now with multi-coloured dedicated keys for Magic Wand and Wordstar; the ultimate word processors.

AUTHORISED TANDY DEALERS

COMPLETE MODEL I 48K SYSTEM

SPECIAL OFFER: LIMITED PERIOD 48K System — 16K keyboard, 32K Expansion Interface, dual Disc Drives, Green VDU, complete with all cables. . **£999**
16K keyboard with UHF Modulator **£375**
16K System with VDU & Cassette **£475**
32K Expansion Interface **£289**
Dual Disc Drives **£399**
Double Density Doubler **£75**



MODEL II
from £1999 including CP/M

We supply Model II with TRS DOS AND CPM at NO EXTRA CHARGE.

MODEL III

From £650
16K without disc drives **£650**
48K without disc drives **£695**
48K with disc drives **£1350**
With Epson MX-80 and Scripsit for Wordprocessing **£1799**

CP/M SOFTWARE WORD PROCESSORS

WORDSTAR **£275**
WORDSTAR WITH DEDICATED KEYS **£340**
WORDSTAR MAIL-MERGE **£65**
MAGIC WAND **£185**
MAGIC WAND WITH DEDICATED KEYS **£250**
SPELLBINDER **£185**
SPELLBINDER WITH DEDICATED KEYS **£250**

DATA BASE SYSTEMS

DBASE II RELATIONAL DATA BASE **£375**
CONDOR **£250**
TIM **£75**

CRITICAL PATH ANALYSIS

MILESTONE **£250**
TASK **£250**

TRS-80 MODEL I SOFTWARE

ELECTRIC PENCIL (DISC) **£60**
SCRIPSIT (DISC) **£61**
SCRIPSIT (CASSETTE) **£25**
MAIL-MERGE FOR PENCIL & SCRIPSIT **£45**
VAT AID PROGRAMME **£45**
CCA DATA MANAGEMENT SYSTEM **£125**

FINANCIAL PLANNER/ MODELLING

T/MAKER **£155**
SUPERCALC £250 **£250**
MINI-MODELLER **£350**

THE SPECIAL LCC APPLE SYSTEM

48K Apple, Dual 40 Track Disc Drives & 12 Green Screen Monitor **£1395**
80 Column Card with Decenders **£135**
CP/M Softcard **£95**
16K RAM (Integer) Card **£65**
Centronics Parallel Card **£75**
Serial Printer/Communications Card **£75**

ALL PRICES ARE EXCLUSIVE OF VAT AND DELIVERY
DEALER ENQUIRIES INVITED ON ALL PRODUCTS

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



ZX81 Basic Book

NEW

Robin Norman

If you have a ZX81, or are thinking of buying one, this book will tell you all you need to know to get the best from it.

The ZX81 Basic Book covers the Basic 1K version, the additional facilities offered by the 16K expansion RAM and how to use the Sinclair ZX printer. There are 14 original programs for you to run on the machine (for 1K and 16K versions), and for those confused by computer jargon (and who isn't?) there is a glossary of technical terms.

Robin Norman assumes no initial knowledge of computing and his undemanding writing style is a perfect beginner's introduction.

0 408 01178 5 176 pages

£4.95

Learning BASIC with your Sinclair ZX80

Robin Norman

This book will be of great value to all ZX80 owners. It tells you how to get the ZX80 working, how to program it and how to get the best out of it.

Contains all the information necessary to use the Sinclair ZX80 to the full plus 14 specially written programs unavailable elsewhere.

0 408 01101 7 160 pages

£3.95

Q&A on Personal Computing

Peter Lafferty

This book will help anyone who wishes to to learn about personal computers and the uses to which they can be put. It describes the development of the personal computer, explains its operation and outlines the principles of programming. It deals in large part with systems that are available to the enthusiast, particularly in the middle price range, and what can be expected from them while a chapter on applications surveys the many uses of these remarkable machines.

0 408 00555 6 96 pages

£1.95

Microprocessors for Hobbyists

Ray Coles

Adapted from a popular series of articles in ***Practical Electronics,*** *this book takes the reader step by step through the mysteries of the microprocessor chip and its instruction set, the support components such as memories and communication interfaces, and the use of the microprocessor in home computers.*

0 408 00414 2 92 pages

£3.25

Coming shortly...

26 BASIC Programs for your Micro

Derrick Daines

Here is a collection of 26 new and varied games programs, from spelling tests to submarine-hunting. They are graded from the most elementary, usable on the simplest home computer, to longer and more complex programs suitable for more advanced machines.

Derrick Daines has written the games in an easy subset of BASIC so that the reader will have no difficulty in translating them for any microcomputer. Each program is described in a lively and informative style, with a list of variables and memory size required, plus a program listing and sample run.

The book is ideal for hobbyists since it helps improve techniques for writing successful programs whilst also providing plenty of entertainment.

0 408 01204 8 200 pages approx.

£5.50 approx.

Introduction to 6800/6802 Microprocessor Systems

NEW

Hardware, Software & Experimentation

Robert J. Simpson and Trevor J. Terrell

A book for students, technicians, scientists and engineers who wish to acquire an understanding of the principles and operation of 6800/6802 microprocessor systems. System hardware, programming concepts and practical experimental work are featured, and the text is designed for hands-on experimental investigations. There are many worked examples to illustrate theoretical and practical aspects of microprocessor systems. Practical application concepts are introduced and investigations using the Motorola MEK6802D5E evaluation system are described and explained.

0 408 01179 3 288 pages approx.

£6.95 approx.

Practical Microprocessor Systems

Ian R. Sinclair

A book for those wishing to get to grips with the practical aspects of microprocessors. It shows with examples how the microprocessor, together with related devices, memory, input/output devices, programs etc., builds up into a usable system. For the student, technician or home enthusiast.

0 408 00496 7 144 pages **£4.95**

Microprocessors – Your Questions Answered

Alec Wood

In writing this book Alec Wood has set out to dispel the mystique that surrounds the microprocessor. He tells you what a microprocessor is, what binary arithmetic is, and how the microprocessor uses it to carry out arithmetical operations. If you have ever been confused by microprocessors, this book is for you.

0 408 00580 7 160 pages **£4.95**

Introduction to Microcomputer Programming

Peter C. Sanderson

A practical guide to programming, with self-test exercises, which enables microcomputer owners to make the maximum use of their machines. It describes BASIC (including common variants) and assembly languages of microcomputer systems that are commonly available. Designed for those with no programming experience, including home users, teachers and owners of small businesses.

0 408 00415 0 144 pages **£4.25**

ORDER NOW – from your local bookseller

In case of difficulty send cash with order to Patricia Davies, Marketing Manager at the address below.

A division of Butterworths

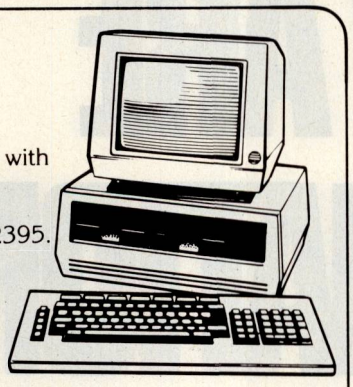
Newnes Technical Books

Borough Green, Sevenoaks, Kent TN15 8PH

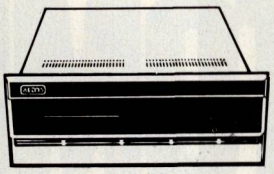
PCW3/82

THE PROFESSIONAL'S CHOICE

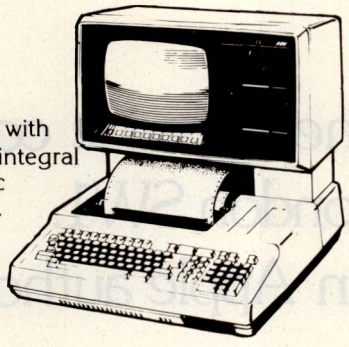
Act Sirius 1
16 Bit Stand Alone micro with superb features.
128K,1.2MB Floppies,
CPM86 as standard – £2395.



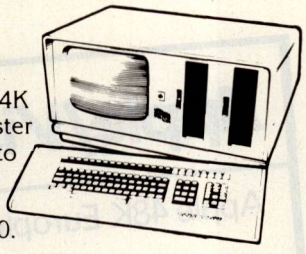
Altos
Up to 4 terminals and 40MB of Winchester Disc.
One of the biggest selling small business systems starting at £2350.
16 Bit system with 8 terminals available soon.



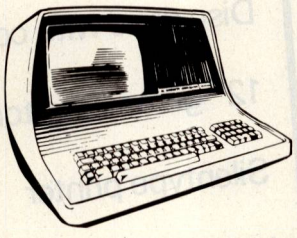
OKI 1F800
Quality graphics micro with full colour screen and integral printer. 64K and Basic are standard – £4750.
Wide range of peripherals available.



LSI M3
High specification Stand Alone micro. CPM, 64K and up to 10MB of Winchester in one package. Very easy to use. Detachable keyboard. User programmable function keys. From £2250.



Superbrain
Still a leader in 8 bit price performance. KGB having sold over 400 Superbrains has unbeatable experience on them. From £1875.



Word Processing - Wordstar £250, Mailmerge £75.
Full on-screen facilities enabling the printing of standard letters and preparation of mail shots.

Accounting - From £300 per module.
Integrated accounting systems with Invoicing, Sales, Purchase and Nominal Ledgers.

Financial Modelling - Micromodeller £645.
Budgets, forecasts and accounting data become easy to prepare. Allows "what if" projections.

Calculation - Supercalc £175.
Electronic worksheet for preparation of budgets and tables of data.

Record Keeping - DMS £400.
Personnel, stock or any other records with quick retrieval, sorting and reporting.

Sales Office Management - Sales Desk £300.
For the busy sales office to manage sales leads and marketing lists.

Accounts - IRIS £750.
Incomplete records and time recording systems.

Payroll - Graffcom £500.
Up to 500 employees both weekly and monthly paid. Automatic deduction for items like company pensions.

Graphics - Price depends on application.
Full on-screen graphics both colour and black and white.

Engineering - SPERT £450.
Suite of programmes for PERT analysis and civil engineering applications.

Communications - Liberator £250.
Enables a micro-computer to act like a mainframe terminal and transfer data from Floppy disc to another computer.

Languages - From £175.
Most major computer languages are available: Basic, Cobol, Fortran, Pascal and Assembler.

Solicitors - Solace £1600.
Solicitors accounting, client accounting and time recording.

Multi-terminals - MP/M and Oasis from £350.
Multi-user systems available.

KGB
MICROS LIMITED

14 Windsor Rd. Slough, Berks. Tel: Slough (0753) 38581/38319

WHY ARE 45 MULTINATIONALS C/WP CUSTOMERS?

C/WP is a long established service company based in Rochester Row, London SW1.

C/WP Computers is an Apple authorised level 1 service centre.

C/WP now offers Personal Computer World readers the chance to buy at its special prices.

Contact C/WP if you are interested in:

Financial forecasting
Communications
CP/M on Apple

Apple/Visicalc offer

Apple 48K Europlus	£ 579
Disc drive with controller	£ 310
12" green monitor	£ 110
Silentype printer	£ 180
Visicalc 3.3	£ 100
	£1279

VAT and installation extra
12 months guarantee

C/WP

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

VISA

NOW YOU HAVE AN APPLE MICROCOMPUTER YOU'LL NEED

OMNIS®

NEW

All you've ever wished for in an information management system.

OMNIS sets new standards in database programs and levels of performance that you never believed were possible on a microcomputer.

- **OMNIS** is written in UCSD Pascal+, this means a better structured, faster running set of programs than could ever be possible using Basic — We believe that UCSD Pascal+ is the best microcomputer language available — OMNIS proves it —
- **OMNIS** is structured around powerful file handling modules. These modules give you the flexibility to store and retrieve your information in the way that you want. Full multi-key indexed access is available to all your database files, you say what you want — OMNIS does the rest.
- **OMNIS** provides you with a versatile report generating module that enables you to define your own reports, lists, mailing labels etc.
- **OMNIS** has unparalleled search facilities to allow you to be selective. Those hours of fruitless searching through rows of card indexes becomes a thing of the past.
- **OMNIS** lets you design your own screen layouts for data entry and inspection — you may have up to 10 screens per file.

OMNIS has an application waiting for it in every business, school and laboratory and workshop. Wherever information needs to be stored and retrieved. OMNIS is available for both APPLE II and APPLE ///. We can also supply OMNIS for use on APPLE microcomputer networks (yes, with true multi-user record locking). Trade enquiries welcome.

All registered users of OMNIS will be sent **FREE BACKUP** disc and you will be kept informed of all updates and upgrades. Free help will be given to all registered users via an OMNIS hotline.

OMNIS — All you ever wanted

APPLE II* version - £174.00 (incl VAT & pp)

APPLE ///* version - £225.75 (incl VAT & pp)

BLYTH COMPUTERS LIMITED
Wenhaston, Halesworth, Suffolk
IP19 9DH

050 270 565

24 hour phone service

*trademarks of APPLE Computer Inc.

+ trademark of the Regents of the University of California, San Diego.

We welcome Access

BARCLAYCARD VISA

® Registered Trade Mark

To: Blyth Computers Ltd., Wenhaston, Halesworth, Suffolk IP19 9DH

PLEASE SEND ME ☐ **APPLE II VERSION** ☐ **APPLE III VERSION**

Cheque enclosed* or please charge my Access*/Barclaycard no:

*Delete as applicable

Name [Block Capitals]

Address

Tel. No

PCW/3/82

"– the most successful show we have ever attended"

This quote from Interactive Data Systems is typical of many made by exhibitors at the 1981 Micro Show. For instance, Systime achieved signed contracts in excess of £75,000 and appointed 15 new dealers. Ingersoll also reported fantastic sales.

The 1982 exhibition is specifically designed for a business audience seriously considering the installation of a micro system or personal computers for business use within their organisation.

Many of the larger display areas have already been allocated, so if your company has not yet reserved space, please contact our Exhibition Department who will make you a provisional booking awaiting your written confirmation.

THE 1982 MICRO SHOW

11-13 May 1982
Wembley Conference Centre
London

INTERACTIVE DATA SYSTEMS

Online Conferences Ltd
Argyle House
NORTHWOOD HILLS
Middx
HA6 1TS

Dear Jane

Our Ref: JS/PL

We have now had the opportunity to follow up the many leads we received at the 1981 Microcomputer Show, and are pleased to say that this show was, without doubt, the most successful show we have ever attended.

We have signed up several new dealers, including one in Eire, and in total the new business we found at the show could result in orders to the value of £½m over the next twelve months.

We will be back in 1982!

Yours sincerely

Jon Spencer
Marketing Director

Online Conferences Ltd., Argyle House, Northwood Hills, Middlesex, HA6 1TS.
Telephone: Northwood (09274) 28211 Telex: 923498

"Whatever are we going to do without our Miss Frobisher?"



A lot of small businesses have their own Miss Frobisher.

Been with the company since year one.

Overall, she probably knows more about the business than anybody.

A one-woman band.

With her own infallible filing methods. (She understands them like the back of her hand. What a pity no-one else does!)

Anything you want she's sure to find. Given time.

Nor does anyone really follow the way she masters each and every ledger.

Sufficient that, somehow, everything always seems to add up.

Everything she does, she does uniquely.

But always well.

Likewise she also handles the payroll.

Not to mention the post; client birthdays and your Christmas Gift list.

Frankly, she's become indispensable. As you discover to your cost everytime she goes on holiday – and you're stuck with a temp or two. Problem is: What's going to happen when she retires?

There's no time like now to think about changing the way you do business. To consider the way everyone else is changing theirs – by entering today's computer age.

We can help you. More than most. Put you right on a small business computer system that's just right for you.

Make it yours for a price a whole lot less than you are paying your Miss Frobisher now.



BUY OF THE MONTH

APPLE PERSONAL/ SMALL BUSINESS COMPUTER

48K II. 1 Disc Drive. 9" High Resolution. Black and White Monitor. Plus FREE Visical Program* (rec. price £149.50) **£1546.75**

*Visi Calc is a Visible Calculator, a first class program that will calculate, revise, project and store, budget and balance sheet information.

Offer ends March 19th 1982

'GROW BIG WITH A SMALL COMPUTER'

METROTECH

A MEMBER OF THE GRAND METROPOLITAN GROUP

AT Ryman

6-10 Great Portland Street, London W1. 01-637 2181 Ex 39.

19-20 High Holborn, London WC1. 01-242 9819.

ZX81 USERS

From "BYG BYTE" comes a fully compatible, assembled, tested and guaranteed

16k RAM PACK

PLUG-IN MEMORY

Send to Name .....

Address .....

.....

.....

All cheques and postal orders made payable to

CAPS LTD

Dept A

And forward to **28 The Spain**
Petersfield, Hampshire GU32 3LA

Allow 28 days for delivery

WHY PAY MORE?

Fully inclusive price each

£34.95

The unique Computer Supermarket brings you computer hardware at cash-and-carry prices

SHARP, COMMODORE, TEXAS, RICOH, ATARI and TANGERINE EQUIPMENT
Fully tested before despatch, or collection complete with instruction manuals, tapes, fitted 13 amp plugs.

SHARP EQUIPMENT

Model	User Ram	exc VAT	inc VAT
MZ80K	48K Ram	**346.96**	399.00
MZ80FD	Floppy Disc	**589.00**	677.35
MZ80P	Printer	**385.00**	442.75
MZ801/0	Input/Output Unit	**87.00**	100.05
MZ80B	64K Ram	**950.00**	1092.50

FREE LEDGER & STOCK CONTROL PROGRAM WITH EVERY COMPLETE SHARP SYSTEM, i.e. 48K Sharp, Twin Floppy Disc, Printer & I/O Unit.

COMMODORE EQUIPMENT

Model	User Ram	exc VAT	inc VAT
4016	40 Col. PET 16K Mem	**445.00**	511.75
4032	40 Col. PET 32K Mem	**560.00**	644.00
8032	80 Col. PET 32K Mem	**755.00**	868.25
4040	347K Disk	**560.00**	644.00
8050	1M Byte Disk	**755.00**	868.25
4022	Printer	**350.00**	402.50
8024	Printer	**975.00**	1121.25
8026	Printer	**835.00**	960.25
8027	Printer	**740.00**	851.00
VIC 20	Personal Computer	**164.35**	189.00
VIC/C2N	Cassette Deck	**34.35**	39.50
VIC 1515	Printer	**175.00**	201.25
VIC 1011A	RS232 Interface Cartridge	**28.00**	32.20
VIC 1801	16K ROM Emulator	**190.00**	218.50
VIC 1210	3K RAM Cartridge	**24.50**	28.18
VIC 1110	8K RAM Cartridge	**34.50**	39.68
VIC 1111	16K RAM Cartridge	**56.00**	64.40
VIC 1212	Programmers Aid	**26.25**	30.19
VIC 1211M	Super Expander Hi Res. Cartridge	**26.25**	30.19
VIC 1213	Machine Code Monitor Cartridge	**26.25**	30.19
VIC Expansion Unit		**78.00**	89.70
Lid for above expansion unit		**6.95**	7.99

RICOH

RP1600	Daisywheel Printer PET Interface	**1200.00**	1380.00

TEXAS EQUIPMENT

TI–99/4 A	**242.62**	279.00

Full range of peripherals available

ATARI EQUIPMENT

Atari 400 16K	**300.00**	345.00
Atari 800 16K	**560.87**	645.00

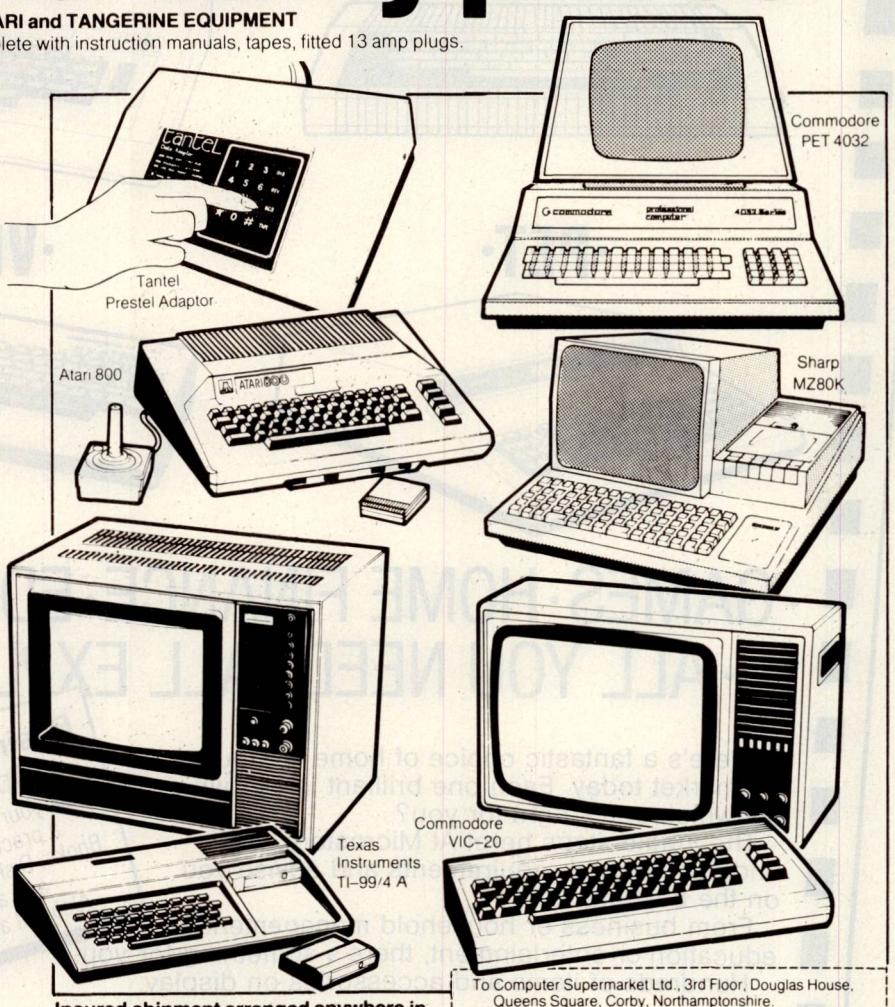
Full range of peripherals available

TANGERINE EQUIPMENT

Micro Tantel Prestel Adaptor	**135.00**	155.25

Full colour output. Connects to any TV. Full British Telecom approval. Requires British Telecom 96A jack-plug. Gives access to massive home computer base information from Mortgages to Theatres, Stocks to Holidays.
Telephone us for further information on ease of installation.

Prices are valid only for the cover date month of this magazine



Insured shipment arranged anywhere in UK for an additional £14.37 (inc. VAT). VIC, Atari and Texas shipped by insured post for £3.50 inc. VAT.
Commodore Approved Distributor
Registered Sharp, Atari and Texas Dealer

All goods sold with full manufacturer's warranty and subject to conditions of sale (available on request).
ALL MACHINES ARE FULL UK STANDARD.

To Computer Supermarket Ltd., 3rd Floor, Douglas House, Queens Square, Corby, Northamptonshire.
Please send me

Model No.	Item	Price	Shipment	Total	Info only (✓)

I enclose my cheque for £_____
Or debit my Access/Barclaycard/
Diners Card /American Express No.

(Cardholders may telephone orders to 05366 61587/8 and 62571

Signature _____
Name _____
Address _____
_____
_____ (BLOCK CAPITALS PLEASE)

Your remittance should be made payable to Computer Supermarket Reader's Account, and shall remain your money until the goods have been despatched to you at the address specified.
All goods offered are subject to Computer Supermarket conditions of sale, copies available on request. Reg. in England No. 2646589.
Prestel subscribers may order through the Prestel service, Directory No. 400400.

PCW

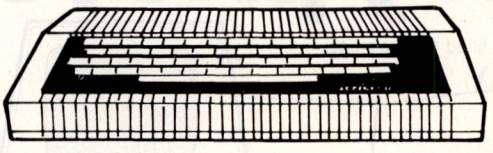
COMPUTER SUPERMARKET

COMPUTER SUPERMARKET LTD (An associate company of HB Computers Ltd)
3rd Floor, Douglas House, Queens Square, Corby, Northamptonshire.
Telephone 05366 61587/8 and 62571 Telex COMPSU 312517 Prestel No. 400400

·JUST OPENED·JUST OPENED·JUST OPENED·

·LONDON'S·
·HOME COMPUTER CENTRE·

·ACORN·



·BBC·



·PET·



·VIC·



·GAMES·HOME FINANCE·EDUCATION·
·ALL YOU NEED·ALL EXPLAINED·

There's a fantastic choice of home computers on the market today. Each one brilliant in its own right. But which one's right for you?

The jungle stops here! At Microstore, we'll understand your requirements and advise you on the best model.

From business or household management, to education or entertainment, there's something for you.

Hundreds of items and accessories on display.

Business Computers
Apple II and III
Talk your requirements over with a practical business man.
Books, Disks, Printers, Programs, and all the back-up.
Also full after-sales-service.

·Come and see them before you buy·

MICROSTORE

·327·KING'S ROAD·LONDON·SW3·
·PHONE·01·352·9291·

MICROSTORE

Microcomputer Budget Beaters

On all orders placed before March 31st 1982

Adda Computers are one of Commodore's selected officially appointed key dealers. Guaranteeing product knowledge and straight, fair dealing. Now we've put together a microcomputer system package which offers substantial discounts over normal list prices. All these are standard Commodore units—tried and proved in everyday use. You can rely on Adda. Everything we sell is thoroughly tested, and we back it with our reputation. Even at budget prices!



The Commodore Pet 4000 series (4032/4016)

- ★ Integrated Unit
- ★ Full size keyboard
- ★ Separate numeric keyboard
- ★ BASIC available on power up
- ★ Exterior peripheral handling capability

4016 Normal list price £550
Adda Budget Beater £434
Adda budget price incl VAT £499.10

4032 Normal list price £695
Adda Budget Beater £549
Adda budget price incl VAT £631.35

Commodore 4040 dual drive floppy disk

- ★ Stores up to 340K bytes of information
- ★ Uses standard 5¼" floppy disks
- ★ Direct connection to IEEE port
- ★ Self contained disk operating system
- ★ Dual drive unit for security copying
- ★ Single-sided disk recording for greatest reliability

4040 Normal list price £695
Adda Budget Beater £549
Adda budget price incl VAT £631.35



Commodore 4022 dot matrix tractor printer

- ★ Low cost matrix printer
- ★ Full PET graphics capability
- ★ Reverse characters (white on black)
- ★ Expanded printing for headings etc.
- ★ Direct connection to your PET's IEEE port

4022 Normal list price £395
Adda Budget Beater £312
Adda budget price incl VAT £358.80





Commodore 2031 single drive floppy disk

- ★ Stores up to 171K bytes of information
- ★ Uses standard 5¼" floppy disks
- ★ Direct connection to IEEE port
- ★ Self contained disk operating system
- ★ Single sided disk recording for greatest reliability
- ★ Ideal for use in Education

2031 Normal list price £395.00
Adda Budget Beater £312
Adda budget price incl VAT £355.80

Accessories

PET—IEEE Cable Normal list price £20 **Adda Budget Beater £18** Adda budget price incl VAT £20.20

IEEE—IEEE Cable Normal list price £25 **Adda Budget Beater £22** Adda budget price incl VAT £25.30

C2N Cassette Deck Normal list price £39 **Adda Budget Beater £31** Adda budget price incl VAT £35.65

How to order

By telephone
Telephone 01-579 5845 to arrange collection or for further information

By post
Post your order with remittance to
Adda Computers Ltd
FREEPOST London W13 0BR

Cash & Carry
By arrangement from
Adda Computers Ltd
Unit 8, 1 - 7 Broomfield Road
West Ealing, London W13.

1. All special Adda prices are cash with order prices.
2. All goods are normally available ex-stock and can be collected by arrangement from our West London warehouse.
3. Insured shipment can be arranged to anywhere on mainland UK for £13.80 incl. VAT for each hardware item.
4. 14 days maximum delivery guaranteed from receipt of order or your money back.
5. All hardware is covered by Adda Computers fully inclusive 90 day Parts and Labour Warranty.
6. All hardware complete with instruction manuals and fitted with 13 amp plug.

Official tenders welcomed
CCTA, Central Government, Local Government and Educational Authority supplier.

=adda=
Adda Computers Ltd.

Xitan
South Coast Leaders in Microcomputer Support Application and Service



Xitan – First for Business & Commercial Systems

Xitan's specialised Administrative and Operational Microcomputer Systems provide cost effective computer support for wide ranging business organisations; from low entry level, stand alone systems for the smaller business, to integrated multiuser/multitasking systems to meet the more specific needs of the larger business enterprise.

Xitan – First in Science and Research

Xitan support the more personalised requirements of the scientific and research users universities and colleges, and in government and independent research establishments with comprehensive practical experience embracing hardware, system, and applicational software.

Xitan – First in Industry

Xitan's depth in microcomputer experience is playing an increasing role in the rapidly developing industrial applications for production and process control, and in product and production development operations.

Xitan – First for Service

Xitan's local reputation is founded securely on Service– both in system development– software and hardware support, and service in the field.

XITAN SYSTEMS

Xitan Systems Ltd 23 Cumberland Place Southampton SO1 2BB Tel: 0703 38740

Cromemco **SHARP** North Star Horizon **comart**

community computers community computers community computers community computers community computers community computers community computers community computers community computers community computers community computers community computers community computers

NEW

The versatile NEC PC 8000 Business Computer System

Budget Word Processing System

64K NEC PC 8000 & Screen, Twin 5¼" Floppy Disk Drives
Olivetti Typeprinter, & Magpie Desk. Word Processing Software included.

£3399·00

Small Business Systems

64K NEC PC 8000 & Screen
Twin 5¼" Floppy Disks
NEC Dot Matrix Printer,
Magpie Desk.
£2245·00

64K NEC PC 8000 & Screen
Twin 8" LoBo Floppy Disks
(2 Mbyte total Storage)
NEC Printer, Magpie Desk.
£3717·00

64K NEC PC 8000 & Screen
10 Mb Ampex Hard Disk
(5 Mb fixed & 5 Mb Removable)
NEC Printer, Magpie Desk.
£5793·00

DataMace **Integrated Software Package**

Comprising Payroll Purchase Sales and General Ledger with Stock and Integrated Job Costing. Price from

£1200·00

Carriage and VAT Extra.

Details from community computers

P.O. Box 3 34 Dragon Street, Petersfield, Hampshire GU32 2ER.
Telephone: (073 087) 567



£1,400 (RRP £2,115)

Plot your data – drawings, graphs etc.

Due to overstocking we are able to offer at greatly reduced prices, brand new, boxed, Hewlett Packard A4 Plotters with 1EEE 488 interface.

Compatible with PET Commodore and Hewlett Packard 85 computers – (other models not tested) – these excellent high quality A4 size Plotters offer a range of advanced features at a genuinely reduced price.

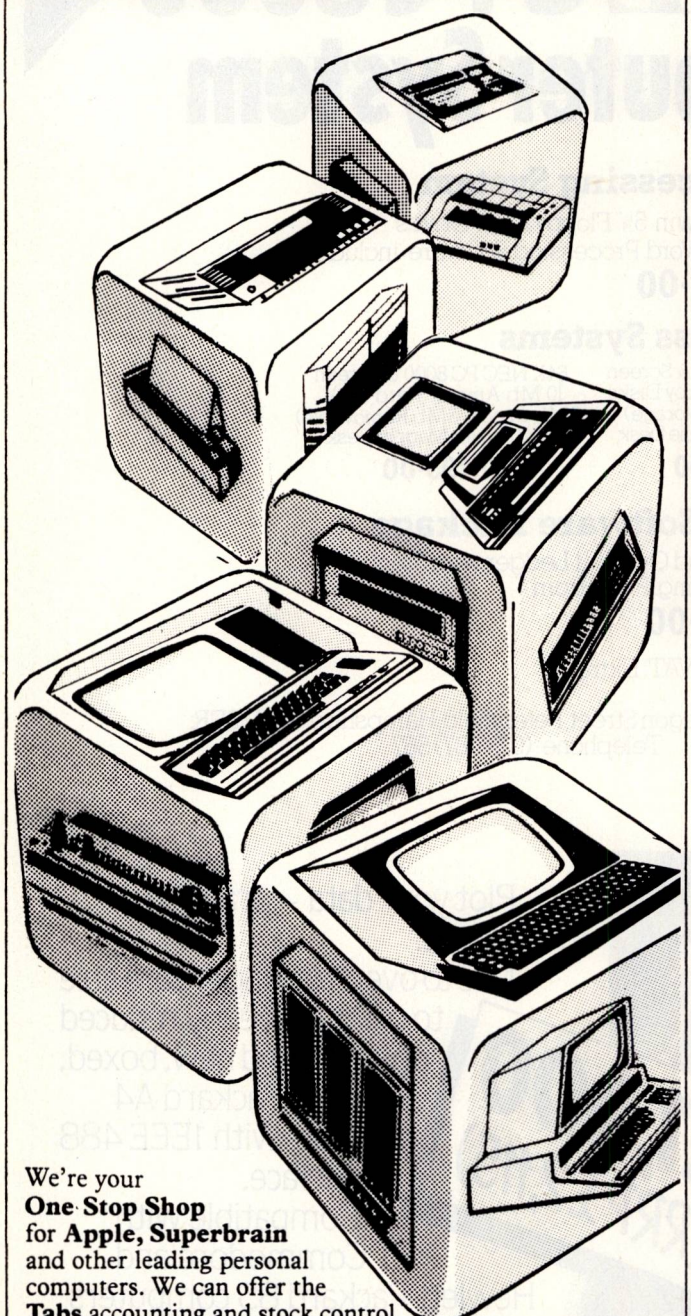
Write today for further details.

BIG SAVINGS ON GRAPHICS PLOTTERS

ECS

Engineering Computer Services Limited,
Piccadilly, Tamworth, Staffs. B78 2ER.
Telephone (0827) 873300.

Don't Gamble when there's so much at stake!



We're your **One Stop Shop** for **Apple, Superbrain** and other leading personal computers. We can offer the **Tabs** accounting and stock control packages, **Wordstar** for word processing and **Visicalc** for financial modelling. We provide on-site maintenance and tailored programming services second to none. We pride ourselves on giving first class customer support and training.

Call us now and arrange a demonstration or ask for details of our free weekly seminars.

SYSTEM LOGIC

COMPUTER SALES AND SERVICES

make sure you get it right

260 Cambridge Heath Road, London E2 9DA
Telephone: 01-981 7311 Telex: 8952578

Dump the Blues....

These seven colours, together with various hues and half-tones mean easier understanding of many applications including graphics, charts, histograms and image analysis.
The CX80 uses standard tractor fed paper and is easily connected to most micro and mini computers.

Also suppliers of furniture, media and accessories.

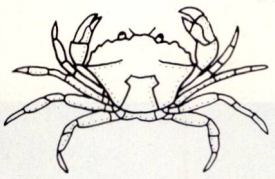
Details from Dept. PCX1



DNCS

WE'RE ALL YOUR COMPUTER NEEDS

D.N. Computer Services Ltd., West Croft Industrial Estate, Manchester Old Road, Middleton, Manchester. M24 4PJ.



CRAB SOFTWARE

(for the TRS-80; Level II)

*Trademark of the Tandy Corporation

CRAB ASSEMBLER -full assembler features **£10.00**

CRAB DISASSEMBLER -compatible to above **£8.00**

BOTH THE ABOVE PROGRAMS £14.00

PUB GAMES:

INVADERS FROM SPACE £5.00

MAGRATHEANS £5.00

DISAS -edtasm compatible disassembler **£8.00**

DEBUG -machine code programming aid **£8.00**

CRAB ALGOL -cassette based high level language (based on ALGOL W) interpreter **£75.00**

Make cheques/postal orders payable to: CRAB SOFTWARE.
Prices are completely inclusive.
10% discount on multiple orders over £15.00.
Send S.A.E. for full software list.

Orders, by post only, to:
CRAB SOFTWARE
2, PONDWICK RD.
HARPENDEN
HERTS AL5 2HG

MICROCOMPUTER PRODUCTS INTERNATIONAL LTD.

MPI

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

GENERAL

Hardware orientated:

Some Real Microprocessors	£20.85
6 Updating Supplements for Some Real Microprocessors	£20.85
Some Real Support Devices	£13.00
6 Updating Supplements for Some Real Support Devices	£20.85
Microprocessors from Chips to Systems	£11.45
Microprocessor Interfacing Techniques	£13.10
IC OP-AMP Cookbook	£9.85
RTL Cookbook	£4.25
IC Timer Cookbook	£7.50
Ciarcias Circuit Cellar	£6.00
8089 I/O Processor Handbook	£4.95
The CRT Controller Handbook	£5.95
The 68000 Microprocessor Handbook	£5.95
16 Bit Microprocessor Handbook	£15.95
4 and 8 Bit Microprocessor Handbook	£15.95

Software Listings:

Computer Programs that Work	£3.95
Home & Economics Programs	£16.50
Education and Scientific Programs	£23.00
Some Common BASIC Programs	£9.85
Practical BASIC Programs	£10.25
Professional Programs: Chess, Medbil, Wdproc	£25.00

Business:

Accounts Payable and Accounts Receivable	£14.85
General Ledger	£14.85
Small Business Programs (Microsoft Basic)	£39.95

Other:

PIMS: Personal Information Management System	£6.50
Buyers Guide to Microsoftware	£2.40
Program Design	£4.75
Programming Techniques: Simulation	£4.75
Numbers in Theory and Practice	£6.00
K2 FDOS	£15.50
CP/M Handbook	£12.10
CP/M Primer	£8.45
CP/M Users Guide	£10.10
Calculating with BASIC	£4.95
Dr Dobbs Journal Vol 1	£15.50
Dr Dobbs Journal Vol 2	£15.50
Dr Dobbs Journal Vol 3	£15.50
Best of Interface Age: Software	£9.95
Programming the Z8000	£12.10
Z8000 Assembly Language Programming	£14.85

FOR THE Z80, TRS-80, ZX81, 380Z

Z80 Programming for Logic Design	£6.30
Z80 Assembly Language Programming	£13.50
Z80 Instruction Handbook (Wadsworth)	£3.50
Programming the Z80 (Zacs)	£11.95
Z80 Software Gourmet Guide and Cookbook	£10.25
32 BASIC Programs for the TRS-80 (Level II) 16K	£11.10
Introduction to the T-Bug (Guide to TRS-80 Machine Language Monitor)	£7.60
30 Programs for the Sinclair ZX80	£6.95
Cambridge Collection for the ZX81	£4.95

CONCERNING LANGUAGE

Beginners Guide for the UCSD PASCAL Systems	£9.50
A Practical Introduction to PASCAL	£4.95
The PASCAL Handbook	£13.95
Introduction of PASCAL (including UCSD PASCAL)	£11.50
SCELBAL—BASIC Language Interpreter (Source Code)	£10.00
BASIC BASIC	£7.00
Advanced BASIC	£6.50
Users Guide to North Star BASIC	£10.00
Microsoft BASIC (a guide)	£7.15
Secret Guide to Computers	£4.00
Fifty BASIC Exercises	£10.25
PASCAL Programs for Scientists & Engineers	£12.70

FOR THE 6502 (PET, APPLE, ATARI etc.)

First Book of ATARI	£TBA
Best of Micro. Vol 2	£5.50
Programming the 6502 (Zacs)	£10.75
6502 Applications	£10.25
6502 Instruction Handbook	£3.50
The PET Revealed	£10.00
Library of PET Subroutines	£10.00
32 BASIC Programs for the PET	£11.10
First Book of KIM	£7.00
PET/CBM Personal Computer Guide (2nd edition)	£11.00
Apple II Users Guide	£11.50
PET and the IEEE (GPIB) Bus	£10.95
6502 Assembly Language Programming	£11.85
Some Common BASIC Programs (PET CBM)	£9.85
PET Graphics	£TBA

NEW BOOKS

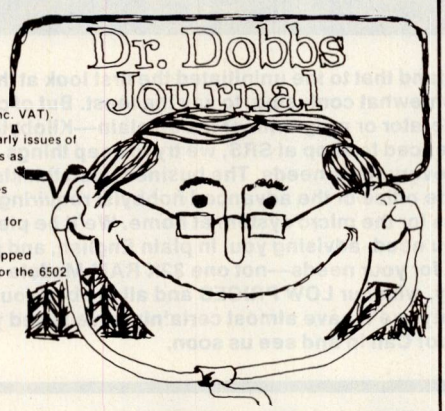
Don't (or How to Care for your Computer)	£9.65
Science & Engineering Programs for the Apple II	£11.60
Some Common BASIC Programs for the Atari	£11.10
Interfacing to S-100/IEEE 696 Microcomputer	£11.10

DR DOBBS JOURNAL
Volume 1 £15.50
Volume 2 £15.50
Volume 3 £15.50

Special Deal on Prepaid Orders
All 3 Volumes £40.00 plus £3.45 p·p (inc. VAT).

These volumes are reprints from the early issues of Dr Dobbs Journal. Covering such areas as

An 8080 Disassembler
Extended Accuracy Arithmetic Routines
A SC/MP Subroutine Supervisor
An Interactive Programming Language for Control of Robots
Computer Applications for the handicapped
A High-Speed Memory Test Program for the 6502
Palo Alto Tiny BASIC
Floating Point Routines for the 6502
FORTH Dump Programs
Autodump
Z80 RAM Tester



These volumes are for the Micro enthusiast who is concerned with improving his programming technique examining specialized applications and utilities, as well as making full use of program listings. Most articles were contributed by readers willing to share their solutions and ideas with you. If you wish to develop your own understanding and skill can you afford to be without these volumes? All prepaid orders will be despatched by return of post.

FOR FUN

8080 Galaxy Game	£6.95
SUPER-WUMPUS—A Game in 6800 Assembler Code & BASIC	£4.25
Computer Music Book	£6.75
Computer Rage (a Board Game)	£6.95
Introduction to TRS-80 Graphics	£6.30
Take My Computer Please . . . (Fiction)	£3.25
Introduction to Low Resolution Graphics for PET, Apple TRS-80	£6.00
6502 Games	£10.25
Inside BASIC Games	£11.50

FOR THE NOVICE

Getting Down to Business with Your Microcomputer	£5.50
Getting Involved with Your Own Computer	£5.50
How to Profit from Your Personal Computer	£6.50
Microcomputer Potpourri	£1.95
Hobby Computers are Here	£3.00
New Hobby Computers	£3.00
Understanding Microcomputers and Small Computer Systems	£7.50
Understanding Microcomputers and Small Computer Systems and Audio Cassette	£9.25
From the Counter to the Bottom Line	£10.00
Buying a Business Computer	£9.75
You Just Bought a Personal What?	£8.75
How to Make Money with Your Microcomputer	£7.00

MAGAZINE BACK ISSUES

Micro 6502 Journal	£3.00
Personal Computing	£3.00
Interface Age	£3.25
Dr Dobbs Journal	£2.15
Computer Music Journal	£3.75
Recreational Computing	£2.15
BYTE	£3.60
Creative Computing	£4.25
Calculators and Computers	£1.95
Kilobaud Microcomputing	£4.25
Compute—for the 6502	£3.75
68' Micro	£2.50
80-Microcomputing	£4.95
On Computing	£1.95
S-100 Microsystems	£2.50
99'ER	£3.00
99'ER Subscription (6 issues)	£13.00
Magazine Storage Box (holds 12)	£2.15

BYTE NIBBLE REPRINTS:

a) A TMS-9900 Monitor	£3.50
b) BASIC Cross-Reference Generator	£1.25
c) 'Tiny' PASCAL in 8080 Assembly Language ('d needed to use this)	£13.00
d) A 'Tiny' PASCAL Compiler	£13.50
e) An APL Interpreter in PASCAL	£13.00
f) Computer Assisted Flight Planning	£2.35
g) Computerised Wine Cellar	£2.00
h) The Design of an M6800 Lisp Interpreter	£13.00

ORDER INFORMATION

MAGAZINES: Magazine back issues that are not currently in stock are often difficult to obtain. For unavailable back issues there is a photocopying service at 15p per page plus 25p p·p plus VAT.

BOOKS: Most books are published in the USA and stocked in Britain by Microcomputer Products International Ltd. We aim to keep all of these books in stock and as a result of this, most prepaid orders are despatched by return of post.
Please add £1.00 towards postage plus 15p VAT for EACH book purchased. If purchasing more than 3 books at any one time, please add 25p plus 4p VAT for each extra title (over the 3).

PAYMENT: All payment must be in sterling and drawn against a UK Bank. Send cash, cheques, postal orders, IMO, Access or Barclaycard No. to: Microcomputer Products International Ltd., Room PCW8, Cambridge House Cambridge Road, Barking, Essex IG11 8NT. Telephone: 01-591 6511. Telex: 892395.

Retailer and OEM terms

MAIL ORDER

TELE-PHONE

CREDIT CARD ORDER

* VISIT *

Full descriptive Catalogue: available £1 — deductable from first purchase

Trade Enquiries Welcome

No experience required to shop here!



We fully understand that to the uninitiated the first look at the Micro Computer world can be somewhat confusing, to say the least. But of course, to the experienced operator or programmer it's all plain—Kilobyte! Well, you don't have to be experienced to shop at SRS, we try to keep things as simple as possible and cater for everyone's needs. The businessman thinking about a small computer for the office or the advanced hobbyist requiring all the extra accessories for the micro system at home. We'll be pleased to give you all the help you need, advising you, in plain English, and plan the system that's just right for your needs—not one 32K RAM Module more! And at the end of the day, with our LOW PRICES and all the bits you were advised NOT to buy, we'll have almost certainly have saved you a great deal of money too! Call in and see us soon.

ATARI
for the HOME & OFFICE

The advanced electronics of the ATARI 400 and 800 systems make them simple to use, even if you've never used a computer before. Yet, for the sophisticated user, they offer full user-programmability. In BASIC or Assembly Language. Connects to any TV. You simply attach them to any home television set, causing no interference to TV reception. And entertainment programs turn your television set into an entertainment centre for the whole family. Call in and find out more about these exciting new Micro Computers.

LIMITED APPLE /// STOCKS! PLEASE PHONE FOR DETAILS

Model 400



16K RAM

Cassette recorder..	PLEASE
Disc drive.....	PHONE
Thermal printer....	FOR PRICE

Model 800



16K RAM

Plain paper printer...	PLEASE
Printer Interface	PHONE
16 Plug-in RAM.....	FOR PRICE

apple® computer Sales and Service

APPLE II 48K; Disc Drive with controller; additional Disc Drive and Video Monitor
Please phone for price.

NASCOM III

Disk Drives, I/O Boards.
These new products will be available as soon as released.
SPECIAL OFFER!
IMP Printer
£199 + VAT.

NASCOM II

This excellent single board Micro Computer is supplied ready built and tested with keyboard but no memory

Power supply	PLEASE
4 x 4118 Memory chips (4K).....	PHONE
48K RAM Board.....	FOR PRICE

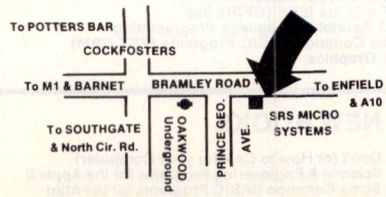
BUSINESSMEN!
We are now appointed dealers for JARMAN SYSTEMS
Demonstrations of these excellent business accounting systems given in our private showroom, anytime, by appointment.

Call in and see us for: Printers, video monitors, computing books, discs, tapes etc.
ACCESS & BARCLAYCARD WELCOME – HIRE PURCHASE AVAILABLE
FREE SECURICOR DELIVERY ON ORDER OVER £100
All prices shown are excluding V.A.T. E. & O. E.

SRS MICROSYSTEMS

161 Bramley Road,
Oakwood, London N14 4XA

Telephone: 01-363 8060
(Closed Monday)



COMPUTER WAREHOUSE

NOW OPEN
MONDAY-SATURDAY
9.30-5.30

BULK BUY SPECIALS

RAM SCOOP
4116 200 NS 8 for £12.95
4164 200 NS £8.50 each
2102-650 NS 8 for £5.50
INC VAT

25 WAY "D" CONNECTORS

		50+	100+
25p	1.70	1.10	0.95
25S	1.90	1.20	1.00

ALL + VAT

WIRE WRAP SKTS.
24 Pin Vero 28p
14 Pin Gold 22p
16 Pin Gold 24p
100 PCS Min Ord.

C10 DATA CASSETTES
10 for £5.75
Inc. VAT

RF CONNECTORS
50Ω BNC PLG 50p
75Ω BNC PLG 50p
PL259 PLG 40p
SO239 SKT 35p
100 PCS MIN ORD.

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
Sound proof enclosure £25.00 + VAT

ICL TERMIPRINTER 300 BAUD TERMINALS



REDUCED TO CLEAR
NOW ONLY £80 +CAR +VAT

Made under licence from the world famous GE Co. The ICL Termiprinter is a small attractive unit with so many features it is impossible to list them in the space available! Brief spec. as follows; RS232 serial interface, switchable baud rates 110, 150, 300, (30 cps), upper and lower case correspondence type face, standard paper, almost silent running, form feed, electronic tab settings, suited for word processor applications plus many more features. **Supplied complete, in as seen condition, no guarantee.**

MPU EXPERIMENTORS +5v+12v-12v+24v POWER SUPPLY

Once again we are very pleased to offer this superb Power Supply Unit, and hope to satisfy most of our previous customers who were disappointed when we sold out due to demand last time they were advertised!!! These units may just have well been made for your lab., they consist of a semi-enclosed chassis measuring 160mm x 120mm x 350mm containing all silicon electronics to give the following fully regulated and short circuit proof outputs of:
+ 5v @ 2 amps DC + 12v @ 800 ma DC
-12v @ 800 ma DC + 24v @ 350 ma DC
and if that's not enough a fully floating 5v output @ 50 ma DC which may be seriesed to give a host of other voltages. All outputs are brought out to the front panel via miniature jack sockets and are also duplicated at the rear on short flying leads. Units accept standard **240v** mains input. They are ex GPO and may have minor scratches on the front panels, they are sold untested but in good internal condition.
£16.50 each + £2.50 p+p complete with circuit and component list. Transformer guaranteed. HURRY WHILE STOCKS LAST!!

HIGH SPEED DATA MODEMS

A superb piece of engineering made by SE Labs Ltd. to a "no cost spared" spec for the GPO, the Modem 12 is a synchronous Modem for use on DATEL 2412 services, or other data links. Many features include switchable V26 modulation, 2400 baud full duplex 600/1200 standby, auto answer, 4 wire or 2 wire operation. Self test, LED status indication, CMOS technology, modular construction, original cost over £700 each. Believed brand new, supplied complete with PSU etc.
£185.00 + £9.50 carriage + VAT.
*Permission may be required for connection to PO lines.

PERTEC

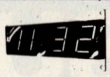
PERTEC TAPE DRIVES
7 track 6840 — 75-25 £175.00 + VAT
9 track 6840 — 9-25 £295.00 + VAT
Phone for more details

DIABLO S30 DISK DRIVES

Another shipment allows us to offer you even greater savings on this superb 2.5 MB (formatted) hard disk drive. Two types are available both fully refurbished and electronically identical, the only difference is the convenience of changing the disk packs.
S30 front loader, pack change via front door £550 + vat
S30 fixed, pack change via removal of top cover £295 + vat
+ & — 15v PSU for 2 drives £125 + vat
SPECIAL OFFER new, 12 sector packs £20 + vat carriage & insurance on drives £15.00 + vat fully DEC RK05, NOVA, TEXAS compatable further info on controllers etc on request.

NATIONAL MA1012 LED CLOCK MODULE

★ 12 HOUR
★ ALARM
★ 50/60 HZ



The same module as used in most ALARM/CLOCK radios today, the only difference is our price! All electronics are mounted on a PCB measuring only 3" × 1½" and by addition of a few switches and 5/16 volts AC you have a multi function alarm clock at a fraction of cost. Other features include snooze timer, am pm, alarm set, power fail indicator, flashing seconds cursor, modulated alarm output etc. Supplied brand new with full data only £5.25
Suitable transformer £1.75.

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 SD5 A10 5 amp £6.95
Corcom Inc F1900 30 amp £13.95 + pp £1.00

MUFFIN FANS

Keep your equipment Cool and Reliable with our tested ex-equipment "Muffin Fans" almost silent running and easily mounted. Available in two voltages. 110 V.A.C. £5.05 +pp 90p OR 240v A.C. £6.50+pp 90p. DIMENSIONS 4¾" x 4¾" x 1½"

ELECTRONIC COMPONENTS & EQUIPMENT 66% DISCOUNT

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. surplus 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 pay plus we always include something from our ads. for unbeatable value!! Sold by weight

2.5kls £ 4.75+pp £1.25 **5kls £ 6.75+pp £1.80**
10kls £11.75+pp £2.25 **20kls £19.99+pp £4.75**

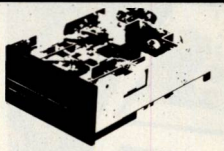
SAVE OVER £1400

THE PRINTER SCOOP OF THE YEAR
THE LOGABAX Z80 MICROPROCESSOR CONTROLLED LX180L MATRIX PRINTER



A massive bulk purchase enables us to offer you this superb professional printer at a fraction of its recent cost of over **£2000.** Utilising the very latest in microprocessor technology, it features a host of facilities with all electronics on one plug in P.C.B. Just study the specification and you will instantly realise it meets all the requirements of the most exacting professional or hobbyist user.
STANDARD FUNCTIONS ★ Full **ASCII** character set ★ Standard ink ribbon ★ RS232/V24 serial interface – 7 xtal controlled baud rates up to 9600 ★ 194 characters per line ★ Parallel interface ★ Handshakes on serial and parallel ports ★ 4 Type fonts, italic script, double width, italic large, standard ★ Internal buffer ★ Internal self test ★ 170 CPS ★ Variable paper tractor up to 17.5" wide ★ Solid steel construction ★ All software in 2708 eproms easily reconfigured for custom fonts etc.
All this and more, **not** refurbished but BRAND NEW At Only £525 +VAT
Also available identical to above LESS Electronics Card £250 + VAT + carriage and ins. £18.00 + VAT
OPTIONAL EXTRAS ★ Lower case £25.00 ★ 16K buffer £30.00 ★ Second tractor for simultaneous dual forms £85.00 ★ Logabax maintenance. P.O.A.

8" FLOPPY DISK DRIVES



Yet again we've managed to secure a large shipment of tomorrows technology at prices as yet unheard of!! And as with most of our purchases can pass these savings direct to you!! The DR 7100 & 7200 8" floppy disk drives have many inbuilt features to provide literally any BUS configuration with full daisy chain via internal jumpers 77 tracks on the single sided 7100 give upto 0.8 MB of data and 154 tracks on the 7200 double sided drive give a massive 1.6 MB of data. Many other features such as soft or hard sectoring, IBM or ANSI standards, only 240v AC, +24 & +5 v dc power requirements, and our unbelievable prices make these drives a snip.
Supplied BRAND NEW and boxed complete with user manual:
7100 single sided £225.00 + 8.50 ins. & carr. + vat.
7200 double sided £295.00 + 8.50 ins. & carr. + vat.
Full technical manual available £7.50 write or phone for more details.

LAMBDA

LMC C5V
5V 10 AMP
PSU, 240V
NEW £45 + VAT
+ £2.50 P&P

— DEC CORNER —

DECTU60 TWIN CASSETTE DRIVE . . . £375+VAT
PDP1105 MINI I/O MEMORY, CPU ETC. £450+VAT
LSI1132KBYTE MOS MEMORY CARDS £295+VAT
RK05 MEMOREX DISK PACKS (12 sector) £20.00+ VAT
LSI1102 PROCESSOR CARD £275.00+ VAT
** All types of DEC equipment purchased for cash **

DIGIT ELECTRONICS

Dept. P.C., 64-66 Melfort Rd., Thornton Heath, Croydon, Surrey. Tel: 01-689 7702 or 01-689 6800

MAIL ORDER INFORMATION
Unless otherwise stated all prices inclusive of V.A.T. Cash with order. Minimum order value £2.00 Prices and Postage quoted for UK only. Where post and packing not indicated please add 60p per order. Bona Fida account orders minimum £20.00. Export and trade enquiries welcome. Orders despatched same day where possible. 3% surcharge on Access and Barclaycard orders.

SOFTY 1 & 2
EPROM BLOWER

Software development system invaluable tool for designers, hobbyists, etc. Enables open heart surgery on 2716, 2708 etc. Blows, copies, reads EPROMS or emulates EPROM/ROM/RAM in situ whilst displaying contents on domestic TV receiver. Many other features. £115 + carr. + VAT. Optional 2716, 2716 Function Card £40 + VAT. PSU £20 + £1.50 carr. + VAT.
Softy 2 for 2716/2732 £169+VAT
Write of phone for more details.

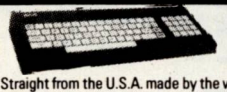
9" VIDEO MONITORS

Ex-equipment 9" Motorola Video Monitors 75Ω composite input, tested but unguaranteed. £39.99 +£7.50 carriage + VAT. Complete with circuit.

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+ bag £2.95 100+ bag £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 at I.C.'s full spec. 100+ £6.90 200+ £12.30 300+ £19.50

RCA FULLY CASED ASCII CODED KEYBOARDS



IDEAL – TANGERINE, OHIO ETC,

Straight from the U.S.A. made by the world famous R.C.A. 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 R.C.A. backed guarantee.

VP601 7 bit fully coded output with delayed strobe, etc. £43.95
VP611 Same as VP601 with numeric pad. £54.95
VP606 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.

5v D.C. POWER SUPPLIES

Following the recent "SELL OUT" demand for our 5v 3 amp P.S.U. we have managed to secure a large quantity of ex-computer systems P.S.U.'s with the following spec.; 240 or 110v A.C. input. Outputs of 5v @ 3-4 amps, 7.2v @ 3 amps and 6.5v @ 1 amp. The 5v and 7.2v outputs are fully regulated and adjustable with variable current limiting on the 5v supply. Unit is self contained on a P.C.B. measuring only 12" x 5" x 3". The 7.2v output is ideal for feeding "on board" regulators or a further 3 amp LM323K regulator to give an effective 5v @ 7 amp supply.
Supplied complete with circuit at only £10.95 + £1.75pp.
Believed working but untested, unguaranteed.

EXPLORER 85

For Maximum Flexibility **SYSTEMS**

Thoroughly versatile 64K, S100 based computer systems



1. 64KRAM 0.5M bytes storage on two 8" drives. Two serial I/0 ports. CP/M 2.2 **£1,850**
2. 64K RAM. 5M bytes. Winchester.(DRIVE EXPANDABLE to 20 M Bytes). One 8" floppy. 5 serial I/0 ports and CP/M2.2 **£3,600**
3. 64K RAM. 10Mbytes Winchester drive (EXPANDABLE TO 40M Bytes). One 8" floppy. 5 serial I/0 ports CP/M 2.2 **£4,500**

Full range of drives, PSU's and S100 cards in kit form or fully assembled are available.

Suggested VDU. Hazeltine Esprit – **£485**
Business software systems available.

VIDEO GENIE

Amazing Value for a Complete Computer System



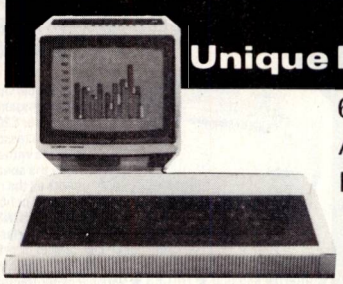
16K User RAM
12K Microsoft Basic in ROM
Utilises Z80

ONLY £279

Full Range of Peripherals available

ACORN ATOM

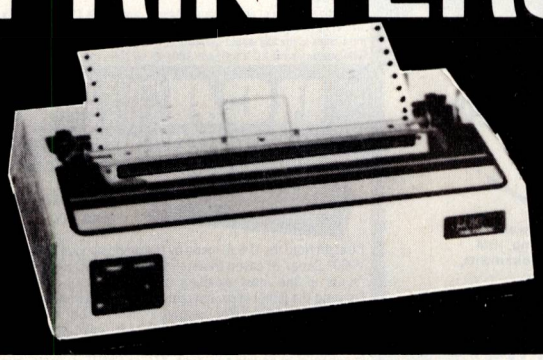
Top Quality Unique Personal Computer



6502 Microprocessor 2K RAM
Audio Cassette Interface
Full Size Keyboard
High Resolution Colour Graphics

Complete £150 Ready to use

PRINTERS



EPSON		OKI MICROLINE	
MX 80	£359	82A	£399
MX 80 FT	£399	83A	£650
MX 80 FT II	£440		
MX 82	£389	**OLYMPIA**	
MX 82 FT	£455	ESW 100 RO	£836
MX 100	£575	ESW 100 KSR	£998

Full Range of Epson Interfaces

MONITORS 12" GREEN SCREEN 18MHz. . **£99.00**

FUJITSU 8

NEW 64K MICRO WITH BUBBLE MEMORY.

MAIN LONDON DEALER



BASIC STARTING PRICE £895

LOOK AT THESE FEATURES

- CP/M and UTILITIES (Optional)
- 30KB ROM BASIC
- 640 x 200 DOT COLOUR GRAPHICS
- 49 8 x 8 MATRIX BLOCK GRAPHICS
- REVOLUTIONARY EDITING FACILITIES
- PRINTER SCREEN DUMPING (with Grey Scaling)
- 2 x 32KB BUBBLE MEMORY CASSETTES (Optional)
- 656KB OF MINI FLOPPY DISK STORAGE (Optional)
- STANDARD SERIAL, PARALLEL, BUSS, CASSETTE & ANALOG INTERFACES
- 80 CHAR. x 25 LINE DISPLAY
- REAL TIME + DATE CLOCK
- CPU - TWIN 6809 plus Z80A
- 48K VIDEO MEMORY
- 64K MAIN MEMORY
- 8 COLOURS
- LOW COST

NEWTRONICS

255 ARCHWAY ROAD, LONDON, N.6 TEL: 01-348 3325

Please add VAT to all prices. P&P extra. Please make cheques and postal orders payable to NEWTRONICS or phone your order quoting BARCLAYCARD, ACCESS number.

We are open for demonstrations and Sales. Monday-Saturday 9.30 a.m.-6.30 p.m. Near Highgate Underground on main A1 into London.

The capability that made Zenith No:1 in the U.S.A., is taking us to the top in the U.K.



Zenith Data Systems didn't get to be the No:1 supplier of CP/M® compatible micro-computers in the U.S.A. on product alone.

Zenith have the hardware for every application of low-cost micro-computers. Systems that can be expanded to 10MBytes on Winchester disk. Peripherals that can meet all input/output requirements. International Standard interfaces that support the input/output devices.

The world standard CP/M® will support your application – be it business, technical, office administration or word processing.

And with the massive backing of our parent company – the multi-million Zenith Radio Corporation of America – we are not only able to improve and develop our products, but to expand our market continually throughout the world. This includes an extensive investment programme for Zenith in the United Kingdom.

With this kind of backing we're going places. So whether you're a dealer, end-user or OEM – Invest in Zenith Technology today and come with us.

It's a solid investment you can afford.

*CP/M is the registered trademark of Digital Research.



Please tell me more about your micro-computer systems:

NAME POSITION

COMPANY ADDRESS

TELEPHONE

ZENITH | data systems

The quality goes in before the name goes on.

Zenith Data Systems, Bristol Road, Gloucester GL2 6EE. Tel 0452 29451.

SEIKOSHA



NEW WIDER VERSION. TAKES STANDARD PAPER.

The Seikosha GP100A
Manufactured by the Seiko Company, Japan.

The micropriced microprinter

80 col dot graphics for around £215 EX. VAT.

Seikosha introduce the GP100A. A wider and updated version of the highly successful GP80. Now able to take standard width paper, the amazingly compact GP100A offers big printer performance at a fraction of the cost.

With a high quality output that includes full graphics capability, the Seikosha's proven reliability and variety of interfaces make the GP100A the ideal choice for hobbyists, educationalists and businessmen. Full service support is provided by DRG Business Machines' nationwide distributor network.

FEATURES INCLUDE:

- 80 col. 30 cps.
- Dot Matrix unihammer action.
- ASCII standard. 116 characters.
- Full graphics.
- Upper and lower case.
- Double width printing.
- Up to 10" paper width.
- Original + 2 copies.
- Tractor feed.
- Self testing.

INTERFACING for most systems:

- Standard: Centronics.
- Options: RS232C, Serial TTL, 20mA current loop. 1EEE-488. Apple II, Sharp (GP100D).

DIMENSIONS:

Depth – 9¼" (234mm)
Width – 17¼" (420mm)
Height – 5¼" (136mm)

OPTIONS:

- Pinch feed.

DRG BUSINESS MACHINES

Telephone the number below and we'll tell you where your nearest distributor is located.
See the remarkable Seikosha GP100A in action.

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

THE FINEST WORLDWIDE SUPPORTED NATIONWIDE.

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

SALE ELECTRONIC GAMES

NOW £40 OFF



ATARI T.V. GAME

THE GAME WITH 50 CARTRIDGES

R.R.P. £129.95 (inc. VAT)

OUR PRICE

£78.22 + VAT

(= £89.95 inc. VAT)

The Atari is supplied with a free mains adaptor, a pair of paddles, a pair of joysticks and a combat cartridge and is the most popular television game on the market and has a range of over 40 different cartridges. In addition to the standard Atari range we also now stock the new Activision cartridges which are currently on special offer reduced from £18.95 to

£16.95 inc. VAT

ATARI CARTRIDGES

20% OFF R.R.P.

Atari Soccer £29.95
NOW £23.95

Activision Dragster £18.95
NOW £14.95

Activision Boxing £18.95
NOW £14.95

ATARI OWNERS CLUB — Why not join our *FREE* Silica Atari Owners Club and receive our bi-monthly newsletter with special offers and details of the latest new cartridge releases. Telephone us with your name and address and we will add your name to our computer mailing list.

NOW £50 OFF



MATTEL INTELLIVISION

THE ULTIMATE T.V. GAME

R.R.P. £229.95 (inc. VAT)

OUR PRICE

£156.48 + VAT

(£179.95 inc. VAT)

6 NEW CARTRIDGES JUST RELEASED:
ASTROSMASH ★ SNAFU ★ BOWLING
SPACE ARMADA ★ BOXING
TRIPLE ACTION

All 19 current cartridges + the six new ones above now retail at £19.95 — **Silica special offer price £17.95 inc VAT**

The Mattel Intellivision is the most advanced T.V. game in the world with a range of over 25 different cartridges all at our special offer price of £17.95. This game uses a 16-bit microprocessor giving 16 colours and three-part harmony sound. The picture quality is incredible with 3D effects and realistic animation. An add on keyboard will be available in the Spring 1982 to convert the Mattel into a full home computer with 16K RAM which will be fully expandable and programmable in Microsoft Basic. Other accessories will be added later in the year. The normal price of the Intellivision + free soccer cartridge is £229.95 but our special offer price is £179.95 inc. VAT saving you £50.00.

MATTEL OWNERS CLUB — Why not join our Mattel Owners Club and recive our regular newsletters containing details of all the latest cartridge releases. Telephone us with your name and addresses and we will add your name to our computer mailing list.

FREE 16 PAGE CARTRIDGE CATALOGUE — If you are interested in owning a Mattel, we now have available a 16 page catalogue describing the latest six cartridges to be released, as well as a new Mattel colour leaflet with brief descriptions of all 25 cartridges. Telephone us for further details.

T.V. GAME CARTRIDGES

We specialise in the whole range of T.V. games and sell cartridges for the following games:
ATARI ★ MATTEL ★ ACETRONIC ★ PHILIPS ★ DATABASE ★ ROWTRON ★ INTERTON ★ TELENG
Let us know if you own any of these games and we will let you have details of the range of cartridges available.
Attention INTERTON & ACETRONIC owners we have over 75 assorted used cartridges in stock all with 1 year guarantee — ***SPECIAL OFFER £8.95 each***

We also have a number of secondhand games and cartridges.

NOW £8 OFF



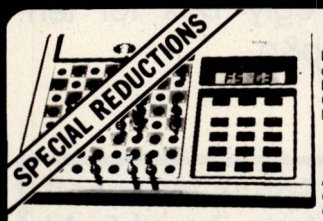
HAND-HELD GAMES

EARTH INVADERS

These invaders are a breed of creature hitherto unknown to man. They cannot be killed by traditional methods — they must be buried. The battle is conducted in a maze where squads of aliens chase home troops. The only way of eliminating them is by digging holes and burying them.

R.R.P. £26.95 **NOW £18.95** inc. VAT

SPECIAL REDUCTIONS



ELECTRONIC CHESS

Liquid crystal battery chess computer with 100-200 hrs battery life and two levels of play. Comes with separate chess board and pieces.

NOW £5 OFF
R.R.P. £24.95
SALE PRICE £19.95 (inc. VAT)

GRADUATE CHESS

A de luxe version of the electronic chess set with integral chess board. The ideal portable chess set — see illustration.

NOW **£29.95** INC VAT

FIDELITY MINI-SENSORY CHESS COMPUTER

The very first chess computer of its price to offer a portable computer with integral sensory board. Battery (6-8 hrs) or mains operated. This is a modular game and additional plug-in modules are planned for 1982 for advanced chess, popular openings, greatest master games, draughts and reversi.

MINI-SENSORY COMPUTER WITH STANDARD CHESS MODULE WAS £54.50 *NOW* £49.95 INC VAT

Silica Shop are one of the country's leading specialists in Chess Computers and now stock a range of more than 20 Chess Computers, including Challenger 7/10/voice, Sensory 8 and Sensory Voice, Diplomat, System 3, Morphy, Great Game Machine, Voice Champion, and the new Scicys Mark V.

NOW £10 OFF



PAC MAN 2

Pac Man 2 is based on the latest pub game. It is a two-colour game of strategy, tactical pursuit and destruction pitting Pac Man against the large Ghosts. The object of the game is for Pac Man to attain as high a score as possible by capturing and destroying Ghosts, Bugs and Energizers without being himself destroyed by the Ghosts. Pac Man 2 incorporates the most modern and complex status displays ever produced and is now on release for the first in the UK offering an ideal present.

R.R.P. £34.95 **NOW £24.95** inc. VAT

NOW £8 OFF



SPACE INVADERS

Based on one of the most popular arcade games, Space Invader™ packs in lots of action with multi-shaped, brilliant LED vessels, including attack ships, bombs, defenders, missile rockets and a beam force cannon, plus exciting electronic sound effects. The attack ships attempt to bomb the ground defenders as they are moving. You manoeuvre the missile rockets — avoiding alien bombs — and destroy the invader force as quickly as you can. Progressive degree of difficulty. Includes automatic digital scoring. For ages 6 to adult.

R.R.P. £24.95 **NOW £16.95** inc. VAT

LESS THAN ½ PRICE



COLOUR CARTRIDGE T.V. GAME

Semi Programmable T.V. game
+ 4 cartridges
+ mains transformer
NOW £43.50 OFF
R.R.P. £73
SALE PRICE £29.50 inc. VAT)

SCOOP PURCHASE NOW ½ PRICE



BACKGAMMON COMPUTER

Silica stock a wide range of Backgammon computers from £28.95 upwards. Special offers now available on Gammonmaster.

Was £99.95

NOW **£48.95** inc VAT

CALL JOTTER — THE AFFORDABLE ANSWER

The Post Office certified telephone answering machine

½ THE PRICE OF COMPARABLE MACHINES



"Sorry darling, I will be late home — Love John"

The Call Jotter I brings the affordable answer at the amazing price of £69 (or £99 for the Call Jotter 2 with built-in remote recall facilities). These amazing telephone answering machines are Post Office certified and guaranteed for one year. They make a thoughtful gift for home or business use.

Call Jotter 3 illustrated
TWINTAPE £139

NOW **£69.00** inc VAT

NOW £75 OFF



ADD-ON ADAPTOR

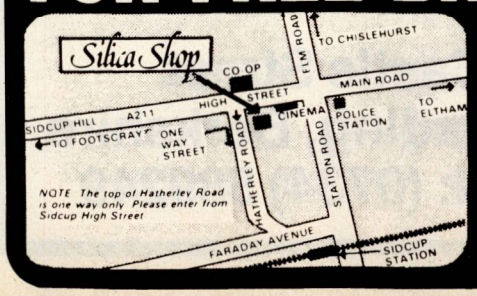
WAS £199 inc. VAT
SALE PRICE £124 inc VAT

RADOFIN TELETEXT

Plug the adaptor into the aerial socket of your colour TV and receive the CEEFAX and ORACLE television information services.

THIS NEW MODEL INCORPORATES:
- Double height character facility
- True PAL Colour
- Meets latest BBC & IBA broadcast specifications
- Push button channel change
- Unnecessary to remove the unit to watch normal TV programmes
- Gold plated circuit board for reliability

FOR FREE BROCHURES – TEL: 01-301 1111



For free illustrated brochure and reviews on our range of electronic games, please telephone 01-301 1111. Free delivery service available. To order by telephone please quote your name, address and ACCESS/BARCLAYCARD number, and leave the rest to us. Post and packing Free of Charge. Express 48-hour delivery service available.

- CALLERS WELCOME — Demonstrations daily at our Sidcup shop open from 9am 6pm Monday Saturday (Early Closing Thursday 1pm — Late Opening Friday 8pm)
- 2 YEAR GUARANTEE — All goods are covered by a full year's guarantee and many are further covered by our exclusive Silica Shop 2 year Guarantee
- MONEY BACK UNDERTAKING — If you are unsatisfied with your purchase and return it within 7 days we will give you a full refund.
- AFTER SALES SERVICE — Available on all machines out of guarantee
- COMPETITIVE PRICES — We are never knowingly undersold
- HELPFUL ADVICE — Available on the suitability of each machine
- CREDIT FACILITIES — Full credit facilities available over 12, 24 or 36 months at competitive rates of interest
- PART EXCHANGE SCHEME — Available on second hand machines
- CREDIT CARDS WELCOME — Access/Barclaycard/Diners Club/American Express

SILICA SHOP LIMITED PCW 0382
1-4 The Mews, Hatherley Road, Sidcup, Kent DA14 4DX
Telephone: 01-301 1111 or 01-309 1111

Silica shop

PCP

Personal Computer Palace

SALE

INC. V.A.T.

~~£367~~



£299

INC. CARRIAGE, FREE SOUND AND DUST COVER

Video Genie

The Video Genie is the modern answer to programming problems. Powerful BASIC compatible with TRS-80.

PRICE BREAKERS

... C12 cassettes £3.50/ten + £1.40 p&p ... quality Verbatim disks (Apple, Pet, Genie &c.) £17.00/ten + £1.00 p&p ... 2000 sheets printer paper 11″×9.5″ £14.00 + £2.00 p&p ... 'egly' box for ten disks £1.80 + 40p p&p ...

EPSON MX80F/T printer £440

Many other great offers are available from the friendly computer shop with unbeatable service. Phone or write for more information/order form.

Super Space Invader II 2 player hand-held game of skill and dexterity.

~~£35~~ **£22**

PRICES LAST DURING JANUARY ONLY

All our equipment is guaranteed for one year, parts and labour, by the Personal Computer Palace Servicing Scheme.

Goods are despatched same day as order received, where possible.

BARCLAYCARD VISA

Buy it with Access

6 Castle Street
Reading, Berkshire
Tel: (0734) 589249

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:

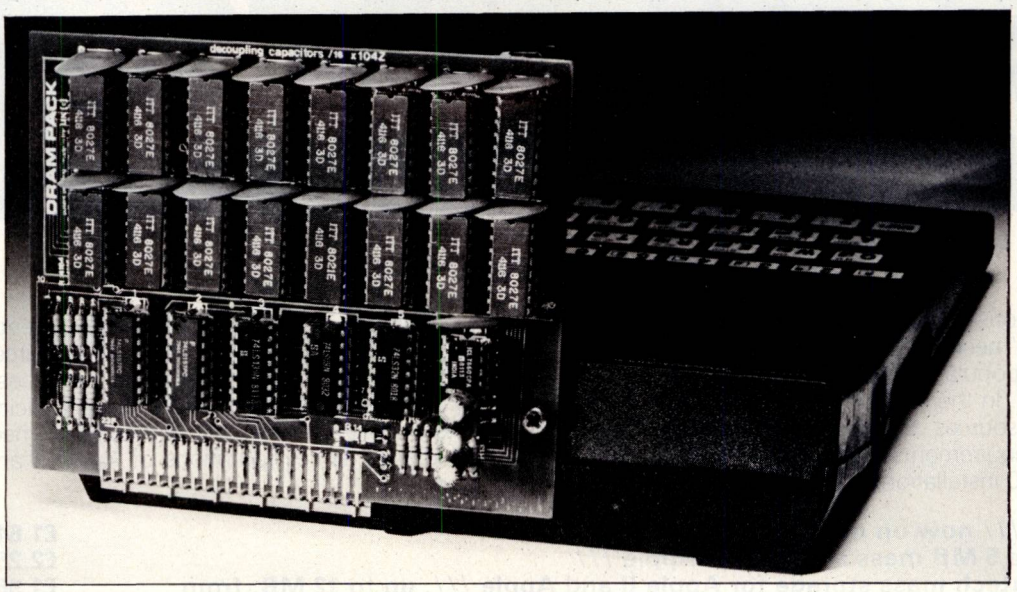
Payroll for 350 employees, 100 departments, all pay periods, printed payslips, approved year end documents, very quick and easy to use, **£375. Sales, Purchases** and **General Ledgers £295** each, detailed statements. **Job Costing** and **Group Consolidation** are amongst many and various applications 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 **£295,** amazing for this small, quiet reliable 'look alike' printer. Tractor option is **£40** and **Serial Adaptor £80**. The **Microline M82**, bidirectional printer with both parallel and serial input is only **£345,** it can have an optional 2K buffer, while the **Microline M83** full width adjustable tractor 120 cps printer with similar specification is only **£595.** 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

32K BYTES FOR THE ZX81



AND MORE....

SPECIAL OFFER!

48340 BYTES FREE!
For TRS80 and Video Genie.
Kit £40.00. Ready built £46.00.
EX-STOCK DELIVERY!!!

Dear Audio Computers,

☐ I am a ZX81 user,

☐ Please send me more technical details on your products.

☐ Please send me the items circled below:

☐ I am using a: (please tick)

☐ Acorn Atom ☐ Pet series... ☐ UK101 ☐ 6502 OS1

☐ TRS 80 model... level... ☐ Video Genie model...

☐ Please send me more technical details on your products.

☐ Please send me the items circled below:

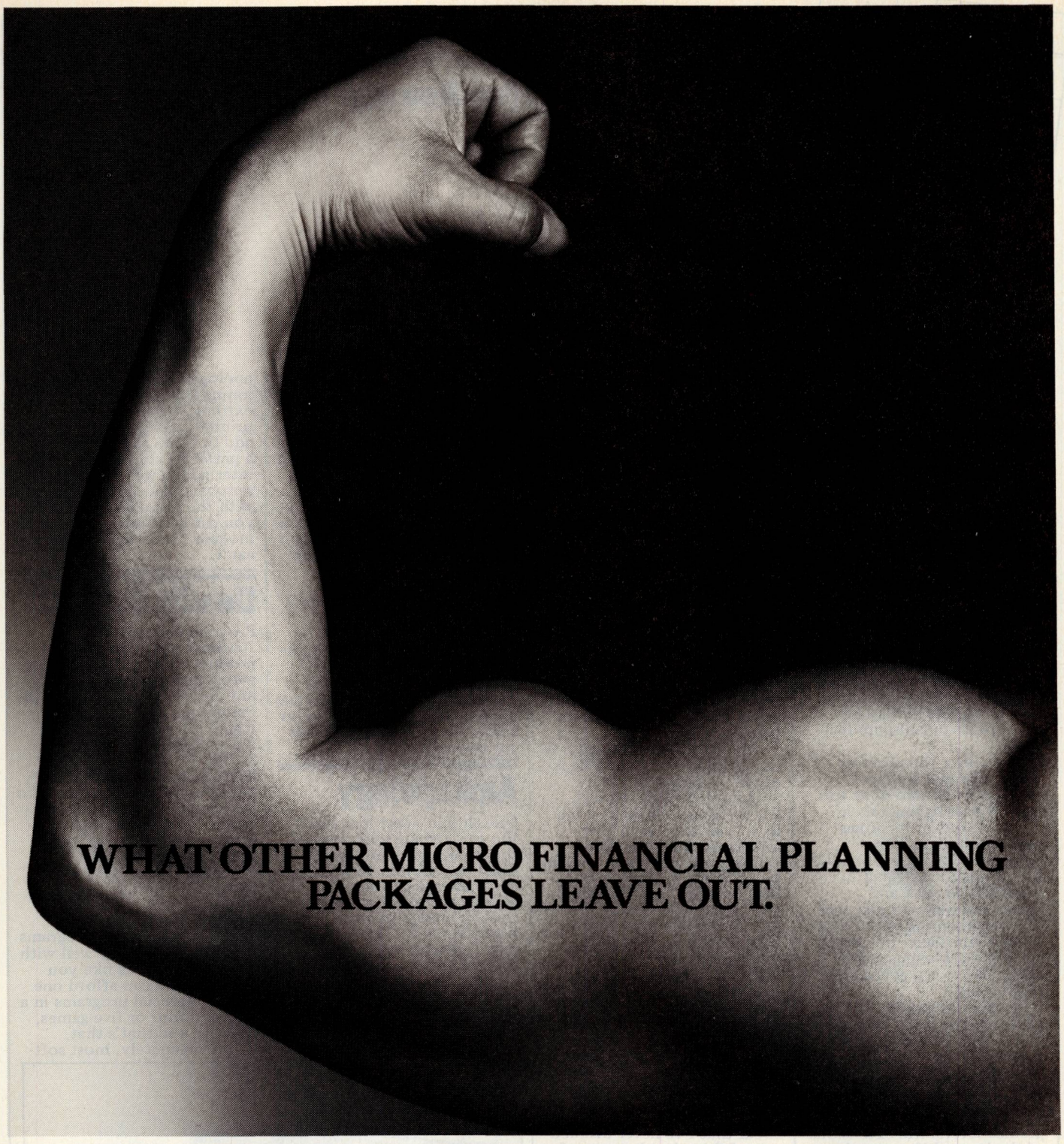
	Z80A based *		6502 based	
	Kit	Ready built	Kit	Ready built
32K bytes Ram expansion	46.00	54.00	59.00	69.00
64K bytes Ram expansion	–	79.00	–	100.00
128k bytes Ram expansion	–	138.00	–	150.00
128k bytes Ram array for further expansion	–	110.00	–	110.00
16k CMOS Ram expansion	£44	£50	£44	£50
16K Eprom expansion	£30	£36	£30	£36

Prices include VAT at 15% and p&p, full documentation and warranty
* Except special offer for 32K on Video Genie and TRS80 modules. See above

◇ I require a VAT receipt
◇ I enclose a cheque/postal order payable to Audio Computers, for £.....
◇ Please charge to my Access/Barclaycard account no. _____
◇ Name: Mr/Ms: _____
◇ Address: _____

Mail (or post) to:
Audio Computers, 87 Bournemouth Park Road, Southend on Sea, Essex

Tel: (0702) 613081
Telex: AUDCOM 995337 G.



At Comshare, while we're developing our software, we're also developing our biceps.

(As we're No. 1 suppliers of financial packages in Europe, it's important to have both.)

Fastplan is our powerful new menu driven micro based financial planning system, at a cost effective £395.

However, add 24 offices throughout Europe, custom-built training schemes, a free enhancement service, as well as our Helpline and you'll appreciate that brains aren't everything.

Muscle counts as well.

James Lascelles, Comshare Ltd.
32-34 Great Peter Street, London SW1.

I want to know more now. Please send me your Fastplan Factsheet.

Name:_____

Company:_____

Address:_____ PCW4/3/82

_____

FASTPLAN FROM COMSHARE

Making the computer make sense.



NEWSPRINT

Compiled by Guy Kewney

Apple sauce

Apple will probably respond to the challlenge of the portable Osborne computer, with some kind of packaged system in a small box, within six months.

Intriguingly, this magazine has, after four years, finally received a review Apple microcomputer for Benchtesting. And so have I (I keep my reviewing quite separate from the official Benchtesting programme).

The main result of my reviewing is this: thank God the machine hasn't long to live. But it is too important a design to dismiss merely because of its out-of-date features.

Nonetheless, the portable Apple planned for late summer will come none too soon. Never having taken an Apple out of its boxes before, I had no idea what a performance it would be. And after plugging in Silentype, disk and games add-ons, the prospect of experimenting with other printer interfaces, 80-column cards, Pascal language systems, and so on, gets a bit frightening.

When all the good things of the Apple II are packaged nicely into one box, with plugs on the *outside* rather than inside, then it will be easy to see why people like Colin Crook of Zynar (selling the Nestar Apple network) predict several life-extensions of the beast. Life extensions, by the way, are recognisable in the motor trade by the appearance of a new bit of chrome, or a new flashing light, so that the people can see it really is this year's model, not an old one with a newer registration. In micros, you are talking more of real upgrades; such as the ability to add hard disks, to double memory capacity, or to put it all in one box with a handle on the side. And that, apparently, is the next trick for the Apple II.

Apart from that, the arrival of the machine has dispelled one or two comfortable illusions. It has been my erroneous belief, for all the years the Apple has been on the market, that you could edit Basic on it the way you can on the PET and HP-85 and Atom — by moving the cursor up to the line involved and re-entering or altering it. It's a severe blow to find out that you can't — and I don't understand why not. And, given that you can't, why hasn't Apple rapidly added this feature?

That said, the truly amazing thing about having easy access to the machine is the incredible amount of software which I can now load and try out, and which previously had to be passed on to reviewers without any real idea of what it was supposed to do.

And of course it was this software that made me interested in having the Apple in the first place.

My attitude to getting free hardware left in my office is not quite as simple as the average user might expect. For a start, it costs me a bit in 'extras' such as printer interfaces , screens, disks, cables, and (not least) storage space. Second, there is no easy way to judge the donors' good faith — they may say they agree that journalists need machines to evaluate software, but what they really means is that this particular journalist should write something truly flattering about the supplier — or the machine will not be needed. And third, there are always undercurrents of friendship and dislike to deal with. Nobody in Apple UK will believe me for a moment when I swear that I've never disliked any of them just because of some of the daft things they've done. Now that I have an Apple to check things out on, will the old Microsense team now expect me to be more favourable 'because we are on better terms', believing that it was animosity which caused criticism before?

Oh, it's a great life being a commentator. I think I'll conclude by passing the hat round for the 'Agonies of Conscience' fund. . .

Think in colour

Colour on the computer screen, when it is of use, is very powerful. For example, it can make a graph with several different functions more understandable than a mere tangle. So, of course, can colour on paper — but most computers don't have any way of making coloured marks on paper.

The 'spreadsheet' program Micromodeller now has colour print available. Since its function is to display complicated sets of financial data, the usefulness of colour can't really be doubted — as long as the user is trained to 'think in colour'.

The producer of this new feature is (not altogether a surprise) a manufacturer of colour printers — DE Computer Services of Middleton, Manchester. The company claims this is the first package program to come with colour printout as standard. Details on 061-643 0016

Alphapology

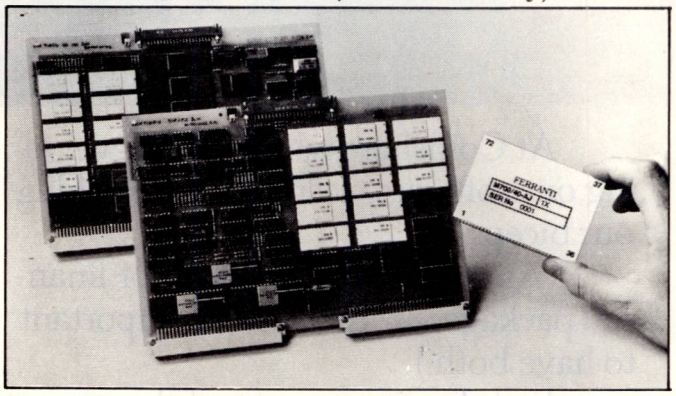
One should never make off-the-cuff remarks, because of the danger of telling only a small part of the story. The occasion which I have in mind is the passing reference to the Triumph-Adler Alphatronic and its RS232 interface which appeared in this column a couple of months ago, and which pointed out the danger of 'improving' such standards. I think I must pay Triumph-Adler the compliment of an apology — because in mentioning the Alphatronic's extremely non-standard printer interface, I omitted to add that the machine posseses a perfectly standard RS232 interface as well. This was a serious omission, because with the standard interface you can plug into a printer or modem — and without it, you can't.

Deadly dongle

Program Protection (of Arizona) has announced a product, called the Deadbolt, which makes illegal copying impossible. It works on Apple computers and is a chip which plugs into the machine's internal games paddle socket. Program Protection supplies this product at $10 per Deadbolt, plus a charge to the software writer, for the service of adjusting the program to run with the Deadbolt in place. This service costs $1200 for the 'initial package' — though exactly what that is isn't too clear.

The trouble with this system of protecting programs is that it works very well with small-time crooks like you and me, who can afford one or two essential programs in a year and four or five games, perhaps, and that's that.

Unfortunately, most soft-



Ferranti's excellent engineers should be very pleased to have their abilities recognised by a Ministry of Defence contract to turn Ferranti minis into very large-scale integration microprocessors — not before time, one might say.

It is a waste of resources, however, to convert a well-used defence computer into a single chip just for the sake of the defence software it will run. In three years' time, the software for the dratted machine will be produced by some Japanese code factory anyway, and the money that should have been spent to prepare for this threat will have been wasted on an obsolete mini.

It's what's known as cutting back on public expenditure, I think.

ware theft is organised, usually by a computer retailer who's having a tough time competing with the shop down the road and who can't match the other shop's low prices. All too often, the dealer makes his package look better by throwing in a little 'free' software like a word processing package, or a stock control system, or even a couple of games, or all four, without charging any extra.

This sort of crook is normally equipped with a programmer and an engineer and can, with a little effort, find a way of duplicating programs even if they are protected by secret codes and Deadbolt-type dongles.

Still, the Deadbolt idea does usually allow the user to make a copy of a disk for his own purposes (in case the original disk wears out, which it will do) so the idea is not totally without merit. Details from PO Box 27268, Tempe, Arizona 85282, or phone (714) 770 8843.

Iona micro

First details of the Iona micro from IOTEC indicate that it will be both very expensive and very cheap.

The machine is being offered by a new company, set up to handle the marketing of the new product, and one of the things it still hasn't quite sorted out is the pricing policy.

However, since most CP/M systems provide 64kbytes or less, and since the Iona can go up to 960 kbytes, it is obviously a lot bigger than most. And since most CP/M systems these days come with their own screens and the Iona can drive an ordinary television, which saves money, it must also have a very cheap version. And since most micros these days (new ones, not old-fashioned things like TRS-80s and Apples) don't bother with audio cassette recorders for storing programs, and this one does. I think we can safely say that the company is planning to appeal to the beginner as well as the corporate chequewriter.

Notice also that the machine can connect to a colour screen as well as to a black-and-white one .

With 960 kbytes, of course, it is obvious that the operating system can't be ordinary CP/M, so the normal warning applies: you may be able to run programs designed to run under CP/M on this machine, but don't count on being able to run this machine's programs under normal CP/M afterwards. Details from Nigel A Tompkins on 01-236 7968.

Services guide

The Computer Retailers' Association (CRA) is something that readers of this column in past months may have noticed mentioned from time to time. From the tone of the voice in which it has been mentioned, it might have been possible to deduce a lack of true reverence towards its aims and existences.

This was never because I saw the CRA as a waste of time. Rather, I saw the idea of setting up a 'club' for retailers, where the entry fee was a promise to follow a system of ethics, as a good idea which could easily be ruined by praising the members.

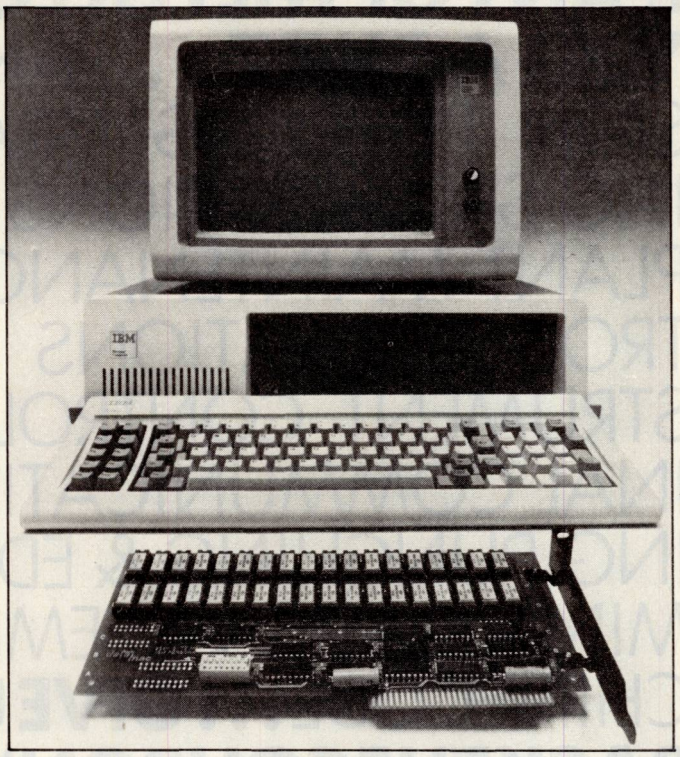
The first thing that happens when a bunch of people get together to monitor their own behaviour is that they sort out a few cowboys. The second thing that happens is that they want to be told how clever they were. And flattery being a powerful aid to getting favours done, this usally follows: before you can say 'prestige', you find the association president being quoted in headlines. And within a year, every cowboy in the business is trying to be the president, not to improve the ethics, but to get into the headlines.

This is all by the way of introducing you to the Computer Services Association (CSA), which has for some years represented the interests of companies who hire out computer programmers and operators, who rent large mainframe computers to large corporations, who sell computer time on their own large mainframes, and who supply hardware and software which they did or didn't produce themselves.

This body has just associated itself with a £25 guide to the services industry. The book was published in January by Gower Press. It looks to be an excellent guide, with 502 pages, a lot of different classifications of service companies, including a very valuable 'first' in this type of book — a geographical index to show not only what firms provide the service you are looking for, but also which of them are within an hour's drive of your problem.

The only warning is that, even though the CSA may have lived through the dangerous period I spoke of above it is still in no position to describe all its members as legal, decent, honest and so on, and the presence of a firm's name in this book should be taken as an indication that nothing is known to the book's Editors about the company that would involve actually taking them to court.

No, you're quite right. I don't trust trade associations, do I? Details on 0252 512331.



Today's enthusiasts (mumbled the ancient sage) don't know what the inside of a computer looks like because they all come in boxes. They probably think this memory board is a computer — but it isn't, it's an attempt to improve on one of IBM's little miscalculations; it provides its personal computer with too little memory. Pic shows, in fact, the Datamac 64 kbyte memory expansion board which can be increased to become a 256 kbytes board — allowing users to squeeze a megabyte into the box.

And to think it's only two years since Kells Elmqvist of Ithaca was boasting about the three or so megabytes that the new S100 bus could control, and everybody laughed when I asked 'why so little?'.

Datamac is in the US, on (408) 735 0323 — but I think you'll find that Mick Punter at Microcomputerland has heard of them.

IEEE add-on

The new add-in circuit which Mike Sterland's Personal Computers company has announced for Apple II is an IEEE-488 interface card. It has so many essential features included 'for the first time in a product of this type' that it's hard to imagine what previous circuits of this type did at all.

The device costs £300 and is made by California-based SSM Microcomputer Products (for whom Sterland is now official UK distributor).

Unlike previous products, this doesn't merely ensure that the right number of wires emerge from the Apple in IEEE-488 format. According to Sterland, it makes the job of producing software to drive them a lot easier, too.

'This card differs from other Apple compatible IEEE cards in the following ways: first it has a six-foot cable (others have only one foot); it supports instruments which operate in binary data mode, it handles bus timeouts and will inform the application program so that necessary action may be taken; it can be controlled from Pascal or Fortran language programs as well; and finally the data can be transmitted at 10 kbytes per second.'

It all sounds like the sort of thing that any IEEE-488 card should do anyway, but when people announce an enhancement of this sort they usually aren't too bothered to explain what it doesn't do. For example, the PET has an inbuilt IEEE interface, which it uses to drive its disks: to make the Apple use PET disks is therefore a theoretical possibility with this interface. All you need is a purpose-written operating program which will control the disk drives and read them and the interface will do it — but getting that software written might just take you a couple of years. Details on 01-626 8121.

IBM woos punter?

Don't believe anybody who tells you that IBM, the biggest computer company in the world, is angry and annoyed to see Mick Punter of Zeus-Hermes importing the IBM Personal Computer to the UK under his new Microcomputerland label.

It is true that IBM doesn't (at the moment) produce a UK version of the machine and it is also true that it doesn't know quite how to

IF ANY OF THE FOLLOWING WORDS GIVE YOU A BUZZ . . . ANALYSIS STATISTICS DE SIGN PLOTTING GRAPHICS REPORT WRIT ING SPECIFICATIONS SCHEDULES COSTING PLANT MAINTENANCE PRODUCTION CON TROL SIMULATIONS IEEE INTERFACING IN STRUMENT CONTROL MONITORING TERM INAL COMMUNICATIONS PAPERTAPE READ ING PUNCHING & EDITING SELF PROGRAM MING BASIC ASSEMBLER LANGUAGE MA CHINECODE . . . GIVE US A BUZZ (OR SEND BACK THE COUPON)

The micro comes of age. The PET has come a long way since micros were regarded as toys. It's designed and built for demanding work and this shows in the 32K memory and 80 column screen as well as in its impressive disk capacity. When it comes to languages, you'll find the PET fluent in BASIC, PASCAL, FORTH, COMAL, LISP, PILOT, FORTRAN, APL and ASSEMBLER.

It can be used as a complete system in itself, or can be linked to other PETs or a mainframe.

Who needs PET? And why? The list above speaks for itself, but that's only part of the story as the PET now has over 600 applications. It's good news for any engineer who's tried to get even a modest budget approved – the PET is very acceptable to the most sceptical of money people.

It's an attractive proposition, too, to DP professionals who need their fingers on the pulse and are fed up with waiting for their turn on the company computer.

In fact, it's the nearest thing to the all-purpose computer for everyone. An extravagent claim? A demonstration can prove it to be true.

The PET has track record. We've been involved with electronics for over 20 years and there are now over 30,000 PET installations in the UK. We manufacture our own microchip which is happily accepted and used by makers of other well-known microcomputers.

You get nationwide dealer back-up with Commodore. What's more, many of our dealers have specific expertise – which means they can advise on anything from business systems to specialist technical applications. So, if your particular problem is of a highly specialised nature, it may be best to contact our Information Department direct. They will then recommend the dealers who understand – and who speak your kind of language.

What does all this cost? Not a lot. In fact, our computers start at £200 and go through to £8,000 – which will buy you a business system. That's just one more reason why any professional worth his salt would be interested in a microcomputer that's made its name in the business world . . . but is far more than just an efficient business brain.



Send to: Commodore Information Services, P.O. Box 109, Baker Street, High Wycombe.
Tel: Slough 79292.
I'd like to know how a Commodore PET could give me a buzz.

Name .....

Company .....

Address .....

Tel: ..... 12 PCI

COMMODORE PET
Quite simply, you benefit from our experience

Commodore Official Dealer List

LONDON
Adda W13
01-579 5845
Capital Computer Systems W1
01-636 3863
Logic Computer Systems SW1
01-222 1122/5492
Merchant Systems Ltd EC4
01-583 6774
Micro Computation N14
01-882 5104
Microcomputer Centre SW14
01-878 7044/7
Sumlock Bondain Ltd EC1
01-250 0505
Informex-London Ltd SE13
01-318 4213/7
CSS (Systems) Ltd E8
01-254 9293
Meares Consultants Ltd NW3
01-431 3410
Data Base NW2
01-450 1388

SURREY & MIDDLESEX
Douglas Moore Ltd Kingston-Upon-Thames
01-549 2121
Micro Facilities Ltd Hampton Hill
01-979 4546/941 1197
PPM Ltd Woking
04867-80111
Datalect Computers Ltd Croydon
01-680 3581
Datalect Computers Ltd Woking
04862-25995
Johnson Microcomputers Camberley
0276-20446
Wego Computers Ltd Caterham
0883-49235
Cream Computer Shop Harrow
01-863 0833
Da Vinci Computer Shop Edgware
01-952 0526
L & J Computers Stanmore
01-204 7525/206 0440

KENT, SUSSEX & HAMPSHIRE
Amplicon Micro Systems Brighton
0273-562163/608331
Business Electronics Southampton
0703-738248
HSV (Microcomputers) Ltd Hants
0256-62444/0703-331422
Millhouse Designs Ltd Alton
042-084517
The Computer Room Tonbridge
0732-355962
Scan Computers Storrington
09066-5432

ESSEX
Dataview Colchester
0206-865835
CSSC Ltd Ilford
01-554 3344
DDM Brentwood
0277-229379
Stuart R Dean Ltd Southend-on-Sea
0702-62707

BERKSHIRE, BUCKINGHAMSHIRE, OXFORDSHIRE & WILTSHIRE
Commonsense Business Systems Ltd High Wycombe
0494-40116
Orchard Computer Services Wallingford
0491-35529
Wymark Micro-Computer Centre Salisbury
04254-77012
Alphascan Ltd Banbury
029575-8202
J R Ward Computers Ltd Milton Keynes
0908-562850
The Computer Shop Oxford
0865-722872
Kingsley Computers High Wycombe
0494-449749

HERTFORDSHIRE & BEDFORDSHIRE
Alpha Business Systems Ware
0920-68926
Bromwall Data Services Old Hatfield
07072-60980/63295
Computer Plus Watford
0923-33927
HB Computers (Luton) Ltd Luton
0582-454466
Photo Acoustics Watford
0923-40698/32006
MMS Ltd Bedford
0234-40601
Brent Computer Systems Rickmansworth
87-71306/70329

EAST MIDLANDS, SOUTH HUMBERSIDE & DERBYSHIRE
Davidson Richards Ltd Derby
0332-366803/4
Roger Clark (Business Systems) Ltd Leicester
0533-20455
Arden Data Processing Leicester
0533-22255
Betos Systems Ltd Nottingham
0602-48108
Caddis Computer Systems Ltd Hinckley
0455-613544

EAST ANGLIA, LINCOLNSHIRE & NORTHAMPTONSHIRE
Arden Data Processing Peterborough
0733-47767
HB Computers Ltd Kettering
0536-520910
Sumlock Bondain Ltd Norwich
0603-26259/614302
Dataview Norwich
0603-616221

WEST MIDLANDS, STAFFORDSHIRE & WARWICKSHIRE
Joseph Ware Associates Birmingham
021-643 8033
Camden Electronics Ltd Birmingham
021-773 8240
Micro Associates Birmingham
021-328 4574
Taylor Wilson Systems Dorridge, Solihull
05645-6192
Walters Computer Systems Ltd Stourbridge
03843-70811

CBS Consultants Ltd Birmingham
021-772 8181
Peach Data Services Burton-on-Trent
0283-44968
Computer Services Midlands Ltd Birmingham
021-382 4171
Business Equipment Rentals Ltd Rugby
0788-65756
Business Equipment Rentals Ltd Coventry
0203-20246

NORTH WALES, CHESHIRE & MERSEYSIDE
Rockliff Micro Computers Mold
0352-59629
North Wales Computer Services Colwyn Bay
0492-33151
Office & Business Equipment (Chester) Ltd Queensferry
0244-816803
Catlands Information Systems Wilmslow
0625-527166
Rockliff Micro Computers Liverpool
051-521 5830

MANCHESTER
Cytek (UK) Ltd Old Trafford
061-872 4682
Executive Reprographic Manchester
061-228 1637
Sumlock (Manchester) Ltd Manchester
061-834 4233
D Kipping Salford
061-834 6367/9
Computastore Ltd Manchester
061-832 4761

LANCASHIRE
Preston Computer Centre Preston
0772-57684
Thanstern Ltd Burnley
0282-813299

YORKSHIRE & HUMBERSIDE
Ackroyd Typewriter Co Ltd Bradford
0274-31835
Alcor Computer Systems Ltd Huddersfield
0484-512352
Deans Computer Services Leeds
0532-452966
Holbrook Business Systems Sheffield
0742-484466
Holdene Ltd Leeds
0532-459459
Microware Computers Hull
0482-562107
Mitre Finch Fishergate
0904-52995
Yorkshire Electronics Morley
0532-522181
Computer Centre (Sheffield) Ltd Sheffield
0742-53519/588731
Microprocessor Services Hull
0482-23146
Ram Computer Services Ltd Bradford
0274-391166

NORTH EAST
Currie & Maughan Gateshead
0632-774540
Dysons Instruments Houghton-Le-Spring
0783-260452
Intex Datalog Ltd Eaglescliffe
0642-781193
Key Computer Services Ltd Jesmond
0632-815157

AVON, WALES & WEST COUNTRY
Calculator Services & Sales (Bristol) Ltd Bristol
0272-779452/3
Computer Supplies (Swansea) Sketty
0792-290047
McDowell Knaggs & Associates Worcester
0905-28466
Somerset Business Computers Taunton
0823-52149
Milequip Ltd Gloucester
0452-411010
Reeves Computers Ltd Carmarthen
0267-32441/2
Welsh Computer Centre Bridgend
0656-2757
Sigma Systems Ltd Cardiff
0222-21515/34869
Reeves Computers Newport
0633-212331/2
Computer Shack Ltd Cheltenham
0242-584343
Midland Micro Stourport-on-Severn
02993-77098/6706
Sumlock Tabdown Ltd Bristol
0272-276685/6
Radan Computational Ltd Bath
0225-318483

DEVON & CORNWALL
AC Systems Exeter
0392-71718
Devon Computers Paignton
0803-526303
Jeffrey Martin Computer Services Ltd Truro
0872-71626
AC Systems Plymouth
0752-260861
JAD Integrated Services (Plymouth) Ltd Plymouth
0752-662616/29038

SCOTLAND
Ayrshire Office Services Ltd Kilmarnock
0563-24255/20551
Holdene Microsystems Ltd Edinburgh
031-557 4060
Robox Office Equipment Ltd Glasgow
041-221 8413/4
Gate Microsystems Ltd Dundee
0382-28194
Gate Microsystems Ltd Glasgow
041-221 9372
Mac Micro Ltd Inverness
0463-712774

EIRE & NORTHERN IRELAND
Northern Ireland Computer Centre Co. Down
02317-6548/9
Crowley Computers Ltd Dublin 2
0001-600681

ISLE OF MAN
Resource Planning Ltd Douglas
0624-4247/8

NEWSPRINT

get the machine onto the market here. But even when IBM doesn't know what to do, it still knows what it is doing and what IBM is doing is planning to release a software standard which could be as enduring as the 78rpm shellac record was.

And so, while you may find the odd IBM executive raging down in Havant, the company itself is corporately very happy to see Punter doing a bit of market research for it.

Punter has just upgraded the imported version (it is different from what IBM will launch because it uses a US mains supply at 60Hz) to offer a great deal more software, plus more capacity.

At the *Which Computer?* Show, Punter exhibited a version with very big disk capacity (up to 20 megabytes), much enlarged user memory (up to one megabyte) and new languages, including Basic, Fortran and Pascal, with CIS Cobol under CP/M-86.

That makes it much more able to match ACT and its rival import, the Sirius, and it will be interesting to see how the rival three letters — ACT and IBM — variously impress dealers and users. You can bet, at any rate, that it will be interesting to IBM. Details from Microcomputerland on 01-637 4071.

Kilostream cometh

Maybe 100,000 miles of wire sounds like a lot but that's how much British Telecom would need today if it wanted to put in the digital communications network that is now running in the UK and if it still used wire.

In fact, a lot of that mileage is in microwave links. And in a few years' time — for example, by 1985 — Telecom believes that it will be installing that amount each year.

From our point of view as computer users, the advantage of digital links is that our computers should be able to use them directly rather than having to translate the ASCII codes of dots and dashes into audio tones of bleeps and bloops first. Bleeps and bloops can get distorted over long distances but digital dots and dashes don't: they are either there or they aren't (roughly), so voice phones of the future will go the other way, and be translated into code dots and dashes first, to ensure they emerge from long-distance calls without sounding as though they've been shouted through a tunnel.

Now British Telecom has announced that it plans to link up with an American company called Satellite Business Systems (one-third owned by IBM), to offer a wide range of joint digital services, particularly video teleconferencing, high speed data, and electronic mail.

And its digital transmission, able to carry computer messages at ultra-high speed is to be called X-Stream, the most interesting of which is a service to be called Kilo-Stream.

KiloStream will link 40 exchanges in London with 60 exchanges in 30 'main business centres' in the rest of the UK by the end of next year (1983). This, says Telcom chairman Sir George Jefferson, will grow to interlink 200 exchanges by 1985.

From that simple bit of information, you can start to plan for the future, because that would seem to be a good rule of thumb for the level at which it will become seriously possible to offer high speed computer communications to any 'main business centre' in the UK. Which means, very simply, that electronic mail will become the business norm.

And that means that having your own business micro will have to be the norm too. There is no point, really, in getting instant mail in the office building if you have to wait for it to be distributed internally by messenger trolley.

Multifunction

Those who believe that the Apple should have a socket into which you can plug a printer or a modem can now get both on one add-in circuit (costing £138 including VAT) from Data Efficiency — and a little digital watch into the bargain.

The card is the Mountain computer CPS Multifunction card, which can generate serial input and output signals (for a modem, for example) or parallel output signals (for a printer, say) and has a permanent clock, with its own battery, good for two years, providing the machine with a way of telling not only the time, but the date, even if you switch the mains power off.

Details on 0442 64561 for dealers. Apple dealers will stock, says DE.

Machine bites master

There is a vast difference between the game of chess and the chess problem. At chess, a very clever player can still beat the cleverest computers. At chess problems, however, a £300 chess-playing micro has now proved itself superior to any problem-setting or problem solving human, by finding three solutions to a famous problem set in 1972 by

leading Soviet expert L Zagorujko.

A chess problem, for those who don't play chess, involves a set of chess pieces placed on a board in a set position. This can be done without any regard to whether or not they could have possibly got into that position in the course of a real game. The idea is to arrange things so that one player can make a move — or a series of moves — which absolutely and inevitably makes him win. That is the problem-setter's job, at any rate. The solver's job is to find that move, or moves.

Zagorujko won first prize in a competition by setting his problem, and in 10 years nobody has succeeded in finding any other way of solving the problem besides the way he showed. The motivation to find other solutions would have been strong: if there is more than one solution the problem is not valid and certainly couldn't win first prize.

Last month, Chess Champion Mark V found three solutions, while racing to find solutions against a human being — problem solving champion Dr John Nunn (right in our picture). Nunn found no solutions to the Zagorujko problem.

Details of the problem can be obtained from Andrew Page, SciSys Computers, on 01-352 8855 or 352 8912 — or send self-addressed envelopes to him at Suite 8, London House, 266 Fulham Road, London SW10. I dare say he'll try to sell you a Mark V, too.

Micro course

The University of London is now running courses, based around the Commodore PET, on micro subjects. There are three courses: 'Micro-computers and information' (aimed at 'information specialists', which I suppose means librarians) is the first: 'Basic computer language for information specialists' is the second; and 'Design your own system' is the third. Dates, in order: 21-23 April, 19-21 May, and for the last, 17-19 March and 30 June to 2 July.

Details from Mrs A Vickery on 01-636 4514.

Development tools

In a world where you find everybody being urged to sit down and use a micro to do their work, you will find computer programmers doing their work in front of a piece of paper with a rubber on the end of the pencil (getting worn down).

If you ever do find someone working on a computer project with a micro in front of them, chances are it's an engineer, not a programmer, and the micro is an 'instrument' called a development system.

At last the worm is turning, and programmers are wanting their own systems. And they're finding that the 'instruments' do very well for the purpose, even if the programming aids at the language level tend to be a bit out-dated.

The trouble is that development systems are very expensive and programmer budgets all too often just don't run to that sort of thing.

Hence we find chip maker Mostek producing a sort of truncated development system called a Software Development Tool, for programmers working on Z80 systems (Mostek makes the Z80). It is a piece of hardware with specialised software aids for the software writer. And it is compatible with the full engineers' instrument, but cheaper.

And we also find microcomputer distributor Vector in Belgium moving from user-computers into the development business, by launching a CP/M based development system for 8080 and 8085 based microcomputers — as an aid for the design engineer.

The two systems sell for very similar prices — Vector's machine for 'under $5000' in basic form, and Mostek's for £2289.

Details from Mostek agent Celdis on (0734) 582211; and from Vector in Leuven, on 32 2 538 91 14 if you can sort out the dialling code from that.



See 'Machine Bites Master'

Sanyos arrive

This month, the Japanese Sanyo machines should make their appearance, with two UK distributors at least handling the business — one of these being a new company called Lend-Let.

Four Sanyo machines should appear, all reported by those eager to sell them as 'very impressive', starting with a machine in a briefcase, cheaper than the Osborne, and rising to an expensive job with hard disk options, 22 special function keys, and CP/M capacity.

Watch this space for details. I also gather that software producer Microtrend has a couple of sample computers from Sanyo, to develop programs.

Robot teacher

If robots are to be the salvation of incompetent factory managers who can't manage humans, someone had better start training our factory engineers in the art of managing robots.

Cheap educational robots are the way to do this, according to Colne Robotics of Twickenham, where a £200 kit for a robot arm has just been launched.

The machine has five axes (joints) and is driven by stepper motors. It has a reach of 17 inches, it has a three-fingered gripper, and it can lift a 10-ounce weight.

Colne reckons any 8-bit microcomputer with a bi-directional parallel port can be programmed to drive the arm and also reckons that eight kbytes of memory is all you need to fit the program in.

Already written is a program for the Tandy TRS-80 level II (that's the Video Genie model) 'which can be modified for any Z80 machine', Colne says.

A competition (with a first prize of £100) is being run by a popular electronic experimenters' magazine *Electronics Today International* to develop more programs — on the PET, Tangerine Micron, Sharp, Tandy Model III, Superboard, Video Genie, Apple, Nascom and Acorn Atom.

Details from Colne at 1 Station Road, Twickenham, Middlesex, or phone 01-892 7044.

Texas tunes

The definition of a 'serious musician' according to Texas Instruments, is one who uses treble and bass clefs, rather than the special Sound Graph TI has invented for its 99/4A home computer.

Composition of three-part music is now possible on the machine — either using standard music notes and staves, or using these Sound Graphs — once you have added the £34.95 Music Maker module to the basic £300 machine.

All this is part of the battle between Texas, Atari, Commodore and the BBC to produce the most efficient cheap, colour, sound and pictures machine. This is a nice module, but I'm afraid my money is still on the BBC.

Better late...

Why the BBC micro was not out on time when the computer programme 'The Computer Programme' started on television is not a question with one answer.

The actual fault which delayed the release of the BBC Computer was the failure of two mass-produced special chips, made by Ferranti.

The fault lay in the choice of silicon for the chips. On the prototypes, Ferranti had used silicon which produced fast-switching circuits; on the production run, a slower silicon substrate was used. The result was that the chips didn't work. Actually, if you want to get technical, the result was that the chips worked perfectly, but only if you pumped the clock signal directly into the centre of the chip with a probe — because the clock signal was losing its nice, clean 'instantly on, instantly off' square wave pattern as it was passed from component to component across the chip.

Before it was found that the design was okay but the production at fault, Ferranti had moved heaven and earth and the Ferranti design department computer, and had produced three separate redesigns on the chip, John Coll at Acorn tells me. He was most impressed, and clearly quite forgave Ferranti.

To be sure, it is a very understandable mistake, often made by semiconductor production people but I somehow felt (talking to people who rang me up to ask if I knew what 'those conmen' had done with the machine they had paid for already) that customers weren't quite so ready to forgive as John Coll.

If it helps at all, I can say

The Printer People



You've come this far to find a printer supplier – don't blow it now.

*Lots of people can sell you terminals. But no one can give you terminals that come with the guaranteed immediate delivery that ours comes with!**

So what's it to be? A terminals from a company that makes lots of promises?

Or a terminal from a company that delivers what is promises?

*subject to being in stock

EPSON

MX80 RANGE



The unbelievable quality printer from the world's largest print head manufacturer. A whole stable of machines to suit a wide variety of applications: MX80 , MX82, MX 80FT/1 & MX80 FT/New Type 2. MX100

MICRO-CUE

PRINTER BUFFER

Multi-port printer buffer means one to four printers can be interfaced with one to four computers in any combination to allow all machines to be in operation at same time



16K

BDT

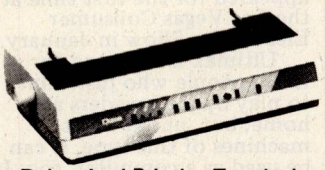
ASF 160/560



BDT automatic sheet feeders automate the only thing left in word processing that needs automation. No word processing system is truly automatic if an operator is required to hand feed sheets into the printer, or resort to perforated continuous stock. This handling individual sheets can now be a thing of the past.

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.

NEC

3500



35 CPS Impeccable print quality printers utilising the NEC print "thimble". KSR and RO versions available all with a whole host of impressive features you have come to expect from NEC.

TEC

STARWRITER



Daisy wheel printer for word processing, professional results. Diablo compatible, suitable for most micro and mini computers.

TVI

910/920/925/950



Green Screen Fully intelligent terminals with 24x80 display & dual intensity, blinking, reversed, underlining and protect fields, 96 ASCII chrs etc.

HAZELTINE

ESPRIT Green Screen

The Hazeltine Esprit is a buffered terminal capable of displaying the complete 128 ASCII character set. Based on a 12" diagonal non-glare CRT, the video is crisp and clear with each character presented on a large matrix to reduce eye fatigue.



NORTHAMBER LIMITED

3 & 4 DAWES COURT, ESHER, SURREY.

Tel: Esher (0372) 62071 or 66398 (from 01 nos. dial 78-62071 or 78-66398)

Importers, Distributors & Wholesalers of quality Computer products.

0372 62071

You've come this far to find a printer supplier – don't blow it now.

this: it's a miracle that the machine is even half-way off the drawing boards, never mind only a couple of weeks (okay, months) later than it was hoped.

Remember, the Acorn Proton design was only half-baked in spring last year, when the BBC found itself high and dry without the Newbrain (which it had chosen to star in the TV series in November 1980). The design then had to be adapted, improved, approved, and finalised, before plans for its production could be started.

Acorn was under another handicap, too. The blaze of publicity around the BBC machine once its full specification was known was exactly the sort of publicity that Nascom once attributed its collapse to. That is, everybody who was thinking of buying an Acorn Atom knew that the company had something vaguely similar, only slightly more expensive, and a lot better, under way. When the Nascom 2 was first rumoured, sales of the Nascom 1 dropped off sharply — or so the people who used to run Nascom assure me.

Acorn, nonetheless, had to carry on selling Atoms to survive. I must admit I'm impressed.

CC Writer

'Dear Editor: It's not every day that a young upstart company announces that it intends to take on the Tandy Corp and win. So spare us a few moments before filing this letter in the round file alongside your desk.'

Derek Tidman who wrote me that absurd letter is quite wrong: that sort of grandiose statement gets transmitted here every week and sometimes for something more impressive than a word processing package for the Tandy Colour Computer. What doesn't happen every day, Derek, is that the person who announces that he will take on Tandy actually does win.

Derek is importing a word processing package called CC Writer. His company, Work Force in Luton, is importing the package from Transformation Technologies of Illinois. 'The package can drive any printer that can be attached to the colour computer, it is written in extended Basic, it will fit in 16 or 32 kbytes, and is supplied unprotected.'

Without using the package, my opinions count for nothing, of course: but I was impressed with one feature which Tidman claimed for the software. That is: you can input ASCII codes into your text, to control printer operations directly. As long as that isn't the only way to control the printer, the package may be interesting. At £26, it sounds as if it's worth a look — and the manual costs £6, refundable if you buy the program.

Big disk

Biggest of Control Data's big-storage disk drives is the latest, the Finch with 32 megabyte capacity. Like the eight and 16 megabyte drives, this one will fit into the space normally left for an 8in disk drive in a microcomputer crate. Details from Control Data on 01-240 3400.

No disk calc

Simplicalc, according to the programmer who wrote it, 'is not machine code Visicalc rewritten in Basic for the 8 kbyte PET'.

At £30, obviously it isn't; what it is, then, is 'a completely new program which recognises that in small computers, program and data fight for memory space.'

The main point about Simplicalc is that you don't need a disk drive to use it.

Like Visicalc, Simplicalc allows the user to perform 'what if' projections of business projections.

It is a 134-line Basic program, according to its creater, accountant Mark Turner, who heads up the new computer division of Cronite Group (a company specialising in high grade nickel alloys used in nuclear and energy equipment, it says here).

Apparently they use Simplicalc at Cronite. And as well as working on the PET, it now runs on the VIC and the Apple, while there are plans to put something of the sort on the Sinclair and BBC micros. Details from Turner on 021-773 8281.

Unix nox eighty six?

Now that we have seen the first 16-bit micros and have seen CP/M-86 on them, we can be sure that some other operating system will dominate the world in five years' time. The question 'will it be Unix?' is one which CDS Computers is prepared to answer quickly enough: 'The portability of Unix and these new low prices mean that Unix will dominate the 16- and 32-bit market and to the detriment of older competitors.'

It probably isn't all that simple because, even making allowances for the fact that CDS is selling multi-user licences, the company's optimism appears to be totally untempered by knowledge. It refers to competitors which it will displace: they are listed as TSX, RSX-11M, RSTS-E, and VMS on DEC hardware. A company incapable of grasping that DEC hardware is not the universe, and that an inferior product (CP/M) might be more significant to the 16-bit market, shouldn't worry Digital Research too much.

For DEC users, CDS is on 01-726 6501, and prices for Unix binary licences start at £1000, coming down to £300 for 10 or more processors.

More significant to the future of Unix on micros is the arrival of /USR/ group in the UK. This started out in the laid-back reaches of the hippy kingdoms in Santa Cruz, with a few commercial adaptors of Unix getting together to grouse about Bell's uncooperative attitude to their work.

Now, Tim Keen of Keen Computers, an importer of one of the software products involved in that grousing (Onix) has been asked to set up a /USR/ Group in the country. Keen proposes to take this function under the wing of the Computer Retailers' Association: contact him on 0763 71209 to arrange a first meeting of interested British parties.

No flash, no weave

The screen display on the Nascom 2 micro has two deficiencies, says EDAC Engineering.

'First, screen flash when the screen memory is written to or read from, and secondly, the ripple effect that Nascom owners have come to know as screen weave.'

Both problems have been tackled by EDAC, which has now announced a £14.75 screen weave eliminator. Product specifications can be received in an envelope with your name and address on, which you send to Edwin Crook at 257 Orphanage Road, Erdington, Birmingham B24 0BD. Or phone 021-373 1260.

Close call comp

One of the very first things Clive Sinclair told me he would do, when he had just about got ready to launch his second computer, was to design a Prestel adaptor for it.

No, that wasn't for the ZX81, you aren't thinking. That was his third computer. His first was the Science of Cambridge Mk 14. And from that day to this, he has dodged all questions as to 'when?' with the simple statement that he hadn't got a suitable design.

Now he's proved it: Uncle Clive has announced a competition — 'to design the best Prestel adaptor for the Sinclair ZX81 personal computer.'

Clive's company will provide one of the judges for British Telecom, which is actually organising the competition. I don't think he can have designed the competition itself, which is billed on the press handout as 'closing date March 14th'. I know there are a couple of weeks between the appearance of the March *PCW* edition and 14 March, but surely not enough to design an adaptor 'which best combines low price, elegant design and practical robustness'?

Phone Tony Sweet at Prestel headquarters (01-583 9811) and inform him about one or two of the publishing realities of life — like printing lead times and editorial deadlines. Doesn't he want any entries? Go on, ask him!

New Commodores

On the face of it, the new super-cheap super-VIC (not the one you know about already, but a 40-column one announced in January) and extra-cheap Commodore 64 are worth getting very excited about. Their new music and TV games machine, too, looks like a remarkable announcement.

In Britain, however, you would do best to save your excitement for this time next year.

The new machines from the PET stable start off at an amazingly low $150 in the USA — around the cost of a Sinclair kit — for a machine called the Ultimax. This appeared for the first time at the Las Vegas Consumer Electronics Show in January.

Ultimax is designed for those people who just want to play Space Invaders at home; but, unlike most machines of this type, it can be used as a computer, too. It has some sophisticated music synthesiser circuits in it, too, but there is no news yet on what it costs to turn it into a computer — and it must cost something to put even a very cheap second keyboard on the thing.

The Super-VIC sells at $400, with 16 kbytes of memory, giving a 40-column display. This comes as no surprise, since it was revealed almost a year ago that such a beast was on the way.

The really interesting product, however, is the Commodore 64, which has a full 64 kbytes of memory in it. It is obviously designed to sell to the people who would like an Apple II or an Atari 800 but want to pay a bit less (a lot less in the case of the $1530 Apple).

There isn't too much point in getting all worked up about the details of these three machines, however, as

they have only just been shown to the trade in the USA. They won't appear, even for the trade, in Europe until the Hanover Fair at the end of April — and the British trade won't see them until the June Commodore Show.

As to when they will appear as products in shops, your guess is as good as mine. Commodore reckons it will be 'late 1982 or early 1983', and Commodore isn't famous for its pessimism on these matters. Watch this space for details.

Z8000 second source

Zilog may have been deserted by its partner AMD over the big Z8000 microprocessor chip, with AMD moving back to its former lover (Intel) and the 8086 — but the Italian link with SGS-Ates remains firm. The two companies have announced that the Z80 deal (under which SGS made the 8-bit chip) now covers the big Z8000, too, plus several new support chips which SGS has not agreed to produce before. Good for morale inside Exxon, I suppose.

Pupil power

ZX81 programs for pupils as well as teachers have been announced by Scisoft in Nottingham.

The teachers' program is one to impress parents with at the end of term — it sorts out marks for each pupil, and sorts the whole class or whatever into either alphabetical order or rank order. It can print out either a full page of marks or an individual pupil profile. That is 'Markbook'. 'Revise' is for pupils and is aimed at the physics student, in four-part helpfulness. First, it includes O-level revision notes for the syllabus. Second, it advises and demonstrates good revision technique. Third, there are test programs for formulae on heat, pressure and sound, light and electricity, mechanics and units. And finally, there is a program of questions which are 'typical of the problem type found in O-level papers'. Contact D R Valentine at 5 Minster Gardens, Newthorpe, Eastwood, Notts.

DOSsers' delight

The activity of program-writing resulting from the IBM personal computer has already reached enormous proportions, even though the machine isn't available (officially) outside America yet. Software products announced so far include programs in which to write programs for the IBM machine on something different. And, of course, programs to help get your old programs (written for ordinary CP/M) transferred to the IBM machine.

A package to help the machine send messages down the line to large computers, or to swap files from one machine to another, has been announced by Westico in Connecticut. It is called Ascom, and it works under the IBM DOS requiring a serial communications module.

The bit about running under IBM DOS is worth a little after-note.

There are two official programs which are sold as operating system software for the IBM machine. One is a version of CP/M which is apparently merely a copy of all the functions of the original CP/M with a few new special bugs all of its own. The other was written by Microsoft, and is called MS DOS or PC DOS or IBM DOS depending on who you're talking to.

Now it so happens that MS DOS is not ready yet, and so most people who want to buy programs for the IBM machine do so under CP/M-86 (for the obvious reason that they want to run them and they won't run under a non-existent operating system).

Perhaps we have all learned from the past that if an operating system 'catches on' we are stuck with it — and all the horrors that go with it. For example, we have computers with cursor arrows which don't work because CP/M doesn't know what an up cursor means. We have Z80 machines that are restricted to 8080. And lots more features that came out of the ark but have been encased in granite by common usage.

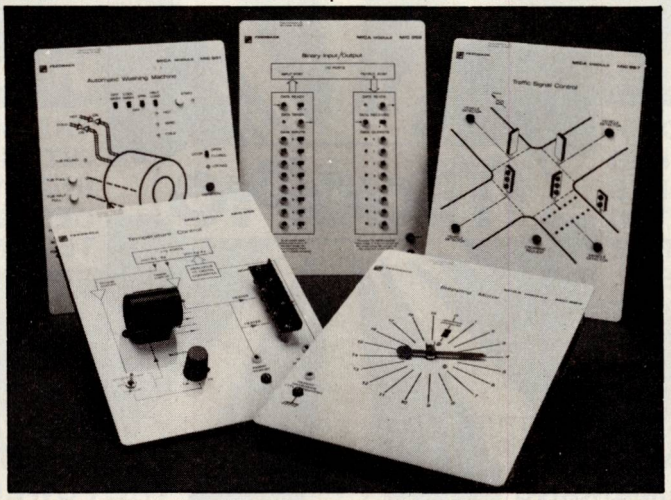
But delaying programs that run under CP/M-86 is not the answer to a late MS DOS. I don't know what the answer is, and it may be that there isn't one — but taking a restrictive attitude is no solution to anything.

I have to be honest and say that CP/M-86 fills me with horror because, in the short time it has been around, I find that many programs which 'run under it' don't. They have their own operating routines, written in assembler, because the producer of the code just couldn't be bothered with the restrictions of the outdated system structure, and so did it 'properly' the way the operating code should have done.

But surely Microsoft, of all people, must know that you take advantage of what exists, rather than trying to direct the market yourself. It was Microsoft which launched the CP/M card for the Apple, even though CP/M was not its own product — and that did a lot of good for everybody. The fact that it also benefited Digital Research (originator of CP/M) and Digital Research is a rival of Microsoft was a plus, not a minus, surely?

Wake up, Microsoft! You can't bank might-have revenues from might-have sales. And we can't run maybe programs.

Details of Ascom from Westico, (203) 853 6880. It costs $175. The company also sells a critical path method program called MicroGANTT, for $395, also for the IBM machine.



You have probably seen these pix before, but don't expect an apology for repetition — because the devices, made by Feedback Instruments, carry a message.

'It is at last being recognised,' the company says, 'among educationalists that "teaching computers" in schools, colleges and universities involves a lot more than buying one micro and teaching a clutch of students the rudiments of programming.'

These devices are 'models' of the sort of controllable machinery micro engineers will have to understand — washing machines, temperature meters (not the same as thermometers), traffic lights, generators, and so on — in the near future.

Feedback warns: 'What we said in our special report on micros in the eighties, published early last year, was that coupled with serious shortages of staff in micro based industries there was a lack of anything being done to correct the situation.'

Manpower shortages, says Feedback, are clearly going to be prevalent among electronics process engineers, applications engineers, electronics test technicians, electronics maintenance and service technicians, control technicians and theorists, not among computer programmers and data processing staff.

In other words, despite the fears of a country in which factories will be deserted except for robots, 'the shortages are not going to be in the office, but on the factory floor'.

Well, it's true, and having cheap training devices like these can help the teacher or lecturer, so I think they are worth a plug at £45 to £132 for each module.

I hope that somewhere there's a firm which is training software engineers, and which can start offering similar training equipment to teachers of the people who will have to rival the Japanese software factories of the '90s.

Feedback is on Crowborough (089 26) 3322.

Hook-up 1

For anybody who has ever admired Olivetti's electric typewriter and wanted to hook it up to a computer as a printer, the people to approach are Duplex Communications, who have done it. They call the result the Octet 121. Details on 0455 209131.

Hook-up 2

To my incredible relief, users of the new Osborne don't have to buy the ugly Osborne-supplied add-on screen if they want a big display (the machine has a five-inch screen which frightens some people). Ian Dunkley at Datron is now working on a simple modulator which allows you to whip the green monitor off your Apple and plug it right into the normal 'ext vid' socket on the Osborne.

Displaywriter software

It was not entirely accurate of me to explain, painstakingly, that since IBM's big word processing box (the Displaywriter) had an Intel 8086 inside it, it could be used for ordinary 8086

Micropro Software at less cost than Micropro Software!



This discount offer is available for a limited period only-Please tick appropriate box and send the correct remittance to the address below before April 30th 1982

GDS

GRAHAM DORIAN SOFTWARE SYSTEMS LTD
Unit 58
Suttons Park Avenue
Earley, Reading
Berks RG6 1AZ
0734-664343/6

	CP/M PRICES			APPLE PRICES		
	REC. RETAIL PRICE	GDSS DISCOUNT PRICE	MANUAL	REC. RETAIL PRICE	GDSS DISCOUNT PRICE	MANUAL
☐ WORDSTAR	£285.00	£195.00	£25.00	£215.00	£145.00	£25.00
☐ MAILMERGE	£ 85.00	£ 55.00	£15.00	£ 70.00	£ 50.00	£15.00
☐ SPELLSTAR	£145.00	£105.00	£15.00	£115.00	£ 75.00	£15.00
☐ DATASTAR	£200.00	£150.00	£25.00	----------	----------	----------
☐ SUPERSORT I	£145.00	£105.00	£20.00	£115.00	£ 80.00	£20.00
☐ SUPERSORT II	£115.00	£ 80.00	£20.00		----------	----------
☐ INFOSTAR	NOT	YET	RELEASED	----------	----------	----------
☐ CALCSTAR	£170.00	£120.00	£20.00	£140.00	£ 75.00	£20.00
☐ WORDMASTER	£ 85.00	£ 60.00	£20.00	N.A.	N.A.	N.A.

● Price of software includes manual. If manual purchased initially, 100% credit if software purchased subsequently ● Calcstar, Datastar, Wordstar, Mailmerge, Supersort, Spellstar, Infostar and Wordmaster are all Trademarks of MicroPro International Corp. ● Prices do not include VAT and are subject to change without notice.

computing applications.

IBM, it now appears, cleverly used one or two of the normal programming instructions of the 8086 for their own purposes in the machine. The result is that you can't use programs which use these instructions.

In announcing CP/M-86 for the Displaywriter, Digital Reserach's agent in the UK (Xitan Systems in Southampton) has let it be known that the software has had to reconstruct the missing instructions. Apparently it all works fine now, but there must have been one or two uncomfortable moments. . . Xitan (0703 38740) also has CBasic-86 for the Displaywriter, by the way.

Alice in Logoland

Logo is a language originally developed by Massachusetts Institute of Technology for teaching programming to young people. It is now available on the Apple II for $180 from a New York firm called Krell Software Corp.

Krell specialises in educational software (it has run into incredible trouble by offering a training package to help students with the equivalent of the 11-Plus there — the local authorities believe that the name of the exam is a trademark and that Krell has violated it by talking about it in the adverts, but never mind), and claims that its Logo language is not a cut-down version, but the full programming language.

The package, they say, 'includes an instant Logo tutorial program, and "Alice in Logoland", an introduction to Logo'. Since Logo requires a disk system with 64k of memory, an optional 16k memory board extensiou is available at the special price of $109.95, the company adds. Details on (516) 751 5139.

Atari games

Prices of the Atari 400 and 800 in Britain are still what I would call unrealistically high, presumably because Ingersol still can't get as many as it would like from the American supplier, but the games software remains excellent and improves daily.

Latest development is that the superb games developed by the eager-beaver programmers inside Thorn EMI in London's Soho have been taken on board by *Creative Computing* in the USA.

This may be a Triumph; then again, it may be only a modified triumph because the deal was always going to include US distribution, and my original understanding was that games would be sold by Atari centrally, not by David Ahl's software publishing house. Maybe somebody was boasting too soon.

The games include Darts, Cribbage, Pool, Snooker, Billiards and Tilt.

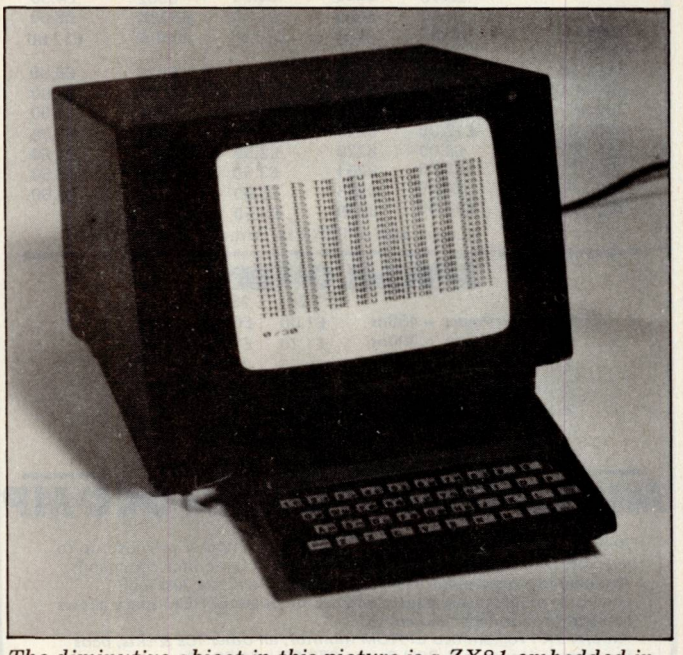
NEC packs

If Apple does adopt Micromodeller as its first official Apple software product — as it is now planning to do — then the decision by its distributors to put the price up will have been justified.

The package has sold extremely well, despite my astonishment at its high price, and it has now been adopted by IBR Microcomputers for the Japanese NEC PC8000 micro which that firm imports. The cost of a full package (computer and Micromodeller software) will be around £3000, says IBR.

I do note, however, that a package called Micro Finesse has been released by P-E Consultants, and that this is selling like mad in the USA through Osborne-McGraw-Hill; it is priced much lower than Micromodeller in the UK as a result.

Micro Finesse does a similar job (say its adherents), but is menu-driven — making it 'too friendly' for the expert user, say its detractors.

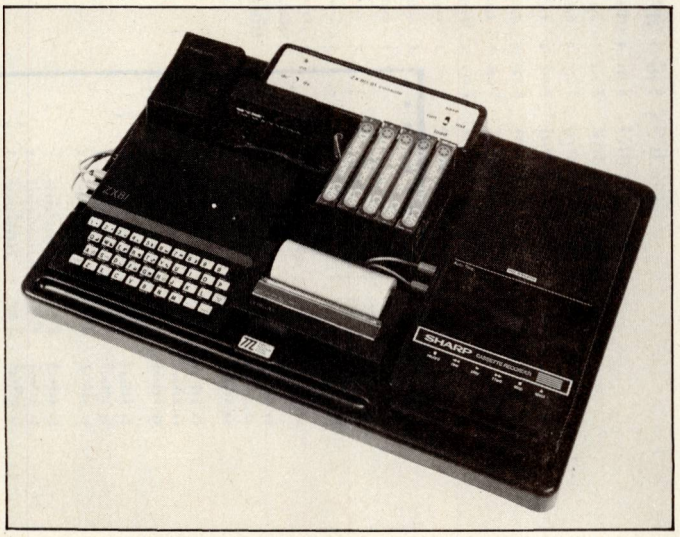


The diminutive object in this picture is a ZX81 embedded in a new monitor devised by the Danish firm of Bergqvist and Hobberstad. No soldering or dismantling of the '81 is required; two self-tapping screws fix it, and connection is made via the normal TV output. Power for the ZX comes from an internal supply making it a neat stand-alone unit. The bus connector for printer and RAM expansion is extended through to the rear panel of the monitor.

The 7½in screen has 1800 line/22MHz resolution giving crisp characters — which should delight those used to the fuzzy TV display — and a combined green phosphor and green filter provide excellent contrast even in strong direct light. Phono sockets allow composite video input from other computers or output to another monitor.

B&H expects it to be on sale in a couple of months through a large retail chain and it hopes to do well in the educational market, Beebopoly notwithstanding. At £79 ex VAT, it could find its way into some homes too (no more fighting over the telly).

B&H is on Copenhagen 451 133 188.



If the Sinclair ZX81 cost £500, then a price of £33 (including postage, VAT and everything) for a desk console for it would seem cheap. As it is, if the thing shown here looks like a good way of tidying up all the cables, flopping memory add-ons, and other spaghetti problems of using an expanded ZX81, then justify it on aesthetic or functional grounds, not cost. Details from Traffic Technology, PO Box 2, Warminster, Wilts, BA12 7QX.

WPL package

After Applewriter, the 'word processor' (joke) given away with Apple II machines so that you know what software is like to load, there is the Applewriter II and, for the new big brother machine, Applewriter III. 'An important and useful feature,' says Apple, 'is Word Processing Language (WPL) which allows you to write your own programs and make automated word processing possible.' This feature will allow you to merge information from Visicalc, and will even allow the user to 'translate' typewriter shorthand into longhand automatically. The package costs £135 from Apple dealers.

Bonsai!

Connoisseurs of false modesty will not be pleased by the outspoken bravado of Michael Kraftman, who has opened a micro shop called Bonsai (Japanese for 'small', he says) in London, with the words: Within 10 years, there will be a Bonsai microcomputer showroom in every major conurbation in this country.'

Kraftman holds (with equal lack of reticence) strong opinions on how computer shops should be run, because he has 'conducted probably the most exhastive investigation ever by an Englishman into the US microcomputer business.' So says his publicity man, Simon Chapman.

Now Kraftman has bought the old hi-fi shop where Imhofs used to live, in the shadow of Centre Point in London.

And he reckons he will supply the businessman who

MICROS MEMORIES TTLs AND INTERFACE DEVICES

Z80	£3.70	6800	£3.70	6502	£4.50
Z80A	£4.50	6802	£4.25	6502A	£6.00
8085A	£5.50	6809	£10.00	2650A	£12.00
Z80B	£16.00				
Z80CTC	£3.00	8205	£2.20	6522	£5.00
Z80ACTC	£3.50	8212	£1.60	6532	£8.00
Z80DMA	£10.00	8216	£1.60	6821	£1.60
Z80ADMA	£12.00	8224	£2.50	6845	£7.75
Z80 ADART	£8.00	8228	£2.50	6850	£1.60
Z80 PIO	£3.00	8251	£3.50	6852	£2.50
Z80A PIO	£3.50	8255	£3.50	6875	£6.00
Z80 SIO-O	£12.50	8279	£9.50		

Large range of PERIPHERAL devices available.

SPECIAL OFFERS

	1-24	25-99	100
2114Low Power – 450ns	£1.00	£0.90	£0.85
2114Low Power – 200ns	£1.10	£1.00	£0.90
2716 (+5v)	£2.25	£2.10	£2.00
2732 (+5v)	£4.50	£4.00	£3.75
2532 (+5v)	£4.50	£4.00	£3.75
4116 – 200ns	£0.75	£0.70	£0.65
6116/3 – 150ns	£6.50	£6.00	£5.80

MICRO TRAINER NANOCOMP

(as described in W.W. 17 January 81)

Based on 6502 processor & 8 ICs, this micro computer provided up to 4K EPROM, IK RAM, PIA & 6 digit display & 8 monitor commands. Although designed as a trainer kit, it can be used as a desktop computer or a software development tool. Spare EPROM space allows applications for dedicated control.
Kit c/w 2K Programmed EPROM monitor, all other ICs & skts, pcbs for cassette interface & PSU & case £72.00 + £1.50 p&p
6502 Prog. Ref Manual £5.50 + 0.80p p&p (no vat)

ACORN ATOM

A personal computer supplied with full size QWERTY keyboard and a UHF modulator for connection to a domestic TV. Basic unit is 2K RAM & 8K ROM expandable to 12K + 12K.
Built & tested £135 Fully expanded £185 p&p £2.50
Power supply 5v 1.8A £10.20 5v 3A £22 + £1.20 p&p
4K Floating Point ROM 1K RAM (2 x 2114 low power) £2.00
6522 VIA £5.00
64K Dynamic RAM Card (fits into Atom case) 200mA at 5v
Ready Built & Tested £95.00

ATOM SOFTWARE
Games Pack 1-10, SOFT VDU, Maths Pack 1, Data Base, Desk Diary, Chess, Word Tutor, Adventures £10 ea.
ATOM FORTH with manual £16 Word Pack ROM £26
Invaders £7.00, Fr. m/c, Breakout, UFO Bomber, Disassembler £3.50 ea.
Program Toolbox ROM £25.00.
ATOM CONNECTORS:
2 x 32 Way Plug £3.00 Skt £4.00 26 Way Plug £2.00 Skt £2.00

ADD SOUND TO YOUR ZX80/81

Port module plugs directly into 2 x 80 or ZX81 to provide 8 input and 8 output lines. These allow input of data from switches, photocells, sensors, joysticks etc. VARIABLE TONE AUDIO OUTPUT can produce YOUR OWN SOUND EFFECTS, additionally output can be used for control of up to 8 relays, 7 segment displays or LEDs. Port access is by simple PEEK & POKE commands.
READY BUILT & TESTED UNIT £14.95 + 70p for P&P
Reprints of PCW articles £1 + large SAE

For ZX81 users, extender card for mounting RAM PACK provided F.O.C.

UK101: INTERFACING COMPUKIT

A TWO BOARD HARDWARE INTERFACE
DECODING MODULE: plugs into UK101/OH1011 socket to provide 16 bit user port plus a wide variety of decoding lines for interfaces (incl. full decoding for AY3-8910/12 PSG) and a 40 pin skt for furthe further expansion. Kit Price £27.50

ANALOGUE BOARD: interfaces with Decoding Module to provide D/A Converter, 8 channel multiplexed A/D converter. AY3-8910 PSG plus 6522 via allow complex timing & complex timing functions plus 16 bit port. Kit Price £39.95
Reprint of PE articles £1.50 + large SAE.

MEMORY EXPANSION PCB

A low price versatile compace memory expansion PCB suitable for 6502 based computers like ATOM, UK101 & SUPERBOARD. PCB layout fully buffered & decoded. Expansion capability of 8k RAM + 4, 8 or 16k ROM or 16k RAM. (for ATOM 5k RAM + up to 16k ROM or 13k RAM). PCB: £11.50

PLEASE ADD P & P 40p AND VAT AT 15%
SEND SAE FOR DETAILED PRICE LIST.

TECHNOMATIC LIMITED

Colleges, Govt etc. orders welcome.

Barclaycard & Access orders accepted.

SHOPS:
15 Burnley Road, London NW10
305 Edgware Road, London W2.
Tel. 01-723 0233

MAIL ORDERS:
17 Burnley Road, London NW10
Tel. 01-452 1500/ 450 6597
TLX 922800

VISICALC UTILITIES SOLVES A PROBLEM

Problem

Have you ever wanted to study the formulae in a Visicalc worksheet without being confined to the APPLE screen?
Have you ever wished that you could have a more flexible format for the printout from your worksheets?

Solution

Visicalc Utilities Apple computer program which includes:-

Visiform

Enabling you to list out on your printer or VDU all the worksheet formulae. (Fig.1)

Allows you to display or print those formulae too wide for the Visicalc display area.

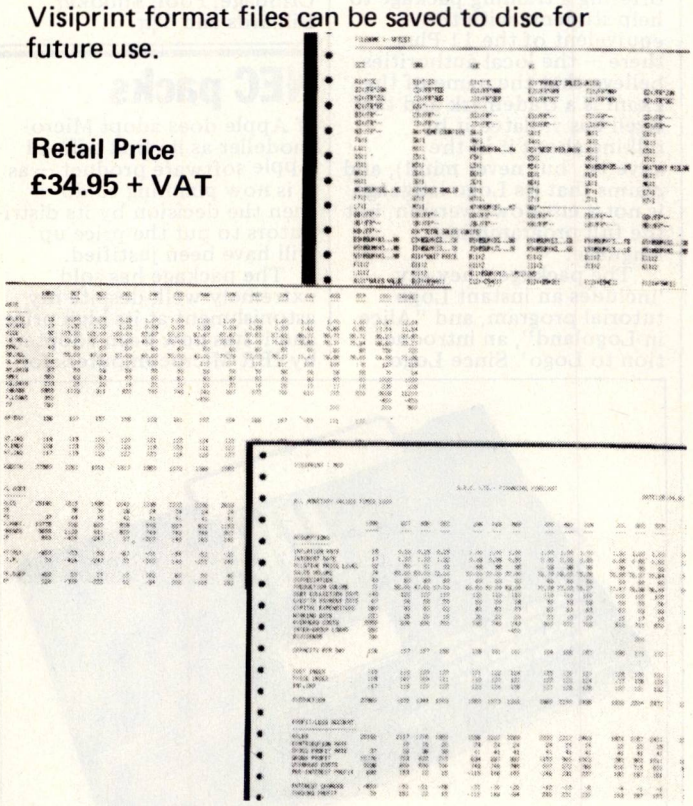
Visiprint

Re-format the printout of your worksheets with variable column widths, additional text headings, dates, page control and numberings. (Fig.2).

If you have a clock card the date and time are automatically included in your printout.

Visiprint format files can be saved to disc for future use.

Retail Price
£34.95 + VAT



LEICESTER
computer centre limited

67 Regent Road, Leicester LE1 6YF. Tel: 0533 556268

wants a middle-range machine, not just an off-the-shelf box, nor yet a very expensive item wrapped up in even more expensive 'consultancy' — that is, ranging from £600 to £25,000, the last being an eight-station, multi-user system.

Machines include the Japanese NEC machine, plus the Micromation and LSI Computers products. Software will be a package called Integrated Accountancy Software System, and a word processor which checks spelling according to English usage rather than American.

Contact this 24-year old genius and workaholic on 01-580 0902.

All night chaos

Regular readers will know that recently *PCW*.s Publisher won an Atari 800 whilst sunning himself on a Caribbean cruise on the QE2.

The acquisition of this machine has brought chaos to the higher echelons of management in our establishment. The office cleaners arrived one day last month at 6.30 in the morning to find our Publisher slumped over his desk after an all-night session. Had this representative of British entrepreneurial spirit been wrestling for 12 hours with Visicalc projections of the impact of dollar exchange rates on paper prices for his magazines? Or examining ways of rewarding his overworked staff with complex incentive bonuses without crashing the cashflow?

Had he hell! He'd been trying to extricate Princess Buddir from the clutches of Dragons and Minotaurs in the depths of the Magic Mountain. While we quietly removed him on a stretcher he revived long enough to tell us the grisly details of what is apparently a first-class fantasy game featuring over 120 characters in full colour high resolution graphics, plenty of music and sound effects and which obviously provides hours of amusement and frustration for any owner of an Atari Personal Computer with 32k RAM and a disk drive. The price is £23 including VAT, post and packing. Name of the game is Ali Baba and The Forty Thieves by Quality Software of California. Details from Audio Video Offers, Hoddesdon 68870.

Programmers' Ada

Please, Zilog, if you are going to get Litton Systems to fix it so that we can write programs in the new, exciting Ada language for your wonderful 16-bit micros (the Z8000) do ask them to bring computers into the 1980s.

I mean, simply: let us pretend that computer programmers are people whose work would be made easier by the use of computers. Let us have a program which allows the programmer to do his work at the computer keyboard and screen, rather than putting it all down on coding sheets with pencil and paper, then queuing up to use the compiler, then going back with a sheaf of error reports and code dumps to start with pencil and paper again.

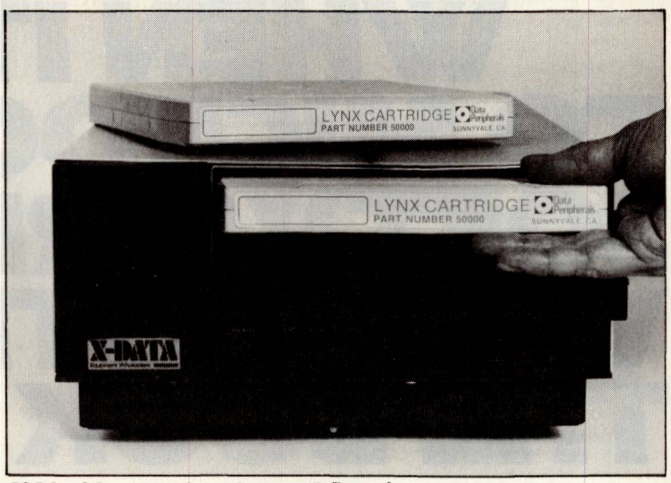
The whole point of using Ada, after all, is to make the programmer's life easier, so that he can get more done in less time and with less effort; so that he can actually get more done.

But I bet we end up with a compiler, a debugger, a loader and a run-time package, all running separately in batch mode.

Ada is being put onto the Zilog micros by Litton under an agreement designed to get military computer contracts, since the military designed Ada and is going to use it. It will take some time: the agreement still has to be 'formalised'. Details from Zilog on Maidenhead, (0628) 39200.



See 'All night chaos'



If I had known that this product was on show at the huge Compec exhibition in November last year, I'd have got quite excited about it — it's a removable 10 megabyte disk storage cartridge.

Normally, the magnetic storage disk is locked permanently into the box of these hard disks, so you do get ten million characters of storage but you can't get rid of it and replace it with another ten million. With this one, you can, just as if you were pulling out a humble 200,000 characters on a floppy disk.

The Lynx DP100 comes from Data Peripherals in California, and is distributed in the UK by X-Data. A drive is £1999 and cartridges are £99 each (one-off prices).

Details from X-Data in Slough, on 0753 49117.

Constructive comment

Construction isn't everyone's line, but the announcement of a micro expert specialising in that trade is unusual enough to catch my eye — especially when it is selling specialist software, as Jacys Computing Services is.

Jacys software 'has been specially designed for structural engineering in general and concrete design by the current author of the best-selling reference books in this field,' says the announcement, 'Charles E Reynolds and James C Steedman' — I haven't time to work out why he has two names, so you can ask.

The software runs on Apple II, and details are available on (0903) 814923.

Comal for Gemini

As a rival to the BBC's shiny new Basic language, many educationists have proposed a Danish development called Comal: both are described as 'having none of the disadvantages of Basic'.

Comal has now been adopted by Gemini Microcomputers, the family of British-built cheap micros being promoted by John Marshall (he who once became famous as the founder of Nascom).

The machine it is available on is the Multi-Board system, which is not the nice low-cost Mimi, but a rather more ambitious family of systems which can be expanded by plugging in extra circuits — as the name suggests (tested in Feb *PCW*).

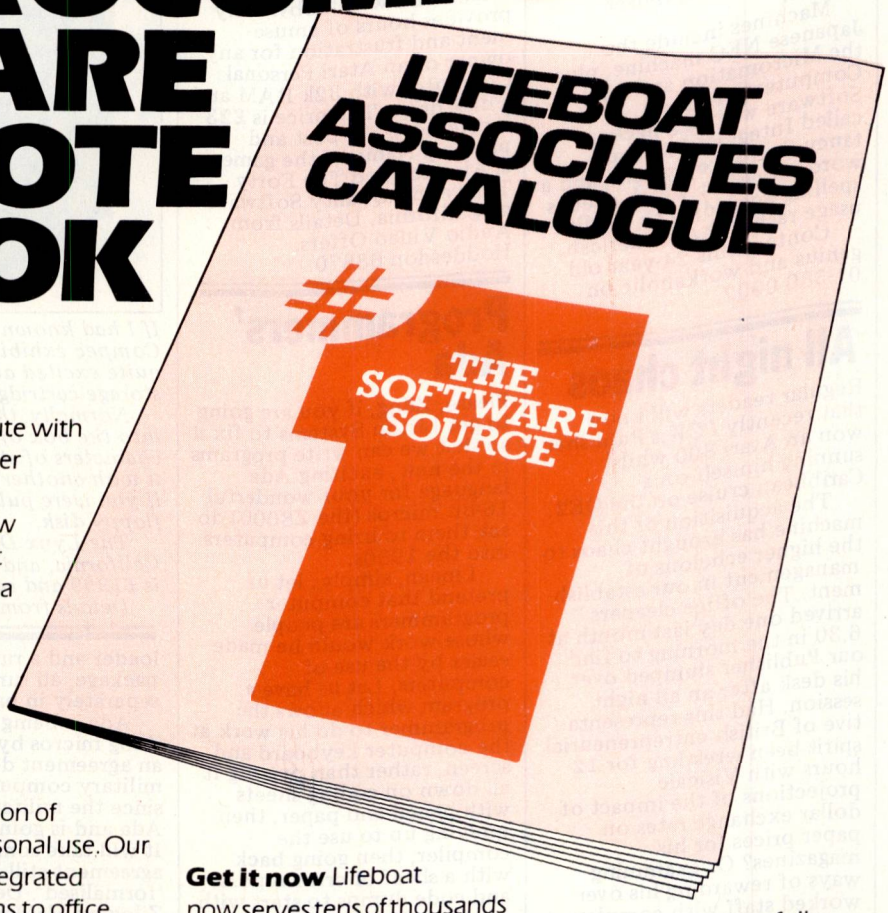
'Comal', says Gemini's announcement, 'contains (besides a full extended Basic), a great number of the structures found in Pascal. It is believed to be the most extensive interpreter available for today's micros.'

Features highlighted by the announcement are: built-in programming support — such as free-format input, line-by-line syntax checking, and run-time error messages that identify correct lines; plus the fact that it is easy to learn (that's the Basic inheritance).

It is also 'structured' — a favourite bit of programmers' jargon which mainly means that sections of code which do specific sub-tasks are easy to see on the page or the screen, and easy to change in themselves without breaking the flow of the rest of the program.

Comal for the Gemini MultiBoard is available either on tape or on 5¼ inch diskette at £115 inc VAT from MicroValue dealers (see adverts in most *PCW* issues). Or get details on (02403) 28321.

WHEN IT COMES TO MICROCOMPUTER SOFTWARE WE WROTE THE BOOK



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

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

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

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

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

That includes:

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

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

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

#1 **Lifeboat Associates**

World's foremost software source

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

☐ Please send me a free lifeboat catalogue.

Name

Title

Company

Address

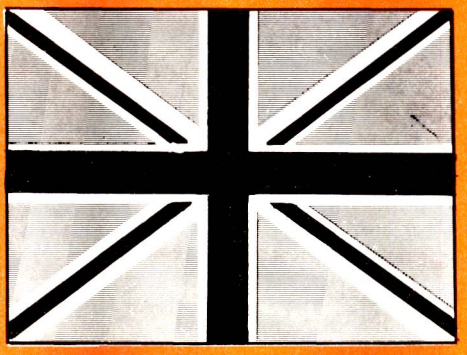
Postcode

Copyright © 1981, by Lifeboat Associates.

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

USA Lifeboat Associates 1651 Third Ave. New York NY 10028 Tel (212) 860-0300 Telex 640693 (LBSOFT NYK) TWX 710 581-2524 **JAPAN** Lifeboat Inc. OK Bldg. 5F 1-2-8 Shiba-Daimon Minato-ku Tokyo 105 Japan Tel 03-437-3901 Telex 2423296 (LBJTYO) **ENGLAND** Lifeboat Associates Ltd PO Box 125 London WC2H 9LU England Tel 01-836 9028 Telex 893709 (LBSOFTG) **SWITZERLAND** Lifeboat Associates GmbH Hinterbergstrasse Postfach 251 6330 Cham Switzerland Tel 042-36-8686 Telex 865265 (MICO CH) **W GERMANY** Intersoft GmbH Schlossgartenweg 5 D-8045 Ismaning W. Germany Tel 089-966-444 Telex 5213643 (ISOFD) **FRANCE** Lifeboat Associates SARL 10 Grande Rue Charles de Gaulle 92600 Asnieres France Tel 1-733-08-04 Telex 250303 (PUBLIC X PARIS)

Over the last two years, more than 2000 non-technical users in the UK alone used the British program DMS to keep personnel records, mailing lists, sales records, maintenance contract records, electoral rolls, blood donor records, patient and pharmacy records, stockfiles, library lists, insurance brokers records, property management files, client records, etc. In fact the uses of DMS range from parrot breeding records right through to murder hunt records!



COMPOSOFT'S DMS DATA MANAGEMENT SYSTEM

DMS on CP/M* links to WORDSTAR, SPELLBINDER, and USER WRITTEN SOFTWARE and can automatically convert DATASTAR files into DMS format.

DMS on COMMODORE PETS links to WORDCRAFT, WORDPRO and VISICALC, and USER WRITTEN SOFTWARE.

Designed for use by clerical, management and secretarial staff, the easy to read manual leads first time users through the following powerful functions.

1. Create file, type in and amend records.
2. Sort records into alphabetic, date or numeric order.
3. Select batches of records which meet various parameters.
4. Print lists, reports, letters, self-adhesive labels.
5. Perform sophisticated calculations routines.
6. Merge information from DMS (usually names and addresses) with standard letters created with a wordprocessing package, such as WORDSTAR, WORDCRAFT and WORDPRO.
7. Transfer data to and from user written software.
8. Merge, copy, and split data files without loosing existing data.
9. Datastar users can now convert automatically to DMS and retain their existing files.

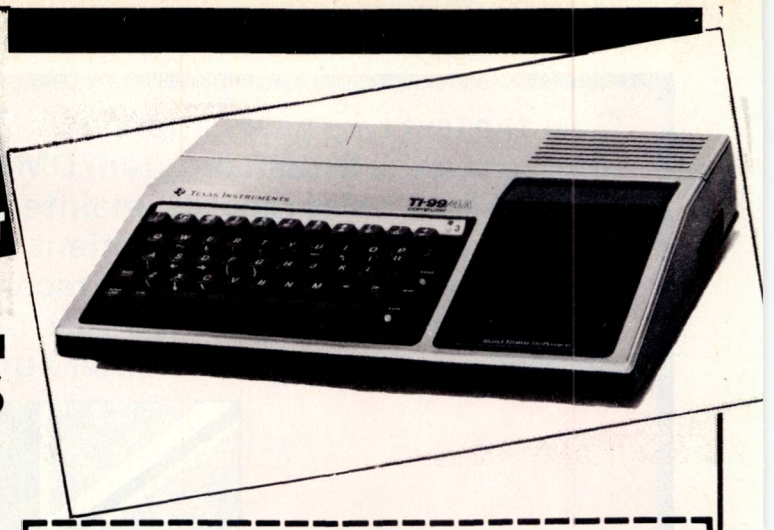
DMS is ideal for first time users who want power, flexibility AND simplicity.

Available for all types of COMMODORE Pets (details vary), or most CP/M machines with hard or floppy discs, including the NEC PC8000, The RANK XEROX 820, RAIR, SUPERBRAINS, SD machines, HEATH, CIFER, EQUINOX, SHELTON, and many more.

Full details. **COMPSOFT LTD, Great Tangley Manor Farm, Wonersh, Guildford, Surrey. GU5 0PT. Tel. Guildford (0483) 505918 or 39665**

***CP/M is a registered trade mark of Digital Research.**

THE NEW TEXAS T199/4A 42K PERSONAL COMPUTER ONLY £299.00+VAT



LOOK AT THESE FEATURES

9900 16 BIT PROCESSOR 3.5 MHZ ● 26K ROM INCLUDING 14K BASIC ● 7.6K GRAPHICS LANGUAGE INTERPRETER ● 4.4K MONITOR ● 16K USER RAM (EXPANDABLE TO 48K) ● ● HI-RES GRAPHICS 192 x 256 ● 16 COLOURS WITH FORGROUND, MIDDLE, AND BACK GROUND ● FULL MEMORY MAPPED SCREEN ● 5 OCTAVES SOUND FROM 110Hz TO OVER 40000 ● 3 SIMULTANEOUS TONES + NOISE GENERATOR ● BUILT IN LOUDSPEAKER WITH VOLUME CONTROL ● PLUGS INTO ANY STD COLOUR TV (B/W GIVES SHADES OF GREY) ● INTERFACE TO CONTROL 2 CASSETTE PLAYERS (AUTO COPY AND UPDATE FROM ONE TO THE OTHER) PLUS MANY MORE SUPER FEATURES ● 12 MONTH GUARANTEE ● OPTIONS INCLUDE:- BIG RANGE OF SOLID STATE PLUG IN SOFTWARE ● RS232 INTERFACE ● THERMAL PRINTER ● DISK DRIVES ● SPEECH SYNTHESIZER JOYSTICKS ETC ETC.

Please send me
TI99/4A COMPUTERS (Inc.
Power supply modulators
and cass. interface).
Please send me details and price list
for which I enclose a large S.A.E.
Name _____

Address _____

_____

_____ Phone _____

I enclose cheque for [ ] (£343.85 per computer including £44.85 VAT)
Please charge my Access/Diners Club Card.
Number [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]
or telephone your card order during shop hours to:-
Watford (0923) 40601 or 44057

Signed _____

Send to The Computer Centre, Watford, Ltd.
150 High Street, Watford, Herts. WD1 2EN

NEW

IMPROVE YOUR PETTING TECHNIQUE!

PROGRAMMING THE PET/CBM BY RAY WEST

Contents include this and very much more:-
Comprehensive list of contents :

1 **Introduction and overview:** Plan of the book, sources of information and help, features and chronology of CBM hardware
2 **BASIC and how it works:** Storage of BASIC and variables; pointers, syntax; modifying, running, and optimising BASIC
3 **Program and system design:** What the equipment can do; charts, structured design, algorithms; estimating size, timing
4 **Effective programming in BASIC:** Subroutines, DATA, date handling, crashproof INPUT, packing, rounding, searching, etc.
5 **Alphabetic reference to BASIC:** Full descriptions, examples, notes for all keywords, plus DEL, OLD, POP, SORT' VARPTR, etc.
6 **Disk drives:** Descriptions; six file types and uses; CBM disk handling, direct access, machine-code; Compu/think; reliability, bugs
7 **Alphabetic reference to disk BASIC:** BASIC 4 disk commands with syntax, examples, and notes; earlier equivalents
8 **Other peripherals and hardware:** Cassettes; tape timing, storage, ROM routines; printers; keyboard programming; reset switches
9 **Graphics and sound:** Tables of characters, graphics; CRT chip; 6502 animation, bar plots, 80 by 50 etc.; square-wave & 8-bit sound
10 **Transition to machine-code :** 8-bits and 16-bits; BASIC and 6502; use of MLM-BASIC MONITOR, SUPERMON, EXTRAMON &C, demonstrations
11 **More 6502 machine-code:** 6502 addressing, flags, PC,SP, etc.; how to compare, negate, add, subtract, multiply, divide, increment etc.
12 **Alphabetic reference to 6502 opcodes:** Examples, notes, full details on all opcodes from ADC to TYA
13 **Using ROM routines:** IRQ, NMI, RESET; BASIC, the kernel; modifications-LIST, PRINT USING, TRACE; writing relocating loaders
14 **Effective 6502 programming:** BASIC, CHRGET and wedges; assemblers; examples; PIAs, VIA, IEEE; common mistakes
15 **Index to BASIC ROMS and RAM:** Memory map; the first four pages; comparisons and detailed explanations of BASICs 1, 2, and 4
16 **Mathematical Programming:** Accuracy; equations; statistics; simulation; finance; trigonometry; matrices; how ROM routines work
17 **Business and education:** Examples, applications, cautions; menus, users, input; packages; documentation; educational needs

Appendices: 6502 reference charts, tables, SUPERMON listings, pseudo-codes, ASCII, glossary.
Index.

Many programs, diagrams and charts. Paperback (suitable for ring binding), 504 pages 19 x 26 x 2½cm. ISBN 0 9507650 0 7.

LEVEL LIMITED, P.O. BOX 438, HAMPSTEAD, LONDON NW3 1BH

U.K. Price £14.90 (includes postage, packing) — Please allow 6 days for delivery

LEVEL LIMITED, PO BOX 438, HAMPSTEAD, LONDON NW3 1BH

Please send me/us . . . . copy/ies of 'Programming the PET/CBM' by Ray West.
I/we enclose cheque/postal order value . . . . . number . . . . . .
NAME: . . . . . .
ADDRESS: . . . . . .
. . . . . .



David Tebbutt brings you the latest update.

Remember Alan Waring? He started ComputerTown Enfield and then decided to start one in Palmer's Green as well. As if that wasn't enough, he has just decided to open his third ComputerTown! This one is for the benefit of the staff of the City of London Corporation, where he works. ComputerTown Guildhall will usually be run on the first Thursday of each month in this lovely building. Since Lyn Antill and ComputerTown Barbican is virtually on the doorstep, there seems to be plenty of scope there for some collaboration.

Alan got the idea of starting the group when he discovered that several departments in the Corporation had quietly acquired microcomputers almost without the people in the next office realising it. All sorts of machines are in use, primarily PETs. Tandys and ZX-81s. A letter from Alan circulated to all departments elicited 38 responses from people wanting to come along to the proposed ComputerTown meetings. Only six of those replies came from the computer department. The others were users and interested people from all levels of experience.

Maybe this idea of an 'in-house' ComputerTown would work in your Organisation. Think about it and let me know if you decide to pursue the idea.

Before leaving Alan and his one-man computer literacy movement, I should mention that he has some software available to bona-fida ComputerTowns (as listed in *PCW*). The first in an interactive ComputerTown demonstration which explains ComputerTown, what a computer is, what it can do, etc. This is available on the TRS-80 16k, Video Genie 16k, UK 101 and PET 8032. He also has a ComputerTown directory of some 60 names and addresses and their relevance to CTUK. Of these, probably 20 are local references, the others are global. This runs on the PET 8032. If you are interested, write to Alan (his address is at the back of *PCW*), enclosing appropriate blank cassettes, an envelope and the necessary postage.

Now for the people who have expressed a serious interest in starting their own ComputerTowns;

Frank Fadipe of 1 Brook Close, Ruislip, Middlesex is an Apple owner, and he would like to join others in the area interested in setting up a 'Town in the Barn Library. The borough librarian has already been approached and he would be very happy to see a ComputerTown in every library in the borough of Hillingdon. If you live in another part of the borough and you would like to start a ComputerTown then contact me at the address in the box below.

Mick Marston writes from 22 Coventry Gardens, Newcastle-upon-Tyne 4. He is very keen to start spreading the word in local youth and community centres.

Paul Tombling has written from Abingdon to express his intention of starting a ComputerTown there later in the year. For the moment, anyone wanting to contact Paul should write c/o me at the address in the box below and I will pass the letters on as soon as they arrive.

Charles Cooper of 2 Langfield Road, Knowle, Solihull, West Midlands, B93 9PN is well on the way to setting up a Solihull ComputerTown. Charles and a number of friends are already investigating likely venues and rustling up the necessary equipment. I'm sure that, like all other 'Towns, a little extra help wouldn't go amiss.

Sean Grimes is thinking of starting a 'Town in Sutton Coldfield. His address is 98 Wylde Green Road, Sutton Coldfield, West Midlands, B72 1HH.

Mr P Burton, the Assistant Chief Librarian of Cambridgeshire Libraries, read about ComputerTown in the *Training Action* magazine. He is planning to celebrate Information Technology Year by holding a list of all the libraries presently involved in CTUK. Now he is looking for local suppliers to join forces with him. Write to Mr Burton at Cambridgeshire Libraries, Peterborough Divisonal Headquarters, Broadway, Peterborough PE1 1RX or telephone him on Peterborough 48343.

Other enquiries have been received this month from (in no particular order) Ovington, Ipswich, Boston (Lincs), Canterbury, Maidenhead, Porthcawl, Plymouth, Portsmouth, London, Woking, Northwood, Clara Vale, Belfast and Harrow.

If you are interested in going along to an existing ComputerTown, then all the addresses are listed at the back of the magazine. If you would like to start one, write to me and I will put you in touch with anyone else in your area who has also expressed an interest.

Now that Christmas is out of the way, (this is being written in mid-January) I hope to receive a flood of letters from newly-started ComputerTowns. Two or three people said they would launch 'Towns in the New Year. Also, it seems that Alan Waring is the only person providing regular updates about activities in existing 'Towns. How about it, you others? — It gives your ComputerTown some free publicity and it helps others treading the same path.

Thank you all for your help and support. Remember to write whenever you have some news or advice to give to others involved in setting up or running their own ComputerTowns.

ComputerTown UK! is an ever-growing network of computer literacy centres, where members of the public are given free access to microcomputers, courtesy of those willing to volunteer their time and equipment. ComputerTowns might be found anywhere: in a church hall, a library or maybe in a school after hours. The emphasis is on making computing enjoyable and non-threatening and, because Computer Town is entirely non-commercial, overt axe-grinding of any sort is banned. Guidelines are available for those interested in setting up their own 'Towns: Write to CTUK!, 7 Collins Drive, Eastcote, Middlesex HA4 9EL and remember to enclose a large SAE (A4 would be fine) for your reply. Please don't try to telephone *PCW* for information because this project is entirely a spare-time activity.



'You don't even talk to me anymore.'

COMMUNICATIONS

PCW welcomes corespondence 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,* **14 Rathbone Place, London W1P 1DE.**

Queries answered

A query on Number Crunching (*PCW* Jan '82). The final formula in the article for pi ($\pi/4 = 4$ arctan 1/5- arctan 1/239) is described as converging. What are the later terms which make it converge? As a beginner interested in such problems I would appreciate a more detailed explanation of the program.

I recently purchased a copy of the *Penguin Dictionary of Computers* (£2.75), hoping to find explanations of terms used in *PCW* and not described in 'Newcomers Start Here' (CP/M for example). Although described as 'Revised in 1977', the book didn't include terms like ROM, RAM, PROM, EPROM, etc. Can you recommend a more up-to-date book?

In a magazine of 256 pages, an index on page 1 of the page number of articles would be most useful, especially for later reference.

Mike Priestley, Edinburgh

1. The arctan terms must be expanded as Taylor series — the formula is a shorthand description.
2. Personal Computing *by Peter Lafferty (Newnes Technical Books) may be of help.*
3. What's wrong with the index on page 3? — Ed.

Lusty BASGF

Sean Morgan (Communications October *PCW*) will be pleased to note that the Basic keyword table for RML BASGF 9k Basic begins at 5F9E with the letter E of End and ends at 60ED with the R of LVAR. Between locations 60EF and 6271 he will find the Error Messages. Location 6277 contains the first letter of the message 'Break'. Locations 6306 to 6318 contain the message 'RML 9k Basic' issued when the Basic is first loaded.

This information will I hope be of interest and help to users of the 380Z.

In response to George Sassoon (Communications Jan *PCW*), 2 years ago when I was still at school I had a modified version of BASGF which accepted obscene keywords such as, 'Lust' for 'List' and others like 'Gimme' for 'Input'. It also gave out messages like 'Major Cockup At Line XX'. This I think made it more of a personal computer, but also had the effect of hiding your programs from other users.

Although, alas, I no longer have access to an RML380Z (kind offers gladly accepted), I have upwards of 1000 programs for this machine and I am more than willing to swap listings (or sell) to any one who sends an SAE to me. As I have a 16k Compukit, maybe some one would like to send software for that.

G Staples, Beckenham, Kent

Basic Interpreters

I enjoyed AFT Winfield's article on Basic interpreters (Jan '82); it straightened me out on many points. But he doesn't discuss one thing that has puzzled me, namely the arrangements for finding the return address for RETURN and NEXT.

My interpreter stores the return line number, which then has to be searched for as in a GOTO. This line number is stored as part of the interpretation of the corresponding GOSUB or FOR statement; but, at this stage, the *absolute* address of the next statement — to which the return has to be made — is bound to be readily available. If this absolute address were stored, it could be used by the RETURN or NEXT, no searching would be necessary, and the operation would be much quicker.

Do any Basic Interpreters store absolute addresses for these operations?

W E Thomson, Aldeburgh

Most probably store just the appropriate line number rather than pushing absolute addresses onto a stack — Ed.

Up the BEEB!

Regarding your review of the BBC computer, which I hope to receive on February 12th, I feel that you have missed several important points about the system:

The BBC has one of the fastest set of Benchmark timings for any machine you have reviewed.

The BBC use of long variable names means that the obscure commands such as PLOT and SOUND could be made easy to read as shown below:

```
10 filltriangle = 85
20 point =&41
.
.
.
.
100 PLOT filltriangle,
    Xcoord, Ycoord
200 PLOT point, across, up
```

The placing of a TV/monitor on the case should be an unlikely practice, anyway, and in the 'domestic environment' most colour TVs are around 22in anyway, so would crush even the strongest micro.

Finally, although the review ended on a good note, couldn't you have emphasised the fact that this British machine offers more than, say, an Apple II on almost all fronts — the likely sales — but is under half the price?

Say it: the BBC is a *brilliant* machine and, although not perfect, is near to it for almost any use, and beats machines up to £700.

Please continue to provide full details of delivery dates and hardware/software for it, and keep *PCW* the best.

I have nothing to do with the BBC except that I watch it, sometimes (but I wouldn't say no to delivery a few days earlier!).

MGT Morris, Barnet

But what would you say to delivery a few weeks late? — Ed.

Beeb correction

I would like to point out that information as to the purchase of a BBC Computer, given on page 188 of your January edition, is incorrect.

It says that the BBC can be bought from BBC Microcomputer Systems, 14 Station Road, Kettering, Northampton.

After trying Directory Enquiries and finding there was no number for them I decided to buy a day return rail ticket (£10.90) to Kettering as my eldest son was hoping for one as a Xmas present.

Much to my dismay 14 Station Road turned out to be Alba Marketing through whom the BBC can be purchased after filling in the necessary order form and going on the lengthy waiting list.

Whilst I appreciate you could not have known, the people at Alba Marketing were quite appalled at the possibility of other people travelling long distances in the mistaken belief that the computer can be bought over the counter.

J Proctor, Didsbury, Manchester

We would like to make it clear that the BBC Micro is available by mail order only *from the above address — Ed.*

Someone has one

In the February 'Communications' you state that the absence of PEEK and POKE in BBC Basic helps with portability. Considering the number of micros which do have these commands, this statement is a little strange. Why did you not refer the reader to page 162 of the same issue, where Sheridan Williams correctly reveals that the equivalent Atom commands ? and ! are available?

I think Sheridan should have said that the BBC Model A comes with only the cassette interface — extra components are required for all others. Sheridan also says that the RAM cannot be extended without the rest of the upgrade, but this sounds to me like a marketing policy rather than a hardware problem. From the appearance of the insides of my Model A, eight RAMs and a couple of links are all that are needed.

Your readers might like to know that production standards on the early models may be a bit low — when I unpacked mine, it rattled! Opening the case revealed three ROMs out of their sockets and the modulator case about to lose its lid! The power supply occasionally breaks into a nasty hum which upsets the TV output as well.

As a mainframe user (Cyber 170), I'm used to getting as much memory as I need without having to think much about it. It didn't take me long to find out that using graphics means that most of your RAM is used for the screen, leaving only around 2k for your program. I'm slowly learning how to get around this kind of problem, but the provisional User Guide is no help at all — I hope the next version is

somewhat better.
David Allman, Hulme, Manchester

Next one

Is November's Chip Chat going to be the last mention of The Last One in *PCW?*
J Read, Martuck, Somerset

No, neither is this — Ed.

Spare part surgery

I read your Benchtest of the Casio fx-9000p with considerable interest — as I am sure did many of your regular readers. In particular I noted the kind references to the Hewlett-Packard HP-85A.

May I point out that, while the HP-85A may have cost 'an arm, a leg and several back teeth' in the past, this is no longer strictly the case. Since the 1 January 1982, the HP-85A has been reduced by £330 — with the same high performance.

I would appreciate it, therefore, if you could inform your readers at the earliest convenient opportunity that the HP-85A now *only* costs an arm and a leg!
Andrew Palmer, Marketing Specialist, Personal Computing Products, Hewlett-Packard.

Knuckles rapping spot

May I firstly thank you for your understanding and courtesy when dealing with an irate managing director of this company, with reference to a letter published by *PCW* on page 74 of the January issue under the section 'Communications', sent in by Mr Sinclair of Sible Headingham, Halstead, Essex, relating to a secondhand ICL 7075 Termiprinter, shipped by Securicor on 3rd September 1981.

May I firstly take *PCW* to task, in that, before publishing this letter from Mr Sinclair, we were not approached, nor invited to make comment. Mr Sinclair is obviously one of those people who don't think nor make sure 'brain is engaged before opening mouth' (or writing).

On reading his first paragraph, one must assume he is a technically competent 'expert', in that since he could not record Ceefax data last January, ergo, no one else could. (Is this violation of copyright?)

Mr Sinclair also in his flippant letter doesn't give all the facts. This order was placed by telephone, and serviced via Access. The conversation included the information that he 'had on order from company XXXXXX, a Termiprinter for 3 months, and was still awaiting delivery — at a price of £295 plus VAT & carriage — in working order' — but no manuals mentioned.

Within a few days of delivery Mr Sinclair telephoned us, stating he 'could not make it work — and had spent £190 for nothing, and what were we going to do about it? We suggested he returned his equipment to us, and we would interface the Termiprinter and make it work — no charges were mentioned, but it is normal practice that goods are returned carriage paid, and people get paid for work and knowledge.

This offer Mr Sinclair refused, then demanded his money back, at the same time telling Nick that he had 'sold his RS232 interface anyway'. I wonder what funny toy he has as a machine — that hardware interfaces such as this are not fitted as standard.

The previous notes don't in any way question Mr Sinclair's system understanding and technical ability to ensure that the system/interface/Termiprinter protocols were compatible, that the driver software was compatible, that the transfer speeds were compatible, that the character codes were compatible, that the cable-form pin connections were correct, etc. One is forced to assume that Mr Sinclair knew the capabilities of the Termiprinter, and its age as a type, before placing his previous order with the other company, who must be thanking their lucky stars that they were 'out of stock' at the pertinent time.
Ron G Smith, Managing Director, Purley Computer Systems Ltd

Shameless flattery spot

Congratulations for your 'Newcomers start here' introduction to the computer world. When I became interested in computers last spring, I sorely missed such a guide in your French counterpart *L'Ordinateur Individuel.* I lost lots of time wondering what PEEK and POKE meant in French or what a bus could be outside a public transport authority!

Best wishes for '82 and a long & happy life!
Marc Ducommun, Lausanne, Switzerland

C'est rien — Ed

The submission of PET 'Fantasy' by Jeff Aughton (a well-admired programmer in my school) from your December edition who states that no one has yet succeeded in gaining enough treasure in which to escape has now been proved wrong.

It all began on a cold winter's day as the snow lay thick outside. We arrived at school to find that it was to close down for the day at 12.30pm due to the weather conditions, but a handful of us from our sixth form computer club, plus teacher, attempted to get out of the adventure game using a 32k 40 column PET for which the program was designed, and after three hours we eventually got out.

This wasn't done by pure chance but by the use of a map which was constructuted very laboriously by trying each exit given to us, and so we found that we had consequently drawn a foolproof map which would work each time the program was run.

The program was a great challenge to us all and we praise all the various other programs which have been submitted by Jeff Aughton in the past.
The Helena Romanes Sixth Form Computer Club

Doubling up

On page 147 of the December 1981 issue you suggest that the RAM of a ZX81 can be doubled 'easily' by replacing the existing RAM chip with a 2K*8 chip.

Please warn your readers. It may not be so easy! Out of four machines that I have seen, none had IC sockets for the 4118 but, curiously, two had the other three chips in sockets.

A solder sucker is a *must* and after removing the RAM it is best to solder a socket in the IC4 position and plug the 4118 back. If it still works and
PRINT PEEK 16388+256* PEEK 16389
still gives 17408, change the chip and try again.

There are screws under three of the four rubber feet. The 'odd man out' is the back one on the side away from the extension connector. The two short screws belong at the front when you put it back together. There are four interesting pins at the end of the RAM socket. . .
Peter Bendall, Kaltenkirchen, West Germany

Fame at last

You have at last reached the highest possible level of official recognition. . . I turned on the television this morning and happened to notice that the test card didn't look quite right. I took a closer look. . . the girl in the photograph was not using any chalk, in fact she was playing OXO on a TV screen. And yes, there was a keyboard in front of her partner — *The BBC used the picture from the front of your December issue.* I thought I was imagining things at first, but what a complement!!! It was only for about 5 minutes, at about 10.35am on BBC2, but it was still a surprise! Keep up the work on a great magazine.
Andrew D Wallace, Wigan

Dongle replacement

Replying to Mike Lake and his request for a replacement for his 'dongle' I would suggest the word 'doobrie' which has the following advantages:
1. Having been used by a colleague of mine for over 15 years it has shown no long term side effects to either user or recipient.
2. 'Doobrie' is pure bred as the catalogue of 'doobries' has several thousand entries to date.
3. It can be used several times in one sentence without confusion.
4. With such a pedigree it is practically an industry standard and almost certainly qualifies for a BS number.

I hope this has solved your doobrie.
Peter A Elbro, Sandyballs Estate(!), Fordingbridge

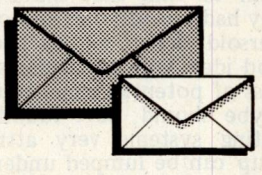
One liner

The conversion of decimal numbers to binary often causes problems, particularly when negative numbers are converted using '2's complement'.

Here is a compact conversion program in Microsoft 2 Basic, which can be added to the collection of 'one-liners', *(PCW* Oct '80, Aug '81).

```
0 INPUTD:D=D/16∧4:
FOR I=0 TO 15:D=2*
(D-INT(D)):PRINT-
(D>=1); :NEXT:RUN
```

Jack Pike, Bedford

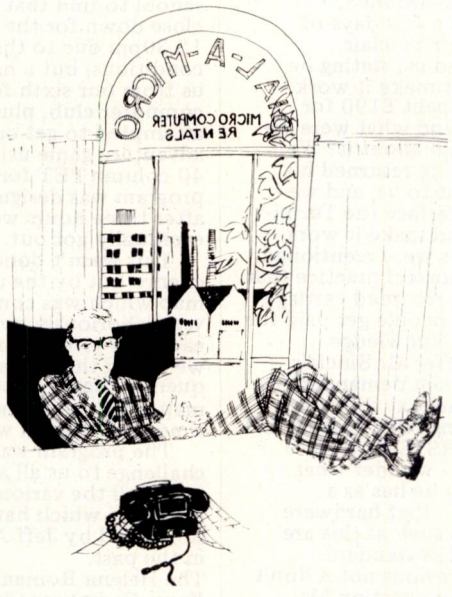


Stop press

The price of the BBC Micro is to go up to £299 for the A model and £399 for the B, from 1 Feb. The 12,000 people already on the waiting list will be supplied at the old price.

Banks Statement

RENT-A-MICRO



Martin Banks examines the potential for microcomputer rental.

Rent asunder — what a lovely, rounded phrase that is. I must admit that I'm not entirely sure what a sunder is, or whether I would want to rent one even if I did know. It sounds, however, as though it somehow ought to be interesting, something worth renting for that smart party you're planning, something to put on the coffee table as a conversation piece. It is certainly a more interesting word than 'micro'. Perhaps that is why renting micros has never really taken off.

At face value it is easy to assume that it could be something as simple as that: the fact that renting a 'micro' has not had the panache for the general public that renting a 'limo' has had. Seems unlikely somehow, but it could be the reason why the rental side of the personal computer industry has played such a minor role in the development of the marketplace.

There are, in fact, one or two very sound reasons why rental has never really become a strong marketing force, and they are mainly related to money. There are, however, indications that this situation is slowly changing and that renting could become viable in the future. If it does, this could have some interesting effects on one of the major growth sectors of the personal computer market for the immediate future: the very large customers.

In theory, renting in the personal computer business should have taken off like a rocket. It would have been, and to some extent should have been, the ideal way for potential users to find out whether the system they were thinking of spending their hard-earned cash on was going to be suitable — or a dog. It must have been hard on some of them to find that the £400 or £500 they had recently laid out on a probably oversold can of worms had not been a good idea. One particular sector of that mass of potential users could, and again maybe should, have found the idea of renting systems very attractive. That group can be lumped under the general heading of 'large customers', the type of user now being targeted by many of the major manufacturers and distributors as a big source of future revenue.

This group of customers can be characterised as a large company with many internal departments or divisions. It could quite possibly be a multinational organisation. It will almost certainly already be extensively computerised, with either mainframe and/or mini-computer installations scattered around. The addition of personal computer systems within that structure is quite logical and a sensible place for the personal computer manufacturers to go looking for business. They are, however, very structured organisations that normally have to impose fairly rigid controls on the way internal operations are carried out. There is therefore a natural desire for some measure of control over the introduction of personal computers into the infrastructure of the organisation. This task, as it involves computer-type objects, often becomes the responsibility of the data-processing manager. The DPM has to decide which type or types of hardware are allowable and what software will be used. Now DPMs as a breed actually seem to have something against personal computers; but that is the subject of another discussion. What would (or might) have helped them come to whatever decision they might arrive at would have been the ready availability of rented systems with which to play.

So why weren't they around? As I have already said, the answer lies primarily with money, or more precisely with the people who control the activities that money gets involved with. It is also related to the actual technology and the systems it has produced. Although it can be extremely profitable, renting equipment of any sort requires two main things. One is a reasonably large amount of money to start with, and the other is a fair degree of patience. The former is needed to purchase the equipment that is to be rented out. A reasonable cross-section of a product range may be needed to cover the potential marketplace, and a reasonable volume of each selected type of product will be needed to ensure that the potential demand can actually be met.

The latter is essential, for it will take some time for this up-front investment to yield a real return. Certainly, accountants can juggle the figures so that revenues can be shown at any time, but it is normally eighteen months to two years before the actual investment is paid back with interest

This is the point where the technology of personal computing comes into play, for historically (if such a word is yet tenable in the personal computer business) the speed with which the technology itself has developed has pushed the rate at which systems have developed. No sooner has a personal computer hit the market, and been accepted there, than the technology allows the production of a bigger read-only memory (for the sake of argument), which in turn allows a more comprehensive monitor to be written and installed, allowing a more comprehensive high level language to be used which cannot be run on the older machine (probably because the new ROM is in a different package that won't fit). Now, a better(?) language means better(?) applications programs that the user will want, so he swaps the system currently on rent for the later version. The renter is then left holding an expensive baby that not many users want to rent — they all want the later machine.

These changes seem to occur with startling regularity, and certainly at a rate that is considered far too risky by most companies normally involved in renting — even those involved in renting computer systems such as mainframes and minicomputers.

A subsidiary problem for the renters has been a shortage of suitable systems to rent. In practice, items such as personal computers are best rented to the business community, and it is only recently that suitable systems have started to appear that fill the gap between

the low end machines such as the PET and Apple and the more powerful but vastly more expensive low end of the minicomputer range.

One of the current favourites amongst the newer systems seems to be the Intertec SuperBrain. This appears to have gained favour as much for its integral design as for its facilities or intrinsic computing power. It is, however, the system that is starting to break through on the renting front, because the renters believe that it both fits the right slot in the renting marketplace and will be around for long enough for them to get the pay-back they feel they deserve.

So, renting is at last showing signs of taking off and perhaps having some degree of significance in the overall personal computer marketplace. Some of the renters are beginning to think in terms of market estimates for the future (in fact, they must have thought about them for ages — now they are starting to talk about them, which shows some measure of confidence). While renting is currently responsible for only about one to two percent of installations in this country, it is now being estimated that by 1985 as many as 25 percent of that year's installations will be rented systems. Given the size of the market by that time (which will be doing badly if it is not topping a 30 percent growth rate by that year) renting should be a healthy business to be in.

It does depend, of course, on what technology still has up its sleeve, for the existing systems are liable to change, and new systems introduced, at a continuingly rapid rate. Not all of the new systems, or the changed ones, will be as good as at first they might appear (as has oft been the case in the past). There are plenty of colds out there, just waiting to be caught. END

WE'VE GOT YOUR NUMBER!

DECODING YOUR SUBSCRIPTION ADDRESS LABEL

SAMPLE ADDRESS LABEL

A. SMITH
100 HIGH ST.
ANYTOWN
BIRMINGHAM

01 G 005 110 PERSO1342

- 01 — Issues per month received
- G — Code of Country
- 005 — Remaining copies in subscription
- 110 — Office use only
- PERSO1342 — Your code number for use in enquiries and renewing

Dear Readers,

When you receive your subscription copy of *PCW* perhaps you have noticed an increasing collection of numbers and letters at the bottom of your ADDRESS LABEL. As you might have guessed there had to be a reason for them.

ALL IS NOW REVEALED.

When you have only one issue left you will automatically receive a renewal form with your penultimate edition. As a further reminder a second form will be enclosed in your last edition, You can keep track of your subscription, by checking the 'remaining copies' section on your address label.

Please notify us as early as possible regarding any change of address. And it helps, when renewing or changing your address, if you enclose a sample of your address label (or even your code number) with your notification. Thank you.

PCW Subscriptions Dept
14 Rathbone Place
London W1P 1DE

For the best PET software...

COMMAND-O.....	For Basic IV CBM/PET, 39 functions with improved "Toolkit" commands	£59.95 + Vat
DISK-O-PRO....	For Basic II PET, adds 25 commands including Basic IV, in one 4K rom	£59.95 + Vat
KRAM.....	For any 32K PET/CBM for retrieving disk data by KEYED Random Access	£86.95 + Vat
SPACEMAKER IV	For any PET/CBM, mounts 1-4 roms in one rom slot, switch selection	£29.95 + Vat
* USER I/O	For software selection of up to 8 roms, in any two Spacemaker Quads	£12.95 + Vat
PRONTO-PET....	Soft/hard reset for 40-column PETs	£9.99 + Vat

SUPERKRAM, REQUEST & KRAM PLUS will be available shortly

We are sole UK Distributors for these products, which are available from your local CBM dealer, or direct from us by mail or telephone order. To order by cheque write to: Calco Software, FREEPOST, Kingston-upon-Thames, Surrey KT2 7BR (no stamp required). For same-day Access/Barclaycard service, telephone 01-546-7256. Official orders accepted from educational, government & local authority establishments

...at the best prices!

WORDPRO IV PLUS	RRP £395	less £98.75	= £296.25!
WORDPRO III PLUS	RRP £275	less £68.75	= £206.25!
WORDPRO II PLUS	RRP £125	less £31.25	= £93.75!
VISICALC	RRP £125	less £25.00	= £100.00!
TOOLKIT Basic IV	RRP £34	less £9.50	= £24.50!
TOOLKIT Basic II	RRP £29	less £7.25	= £21.75!

The items above are available by mail or telephone order at our Special Offer Price when purchased with any one of our software products. This offer is for a LIMITED PERIOD only. UK - ADD 15% VAT. OVERSEAS airmail postage - add £3.00 (Europe), £5.00 (outside Europe).

Calco Software

Lakeside House - Kingston Hill - Surrey - KT2 7QT Tel 01-546-7256

The Prince— a micro computer that offers you everything

Everything?
Well, check it out for yourself and see if there's anything missing.
But be warned, the Prince is not a plaything although the price might suggest it. Its a real business machine with full computer facilities.

Keeping up with technology.
Digico Computers have enabled their users to keep pace with technology since 1966.

Provides for growth
By linking you to powerful mini systems and permit you to develop a real big system capability.

Maintenance for seven years.
Offering a **seven year** maintenance guarantee* the Digico Prince provides the 'coming of age' seal to the micro industry.

Backed in Britain.
Digico Computers have been in the business of computer hardware design, manufacture and maintenance for over fifteen years. With factories in Leeds and Stevenage, the Prince is fully supported in the United Kingdom.

Rentals for low cost items.
Including maintenance, rentals start from way under £20 per week.

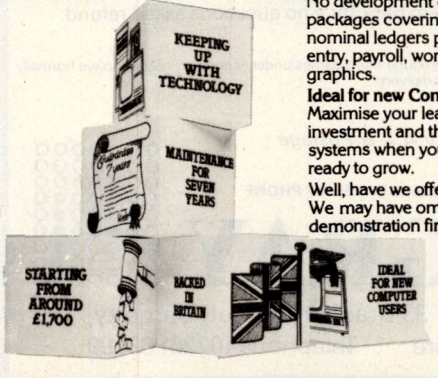
Minimum Interruption Plan (MIP)
If your Prince goes down, we'll exchange it for a replacement to keep you running — **all** in the rental price!

Starting from around £1,700
Start with the computer, visual display, diskette storage, add CP/M operating system plus languages and build up from there.

Ready made accounting
No development cost — just buy proven packages covering sales, purchase and nominal ledgers plus stock control, order entry, payroll, word processing and full graphics.

Ideal for new Computer users
Maximise your learning on a minimum investment and then link up to larger systems when you're fully familiar and ready to grow.

Well, have we offered you everything? We may have omitted to mention a demonstration first.



DIGICO Computers MICRO DIVISION
Arena House
46 Broadway
Letchworth
Herts SG6 3BX
Tel: (04626) 78172

*Providing there is a maintenance contract continuously from new.

TRS-80, APPLE, Software

Fantasy at your fingertips

Are you fed up with games where you just shoot a few invaders or depend on your reactions, then try a whole new world of computer fantasy, a world in which Sorcery and Monsters hold sway, try:

SORCERER OF SIVA

A real-time GRAPHIC adventure

Sorcerer of Siva is a game where you enter a different world where Amulets, rings, necklaces, scepters — and — oh, yes, a pair of old boots await you — in the magical mines of Siva.

Enter the dark stillness of the mine, armed with just a dagger and relying on your magical abilities. But beware of the wandering soulless creatures that dwell in the magical mine, guarding every treasure and trap door.

Use your magical powers to slay the bloodthirsty banshee, put an end to the deadly demon, or the goblin waiting to waylay, you.

Walk through walls and sealed entrances, cast a spell to heal your wounds, regain your strength, or hurl bolts of lightening.

A wizard you are, yes, but watch out for the evil Sorcerer who is waiting to cast his favourite spell — forgetfulness — to deprive you of your most valuable magic.

But all is not lost — you may regain a spell or two, or perhaps even one new to you — if you can discover the wondrous touchstones, stone saturated with powers to restore your magical abilities. Be warned too, that not all treasures you might find are true. In experience lies wisdom.

£15.95 TRS-80 & V.G. (level II, 16k) cassette

£17.95 TRS-80 (32k TRSDOS), Apple (48k with Applesoft in ROM)

The Upper Reaches of Apshai . . .

. . . is the first in a series of expansion modules for "The Temple". Horrible monsters lurk in the Innkeepers backyard. Discover the secrets of Benedic's Monastery and the cottage of Merlis the Mage. Who knows what secrets the cellar of Olias holds.

Over 150 new rooms for you to explore.

The Keys of Acheron

For those of you who have succeeded in rescuing Brynhild as the Hellfire Warrior, now have an even **more** difficult task; Four magical jewels, the keys, each in a different dimension, must be recovered from Kronus the Demon.

Both The Upper Reaches of Apshai and The Keys of Acheron are expansion modules for the Temple and Hellfire, you **must** have these games to play them.

£11.95 TRS-80 & V.G. (level II, 16k) cassette

Temple of Apshai £16.95
Hellfire Warrior £16.95

SPECIAL OFFER: If you don't have Temple or Hellfire, then purchase both Temple and The Upper Reaches of Apshai **or** Hellfire Warrior and the Keys of Acheron for just £24.95 Cass. £26.95 disk.

Don't forget our 10 day money back guarantee: If you don't them just send them back for a no questions asked refund.

Also please note: We produce these games under licence, in-house, so we normally operate a return of post delivery.

All prices include V.A.T. & Postage

ACCESS ORDERS TAKEN BY PHONE

ALGRAY

Algray House, 33 Bradbury Street, Barnsley,
South Yorkshire Telephone (0226) 83199

Micromail

MAIL ORDER ITEMS

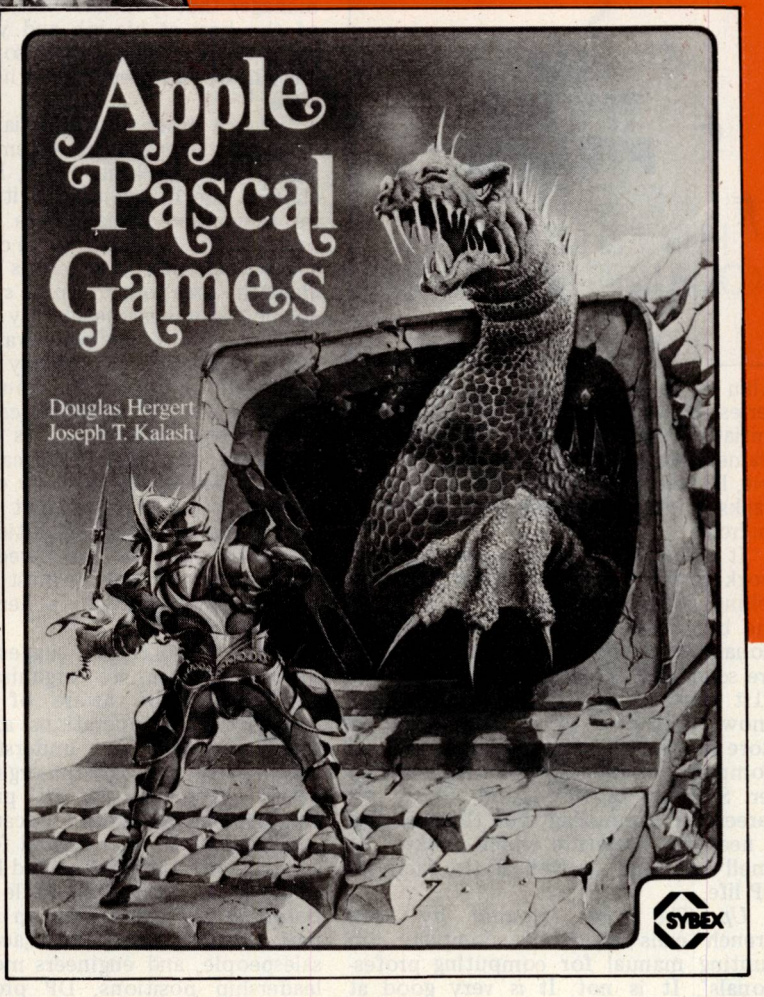
	Net	Including VAT & carriage
Apple 48k	650.00	760.00
Apple Disk + Controller	340.00	400.00
Apple Disk without Controller	265.00	315.00
Micro-Sci A40 Disk + Controller	295.00	350.00
Micro-Sci A40 Disk without Controller	235.00	280.00
Micro-Sci A70 Disk with Controller	415.00	485.00
Micro-Sci A70 Disk without Controller	355.00	418.00
NEC 12" Green Screen Monitor	160.00	194.00
Visicalc 3.3	99.00	116.00
Visiterm	75.00	89.00
Visiplot	80.00	94.00
Visidex	99.00	116.00
Visitrend/Visiplot	125.00	146.00
Visifile	125.00	146.00
Micromodeller	360.00	420.00
DOS 3.3 Toolkit	35.00	42.00
Desktop Plan	99.00	116.00
Bit 3 Full View 80 Column Card	175.00	210.00
Executive Secretary (Apple Word Processor)	160.00	186.00
Apple Writer (Apple Word Processor)	35.00	42.00
CCS Asynchronous Serial Interface	85.00	100.00
16k RAM Card	75.00	88.00
Tasc Compiler	100.00	118.00
Wordstar	160.00	186.00
Mailmerge	60.00	71.00
Supersort	95.00	110.00
CPS-Multifunction Card	125.00	146.00
40 Track DD Verbatim 5¼" Disks	17.00	21.00
77 Track DD Verbatim 5¼" Disks	30.00	36.00
Illustrating Basic	3.00	3.50
Some Common Basic Programs	10.95	11.50
Basic Computer Games	5.90	6.50
More Basic Computer Games	5.90	6.50
6800 Assembly Language Programming	11.95	12.50
Z80 Assembly Language Programming	11.95	12.50
6502 Applications	10.20	11.00
Programming the 6502	10.20	11.00

Micromail Micromail Micromail Micromail Mic

*Cash with Order
MICROMAIL, PO Box 34 (Dept PCW),
Leighton Buzzard LU7 8SJ
Telephone: (0525) 376600.
Barclaycard/Access accepted
Petchberry Ltd. Trading as Micromail

FRESH OFF THE PRESS FROM SYBEX!





DON'T
(Or how to care for your Computer)
By Rodney Zaks
200 Pages 100 Illustrations Only £9.65

Apple Pascal Games
By Douglas Hergert
& Joseph T. Kalach
350 Pages 40 Illustrations Only £11.45

DON'T (Or how to care for your Computer)
This is the first book exclusively dedicated to the care, preservation and correct operation of a small computer system: The computer itself, the CRT terminal, the printer, the magnetic disks and tapes – even the Computer room.
In everyday langauge, this invaluable book gives all the do's and don't's of successful operation for each piece of computer hardware and software. An indispensable book for users or owners of a computer system.

Apple Pascal Games
A collection of some of the most popular Computer Games, all written in UCSD Pascal. Includes Cribbage, Horserace, Keno, Overunder, Baccarat, Kismet, Black Box, Chuckaluck and many others. Each game includes a complete listing of the programme, a description of the rules, a sample run and an Illuminating Guide to understanding the structure of the programme itself.

Dept. PCW **The Computer Bookshop**

30 Lincoln Road, Olton, Birmingham B27 6PA
Tel: 021-707 7544

Get these invaluable books from your local Bookshop or Micro Store – Now.

In case of difficulty, send S.A.E. and we'll let you have the name of your nearest stockist.

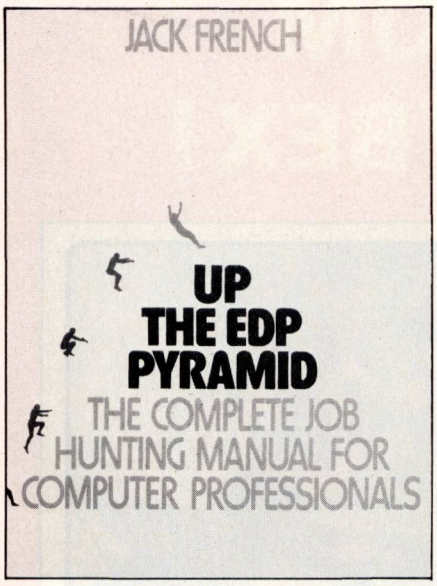
The Computer Bookshop is the exclusive distributor for all Sybex books in the UK.



BOOKFARE

Malcolm Peltu looks at the latest micro literature

DP snakes and ladders



Alan Woods's Frames of Reference series is an important bridge-building initiative (see page 123 for the latest frame). With expertise, intelligence and wit, he tells professional data processing hacks about the brave new world of micros.

It would be useful if someone started work at the other end of the bridge — telling personal computer hacks about the brave middle-aged word of professional DP. After all, computing experts are scheduled to inherit the earth in the 21st century, and micro freaks should know what kind of career may be in store for them. Bodies like the National Computing Centre and British Computer Society provide good advice on careers in computing; but there is also a need for literature which evokes the smell and tang, as well as the facts, of DP life.

Up The EDP Pyramid by Jack French calls itself 'the complete job hunting manual for computing professionals'. It is not. It *is* very good at capturing the style of a particular way of DP life. Unfortunately (or fortunately, depending on your outlook on life), its setting is in the macho jungle of American business, where the motto seems to be 'hunt and kill — or be killed'. (Note: EDP is an abbreviation for Electronic Data Processing.) French offers some universal truths about commercial DP. But the harsh American accent means that the book is more interesting as a sociological comment on what motivates Americans than a practical guide to working in a British (or any other non-American) 'DP shop'.

This is a pity because French scatters nuggets of useful advice along the way in his ruthless route-march to the top of the corporate heap. Although the managerial in-fighting may be more openly vicious in the States, many of these helpful tips relate to organisation politics rather than the technical aspects of computing.

It is appropriate that one of French's key warnings is taken from that arch schemer, Machiavelli. French's whole approach to career planning is machiavellian. For example, he recommends that 'one effective way to search for a position is to develop friends who are a couple of levels higher than you'. When you go for a job interview, he boldly says, you should tell the DP manager that 'you have heard he is one of the best at his job and you simply want to *meet* him to get some advice. He will be flattered, unless he is a computer.'

French brings in Machiavelli explicitly in a section on systems development. Way back in 1513, Machiavelli showed the foresight to write: 'It must be remembered that there is nothing more difficult to plan, more doubtful of success nor more dangerous to manage than the creation of a new system. For the initiator has the enmity of all who would profit by the preservation of the old institution and merely lukewarm defenders in those who would gain by the new one.' In a typical career game-plan, French translates this to modern times by advising: 'You can advance your career significantly by engaging in new systems development [provided you remember that] evolution in small pieces is the key to career success. Sometimes even the smallest of systems results can make you a hero in your own time.'

French also rightly suggests that, to develop within an organisation, DP staff should be aware of corporate objectives and operations and should gain experience and understanding of the industry in which the organisation is active. Otherwise the DP professional can become boxed-in. 'Because of the specialised training required for DP persons, some companies regard DP staff as mere technicians with little talent or potential for promotion up into other parts of the business. While accountants, salespeople, and engineers move to the leadership positions, DP professionals are often relegated to supporting roles,' he says.

In French's world, there seems to be no place for the person who would like to spend a whole career in DP. 'In DP there can be no retirement. You either progress up or not,' he quips. Then, after telling you how to clamber up the DP ladder, he depressingly states, 'If you thought your career planning ended when you got to the top of the DP pyramid, you were wrong. It has just begun, and it is now much more difficult because the way has narrowed and the competition has increased.'

In addition to the ladder, French also sees snakes everywhere, ready to hurl you down into the pits. Apparently, 'terminations' are a common experience to American executives. In Britain it would be known as 'getting the boot'.

In such a jungle, it is no wonder that French advises the aspirant DP person to prepare a career thoroughly. This ranges from making sure the company you are joining is finanacially secure to such personal comments as: 'If you are married you are okay. If you are single and past thirty, you are odd or a swinger.' Not to mention: 'If you are ugly, you had better be good. If you are handsome, you are in until you are forty.'

In his single-minded pursuit of power, French throws a sharp light on the underbelly of the American Dream. 'If you have a name indicating and ethnic background, change it.' And if you are a female, 'You can always find functional jobs, but your chances of becoming a manager of men are not equal. You are acceptable as a supervisor of women.'

His ultimate in sick-making honesty is to say, 'Be sure your image closely parallels that of your boss. . . bosses tend to hire and keep people like themselves.' By almost parodying the naked, clawing nature of American business, French does hold up a magnifying mirror to many of our own warts, attitudes and business practices. Much of what he says could therefore be translated into subdued European terms.

To get by in computing in Britain, however, less attention is paid to appearances — at least in more technically oriented jobs. Most British programmers who have gone to work in the States have commented that the typical US DP professional is less hairy, more conventionally dressed, more concerned about formal timekeeping but less productive than his British counterpart.

French's biggest mistake, however, is that his obsession with defining and sticking to a clear career path has blinded him to the most significant developments to have hit DP recently — micros and office automation. His description of the typical DP environment is a snapshot of a passing phase, just before it disappears into the history books. The availability of personal computers, intelligent terminals, Visicalc, non-specialist programming languages, word processors, electronic mail, etc, is transforming the role of DP.

The real managerial battlefront is becoming the post of Information Manager who co-ordinates DP, personal computing, office automation, telecommunications, etc. Yet this gets barely a mention. (Immodestly, I would refer you to my own book, *Using Computers — A Managers' Guide* (National Computing Centre, £7.50) in which I explore the evolving nature of information management.)

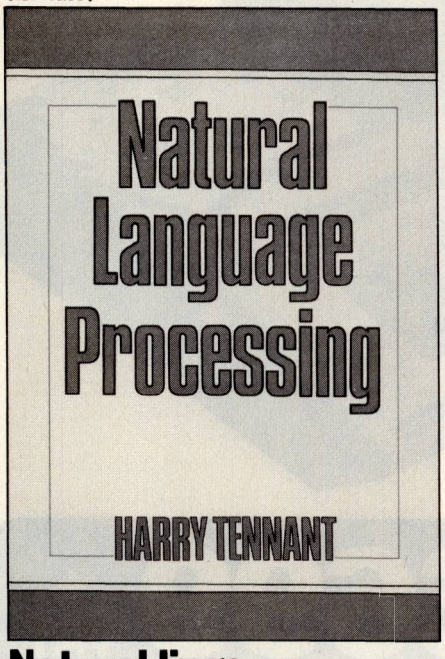
The kind of DP shop described by French will remain in existence for many years to come because there is a heavy investment in systems and in the skills and attitudes of managers like him.

If you have come to computing through the excitement of micros, you could have a head start on older DP people because you are *au fait* with new developments. To succeed, however, you must also be aware of what you *don't* know. Provided you do the neces-



sary transatlantic translation, the excesses of French's approach to career planning and executive snakes and ladders make a vivid, if incomplete, first rung.

You should also keep on reading Frames of Reference. You will find out a lot about the attitudes and knowledge of DP people, because Woody is one of the rare breed of people who have crossed the bridge from traditional DP to personal computing and has lived to tell the tale.



Natural lingo

Natural Language Processing by Harry Tennant is a beaut of a book. It treats a serious and important subject with intelligence, clarity and honesty. Whether you want to program your own natural language systems or just wish to gain an insight into the current state of understanding on the subject, this book is an excellent starting point.

Natural languages are the languages which humans use — English, French, Swahili. The subtleties and complexities of natural languages may be within the group of children but are still generally beyond the capability of computer systems. The issue addressed by Tennant is not so much concerned with natural languages for programming but with the development of natural languages' interactions, dialogues, enquiries to databases, etc.

As low cost silicon power has spread through computing, the need for providing more flexible and easy to use interfaces has become one of the prime objectives for systems designers. Tennant lucidly explains the underlying principles of natural language research; these are primarily concerned with linguistic analysis of the syntax, semantics (understanding), and structure of languages. He fleshes out the theoretical skeleton by quoting a large number of research case studies to illustrate the underlying principles and to show how far these have been translated into working systems.

The most refreshing aspect of Tennant's approach is the way he highlights his scepticism about over-optimistic research findings. And he uses his own research as an example of the holes that could be picked in what seems to be a perfect development approach.

Tennant developed an Automatic Adviser which can be used to provide answers and 'advice' on a database holding information on engineering courses. Although the Adviser can handle a wide variety of queries and dialogues using ordinary language, Tennant shows that it also failed to handle many sentences and questions which could crop up.

Tennant says that he is able to point out the shortcomings of the Automatic Adviser because he wrote it and used it. But, he adds, 'unfortunately the same kind of criticism is not possible for the other natural language programs [I describe] in the book. They all have their shortcomings. . . but it has not been common practice for the designers to discuss the limitations. . . Readers should be aware that the kinds of criticisms made about the Automatic Adviser could be made about all current natural language processors; they must therefore beware when reading about other systems. The faults are there — they just have not been identified by the program designers.'

This comment is applicable to many write-ups of research work in other fields. Tennant's honesty is to be commended.

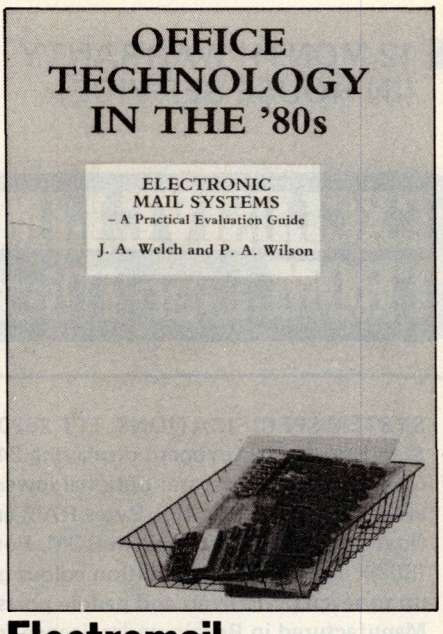
The case studies provided by Tennant cover each major aspect discussed by him, starting with an interesting historical perspective on early natural language programs. He makes the important point that the average hobbyists today have more computing power under their control at home than most researchers into natural language processing in the largest universities had twenty years ago. That is one reason why the pace of work in natural language processing has gained momentum in the last five years or so.

Another is that researchers have, to some extent, become less ambitious. Early research tried to find general solutions — 'natural language compilers' that could operate in many environments. There were also attempts at creating automatic language translators. These general solutions quickly gave way to the current mainstream of enquiry, which is to aim initially at solving a problem within a specific environment or 'domain'. This could be, for example, a doctor/patient dialogue, answering travel enquiries or access to a database. Tennant describes the most significant landmark research projects, such as Weizenbaum's Doctor, Winograd's SHRDLU, and LUNA (the system used to analyse the Apollo moon landings' geological booty).

He describes these and many other interesting case studies in sufficient depth to give an understanding of how a system works and how it illustrates a general principle of syntax, semantics, knowledge and representation of dialogue structure. Yet he does not get bogged down in too much detail. He does not provide the program code used to implement any routines but if you are interested in the subject his case studies provide sufficient systems description for you to translate into your own requirement. Tennant sticks to the central issues of natural language processing but he does provide pointers to other interesting related areas, such as artificial intelligence, linguistics and psychology. Each chapter has a good bibliography of further reading.

My only real criticism is that the American origins of the book get in the way. This is particularly annoying in a book on linguistics. For example, where he is describing linguistic ambiguities he uses the word 'heater' as an example. Now, I did not know that heater was American slang for a gun. So I did not understand what he was talking about.

This American blemish, however, doesn't really get in the way of the book's main appeal. If you ever wanted to find out about the practical aspects of natural language processing, this is the one to kick off with.



Electromail

The National Computing Centre is publishing a useful little series of briefings called *Office Technology In The '80s*. The first is on one of the most trendy office automation topics, electronic mail systems.

The NCC approach, however, is far from trendy. The neat little book (about 120 pages) by J A Welch and P A Wilson looks and reads something like a reference manual. In fact, it is essentially a specification of the capabilities of electronic mail systems, as can be gathered from its subtitle — a practical evaluation guide.

There are two main sections. The first examines in detail the criteria that should be considered in selecting a system. These include a range of functions to be expected, such as the ability to prepare, send, receive and file messages with adequate security.

It is good to see that the authors give equal priority to two other evaluation criteria — ease of use and the stability

ITT 2020

48 K Disk Based Computer System

WITH COLOUR GRAPHICS & T.V. MODULATOR FOR T.V. DISPLAY

- DISK DRIVE WITH CONTROLLER INTERFACE
- 48K + 12K FLOATING POINT BASIC
- APPLEWRITER WORD PROCESSING SOFTWARE PROGRAMME
- ALL NECESSARY LEADS AND MANUALS PROVIDED
- 12 MONTH WARRANTY (IN HOUSE SERVICE)



EXCLUSIVE LIMITED OFFER FROM Lion Micro Computers £699 + VAT

SYSTEM SPECIFICATIONS: ITT 2020 Microcomputer: Standard ASCII Keyboard displaying 24 lines x 40 Characters in upper case: optional lower case display available. 6502 CPU, 48K Bytes RAM and 12K fast floating point Palsoft Basic in ROM. Both high resolution (360 x 192) and low resolution colour graphics, ports for up to seven peripherals and paddle ports as standard. Manufactured in Britain under licence from Apple – largely compatible with Apple hardware and software (contact Lion for advice – this is NOT an Apple). ITT Disk Drive. 116K Capacity, random or sequential file access, 35 Track soft sectored disks – Apple DOS 3.2 (contact Lion for advice on other operating systems). Field Maintenance contracts for all equipment are available.

EXPANDABLE & VERSATILE	PRICES EX. VAT.
Second Disk Drive	£200.00
Lower-case screen (fitted)	£50.00
Visicalc 3.2	£75.00
Silentype printer	£207.00
Centronics 737	£425.00
Olympia RO Scripta	£836.00
12" Green Monitor	£119.00
Printer interface	£90.00
Database	£75.00
Vinyl Carrycase	£17.00
Cleaning Kit	£30.00
10 x Disks in case	£25.30
2000 sheets paper	£15.00
OTHER ACCESSORIES	POA
OTHER PERIPHERALS	POA
CP/M For 2020	£250.00

OVER £1200 VALUE FOR £699 + VAT



Lion Micro Computers

Lion House,
227 Tottenham Court Road, London W1P 0HX
Telephone: 01-580 7383 & 01-636 9613
Telex: 28394 Lion G

CRA COMPUTER RETAILERS ASSOCIATION

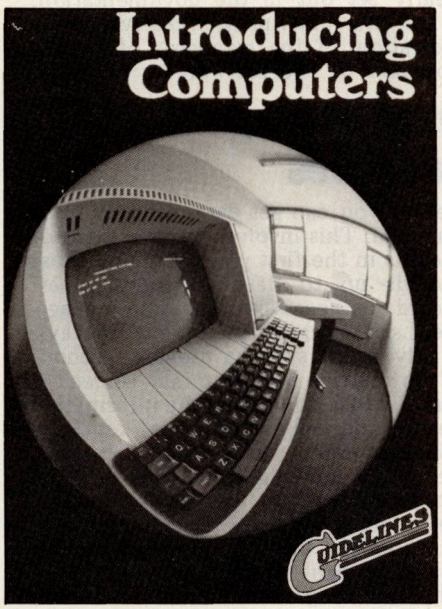
VISA AMERICAN EXPRESS



and performance of the vendor. These are often forgotten in the rush to enunciate all the technical bells and silicon whistles.

The second section discusses how the evaluation procedure should be carried out. At present, electronic mail may be of particular interest only to larger organisations. But office automation is such an important and integral part of computing that nobody can afford to ignore these developments.

The NCC series looks like filling the gap between skimpy intros and detailed technical material. The books could be very useful as part of general course on computing and information technology as well as being of practical benefit to people actually selecting systems.



Looking good

The look and feel of an introductory book can be as important as the content. If you are new to a subject, the last thing you want is to be presented with a daunting and unappealing tome.

As far as looks go, *Introducing Computers* by Ron Condon is one of the prettiest I have seen and is cheap to boot. Its approach is similar to Chris Evans's *Making of the Micro* (Bookfare, April 1981). It mixes a description of the history and technology of computing with pictures, graphics, drawings, etc.

The accompanying text by journalist Condon is a professional round-up of the varied views about the impact of microelectronics and computing. Some of the main chapter headings give a flavour of the structure and approach of the book: Computers Mean Change; History of Computers; Structure of Computers; Working with Computers; Communications; Computer Intelligence; The Future; Social Implications.

For a book of this nature, Condon gets a bit bogged down in describing the innards of a computer, binary arithmetic, etc. The main thrust of the book is also too biased towards traditional mainframe and mini computing, with micros making their main appearance at the end in chapters on choosing a system and programming in Basic.

With less than 100 pages including many illustrations, do not expect *Introducing Computers* to go into great depth. At only £2.50, however, it is good value for money particularly for the less technically oriented beginner.

In addition to Condon, credit should be given to designer David Worth and picture researcher Caroline Mitchell for putting together this attractive little package.

On target

One of the problems with many introductory books on micros is that they attempt to cover everything from bits to satellites, personal computers to international networks. *Introducing Microprocessors* by Ian R Sinclair avoids this danger by sticking to a narrow hardware scope.

His ambition may be limited in terms of the range of technology covered, but he pursues his chosen objective with a straightforward and reasonable text which makes the book much more useful than those which try inadequately to cover the whole computer waterfront.

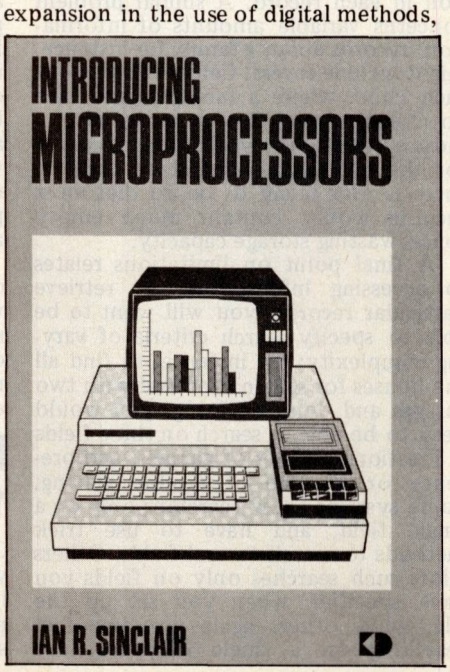
There are seven chapters, each less than 30 pages long, indicating that he goes beneath the surface but does not dig too deeply into each topic. The chapter headings are: Digital circuits and actions; The Microprocessor; Other chips (mainly about memories); The microprocessor registers; Load and store instructions ; More program operations; The next steps (mainly about software, compilers, etc.).

From this it can be seen that Sinclair sticks primarily to the hard end of the micro spectrum. The programming examples are mainly for Z80 and 6502 assembler. Although he introduces programming principles, he does not attempt to provide an intro to high level language programming.

Sinclair achieves what should be every author's main intention — to live up to his own Preface: 'Because of the sudden expansion in the use of digital methods, many people are finding the need to try to understand the action of the microprocessor without having progressed along the traditional path of electronics, and with no time to follow such a path.

'This book is intended specifically for such readers; no previous knowledge of electronics is assumed, but since microprocessors are invariably a part of other electrical circuits and exercise control by electrical means, some background knowledge of elementary circuits must be assumed.'

If that description fits your bill, this is the book for you.



The right way

According to C Roger Smolin, there are two ways of avoiding a cock-up when buying a business computer — education and planning. 'By educating yourself, you gain the vocabulary you need to allow fruitful interactions with those in the industry who stand ready to help you. Planning ahead will allow an orderly transition from the manual mode to the more efficient, productive, and profitable automated business in the future,' he writes in his *How To Buy The Right Business Computer Systems*.

Smolin concentrates mainly on the education side, trying to familiarise the reader with the basic jargon of commercial computing. Despite the title of the book, however, he does not go into great detail into the evaluation and selection procedures to be undertaken, when buying a system. He covers all the computing capabilities you would expect — hardware, systems software and (in two chapters which take up almost half the book) applications software.

The best aspect of the book is not so much the technical material covered but Smolin's practical cynical comments which get through to the truth rather than the theory of computing.

He has a useful little section on human engineering of software. This should have been expanded and extended to include hardware ergonomics.

Unlike other similar books, Smolin steers clear of specific system specifications and prices, except for some 'ballpark' figures. By sticking to general principles and practice, he has written a book which will last a long time and which is as valid outside America as it is in the States.

Up The EDP Pyramid by Jack French (John Wiley & Sons, £14.75).
Natural Language Processing by Harry Tennant (Petrocelli/Van Nostrand Reinhold, £14.90).
Office Technology in the '80s — Electronic Mail Systems by JA Welch and PA Wilson (National Computing Centre, £4.00).
Introducing Computers by Ron Condon (Macdonald Educational Guidelines, £2.50 paperback, £3.95 hardback).
How To Buy The Right Small Business Computer System by C Roger Smolin (John Wiley & Sons, £6.60).
Introducing Microprocessors by Ian R Sinclair (Keith Dickson Publishing, 17 Hendon Lane, London N3, £4.50). END

CHOOSING A DATABASE

Following January's introduction to databases, Kathy Lang describes the criteria for testing DB packages

All programs which process data on a computer could be called data management systems, since they all process or manage data. Here, though, we shall be talking about those packages whose *main* concern is with managing information — checking it on input, storing it, retrieving it for display at the terminal and using it to create printed reports. There are dozens of packages on the market which aim to allow the end user (rather than the computer buff) to tailor a system to meet particular needs for a set of personnel records, stock recording system, register of houses for sale, etc. This article will set out some criteria to use when deciding if a particular data management system will meet the user's needs in a small business or the like — where the volumes of data are likely to be rather larger than in a typical home application.

In January's *PCW* Lyn Antill described the various methods used to implement databases. This month we'll look at the limitations imposed on the user: the facilities provided for storage, retrieval, security, tailoring to meet particular needs; the ease of use and friendliness of the system; stability and reliability of the system and its supplier; and the costs — obvious and hidden — in implementing the system.

System limitations

Most packages put limits on the numbers and sizes of files which may form part of the information management system, either globally or in simultaneous use. These limitations may not make it impossible for you to do particular things but they may affect your approach. For instance, if you want to keep all your stock items on a single file you may find that the total amount of information will exceed the size of file allowed, and you will be obliged to split your records into two or more files.

The extent to which you can link files together is also important. For instance, in our stock/supplier example, one solution would be to allow both files to be read at the same time, with information from the two being merged. Another would be to select from the stock file all the required items, keeping a separate list in the computer's memory of the supplier code for each selected record and then using that list to select the supplier records from the supplier file. If you can neither read two data files in harness nor link them indirectly, you could still achieve your purpose by keeping the supplier's name and address on each product record. But this would give you an extra 150 characters or so in every product record, increasing search times and perhaps bringing you up against the limit on total file size. You would also need to keep this name and address information on your purchase ledger, and change it in both places if the supplier moved premises: more wasted storage space, and — even more important — greater danger of error in updating, or of forgetting to make the change everywhere the data item occurred.

Most systems also have limits on the size of a record, and of a field within a record. Only by having a fairly clear idea of what you want to do can you decide before you buy whether these constraints will affect you in practice. A hidden problem in this area concerns record structure. If the system requires all records in a file to have the same structure, then records may sometimes become unnecessarily long. For instance, a file consisting of records about cars might include some data on their gearboxes which differed in structure for cars with manual and automatic gearboxes. Since no single car will have both, a sensible system would allow the alternative information to occupy the same position and space in the record — but in many systems you would have to have space for both kinds of information in each record. A similar problem concerns variable amounts of information: records about a family for instance, might include several fields of data about each child, where a family might have no children, one, two or more, etc. In most systems, you would need to allow for the maximum number of children there is ever likely to be, so that most records would contain much empty space, wasting storage capacity.

A final point on limitations relates to accessing information. To retrieve particular records, you will want to be able to specify search criteria of varying complexity; for instance, to find all the houses for sale in Bradford with two garages and double glazing, you would need to be able to search on three fields — location, number of garages, and presence or absence of double glazing. Some systems allow searching only on a single field, and have to use trick methods to search several fields. Others allow such searches only on fields you have specified when you set up the file, while others again give you fast searching on a single field and use slower methods to search on subsequent criteria.

It is often hard to discover exactly a system's limitations. They should be clearly set out in the documentation; if not, you may find such reserve a good indication of the standards of professionalism of the software as a whole.

Data storage facilities

Before you can get data out, you must put it in. This involves creating a file of records in the first place, keeping those records up to date and adding new records as necessary. The data management system can help in two main ways. Firstly, good systems provide methods of formatting the terminal screen to make it easy to provide the information needed and make good use of keyboard facilities such as cursor controls. Secondly, good data checking facilities (ie, to prevent the user entering alphabetic characters in a field meant only for numbers) help a good deal in getting the data right. This applies not only when creating records but also when updating them — by requiring confirmation it ensures that the record to be changed is the one the user intended, for example.

All this assumes that the data is being entered from the keyboard. Sometimes the data may be in the computer already and perhaps just needs incorporating in another file, or reformatting; it can be very helpful if the data management system can read files of data created outside the system itself by other programs, such as your accounting suite. (You may also want to write to files which such software can read, thus integrating your information processing activities to prevent waste and duplication.)

Pitfalls to watch out for when updating include restrictions on file size, which may affect how many new records you can add, and constraints on changes to record structures, which may prevent you adding new fields to existing records.

Data retrieval facilities

Occasionally you will want to get all your data back in just the order you put it in but usually you will want to select parts of it. This may mean selecting some fields from every record, or every



Catherine Denwir

field from some records, or some fields from selected records. To select some records from the file, the system must either read every record to decide whether it is needed or not, or else be told in advance how to make such decisions to provide a more efficient method of selection. Because it takes a comparatively long time to read each record in turn, most systems use a form of indexing.

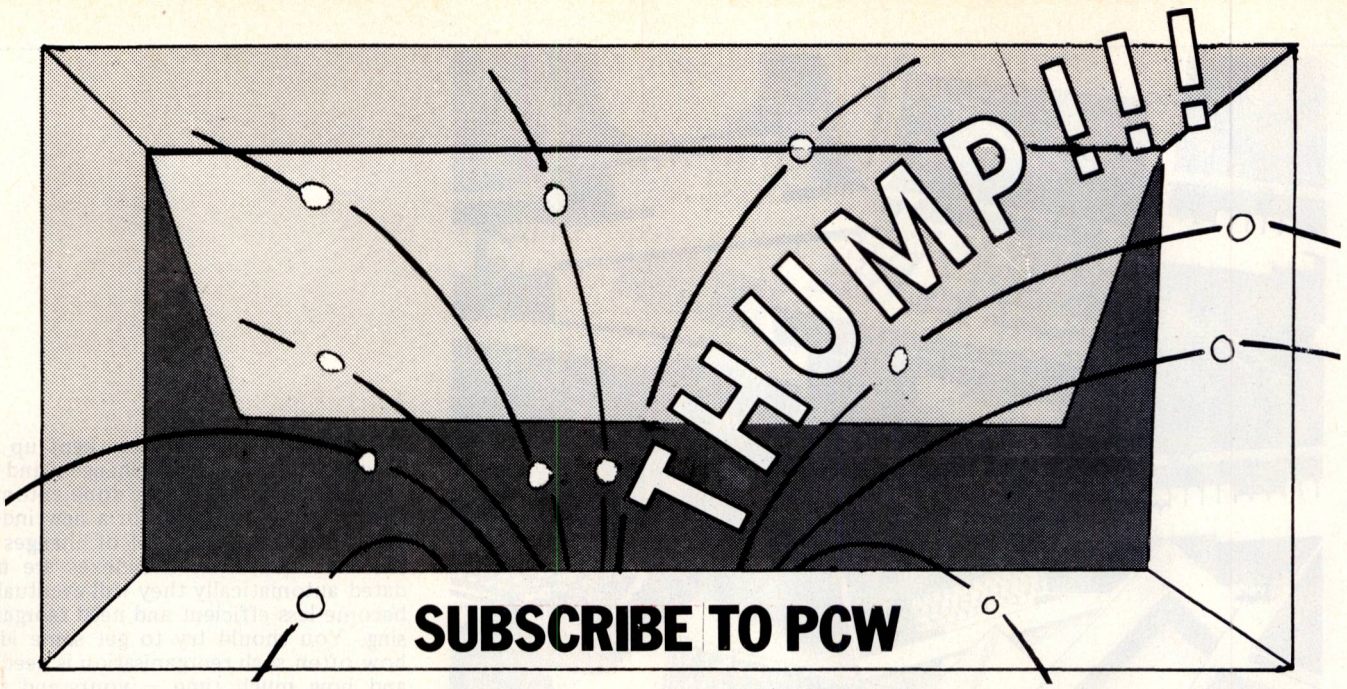
Some systems allow only one field to be used as the key for indexing, while others permit several, which may have to be specified when you set up the file — more flexible systems allow you to specify fields later. Frequently a key field has to contain unique information, so one may index on, say, the names in a telephone directory only if each person's name appears only once, and must use a modified form of the name to make each name entry unique if there are duplicates. Of course indexes are only useful if they are kept up to date when the data file changes, and in some systems this is not done automatically — you must ask for a new index to be made after each set of changes to the data file. Even if indexes are updated automatically they will eventually become less efficient and need reorganising. You should try to get some idea how often such reorganisation is needed and how much time — yours and the computer's — will be needed. Another difficulty to watch out for here is any restrictions on space allowed for indexing, which will of course need to increase as the data file grows and with any growth in the number of fields to be used as keys.

Some data fields will have values which cause the record to be selected on the basis of the presence or the absence of the value — for instance, a telephone directory entry either relates to a particular person or it doesn't. But there are several other kinds of selection you may wish to make. A common requirement is to extract all records relating to a particular time span — all orders issued in the last VAT quarter, say. Or you may perhaps wish to find out which of your customers owe you more than £1000. Frequently it is necessary to combine several selection criteria, as in our house example. Data management systems vary considerably in their flexibility and power in this respect.

Having specified the records you want, the package may give you a choice about how they are displayed. Some systems allow you to show the records with equal ease on the screen and as a printed report, while others have only limited facilities for screen selection and display and require you to create a file of specifications to 'batch up' the more complex criteria. Either way, you should have some choice about the way printed reports are shown, with user-supplied headings and format specifications. The best systems supply simple layouts which you can use unmodified to start with, and then adapt to your own needs. Whether on screen or printer, the system should allow you to manipulate the results — perhaps totalling all the entries in a particular column, or using one entry to modify another — and should let you specify that the records should be sorted in a particular order before they are displayed.

Security

As far as *human* error is concerned, security is involved both with the right people doing the wrong thing by mistake, and with anyone doing the wrong thing deliberately. Errors may involve



SUBSCRIBE TO PCW

"Personal Computer World is the most consistent, intelligent, informative and irreverent publication on the subject available. It's a pleasure to hear it thump through my letterbox every month."

An authentic, unsolicited reader comment. Perhap's that's why PCW is easily Britain's largest selling microcomputing magazine. And why our subscriptions have risen to more than 8,000 copies per issue, doubling in the last year alone.

Why not ensure your copy of Personal Computer World every month. Use the coupon below or the subscription card you'll find elsewhere in the magazine.

And listen out for the 'thump'!

SUBSCRIPTION ORDER FORM

I would like to subscribe to Personal Computer World for one year (12 issues).
Please start my subscription from the _____ issue.
☐ This is a new subscription ☐ This is a renewal
☐ UK: £10.00 ☐ Rest of the world: £17.00.
☐ I enclose my cheque, made payable to Personal Computer World, for £_____
☐ Please invoice my company (UK only).
☐ Please debit by American Express/Access/Barclaycard (delete where not applicable)

Account Number _____

Signed. _____

Name

Address

Please use block capitals.

For Office use only ☐ a ☐☐ b ☐☐ c ☐ d ☐☐☐☐ e

Please send this order form, with your remittance, to Personal Computer World, Subscriptions Dept, Freepost 7, London W1E 4EZ. No stamp is required.

MICRO GEN

24 Agar Crescent,
Bracknell,
Berkshire.

Telephone (0344) 27317

JOYSTICKS FOR THE ZX81 AS SEEN AT THE ZX MICROFAIR

Dear Reader,

Micro Gen proudly announce the most exciting development ever for the ZX81. This add on effectively turns your ZX81 into a true programmable games machine. Benefits are a responsive interface between the ZX81 and the user play space invaders, break out etc like you have never played before!
Free yourself of that dead unresponsive keyboard and even if you have brought an add on keyboard our joystick package will enable you to play games with far more enjoyment and efficiency.
The controller board connects between the ram pack and the ZX81. (It does not affect the normal operation of the machine and no special skill is required to make this connection.) This board has the facility to accept one or two joysticks. Games using two joysticks thereby allowing two players to play against one another will be announced in the near future.
It is our intention to market a wide range of cassettes similar to that of the popular cartridge games machine on the market but at an extremely competitive price.
Detailed instructions will be supplied to enable our customers to use the joysticks in their own programmes you will require one joystick and a controller board for the games presently available.
If you write a programme which is exceptional please submit it to us and we will consider marketing it on a royalty base.

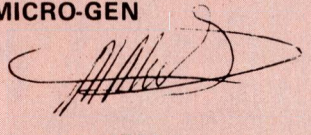
Prices are Controller Board £19.80 inc VAT
Joystick £ 9.60 inc VAT

Please add 0.80p Postage and Packing.

Games Available for the joysticks ZX Space Invaders and ZX Maze £4.95
ZX Breakout

Please add 40p Postage and Packing.

Yours faithfully,
for MICRO-GEN



M. MEEK

ZX81 CHESS

* GRAPHIC DISPLAY
* SEPARATE DISPLAY OF YOUR MOVE AND THE COMPUTERS
* SUPERFAST MACHINE CODE
* SIX LEVELS OF PLAY
* ALLOWS ALL LEGAL MOVES INCLUDING CASTLING AND EN PASSANT
* IF AN ILLEGAL MOVE IS ENTERED WILL REPLY "ILLEGAL MOVE"
* BOARD CAN BE SET UP TO ANY CONFIGURATION
* ABILITY TO CHANGE SIDES IN MID GAME
* SUPERB POWER IN A 10K PROGRAMME

+ CHESS CLOCK

* SINGLE KEY ENTRY
* INCREMENTS TIME FOR EACH PLAYERS MOVE RESETTABLE FUNCTION

ZX NEW YORK

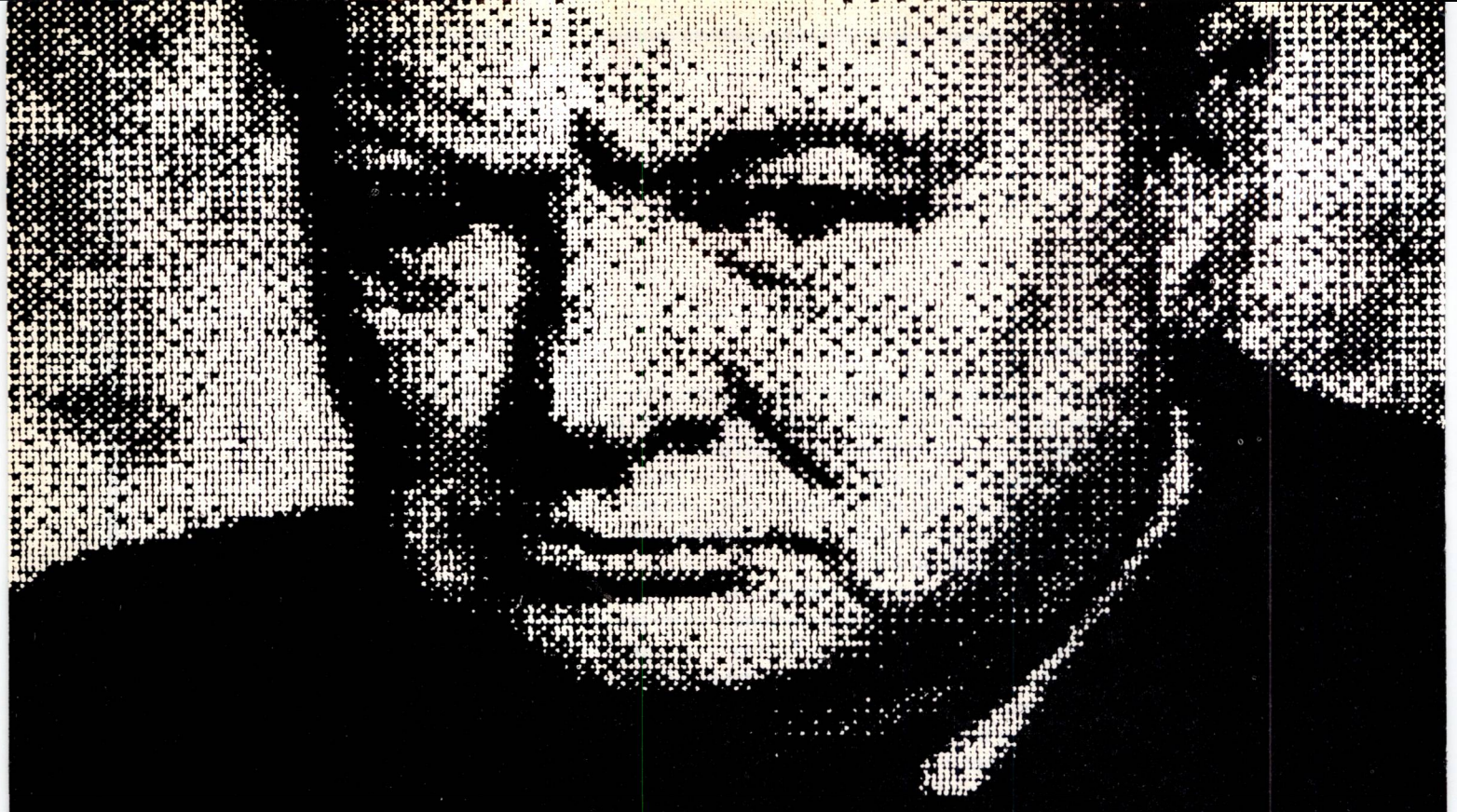
Can you bomb and blow up your targets before your plane loses altitude and crashes?
Superb Graphics, Superfast Machine Codes, Score continuously incremented, Simulated bombs and rockets
Runs In 2K of Memory

+ ZX REFLEX

Are you as fast as thought?
Find out with this game!

ZX81 CHESS + CHESS CLOCK ONLY £9.50 + 40p p&p
ZX NEW YORK + ZX REFLEX ONLY £4.50 + 40p p&p

MICRO GEN, 24 AGAR CRESCENT, BRACKNELL, BERKSHIRE. TELEPHONE: (0344) 27317



HERE'S ONE PERSON WHO WOULD HAVE APPRECIATED OUR LINEAR PROGRAMMING AID TO OFFENSIVE RESOURCING

When there were so few boats to pick up so many people

When food was rationed to ensure basic supplies

When money was never scarcer...

During those days, Churchill would have appreciated Optimiser, Caxton's new aid for optimising the allocation of scarce resources.

And with today's drive to improve productivity, Optimiser will help you decide the best allocation for materials, machines, manpower and money.

Optimiser places the power of linear programming at the fingertips of everyone from accountants to zoologists, and all those who want to know the answer to the question: "What is the optimum mix of my scarce resources?"

All you need is a 48K Apple, Applesoft, a disc drive and printer. Use the Optimiser Tutorial to learn all about this powerful aid. Those familiar with LP go straight to the User Manual and start working on problems. Optimiser provides a set up tableau to make it easy to specify constraints and variables. The matrix and full sensitivity analysis cater for a wide range of optimisation needs.

See Optimiser at your local Apple* dealer. Or we'll send it to you with a dealer list. You will find it simplicity itself to operate. Call or return the coupon to us.



*CP/M version available soon.

Apple and Applesoft are trademarks of Apple Computer Inc.

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 ☐ Optimiser, I enclose a cheque for £295. (+ VAT at 15% and £2 p & p.)

Name _____ Position _____ Company _____

Address _____

Caxton

CHOOSING A DATABASE

updating the wrong file, or making mistakes when changing a record. The system should be able to provide checks, such as the data validation we've already mentioned, to minimise the risk of mistakes occuring. 'Doing the wrong thing deliberately' may simply mean gaining unauthorised access to confidential records, or it may go as far as positive fraud — perhaps by falsifying payroll records. Some systems provide password protection on important files, and sometimes on individual records as well. So much for prevention: detection of human error (unintended and deliberate) and recovery from it may be possible if the system keeps records, known in some contexts as audit trails, of what changes have recently been made to the data.

The package should aslo have some protection against *system* errors. For instance, when a system is used by several people it should not be possible for two users to change a record simultaneously. The system should also keep a journal of its own activities, so that if the system fails for any reason information is not damaged beyond recall. Ideally, there should be some way to repeat the activities being undertaken when the system failed.

Tailoring the system

Every data management application will involve tailoring the system to your requirements; how much will be possible and/or desirable will depend on the system and on your needs. First you must describe to the system the nature of the data. Once described, the way in which the data is input may be specified completely by the package, or the user may be able to adapt the user image to the needs of his application. The most obvious adaptation is to design the screen display to make it easy to enter data quickly and acccurately. But data management systems can permit much greater adaptation of the user image, allowing the user to present selection menus or to set up detailed messages for novice users. It should also be possible, within the limitations of direct instructions in the package's own command language, to specify a range of calculating and manipulating functions. Often, too, you will want to carry out the same sequence of actions many times — every day or week, perhaps — and a system which allows you to use some kind of shorthand to initiate the sequence can both save you time and prevent errors. Finally, there is a limit to the amount of flexibility any system can allow within its own command language. You can gain even more flexibility if the system allows you an interface with another program, either one written (in Basic, Cobol or whatever) by the user or to his specifications, or else to another general purpose package. The latter is most likely to be one which will process the results further; for instance, you might want to use a word processing package to write circular letters to all those customers who owe you more than £1000. A link to such a package means that the data management system need not duplicate these facilities itself.

Ease of use

Probably the most obvious aspect of this is the image the system presents to the end user — the person who has to design the data structures and sit at the terminal entering the information. A good system will make it easy for the user to tell the system what is required of it, enter correct information and recover from errors. You should remember, too, that users change as they get to know a system; the user image should be adaptable, so that an experienced user can make use of his knowledge to take safe shortcuts through the detailed instructions needed by the novice.

Where a system has more than the most rudimentary facilities for tailoring to meet particular needs, especially if it can be interfaced to user-supplied programs, different considerations arise. Usually the biggest problem is finding out enough about the internal working of the information management system to be able to hook in one's own program. This usually has to be gleaned from the system's manual, and a close look at the documentation should give you a pretty good idea quite quickly about how helpful the package is in this area.

However helpful the system is to the end user when at the screen, he too will need to rely heavily upon the documentation. Sad to say, the quality of most computing manuals ranges from barely adequate to appalling. Pointers to look for include the amount of computing jargon, the size and adequacy of the index and the clarity with which the manual is laid out. Plenty of diagrams, simulated drawings or photographs of the screen displays and lots of examples of practical applications all help to make technical manuals more intelligible. The quality of the user documentation is usually a good indication of the amount of thought and effort which has gone into the user image as a whole.

Some suppliers give training in the use of their software, so that you may not have to rely wholly on the documentation to learn about the package. Such training is likely to be oriented solely towards acquainting the user with the software which is supposed to solve his problems. Of course, you must have some knowledge of the system in order to be able to use it, but such a 'solution-oriented' approach is not enough by itself. The user starts with a problem, and may need help to see it in terms to which he can apply the solution provided by the information management system. If you can find someone — another user, the supplier if he is a good one, a consultant who will help for a fee — who can help you find answers to all those questions which begin 'How do I. . .' by taking a 'problem-oriented' approach, you stand a much better chance of achieving your aims with the system than if you just try and muddle through by yourself.

Stability and reliability

Obviously, a system that is to hold important information needs to be reliable. The more users a system has, the longer it has been in use, the more likely it is that the system will be reliable. But bugs will occur — you may not come across them, if you're lucky, but the only bug-free program is one that's no longer in use — and it's important to find out what arrangements there are for reporting faults, and how, as well as how quickly, errors are put right. If the system is still being developed, because it's widely used and popular and people keep requesting enhancements, it's worth checking how such improvements are marketed — do you have to buy a complete new system if you want the new features? Will data stored under earlier versions still be usable by later releases of the software? (If the system is still being developed in order to give it basic facilities, treat it like the measles until it's been around a bit longer.)

Costs

As well as the straight monetary cost of the system itself, there are two other areas to consider. Data management systems can be quite demanding of computing resources, especially processor power and disk storage, so it's important to check properly that the system will run in reasonable time on the computer on which you plan to use it. An important consideration is the amount of trial you can give the system before you buy it. Many systems have a dealer demonstration pack which is free to suppliers, but which can only show a very small set of data in use — typically five or ten records in a file. With such small amounts of data any system will run quickly. If you can, get the supplier to show you a more realistic demonstration. The dealer packs are sufficient to show the supplier whether the system is worth taking seriously, but any dealer worth his salt should be prepared to buy a full copy of the system to demonstrate its facilities properly and to enable him to become sufficiently acquainted with it to deal with his customers' queries.

Remember, too, that while you may buy data management software for a particular purpose, the chances are that if it's successful in its first application you will want to implement others; find out about how easily the system can be extended and how much such enhancements might cost. The other costs involved will be your resources — the time and effort needed to set up and run the system. This is probably the hardest cost to estimate but if you don't do the implementation thoroughly, the system will be a failure however good its potential facilities.

What next?

In this and following issues, the selection criteria outlined will be used to review a number of data management systems. A data management system is likely to be at the centre of most business computing and it's worth taking time and effort to get the right system because that system will have a big impact on your subsequent computing development. The aim of this article and of the reviews of particular systems which will follow, is to help you to get that decision right.

END

BENCHTEST SOFTWARE

DMS UNDER CP/M

Kathy Lang begins our series of database Benchtests with an all-british product.

DMS is a data management system for CP/M written by Compsoft and based on the PET system of the same name. The package uses a single data file for each application, with one key field in each record which must be unique within the file. The file of data can be processed by a series of linked programs which are invoked from a main menu. Each program provides a feature such as, for example creating a file of data from the keyboard, sorting the data in ways specified by the user, selecting records which meet a certain set of criteria — all four-bedroomed houses in Walthamstow with central heating and a garage, for instance — or printing reports using the data and simple derived calculations. The data is stored in a DMS file indexed by the unique key; when you ask to sort the file on other fields the package creates one or more indexes which allow screen displays and printed reports to access the data file in the correct order.

So DMS would be suitable for fairly straightforward applications, provided your needs fitted within this quite limited framework. It would not be so suitable if you needed to keep two sets of data in separate files and then relate them to each other. For instance, you might have information about products and about suppliers, where some suppliers sold several products and some products could be obtained from several suppliers. The most convenient way to process this kind of information would be to have two files, using a product key and a supplier key to interrelate them; this would be seem to be impossible within DMS.

Although DMS allows you to process just one data file at a time, it is quite generous in its allowances of space and amounts of data, permitting a maximum of 26,214 records in one file or a file up to 8 Mbytes in size, whichever limitation is reached first. However, you might not be able to reach either limit in practice, since under CP/M a data file may not spread over more than one floppy disk, so you would also be limited by the capacity of your disk drives unless you have a winchester, of course.

You must decide when you set up a data file how many records you will need and what the format of each record should be. If you later find that you need more records, or a different structure, you can use utility programs to set up a restructured file containing the existing data in the new format.

Each record may contain up to 1024 characters; every record must have the same structure. You may have up to 60 fields in each record, and these may contain numbers, characters (letters and numbers mixed), or dates. Character fields may be up to 80 characters long; numeric fields may contain up to 14 digits. When creating a data file, you will first be asked to define the data structure, giving each field a description which may be up to 15 characters long, and specifying for each field its type and length; numbers occupy one byte for each digit and the plus or minus sign, and one byte for the decimal point if any. To estimate the total size of the data file in bytes, multiply the number of records by the length of each record and then increase the result by 20 per cent. Index files are economical in space and take about two bytes for each record in the data file.

Data input and updating

There are two main ways to get information into a DMS data file. Before using either you must first tell DMS how to format the data file, using the CREATE function. This sets up a data description file and uses this to format the data file to receive the maximum number of records you specify. This process takes a little time — six minutes to format a data file of 1200 records each of 155 characters on the Benchtest machine — but after that the data input process is as quick as your typing can make it. At this stage, you may specify a password for your data file to stop any unauthorised person getting access to it. Once you have formatted the file, you use either the KEY function or the . TRANSACT function to get data into it. KEY can be used only by those who know the password to the data file, while TRANSACT can be used by others but with their access limited in whatever way you specify.

The KEY program asks you first for the value of the key field for the current record: this must be a value unique to that record. If a record with that key does not exist, you will be asked if you wish to create a record; if you reply 'Y' (throughout, DMS will accept only Y or N and will ignore all other replies), you will then be asked for the value of each field of the record in turn. DMS tells you what type of field is needed and how long it should be; you will not be allowed to give a date of 31 November, type a value longer than the maximum length allowed for a field, or put letters into a numeric field. It also saves you some typing by allowing some short cuts; if you have records in which one field is the same for several records — perhaps a personnel file where several staff belong to the same department — you may ask DMS to duplicate the corresponding field in the previous record. The current date may be specified by pressing a single key.

If, either during input or just before the record is saved, you realise you've made a mistake, you can abandon the current record and start inputting it again. Or you can continue and amend it later, using the facilities for updating.

If you specify a key which already exists, DMS will assume you want to update an existing record, you then have the option of amending parts of records by specifying the names of fields you want to change. Again, DMS saves you time by allowing you to type just enough of the field name to make it unique. You can also delete or print particular records, so this would be the program to use if you wanted a paper record of some current records with particular keys. Indeed, the mechanism of unique keys is oriented primarily towards getting at *individual* records, to update or print them, rather than retrieving *groups* of records.

The other program used for data input and updating is TRANSACT. This allows you to restrict access to the data and to specify how it is to be displayed. For instance, in the personnel records example, there is likely to be some highly confidential material on such a file, as well as data to which many people may rightly be allowed access. TRANSACT allows you to design masks for your

data files, so that only part of them may be displayed using TRANSACT and perhaps a still smaller subset modified. A mask could be set up displaying the person's payroll reference number, his name, address and current work location, and allowing all of these except the reference number to be modified. Then if an employee changes his address, the records could be modified to show the new address without the person making the change being able to see the employee's salary or work record. You could also use this facility to allow people simply to display part of all of each record, with no power to change data at all. All masks may have passwords attached, so some people can be given more extensive access than others and, unlike the other methods of changing and inspecting data, users of masks need have only the password for the DMS data file itself. You can also attach a processing option to the mask, so that calculations are performed automatically on data items as they are input. The latest version of TRANSACT, which I did not have a chance to test, has cursor control added, so that prompts and field specifications may be placed anywhere on the screen.

Using TRANSACT, however when you set up the mask you do have to supply full prompts to guide the person putting in the data, rather than relying on DMS prompts as in KEY. You also still have only the limited validation facilities of KEY; it is not possible to design testing sequences to make sure that data is accurate as well as valid. For instance, most people retire at 60 or 65, so the chances are an error has been made if an age of 90 is specified in one of our employees' personnel records. But DMS can check only that the data consists of a number of not more than two digits; you would have to use the DMS selection facilities to extract records of doubtful validity if you wanted to check the accuracy of your data.

Displaying data on the screen

When you need to retrieve an individual record by its key, then KEY is the function to choose. However, you will often want to access your data in other ways. DMS allows you to display records on the screen by either scrolling through the file record by record or by going to particular parts of the file if it has been appropriately sorted first. You can also pre-select parts of the file, so that you may, for instance, look only at records for staff in a particular department, or houses in specified areas. But this sorting and selecting must be done before you begin the display process; if you decide that your selection is inadequate — say you find there are not very many five-bedroomed houses in the area you have chosen, and you'd like to look at those with four and six bedrooms as well — then you must quit the SCREEN program which displays data, go back to the SELECT function and set up another selection, invoke the SORT function again, and finally display the newly selected part of the file.

Reporting on data

To get printed reports, there is a special function called REPORT which allows you to design formatted reports. You can specify particular ways of laying the report out on the page if you wish, or ask for one of the standard DMS layouts. The report may consist of lists of records or of totals and summaries, or both; in either case you may ask for reporting on selected fields only. The totals may cover the whole set of data in use, or may be accumulated over parts of it. For instance, you may have data about staff in different departments in each office, and have several regional offices. You could set up DMS to accumulate totals by department, by region and overall. Up to three levels of accumulation are allowed (this is really a sorting restriction — see below).

While DMS gives you considerable flexibility over text layout and inclusion of headings, it is rather hard to change the layout once you have set it up, as all specifications of position are done with reference to absolute column and row positions. So if you decide you want to add a field into the report to the left of several other fields, you must, if you are using your own layout, respecify the positions of all the other fields — you can't just say 'move all the remaining columns over ten places'.

Selecting sets of records

Both REPORT and SCREEN allow you to inspect pre-defined selections of records. You must set up a selection file containing your choices before you go to the display programs. Up to eight selections are allowed, and these are grouped into four pairs. So you can ask to select all houses with, say, 'three or four bedrooms' and 'central heating and double-glazing' and 'three acres in Stockport' or 'one acre in Wilmslow'. Character fields may be tested for equality, or for being in a particular range; you may restrict your search to part of the field, and you may ask to check if the test characters are anywhere within the field if the search string is shorter than the field you are searching. Numeric fields may also be tested for being greater than or less than the test number. The number or character string you are searching for may be a constant which you put in the selection set, or a constant put in from the keyboard when the selection is actually made by SCREEN, SORT or other DMS processing function. Or you may compare two fields in the same record: you might, for instance, want to check whether a customer's current debt to you exceeds his credit rating.

Sorting records

DMS allows you to sort your data before you print or display it. You may sort on up to three fields at any one time and for character fields you may use all or part of a field, but the total number of characters in all the sort parameters must not exceed 30 characters. The whole file may be sorted, or parts of it chosen by the SELECT function. Sorting is always in ascending order. DMS does not actually sort the data file but produces an index file pointing to the records in the right order for this particular sort. While sorting, a work file is used; DMS gives you the opportunity to put this on a separate disk from the data to speed things up.

If you change your data file after you have run SORT, your next use of these criteria may give you wrong results. Because DMS does not sort the actual data file, you will only have problems if you have changed data in fields which were used for sorting or for selection by that run of SORT.

Calculations

I've mentioned the calculating facilities for giving totals on reports. DMS has two other functions which can manipulate the data. One is used in TRANSACT, to do calculations on data as it is input. The other is the PROCESS function, by which you can do quite substantial amounts of arithmetic on your data, either to make one field in the record store the result of calculations on other fields, or to update fields by applying constants. For instance, you could automatically increase all your prices by 10 percent by setting up a PROCESS run to carry out such a calculation on every record. In any one run, you may have up to eight processing statements, each up to 100 characters long. You may also use accumulators provided by DMS, to build up results as you go along; these may relate to individual records, or be accumulated over all records. You may use PROCESS on the whole data file or select parts of it, but you cannot make the calculations themselves dependent on the values of individual fields within a record.

One rather limiting feature of PROCESS is that calculations may use the usual arithmetic functions except brackets. So you have to be very careful about the precedence rules to get your results right — and this may give you some rather verbose rules which limit the extent to which you can exploit the full scope of this function.

Security

DMS allows password protection on individual files. However, this is only effective if you use DMS in an orderly way — after use, if you just hit system reset instead of using the menu command to leave DMS the current data file remains open when you next load DMS. As mentioned above, quite extensive protection on both reading and updating is given by TRANSACT. DMS also allows you to check what you are doing by logging all transactions on the printer if you wish. So, if you need to backtrack because you have made a mistake, you at least have a printed record of what you've done, although a disk record would be even more helpful because it can be read by the computer as well as by the user.

Tailoring

There is a sense in which all data management systems can be tailored, because they can be adapted to different kinds of data. By this I mean tailoring the user image for particular purposes (that is, adapting the way the package looks to the user) and also tailoring the facilities provided — the ability, for instance, to add a processing routine to provide a function not in the

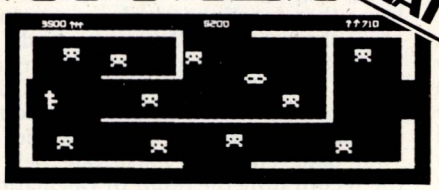
The Essential Software Company

47 Brunswick Centre, London WC1N 1AF



ROBOT ATTACK

THE GAME THAT TALKS

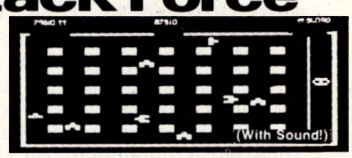


TRS 80 Levels I & II 16 K Tape
Video Genie 16 K Tape

The Newest and Most Astounding Arcade Game that TALKS has just Reached Planet Earth. You can't help yourself. You have to stop them at all cost. Don't let up. Written especially for high quality graphics you'll simply be dazed and excited by the action.

TRS80 VIDEO GENIE

Attack Force



Dodge the alien Ramships and fire missiles to destroy them before they get you. The alien Flagship uses his deadly laser bolt to transform a Ramship into another Flagship or into your ship's double. Look out! Destroy your double and you could destroy yourself.

TRS 80 Level I & II 16K Tape
Video Genie EG3003 16K Tape

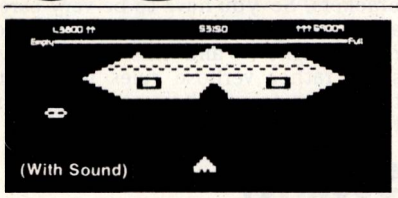
Galaxy Invasion



The newest and most exciting invaders type game yet! Cruel and crafty aliens attack Earth. You are the sole defender. As you fire your laser at the aliens they swoop down and bomb you. Exciting use of graphics! Must be seen.

TRS 80 Level I & II 16K Tape
Video Genie 16K Tape

GOBBLE MAN



Your fighter appears below a convoy of Aliens! If you destroy them another set appears who seem to be slightly cleverer than before! Soon your space station nears but before you can dock the station comes under attack! Survival is up to you! The excitement is just beginning!!

TRS 80 Levels I & II 16K Tape
Video Genie 16K Tape



Watch out behind you! As you hurry through the maze collecting modules you score points. But don't let the Gobblemen catch you. If you are crafty, sneek up behind them and neutralise them to gain extra points. Just keep a watch. When they attack you they come in fast. Just don't lose your nerve.

TRS 80 Levels I & II 16 K Tape
Video Genie 16 K Tape

Cosmic Fighter



3-D means that as you wander through the mazes and buildings, full screen graphic display constantly shows your position in a perspective format as though you were actually there! This "rat's eye" view adds an entirely new dimension to adventure.

English language commands can be entered at any time to manipulate your environment.

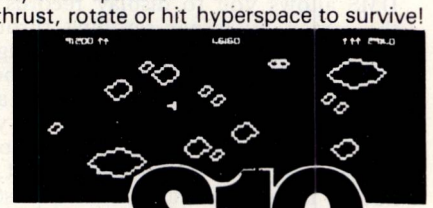
The command sets are extensive and sophisticated. Dozens of objects are scattered throughout the mazes and buildings. You can pick them up, burn them, throw them, etc. You may need the sword to fight off an ugly little man. Or a steel rod to hold apart crushing walls. Deathmaze 5000 and Labyrinth allow the traditional one and two word commands.



Asylum incorporates our Advanced Language Interpreter which allows full sentence input Deathmaze and Labyrinth over 550 locations! Asylum 1200

SuperNOVA

Now the amazing ASTEROIDS arcade game for your TRS 80! Your ship is floating in the middle of an asteroid belt! Your only escape is to destroy them and the crafty alien spacecraft! Blast them laser, thrust, rotate or hit hyperspace to survive!



All Tapes £10 ea

ASYLUM Tape £12

THE ESSENTIAL SOFTWARE COMPANY
(Viscounti Ltd.) 01-837 3154
47 Brunswick Centre, London WC1N 1AF

I have a ..... microcomputer.
[ ] Please send me your software catalogue. I enclose a stamped self addressed envelope.
[ ] Please send me .....
I enclose a cheque/postal order for £ .....
(plus 70p post & packing)

Signature .....
Name .....
Address .....
Postcode .....
My ACCESS No is .....

DMS UNDER CP/M

package. DMS has rather limited facilities for tailoring the user image, provided mainly by the TRANSACT function already described, to make both the form of updating and the way individual records are displayed conform more closely to the user's requirements. DMS does not provide the ability to include extra functions, supplied by user-written programs, within the system. But it does enable the user to copy data from a DMS data file into an ordinary sequential file, which can then be read by another program, and there are special facilities to enable you to write a file which can be read by the Wordstar Mail-Merge facility — unfortunately I didn't get a chance to try that out. There is also a utility to copy sequential files back to DMS data files.

Ease of use

DMS is intended for people with little or no computing experience; it aims to lead them gently into familiarity with the package. The user image of the screen displays and prompts meets this aim (by and large). The overall menu-driven approach is easy to understand, though it would be helpful if the commands were more mnemonic. For instance, the individual functions are presented in roughly the order they might be used, and are labelled alphabetically within that order: the CREATE function is activated by pressing the letter B, the KEY function by pressing the letter C, and so on — C for CREATE and K for KEY would have saved me (and the beginning user I talked to) several mistakes! The layout of the menus within the functions is also poor in places.

Error messages and warnings are usually fairly clear. DMS never left me wondering what it was up to — when an operation took more than a few seconds a message was displayed to say what was going on. But recovering from one's logical errors is sometimes more tedious — for instance, the SORT and SELECT functions create specification files which, once set up, cannot be edited — you can only start again. The specification files for the REPORT function can be amended in a very limited way but you can't add extra requests to an existing specification.

Once you get beyond the novice stage, the user image is less helpful. There seems to be no way to speed up the specifications and commands once you become sufficiently experienced with the package to do without detailed prompts, which become very tedious quite quickly. Of course, it is vital for a package to help the novice as much as possible — but a good system should cater for the experienced user too.

The documentation is also of rather mixed quality. I got on rather better once I'd changed the PET manual I was sent for one which described the CP/M software which came with it! But even then, I found the approach taken tended to fall between two stools. As is usual with such manuals, DMS is described in terms of the individual facilities it provides — CREATE, SORT, TRANSACT and so on. This made it quite difficult to see just what DMS was doing with my data. For instance, it was only by experimenting with the software that I could tell that the sorting routines create indexes rather than actually sorting the data file; this may make a substantial difference to the number of times the index must be re-created to keep it up to date. It would have been much better if the data model had been simply explained early on. This is particularly important where divisions between functions — for instance between TRANSACT and SCREEN — appear rather arbitrary.

On the other hand, there was insufficient attention paid to the problems of applying DMS in real life. Some sample files are provided with the package, which is a real help, but the manual could and should have been a lot more helpful in answering some of the 'How do I ...' questions users ask when trying to implement a real application. This is especially important with a package like DMS, where the user is largely dependent on the supplier for training and guidance. This may include some help in learning about DMS but it is most unlikely to include a detailed analysis of even one application. Such help is, of course, available from several sources for a fee, and there is much to be said for budgeting for some training when buying a package like DMS.

Stability and reliability

There are over 1000 DMS users, although many of these use the PET rather than the CP/M version. This makes it likely that most major bugs have been ironed out, although one must always be on the lookout for oddities. If things do go wrong, the fact that Compsoft is a British company should help to get problems fixed quickly.

DMS is being steadily improved. I am told that new versions are intended to be compatible with existing ones and are distributed to existing users for a small handling charge. I also understand that a users' group is about to be formed.

Costs

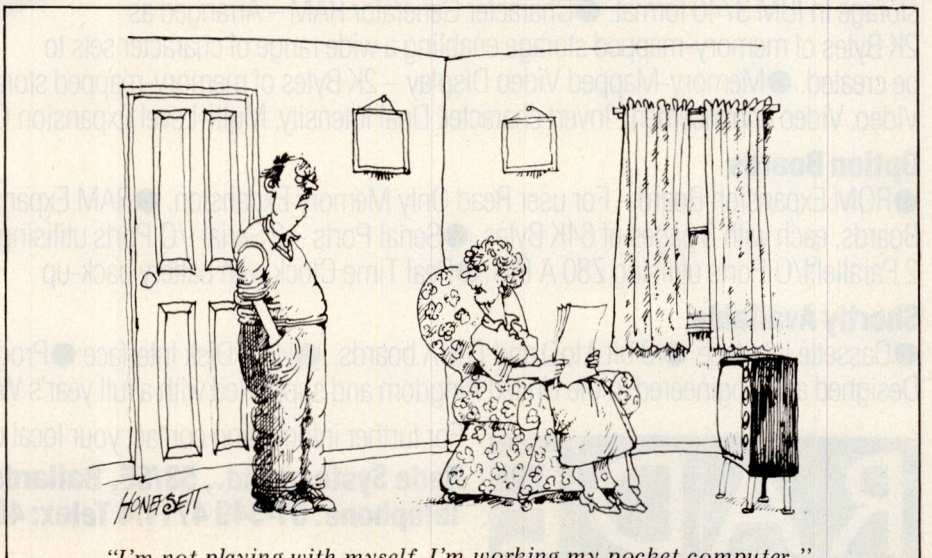
The CP/M version of DMS costs £400 — a substantial sum in comparison with some of its competitors and more than twice the price of the PET version (mainly because the large number of different CP/M systems supposedly makes it more difficult to maintain the CP/M version). It needs about 380k of disk space for the whole system, not including any data files. Ideally you should have enough disk store to keep all of DMS on one disk drive; since you do not need all of DMS online at once, you could spread it over more than one disk if you have minifloppy disks; but this could be a real nuisance.

Like many packages, the dealer sample packs allow only small test files to be set up; in the case of DMS a maximum of five data records is allowed in sample files. So you may find it hard to get a realistic demonstration of processing times. Later in this series, we shall be publishing Benchtests on the packages reviewed, so that you can get some idea about how the major data management packages compare for processing times.

Conclusions

DMS provides quite a wide range of facilities for creating and accessing data held in a single file. It is rather expensive compared with some of its competitors; in subsequent reviews, you will have a chance to see whether the price is justified by facilities and performance.

END



"I'm not playing with myself, I'm working my pocket computer."

The Systems

RADER 1000 with Dual 5¼″ drives **RADER 2000 with Dual 8″ drives**

By combining the economy of using the most up-to-date techniques of microprocessor technology with the reliability of British design and engineering, these highly advanced systems of tomorrow are affordable and available to you today. Just look at what we're offering.

Start with the economically designed, free-standing keyboard, where your fingertips can glide easily over the 92 keys, which eagerly respond to your touch through innovative capacitive technology. It has it's own intelligence, through it's micro-processor control, enabling fast reliable response to your every instruction. A special feature is full diagonal cursor control for rapid cursor positioning (keyboard layout can be easily reconfigured for special applications).

Your eyes can rest comfortably on the 12″ screen, with it's clear, high resolution display, enabling quick decisions to be made from it's clarity of output. The latest lowpower 5¼″ or slimline 8″ double-sided double-density precision drives provide accurate, fast retrieval of data from the highly efficient data store, which uses double-sided double-density floppy disk format.



The powerful heart of the system, it's Z80 A microprocessor, pounds quietly and efficiently away at a rate of 4 MHz. It will obey your every instruction, and memorise every bit of information in it's on-board 64K of dynamic RAM.

This highly flexible machine will communicate to the peripherals of your choice, through dual parallel or serial input/output ports. Future needs are well taken care of, as we've allowed sufficient room for 12 or more dual port expansion boards.

The whole system is reliably powered via it's sophisticated multi-output switched-mode power supply.

To all this, we've added the ease and availability of running CP/M 2.2 software plus the entire CP/M users library and also the new Paxton.

RADER 1000 £1480 RADER 2000 £1980

Features of these surprisingly low-priced systems include:–

●CPU – Z80 A 4 MHz ●ROM area expandable to – 16K x 8 bits ●RAM area – 64K bytes of RAM ●DMA capability – Powerful and versatile management of data transfer between ports. Memory to ports, port to Memory. ●Floppy Disc Control – Using the WD 1397 chip-set to provide full double-sided double-density storage in IBM 3740 format. ●Character Generator RAM – Arranged as 2K Bytes of memory-mapped storage enabling a wide range of character sets to be created. ●Memory-Mapped Video Display – 2K Bytes of memory-mapped storage provides fast, flexible display. Inverse Video. Video enhancement. Invert character. Dual Intensity. Multi-Level Expansion Connectors available.

Option Boards

●ROM Expansion Board – For user Read Only Memory Expansion. ●RAM Expansion Board – Through P IO Controlled Boards, each with 3 pages of 64K Bytes. ●Serial Ports – 2 Serial I/O Ports utilising Z80 A SIO ●Parallel Ports – 2 Parallel I/O Ports utilising Z80 A PIO. ●Real Time Clock with battery back-up

Shortly Available

●Cassette Interface ● 8 bit A to D and D to A boards. ●Hard Disk Interface ●Programmable Video Controller

Designed and Engineered in the United Kingdom and supported with a full year's Warranty.

RADE

For further information contact your local dealer or 'phone or write to:

Rade Systems Ltd., 53/55, Ballards Lane, London N3 1XP.
Telephone: 01-349 4711/4 Telex: 46523 SIMSYS G

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
Woodhouse Street
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 Eccleshall 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

St Neots Cambs PE19 3JG
Tel (0480) 215005
Telex 32514 Comart G

comart communicator

The clean simplicity outside...



NOW WITH 5 MEGABYTE HARD DISK DRIVE

...conceals the pedigree inside.

First came the Communicator CP100, a British designed, British made Microcomputer; Z80A™ processing power, Twin Floppy Disk Drives, S100 Bus Construction, CP/M™ operating system, neat compact styling, and a standard of engineering reliability uncommon in such a new system.

In just a few short months Communicator was the focal point of a new range of Microcomputers.

It offered floppy disk drive options: double density, quad capacity, and 80 track quad capacity. It offered floppy disk and S100 Bus expansions. It had a 20 Megabyte Hard Disk Sub System and Cassette Back up.

Now there is Communicator CP500, a dedicated system within a System. CP500 provides over 5 Megabytes of on-line data storage with its integral 5 MegaByte 5" Winchester Technology Hard Disk and very high capacity floppy disk drive.

To the user, CP500 means greatly improved utility. It will support larger scale computer operations at several times the speed and convenience of conventional floppy disk systems. And it offers greater application flexibility, with reduced operator involvement in diskette management routines.

Find out more about the Communicator range today.

comart

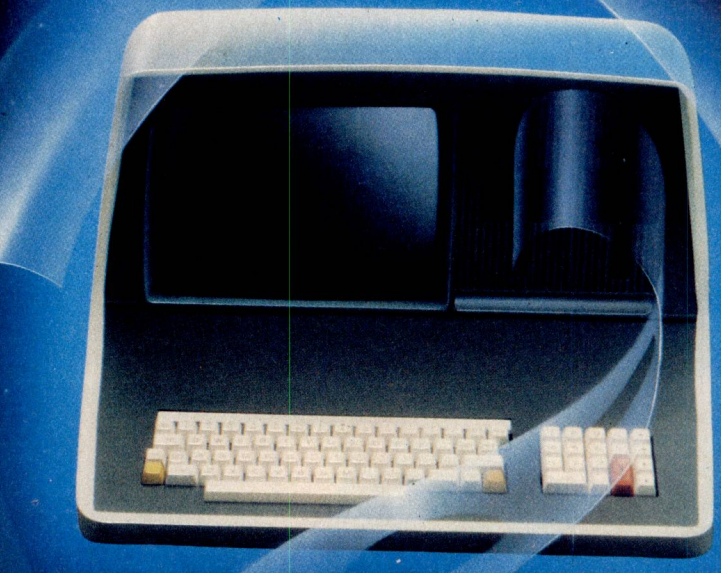
SPECIALISTS IN MICROCOMPUTERS

A member of the Comart Group of Companies.

TM CP/M is a trade mark of Digital Research Inc Z80A is a trade mark of Zilog Inc

MatheMagic®

TRANSFORMS YOUR MICROCOMPUTER INTO THE ULTIMATE CALCULATOR





FOR BUSINESS, SCIENCE, ENGINEERING, EDUCATION OR IN THE HOME.

THERE IS NOTHING ELSE LIKE IT ON THE MARKET!

Now, use your computer for sophisticated mathematical calculations without any programming. International Software Marketing introduces a unique software product – MatheMagic®.

Whether your applications are as complex as structural engineering or as simple as balancing household accounts, MatheMagic® is flexible and easy to use.

MatheMagic® is the answer to numbers processing for business, education, engineering, science and home management.

The Ultimate Calculator is available for Apple II or II+; available soon for Atari, TRS-80 I, II & III, Z-80 based micros with CP/M 2.2, Commodore Pet, CB/M and IBM PC.

CP/M is the registered trademark of Digital Research, Inc. Z-80 is a registered trademark of Zilog Corp.

FEATURES:

Menu-driven format for rapid learning and ease of use.

On line "HELP" for every MatheMagic command and option.

Free-form entry of expressions of up to 240 characters (including standard maths operators, pre-defined functions, user-defined formulas, parentheses, variables, etc.).

Virtually unlimited use of all formulas within formulas.

Built-in mathematical functions (trig, logs, conversions, etc.).

Easy to create and edit variable sets and values.

Disk storage and recall of user-defined formulas and variable sets.

Automatic retention of variable values for chain calculation.

Free use of "ask variables" to allow "what if" and repeat types of calculations.

Full hard copy support, including a trace function.

A configuration segment to take advantage of your system facilities.

User numbers assigned, so multiple user files may reside on disk.

Number base conversions (e.g. Hex/Decimal) provided.

Rapid calculation or stepped calculation for viewing intermediate results.

Automatic repeat calculation.

Comprehensive user reference manual with sample applications.

To: ISM, International Software Marketing,
Hayden House, 5-6 Millmead,
Guildford, Surrey, GU2 5BE. Tel: 0483-503603

Please send me further information regarding MatheMagic

Name _____

Company _____

Address _____

PCW/1

ism

International Software Marketing
Hayden House, 5-6 Millmead,
Guildford, Surrey, GU2 5BE.
Telephone: Guildford (0483) 503603.

HIGH DENSITY VDU CARD

Brian Hawkins continues his article on building a VDU with a look at the software.

Last month I described the principles, hardware design and construction of a high-density VDU card. This month we'll cover the assembler language driver routines to enable the VDU card to be interfaced to an 8080/8085/Z80 processor-based system to give a professional quality, full cursor control display screen.

Functional description

The function of the screen handler or driver routines is to control the placing of ASCII date to the display RAM and to correctly respond to certain screen control ASCII characters. This allows the user's main program to simply pass various parameters to, and call as a subroutine, the driver routines which take care of the detailed functions of the control of the display screen. There are a number of ASCII character codes that are used for control purposes instead of display characters, and the driver routines will respond to these codes and carry out the required function:

i) Clear screen (0CH) clears the screen and resets the cursor to the top left hand corner;
ii) Cursor advance code (09H) advances the cursor along a line;
iii) Backspace cursor (08H) moves the cursor to the left along a line;
iv) Cursor up (1AH) moves the cursor up one line;
v) Cursor down (0AH) moves the cursor down one line;
vi) Carriage return (0DH) fills the rest of the current line with spaces and resets the cursor to the start of the next line.

The cursor's position on the screen is indicated by the character displayed at that position being video inverted, so that, for example, for new text entry to the screen the cursor appears as a solid rectangular block (ie, the video inverse of a space). For editing existing text, if the cursor was at a position displaying a character it would appear as a black character inside a white or green block. The cursor control codes enable the cursor to be moved about within the confines of the displayed screen area; when a screen boundary is reached the driver routines will ignore further commands that try to move the cursor outside the screen area.

All other ASCII codes from 00H to 7FH cause display characters to be written to the current cursor position and the cursor advanced to the next position. When the cursor reaches the end of a line a carriage return and line feed command will automatically reset the cursor to the start of the next line. In a similar fashion, when the last character of the last line is reached the driver routine automatically scrolls the screen up one line, clears the last line, and resets the cursor to the start of it.

Figure 1 shows how the display memory map is organised. In my prototype system, the base address of the 4k memory block was set at F000H. The diagram shows that the map is not continuous, and so one of the main functions of the driver routine is to turn this into a continuous map (ie, so that the start of line 1, for example, will appear to the host system after the end of line 0). The software does this by keeping the current cursor position stored as two variables, a character position and a line number, and operating on these two variables to keep the cursor within the displayed memory area. The variables required by the driver routines are in fact stored in a section of the non-displayed memory of the high density VDU card.

Detailed software operation

The screen driver software consists of a number of routines and subroutines written in 8080/8085/Z80 assembler code (400 bytes of code).

The main driver routine is called CHAROP and its function is as a single character output subroutine; this is the main software interface between the host machine's software and the VDU card. CHAROP should be called by the host machine's software with the ASCII character that is to be displayed (or an ASCII command character) in the accumulator. On entry to the subroutine the processor's current status and registers are pushed onto the stack and then the ASCII code in the accumulator is tested to see if it is a display character

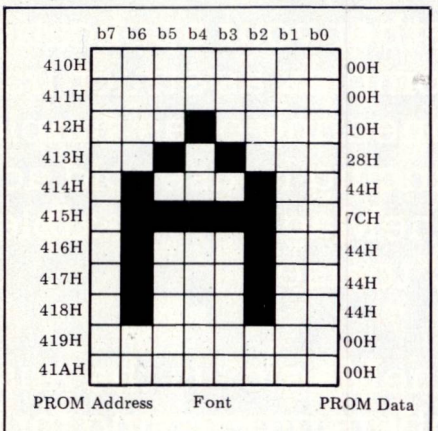


Fig 2

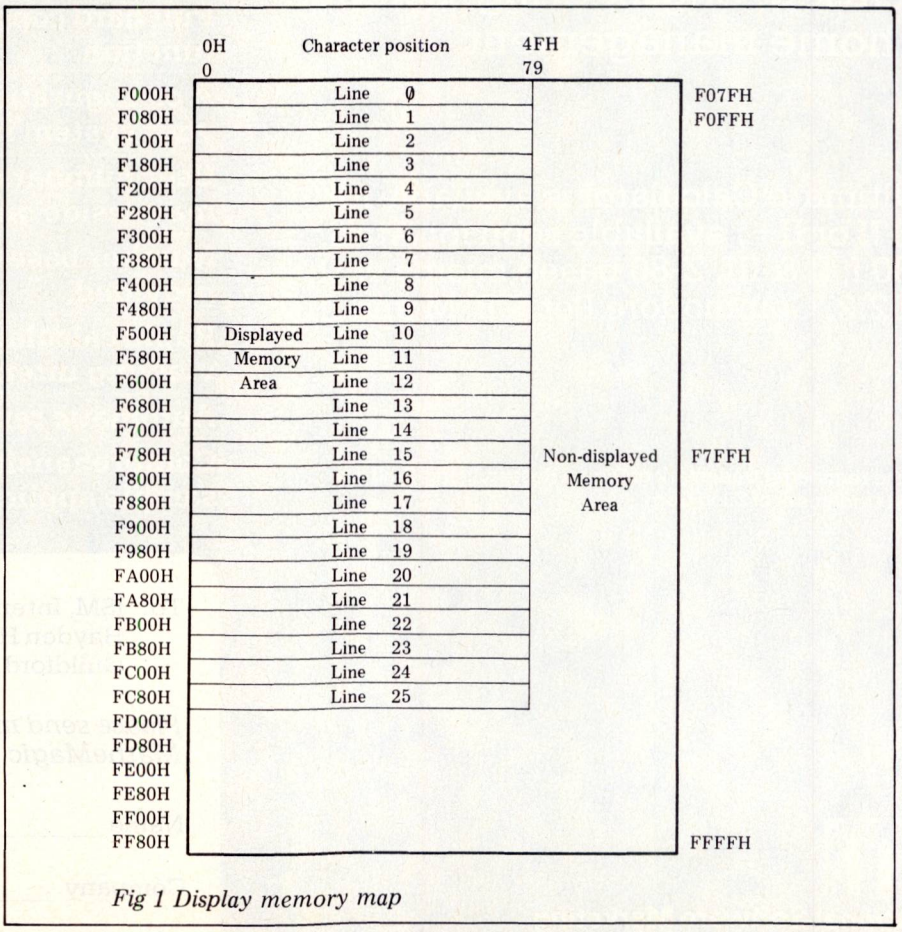


Fig 1 Display memory map

or one of the command characters previously described.

If the ASCII character in the accumulator is a normal display code, the next step is to copy the character to the B register and then to call the subroutine INVCLC. The function of the INVCLC (invert video at current line and character position) subroutine is to find the display memory address that corresponds to the current line number and character and then to invert the video at that position. At this point in the CHAROP routine this subroutine has the effect of removing the cursor from the screen and returning with the memory address of the current cursor position in the H and L index register. The next operation is to write ASCII code in the B register to the memory byte whose address is contained in H and L (MOV M,B). The subroutine CURINC, cursor increment, is then called. This subroutine function is to increment the current cursor position to the next permissible location. The subroutine INVCLC is then called to replace the cursor back onto the screen and finally the processor's status and registers are 'popped' off the stack before returning from the CHAROP subroutine to the user's program. If, on the other hand, a control code is sent to the CHAROP subroutine, a number of other sections of code will be implemented.

1. Carriage return '0DH' Program flow jumps to the label CARRET; the first step is to remove the cursor from the screen by calling INVCLV. The next step is to calculate the memory address corresponding to the current cursor position by calling FNDLOC. An ASCII 20H (Space) is then written to memory and the position number is then examined to see if it is zero (i.e. we have reached the start of a new line); if this is not the case, program flow jumps to CAR1 and the above steps are repeated. If, however, the condition is satisfied, the cursor is restored to the screen by calling INVCLC and the CHAROP subroutine is left by jumping to RETCH. In this way, when a carriage return code is sent the driver routine fills the rest of the current line with spaces and resets the cursor to the start of the next line.
2. Cursor Advance '09H'. Program flow jumps to the label CURADV and again the first step is to remove the cursor from the screen by calling INVCLC. The character position number CHARNO is then examined to see if it is '4FH'. If it is, the cursor has reached the end of a line and no action is taken, the cursor then being replaced and the subroutine exited from. If, however, we are not at the end of a line the character number is incremented and the cursor replaced, and the subroutine left by jumping to RETCH.
3. Backspace cursor '08H'. Program flow jumps to the label BACKSP and the cursor removed from the screen. As in the last case the character number is examined but this time for the start of a line. If this is the case no further action is taken, the cursor is restored and the routine left via RETCH. If the cursor has not reached the start of the line, however, the character number is decremented (hence moving the cursor back one space), the cursor restored to the screen by calling INVCLC and the routine left via RETCH.
4. Line feed (cursor down) '0AH'. Program flow jumps to LFEED. This is similar to the last two cases except that this time the line number is incremented unless the cursor is already on the last line.
5. Cursor up '1AH'. Program flow jumps to CUP, and the routine is similar to that for cursor down except that the line number is decremented unless the cursor is at the top of the screen already.
6. Clear screen '0CH'. Program flow

ASCII code	Character	PROM address	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	NUL	00X																
01	□	01X	FF	81	81	81	81	81	81	81	81	81	FF					
02	◆	02X			10	38	7C	FE	7C	38	10							
03	▲	03X				10	10	38	38	7C	7C	FE	FE					
04	■	04X				7C	7C	7C	7C	7C								
05	×	05X			82	44	28	10	28	44	82							
06	●	06X			38	7C	FE	FE	FE	7C	38							
07	BEL	07X		18	18	3C	3C	3C	3C	3C	3C	7E						
08	←	08X				20	40	FF	40	20								
09	→	09X				04	02	FF	02	04								
0A	↓	0AX	10	10	10	10	10	10	10	92	54	38	10					
0B		0BX				3E	1C	FC	1C	3E								
0C	↖	0CX		F0	C0	A0	90	08	04	02	01							
0D		0DX				7C	38	3F	38	7C								
0E		0EX		10	10	54	7C	7C	7C	44								
0F		0FX				44	7C	7C	7C	54	10	10						
10		10X				F8	20	71	7F	72								
11		11X				1F	04	4E	FE	8E								
12		12X			0C	18	31	FE	31	18	0C							
13		13X			20	18	8C	7F	8C	18	30							
14		14X	10	10	38	38	38	38	38	7C	7C	7C	44					
15		15X	CC	CC	33	33	CC	CC	33	33	CC	CC	33					
16		16X	38	38	38	10	38	54	92	38	28	44	44					
17		17X	55	FF	55	FF	55	FF	55	FF	55	FF	55					
18		18X	24	24	FF	24	24	FF	24	24	FF	24	24					
19		19X	FF	99	99	99	99	FF	99	99	99	99	FF					
1A	↑	1AX	10	38	54	92	10	10	10	10	10	10	10					
1B	⊡	1BX	FF	81	81	81	99	99	99	81	81	81	FF					
1C		1CX			08	10	20	10	08	20	10	08						
1D		1DX					40	7C	10	7C	04							
1E		1EX			20	10	08	10	20	08	10	20						
1F		1FX	3C	24	24	E7	81	81	81	E7	24	24	3C					

Fig 3(a) Character font (all unmarked bytes are 00H)

ASCII code	Character	PROM address	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20	'Space'	20X																
21	!	21X			10	10	10	10	10		10							
22	"	22X			28	28												
23	#	23X			28	28	7C	28	7C	28	28							
24	$	24X			10	3C	50	70	1C	14	78	10						
25	%	25X		20	52	24	08	10	24	4A	04							
26	&	26X			30	48	50	20	54	48	34							
27	'	27X			18	18	20											
28	(	28X			08	10	20	20	20	10	08							
29	)	29X			20	10	08	08	08	10	20							
2A	*	2AX			10	54	38	7C	38	54	10							
2B	+	2BX			10	10	10	7C	10	10	10							
2C	,	2CX								18	18	20						
2D	—	2DX							7C									
2E	.	2EX								18	18							
2F	/	2FX			04	04	08	10	20	40	40							
30	0	30X			38	44	4C	54	64	44	38							
31	1	21X			10	30	10	10	10	10	38							
32	2	32X			38	44	04	08	10	20	7C							
33	3	33X			38	44	04	18	04	44	38							
34	4	34X			08	18	28	48	7C	08	08							
35	5	35X			7C	40	78	44	04	44	38							
36	6	36X			18	20	40	78	44	44	38							
37	7	37X			7C	44	08	10	20	20	20							
38	8	38X			38	44	44	38	44	44	38							
39	9	39X			38	44	44	3C	04	08	30							
3A	:	3AX					18	18		18	18							
3B	;	3BX					18	18		18	18	20						
3C	<	3CX					08	10	20	10	08							
3D	=	3DX						7C		7C								
3E	>	3EX					20	10	08	10	20							
3F	?	3FX			30	48	08	30	20		20							

Fig 3(b) Character font

jumps to the label CLRSCN. The subroutine CSCRN is called and this routine clears the screen by filling the screen with ASCII spaces and zeros the line and character number variables CHARNO and LINENO. The cursor is then replaced onto the screen and the routine left by jumping to RETCH.

Other Subroutines are:

Initialise screen (INSCRN) subroutines. This initialises the various screen pointers, clears the screen and set the cursor up in the home position. It should be called by the host systems' software as part of the system initialisation procedure routine.

Find screen memory location (FNDLOC) subroutine. This takes the current line and character number from the variables CHARNO and LINENO and from them calculates the corresponding display memory address (see Figure 1). This address is placed in the index register H and L and control is then returned to the caller.

Invert video at current line and character position (INVCLC) subroutine. This first finds the display memory address corresponding to the current line and character numbers by calling FNDLOC. The routine then fetches the memory byte stored at that address and inverts the top bit; this has the effect of video inverting the character cell from white on black to black on white (or vice versa).

Cursor increment (CURINC) subroutine. This increments the current cursor position held in the two variables CHARNO and LINENO. When called, this routine increments the character position in CHARNO and then checks to see if it needs to start a new line (see Figure 1) by comparing with '50H'. If this is the case, the character number is reset to zero (ie, the start of a line) and the line number LINENO is incremented. The line number is itself then checked to see if the end of the page has been reached; if this is the case the subroutine called SCROLL is called to scroll the whole display screen up one line to allow text entry to continue.

Scroll screen subroutine. This has the effect of moving line 1 to line 0, line 2 to line 1 . . . line 25 to line 24, and clearing the last line, line 25; thus the complete screen is scrolled up one line. To do this a scroll line number and scroll character number SCHARN & SLINEN are used so as to leave the normal character and line numbers unaffected by this routine.

Fill screen (FSCRN) subroutine. This fills the complete screen area with the character whose ASCII code is in the accumulator when the routine is called. Its main function is in the clear screen routine which clears the screen by filling it with ASCII space characters, but it could be used to create the background for a graphics type game, for example.

Clear screen (CSCRN) subroutine. This subroutine clears the screen by loading the accumulator with '20H' (ASCII space) and calling FSCRN.

As described in part one, the character font uses a 2716 EPROM to store 128 characters corresponding to the ASCII codes '00H' to '7FH'. A character cell consists of 11 rows of eight columns. Figure 2, for example, shows the character font and PROM data pattern for an 'A'; this demonstrates how to code the PROM data for any required font pattern. Figures 3,a, b,c, and d give a listing of the data for the standard ASCII character set plus some example graphics characters (Figure 3a).

Conclusion

These two articles have described a flexible low-cost high-density VDU interface card that may be added to most of the popular systems on the market today. The addition of this unit will help to upgrade a system to that of a much more expensive professional machine at a cost that will allow more computing power to more people — which after all is what personal computing is all about.

A full software listing plus circuit diagrams will be published next month.

ASCII code	Character	PROM address	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
40	@	40X			1C	22	4E	54	4C	20	1C							
41	A	41X			10	28	44	7C	44	44	44							
42	B	42X			78	24	24	38	24	24	78							
43	C	43X			38	44	40	40	40	44	38							
44	D	44X			78	24	24	24	24	24	78							
45	E	45X			7C	40	40	78	40	40	7C							
46	F	46X			7C	40	40	78	40	40	40							
47	G	47X			38	44	40	5C	44	44	38							
48	H	48X			44	44	44	7C	44	44	44							
49	I	49X			38	10	10	10	10	10	38							
4A	J	4AX			1C	08	08	08	08	48	30							
4B	K	4BX			44	48	50	60	50	48	44							
4C	L	4CX			40	40	40	40	40	40	7C							
4D	M	4DX			44	6C	54	54	44	44	44							
4E	N	4EX			44	44	64	54	4C	44	44							
4F	O	4FX			10	28	44	44	44	28	10							
50	P	50X			78	44	44	78	40	40	40							
51	Q	51X			38	44	44	44	44	4C	3C							
52	R	52X			78	44	44	78	50	48	44							
53	S	53X			38	44	40	38	04	44	38							
54	T	54X			7C	10	10	10	10	10	10							
55	U	55X			44	44	44	44	44	44	38							
56	V	56X			44	44	44	28	28	10	10							
57	W	57X			44	44	44	54	54	6C	44							
58	X	58X			44	44	28	10	28	44	44							
59	Y	59X			44	44	28	10	10	10	10							
5A	Z	5AX			7C	04	08	10	20	40	7C							
5B	[	5BX			38	20	20	20	20	20	38							
5C	\	5CX				40	20	10	08	04								
5D	]	5DX			1C	04	04	04	04	04	1C							
5E	↑	5EX			10	38	54	10	10	10	10							
5F	—	5FX									FF							

Fig 3(c) Character font

ASCII code	Character	PROM address	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
60	'	60X			18	18	08											
61	a	61X					30	08	38	48	34							
62	b	62X			40	40	58	64	44	64	58							
63	c	63X					38	44	40	44	38							
64	d	64X			04	04	34	4C	44	4C	34							
65	e	65X					38	44	7C	40	38							
66	f	66X			08	14	10	38	10	10	10							
67	g	67X					34	4C	4C	34	04	44	38					
68	h	68X			40	40	58	64	44	44	44							
69	i	69X			10		30	10	10	10	38							
6A	j	6AX			08		18	08	08	08	08	48	30					
6B	k	6BX			40	40	48	50	60	50	48							
6C	l	6CX			18	08	08	08	08	08	1C							
6D	m	6DX					6C	54	54	54	44							
6E	n	6EX					58	64	44	44	44							
6F	o	6FX					38	44	44	44	38							
70	p	70X					58	64	44	64	58	40	40					
71	q	71X					34	4C	44	4C	34	04	06					
72	r	72X					58	64	40	40	40							
73	s	73X					38	40	38	04	78							
74	t	74X				10	38	10	10	14	08							
75	u	75X					44	44	44	4C	34							
76	v	76X					44	44	44	28	10							
77	w	77X					44	54	54	54	28							
78	x	78X					44	28	10	28	44							
79	y	79X					44	44	44	4C	34	04	38					
7A	z	7AX					7C	08	10	20	7C							
7B	{	7BX			08	10	10	20	10	10	08							
7C	|	7CX	10	10	10	10	10	10	10	10	10	10	10					
7D	}	7DX			20	10	10	08	10	10	20							
7E	~	7EX					20	54	80									
7F	BJH	7FX	C0	A0	C0	A0	BC	CC	0D	2F	15	05	05					

Fig 3(d) Character font

"Give me one good reason why I should choose a VIC 20 home computer."



1. VIC is outstanding value for money. No other colour home computer can give so much for under £200.

2. Total standard memory 25K made up of 20K ROM and 5K RAM.

3. Fully expandable to 32K of user RAM.

4. Microsoft Basic interpreter as standard.

5. Accessible machine language as standard.

6. Connects direct to monitor or standard television.

7. Full size typewriter-style keyboard.

8. Full colour and sound.

9. All colours directly controllable from the keyboard.

10. 62 predefined graphic characters direct from the keyboard.

11. Full set of upper and lower case characters.

12. 512 displayable characters direct from the keyboard.

13. High resolution graphics capability built into the machine.

14. Programmable function keys.

15. Automatic repeat on cursor function keys.

16. User-definable input/output port.

17. Machine bus port for memory expansion and ROM software.

18. Standard interfaces for hardware peripherals.

19. VIC 20 is truly expandable into a highly sophisticated computer system. The comprehensive list of accessories includes the following:

- Cassette tape unit.
- Single drive 5¼" floppy disk unit (170 K bytes capacity).
- 80-column dot matrix printer.
- 3K, 8K and 16K RAM expansion cartridges.
- Programming aid packs, including a high resolution graphics cartridge, a machine code monitor cartridge and a programmers' aid cartridge.
- Memory expansion board.
- Plug-in conversion box for a full 32K, 40-column x 25 lines VIC including Prestel compatability.
- Prestel/Tantel interface package.
- RS 232C communication cartridge.
- IEEE/488 interface cartridge.
- Joysticks, light pens, paddles and motor controllers.

20. Full range of software for home, education, business and entertainment on disk, cassette and cartridge.

21. Books, manuals and learning aids from Teach Yourself Basic to the VIC programmers' reference guide (a must for advanced programmers).

22. Full support for VIC owners – their own magazine 'VIC Computing' as well as a national network of VIC user groups.

23. National dealer network providing full service and support to VIC owners.

24. Expertise and experience – Commodore are world leaders in microcomputer and silicon chip technology.

25. Commodore is the leading supplier of micro-computers in the UK to business, schools, industry and the home.

26. VIC 20 is the best-selling colour home computer in the UK.

How many reasons was it you wanted?

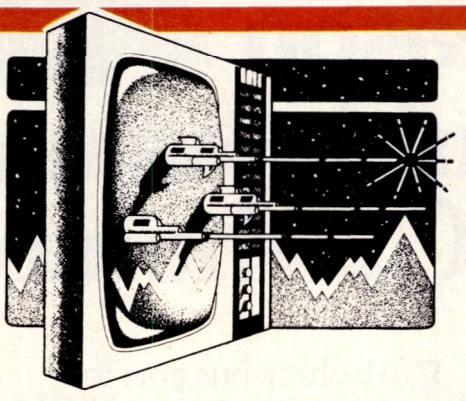
commodore

VIC 20

The best home computer in the world.

FOR MORE INFORMATION ON THE VIC20, TELEPHONE OR WRITE TO: COMMODORE INFORMATION CENTRE, BAKER STREET, HIGH WYCOMBE, BUCKS, OR TEL: SLOUGH 79292.

SCREENPLAY



In this new series Dick Olney reviews the games software for popular home computers. This month the Texas Instruments 99/4A

The advances in computer-controlled video games over the past five years or so are breathtaking. A limited number of (mainly textual) computer games had been available to large computer users for many years, but the computing power required prohibited their use by the general public. In the mid-'70s, as the price of components fell and video techniques improved, the first stand-alone video games appeared, seemingly overnight, in arcades and bars throughout the western world. It started with those tennis games, where each player had a flat paddle (sometimes two) with which to return a simple bouncing ball. A slight sophistication of this was the popular 'Breakout', with the ball being used to knock out bricks from a horizontal wall. Then came Space Invaders, which rapidly achieved such notoriety that its name is now often (erroneously) used to describe the entire *genre*.

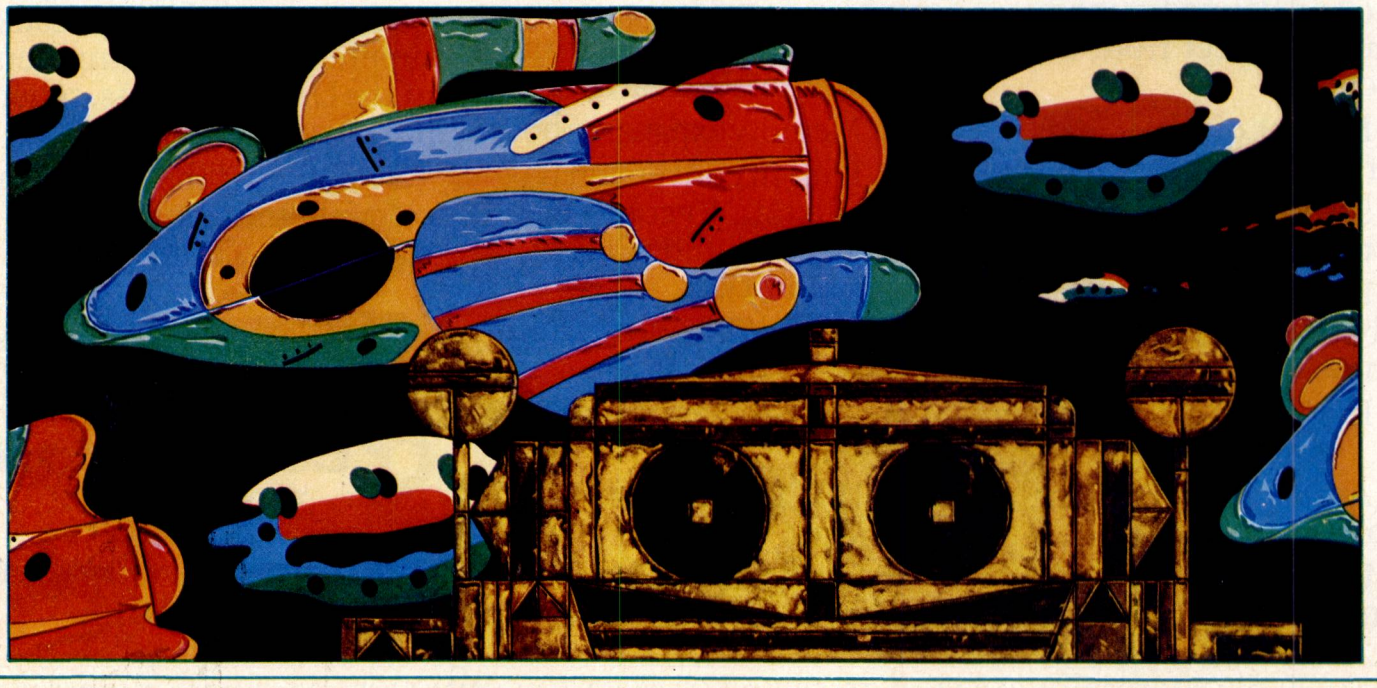
As Space Invaders and all its descendent forms took over the arcades, the paddle games became available on cheap modules plugging into a domestic TV. For a while, microcomputers could offer only fairly limited textual stuff (like Hangman), but with the advent of cheap graphics they, too, began to run sophisticated and colourful video games. Now the gap between home computers and TV video game modules has started to evaporate and may very soon disappear altogether. After all, if a unit has the power to run complex games programs, why not make that power available to the user?

Over the coming months I shall be looking with a critical eye at the games which home computers have to offer. Although many of the arcade originals like Space Invaders are now available on micros, the arcade games will remain some way ahead of their living room counterparts, if only because it makes sound economic sense for whoever owns the software copyright. For this reason I intend to look also at some of the best of these games.

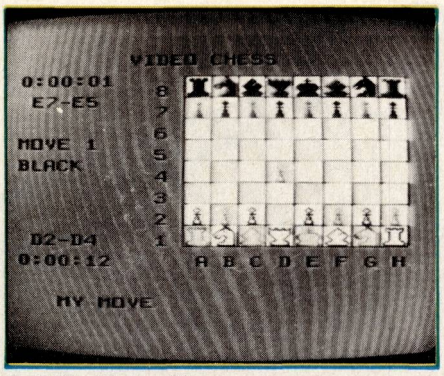
Hardware

We start this month with the Texas Instruments 99/4A, a compact and attractive microcomputer (see the Benchtest elsewhere in this issue) which, at £300 for the basic system, is aimed directly at the home market. It interfaces to a domestic TV though an external PAL modulator (the original machine only worked on American TVs), giving good — though not high resolution — colour graphics. Up to four disk drives can be attached but these aren't necessary to run the games software, which is supplied in plug-in ROM packs called 'Command Modules'. The machine is built around the 9900 16-bit processor and carries 16k of RAM (expandable to 48k).

Many of the games either require or are enhanced by ownership of 8-way joysticks which will cost you around £30. The system has an external power supply and with all the bits and pieces you'll find a lot of loose wires trailing about. Even a slight tug on one of these and your game may be abruptly terminated; so if you've got kids then beware.



Chris McEwan



GAME: Video Chess
PRICE: £49.95
SUPPLIER: TI

This is the most expensive game TI supplies. After plugging in the module, selecting from the initial menu, and watching some oversized pieces move around part of a board accompanied by a little tune, you are presented with six options. The first two involve playing a game against the computer; either going straight into a beginner's game or choosing your own skill level. The program plays at three levels — described as beginner, novice and intermediate — and you can instruct it to use normal, defensive or aggressive tactics. The vertical plane representation of the board took a little getting used to, as did the Cartesian co-ordinates used to move, but it is fairly easy to get the hang of.

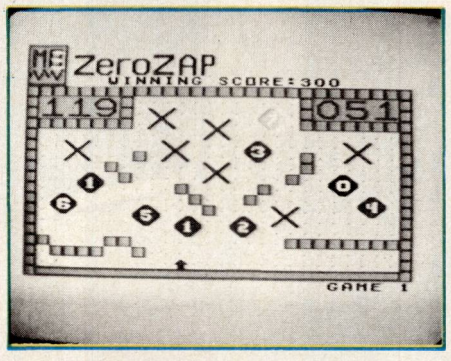
You can be assured of a very competent game of chess at all levels, although after a few games some rather interesting features become apparent. Rooks are given a very high priority, which is all very reasonable, but the TI chess seems to have an almost neurotic obsession with them. It is also a little too paranoid about its Queen, so that this piece is rarely exploited fully, and it generally ignores attempts by opposing pawns to reach the top of the board. Having said this, I should point out that I am not the world's best chess player! As the description of skill levels suggests, any really good chess player can be sure of beating the TI every time. Of course, nobody wants to play any game which they consistently lose but I do feel that we should at least have the option of a slightly more formidable opponent.

There are some nice touches which should prove of particular interest to learner chess players. The computer can swop sides at any time during a game and — associated with this ability — can always be persuaded to suggest a good move for you (yes — it always carries out its own suggestions if called on to do so). Pieces can be changed around at will during a game and any move can be replayed if desired.

Other options include setting up problems — that is positioning the pieces as if in the middle of a game — and using the board with two human players. Personally, if I'm playing another person, I'd rather use a normal chessboard but the problems setup is very good indeed. Another feature was the option to play up to eight simultaneous games against the machine, though you'll need plenty of time on your hands to fully appreciate this. There is also an option to load games to and from cassette, but I was unable to test this.

Despite its limitation in skill level, the TI Video Chess is a well-presented package which provides you with a competent chess partner. Its high price is balanced out by the proven lasting interest generated by the game of chess, but it is definitely more suited to a casual chess player than to a chess fanatic.

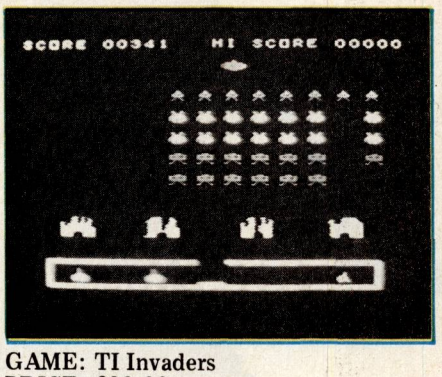
PRESENTATION: *****
SPECIAL FEATURES: ****
PLAYING SKILL: ***
VALUE FOR MONEY: ****



GAME: Zero Zap
PRICE: £ 19.95
SUPPLIER:TI (Produced by Milton Bradley)

This is a sort of pinball game in which you fire a small arrow upwards into a configuration of crosses, diamonds and small squares. Each shape causes the arrow to rebound in a different direction, with the crosses changing to diamonds if hit and vice versa. Only diamonds score points and each one displays a value between zero and nine. The name of the game derives from the fact that if your arrow hits a zero diamond it 'dies' and your go terminates; otherwise the arrow continues until it hits the base line. Three different configurations are offered. There appears to be a facility for designing new ones, but I couldn't get it to work. Zero Zap has an intriguing quality not unlike those executives games with balls on strings moving under the influence of various magnetic forces. It is somehow relaxing and comforting to watch, if a little mindless to play.

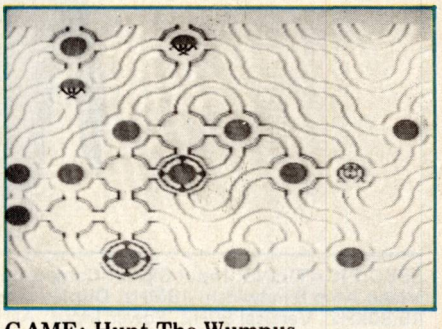
ADDICTIVE QUALITY: **
USE OF GRAPHICS: ****
RESPONSE SPEED: N/A
VALUE FOR MONEY: *



GAME: TI Invaders
PRICE: £39.00
SUPPLIER: TI

As you've probably guessed, this is Texas Instruments' version of Space Invaders. It should be available soon and is very slick, although strangely it only allows one-player games. Good use is made of the graphics by the colour scheme, and the program runs fast and fluently. I long ago tired of this game in the arcades, but having such a good version in my living room did rekindle my interest. If you haven't already spent your quota in ten pences then you'll probably find this module good value for money.

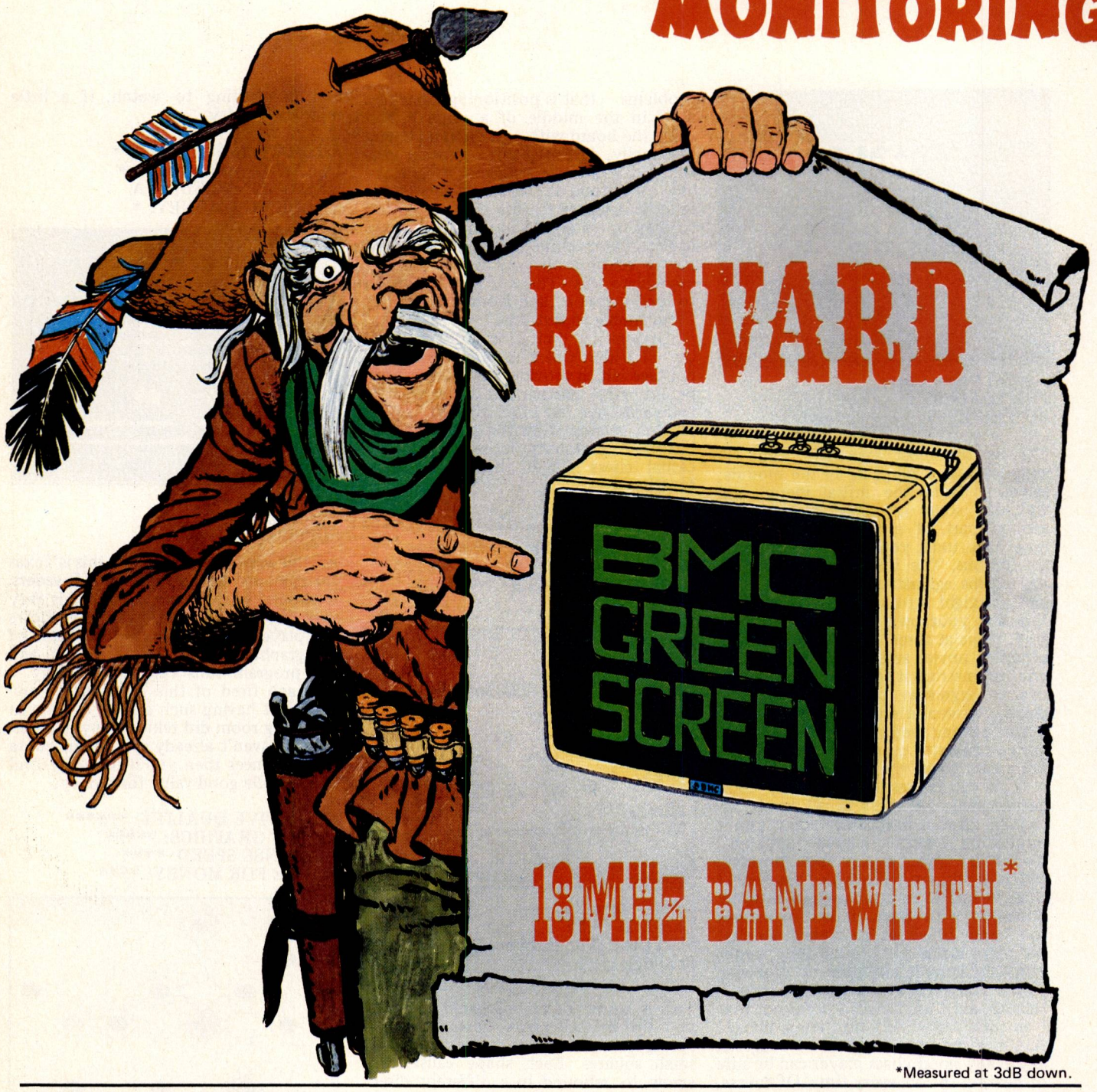
ADDICTIVE QUALITY: ******
USE OF GRAPHICS: *****
RESPONSE SPEED: ****
VALUE FOR MONEY: ****



GAME: Hunt The Wumpus
PRICE: £19.95
SUPPLIER: TI

Many versions of this game can be found on various computers. It involves moving a little man (woman?) around the screen which gradually reveals a maze of caverns, one of which is inhabited by the carnivorous Wumpus Indications are given when you are two caverns away from the aforementioned or one away from a deadly slime pit. Some caverns may also contain bats

WANTED – BETTER MONITORING



*Measured at 3dB down.

SPECIFICATIONS: Input Signal: Composite Video, Negative SYNC. 1.0±0.2V p-p, 75ohms. CRT Size: 31cm (12" diag). CRT Colour: P31 Green. Video Amp Bandwidth: 18MHz. Display Area: Hor. 21cm x Vert.15cm. Display Format: 1920 Characters Max. Scanning Frequency: Horizontal 15.80kHZ, Vertical 50HZ. Power Input: AC 230V, 50Hz. Power Consumption: 26W. Dimensions: 32 (W) x 27.9 (H) x 30.8 (D)cm. Weight: 7kg.

Sole UK Importer and Distributor:

Micro Peripherals ltd.

61 NEW MARKET SQUARE, BASINGSTOKE, HAMPSHIRE.

Telephone: BASINGSTOKE (0256) 56468 (4 lines)

JAPANESE OFFICE: 101 Abe Bldg, 4F, 2-42 Kanda Jinbocho, Chiyado-ku. Tokyo, Japan.

WHOLESALERS AND DISTRIBUTORS OF QUALITY JAPANESE MICRO PRODUCTS

BMC INTERNATIONAL

No. 27, 5-Chome, Tanimachi, Higashi-Ku, Osaka 540, Japan.

which occasionally transport you to random portions in the maze. When you have located the Wumpus, you fire an arrrow up the tunnel towards the cavern in which you think he's hiding (having positioned yourself in an adjacent cavern). If you miss him — or if you stumble into his lair by mistake — the Wumpus wakes up and eats you, so you've only got one try. Three different complexities of maze are possible as well as express (missing out tunnels) and blindfold (the maze disappears behind you) versions. Your character can be moved via the keyboard or using the joysticks, and can travel in four directions. The game is a lot of fun for a while but I'm not sure how long it would hold my interest. I loved the slime pit graphics!

ADDICTIVE QUALITY: **
USE OF GRAPHICS: ****
RESPONSE TIME: N/A
VALUE FOR MONEY: ***



GAME: Tombstone City
PRICE: £39.00
SUPPLIER: TI

This game has the irritating feature of using the 8-way joysticks for 4-way motion. Fortunately, there is also the option of using the arrow keys (E, S, D, and X) which I actually found easier. You control a small triangle, described as a schooner, which can fire missiles at hostile little monsters called, 'morgs' and at balls of tumbleweed. The former turn into 'saguards' if hit; these look like tombstones and obstruct movement. The schooner can take refuge inside a square grid of corridors in the centre of the screen. Saguards will block the exits to this area, however, so care must be taken not to seal

GOTO page 192

ARCADE ACE



Inevitably the arcade game I have chosen to kick off with is my personal favourite; the complex 'Defender'. Generally, I begin to lose interest in games soon after my score ceases to improve (though I'm not sure which way this relationship works), but I've found 'Defender' an inexhaustible source of amusement. The playing object looks like a jet fighter and moves both horizontally and vertically. Vertical movement is controlled by a simple two-way joystick, and horizontal movement via a 'thrust button'. There is also a reverse button which turns the craft round, so you really do have complete control over it. At the bottom of the screen there is an outline of mountains, presumably representing the surface of a planet, but this does not restrict your movement.

The main screen shows only a section of the action and this is complemented by a small scan screen at the top showing the entire playing area. There are ten humanoids scattered around the planet's surface, and your main task is to prevent these being kidnapped by yellow splodges called 'Landers'. The fire button gives a rapid and continuous beam from the front of your craft and to supplement this you are also supplied with a limited number of 'smart bombs', which kill all aliens on the main screen. The landers try pick up the humanoids and carry them to the top of the screen. If successful, they turn into 'mutants' which give you a lot of trouble. If you shoot a lander while it is attempting this, you can pick up the humanoid and deposit it back on the planet, for which you gain 1000 points. When all the aliens have been destroyed you are given a bonus for remaining humanoids and a fresh attack wave begins.

In the second and subsequent attack waves a varied selection of aliens is thrown against you. 'Bombers' are little purple squares pursuing a kind of sine wave course in packs of three or more and leaving deadly mines in their wake (luckily these mines are only active for a limited period). 'Pods' are little glistening orbs which, when hit, release a random number of 'swarmers'. The swarmers, as their name suggests, tend to stick together, and are like fast moving orange pips. If you take too long over an attack wave, then 'baiters' appear; they look like little flying saucers and are very difficult to shoot down. I should add that all of these except pods and bombers are constantly firing missiles at you.

If all your humanoids are destroyed (either by landers or your shooting them by mistake) then the planet surface disappears and all landers turn into mutants which mount a concerted and sustained attack on your craft. You start with three ships and three smart bombs and get an extra one of each for every 10,000 points. This means that the game could, theoretically, go on for ever; but in practice the real experts seem to knock up a maximum of around 250,000.

The positioning of the various controls can vary, but usually your left hand controls the joystick and reverse button, whilst your right hand is responsible for the thrust, fire and smart bomb buttons. One other feature is a hyperspace button which randomly transports your ship to a new position in the playing area. This is fairly hazardous and — partly because the button is out of reach of both hands — I have yet to integrate this function into my game, though many people use it reasonably effectively in cases of extreme panic.

The graphics and sound effects are superb, but the real joy of this game is the extensive control which you have over your ship. The incredibly rapid responses of the machine make for a fast-moving and exciting battle, and the varied nature of the aliens and their modes of attack call for complex tactical manoeuvres. The only drawback to all this is that it takes some time (and a very large number of ten pences) before you really play a satisfying game. I look forward to the time when games of this speed and quality are available on home units.



BENCHTEST
BUSINESS SYSTEM

THE SOFT MACHINE
HP-125

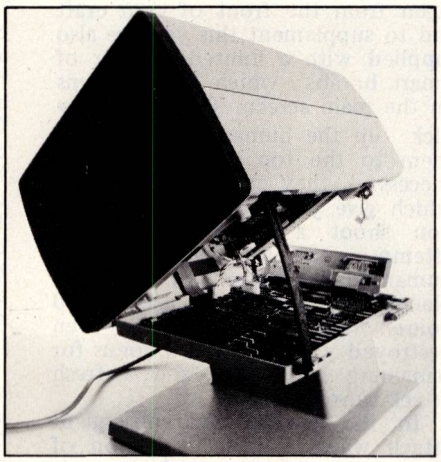
Dick Pountain gets to grips with HP's classy business micro

Digital Research must have found 1981 a most satisfactory year indeed. Prior to 1980 it would have been fair to describe its best-known product, CP/M, as one of the leading microcomputer operating systems; nevertheless, it still had competition from this DOS and that DOS. In 1981, however, CP/M became unquestionably *the* operating system for commercial users, largely through the actions of three firms: IBM, Xerox and Hewlett-Packard. None of these firms are exactly wet behind the ears where computers are concerned; all three were entering the business micro market for the first time and all three decided to offer fealty to the new sovereign, CP/M.

The only problem with all this is that, though it has lots of nice aids for the programmer (like assembler-debugger-disassembler and file handling routines), CP/M is about as friendly to the end-user as a praying mantis. As far as most businessmen are concerned DDT is a fly spray and PIPs are something you spit out. One of the prominent features of most successful CP/M software packages, like the word processor I'm writing this on, is that they keep you as far away as they can from the operating system by wallpapering it over with their own mnemonic command codes; even then it's usually not far enough.

Hewlett-Packard has an enviable, Rolls-Royce like reputation for supplying high quality goods at high quality prices. It is no surprise, therefore, to discover that having (wisely) decided to swim with the tide and adopt CP/M for its new business micro, the HP-125, it felt obliged to knock some of the rough edges off. This has been accomplished not by altering the op-system itself but by carefully designed hardware aids such that an end user can use the machine for months without ever seeing A>.

At a minimum system price of £4,800 the 125 is not bargain-basement stuff, and a principal object of this test was to find out what could justify spending such a sum when an ostensibly equal system can be had for well under £3,000.

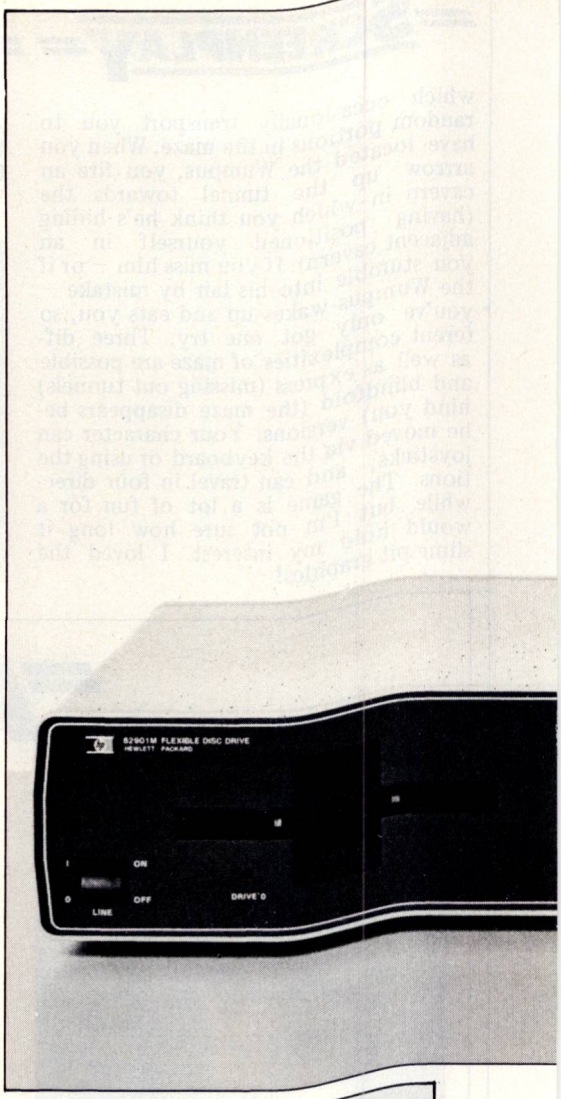


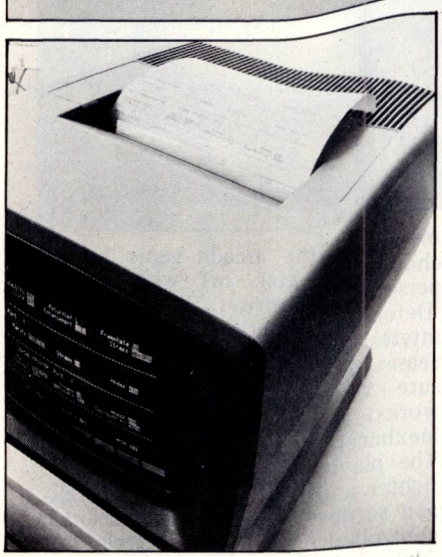
Under the hood

Hardware

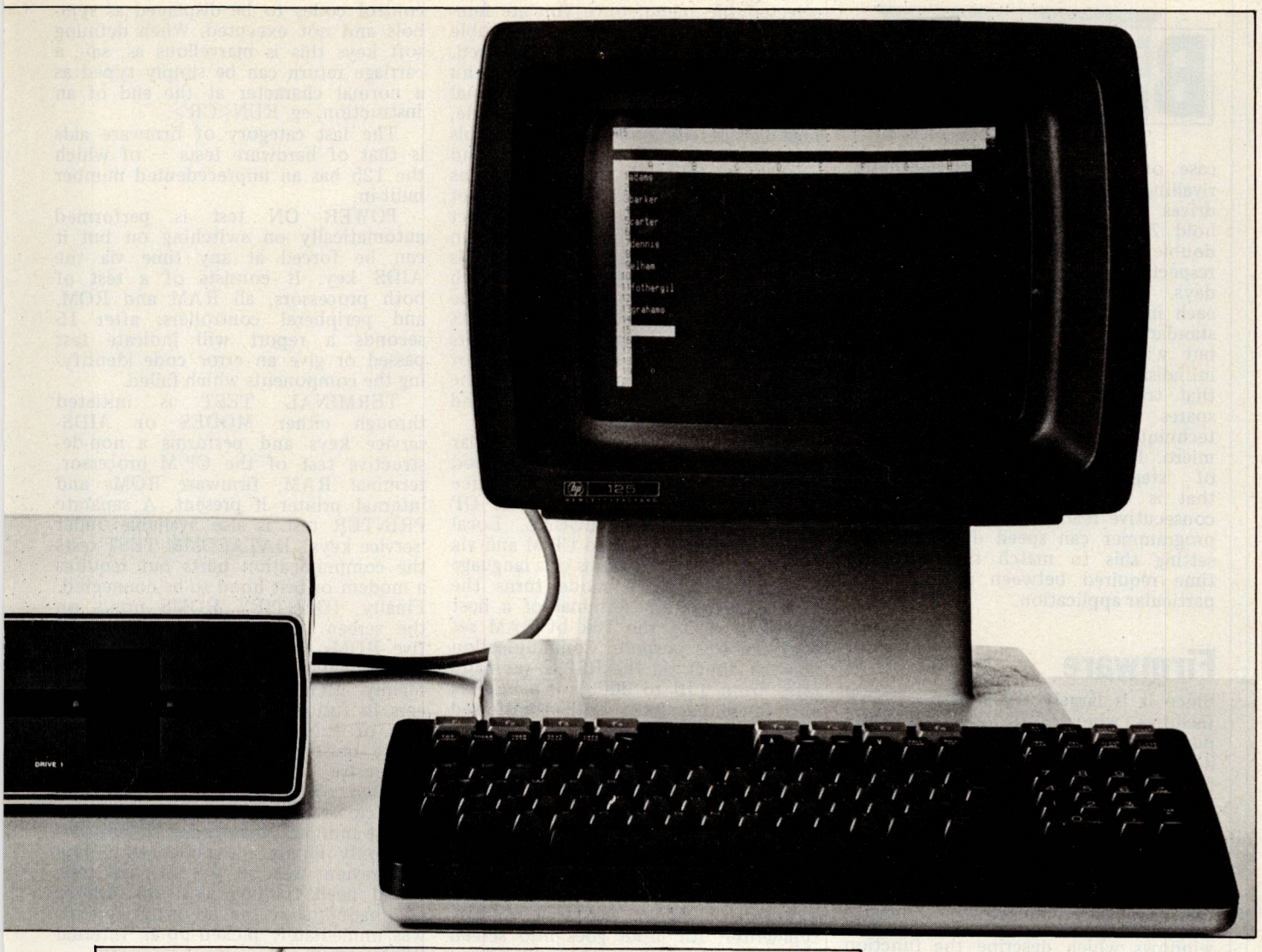
The HP-125 comes in a package which, in conformity with the current trend, features a remote keyboard (as do the IBM and Sirius). The processor and VDU are housed in a separate pedestal which is adapted from HP's own 2621 terminal design. This high-quality ABS moulding opens sideways upon slackening two screws and props open like a car hood, revealing a single main board which is removed in a trice from its four 'pop' fasteners. This board contains the two Z80A processors and 80k of RAM, of which 16k is reserved for the terminal functions. In addition there are five ROMs (32k in all) containing the firmware which supports the 125's fancy features. One of these may be replaced with optional foreign language character sets. The machine is in fact designed as two entities, the computer and the terminal, each with its own processor and memory. The front end requires the computer to send it standard HP escape codes just as if it were a remote terminal; the two can even be (logically) disconnected. The closely packed electronics are kept cool by a quiet fan in the base which blows air up the pedestal column and out through louvres in the top; as the intake is under the foot it is as well not to stand the 125 on a shag-pile rug.

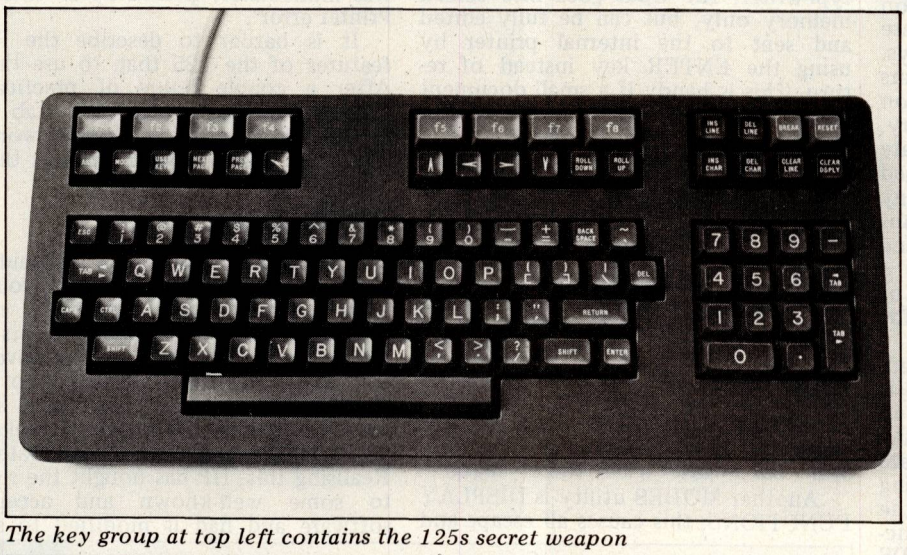
The 12 in CRT displays in untrendy black and white. The resolution is





The integral thermal printer





The key group at top left contains the 125s secret weapon

a very high 720 x 360 dots which permits the use of well-formed characters on a larger than usual 9 x 15 matrix, making for excellent readability. The screen holds the standard 80 x 24 characters though in fact 26 lines are displayed, the bottom two being permanently reserved for the soft key function labels — of which more later. The other unusual feature of the screen is that the display buffer holds 120 lines of text or five screens-full; the screen is treated as a window into this longer document and can be scrolled up or down either one line or one page at a time by four special keys.

Set in the top of the case on the machine I tested was the optional internal printer, a thermal device which takes rolls of friction feed 8½in paper and produces clear blue characters at a commendable 100 cps. It is permanently online and can be selected from the keyboard for listings, screen dumps and the like, though it is definitely not intended for serious word processing.

The keyboard is connected at the back of the case via a rather short stiff cable; a coiled connector would have allowed freer mobility when used on the knee. The 97 keys are of excellent quality and feel, are fully debounced with n-key roll-over, and all have auto repeat. Apart from the main Qwerty block there are numeric pad, cursor key, edit key, help key, and soft key blocks. The cursor controls are four-way plus 'home'; edit controls are character or line delete and insert, and clear from present cursor position to the end of screen memory (clear screen is achieved by preceding this key with 'home'). ROLL UP/DOWN and NEXT/PREV PAGE control scrolling through screen memory. My only complaint about the keyboard is that the CAPS lock has no light or other signal to show that it's engaged.

The rear of the pedestal proffers two RS232C ports for peripherals and communications and one HP-IB (more familiar as IEEE-488, though Hewlett-Packard did invent it) port through which the disk drives and HP printers connect. The supplied connector cable for this interface has plugs which carry a second socket so that they can be stacked up, which allows daisy chain or parallel arrangement of peripherals or a mixture. You could have eight disk drives daisy-chained with a printer and a plotter in parallel all on the one socket; since each HP peripheral can be set to a unique 'device address' no recognition problem will arise.

Both 5in and 8in disk drives are available, though the test was carried out with the dual 5in. Each type occupies a separate housing which in the

case of the 8in drives is enormous, rivalling the gargantuan TRS-80 II drives in sheer bulk. The 5in disks hold 256k per drive (double density, double sided, soft sectored) which is respectable if not remarkable nowadays. The 8in drives hold 1 Mbyte each in a choice of two formats; IBM standard or HP's own which is similar but with two tracks reserved; if on initialisation a duff sector is detected, that track is closed and one of the spares substituted, a 'big computer' technique not used until now on a micro. Both disk types allow selection of 'stagger' during initialisation — that is the degree of interleaving of consecutive read/write sectors. A smart programmer can speed disk access by setting this to match the processing time required between accesses in a particular application.

Firmware

Since it is largely the superb terminal facilities which stop the 125 being just another 64k CP/M machine I shall devote a whole section to them. They fall into three main categories: Help features, Operation Modes and Test routines.

The keyboard has eight soft keys, f1 to f8, below which are three keys marked AIDS, MODES and USER KEYS. On the CRT screen the bottom two rows contain eight reverse field windows which describe the function currently allocated to each key and are placed exactly above their own keys. In the central gap appear two numbers which announce the cursor's position in the whole 120-line screen memory. If USER KEY is pressed, the keys are handed over to user programmed definitions like the soft keys on many other computers. These definitions are entered and edited by pressing SHIFT USER KEY which displays a menu of all the assignments. Labels of up to 16 characters are permitted for key functions.

When AIDS or MODES are pressed, however, control of the soft keys is handed over to firmware routines in ROM which allow selection of all the terminal features. These routines are written in a very ingenious way using a 'tree' search structure so that the eight keys can provide a host of functions. For instance, depressing AIDS displays six headings over the f-keys; printer control, margins/tabs/cols, service keys, enhance select, load op sys and config. Load op. sys. performs a reboot but any of the other options will display *another* menu of key assignments from which a further selection is made. For instance, pressing, 'enhance select' produces the options 'remove enhance', 'enhance char.' and 'enhance line'. These apply whichever enhancement is selected (reverse video, underline, dim, flashing or any combination) to the screen. These sub-menus are carefully designed so that the most used function is on the same key which selected the menu; once you are familiar with the system a quick double stab at the key is all that's required. 'Config' displays a whole-screen menu which allows setting of all the terminal parameters such as enhance mode, port status, communications protocols and baud rate, device selection and even keyboard click on/off and mains frequency. These parameters are set by moving the cursor to the correct place and using the soft keys for option selection; unfortunately the cursor is only a small flashing underline which is easily lost in the dense menu. The configuration is stored in a small CMOS memory which retains its contents under battery power so that it need not be reset every session; curiously, the USER key definitions are not included in this excellent scheme.

The MODES key works in a similar fashion but now what is being selected is the mode of operation. The three fundamental modes are LOCAL OP SYS, REMOTE and LOCAL. Local op. sys. hands control to CP/M and via it to applications programs or a language interpreter. Remote mode turns the 125 into a dumb terminal of a host computer, using the 16k of RAM set aside for this purpose. Communication may be direct via the RS232 (at baud rates from 110 to 9600) or a modem and telephone link. Data transferred in this mode may be logged on the internal, or any other printer. The Config utility is used to set up suitable protocols including various handshake modes and parity checks. Local mode is entered by disabling both Remote and Local Op Sys (both are toggles which display an asterisk in their window when enabled) and turns the 125 into a rather expensive electric typewriter. All input goes into screen memory only, but can be fully edited and sent to the internal printer by using the ENTER key instead of return. This is handy if a small document needs typing which doesn't justify loading up a word processor.

This brings me on to the first items on the MODES menu: MODIFY LINE and MODIFY ALL. The editing keys, in fact, only work on screen contents unless MODIFY ALL is engaged, in which case the alterations are sent to CP/M; editing is screen oriented using the cursor. MODIFY LINE allows editing of one line at a time. Neither of these keys has any effect in local mode of course and care must be taken to disable them while running Basic programs since Break and Control-C will not work with them engaged.

Another MODES utility is DISPLAY FUNCTIONS; this causes all escape and control codes to be displayed as symbols and not executed. When defining soft keys this is marvellous as, say, a carriage return can be simply typed as a normal character at the end of an instruction, eg. RUN<CR>.

The last category of firmware aids is that of hardware tests — of which the 125 has an unprecedented number built-in.

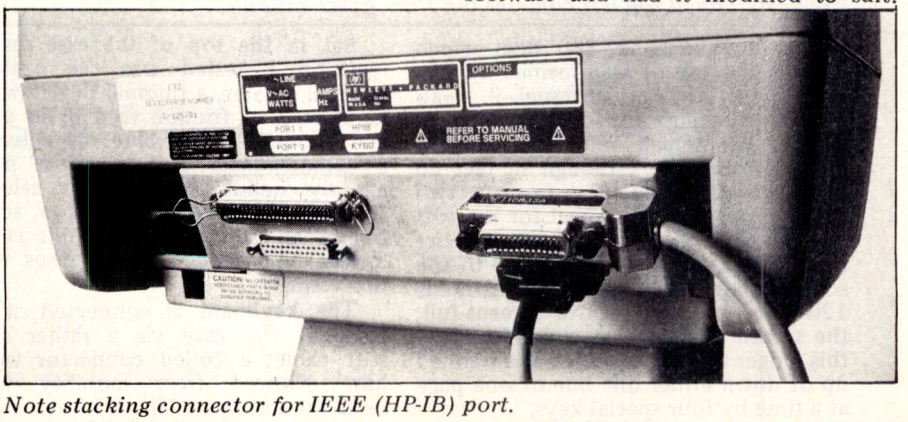
POWER ON test is performed automatically on switching on but it can be forced at any time via the AIDS key. It consists of a test of both processors, all RAM and ROM. and peripheral controllers; after 15 seconds a report will indicate test passed or give an error code identifying the components which failed.

TERMINAL TEST is initiated through either MODES or AIDS-service keys and performs a non-destructive test of the CP/M processor, terminal RAM, firmware ROMs and internal printer if present. A separate PRINTER test is also available under 'service keys'. DATACOMM TEST tests the communication ports but requires a modem or test hood to be connected. Finally, IDENTIFY ROMS prints on the screen the serial numbers of the five ROMs fitted and includes a code saying which version they are; this is mainly intended for HP service engineers in future years, when a proliferation of ROMs may be in circulation. These must surely be the most comprehensive diagnostic routine ever supplied on a micro and bring us a little closer to the conveniences enjoyed by the mini and mainframe fraternities. The only failure I experienced during this review was on the terminal test; I had been fiddling with the printer and hadn't shut the lid properly; this was immediately picked up as 'Internal Printer error'.

It is harder to describe the Help features of the 125 than to use them. After a couple hours of practice it becomes second nature to stab the function keys and you begin to wonder how you ever managed without them.

Software

The attraction of CP/M to a manufacturer like Hewlett-Packard is, of course, that a substantial amount of commercially proven software exists to run under it. However, having devoted so much care and attention to the friendly firmware, it would be a little crass to provide bog-standard packages which cannot exploit the 125's features. Realising this, HP has bought the rights to some well-known and accepted software and had it modified to suit.



Note stacking connector for IEEE (HP-IB) port.

CP/M itself (version 2.2) has several functions added, including a reader status call and output to an HP-IB device. Another interesting addition is call 125 which enables 'keycode mode', in which the terminal portion intercepts a keystroke on its way to CP/M and allows its redefinition under program control.

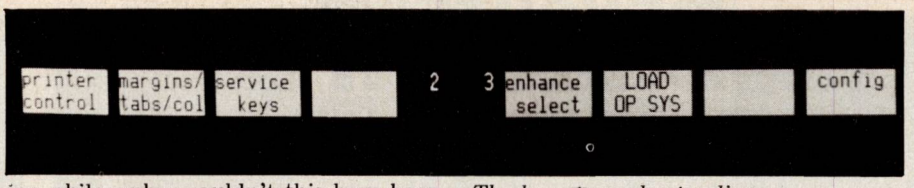
On booting CP/M (automatic on power-up from drive 0) a Welcome menu appears which has all the applications programs on the current disk assigned to soft keys; pressing the appropriate key loads and runs the program. The last option is 'exit to CP/M', which is why my earlier jest about never having to see the prompt A> could easily come true. It is heartening to see that HP has provided its own error messages, which are displayed in screen lines 25 and 26. No more 'BDOS error on A' nonsense, but plain English (American?).

Five applications are available at present, and these are supplied on separate master disks. The user installs them as required on a work disk using a routine accessed from the Welcome menu which ties the program to this menu and to a soft key. A program called Utility/125 is included which formats up to eight disks simultaneously using a menu of options. A utility for installing applications is also included. This also copies disks, consolidating files as it does so; 39k of free space was increased to 65k after its use. Formatting a 5in disk took three and a half minutes and copying 191k three minutes, which is not fast; formatting an 8in disk seemed to take forever.

Basic/125 is at root Microsoft's Basic 80 version 5.2 with the addition of facilities to incorporate the soft keys via escape sequences and to use overlays. It occupies 36k (CP/M included) of RAM, leaving the user 28k. Arithmetic is single 7-digit or double 16-digit precision, random and sequential files are supported, and several nice aids like auto line number, renumber and trace are provided along with IF ... THEN ... ELSE ... and WHILE ... WEND. The 125's superior editing overrides the rather spartan Basic-80 line editor (you remember, the one that makes you edit lines you can't see). Unfortunately, the Microsoft editor must be used for lines which occupy more than a single screen line. While Basic is running all the AIDS and MODES are available, as are the user keys, which can be assigned for single stroke entry of reserved words.

There are no new instructions in HP's implementation of Basic-80; the special hardware features are all got at by sending Escape sequences. In particular, there are no graphics statements; he who would light pixels will have to go into machine code. The soft keys (in USER mode) can be defined from a Basic program by defining a function which sends the correct string of ESC codes; this is covered in the Basic/125 manual and a complete list of codes is in the system reference manual.

The only real atrocity I found in Basic/125 is that attempting to save to a write-protected disk causes a fatal error, requiring a reboot with loss of your program. Given the general machine philosophy, couldn't this have been trapped so as to return you to Basic command level with a suitable (ie, sensible), error message?



The keys to understanding

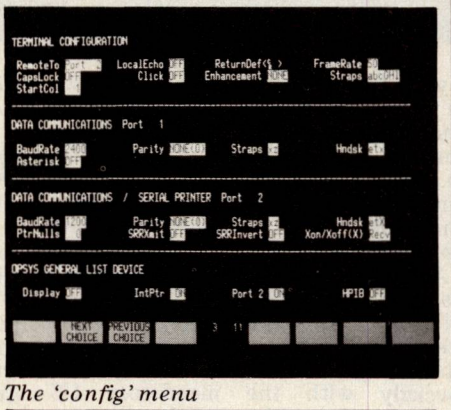
Graphics/125 is a comprehensive set of plotting routines which can produce bar charts, pie charts and X-Y graphs with linear or logarithmic axes on an HP Plotter (7225B or 9872C); it will not work without a plotter connected and does not display on screen or printer but it can plot in eight colours, add legends, grids and seven types of shading, 'explode' slices from pie charts and produce overhead projection slides. Data entry and formatting is very easy using a screen menu and the soft keys, but lack of a plotter prevented me from performing an actual run. A very important feature is that it interfaces with Visicalc/125 by its capacity to load DIF files; it can also if required load WORD/125 files.

Visicalc/125 is the self-same 'Top of the Pops' program from Personal Software adapted for the first time for Z80+CP/M operation; why HP chose this expensive route rather than a CP/M ready lookalike such as Supercalc I can't say, though the mere name itself strikes a certain chord nowadays. It appears to run faster than its Apple equivalent, thanks to the separate I/O processor (the Benchmarks do not adequately reflect this bonus). This is the only application which makes no use of the soft keys; standard Visicalc codes are used and AIDS and MODES are disabled.

Word/125 is in fact Lexisoft's Spellbinder, which several trusted colleagues prefer to the more popular Wordstar though this was my first encounter with it. Certainly in this implementation, with maximum use made of the soft keys, it is a superbly fluent word-processor and creditably rapid in its response times, again thanks to the second processor. Virtually all the commands have been assigned to the soft keys using three levels of access where necessary, like AIDS. For instance, to highlight a character involves three quick taps of a single key. Sideways scrolling allows 160 chars per line. Mailing list, label printing, line numbering and boiler plating are all supported.

Link/125, the fifth program, makes the 125 into an intelligent terminal for an HP 3000 minicomputer, allowing two-way file transfer and interrogation of a remote database by QUERY files. Not having an HP 3000 about my person I didn't try it, though predictably it works through a menu and soft key selection.

Although this is all that is currently available with the HP trademark, Lifeboat Associates in the US is stocking a large range of programming tools like Macro-80 and the ZSID debugger plus various Pascals, Cobols, Basic compilers, Fortran and Algol-80 and database packages DBMS and dbase II. Presumably these do not make use of the special terminal features.



The 'config' menu

Expansion and potential

The HP-125 (called the Business Assistant in HP brochures) has been designed quite unambiguously and single-mindedly as a business computer. The customer whom HP probably had in mind is the largish firm, which perhaps already has a DP department (preferably with HP hardware) but has decided to move with the times and provide personal application computers for key staff which can if needed communicate with the big stuff. In short, it is an ideal management tool.

It is, however, a quite suitable machine for the small business which is far-sighted (and liquid) enough to spend more than might appear necessary in order to ensure reliability, good service and user convenience. It is certainly the most user-friendly machine I've ever used, though the programmer is not catered for quite so cosily. The existing software is of high quality but the various Ledger and Data Retrieval packages needed by the smaller business do not yet exist.

This brings me to my only serious reservation about the machine. To justify paying the high cost of this machine you need to run software which utilises its hardware niceties to the full; this to some extent neutralises the advantage of choosing CP/M unless a steady supply of such software can be guaranteed.

The 125 lacks the graphic flexibility and the maths capability to appeal to scientific users who are in any case already catered for very well in the HP catalogue. It is quite simply too expensive to appeal to educationalists or hobbyists.

The basic system can be extended to include eight disk drives which would represent 8 Mbytes on line if they were all 8in. Single master drives and single or double slave drives are available in both sizes. At £4,000 for a dual 8in master drive 8Mb is horrifically expensive, and someone with that storage requirement will probably wait for winchesters to become available. I suspect two 5in or two 8in will be the most common installation.

GOTO page 190

BENCHTEST
PERSONAL COMPUTER

TEX

Vincent Tseng tests TI's relaunched home micro, the 99/4A.

Way back in 1978, Texas Instruments, the giant of the electronics industry, announced (with all the attendant rumours) that it was going to enter the personal computer market. The plan then was to bring out an upward compatible range of personal and home computers.

As you now know, what arrived was the TI-99/4 Home Computer in 1979, and, although it worked competently, it was nothing particularly outstanding — it was over-priced, especially with the mandatory US standard colour TV, and it was generally regarded as a damp squib.

Texas Instruments has now brought out the second version of its home computer, the TI-99/4A. An in-joke in the electronics industry is that components with a subscript 'A' are the versions that have finally been made to work properly! Perhaps it is a little unkind and unfair to apply this quip here, but has Texas Instruments finally got it right?

The TI-99/4 and the TI-99/4A have always been sold as home computers and named as such; no attempts have been made to promote them as anything else (eg, as a business computer, as is so often the case). One of the most significant changes in the move to the 'A' version is non-technical, but nevertheless a vast improvement, and that is the price — at around £299 including VAT. (It is interesting that machines designated as 'home computers' are now priced inclusive of VAT.) This puts it squarely into competition with computers such as the VIC, Atom, Tandy Color Computer etc.

Hardware

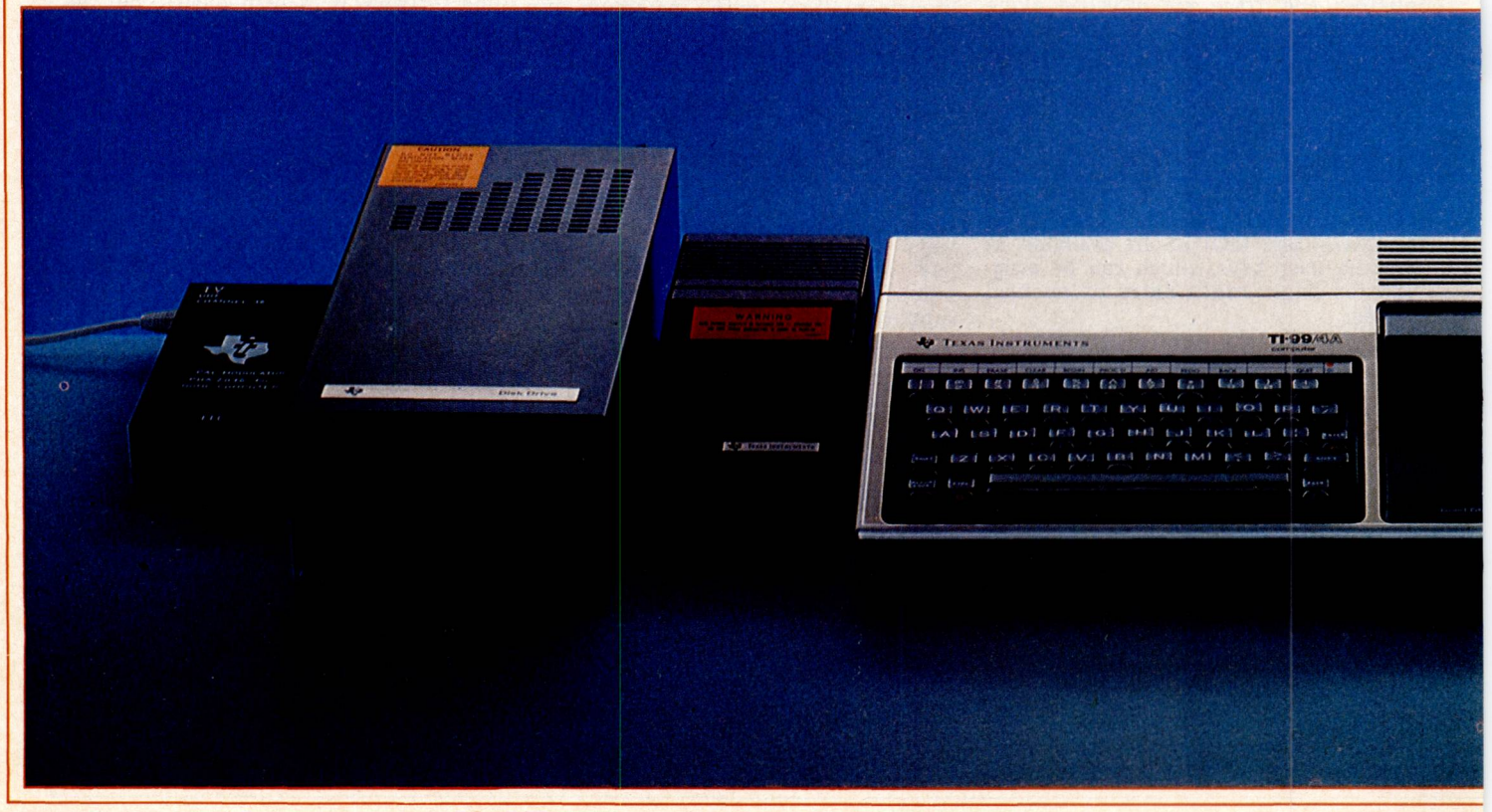
The TI-99/4A arrived well packed with a whole host of peripherals and accessories in a very large cardboard box. The items supplied for test were the TI-99/4A main console unit, and its power supply, a PAL modulator, a speech synthesiser unit, a disk controller unit with one minifloppy disk drive, an RS232 serial interface unit, a thermal printer, a cassette lead and various plug-in ROM cartridges called 'Solid State Command Modules'. These modules included TI Extended Basic, disk manager, speech editor, terminal emulator I, household money management, video chess, blackjack and poker, addition and subtraction 1, and Teach Yourself Basic on disk.

As you can see, there's quite a number of items supplied, and to keep this Benchtest manageable I will concentrate on a few and briefly report on the others.

Unpacking and setting up the main console unit was no problem. Texas Instruments had thoughtfully provided a leaflet entitled 'Read This First' to give simple instructions on setting up and getting started. Unfortunately the sheets supplied were for the original 99/4 and not for the 'A' version, so there were a few points which did not tie up, but at least none were damaging or dangerous. The correct setting-up procedures were in fact in the TI-99/4A User's Reference Guide and no doubt Texas will correct this oversight.

The main console unit's casing is virtually identical in shape and size to the original 99/4, being approximately 37.5cm wide, 26cm deep, and 7cm high, taking up a base area about the size of this magazine opened out. The casing material is black plastic with a brushed aluminium fascia (with a slight bronzed tint). The most noticeable difference from the 99/4 is the typewriter-style keyboard, which is of standard pitch but looks more compact. The layout is qwerty, with only 48 keys in all, so some of the punctuation marks are in non-conventional positions and are accessed by a FunCTioN key as opposed to the normal SHIFT, which could become annoying. The punctuation marks (as well as the cursor keys) accessed by the FunCTioN key are inconveniently marked on the lower side face of the keys, but there is an alpha lock key which does latch in the down position. But more disappointing is the feel to the keyboard, which is spongy and seemed heavy — so much so that, without realising it, I found that I had reverted to two finger and one thumb typing and could not manage to type fast with all fingers. To the right of the keyboard is a recessed area with a spring-covered slot to accept the command modules (plug-in ROM cartridges). All in all, the main console unit seemed very attractive to my eyes and would not look out of place on the shelf or even on the coffee table at home.

Unfortunately the same can't be said of the ugly power supply unit,



AN REVAMP

which is wedge-shaped (to match the sloping front of the main console, I suppose) but is black and looks like a sewing machine foot pedal and is best kept hidden out of sight! The other unit which had to be attached to the console was the PAL modulator which enables the 99/4A to work with a standard 625 line UK colour or monochrome TV. The black metal box is attached to the console by a reasonably long cable; the box connects to the TV by a short co-axial lead.

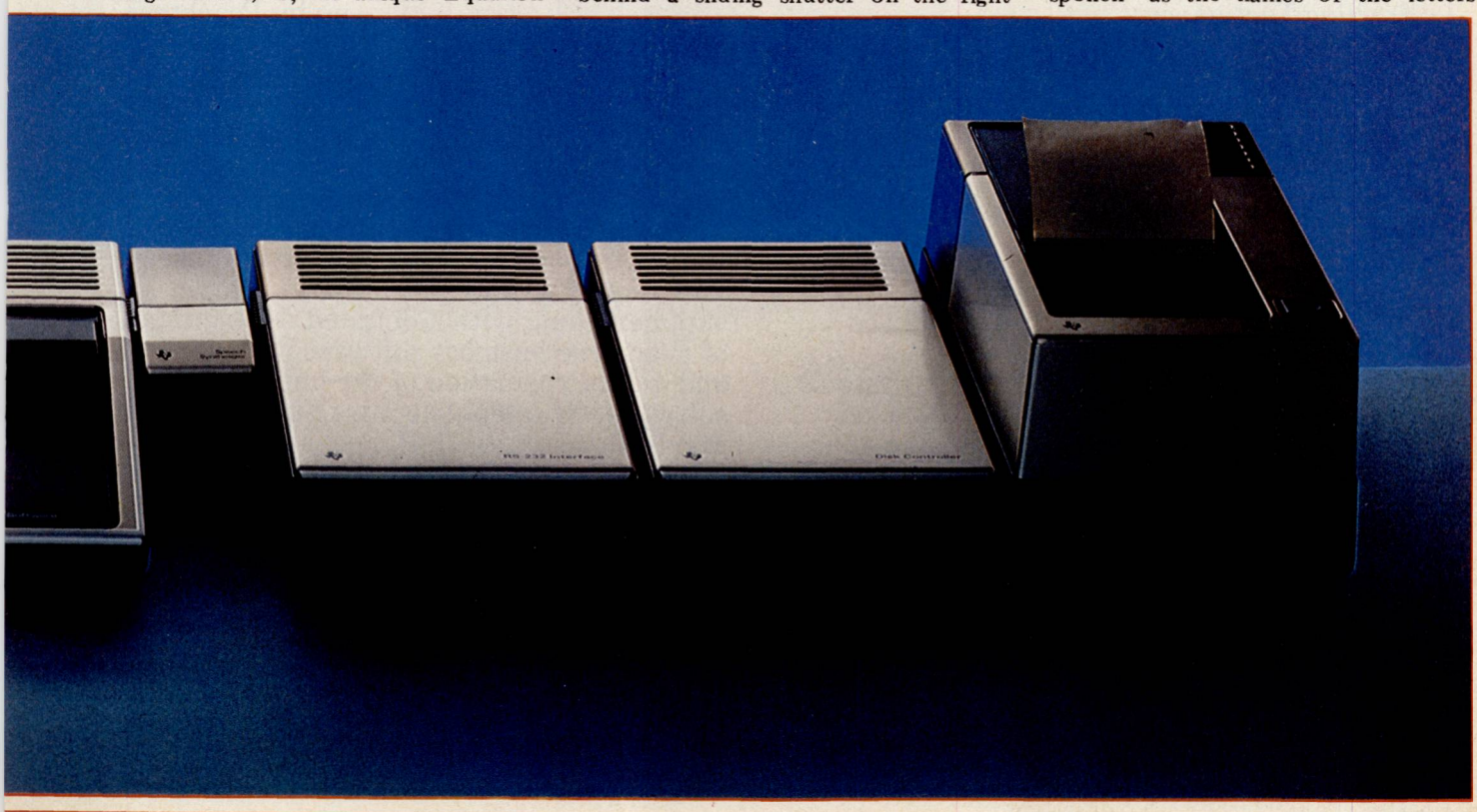
On opening up the main console unit you find that there are three boards packed quite tightly; for keyboard, power regulation and the main CPU. The main CPU board is well shielded in a sheet metal casing to conform to the US FCC regulations. Removing and opening the shielding (which is a feat in its own right) reveals the enormous 64-legged TMS 9900 chip in plastic packaging, a cluster of 4116 dynamic RAMs and a couple of Motorola 6810s (128 x 8 static RAMs — which I assume are used for system store as well as for the 9900's CRU — control register unit for I/O). The board looked well laid out but there was no spare room for any internal memory expansion (perhaps just as well, considering the difficulty in dismantling to get to the unit).

The TI-99/4A worked competently; there was virtually no difference between this and the original TI-99/4 (reviewed in *PCW* vol 3 no 5, May 1980) except that the second option on the main menu on start-up no longer exists; ie, the unique 'Equation Calculator' is no longer available. The display on my colour TV was steady and the clarity was good, due mainly to the large characters (which tend to look a little clumsy). The character set under TI Basic is now 32 to 127 (decimal) inclusive in ASCII, which should include lower-case alphabetics, but instead they are displayed on the screen as small capitals — a pity. There are also control codes in the range 129—159 dec, but these are not the conventional ASCII codes (the function keys take up some of the conventional ASCII control codes).

The screen can display 29 columns of 24 lines under TI Basic; the user's guide, however, says that there are only 28 print positions, which is also correct, because the first column is only used for the prompt character '>'. In graphics mode, the display is capable of 32 columns by 24 lines. Sixteen sets of eight graphics characters can be user-defined over the standard ASCII codes (ie, 32 to 127 dec), plus the range 128 to 159 dec. Each graphics character is in an 8 x 8 matrix, making the screen resolution in graphics mode 256 x 192. There are 16 colours, and the screen, character and character background can be defined by sets. The colours include transparent, which allows shapes to appear to walk 'behind' other shapes. Graphics screens have a border all round to allow for fall-off in edge definition on TV sets.

Peripherals and accessories are connected mainly by an edge connector behind a sliding shutter on the right side of the console. Each accessory has a well-shielded edge connector socket on its left to mate with the console's edge connector, as well as its own right-hand edge connector behind a similar sliding shutter, allowing accessories to be connected in a tandem fashion. Connection and cascading the accessories was straightforward, with very little chance of error. With only one or two accessories attached the system still looks quite reasonable as the units are well matched cosmetically, but with three or more the set-up begins to look silly as well as occupying quite a wide area. I could not find anything in the documentation on any limits to the number of accessories one can connect in cascade, and the only rule appears to be to connect the speech synthesiser (if you have one) as the first item. The apparent unlimited length of attachments, apart from being physically cumbersome, could give some room for worry in terms of signal fan-out and shielding. On opening up two other accessories, I found that the signals were conducted through the units by a sort of 'motherboard', and both this and the logic boards were as well shielded as in the main console.

The accessories are the same as ones produced for the 99/4. The most interesting item is the speech synthesiser, which has a vocabulary of approximately 373 words including some phrases, numbers — represented both numerically as well as by the actual words — and the alphabet. The alphabet is 'spoken' as the names of the letters



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 together, enabling you to get more out of your computer.

Because Peachtree software works on so many different types of computers it also means you're more likely to be able to take your application systems with you as you expand your use of computers in the future. You will be able to protect your investment in computer systems as you grow.

Until now microcomputer software has been a jungle. Now MSA, the world's largest company specialising entirely in business computer software products for large computers (nearly £40 million worldwide sales in 1981), has joined forces with PEACHTREE SOFTWARE, the world leader in these products for microcomputers.

Together we make an unbeatable combination. As a public company, MSA has the resources to *guarantee* you and your computer supplier support, both now and in the future. Peachtree software is supplied by computer manufacturers themselves, on a whole range of small computers - including the new IBM personal computer.



First things first.

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.....

..... TELEPHONE NUMBER.....

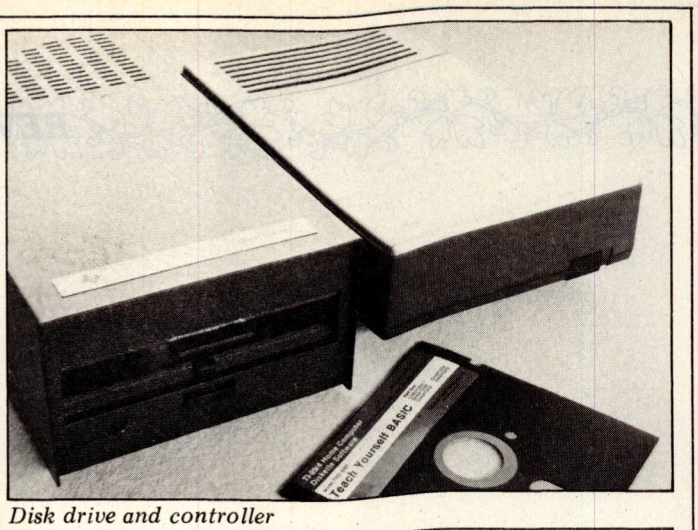
Please return to Susan Jane, Peachtree Software International, MSA House, 99 King Street, Maidenhead, Berkshire SL6 1YF. Telephone Maidenhead (0628) 71011 Telex: 847400 MSAUK G
MSA (Management Science America) Ltd is a subsidiary of Management Science America Inc.

PEACHTREE SOFTWARE
AN MSA COMPANY

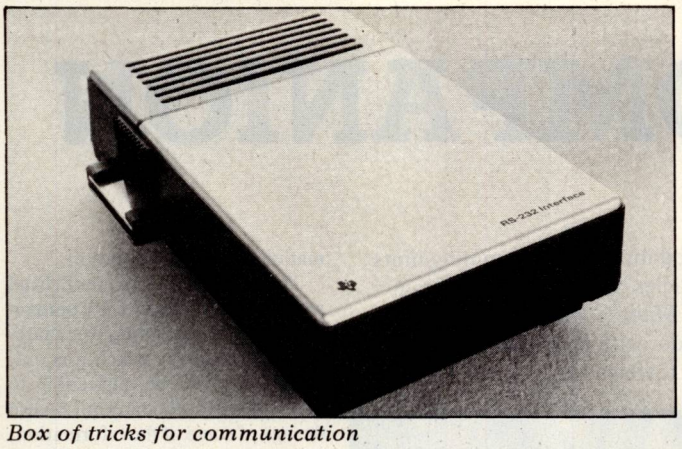
TEXAN REVAMP



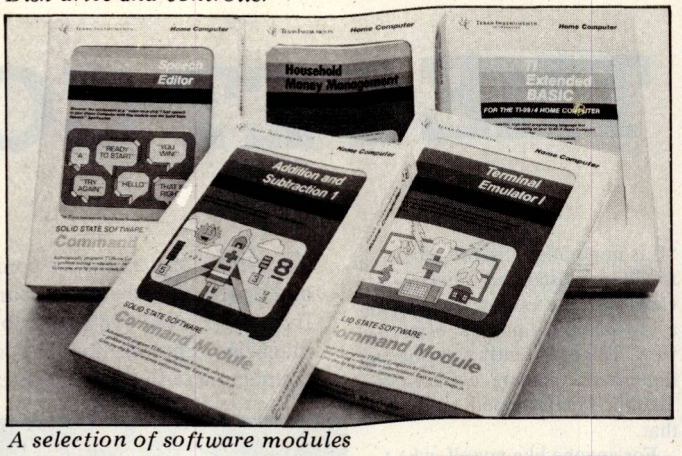
Console is neat and pretty



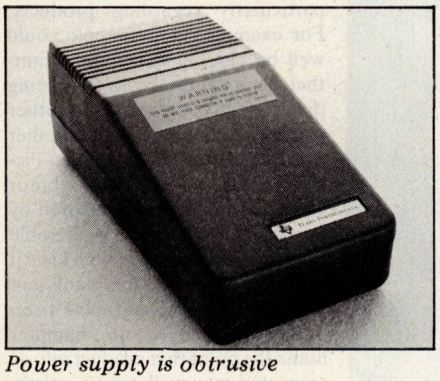
Disk drive and controller



Box of tricks for communication



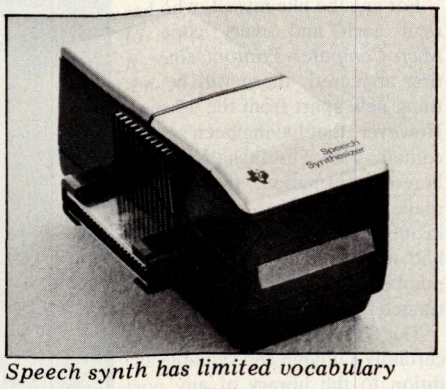
A selection of software modules



Power supply is obtrusive



No more US TVs needed



Speech synth has limited vocabulary

and not as the phonetics, which makes construction of words not already included in the vocabulary very difficult. I believe that the components used are those in the 'Speak and Spell' game. It would have been much better to have the phonetic alphabet as well as some of the more commonly used combinations such as 'ch', 'th', 'ing', etc. As it is, making up some words from a combination of the existing vocabulary is a very contrived effort and the results sound so, too. Apparently Texas has a new Emulator Command Module which should be able to give an unlimited vocabulary, but this was not supplied for the test.

The TI-99/4(A) Disk Controller module can control up to three mini-floppy disk drives, recording single sided, single density disks with a capacity of approx 90 kbytes per disk. The Disk Controller and each disk drive require a separate mains lead (as do most of the accessories) which makes for a high number of spaghetti-like mains leads on an expanded system. The disk drive connects to the controller by a ribbon cable with an edge connector socket on the end; there's also a similar connector in the middle of the cable with an adaptor board to allow another drive to be daisy-chained.

Although the edge connector on the disk controller unit for the drives had a polarity cut-out in it, there was no polarity key in the connector socket on the drive's cable — and there was no mention in the manuals of which way the connectors should be aligned. The connectors could, in fact, be joined either way. The correct way was to have the cable coming upwards from the connector, which can be deduced by careful scrutiny of the diagram shown in the manual; of course, if the polarity pin was in the connector there would have been no problems. The drive supplied sounded very noisy, but it worked with no problems and with reasonable access times. Supplied with the controller was a command module, 'Disk Manager', which gives an operating environment for the disk system (but not quite to an operating system standard).

A thermal printer is also connected in the same manner to the system. This item I found very unimpressive, mainly because of the print quality — or the lack of it. There appeared to be a strip toward the middle of the 9cm wide thermal paper where the matrix of the characters printed did not come out well. The printer prints 32 characters across the roll paper, and seemed of reasonable speed despite the fact it was rated at only 30 cps. There is a default character set of 128 characters and this time there is lower-case (although without descenders) and there are 32 predefined graphics characters using ASCII codes of 0 — 31 dec. User-defined characters can also be printed in code 32 — 159 dec, but these are restricted to a 5x7 dot matrix. A good point for the printer is that it is quite quiet.

The cassette cable supplied is again the same as the one for the original 99/4. It connects to the main console by DIN-type plug, and at the other end there are connectors for two cassette recorders; one of these is allowed to record and playback and the second is for recording only. The connectors are standard mini jacks which fit the microphone and earphone sockets of most commonly available cassette recorders.

THE PET COMPANION

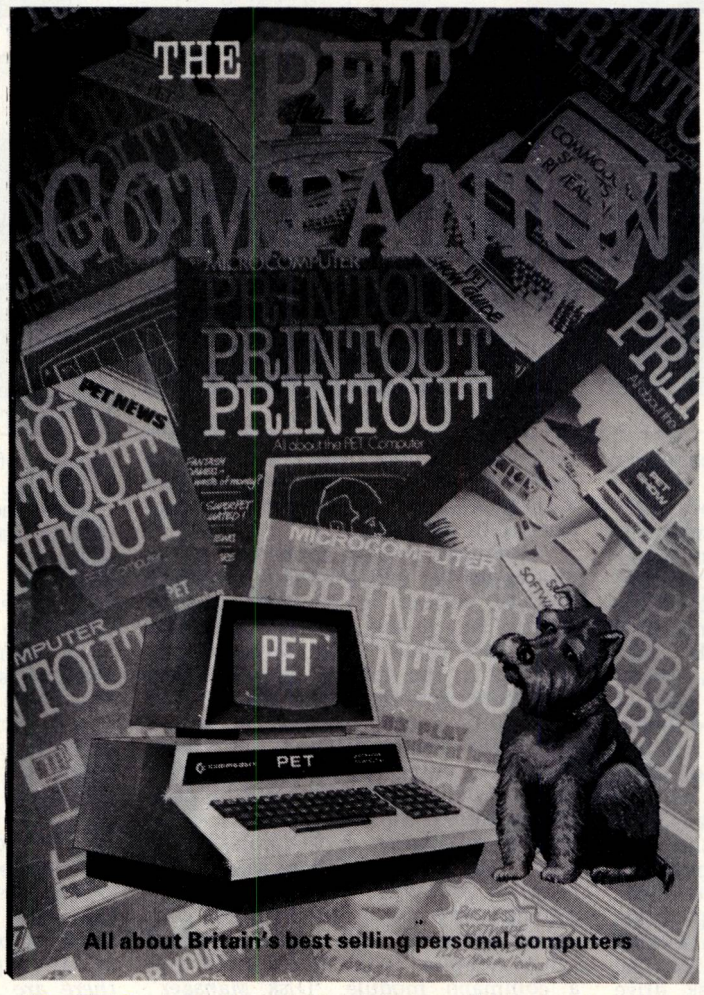
The *PET Companion* is a compilation of programming hints and tips, news, reviews and articles on PET programming from the 1979 & 1980 issues of *MicroComputer Printout* magazine. **Paul Walford**, a reader with no previous connection with the magazine, reviewed it.

"It is imperative that we receive a totally unbiased and objective review" said the Editor, handing me a 14p stamp for postage of my review. This apparently being his definition of "joining a First-Class Team", I determined to do just that.

For anyone like myself, who has read each and every copy of *MicroComputer Printout* since it first appeared, there will be nothing new apart from the adverts. However, that having been said, it contains a lot of useful half-remembered information that earlier readers will find more convenient in one volume rather than spending half a day leafing through back-numbers and invariably getting distracted by other morsels.

The PET Companion is most certainly a unique and valuable addition to the library of any post 1980 owner, not only providing the aforementioned information, but giving a useful over-view of the PET scene development, as well as an insight into some of the long-standing dialogue currently appearing in *MicroComputer Printout*.

MicroComputer Printout has never been an 'Idiots Guide' or a 'Machine-Code Special' but has carefully trodden the middle ground for the majority whilst also being broad-based enough for the extremes. Thus the 'PET Companion' is ideal for beginner and experienced user alike. I refuse to say 'beginner and *expert*' because I still feel there is much to be discovered, and there ain't no such animal as an expert, although *MicroComputer Printout* and readers have done much, and possibly most, to guide many in this direction, bringing something entirely fresh on many occasions to provide a helping hand in the mass (mess?) of information and mis-information.



'The PET Companion' is available from Printout Publications Ltd., P.O. Box 2, Goring, Reading. The price is £9.95 post fee in the UK, £12 Overseas, and $25 USA. Cheques, Postal and International Money Orders are accepted. Credit card orders are accepted for Visa and Access/Mastercard/Eurocard holders, by post or over the telephone on 0635-201131.

The only really serious criticism I would make of The PET Companion is that, in reprinting past material in the form in which it is presented, it could be misleading to newer readers who may not realise the age of some of the information, particularly regarding products. For example, many people could well be chasing Petsoft programs that no longer exist or are being distributed through another software house now. On the other hand, many could assume that PicChip has no U.K. distributor whereas it has been distributed by Supersoft for some considerable time now, and many dealers have it in stock. I feel that the blank leaf inside the cover could have been usefully employed to hammer home the point that product info as presented may well not be strictly accurate at the time of purchase.

On the purely personal side, I would have liked to have seen the various contributor's columns presented together, in chronological order, but there are doubtless many who would disagree with that. Following the predictions, and sometimes unnerving accuracy of Inside Trader can be a most entertaining pastime.

In conclusion, I would regard The PET Companion as an indispensible guide for the newer owner, and very useful for the older hands not blessed with an elephantine memory.

'MicroComputer Printout' is the monthly magazine for newcomers to computing. It is written in plain English and costs £11.40 for a years subscription. Sample copy £1 post free from P.O. Box 2, Goring, Reading RG8 9LN.

TEXAN REVAMP

For each recorder there were provisions for remote start/stop control via sub-mini jacks, again the most commonly used fitting on domestic recorders. I tested the cassette interface/cable with a really cheap and fairly poor cassette recorder (which I keep specifically for equipment testing) but with good quality recording cassette tape. This combination worked well with the T1-99/4A once the volume level had been adjusted. I was impressed by the acceptable range of the volume level — it was around halfway (which was as recommended in the user's guide) with a tolerance in level adjustment of about a quarter each way. On playback a reasonably muted sound of the tape is relayed via the TV's speaker — a nice touch to give users confidence. There was detailed prompting from TI Basic when the cassette was called up by the SAVE and OLD commands, which I found a little pedantic, but it has the advantage of leaving very little chance of operating error.

A serial RS232 interface was also supplied for test. It connects to the main console or in cascade with another accessory by the same method as described for the others. The interface requires (yet another) mains lead, and provides two serial ports via standard D-type connectors. The interface used only seven out of the 25 pins, which is obviously a sub-set of the full RS232C spec. The ports are configured as for a computer/processor (ie, pin 2 is signal in, pin 3 signal out, 6 data set ready, 20 data terminal ready). Baud rates are from 110 to 9600 and these, as well as the number of data bits, parity, stop bits, null characters, checking of parity, echo (half/full duplex), are all selectable by programming in TI Basic. There are also options to suppress carriage return and/or linefeed. For quick use there are default values for all the options (the default baud rate was 300). The command module — Terminal Emulator I — was designed to set up these options by commands and prompting. Also, as the name implies, it turns the TI-99/4A into a terminal. The set-up could then input via the RS232 interface and relay data to disk, cassette, thermal printer or out via the other RS232 port.

TI Basic

The main console works under TI Basic when there are no command modules plugged in. The version for this TI-99/4A looks identical to the one on the original 99/4. Running the standard Benchmarks show the timings are virtually the same as the *PCW* Benchtest of the 99/4. Although the Benchmarks looked slow in comparison with most modern home computers, on balance the numeric accuracy and range is high, being accurate to 13 digits and with a range of $+/- 1 \times 10^{+/-128}$. This is as accurate as, and with a wider range than, even top of the line scientific calculators. The Basic is also quite comprehensive for setting up graphics; it has many sub-programs. This is evidence against reading too much into Benchmarks alone, without reference to the features and power of the language. A nice touch, retained from the original, is that in command and program entry mode the screen is a cyan colour; when a program is running the screen colour turns to green, then reverts to cyan once the program execution is stopped.

TI Extended Basic

TI Extended Basic was supplied on a Command Module, which added an extra 36k bytes of ROM to the TI-99/4A. The TI-99/4A has 16k RAM as standard, expandable to 48k; there is 26k of ROM. Now, add the 36k of ROM and you have a possible total memory of 110 kbytes, whereas the normal maximum addressing range of the TMS 9900 is only 64k. The large memory is achieved by memory paging so there are quite a few command modules which are not accessible by TI Basic. TI Extended Basic retains all the features of TI Basic and adds around 40 extra commands or sub-programs. There are also enhanced or added features such as higher dimensions for arrays (up to seven from three), better and more informative error handling, protection on SAVE and LISTing, and others.

The most significant addition is the programming of 'sprites', which are programmable *moving* characters. These sprites provide very smooth movement on the screen, in contrast to the usual erratic jumping. Some 28 independent moving characters can be defined; all with different (or the same) velocities and directions (defined by horizontal and vertical components of velocity) and all on the screen at the same time. 'Internal' movements of a defined sprite character (eg, in a character 'walking', the movements of its arms and legs) can be achieved by changing in a PATTERN sub program, without having to redefine the whole sprite. Sprites are given priority, with the lowest number having the highest priority on the screen, so that when two sprites are coincident the higher priority covers the other. Sprites also pass over other (fixed) graphics characters on the screen. The MAGNIFY sub-program can enlarge all the sprites so that the moving objects can change size easily. I was very, very impressed. Two of the three sample programs listed in the Extended Basic manual for illustrating the use of sprites can give you an idea of the power of this feature. One of the programs generated several (up to 28) star-shaped objects on the screen which emerged from a first central 'star' in five colours, and all moved in different directions at different speeds on a black screen. The result was spectacular, but all this required only eight lines of Extended Basic! The other program was not as spectacular, but those of you who program moving graphics/animation will appreciate what could be involved in setting up the following sequence: two different coloured people walk across the screen, both swinging arms and legs; one of them walks through a stationary barrier while the other jumps over it. The jumping person walks faster and eventually catches the other, whereupon they are both reduced in size and continue to walk (when they reach one end of the screen they reappear at the other end) until the faster figure catches up again; it then disappears, leaving the other figure walking until the screen edge is reached and the program ends. Only 55 lines of Extended Basic were required for the whole sequence.

Other Modules

The Disk Manager module was supplied with the disk controller unit, as mentioned earlier. It provides commands or functions related to the disk system which are either not possible or inconvenient under TI Basic. A sort of enquiry and change environment is provided, allowing the expected functions for disk handling such as initialising disks, copying/backing up disks, directory, renaming, deleting, and protecting files. And there were some destructive and non-destructive (to existing files, that is!) disk tests. The only remarkable item was that the disk initialisation process took well over four minutes, whereas the manual says it takes about one. The disks I used were a couple of Verbatim disks and it didn't matter whether I specified 40 or 35 track initialisation.

The Speech Editor command module allows direct access to the speech synthesiser unit without having to execute the TI Basic commands of CALL SAY. One merely has to type in the required words with the correct separators/punctuations, press ENTER and the words displayed on the screen are spoken through the TV's speaker (that is, if all the words used are valid ones in the synthesiser's vocabulary—as mentioned, on the basic unit this was rather restricted). Unrecognised words are beeped and flashed at the bottom of the screen. One method which I found useful is to use ENTER on each word as it is inputted on the screen, followed immediately by a required separator; this way each word is confirmed, and correction by editing is only needed on the last word/phrase entered.

T1 BASIC WORDS

ABS
ASC
ATN
BREAK
BYE
CALL CHAR
CALL CLEAR
CALL COLOR
CALL GCHAR
CALL HCHAR
CALL JOYST
CALL KEY
CALL SCREEN
CALL SOUND
CALL VCHAR
CHAR
CHR$
CLEAR
CLOSE
COLOR
CONTINUE
COS
DATA
DEF
DELETE
DIM
DISPLAY
EDIT
END
EOF
EXP
FOR-TO-STEP
GCHAR
GOSUB
GOTO
HCHAR
IF-THEN-ELSE
INPUT-with files
INPUT-with keyboard
INT
JOYST
KEY
LEN
LET
LIST
LOG
NEW
NEXT
NUMBER
OLD
ON-GOSUB
ON-GOTO
OPEN
OPTION BASE
POS
PRINT-with files
PRINT-with screen
RANDOMIZE
READ
REM
RESEQUENCE
RESTORE-with files
RESTORE-with DATA
RETURN
RND
RUN
SAVE
SCREEN
SEG$
SGN
SIN
SOUND
SQR
STOP
STR$
TAB
TAN
TRACE
UNBREAK
UNTRACE
VAL
VCHAR

T1 EXTENDED BASIC WORDS

ABS
ACCEPT
ASC
ATN
BREAK
BYE
CALL
CHAR
CHARPAT
CHARSET
CHR$
CLEAR
CLOSE
COINC
COLOR
CONTINUE
COS
DATA
DEF
DELETE
DELSPRITE
DIM
DISPLAY
DISPLAY ...USING
DISTANCE
END
EOF
ERR
EXP
FOR-TO-STEP
GCHAR
GOSUB
GOTO
HCHAR
IF-THEN-ELSE
IMAGE
INIT
INPUT
INPUT (with files)
INT
JOYST
KEY
LEN
LET
LINK
LINPUT
LIST
LOAD
LOCATE
LOG
MAGNIFY
MAX
MERGE
MIN
MOTION
NEW
NEXT
NUMBER
OLD
ON BREAK
ON ERROR
ON GOSUB
ON GOTO
ON WARNING
OPEN
OPTION BASE
PATTERN
PEEK
PI
POS
POSITION
PRINT
PRINT USING
RANDOMIZE
READ
REC
REM
RESEQUENCE
RESTORE
RETURN (with GOSUB)
RETURN (with ON ERROR)
RND
RPT$
RUN
SAVE
SAY
SCREEN
SEG$
SGN
SIN
SIZE
SOUND
SPGET
SPRITE
SQR
STOP
STR$
SUB
SUBEND
SUBEXIT
TAB
TAN
TRACE
UNBREAK
UNTRACE
VAL
VCHAR
VERSION

TEXAN REVAMP

The rest of the command modules and software supplied were not tested in detail due to the lack of both time and space. Nevertheless, here is a very brief account of each.

Household Money Management — I looked at this in detail on the original 99/4 and this time round I found no significant changes — even the manual was the same. The module does what its name suggests; it sets up a budget account which allows cross referencing of up to 34 active categories (although up to 99 categories are available for you to select the active categories). Information regarding the budget can be displayed in tabular form or by coloured bar charts (useful for seeing trends). Detailed instructions are given in the manual for saving and backing up data, which is good, although only cassette was given as the recording device; I don't see any reason why disks could not be used though.

Video Chess, Blackjack and Poker are obviously games and are what the titles say. I am not expert or enthusiastic enough to give any valid comments on these, but I would venture to say that the Video Chess probably plays a reasonable beginner's game, as I had to resign when playing the beginner game in a late night session!

Addition and Subtraction 1 is a teaching program using colour graphics for illustrations, designed for youngsters. I was not very impressed with the disk-based Teach Yourself Basic course. It is basically a book on disks, lot of text with some interactive examples (good), but with no way of controlling your own rate of progress or skipping sections within 'chapters' — there is much to be said for the genuine random access of a conventional book.

Documentation

As you'd expect from Texas, almost all the documentation was of a high standard. Most was suitable for someone starting out, as well as for quick reference. This is really what's needed, and I hope other manufacturers will take a lesson from this. The exception is that some of the manual needs updating from the 99/4 to the 'A' version, although once the new function keys have been noted there's very little change from the original 99/4. Also, as already mentioned, the 'Read This First' leaflet requires immediate updating as it would give a bad first impression of the system and the documentation. The only real criticism is the lack of machine/hardware details (for example, a memory map) and explanation of the way the CRU is structured for the computer would be useful. As it was, and with the lack of facilities to get down to machine code level (although there is apparantly an assembler available but not supplied), I was unable to get a memory map for the 99/4A.

Users

The TI-99/4A is aimed at the home user and hobbyist (I say the latter with reservations) and it is promoted as such. The reservation on hobbyists is the fact that the TI-99/4A works at quite a high level and was not really intended to be used at machine code level; for example, absent are the usual PEEK, POKE and USR (or USER) commands, thus making any user modification/customising to the operation of the TI-99/4A almost impossible. Also the good construction but difficult dismantling does not encourage any hardware changes (which I suppose Texas would call 'tampering'!).

But, having said that, the TI-99/4A is very suitable for those who do want to work at a high level with Basic (and Pascal is promised), and I would recommend anyone interested in moving graphics or animation to use it with the Extended Basic for a much easier life!

Competition

The new price of the 99/4A puts it into the bracket of the new home computers such as the VIC, Tandy Color Computer, the Atom, and even the BBC Computer. In terms of money, the VIC is the cheapest of this group even when expanded up to 21k RAM; VIC colour graphics are about the same as the 99/4A in terms of resolution and the Basic is faster in the Benchmarks although not necessarily more powerful or accurate. The BBC Computer is more powerful in terms of facilities offered in the Model B form, and it has much higher resolution graphics and much better expansion capabilities. But the TI-99/4A is the only one with sprites (with Extended TI Basic) and at the moment is the only one with convenient speech synthesis (probably only worthwhile with the speech emulator command module).

Prices and availability

Most items tested are already available, since the accessories were produced for the original 99/4. At the time of writing (January '82) I could not get information on the actual shipping of the TI-99/4A unit as the department at Texas was still all on leave!

The price for the TI-99/4A main console is reasonable and competitive; the accessories, although again reasonable, tend toward the high side.

TI-99/4A around £299	
Speech Synthesizer	£99
Disk Controller	£199
Disk Drive	£399
32k RAM expansion	£299
Thermal Printer	£269
RS232 Interface	£149
Wired Remote Controls	£30
Cassette Cable	£10

Command Modules or plug-in ROMs vary in price according to program, range is approx £17 to £50 (no price for Extended Basic).

All priced inclusive of VAT.

Conclusions

Despite the chequered history of the 99/4, I liked the TI-99/4A — especially for the Sprite facilities in Extended Basic.

All accessories and command modules worked without fuss, even if they may not have been the best I have come across. The exception was the thermal printer and I can see no advantage of this printer over a cheaper type like the ZX-81 or the ones for the new Casio pocket computer. The problem-free operation is the sort of high standard users expect and want.

Documentation was generally excellent and users should not accept less from other manufacturers.

Speech synthesis was novel but restrictive in the basic unit; it would probably be much better value with the speech emulator command module, provided this plug-in ROM is not priced too high.

The most significant improvements to the 'A' version over the original are the price and the keyboard (which is more robust and suitable for home use — it was extensively tested by my three year-old son!).

Whether *I* would buy one at the price is debatable; it is reasonable value for money even in comparison with the latest home computers, but the facilities offered (and the lack of low level access) are probably not what I would look for in a computer. Nevertheless, for the moment the sprite facility and the speech synthesis make the TI-99/4A something special, and it may be just what you are looking for.

END

Benchmark Timings

for TI Basic (timings in seconds)

BM1	3.0	BM5	26.2
BM2	9.0	BM6	61.9
BM3	24.0	BM7	84.6
BM4	24.8	BM8	38.4

for extended Basic

BM1	6.5	BM5	42.0
BM2	18.5	BM6	98.4
BM3	40.0	BM7	140.3
BM4	40.1	BM8	24.0

(note despite the fact Extended Basic runs slower than TI Basic, BM8 actually runs faster with Extended.)

Technical specifications

CPU	: TMS 9900 16-bit micro
ROM	: Internal 26K (TI Basic takes 14K), command modules can add up to an extra 36K
RAM	: 16K internal, using 4116 dynamics. Expandable with an extra 32K,
Keyboard	: Typewriter style with 48 keys
Display	: Uses domestic TV, gives 29 x 24 lines under TI Basic, 32 x 24 (or 256 x 192 resolution) plus three layers of 16 colours in graphics. (under Terminal Emulator I the screen is 40 ch x 24 lines)
Cassette	: Domestic audio recorder
Ports	: Edge connector for accessories (can connect in daisy chain), cassette, and for remote controls.



AIO-11 *and the unique IEEE!*

Every Apple is created equal, but you can make yours more equal than others

Having decided on Apple equipment you will want the best possible return on your investment. That means utilising your Apple with possibly serial and parallel printers, graph plotters and modems.

The AIO-II card from SSM permits easy selection of four functions: serial modem, serial terminal/printer, parallel Centronics printer and general purpose printer. This card gives true simultaneous operation. It's totally transparent to the user; there's no software to write and no need to modify your Apple. The AIO-II costs £140 (ex VAT).

For low cost, single function operation the serial ASIO or parallel APIO cards may be utilised. The ASIO connects the Apple to a modem with an optional terminal routine, or to a terminal/printer without modifying the cable. It has standard RS-232 interfacing with complete hand shaking as well as selectable band rates from 110 to 9600 band. The APIO parallel interface supports general purpose I/O and all popular Centronics compatible printers including Epson, Paper Tiger, Okidata, Anadex and others.

All SSM boards are designed to make the Apple more productive. Optional software compatibility with Apple Pascal and Microsoft CP/M is provided.

SSM AIO Serial/Parallel Card	**£120.00**
SSM ASIO Serial Card	**£86.00**
SSM APIO Centronics Printer Card	**£86.00**
SSM Prototyping Board	**£16.00**
SSM Extender Board	**£17.00**
SSM IEEE Interface with Cable	**£299.00**

For further details of these cards and the IEEE-488 controller (with the highest performance available) please contact:

DISTRIBUTOR

Personal Computers Limited

194/200 Bishopsgate London EC2M 4NR

Tel: 01-626 8121

DEALERS WANTED!

All prices excl. VAT.

The *if* 800-Colour

FEATURES
- Powerful Z-80A 4MHz Processor
- Memory 64K – 256K
- High Resolution Multi-Colour Graphics CRT
- CP/M*
- Versatile, 'Easy-to-Use' BASIC
- Twin set of Programmable Function Keys
- Integral 80 cps Printer
- 400K x 2 Floppy disks

OPTIONS
- 8 inch Floppy Disk Unit
- 10 mb Winchester Drive
- I/O Expander Unit
- 132 Column Printer
- Paper Tape Reader & Punch
- 5 inch Floppy Disk Unit
- XY Plotter
- Digitizer
- Light Pen
- ROM Cartridge

INTERFACES
- RS-232C
- Centronics Parallel Interface
- IEEE-488 Instrumentation Interface
- Analogue–Digital and Digital–Analogue converters

SOFTWARE
- Extensive range of business application software to meet all requirements.



KGB Micros Ltd 14 Windsor Road, Slough, Berks. SL1 1EL. Tel: Slough 38581/38310
Encotel Systems Ltd 530-539 Purley Way, Croydon, Surrey. Tel: 01-686 9687
FBC Systems Ltd 10 The Main Centre, Derby. Tel: Derby 365280.

in your Computing

The if 800 brings a new and colourful dimension to business and personal computing. Now you can enjoy and benefit from extensive multi-coloured graphics and a CP/M* environment on the same compact system.

Built around a CPU using the high speed Z-80A processor, the if 800 combines keyboard, hard-copy 5 x 7 dot 80 cps printer, twin 400K 5 inch floppy disk drives, high resolution colour display, and every type of interface into one complete unit.

Just look at some of the fantastic features, facilities, and options offered on the if 800 .....a truly versatile and fully integrated computer system that more than meets the demands and varied applications in today's world of business information processing.

To discover the exciting new horizons of if 800 Multicolour Graphics computing, complete the coupon below or telephone us or our Distributors.

* CP/M is a registered trade mark of Digital Research



LSI COMPUTERS

Copse Road, St Johns,
Woking, Surrey GU21 1SX
Tel: (04862) 23411 Telex: 859592

Please contact me with details of the if 800 today!

Name

Address

Company

Tel

First time on Earth.



Sharp bring you the MZ80B. A machine that offers you functions previously only associated with more powerful, more expensive computers; that gives you versatility to handle a huge range of software and hardware applications in scientific, business and personal use.

The MZ80B opens up a new world of graphic display potential, more flexible data storage and retrieval, and ease of operation.

Here is the computer from the future. Available today.

Stunning Graphic Display.

Seeing is believing. The large-screen, high-focus, green-face display incorporated in the MZ80B gives you high-resolution graphics of 320 x 200 dots.

An additional graphic RAM can be added which allows another 320 x 200 dot resolution pattern to be displayed.

This dual high-resolution graphic ability is especially useful for simulating and displaying a dynamic picture. It can display 40 characters x 25 lines or 80 characters x 25 lines via software switching.

In addition there are facilities for full, on-screen editing, reverse video, partial scrolling and a full range of graphic symbols.

Character and Graphic Printer.

This fast, quiet printer will reproduce your graphic displays and, of course, print-out upper and lower case letters and symbols. A tractor/friction feed version is also available.

Data Storage/retrieval.

The MZ80B has a remarkable memory. 64K of RAM. And that constitutes all the memory area, giving flexible storage of any computer language and its software. The cassette deck is electromagnetically-controlled, with a data transfer speed of 1800 bits/sec combined with a unique programme search facility to make data storage and retrieval super-fast.



A typewriter-style keyboard incorporates characters and symbols plus a numeric key-pad and ten user-definable keys for fast and simple operation.

BASIC is, of course, provided with Z-80 Assembler Packages, PASCAL and a BASIC compiler.

Floppy Disk Drive.

A twin Floppy Disk Drive unit can be added which will give you 560 bytes of storage on double-sided, double-density disks.



Comprehensive Documentation.

Each MZ80B comes complete with a full set of documentation including an owners' manual giving full circuit diagrams, a monitor reference manual and programming manuals.

PCW/3/82

Interfaces

RS-232C and IEEE Interfaces are available from January 1982 allowing the MZ80B to communicate with scientific instruments and other peripherals.

CP/M*2.2

CP/M* is also available making a wide range of packages immediately available including wordprocessing, financial modelling, data base management to mention but a few. CP/M* also increases the disk capacity to 680K.

(CP/M* is a Trade Mark of Digital Research Ltd).

SHARP

First, and foremost

SHARP ELECTRONICS (UK) LTD., COMPUTER DIVISION, SHARP HOUSE, THORP RD., NEWTON HEATH, MANCHESTER M10 9BE. TELEPHONE: 061-205 2333.

Why on Earth don't you find out more?



Please send me full information on the Sharp MZ80B computer.

Name

Address

Tel:

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

FRAMES OF REFERENCE



A DP MANAGER'S GUIDE TO MICROS

By Alan Wood

PART 3 MICROS IN MAINFRAME COMPANY

All but the smallest companies with no computers are constrained by the systems they have already implemented. A medium-sized organisation with a turnover of £50 million will have a mainframe for its accounting system, and, perhaps, a mini for order processing and stock control. Large organisations will have a mish-mash of mainframes, minis, data entry systems and, nowadays, some dedicated word processing systems. Both medium and large companies are subscribing to one or more timesharing services. Much of what has taken several years to implement on mainframes may only now be showing a return. The minis in place, typically for interactive order processing, should have provided a quicker payback.

Computer systems in situ and paying for themselves are best left well alone. The better areas for microcomputers are: completely new systems in the office; applications around the inaccessible fringe of big data processing systems; and timesharing replacement tasks. Tackling these areas will be a prelude to more complete distribution of computers to desktops as powerful micros take hold and link into communication networks and big file systems. When planning future strategy for these systems, it is essential to review the current computing constraints and resources of the company. In particular: mainframe computing; minicomputing; timesharing; word and other processing; communications networks; existing computing expertise; and DP policy and company systems.

Mainframe computing

The introduction of microcomputers into a large company with its own main frame computer will accelerate some of the trends established when minicomputers were introduced.

Some of the current mainframe tasks can be replaced by microcomputer systems. More frequently, however, the tasks performed on micros will be those that never got high enough on the priority list or simply were not economically justified on mainframes. Consequently, it is expected that microcomputing will result in a better understanding and enthusiasm for computing in general, resulting in a growth in demand for all types of computing. Further dispersal of applications on micros can also free mainframes clogged with smaller tasks allowing them to respond better to major company systems.

Mainframe computing will, however, change. Users with limited processing power and storage capacities locally will be seeking to access large central databases. The choice of microcomputer is not significantly affected by the current mainframe, but the choice of mainframe applications will be affected by the increasing capability of microcomputers. The strategy established for mainframe computing should be reviewed so that a general computing strategy to meet future company needs reflects the capabilities and costs of micro technology.

Gradually the incumbent mainframe manufacturers are being forced to come up with their answer to the ubiquitous microcomputer. Of the mainframe suppliers, IBM and ICL have already produced some reply and Univac, Honeywell and the others cannot be too far away — unless they are totally deaf to the strident calls of the new technology. So far, IBM's Personal Computer offers nothing new except the IBM label on an Intel chip and industry standard software, the acknowledgement of which is the most significant feature of IBM's micro. ICL on the other hand has brought out several machines which don't relate to its existing product line, to one another, or to the industry standards. Why it should think these products will make ICL number one in micros in the UK is baffling. IBM has clearly understood the trends and requirements much better and, given this reading and the IBM name, it is bound to sell in volume. But IBM has not provided an easy answer for computing management. It has only produced a personal computer, the lowest animal in the micro world, and there is no sign yet of a powerful multi-user micro and no local area network. It seems unlikely that either of these products will be seen for some time, if they ever appear at all. Powerful micro systems would seriously undermine IBM's existing product line and it has not tooled up to provide early and much cheaper replacement products. The ICL Perq looks promising since it could offer 16-bit distributed power at low cost, provided ICL recruits some systems houses to build software and makes it widely usable and widely available.

Minicomputing

Much of the comment on mainframe computing applies also to minicomputing. Smaller minis will be replaced with large micros, much as large 'minis' have come to replace older mainframes. Micros are rapidly becoming more powerful, and the overlap with small minis is already significant. Expertise gained in minicomputing is directly applicable to large microcomputers. The term 'micro' and 'mini' will become less significant. Intel has already introduced the term 'mainframemicro' with the launch of its 32-bit, 3-chip processor. The 16-bit 'minimicros' will be soon as

FRAMES OF REFERENCE

commonplace as PETs and Apples — indeed those machines are soon to have 16-bit processors of their own.

The mini manufacturers, already showing a reduction in growth compared to the breakneck pace of the '70s, are beginning to respond with their micro offerings. Some have read the market well, while others have made the mistakes evident in some mainframe suppliers. DEC has had a micro, the LSI 11, for as long as anyone. The range based on this chip has been very successful, right up to the PDP 11/23 multi-user sytem. Data General also had the microNova for some while. Both the DEC and Data General micros are old 16-bit technology — not as compact, as cheap or nearly as powerful as the new 16-bit chips which are now displacing them.

Data General has recently moved into the Desktop micro market with a relaunch of the MicroNova in new packaging, the Enterprise. It has laboured for over two years to bring the machine to market with its own software, while the market has been rapidly moving away from it to industry standard software. DG seems to have misread microcomputing as badly as it completely missed the word processing and office automation market into which Wang rocketed. Hewlett-Packard, on the other hand, seems all set to provide a full line from the personal computer with industry standard software, the HP125, right up to its big mainframe replacement machines. The HP125 provides the very successful industry standard operating system, CP/M, over 100 CP/M packages and Visicalc. Endorsement by HP and IBMs of the independent software producers is the equivalent of hi-fi manufacturers making sure pop records can be played on their machines.

Timesharing

The displacement of timesharing services is one of the most rewarding applications for microcomputers. As more packages become available on more powerful micros, this trend will accelerate. Financial modelling, linear programming and PERT are three common applications for today's micros.

Many timesharing systems are personal systems, involving a large amount of interaction with the user. Such applications are ideally suited to a microcomputer. Microcomputer solutions will usually be cheaper, will give a faster, less frustrating response and will allow the user total control over his system. A local microcomputer can also be used to access the wealth of programs and databases on timesharing machines, thus extending the use of the facility. The programming skills required to develop microcomputer systems are similar to those for timesharing systems, ie, programming in Basic, APL and Fortran.

A number of timesharing companies have already started to offer micro front ends to their services. They are recognising the inevitable — if you can't beat them you'd best join them. The microcomputer can cut down the cost of data entry on timesharing services, as well as providing local computing capability off-line for word and numeric processing. The 16-bit micros are complete replacement machines for all but the highly specialised number crunching and big database timesharing services. With one megabyte of 16-bit RAM and a 10 MHz processor, you can perform some vast calculations and, since it will not cost you in connect or CPU time, you can always leave your desktop minimicro on all night to perform heavyweight jobs. The chart comparing old and new 16-bit machines gives you an indication of the power of the new machines.

Word and other processing

Many people are using micros as word processing machines. Others purchase dedicated, purpose-built word processors, which in any case are based on micro chips. In the near future they will require both types of machine to communicate with each other as part of an electronic mail system. Viewdata services are gradually gaining ground as information providers to the larger company. Yet again, the ubiquitous microcomputer can be used as a viewdata terminal by plugging in the appropriate software and hardware. Word processing on microcomputers is not as simple or as sophisticated as on dedicated word processors. Sophistication is not so important since, as on fancy calculators, the clever features that sell the machine are seldom used. The simplicity factor is important, especially if you are dealing with typing pool word processing. WordStar, the most popular wordprocessor on CP/M micros, is not 'user friendly' compared to the dedicated word processor. WordStar will work on a standard VDU and can be configured to run on all the popular makes of VDU. This means that the same VDU can be used for standard data processing and the normal cursor control features are available to the programmer. But it also means that the commands appear on the screen and there are no one-step function keys as with the dedicated word processor. Because of the popularity of the WordStar, VDU suppliers are now producing WordStar options on their keyboards to make the package simpler and quicker to use.

There is no simple rule-of-thumb for choosing between a dedicated and a microcomputer word processor. If the application is 75 per cent word processing, you will be better off with a dedicated machine. If the application is part data processing and part word processing, a microcomputer is the solution. However, if you look at the office of tomorrow linked into computing and communications, general purpose microcomputers are likely to provide more flexibility. For example, a two-station microcomputer could service an executive and secretary, where the one is performing financial planning, the other word processing and both are sharing an electronic filing cabinet. The combination of information management with numeric word processing is becoming increasingly common. On the same station, the office team could also link into private viewdata and have a mainframe connection. Recognising these trends, Wang has recently put the CP/M operating system on the Wangwriter to provide access to the CP/M software bank. Digital Research has also implemented CP/M on the IBM Displaywriter.

Communications network

The demands of all the new computing are going to overburden existing communication networks. The requirements for voice, fax, video and data transmission both within buildings and to and from remote locations are creating demands for much more sophisticated and much faster communications channels. Micros are just adding to the load and bringing the demands forward by placing computers in the hands of more and more users who want to communicate with one another. A variety of architectures is being developed to meet these demands, one of the most significant in microcomputing being local area networks.

Like microcomputers themselves, local networks vary enormously in sophistication. The simplest provide a means of slaving a number of micros off a master machine and sharing data storage. A second level provides fast site communications and the capability to string hundreds of devices around a building, effectively replacing the multi-user minicomputer. At a higher level still come those universal networking and data management systems which provide for the intermixing and interchange of data between otherwise incompatible mainframes, minis, wordprocessors, micros and other digital devices.

Existing computing expertise

This is the most important current resource to consider. Computer departments have established a wealth of expertise over the years and it is a considerable company asset. Much of what has been learnt in mainframe and minicomputing is valid for microcomputing, although the better computer departments question the relevance of this experience to the latest technology. Skills must be updated on micros, and additional expertise in hardware engineering should be added. But computer departments can become better equipped to support microcomputing than any other department. In establishing a rationale for microcomputing, it will be especially important to consider existing software skills and programming languages.

New computing is changing the role of management service and computer managers. More and more they have to function as consultants and contract negotiators, steering the organisation through the maze of technology and buying in most of the software and complete systems needed to satisfy their requirements. The job is becoming less a line management, recruitment and staff motivation function and more a super-

consultant and purchasing management position. The trend began with minicomputers and is accelerated by micro technology. Some of the actions which flow from the changes are to: ensure you have a consulting function available to your department; design a software strategy that takes advantage of packages from software manufacturers on mainframes, minis and micros; develop and disperse in the direction of software availability and suitability; buy in turnkey systems rather than build new technology teams; and pursue self-education with a technology update and training in purchasing as a minimum.

DP policy

The introduction and application of microcomputers should fit within a revised DP policy which relates current and future technology to the present and future needs of the organisation.

It is important to draw a clear distinction between company systems — those that are integral to the company's business — and personal systems — those that are peculiar to one or more individuals. For example, micros have been very successfully deployed for goods receiving, warehouse stock location local stock control, and branch information processing. These are all company systems, frequently with multiple sites. They must be controlled from a central point. Time-sharing replacement systems — modelling, for example — are often personal systems, an extension to an individual's skill. If the individual leaves the company, his successor may employ different techniques to achieve the same results. Personal systems should be approached with the same passion for central control associated with company systems. A very fruitful route for future planning is the development of company packages on micros that can be used on many sites. Company packages can greatly increase efficiency, keep development costs down and avoid re-invention of solutions to the same problems. Provided as turnkey sytems to users, they are one pointer to the future role of data processing departments.

Other factors

When developing a strategy for microcomputing, each organisation should establish a list of significant factors affecting such a policy.

1. Company environment: As well as computing resources and constraints, there are company constraints; the implementation of microcomputing has to take into account the company environment. The nature of the business is clearly important; for example, a manufacturing business has different microcomputing requirements from those of a service industry. The company structure has a strong influence on the manner in which microcomputers are introduced and should be carefully considered. It is vital that control of microcomputing be situated at the right place in the company structure. The new technology will have a profound effect on the company as a whole and the computer department in particular. Important changes of this nature invariably lead to problems of internal politics with different departments seeking control. Microcomputing will have a strong influence on future company policies for several aspects of the company's business. For example, it is likely that turnkey micro systems will lead to staff retraining and redeployment. The planning of future staffing must be integral to the introduction of new technology. Like other computer systems before them, micros are at their best and are most frequently used in areas where business is expanding. Put in the hands of interested users, the new technology will create a base of new products and services as well as improve productivity.

2. Users' attitude towards DP: It would be unrealistic to assume that all users are favourably disposed towards DP departments. Disappointments with previous computing, frustrations over delays and costs, and naivety about computing generally, allied to continual press and TV bombardment about the micro revolution, will lead some users to seek their own solutions which can be expensive to the company as a whole. The establishment and promotion of a professional microcomputer service by DP departments will go a long way towards ensuring that the optimum use is made of microcomputer technology. DP departments should be aware that many user managers will have budget authority to spend the capital sums to acquire a micro, as will engineers, technicians and scientists. It will not usually be possible for DP to establish a monopoly on micro supply and application. However, the need for advice and support services from DP will grow and an increase in user independence should encourage healthy mutual respect. It is vital that DP gears up to provide a rapid response to user needs, especially through purchase of turnkey systems. Response times normally associated with mainframe systems (six to 18 months) will frustrate users further and understandably encourage them to seek satisfaction elsewhere.

3. Software and services: While hardware costs continue to fall, manpower costs are rising with inflation. Increasingly, software development and services will represent the highest cost in a total system. But the naive user does not understand software and relates cost to hardware prices. In microcomputing, software and associated services are rarely less than the hardware and frequently three times more than the hardware cost. It is vital to tap available expertise, using good development aids and packages wherever possible. Computer departments have a very important role to play in protecting users and the company from making expensive software mistakes.

4. Security of suppliers: The micro industry is young and volatile. The first microcomputers came on the market in 1975. Some companies have become established in sectors of the market, a few have come and gone already. There is no one dominant manufacturer: no IBM or DEC. However, there is much more software and hardware conformity in microcomputing than in mainframe and mini computing because the industry is a component industry. The common international hardware and software standards should be adopted. They will provide independence from any one supplier and give a wide range of choice in products.

5. Maintenance and day-to-day operation: In looking at any new development in computing, the promise of the technology frequently overshadows the more mundane but vital aspect of reliability, maintenance and day-to-day operation. DP departments are well equipped to advise their users on the importance of these aspects since they apply equally in microcomputing as to mainframe and minis. An important element in choosing equipment is the availability of maintenance and spare parts. Equipment which is supported under complete system maintenance contracts by established companies is advised.

6. Component industry: As already mentioned, the microcomputer industry is predominantly a component industry. This has developed partly by chance and partly by necessity. Most of the manufacturers started off in a small way. Some significant companies today, eg, Apple, Dynabyte, started in someone's garage only a few years ago. Many were hobbyists and technicians who obtained relatively modest private

The American Educational Tour

Every computer professional should spend 3-4 weeks on a technology update. This tour should concentrate on:

1. Your mainframe supplier's future developments and timing.
2. The leading mini suppliers: DEC, Hewlett Packard, Wang.
3. A semiconductor manufacturer: Intel.
4. The technology universeities: Stanford, MIT.
5. The software manufacturers: Digital Research, Microsoft, MSA.
6. New architecture companies: Tandem. 3 Com, Xerox.
7. Exhibitions: Comdex: NCC, West Coast Computer Faire.
8. Random trips in Silicon Valley to recommended sites.

Micro Options to Conventional Systems

1. Systems economically justifiable on new low cost technology.
2. Systems with data volumes in the 100k — 100M range.
3. Terminal systems with stand alone capability.
4. Systems with 1-16 users.
5. Local area network replacement for minis.
6. Timesharing replacement for numeric applications.
7. Mixed processing systems, data, information and word processing.

FRAMES OF REFERENCE

financial backing to produce specialist printed circuit boards. Other private companies went into business putting these boards together to form microcomputers. Even at chip level, it is a component industry with board manufacturers using a selection of chips from a variety of manufacturers. Through necessity, hardware standards developed and the industry is growing into adulthood. The flexibility, robustness and economies of scale resulting from a component industry with good hardware standards has resulted in a healthy industry in which non-component companies (such as IBM, ICL, Burroughs etc), are less competitive. Micro companies are still relatively small and some will undoubtedly go out of business. When selecting microcomputers it is therefore essential to carefully consider the financial standing and reputation of the manufacturer. It is also necessary to buy in expertise because front-line support is limited in comparison with that provided by mainframe and mini manufacturers.

7. Communications and policy for convergence: Communication is a subject frequently raised in the same breath as microcomputing, especially in large companies with dispersed computing facilities. Today it is practical to use a microcomputer as a terminal and to transfer files from one microcomputer to another. A number of communications software manufacturers have emerged and IBM 2780/3780 and 3270 protocols are generally available to turn Z80 microcomputers into very cheap emulators. Emulation software for other popular machines is arriving on the market, and some users will develop their own emulators for distributed micro systems with mainframe connections. However, microcomputers are justified most frequently as linkless terminals where communication is not required or where a postal floppy disk service is perfectly adequate. There is a growing demand for a means of interconnecting not simply micros and minis but other devices, eg, word processors, fax machines, viewdata services. It is important that the impact of these demands on existing communication networks is considered and a strategy to meet future requirements established.

8. Future technologies: Microcomputer technology is changing rapidly. Companies will often wish to take advantage of the latest technology but should be careful about pioneering new products in operational systems. Continuously keeping near the forefront of technology can be costly if it means replacing equipment every year and expanding the range of supported systems. It is possible to adopt new technologies inexpensively by using relatively well-proven products. The position of microcomputing a year ago was that there were proven, operational, single-user systems performing calculations and data processing tasks. Today there are proven multi-user systems with substantial cheap storage and communications capability. In a year's time proven technology will be available to facilitate the convergence of disparate computer architecture and the exchange of data between many different devices. The gateway to these technologies is in standard software, CP/M, MP/M, Unix, MBasic, CIS-Cobol and Pascal — a point that is repeated to ensure that the software media is the message.

Provided they are identified as prototypes, a valuable contribution can be made from experimental systems, and large departments should have a research and development budget to test new products. Communication and convergence products can be taken on now in controlled experiments which can add considerably to subsequent computing capability and economics. One reason US technology is in advance of the UK is that ultra-conservative management here makes much less provision for research and development in their budgets.

Summary of possibilities

A later chapter explores the applications for the general-purpose microcomputer but a summary at this stage will help put this powerful and versatile machine into the context of existing computer resources and constraints.

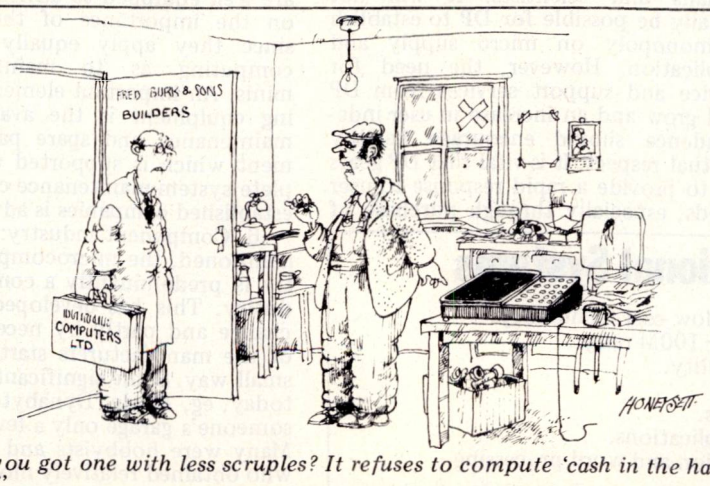
1. Options to mainframe systems.
- Low priority systems: Systems not economically justified on mainframes and/or those that never appear high enough on the priority list to be implemented.
- Replacement of creaking systems that need major overhaul.
- Low data volume systems. Systems with file sizes from 100k to 100Mb.
- Terminal systems with stand-alone capability. Sytems primarily used for local processing with occasional need to access/update mainframe files.
- Extensions of big systems to lower levels in the company, eg, depot stock recording.

2. Options to minicomputer systems.
- Similar options to mainframe systems.
- More affordable 'minicomputer'. Systems with 2-16 users.
- Local area network alternative to multi-user minis.

3. Options to timesharing systems
- Replacement of numeric applications, financial planning, PERT.
- Replacement of lower data volume systems.
- Use as data entry devices to cut connect costs.
- Terminal systems with stand-alone capability.
- Local area network with timesharing capability.

4. Options to word processing and other systems.
- Alternative to dedicated word processors.
- Suited to combined data processing and word processing applications.
- Alternative to dedicated viewdata terminals.
- Local area networks with electronic mail capability.

5. Relevance of existing expertise.
- User timesharing skills apply, eg, Basic, APL, Fortran.
- DP development skills apply, eg, ANSI Cobol availability.



"Haven't you got one with less scruples? It refuses to compute 'cash in the hand' estimates."

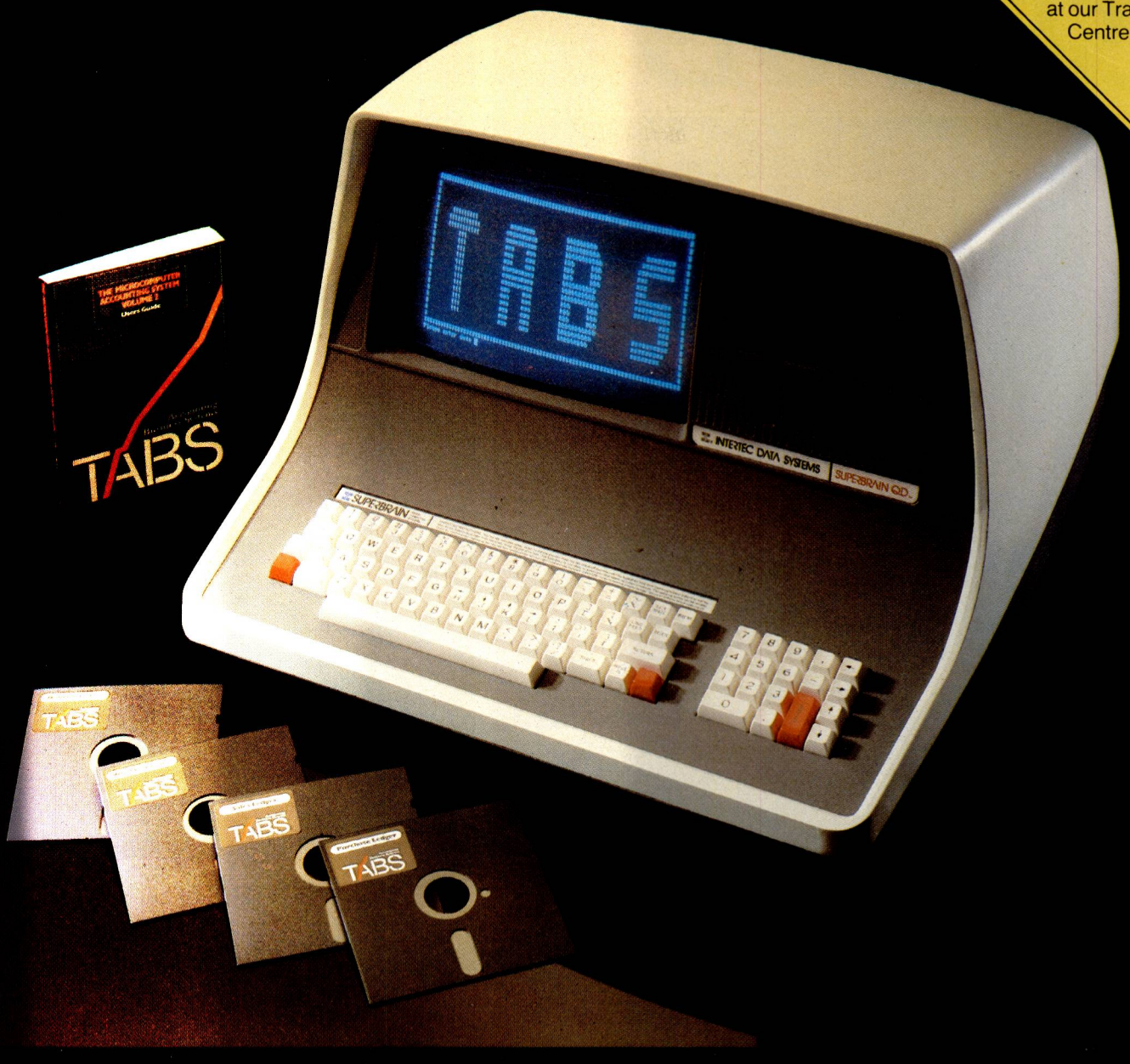
The third commandment of microcomputing

Thou shalt not be inhibited by the limitations of today's microcomputers. Even as they are being discussed, the inadequacies of the current generation of microcomputers are being made good in subsequent generations. The summary of possibilities describes some options created by today's 8-bit and 16-bit machines. The emergence of commercially available 32-bit devices in two years' time will dramatically enhance the application of micro technology, especially as it combines with new video, communications and storage technologies. Companies planning a five-year computing strategy must be aware of those possibilities and make decisions that will provide a pathway from 8-bit to 16-bit to 32-bit machines. It is essential for management to investigate developments in the different fields of computing.

Management service executives should spend several weeks in the USA visiting leading semiconductor, mainframe, mini, micro, peripheral, communication system and software suppliers. Such a trip will be a revelation: no words can have the impact of actually seeing the new products that the microchip is siring. The sophistication of the products and the speed with which factories mushroom to produce them is stunning even for those close to the technology.

END

Come to one of our
Free
Introductory
Seminars
at our Training
Centre in Andover.



...now on SUPERBRAIN

TABS unique business software is a flexible package designed to maximise business efficiency and profitability.

TABS is also **modular**. Each of 13 modules may be run individually or together. Modules include: Sales Ledger, Purchase Ledger, Sales Order Processing, Invoice Compiler, Fast Data Entry, Nominal Ledger, Management Accounts, Job Costing, Payroll, Bill of Materials, Stock Control, Word Processor, Mail List.

The system is **fully integrated** so that updated information on one module automatically updates information on a related module e.g. items entered on the Sales Ledger would deplete Stock Control.

Each module is **parameter driven** enabling end users to adapt each module to suit their unique accounting requirements.

The TABS system is **upgradeable**. It bridges the gap between micro and mini computers facilitating expansion from the single user system to the multi user system on SYSTIME and D.E.C.

Finally, TABS is **universal**. The modular system currently running on PET, Apple and Superbrain will shortly be available on most CPM microcomputers.

We would, however, like to add a word of caution to the end user. Naturally a package as flexible as this is a sophisticated product and although simple to operate we strongly advise professional help either from your Dealer or from TABS during its installation.

For more details about TABS software and hardware, please tick box(es) and return coupon to us. We are pleased to offer credit card facilities to our customers.

PCW 9

Dealer enquiry
☐ Please send me details of your Dealer Plan

User enquiry
☐ Please send me details about TABS accounting systems
☐ Please send me the TABS User Manual £20 inc p&p

I enclose cheque/postal order for £ _____

Signature _____

Name _____

Address _____

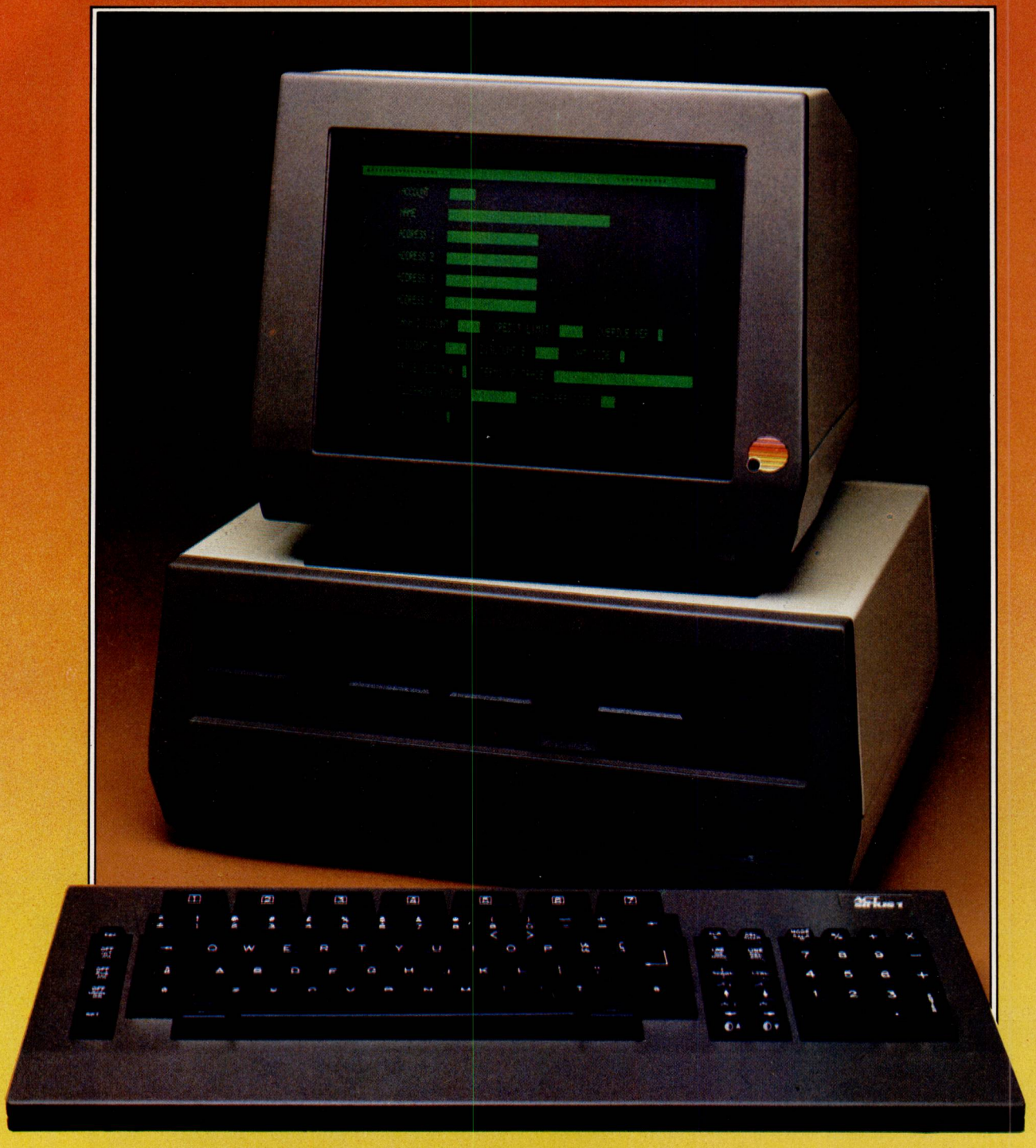
_____

Tel. No. _____

TABS Ltd, Sopers House, Chantry Way, Andover, Hants. SP10 1LU
Telephone: Andover (0264) 58933

Accounting Business Systems
TABS

SEEING IS BELIEVING



ACT sirius 1

NEW ACT SIRIUS 1
Minicomputer Performance. Personal Computer Price.
16 bit processor: £2,395

The best price/performance ratio you've ever seen on a personal computer.

	ACT Sirius 1	Typical Personal Computers	Typical Business Systems
Memory	128K-1024K	32K-64K	48K-256K
Disk Capacity	1.2Mb-10 Mb	140K-1Mb	1.2Mb-10 Mb
Processor	16 bit	8 bit	8 bit
Operating Systems	CP/M-86, MSDOS	CP/M or Machine Specific	Usually Machine Specific
Languages	Microsoft BASIC Compiled BASIC COBOL PASCAL FORTRAN	Microsoft BASIC perhaps one or two others, eg PASCAL	BASIC and perhaps one or two others
Price	£2395	£1800-£3000	£4500-£8500

ACT Sirius 1 is a new generation personal computer. Quite simply, it has no competition at the price.

It's the first personal computer developed from the outset for business and professional use.

It's launched with more software than anything before it.

It's supported and distributed solely by ACT — the biggest name in personal computer software.

And it's developed by Chuck Peddle, formerly of Commodore and generally regarded as the father of personal computing.

SOFTWARE SPELLS SUCCESS

ACT Sirius 1 has more software than any other new personal computer:

A choice of two operating systems — CP/M-86 or MSDOS, from Microsoft.

For Software Houses

The ACT Sirius 1 has a language for you. Microsoft BASIC 80, two BASIC Compilers, two COBOLS, PASCAL and FORTRAN.

For Applications

Wordstar, Mailmerge, Pulsar, SuperCalc and MicroModeller — all the best sellers.

And the ACT Sirius 1 can run any software written for CP/M — that means hundreds of specialised packages.

THE BODY IN QUESTION

Ergonomics play 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.

STAYING OUT IN FRONT

The ACT Sirius 1 is designed to keep you out in front. Winchesters, networks, multi-user facilities and colour graphics are all scheduled during the next twelve months. And all at the same record-breaking price levels of the ACT Sirius 1.

SEEING IS BELIEVING

The ACT Sirius 1 goes through the most exhaustive quality control process of any microcomputer — including the much vaunted Japanese products.

ACT Sirius 1 has been successfully operating in testing field trials for over 6 months already. And now it's at your nearest ACT Dealer — ready to revolutionise your ideas on personal computers.

Clip the coupon for literature. Better still, call David Low now on the hot line 021-454 8585, get the name of your nearest dealer and see a demonstration as soon as you can — because seeing is believing.

To: ACT (Microsoft) Ltd, FREEPOST,
Birmingham B16 8BR.

☐ Please send a brochure and name of my nearest dealer

☐ I am interested in dealership — send the dealer pack and ask your sales director to contact me.

Name_____

Position_____

Company_____

Address_____

Telephone_____ PCW/3

ACT No.1 in Total Computing.

DO NOT ADJUST YOUR SET!



This is an actual photograph taken from a TV receiver.

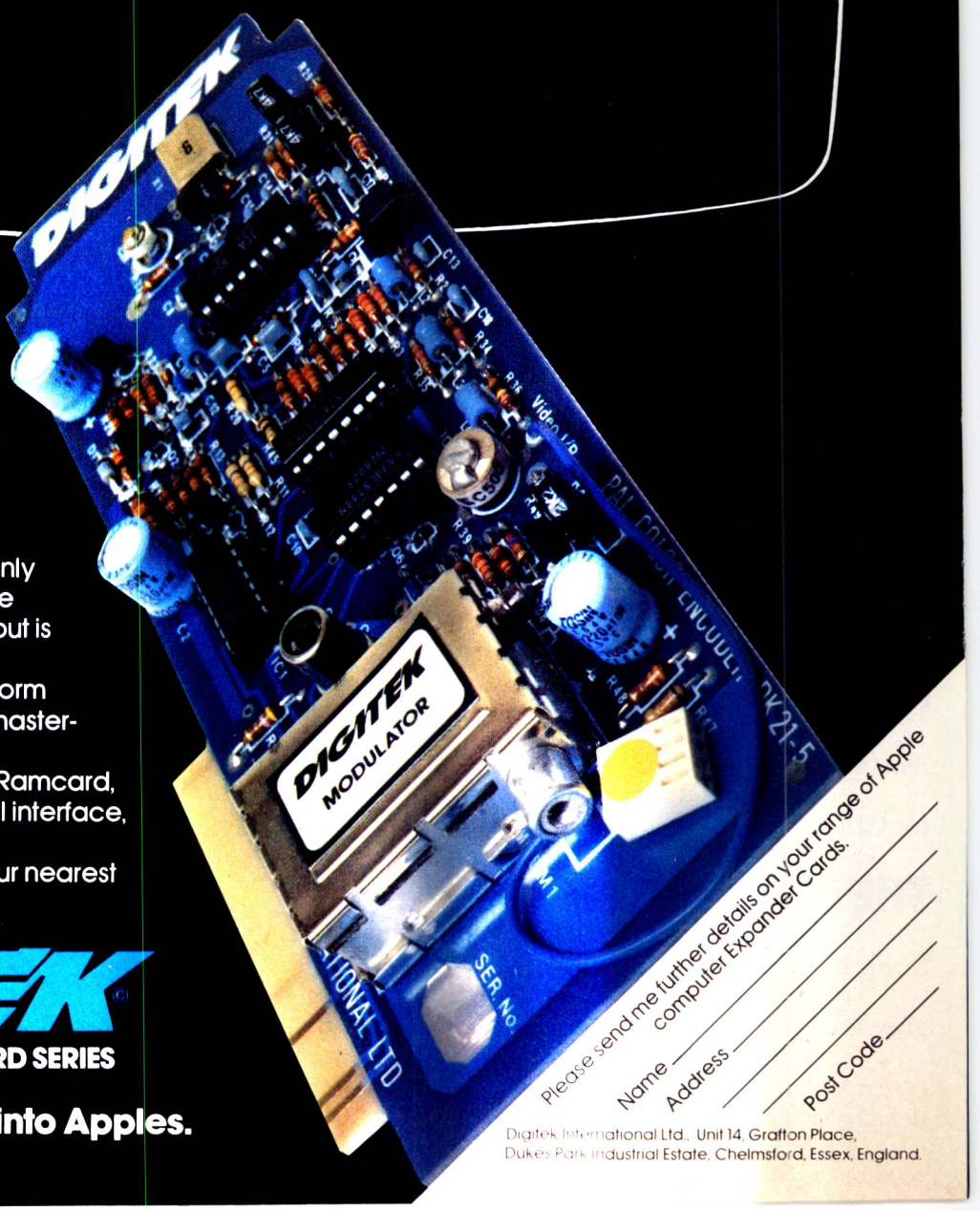
That's the colour of the Digitek PAL Encoder Card for APPLE II computers.

Featuring an on-board UHF modulator and the unique Digitek 'Safety Tab' for sure, easy handling.
This principal member of the Digitek range of Apple expander cards not only gives the best quality PAL version of the Apple's colour graphics capabilities, but is also simplicity itself to install.
One plug-in card is all it takes to transform your dull display into a techni-colour masterpiece.
Also in the Expander Range are a 16k Ramcard, Z80 Expansion card, High speed serial interface, and more!
Send in the coupon for details and your nearest stockist.

DIGITEK©

EXPANDER CARD SERIES

The people who are really into Apples.



Please send me further details on your range of Apple computer Expander Cards.

Name _____

Address _____

Post Code _____

Digitek International Ltd., Unit 14, Gratton Place, Dukes Park Industrial Estate, Chelmsford, Essex, England.

ELECTRONIC DEMOCRACY
THE DISTAFF SIDE

By Ian Lloyd M.P.

In my last article I discussed the possible impact of interactive cable television which, in the QUBE system already installed and active in Columbus (Ohio) and a number of other US cities, is likely to spread very rapidly throughout the developed world. When I wrote that article I was not aware that Robert Atkins, the MP for Preston North has been successful in the ballot for motions for discussion in private members' time on Friday, and that the House would have an early opportunity for a fairly general and interesting debate on the broader aspects of information technology. In that debate I had an opportunity to describe QUBE very briefly and to put down one or two warning markers. It is on these markers that I would like to expand in this article.

My first warning to the House was that I very much doubted whether any Government of any party would be able to prevent the spread of interactive television. The only effective restraint, as I see it, will be the cost of a cable network. Kenneth Baker has told me he expects that this will probably be the largest single capital investment ever undertaken in either sector in the United Kingdom. Wiring every house, office building, village and town with fibre-optics will certainly require expenditure on much the same scale as the railway system in the 19th century and North Sea oil in the second half. So governments will be able to prepare and adapt reasonably slowly as the investment takes place. There will, however, come a time when the 'critical mass' is present, and in political terms that will be when what the statisticians define as a 'stratified sample' of the population has interactive television. That will take place sooner than we expect but it will, of course, require the existence of sets in all social classes, economic groups, urban areas and geographical regions of the UK. What then?

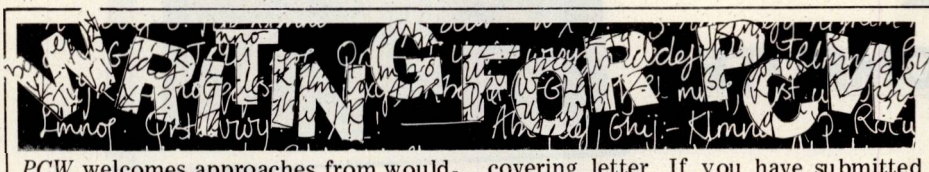
Those whose political views and instincts tend naturally to the populist version of democracy (all the people, every issue, every time) will then demand the use of the electronic AGORA. Tony Benn (or his successor) will argue powerfully that if it can be done it should be done and they will seek, in my judgement, to discredit the validity of decisions for which approval is sought in any other way.

The dangers and problems are probably best revealed by considering a similar example of such a decision. Should we or should we not build more nuclear power stations? These are the questions (among others) which would have to be answered. First, how long is the debate to continue — one month, one year or longer? Second, who is to have access to the system? The political parties, the CEGB, the nuclear industry, Friends of the Earth, the mayors of affected towns, villages or communities, industrialists who will have to meet higher energy costs, alternative energy lobbyists, academics, journalists, trade unions — to name the more obvious claimants. Assume that this is settled without immense controversy (unlikely). In what order are their arguments to appear, how long is each to have on the air, is every presenter to have the right of reply, who will close the debate? Assume that these questions are settled without controversy (*most* unlikely). We then enter even more formidable lists of controversy.

Is *every* accessibly and appropriately equipped viewer to have a vote? Of course, say the populists. But what about those who acquired their sets the day before the vote and might therefore be presumed not to have listened to all the arguments? Is the vote to take place in the morning, midday, afternoon, or evening? If pm is chosen, will it be after the 'Dallas' of the day or before? How will the organisers ensure that some votes are not cast by children (although it is of course arguable that some 15-year-old enthusiasts will understand 10 percent of the jargon of the argument!). Will organised groups dedicated to one or other outcome be permitted to arrange button-pushing parties (analogous to the attempts made in our more conventional elections to organise the votes in old people's homes)? What percentage response rate will validate the decision? And, finally, if the decision is perceived to be disastrous will it be allowed to stand? If it is not allowed to stand, how will a democratic government justify a different policy or executive decision?

These are some of the difficulties which I foresee. There may well be others. I hope that readers will think about this issue. I would like to know their ideas about what can be done to preserve *Parliamentary* democracy in such an environment, which is almost upon us. If we think these things out in advance we may have some hope of obtaining the best of both worlds, for both have something to offer. Parliamentary democracy can always be made to work better and be seen to be more effective as well as more responsive. But the great decision must, in my judgement, be made by an informed community, and my political experience tells me that on most issues, most of the time, most people don't want to be bothered. Equally, electronic democracy will not go away. It will be thrusting aggressive intruder at the table of power. It will alter the balance and nature of political power. The demagogue, in particular, will see and seize great opportunities. There is much at stake, including responsible government. By forethought it may just be possible to ensure that it is improved and not destroyed by Information Technology.

END



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 look-out 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.

THE NEW APPLE ///

MORE COMPUTER POWER ON YOUR DESK-TOP

Apple II has already captured the imagination of the world – and now we have introduced Apple /// built to handle bigger problems – faster.

MORE POWER

Apple /// has a 128K processor (expandable to 256K), a built-in disk-drive with controller and an ergonomically-designed keyboard with sculptured keys and a separate numeric key-pad. There's also a design-integrated monitor, Monitor /// – with a full 80-column upper and lower case display.

But look closer and you'll find out why Apple /// is unique, providing a total solution to business problems.

MORE ABILITY

Apple /// has a Sophisticated Operating System – the essential foundation for all software developments. But the really big news is ProFile,™ the 5-megabyte hard-disk drive that's been developed for Apple ///. Apple /// and ProFile represent the ultimate in personal computer hardware.

Apple /// can be programmed in Business BASIC or using Pascal /// for a really powerful development environment.

MORE CAPABILITIES

And, of course, there's a range of Apple Software for Apple ///.

Apple Writer /// – the complete word-processing package. VisiCalc /// – the latest version of the most widely-used financial planning package – using the unique capabilities of Apple ///. Mail List Manager – to allow you to create, sort and edit all kinds of mailing lists (and Mail List Manager interfaces to Apple Writer ///). Access /// – a data communications package which allows Apple /// to be connected to a larger computer or other Apples.

And already software developers have caught up with Apple /// – creating software to handle ledger systems, database management, data communications and stock control – to cope with bigger business problems, faster.

MORE INFORMATION?

Simply send back the coupon (no stamp required).

Apple Computer (UK) Limited
Finway Road, Hemel Hempstead, Herts. HP2 7PS.
Tel: Hemel Hempstead (0442) 48151

®Apple and ProFile are trade marks of Apple Computer Inc.

apple®

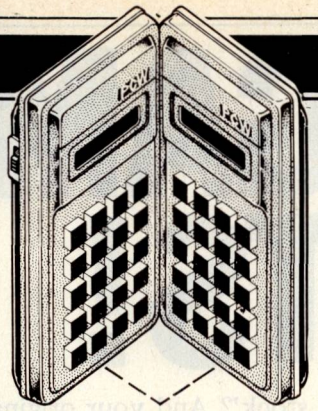
THE PERSONAL COMPUTER



Please send me further details on the new Apple /// and ProFile.
I am interested in:– ☐ Business Use. ☐ Developing Software. ☐ Dealership Details.
Please complete this coupon and return it to:–

Apple Computer (UK) Ltd,
Finway Road, Hemel Hempstead, Herts, HP2 4BR, FREEPOST.

Name _____ Position _____
Address _____
_____
Telephone No. _____



CALCULATOR CORNER

Compiled by Dick Pountain

Hewlett-Packard in a loop

On first hearing, the notion of networking HP-41C programmable calculators sounds a little daft — calculators are almost by definition personal and private instruments. Nevertheless, Hewlett-Packard has just announced a new interface, HP-IL, which does just that, and on closer examination it is far from daft.

It was, of course, Hewlett-Packard which invented the HP-IB interface for its large computers, and this, under its better known name of IEEE, has become an international standard for instrument control. HP is therefore no newcomer to the art of interface design.

HP-IL (the IL stands for Interface Loop) is as the name suggests a closed loop, using two wires to connect up to 961 devices in series. The reason that it isn't daft is that HP has announced at the same time several new peripherals to go onto the loop, as well as an interface card, for the HP-85 micro.

The first remarkable thing about HP-IL is its transmission capability, namely that data can be moved up to 5 kb per second (in one direction), and the distance between devices may be up to 100 metres; this, don't forget, is with *battery-powered* devices! For comparison, the widely used RS232 serial interface only allows five feet between stations.

The loop is operated on a 'master-slave' basis, where one device is nominated as master and sends a command around the ring which is received and passed on by each device in turn until it arrives back at the master; only the device for which the command is intended will act upon it. This system allows error checking, since the master can see whether the command is the same as when originally sent. A polling system allows user programs to be quite unspecific about devices, needing to specify neither address nor device number. For instance, a PRINT instruction will send a command that looks for any printer on the loop and activates the first one it finds.

So what can you hang on such a loop and why? The new peripherals announced include a digital cassette recorder, a new thermal printer, two new memory expansions, a real-time clock unit and a digital multimeter, plus interface adaptors for the HP-85 and for measuring instruments.

The cassette recorder provides 131k of storage per micro-cassette, using digital rather than audio encoding for speed and reliability. Searching is performed at 30in/sec. Programs as well as data can be stored in named files, and a directory is kept as on a floppy disk.

The thermal printer is basically the same unit as the current HP-41C printer but with the interface logic built in to allow its HP-IL use.

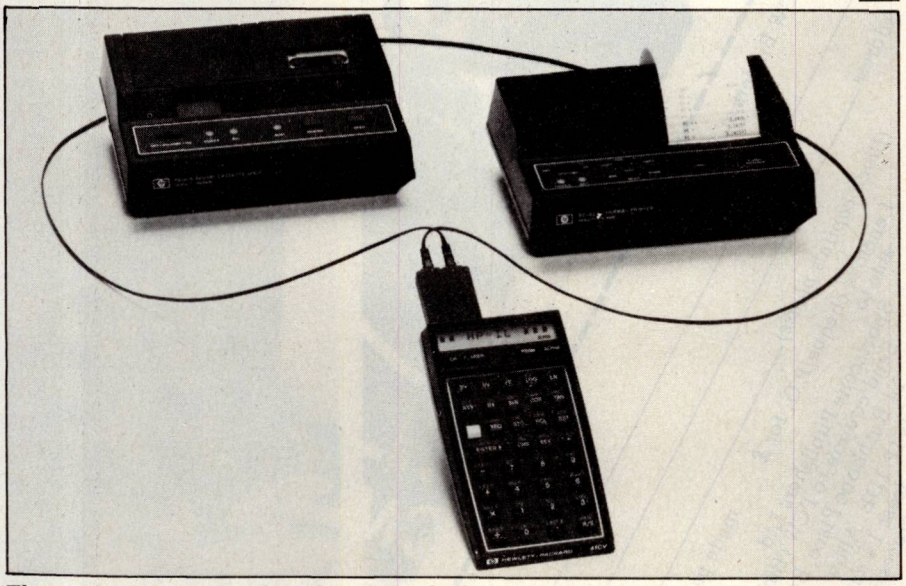
Two RAM extensions called HP82180 and 82181 allow the expansion of an HP41 C/CV to 6.5k of continuous memory. The first-named module contains, in addition to 889 bytes of RAM, a set of extended memory functions in ROM, which enable transfers to be made between main RAM and the 82181 module, two of which (1666 bytes apiece) may be added. Thus the extended memory is not contiguous with the main RAM but is addressed as an external device using the new commands to set up files. File types supported are Program, Data and ASCII; this last being particularly useful for communicating with another computer such as the HP-80 series.

So what can you use HP-IL for? One obvious application is merely to allow attachment of the printer, cassette recorder and expansion memory to a single HP-41C. Another, more novel, is to include an instrument like the multimeter in the loop and control it from a 41C, processing its data output and storing it on tape or printing it. Using the real-time clock module this could be made to be an automatic process, sampling at regular intervals without human intervention. Since all these peripherals are battery-operated, this could all happen just as well in the middle of a forest or desert as in the laboratory. In addition to HP's own multimeter a board has been produced to build into other instruments making them HP-IL compatible.

If you want to go the whole hog you can stick an HP-85 microcomputer into the loop so that data can be passed between one or more hand-held HP41Cs and the computer: the 41C thus becomes an intelligent data capture terminal. Obviously programs cannot be downloaded since the 41C doesn't speak Basic and vice versa; data must be sent in ASCII form.

HP intends HP-IL to become a permanent and extensive 'small systems' interface, and is planning to make all its future small products compatible with it. Rumoured for the near future is a video interface to allow the 41C to display on a CRT, and an HP-IL/RS232 connector.

With the introduction of this product the 41C/CV now more than lives up to the title of 'hand-held computer' and the system should prove a cost-effective solution to a variety of laboratory data-logging problems, especially where mains power is unreliable or unavailable. I look forward to testing some of this hardware in the near future and perhaps comparing it with the Panasonic HHC which is the only other hand-held system which approaches the HP's new found abilities. END



There wasn't room for the other 960 calculators in this picture.

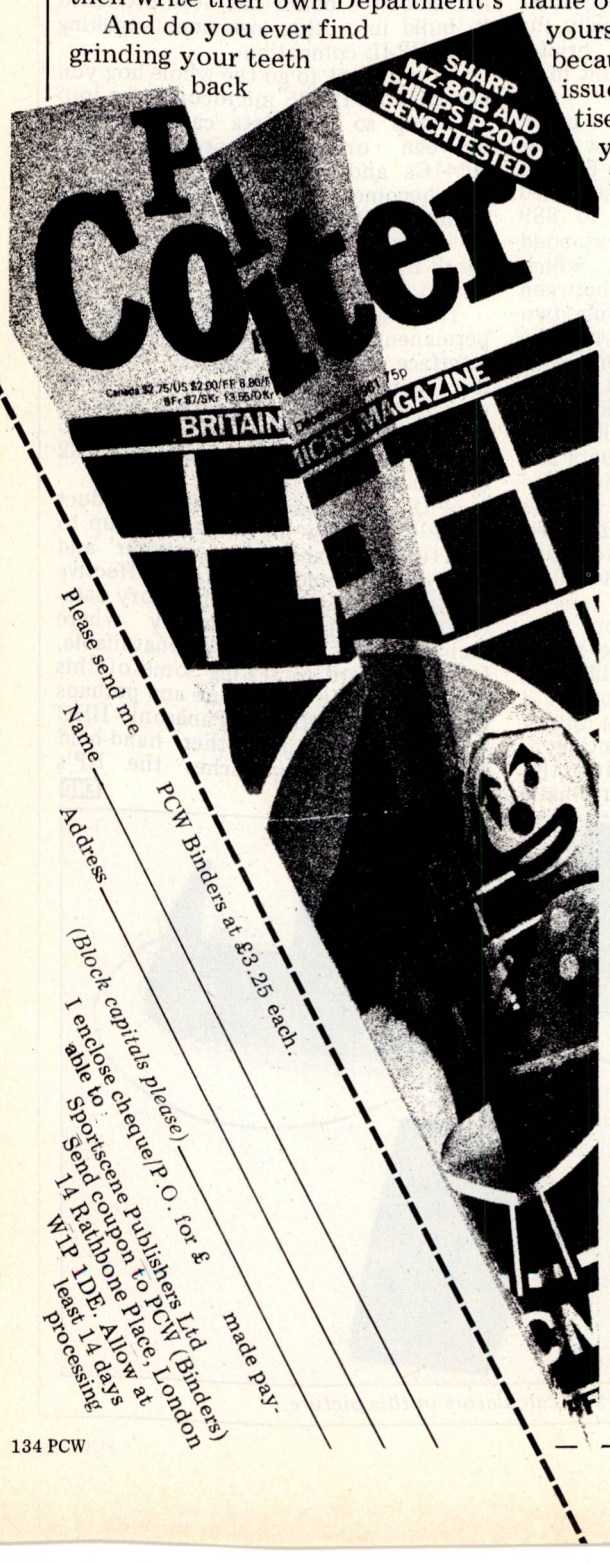
FOILING ORIGAMI MERCHANTS!

Do your friends and colleagues drop by to 'borrow' back issues of **PERSONAL COMPUTER WORLD**? And 'forget' to return them?

Does your mother/father/sister/brother use 'those old magazines you left lying about your bedroom' to line the budgie's cage, the cat's litter or to practise the ancient art of origami?

Do people in your organisation filch issues of **PCW** from your office while you're absent and then write their own Department's name on them?

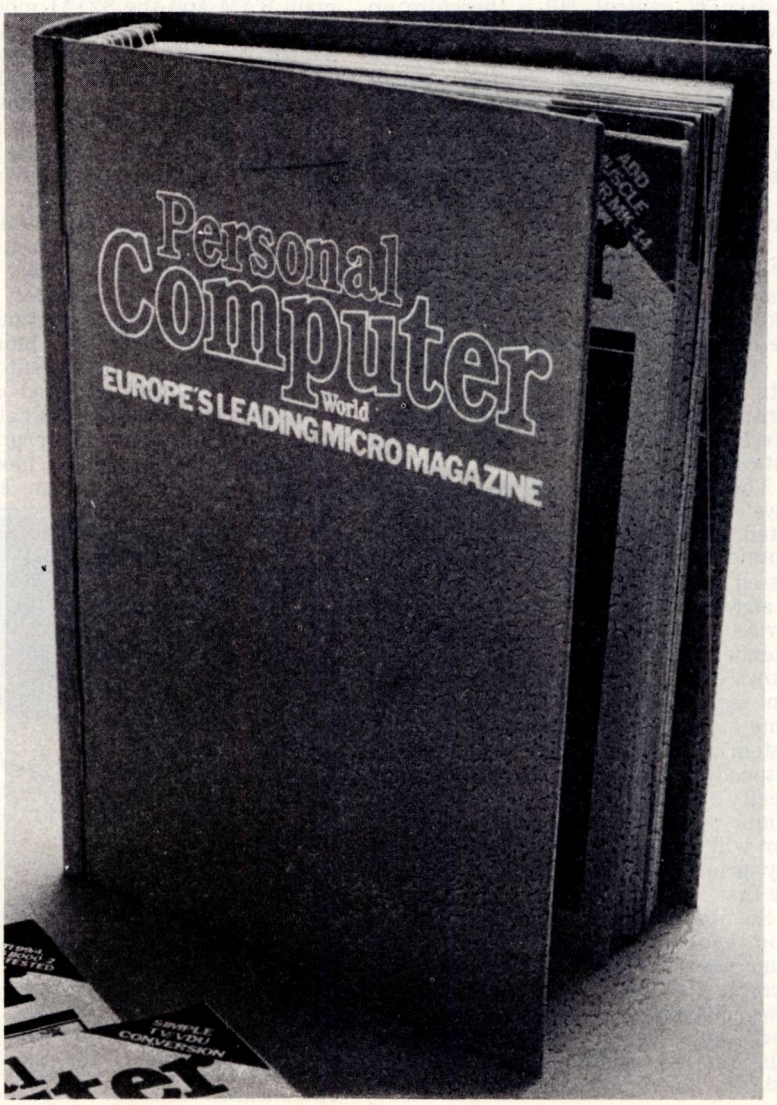
And do you ever find yourself grinding your teeth because our back issues advertisement tells you an issue you urgently need to consult is now 'out of stock'? And your original copy has long since vanished.



THERE IS A SOLUTION

PERSONAL COMPUTER WORLD Binders will keep your copies of Britain's Largest Selling Micro Magazine in pristine condition. They are sturdily made, goldblocked front and spine and designed to hold a year's supply. (We recently enlarged their capacity to deal with the growth in pages of recent issues). And they not only make quick reference a reality at last, but look pretty impressive to boot.

The coupon is at the foot of the page. The price is only £3.25 each (and that price will almost certainly increase shortly) and includes all postage and handling.



Please send me PCW Binders at £3.25 each.

Name _____

Address _____

(Block capitals please)

I enclose cheque/P.O. for £ _____ made payable to Sportscene Publishers Ltd

Send coupon to PCW (Binders) 14 Rathbone Place, London W1P 1DE. Allow at least 14 days processing.

Make the most of your Sinclair ZX Computer...

Sinclair ZX software on cassette.

£3.95 per cassette.



The unprecedented popularity of the ZX Series of Sinclair Personal Computers has generated a large volume of programs written by users.

Sinclair has undertaken to publish the most elegant of these on pre-recorded cassettes. Each program is carefully vetted for interest and quality, and then grouped with other programs to form a single-subject cassette.

Each cassette costs £3.95 (including VAT and p&p) and comes complete with full instructions.

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

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

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

8K BASIC ROM

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

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

16K-BYTE RAM pack

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

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



Cassette 1 – Games

For ZX81 (and ZX80 with 8K BASIC ROM)

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

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

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

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

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

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

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

For ZX81 with 16K RAM pack

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

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

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

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

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

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

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

Cassette 3 – Business and Household

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

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

NOTE PAD – a powerful, easy-to-run system for storing and retrieving everyday information. Use it as a diary, a catalogue, a reminder system, or a directory.

BANK ACCOUNT – a sophisticated financial recording system with comprehensive documentation. Use it at home to keep track of 'where the money goes,' and at work for expenses, departmental budgets, etc.

Cassette 4 – Games

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

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

TWENTYONE – a dice version of Blackjack.

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

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

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

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

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

For ZX81 (and ZX80 with 8K BASIC ROM)

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

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

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

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

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

TEMP – Volumes, temperatures – and their combinations.

How to order

Simply use the order form below, and either enclose a cheque or give us the number of your Access, Barclaycard or Trustcard account. Please allow 28 days for delivery. 14-day money-back option.

sinclair

ZX SOFTWARE

Sinclair Research Ltd,
6 Kings Parade, Cambridge,
Cambs., CB2 1SN. Tel: 0276 66104.

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

Qty	Code	Item	Item price	Total
	21	Cassette 1 – Games	£3.95	
	22	Cassette 2 – Junior Education	£3.95	
	23	Cassette 3 – Business and Household	£3.95	
	24	Cassette 4 – Games	£3.95	
	25	Cassette 5 – Junior Education	£3.95	
	17	*8K BASIC ROM for ZX80	£19.95	
	18	*16K RAM pack for ZX81 and ZX80	£49.95	
		*Post and packing (if applicable)	£2.95	
			Total £	

*Please add £2.95 to total order value **only** if ordering ROM and/or RAM.

I enclose a cheque/PO to Sinclair Research Ltd for £_____

Please charge my Access*/Barclaycard/Trustcard no.

_____

*Please delete as applicable.

Name: Mr/Mrs/Miss _____

Address: _____

PCW 03

THE NEW MIC

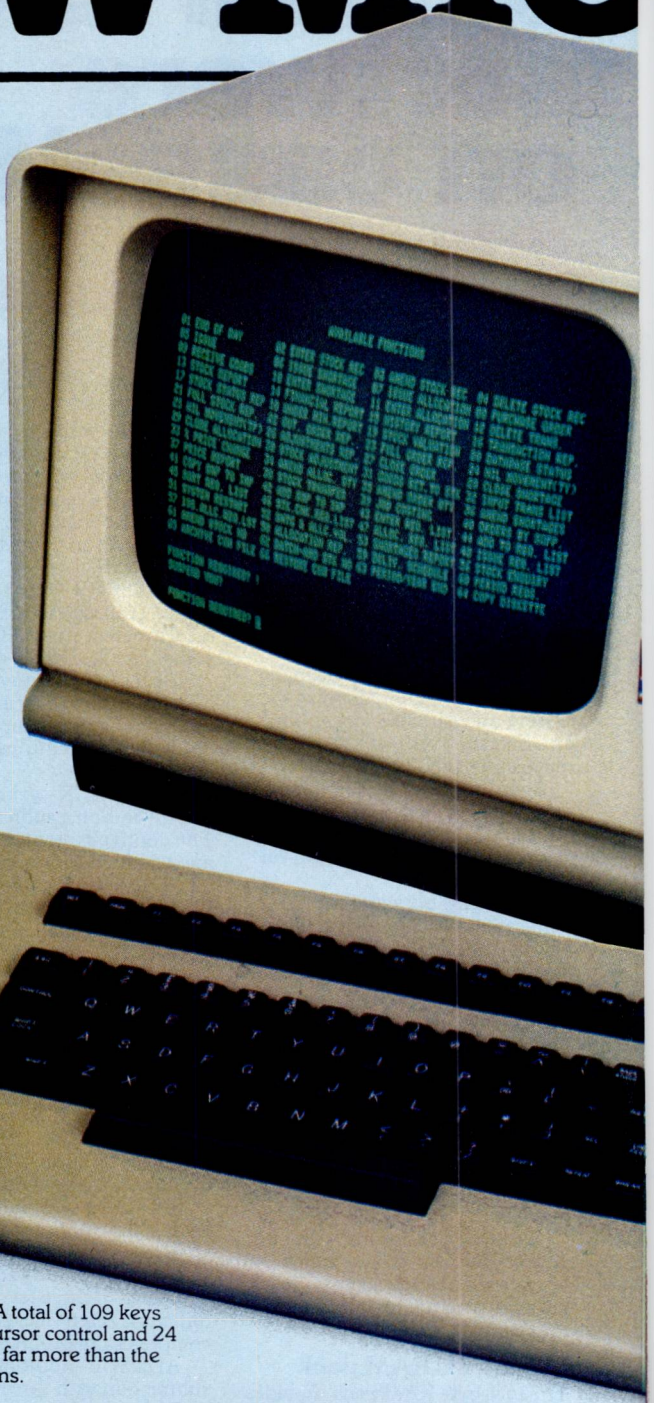
SYSTEM M-THREE

LSI, Britain's leading micro-computer manufacturer, is pleased to present the long awaited low cost, high performance, SYSTEM M–THREE.

From the early days of the large commercial computers, it became obvious that the need would arise for a compact micro-computer for use by smaller businesses, professional people, scientists and in many other areas. With the development of the micro-chip, other manufacturers, mostly overseas, soon flooded the market with their unverified versions of personal or small business computers.

At LSI we approached the matter more thoughtfully. With the success of highly acclaimed SYSTEM M-ONE and M–TWO machines, we were able to put together a large and experienced research and development team. They were given the task of producing a system that would adapt itself to the varying requirements of a single professional person, for example an accountant, or a medium sized commercial business, needing the full range of sophisticated facilities now available to the commercial user.

With assistance from the Department of Industry, no effort or expense was spared in producing a machine that is way ahead of it's class. The end result... a system that caters for all needs, from stock control to word processing; a system which in price, performance, reliability and looks, really has put BRITAIN BACK IN FRONT.



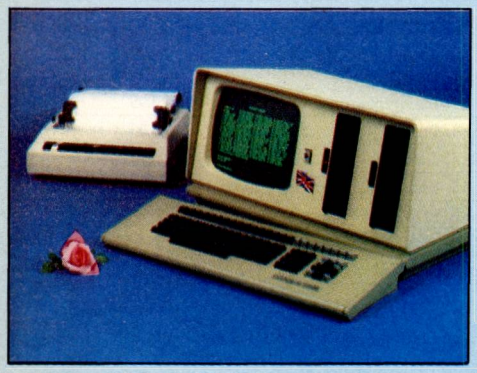
Salient features.

M–THREE is designed in a modular form allowing many versions to be manufactured with the advantages of economics of scale. Common to all basic configurations are:

- Single board computer comprising Zilog Z80 processor with 64K RAM, 2K bootstrap loader prom, optional 2K monitor/diagnostic prom, parallel printer port, RS 232 serial port and optional General Purpose Interface Bus (GPIB/IEEE488/IEC625–1).

- **VDU:** Integral display monitor, green phosphor, bonded faceplate, 80 characters x 24 lines, upper and lower case character set plus graphics characters, reverse video, blinking or non–blinking cursor.

- **DETACHABLE KEYBOARD:** A total of 109 keys including QWERTY, editing, cursor control and 24 programmable function keys; far more than the majority of competitive systems.



- **INTERFACES AND COMMUNICATIONS:** The parallel, serial port and General Purpose interface Bus allow a wide selection of printers and other peripheral devices to be interfaced, plus the capability for communications.

...PUTTING BRITAI

LSI COMPUTERS

LSI Computers Limited Head Office: Copse Road, St Johns, Woking,

RO FROM LSI



Available to the customer as part of the basic system are a wide range of floppy and Winchester disk options:

- **5.25" MINI–FLOPPY DISK DRIVES:** two single sided double density drives totalling 350Kb OR two double sided double density drives totalling 700Kb.
- **8" FLOPPY DISK DRIVES:** two single sided double density drives, totalling 1.2Mb OR two double sided double density drives totalling 2.4Mb.
- **FLOPPY/WINCHESTER COMBINATION:** one 8" floppy disk and one 8" Winchester fixed disk of 5Mb or 10Mb capacity.
- **A SYSTEM HIGHLIGHT:** For larger users the keycap colours and engravings can be customised.
- **HOUSING:** The System, including disk drives, is contained in an extremely attractive foam moulded case ergonomically designed for the professional user; once again, special colours can be provided for large orders.

LSI SALES CENTRES

LSI Computers Woking
Woking, Surrey
Telephone: Woking (04862) 23411

LSI Computers South East
Horsham, West Sussex
Telephone: Horsham (0403) 64363

LSI Computers South West
Bridgwater, Somerset
Telephone: Bridgwater (0278) 722073
also at
Cheltenham, Gloucestershire
Telephone: Cheltenham (0242) 514504

LSI Computers Croydon
Hackbridge, Surrey
Telephone: 01–773–0917

LSI Computers Manchester
Warrington, Cheshire
Telephone: Warrington (0925) 824585

LSI DEALERS

Bonsai Limited
London WC1A 1HJ
Telephone: 01–580–0902

KGB Micros Limited
Slough, Berkshire
Telephone: Slough (0753) 38310 or 38581
Telex: 847777 DELRAY G attn: KMICRO

The Micro Solution Limited
Chipping Norton, Oxfordshire
Telephone: Chipping Norton (0608) 3256

Welsh Business Systems Limited
Penarth, South Glamorgan
Telephone: Penarth (0222) 700059/ 700021

FBC Systems Limited
Derby, Derbyshire
Telephone: Derby (0332) 365280

Dealer enquiries welcome; please apply to head office.

Call into your nearest dealer now, or clip the coupon for further information

N BACK IN FRONT.

Do not think that once you have bought your M–THREE that it ends there. LSI as always, will continue to develop new applications and enhancements to the existing system, all of which are available to you, the user.

It is an important part of the Company philosophy to fully protect existing users by ensuring easy upgrading to new ranges through maximum possible compatibility of software and hardware.

Surrey GU21 1SX. Telephone: Woking (04862) 23411. Telex: 859592

Please send me full details of System M–Three, today!

Name .....
Position .....
Company .....
Address .....

THOUGHT PROCESS

Commodore

Apple

Data General

Future Technology Systems



COMMODORE



APPLE



DATA GENERAL



FUTURE TECHNOLOGY SYSTEMS

Gate Microsystems have thought it out for you first.

A range of small computers to cover every conceivable practical application.

Star names that are all star performers:

COMMODORE, the popular multi-function professional.

APPLE, the most versatile of micro-computers.

Superb interactive single and multi-terminal business data processing systems from DATA GENERAL.

The powerful Series 88 from FUTURE TECHNOLOGY SYSTEMS, combining high performance with advanced distributed processor architecture.

From this comprehensive armoury our experts can cover your every hardware and software requirement, off the shelf or tailor-made, with full training facilities and a prompt, caring after-sales service. Word processing to payroll, stock control to statistics, invoicing to information analysis . . in a host of different contexts—we've given ourselves the complete range of options first.

Now we present them all to you.

GATE MICROSYSTEMS LTD

The Nethergate Centre, 35 Yeaman Shore, DUNDEE DD1 4BU. Tel: 0382 28194.
Abbey House, Bothwell Street, GLASGOW. Tel: 041-221 9372.

PCW SUBSET

This month we introduce another guest writer of 'Sub Set' from among our regular contributors to the series. In this fascinating set of routines Dave Barrow brings the means of handling shapes to any memory-mapped screen driven by a Z80 processor. Send in the most interesting effects you can devise through the use of these routines and, if you don't have a Z80 micro, lose no time in adapting these ideas to your favourite processor. Send your routines to: 'Sub Set', PCW, 14 Rathbone Place, London W1P 1DE

The general-purpose RAM file handling routine, DIFA, has wide application in all aspects of computing. As used here, in creative recreational computing, a file is either one shape table (with number of records, record length of 3 and records being the 3-byte vectors defining the shape) or one of the matrices for transformation (with number of records = 16, record length = 1 and records being the 1-byte entries to TFORM or the quicker but limited version QTFORM). In the index, DIFILE, holding 2-byte displacements from the DIFILE base address to the base addresses of the other files, the first two bytes are not used, as the displacement to file 1 is at the third and fourth bytes, the least significant byte to the displacement is given first at the lower addressed byte of DIFILE, followed by the most significant byte.

To the accompaniment of many groans, I invite you all to take another look at the following.

Tables

The 6502 has a couple of very powerful addressing modes — pre-indexed indirect and post-indexed indirect. The Z80 really can't match them, and so I wrote a routine, CMTA, which repositions HL at byte B of Table C when input HL points at the base address of a table of table base addresses. Alan has the CMTA Datasheet for anyone who has lots of single-byte-entry tables to deal with.

My first Datasheet, DIFA, although larger and slower than CMTA, is of more general use. Allowing up to 356-byte entries classifies it as a file in-RAM handling routine rather than a table-handling routine, but it is for its reasonably efficient handling of matrix and shape tables that I have included it in this set.

Datasheet

```
;= DIFA - Displacement Indexed File Addressing

;/ CLASS: 1
;/ TIME CRITICAL ?: No
;/ DESCRIPTION: Main routine of a File/Table handling system.
                 All files formatted: byte 1 = No. of Records
;
;/                                    byte 2 = Length of Records
;/                                    up to 256 Records.
;/              The Index File (DIFILE) Records are the 2-byte displacements
;/              calculated by FILE BASE ADDRESS minus DIFILE BASE ADDRESS.
;/ ACTION:      POINT<-- DIFILEBASE + (FILENUMBER * 2)
;/              READ FILEDISP
;/              POINT<-- DIFILEBASE + FILEDISP
;/              READ NUMOFRECS, RECLENGTH: INCREMENT POINT TO RECORD1
;/              DECREMENT RECREQUEST
;/              IF = 0 THEN END
;/                    ELSE POINT<-- RECORD1 + (RECREQUEST * RECLENGTH)
;/              END
;/ SUBr DEPENDENCE: None
;/ INTERFACES:  None
;/ INPUT:       HL = DIFILE BASE ADDRESS
;/              C = Requested File number      }
;/              B = Requested Record number    }  00H = 256
;/ OUTPUT:      (HL) = First byte of Requested Record
;/              B = Number of Records in File  }
;/              C = Length of Record           }  00H = 256
;/ REGs USED:   HL B C
;/ STACK USE:   6 max.
;/ LENGTH:      43
;/ TIME STATES: Record 1: 168  Records 2 - 256: 555 to 603
;/ PROCESSOR:   Z80
;
```

```
DIFA:   PUSH AF          ;                                  F5
        PUSH HL          ;save DIFILE BASE                  E5
        LD   A,B         ;save Record number                78
        LD   B,0         ;BC <-- File number                06 00
        DEC  C           ;(making 00H in C into             0D
        INC  BC          ;0100H in BC)                      03
        ADD  HL,BC       ;point at displacement of File     09
        ADD  HL,BC       ;from DIFILE BASE                  09
        LD   C,(HL)      ;get displacement                  4E
        INC  HL          ;in                                23
        LD   B,(HL)      ;BC and                            46
        POP  HL          ;add to                            E1
        ADD  HL,BC       ;DIFILE BASE                       09
        LD   B,(HL)      ;get number of records             46
        INC  HL          ;and                               23
        LD   C,(HL)      ;length of Records and             4E
        INC  HL          ;point at Record 1, decrementing   23
        DEC  A           ;requested Record number to match  3D
        JR   Z,END       ;jump out if already there         28 14
        PUSH BC          ;else                              C5
        PUSH HL          ;multiply                          E5
        LD   L,0         ;requested Record number - 1       2E 00
        LD   B,L         ;by Record length                  45
        DEC  C           ;getting result in HL              0D
        INC  BC          ;                                  03
        LD   H,A         ;                                  67
        LD   A,+8        ;                                  3E 08
MUL:    ADD  HL,HL       ;                                  29
        JR   NC,CNT      ;                                  30 01
        ADD  HL,BC       ;                                  09
CNT:    DEC  A           ;                                  3D
        JR   NZ,MUL      ;                                  20 F9
        POP  BC          ;restore Record 1 Address and      C1
        ADD  HL,BC       ;add to point HL at requested Record 09
        POP  BC          ;restore Number and Length         C1
END:    POP  AF          ;                                  F1
        RET              ;                                  C9
```

Using displacements to address the files allows for easy relocation of the entire set of files/tables. Only one absolute address is required by DIFA — that of DIFILE base address.

One of the main advantages of video output is the ability to produce visually attractive, changeable, moving graphics displays. 'Sub Set', however, has not made much of a show in graphics routines — probably because graphics are awkward to deal with and are usually program-specific.

The graphics package comprising the other four Datasheets is designed to be general purpose and easy to use. It requires only that shape tables be utilized giving x,y co-ordinates and an ASCII graphic value for each point. DRAW is written for a memory-mapped display with a 64-byte difference between lines and a maximum 64 characters per line, but can easily be adapted to other sizes. Because DRAW copies from an original shape table, multiple images can be entered in display RAM at different points whilst the original keeps its position in relation to the origin. Using signed numbers for the co-ordinates makes cut-off simple to program, as any negative value is actually greater than LINE or CHAR when using the unsigned Carry Flag result to jump out.

LOOKING FOR 5¼" WINCHESTERS?

I've got just what you're looking for....



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.

For: SUPERBRAIN, S-100, APPLE II, HEATH H89, TRS-80.

HAL Computers Limited
Invincible Road, Farnborough
Hants. GU14 7QU
Telephone 0252 517171

HAL

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

PCW SUBSET

Datasheet

```
;=DRAW - Copy shape table figure to memory-mapped display
;/ CLASS:  1
;/ TIME CRITICAL?:  No
;/ DESCRIPTION: Uses vectors and ASCII graphic character from a shape table
;/              and an input translation vector to locate a figure on a
;/              memory-mapped-display.  The origin is located at bottom
;/              left of the display.
;/              Line difference must be 64 bytes.
;/ ACTION:      For each vector in shape table
;/                B ← LINE - (y + Ty)
;/                IF B < Ø OR B > LINE - 1 then next vector
;/                C ← x + Tx
;/                IF C < Ø OR C > CHAR - 1 then next vector
;/                BC ← TOP LEFT DISPLAY + B * 64 + C
;/                A ← ASCII GRAPHIC for VECTOR
;/                (BC) ← A
;/ SUBr DEPENDENCE: DIFA
;/ INTERFACES:  None
;/ INPUT:       HL = DIFILE (see DIFA)
;/              A = Shape Table number
;/              D }  Translation vector (Tx)
;/              E }                     (Ty)
;/ OUTPUT:      Figure copied to display
;/              HL = ,Table + 1
;/              DE unaltered
;/              A = ?
;/ REGs USED:   HL AF DE
;/ STACK USE:   4 (10 including CALL DIFA)
;/ LENGTH:      48
;/ TIME STATES: 200 + 175 per char. drawn  (82/108 per char. not drawn)
;/ PROCESSOR:   Z80
;
LINE    EQU  NN         ;number of display lines
CHAR    EQU  NN         ;number of characters displayed per line
DISPL   EQU  NN         ;low byte of Top Left Display Address
DISPH   EQU  NN         ;high byte of Top Left Display Address

DRAW:   PUSH BC         ;                                   C5
        LD   C,A        ;point at Table A                   4F
        LD   B,+1       ;first vector and                   06 01
        CALL DIFA       ;get number of vectors in B         CD XX XX
DRAWL:  PUSH BC         ;save count                         C5
        LD   C,(HL)     ;get x                              4E
        INC  HL         ;                                   23
        LD   A,(HL)     ;get y                              7E
        INC  HL         ;                                   23
        ADD  A,E        ;add Ty                             83
        CPL             ;change into displacement           2F
        ADD  A,LINE     ;from display top and               C6 NN
        JR   NC,NXTP    ;jump out if outside bounds         30 18
        LD   B,A        ;                                   47
        LD   A,C        ;get x in A                         79
        ADD  A,D        ;add Tx                             82
        CP   CHAR       ;test for inside side bounds and    FE NN
        JR   NC,NXTP    ;jump out if not                    30 11
        RLCA            ;BA ← B * 64 + A                    07
        RLCA            ;                                   07
        RR   B          ;                                   CB 18
        RRA             ;                                   1F
        RR   B          ;                                   CB 18
        RRA             ;                                   1F
        ADD  A,DISPL    ;add Top Left Display               C6 NN
        LD   C,A        ;address to displacement            4F
        LD   A,B        ;to give                            78
        ADC  A,DISPH    ;absolute address                   CE NN
        LD   B,A        ;in BC                              47
        LD   A,(HL)     ;get ASCII Graphic                  7E
        LD   (BC),A     ;to display                         02
NXTP:   INC  HL         ;point to next vector               23
        POP  BC         ;restore count                      C1
        DJNZ DRAWL      ;                                   10 D9
        POP  BC         ;                                   C1
        RET             ;                                   C9
```

Because sine/cosine values for 0°, 90°, etc are -1 , 0, + 1, the matrix multiplication in TFORM is very quick. Figure 1 gives the most useful transformations with the encoded matrices. Inputting a matrix table entry number instead of the actual encoded matrix allows for easier computation of the transformation required.

			Matrix coding for: i) TFORM	ii) QTFORM
1	Rotate a c	45°	59	0D
2		90°	0B	2F
3		135°	9A	5C
4		180°	BE	7E
5		225°	A6	49
6		270°	E7	6B
7		315°	65	18
8		360°	7D	3A
9	Reflect in	y = 0	BD	7A
A		y = x	07	2B
B		x = 0	7E	3E
C		y = -x	EB	6F
D	Shear that	x ← x + y	75	38
E		x ← x - y	79	3D
F		y ← y - x	6D	1A
10		y ← y + x	5D	0A

Datasheet

```
;= TFORM - Transformation of Shape Table Figure
;/ CLASS:  1
;/ TIME CRITICAL?:  No
;/ DESCRIPTION: Performs matrix multiplication using a 2 x 2 unitary value
;/              (-1, 0, +1) matrix on vectors in a Shape Table to effect
;/              rotation, reflection or shearing.
;/              The 8-bit encoded matrices have the bit-pair values:
;/                                  10  =  -1
;/                                  11  =   0
;/                                  00  =   0
;/                                  01  =  +1
;/ ACTION:      Use DIFA to get matrix and point HL at Shape Table
;/              FOR EACH VECTOR
;/                C ← (HL)
;/                E ← (HL + 1)
;/                ((HL), (HL+1)) ← (10 32 / matrix bits / 54 76) * (C, E)
;/ SUBr DEPENDENCE: DIFA
;/ INTERFACES:  None
;/ INPUT:       HL = DIFILE (see DIFA)
;/              C = Matrix Table number
;/              B = Matrix Entry number
;/              A = Shape Table number
;/ OUTPUT:      Shape transformed
;/              HL = Shape Table + 1
;/              BC = 0003H   A = last y
;/ REGs USED:   HL AF BC
;/ STACK USE:   4  (12 max. including CALL DIFA)
;/ LENGTH:      51
;/ TIME STATES: 435/822 - 870 depending on matrix (see DIFA)
;/              + 280 to 288 per vector
;/ PROCESSOR:   Z80
;
TFORM:  PUSH DE         ;                                   D5
        PUSH HL         ;save DIFILE                        E5
        CALL DIFA       ;get matrix                         CD XX XX
        LD   D,(HL)     ;in D                               56
        POP  HL         ;restore DIFILE                     E1
        LD   C,A        ;point at                           4F
        LD   B,+1       ;first vector                       06 01
        CALL DIFA       ;of Shape Table                     CD XX XX
TFL:    PUSH BC         ;save vector count and              C5
        LD   B,+2       ;set count for two coordinates      06 02
        LD   C,(HL)     ;get x                              4E
        INC  HL         ;                                   23
        LD   E,(HL)     ;get y                              5E
        DEC  HL         ;point back at x                    2B
COORD:  XOR  A          ;Ø                                  AF
        RRC  D          ;plus -x/Ø/+x                       CB 0A
        JR   C,JMP1     ;                                   38 01
```

PCW SUBSET

```
        SUB  C          ;                                91
JMP1:   RRC  D          ;                                CB 0A
        JR   C,JMP2     ;                                38 01
        ADD  A,C        ;                                81
JMP2:   RRC  D          ;plus -y/Ø/+y                    CB 0A
        JR   C,JMP3     ;                                38 01
        SUB  E          ;                                93
JMP3:   RRC  D          ;                                CB 0A
        JR   C,JMP4     ;                                38 01
        ADD  A,E        ;                                83
JMP4:   LD   (HL),A     ;new x or y coordinate           77
        INC  HL         ;                                23
        DJNZ COORD      ;                                10 E7
        INC  HL         ;move past ASCII Graphic         23
        POP  BC         ;restore vector count            C1
        DJNZ TFL        ;repeat for all vectors          10 DC
        POP  DE         ;                                D1
        RET             ;                                C9
```

TFORM allows for a matrix setting either or both coordinates to 0, which reduces the figure to a line or a point. The transformations in Figure 1 use only eight combinations of (-1, 0, +1)x + (-1, 0, +1)y and can be encoded in 3 + 3 bits. Bits 3 and 7 can be used to test the loop COORD. QTFORM is quicker by about 30 T. States per vector. The matrix codes are in Figure 1 and it is decoded:

```
COORD:  RRC  D
        JR   C, YLD
        LD   A, C
        RRC  D
        JR   C, TNEG
        ADD  A, E
        JR   TNEG
YLD:    LD   A, E
        RRC  D
        JR   C, TNEG
        SUB  C
TNEG:   RRC  D
        JR   NC, BACK
        NEG
BACK:   LD   (HL), A
        INC  HL
        RRC  D
        JR   C, COORD
```

TLATE moves a figure in Shape Table across the plane in relation to the origin. This is necessary for transformations about different points in the figure.

Datasheet

```
;= TLATE - Translation of Shape Table figure by vector addition
;/ CLASS:  1
;/ TIME CRITICAL?:  No
;/ DESCRIPTION: Moves a vector encoded figure in a Shape Table in relation
;/              to the origin.
;/ ACTION:      FOR EACH VECTOR
;/                x ← x + Tx
;/                y ← y + Ty
;/ SUBr DEPENDENCE: DIFA
;/ INTERFACES:  None
;/ INPUT:       HL = DIFILE (see DIFA)
;/              A = Shape Table number
;/              (D)
;/              (E) = Translation vector (Tx)
;/                                       (Ty)
;/ OUTPUT:      Figure translated
;/              HL = Shape Table + 1
;/              A = last vector y
;/              DE unaltered
;/ REGs USED:   HL AF DE
;/ STACK USE:   2  (10 max. including CALL DIFA)
;/ LENGTH:      20
;/ TIME STATES: 200 + 67 per vector
;/ PROCESSOR:   Z80

TLATE:  PUSH BC         ;                                C5
        LD   C,A        ;point HL at Table A             4F
        LD   B,+1       ;first vector                    06 01
        CALL DIFA       ;                                CD XX XX
TLTL:   LD   A,(HL)     ;get x                           7E
        ADD  A,D        ;add Tx                          82
        LD   (HL),A     ;replace new x                   77
        INC  HL         ;                                23
        LD   A,(HL)     ;get y                           7E
        ADD  A,E        ;add Ty                          83
        LD   (HL),A     ;replace new y                   77
        INC  HL         ;move point to                   23
        INC  HL         ;next vector                     23
        DJNZ TLTL       ;and repeat for all vectors      10 F5
        POP  BC         ;                                C1
        RET             ;                                C9
```

The Senior Lecturers in Mathematics and CSE students among you will have noticed that not only do transformations 1, 3, 5 and 7 (Figure 1.) result in a rotation about the origin but also increase the size of the figure by a factor of $\sqrt{2}$ linear. Two such rotations produce a twice linear scaling and so HALF will have to be called to reobtain the original size.

Datasheet

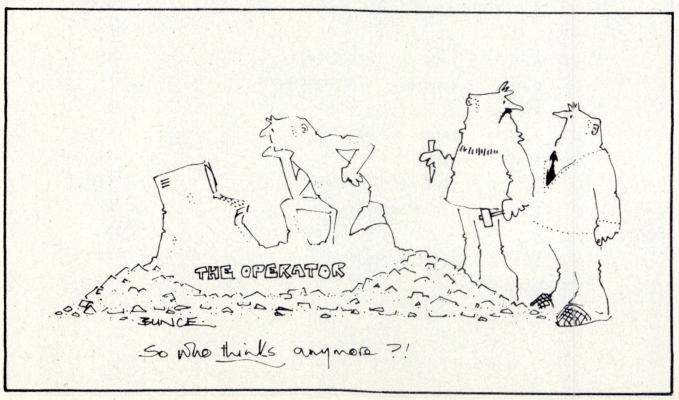
```
;= HALF - Half scaling (linear) of figure in Shape Table.
;/ CLASS:  1
;/ TIME CRITICAL?:  No
;/ DESCRIPTION: Divides each coordinate by two thus effecting a half linear
;/              scaling of the figure with the origin as centre.  Fractions
;/              are lost.
;/ ACTION:      FOR EACH VECTOR
;/                x                    y
;/              7 ⟶ 0                7 ⟶ 0
;/ SUBr DEPENDENCE: DIFA
;/ INTERFACES:  None
;/ INPUT:       HL = DIFILE (see DIFA)
;/              A = Shape Table number
;/ OUTPUT:      Figure halved
;/              HL = Shape Table + 1
;/              A unaltered
;/ REGs USED:   HL AF
;/ STACK USE:   2  (10 max. including CALL DIFA)
;/ LENGTH:      18
;/ TIME STATES: 200 + 61 per vector
;/ PROCESSOR:   Z80

HALF:   PUSH BC         ;                                C5
        LD   C,A        ;point HL at Table A             4F
        LD   B,+1       ;first vector                    06 01
        CALL DIFA       ;                                CD XX XX
HLFL:   SRA  (HL)       ;x ← x/2                         CB 2E
        INC  HL         ;                                23
        SRA  (HL)       ;y ← y/2                         CB 2E
        INC  HL         ;move point to                   23
        INC  HL         ;next vector                     23
        DJNZ HLFL       ;and repeat for all vectors      10 F7
        POP  BC         ;                                C1
        RET             ;                                C9
```

For explosive effects, substituting SLA (HL) for SRA (HL) in HALF produces DOUBLE with the same timing, etc. Any character of the figure which is situated at the origin will be unaffected.

Aces high

DIFA doesn't have any error checking to guard against the requested File/ Record number being greater than the number of Files/Records. As 00H in DIFA stands for 256 (LD B,0 : DEC C : INC BC adjusts to correct 0100H), then any error test must allow for 00>FF.

The sequence DEC A : CP r : INC A will set the Carry Flag if 0<A≤r and sets the Zero Flag if A = 0, but this does not meet the requirements. I'm sure Alan would like to receive the shortest/ quickest solution which distinguishes A≤r when 00H = 256, and any other useful test sequences. I certainly would.



APPLE OWNER!

COLOUR FROM EUROAPPLE WITHOUT COLOURCARD

Now you can purchase the famous

LUXOR 14" COLOUR MONITOR

for your APPLE Computer

Just plugs into your APPLE does not require a Colourcard



The Monitor that gives you the best resolution and the most magnificent colours will work on APPLE II EUROPLUS or APPLE U.S.A.

ACT NOW AND SAVE!!

STILL AT 1980 PRICES

1 year Guarantee!!

ONLY £325.00 + VAT + P&P

We accept cheques, Visa & Access Card conversions

Call Now:

S.B.D. SOFTWARE
15 Jocelyn Road,
Richmond, Surrey, TW9 2TJ
Tel: 01-948 0461 Telex: 22861

OR

PORTATELL LTD.
25 Sunbury Cross Centre, Stains Road West,
Sunbury-on-Thames, Middlesex TW19 7BB
Tel: (Sunbury) 88972

WHY BUY FROM CAMDEN...!

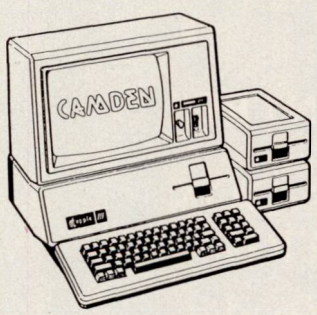
* WE SUPPLY : THE HARDWARE :
* WE SUPPLY : THE SOFTWARE :
* WE SUPPLY : THE BACK-UP :
* WE SUPPLY : THE EXPERIENCE :
* WE SUPPLY : THE KNOWLEDGE :

Main Distributors for all the leading makes of microcomputers and peripherals.

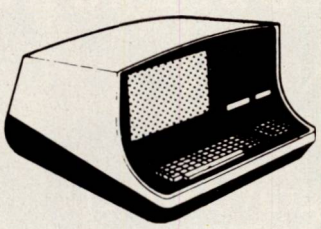
Off the shelf programs to suit most applications from the leading software houses — with proven reliability.

From our own engineering workshops with fully qualified technicians or — on site service — your choice.

As one of the countrys leading distributors with proven sales records — and one of the pioneers of the microchip our fully trained staff will advise on your requirements to suit your needs and improve your business.



APPLE III
128K MODEL
INCLUDES MONITOR
VISICALC III — SDS.
MAIL LIST MANAGER
AND APPLE BUSINESS
BASIC
PLUS SILENT TYPE
PRINTER.
PLUS ADDITIONAL
DISK DRIVE.
£21 PER WEEK LEASE
OR PURCHASE



SUPERBRAIN
64K QD MODEL
PLUS EPSON MX80 FT
PLUS FULLY
INTEGRATED
ACCOUNTS PACKAGE
£21 PER WEEK LEASE
OR PURCHASE

MEMBER CRA COMPUTER RETAILERS ASSOCIATION

BARCLAYCARD VISA

CAMDEN ELECTRONICS LTD. (SYSTEMS DIVISION)
462 COVENTRY ROAD, SMALL HEATH, BIRMINGHAM, B10 OUG
PHONE: 021 773 8240 — 021 772 5718 — TELEX 335909 (CAMDEN G)

CRA COMPUTER RETAILERS ASSOCIATION

PCW 143

ANNOUNCING THE NEW SORCERER



1.2 Megabyte

ONLY £2,680
or £16 per week rental
(exclusive of VAT)

The VIDEO DISK UNIT can be linked with any printer and comes with a FULL YEAR'S guarantee from EMG

Dealers invited

Educational discounts

For Wordprocessing and Accountancy

DISTRIBUTED BY EMG AT EMG MICRO CENTRES

The LONDON MICRO CENTRE
47 Lower Belgrave Street
LONDON SW1
Telephone: 01-730 8791

The SOUTH LONDON MICRO CENTRE
30 Heathfield Road
CROYDON
Telephone: 01-688 0088

Contact us today for further information

An **EMG** Company



ingenious!

. . that's the only word to really describe the superb Genie microcomputer system, the home computer which is compatible with the TRS 80, and ideal for all micro – enthusiasts, especially the committed hobbyist.
Genie has now been upgraded to Genie I, incorporating all of the original, excellent features, but with the addition of:

- Extended BASIC, including RENUMBER and SCREEN PRINT.
- Full upper and lower case, flashing cursor and auto-repeat on all keys.
- An internal SOUND UNIT to add a new dimension to your own programs.
- A MACHINE LANGUAGE MONITOR, with Display, modify, enter and execute (with break points) facilities.

Genie I has all of this, plus the built-in cassette deck, 16K RAM, 12k ROM with BASIC interpreter, full-size keyboard , an extremely wide range of new and updated peripherals, and literally 1000's of pre-recorded programmes available. Yet, almost unbelievably, the price of Genie I is even lower than that of the original Genie.

Ingenious for business



The Genie II is a major breakthrough for small business computers. Harnessing all the advantages of Genie I, including low price, Genie II adapts perfectly to commercial functions with the following features:

- Numeric keyboard
- Four usable, definable function keys.
- Extension to BASIC
- Basic business commands
- Fully expandable with the same peripherals

New!...12" Monitor

Now, a choice of 2 monitors giving a clear easy to read image. The updated EG101 has a new green phosphor tube.





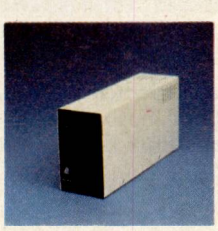
New!...Expander

An updated Expansion Box (EG 3014) is a major feature of the new Genie I system, and unleashes all its possibilities, allowing for up to 4 disk drives with optional double density. It connects to a printer, or RS232 interface or S100 cards. There is 16k RAM fitted and it has a new low price!

New!...Printer

The EG 602 printer can be connected to the Genie either through the expander or directly into the computer using the Parallel Printer Interface. It is a compact unit, with an 80 column, 5 x 7 matrix print-out, operating quietly and efficiently at 30 characters per second.





Disk Drive

As well as the obvious advantage of mass storage, the addition of the disk system to the Genie means much faster access to other languages and full random access file handling. Up to 4 of these 40 track drives can be used on a system.

SPECIAL TECHNICAL GENIE HOT – LINE ON 0629 4995

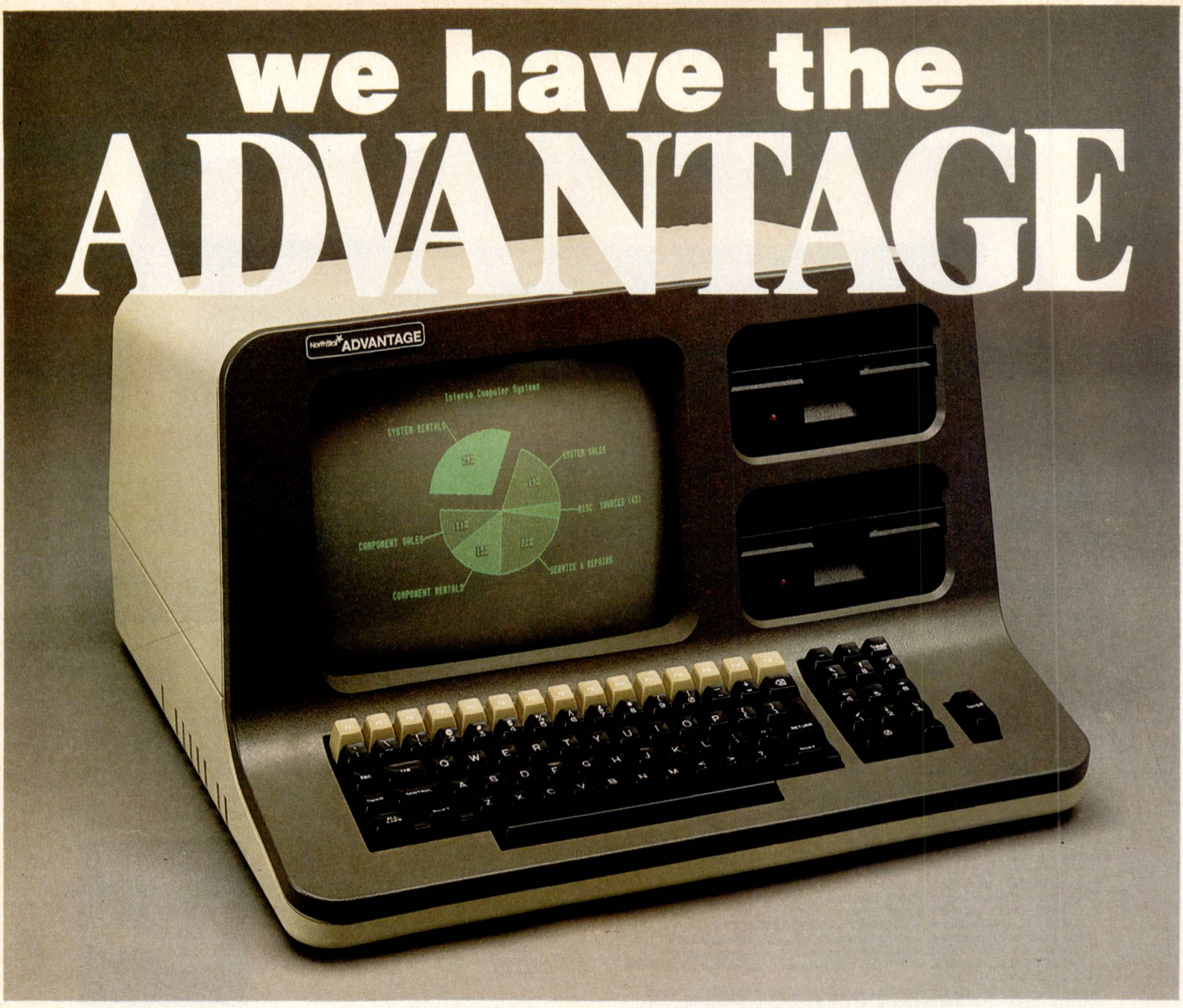
for all your technical advice and service back-up on any aspect of the Genie system direct from the experts!

For full details and demonstration of Genie I, Genie II or advice on any aspect of the system, either call in to your local dealer, or write directly to the sole importers at the address below.

LOWE electronics

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

we have the ADVANTAGE



The NORTH STAR ADVANTAGE is an attractive and powerful integrated graphics computer equally suited to both business and educational use.

The ADVANTAGE is a fast, (4MHz) Z80A based microcomputer with 64Kb (200ns) dynamic RAM.

The ADVANTAGE features:

* An auxiliary processor (Intel 8035 type) off loads the Z80A by servicing keyboard and disk drive control functions.
* A 12 inch non-glare green display screen, operating both Character Mode and Bit Mapped Graphics Mode (240 x 640 pixels) powered by separate 20Kb of fast display RAM.
* Two integrated Quad capacity floppy disks provide 720Kb of data storage.
* An 87 key Selectric style keyboard including 15 function keys and a 14 key numeric/cursor control keypad.
* Six I/O bus slots for serial or parallel I/O interfaces or NORTH STAR's Floating Point Board.

The ADVANTAGE comes complete with sample business graphics, self diagnostic software and graphics demo software. The ADVANTAGE is backed by NORTH STAR's G-BASIC/G-DOS and Graphics CP/M – each of which support both graphics and character mode.

To find out more about the Advantage and our extensive product range, contact us now for further details. Trade enquiries welcome.

ADVANTAGE is a trademark of North Star Computer Inc.
CP/M is a trademark of Digital Research Corp.

INTERAM DEALERS:

Bickerton Management Serv.
Shrewsbury (0743) 68167
Bromley Computer Consult.
Bromley 01-464 8080
C.B.A.S.S.
Luton (0582) 38792
Digital Devices Ltd.
Tunbridge Wells (0892) 37977
D.T. Systems
Norwich (0603) 27833
Fylde Microcomputer Serv.
Blackpool (0253 301306
Harris Brothers Ltd.
Newton Abbot (0626) 872404
Hill Briton Assoc. Ltd.
Edinburgh 031-225 7766
The Hardcore Software Co.
Hampstead 01-722 6436
Interface Engineering
Leeds (0532) 505494
Isis Systems Ltd.
Chiswick 01-995 8636
KBS Computer Services Ltd.
Liverpool 051-236 8333
KBS Computer Services Ltd.
Coventry (0203) 27226
KBS Computer Services Ltd.
Leeds (0532) 32046
Law Computer Services Ltd.
Mitcham 01-648 5641
Loveden Computer Serv. Ltd.
Grantham (0476) 82500
Microcomputer Business Sys.
Glossop (04574) 63819
Micro Facilities Ltd.
Hampton Hill 01-979 4546
Microtek (Ipswich) Ltd.
Ipswich (0473) 50152
Microtech Computer Serv.
Liverpool 051-236 2208/9
Senton Ltd.
Bristol (0272) 276132
Spot Computer Systems Ltd.
Doncaster (0302) 25159
S. Systems
Crawley (0293) 515201
Stag Terminals Ltd.
Teddington 01-977 7749
S.T. Commercial Sys. Ltd.
Ealing 01-840 1926.
Tantus Microsystems Ltd.
Putney 01-788 5054
Tynemouth Computer Serv.
Cramlington (0670) 712624
Video Vector Dynamics
Glasgow 041-226 3481/2

INTERAM

INTERAM COMPUTER SYSTEMS LTD.
46, Balham High Road,
London, SW12 9AQ.
Tel: 01-675 5325/6/7, Telex 925859

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*, **14 Rathbone Place, London W1P 1DE.** *Please keep your contributions as concise as possible. We will pay £10 for any tips we publish (think how much solder and/or Elastoplast that would buy).*

UK101 MULTI MONITOR MOD

There must be many UK101 users like me who have more than one monitor, usually people who have uprated their computer and who still have the old chips. I prefer the old monitor with Nigel Climpson's screen editor (available from Technomatics in a 2716 EPROM) which is a beauty for editing, but occasionally I run a program which needs the new monitor. The EPROM and ROM have chip enable lines of opposite sense and, so that I can change chips, I've made the select logic switchable rather than solder in links. It's quite a simple operation; the tracks at W7 and W6 had to be cut and the centre pads connected to the left rather than the right, so a DPDT switch connected as Figure 1 allows both systems to be used.

The next thing to occur to me was that it's a shame to have to keep on removing chips every time I wanted to use the other system, so why not arrange to have both monitors available all the time? The fact that I'd already built switchable chip select logic into the machine made it very easy to do. All that was necessary was to mount the chips piggy-back, pin-to-pin spot soldered, and the new assembly inserted into the monitor socket. Purists are not going to like this but *it works*. Do yourself a favour and use a socket soldered onto the chip you value less (you can't guarantee not making a mess of it, can you?) With both monitors in the same socket you'll now find on power up that you're running on whichever one has been selected.

If you change over monitors in the middle of a program, the computer will lock up, but a RESET followed by a warm start will usually allow you to carry on, although it's still a good idea to have a copy on tape as back-up.

I haven't tried it, but even if your monitors are both ROMs, and have the same chip select logic, you may be able to use a similar method, and mount them piggy-back but with the enable pins (18 & 20) bent out and connected through a DPDT switch to the select lines.

I dare say that with ambition and enough chips, someone will try building a tower of monitors — buffering, heat dissipation and case headroom allowing — but if you ruin your machine, don't blame me. No-one was more surprised than me when it worked!

David Hattams

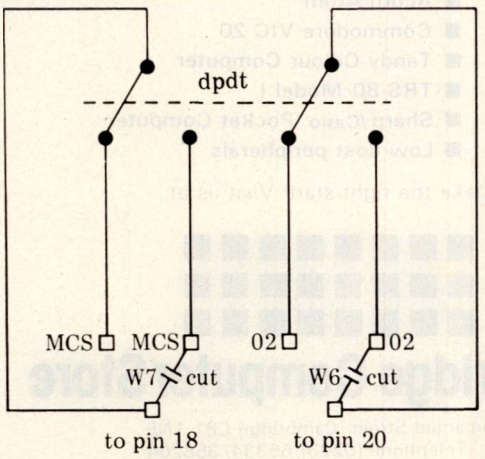


Fig 1 Monitor select switchable logic

AERIAL COUPLING

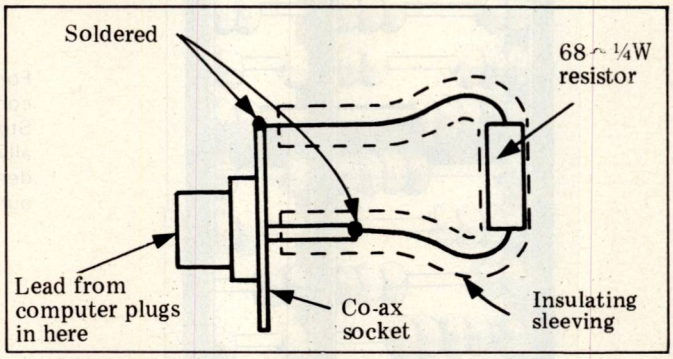
Do you find it a nuisance having to unplug the TV aerial every time you want to plug in the computer? If so, then this simple coupling unit may be of use to you. It enables the TV to pick up sufficient signal from the computer without having to disconnect the aerial.

There are two ways in which it can be used. If your set has a small box on the back to convert the round co-ax lead from the aerial into the flat twin lead which actually goes to the aerial terminals of the set (as on many Japanese sets), then tape the unit onto the twin lead with the wires of the resistor running parallel with those of the lead. If you use an indoor aerial, place the unit against the aerial. It will be necessary to experiment to find the best position. With a 'toast-rack' type aerial, hanging it from one of the rods about 1/3 of the way from the front and close to the centre line of the aerial seems quite good. In either case, if more signal is required, the leads of the resistor can be extended by up to a couple of inches each.

If you have an outside aerial, and the lead is co-ax all the way, then I am afraid that this particular unit is of no use to you.

Warnings 1) Do not place this coupling device within the TV, or make any direct connections to the inside of the set. 2) Since the aerial is still connected, a small amount of signal could be radiated from it. This might possibly cause interference to other sets if their aerials are close to yours or if you are fed from a communal aerial system. Position the unit so that the signal induced into the aerial/aerial lead is no more than that required to stop the picture being noisy.

P. Gascoyne



ATOM GHOST MODS

If you tried to carry out the Atom Ghost RAM modifications in February's TJ's Workshop and couldn't get it to work, it's because the first version contained a few bugs. Here are the corrections: Disconnect IC22 pin 9 from IC20, pin 3 and connect it to PROMSEL. Disconnect IC21 and 22, pins 1 and 19 from IC20, pin 11 and connect them to ground. Disconnect IC19 pin 12 from RAMSEL and connect it to IC20, pin 3. Pin 1 of IC20 should be disconnected from pin 21 of the connector and joined instead to a spare pin on the connector for the control bit. Disconnect pin ±1 of IC24 from ground and link it to connector pin 29. Disconnect IC25 pins 2 and 5 from IC25 pin 8 and connect them to IC20 pin 3. Pin 8 of the on-board EPROM select wire links Now goes to the RAM/EPROM select bit.

Ron Yorston

FROM THE PUBLISHERS OF THE BEST SELLING BOOKS FOR THE SINCLAIR COMES:

Not Only But Also...

PROGRAMS FOR THE SINCLAIR ZX81...IK

Probably the LARGEST range of ZX 81 Software in the WORLD

Not Only...does this book contain over 30 fully debugged and exciting programs, every one of which will fit into the basic IK memory of your **Sinclair ZX81** — including programs such as **STAR WARS, LUNAR LANDER, BLACKJACK, MINI ADVENTURE, DRAUGHTS, BREAKOUT.**

But Also

* Detailed explanation of how these programs were written.
* Lots of hints on how you can write exciting programs for your **ZX81.**
* Numerous space saving techniques — obviously invaluable to the **ZX81** owner.
* **PEEKS and POKES** and all the other 'complicated' functions are clearly explained.
* **MUCH, MUCH MORE...**



£6·95

£8·95

Understanding Your ZX81 ROM

Plus special section: How to use machine code routines in your BASIC programs. by DR. I. LOGAN.

Dr Logan was the first person to dissassemble the Sinclair ZX80 Monitor and was the co-author of the ZX80 COMPANION.

In UNDERSTANDING YOUR ZX81 ROM Dr. Logan illustrates all the facilities of the ZX81 Monitor, how it works and how you can use it in your own programs. A special section shows you how you can squeeze more power into your ZX81, by using machine language and machine language subroutines.

An essential book for those who really want to understand the full working of the SINCLAIR ZX81.

Published by MELBOURNE HOUSE PUBLISHERS LTD.
Send Stamped, self-addressed envelope for FREE catalogue.

THE ESSENTIAL SOFTWARE COMPANY (Visconti Ltd)
47 Brunswick Centre, London W1CN 1AF (01-837 3154)

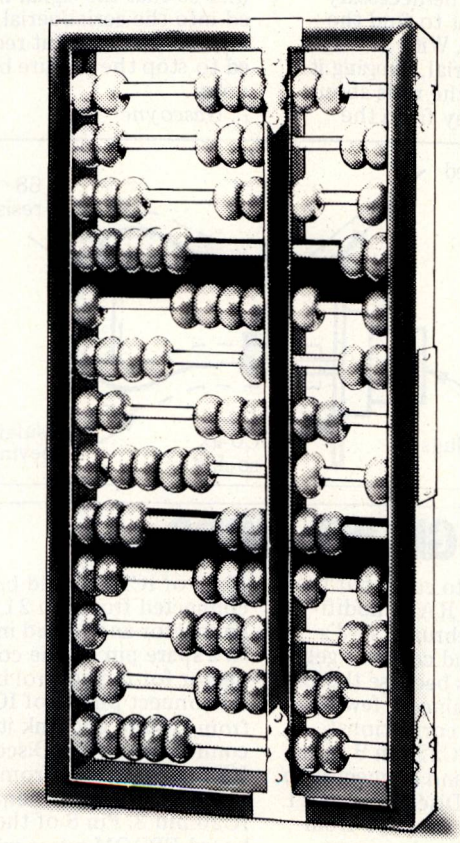
☐ Please rush me NOT ONLY 30 PROGRAMS FOR THE SINCLAIR ZX81 1K: at £6.95 each

☐ Please also rush UNDERSTANDING YOUR ZX81 ROM by Dr. I. Logan at £8.95

I enclose a cheque/postal order for £..... +70p post and pack.

Name .....

Address .....



Low Cost

START COMPUTING IN CAMBRIDGE

For less than £100 you can launch yourself into the world of computing with your own system. At Cambridge Computer Store our "Budget Micro" department offers an exceptionally wide range of inexpensive machines, all generally on demonstration, available from stock and fully supported by our enthusiastic staff.

- Sinclair ZX81
- Acorn Atom
- Commodore VIC 20
- Tandy Colour Computer
- TRS-80 Model I
- Sharp/Casio Pocket Computer
- Low-cost peripherals

Make the right start! Visit us at:

Cambridge Computer Store

1 Emmanuel Street, Cambridge CB1 1NE
Telephone (0223) 65334/358264

TJ's WORKSHOP

ATOM STRING SORT

Here's a handy utility which allows you to type in alphanumeric strings and then sorts them into order according to the ASCII code of each character.

Steve Moore

```
 10 REM ******************
 20 REM *                *
 30 REM *    ATOM SORT   *
 40 REM *                *
 50 REM ******************
 60 REM
 70 REM
 80 PRINT $12,$14
 90 @=0; N=0
100 INPUT '"How many strings? "S
110 IF S<=100 GOTO 140
120 PRINT "Not enough space"
130 GOTO 100
140 S=S-1
150 DIM PP(S),SS(S),X(-1)
160 REM *** GET STRING ***
170 PRINT N+1
180 INPUT $X
190 SS(N)=X
200 X=X+LEN(N)+1
210 IF X&#FFFF<#3C00 GOTO 240
220 PRINT "* * * OUT OF MEMORY * * *"'
230 GOTO 400
240 I=0
250 REM *** TEST STRING ***
260 IF I=N PP(I)=N; GOTO 410
270 IF $SS(N)=$SS(PP(I)) GOTO 370
280 J=0
290 IF SS(N)?J<SS(PP(I))?J GOTO 370
300 IF SS(N)?J>SS(PP(I))?J GOTO 340
310 J=J+1
320 GOTO 290
330 REM *** INCR I ***
340 I=I+1
350 GOTO 250
360 REM *** INSERT STRING ***
370 FOR J=N TO I+1 STEP -1
380 PP(J)=PP(J-1)
390 NEXT J
400 PP(I)=N
410 REM *** INCR N ***
420 N=N+1
430 IF N<=S GOTO 170
440 REM *** PRINT STRINGS ***
450 FOR I=0 TO N-1
460 PRINT 'I+1,".",$SS(PP(I))
470 NEXT I;PRINT $15
480 END
```

ATOM PRINT AT

This routine gives the Acorn Atom a PRINT AT facility similar to the one for the PET by David Viner, printed recently in TJ's Workshop.

The Basic Program must be typed in and run to load the machine code routine into memory. Whenever BREAK is pressed the routine must be re-enabled by:
!#21A = #2800.

The PRINT AT facility is used by the command SHUT [exp]; PRINT [message], where [exp] is a number or a variable and [message] is anything allowed in a normal PRINT statement. So, SHUT 15; PRINT "HI" will print HI in the centre of the top line. The value of [exp] must be from 0 to 511; values outside this range will give an ERROR 18 message.

Dennis May

```
10 P=#2800;[LDY 224;LDA(222),Y; EOR 225;
   STA(222),Y; INX; LDA #42,X
20 ORA #33,X; BEQ P+3; BRK; LDA #24,X;
   CMP @2; BCS P-5; ORA @128; STA 223
30 LDA #15,X; AND @31; STA 224; LDA #15,X;
   AND @224; STA 222; RTS;]
40 !#21A=#2800; END
```

UK 101 VARIABLES LIST

I have discovered that Microsoft Basic on the UK101 keeps a note of the position of its variable table in locations 7BH and 7CH (start) and 7DH and 7EH (end). A bit of judicious PEEKING was needed to see exactly what was there. It transpires that six bytes are set aside for each variable assigned in a program, two for the variable name (even if a variable name is only one character) and four for the value assigned to the variable — the number is held in floating point representation.

The conversion of floating point numbers in Basic is not my idea of fun but it seemed that it would be useful to have a dump of all numeric variables used to date in a program. So you need a program, short enough to be typed in when required, which will list out the variables you have used so far (see Listing 1).

Martyn Croft

```
10 PRINT "VARIABLES USED"
20 FOR Z=(PEEK(124)*256+PEEK(123)) TO
   (PEEK(126)*256+PEEK(125)—1) STEP 6
30 PRINT CHR$(PEEK(Z)); CHR$(PEEK(Z+1)), :
NEXT:END
```

PET PRINTER REVISED

Having read 'TJ's Workshop' (*PCW*, November), I decided to try the PET program for producing lower case listings on a printer written by M Clampitt. I typed in the program, and stored the program I wanted listed on a cassette file and was then amazed to see meaningless strings of characters being printed. I don't know whether the program was designed for a Commodore printer or not, but it certainly didn't work on the 3022 Tractor Printer that I tried it on.

After half an hour's work, however, I did manage to get the program to work. Here's a listing of the revised program.

David Alderson

```
100 rem lists on a commodore printer a program
101 rem saved in an ascii data file
110 poke 59468,14 : print "■"
130 input "Name of program ";z$
140 print : input "Double (d) or single (s) spacing ";y$
150 y$=left$(y$,1)
160 open 1,1,0 : open 4,4
180 print #4,chr$(17)z$ : z=5
190 get #1,a$
200 if st=64 or st=-128 then close 1 : close 4 : end
210 a=asc(a$)
240 if a=13 or a=141 then gosub 300
280 print #4,a$
285 if z>66 or (z>33 and y$<>"s" then z=0 : print #4,chr$(13)
290 goto 190
300 a$=chr$(13)+chr$(10)+chr$(17) : z=z+1
301 if y$<>"s" then a$=a$+a$
302 return
```

DISK SECTOR I/O UNDER TRSDOS

The program described here is intended for any TRS-80 Model I disk system using the TRSDOS 2.3 operating system. It performs the simple but useful operation of replacing the diskette name on a diskette. Its main purpose here is to demonstrate the use of routines present in TRSDOS 2.3 to perform disk I/O between memory and specific disk sectors. These routines are not mentioned in the TRSDOS reference manual and so are described in Table 1.

Table 1: Addresses of Routines

Entry Point	Function of Routine
46DD	Read disk sector into memory.
46E6	Write user data to disk sector.
46EF	Write system data to disk sector

All of these routines have the same entry requirements which are specified in Table 2. On exit, register A contains a standard TRSDOS return code and the Z flag is set if there was no error.

Table 2: Entry Requirements

Register	Contents
C	Disk drive number
D	Track number.
E	Sector number.
HL	Address of buffer in memory.
B	Number of bytes to transfer (256 if zero).

Note that there are two similar routines which write data to a disk sector. The routine at 46EF is used only when writing data to directory sectors. It causes a return code of 6 to be produced on subsequent reads of the sector, indicating to TRSDOS that it has read system data.

The program in Listing 1 uses the routines described above to change the diskette name of a diskette. Assuming that it has been assembled to produce a command file with the name DISKID/CMD, the program is used by specifying the new name after the command. For example:

DISKID NEWNAME sets the diskette name to NEWNAME

DISKID sets the diskette name to spaces.

In order to understand how the program works, the following information is needed:

1. On entry to the program, HL points to the part of the command line following the command. In this case it points to the new diskette name.
2. The program obtains the number of the directory track from the byte at offset 2 in sector 0 of track 0 (the boot sector). The directory is almost always on track 17.
3. The diskette name is stored in an eight byte field at offset D0 (hex) in sector 0 of the directory track (the GAT sector).

Finally, if you decide to try using these routines for other purposes (such as file recovery or password removal) make sure that the diskette that you use for debugging has been backed up!

David Bonham

```
;
;  DISKID — A program to change the diskette name
;
;  Assemble using the MACRO-80 Assembler.
;
        CSEG                    ;ORG nnn on other assemblers
DISKID: PUSH    HL              ;Save pointer to new name
;
;  Read boot sector (track 0, sector 0) into memory . . .
;
        LD      C,0             ;Select drive 0
        LD      D,C             ;Track 0
        LD      E,C             ;Sector 0
        LD      B,C             ;Read 256 bytes
        LD      HL,SECTOR       ;Space for boot sector
        CALL    46DDH           ;Read boot sector
        JR      NZ,DOSERR       ; Make sure all went well
;
;  Extract number of directory track from boot sector . . .
;
        LD      A,(SECTOR+2)    ;Get track number
        LD      D,A             ;Prepare to read directory
;
;  Read GAT sector (sector 0) of directory track . . .
;
        CALL    46DDH           ;Read sector
        CP      6               ;Return code should be 6
        JR      NZ, DIRRERR     ;since we read system data
;
;  Now move the new diskette name from the command line into
;  the GAT sector, padding with spaces as necessary . . .
;
        EX      (SP),HL         ;Save HL, get command line
        PUSH    DE              ;Save DE too
        LD      DE,SECTOR+0D0H  ;Start of name field
        LD      B,8             ;Length of name field
;
COPYID: LD      A,(HL)          ;Next char from command line
        CP      13              ;Check for end of name
        JR      Z,MOVED
        LD      (DE),A          ;Place char in name field
        INC     HL              ;Move on to the next
        INC     DE              ;Character
        DJNZ    COPYID
        JR      NOMORE          ;Moved 8 chars so no padding
;
MOVED:  LD      A,' '           ;Pad out rest of name field
FILLID: LD      (DE),A          ;with spaces
        INC     DE
        DJNZ    FILLID
;
;  Write the modified GAT sector back to the directory
;  (note that we are writing system data) . . .
;
NOMORE: POP     DE              ;Restore track and sector
        POP     HL              ;Restore pointer to data
        CALL    46EFH           ;Write new sector
;
;  If all went well, return to TRSDOS . . .
;
        JP      Z,402DH
;
;  Exit via the TRSDOS error handler if a DOS related error
;  occurred . . .
;
        OR      0C0H            ;Move in flags
        JP      4409H           ;Give error message
;
;  Inform the user that we failed to find the directory
;  where the boot sector said it was (!) . . .
;
DIRERR: LD      HL,DIRTXT       ;Suitable message
  CALL  4467H   ;Output text
        JP      402DH           ;Then back to DOS
;
DIRTXT: DB      'DIRECTORY NOT FOUND',13
;
SECTOR  EQU     $               ;Start of free space
;
        END     DISKID
```

ZX80 TO ZX81 CONVERSION

The contribution by Alan Fowke in the December TJ's Workshop listed some useful tips to be considered when converting programs written for the ZX80 to run on the ZX81. But he missed two subtle difference which can play havoc with a program. On the ZX80 the initial element in an array is zero; on the ZX81 it is one. An array which has been dimensioned A(9) and filled in a loop starting with a statement : FOR I = 0 TO 9 has to be redimensioned A (10) and handled in loops using : FOR 1 = 1 TO 10. If this is not done then report code 3 will result (subscript out of range).

The other difference is that the value of 'true' on the ZX80 is -1; on the ZX81 it is 1. This is important if you use logic statements to reduce the number of lines in a program. For example, the two lines:

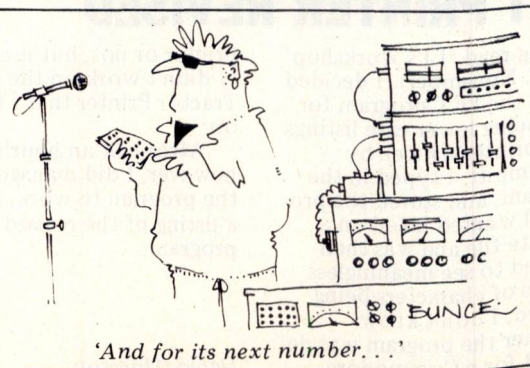
10 IF A<>0 THEN LET B = 10

20 IF A = 0 THEN LET B =20

can be replaced with:

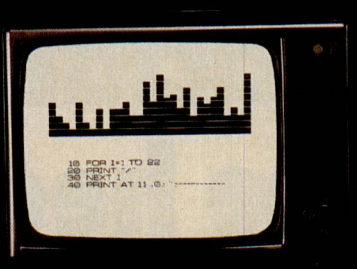
10 LET B = 10 - 10* (A=0) (ZX80) and 10 LET B = 10 + 10* (A=0) (ZX81)

M. Ormerod



'And for its next number. . .'

sinclair ZX81 PERSONAL COMPUTER





Sinclair ZX81 Personal Comp
the heart of a system that grows with you.



1980 saw a genuine breakthrough – the Sinclair ZX80, world's first complete personal computer for under £100. Not surprisingly, over 50,000 were sold.

In March 1981, the Sinclair lead increased dramatically. For just £69.95 the Sinclair ZX81 offers even more advanced facilities at an even lower price. Initially, even we were surprised by the demand – over 50,000 in the first 3 months!

Today, the Sinclair ZX81 is the heart of a computer system. You can add 16-times more memory with the ZX RAM pack. The ZX Printer offers an unbeatable combination of performance and price. And the ZX Software library is growing every day.

Lower price: higher capability
With the ZX81, it's still very simple to teach yourself computing, but the ZX81 packs even greater working capability than the ZX80.

It uses the same micro-processor, but incorporates a new, more powerful 8K BASIC ROM – the 'trained intelligence' of the computer. This chip works in decimals, handles logs and trig, allows you to plot graphs, and builds up animated displays.

And the ZX81 incorporates other operation refinements – the facility to load and save named programs on cassette, for example, *and* to drive the new ZX Printer.



New BASIC manual

Every ZX81 comes with a comprehensive, specially-written manual – a complete course in BASIC programming, from first principles to complex programs.

Kit: £49.95

Higher specification, lower price – how's it done?
Quite simply, by design. The ZX80 reduced the chips in a working computer from 40 or so, to 21. The ZX81 reduces the 21 to 4!

The secret lies in a totally new master chip. Designed by Sinclair and custom-built in Britain, this unique chip replaces 18 chips from the ZX80!

New, improved specification

- Z80A micro-processor – new faster version of the famous Z80 chip, widely recognised as the best ever made.
- Unique 'one-touch' key word entry: the ZX81 eliminates a great deal of tiresome typing. Key words (RUN, LIST, PRINT, etc.) have their own single-key entry.
- Unique syntax-check and report codes identify programming errors immediately.
- Full range of mathematical and scientific functions accurate to eight decimal places.
- Graph-drawing and animated-display facilities.
- Multi-dimensional string and numerical arrays.
- Up to 26 FOR/NEXT loops.
- Randomise function – useful for games as well as serious applications.
- Cassette LOAD and SAVE with named programs.
- 1K-byte RAM expandable to 16K bytes with Sinclair RAM pack.
- Able to drive the new Sinclair printer.
- Advanced 4-chip design: micro-processor, ROM, RAM, plus master chip – unique, custom-built chip replacing 18 ZX80 chips.

Built: £69.95

Kit or built – it's up to you!
You'll be surprised how easy the ZX81 kit is to build: just four chips to assemble (plus, of course the other discrete components) – a few hours' work with a fine-tipped soldering iron. And you may already have a suitable mains adaptor – 600 mA at 9 V DC nominal unregulated (supplied with built version).

Kit and built versions come complete with all leads to connect to your TV (colour or black and white) and cassette recorder.



ter-



Available now- the ZX Printer for only £49.95

Designed exclusively for use with the ZX81 (and ZX80 with 8K BASIC ROM), the printer offers full alpha-numerics *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 intructions.

At last you can have a hard copy of your program listings – particularly useful when writing or editing programs.

And of course you can print out your results for permanent records or sending to a friend.

Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your computer – using a stackable connector so you *can* plug in a RAM pack as well. A roll of paper (65 ft long x 4 in wide) is supplied, along with full instructions.

16K-byte RAM pack for massive add-on memory.

Designed as a complete module to fit your Sinclair ZX80 or ZX81, the RAM pack simply plugs into the existing expansion port at the rear of the computer to multiply your data/program storage by 16!

Use it for long and complex programs or as a personal database. Yet it costs as little as half the price of competitive additional memory.

With the RAM pack, you can also run some of the more sophisticated ZX Software – the Business & Household management systems for example.

How to order your ZX81

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day.

BY FREEPOST – use the no-stamp-needed coupon below. You can pay by cheque, postal order, Access, Barclaycard or Trustcard.

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

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

Qty	Item	Code	Item price £	Total £
	Sinclair ZX81 Personal Computer kit(s). Price includes ZX81 BASIC manual, excludes mains adaptor.	12	49.95	
	Ready-assembled Sinclair ZX81 Personal Computer(s). Price includes ZX81 BASIC manual and mains adaptor.	11	69.95	
	Mains Adaptor(s) (600 mA at 9 V DC nominal unregulated).	10	8.95	
	16K-BYTE RAM pack.	18	49.95	
	Sinclair ZX Printer.	27	49.95	
	8K BASIC ROM to fit ZX80.	17	19.95	
	Post and Packing.			2.95

☐ Please tick if you require a VAT receipt TOTAL £

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

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

*Please delete/complete as applicable.

Please print.

Name: Mr/Mrs/Miss

Address:

FREEPOST – no stamp needed. PCW 03

sinclair

ZX81

6 Kings Parade, Cambridge, Cambs., CB2 1SN.
Tel: (0276) 66104 & 21282.

How the ZX81 compares with other personal computers

SYSTEM IDENTIFICATION		ZX81	ZX80	ACORN ATOM	APPLE II PLUS	PET 2001	TRS 80 LEVEL I	TRS 80 LEVEL II
ROM		8K	4K	8K	8K	14K	4K	12K
GUIDE PRICE	Basic unit – inc. VAT	£70	£100	£175	£630	£435	£290	£375
	Unit plus 16K RAM (*12K RAM)	£120	£150	£285*	£630	£530	£360	£375
COMMANDS	LIST, LOAD, NEW, RUN, SAVE	●	●	●	●	●	●	●
STATEMENTS	PRINT, INPUT, LET, GOTO, GOSUB/RETURN, FOR/NEXT IF/THEN	●	●	●	●	●	●	●
	STEP	●		●	●	●	●	●
	TAB	●			●	●	●	●
ARITHMETIC	ABS, RND	●	●	●	●	●	●	●
FUNCTIONS	INT	●			●	●	●	●
	ATN, COS, EXP, LOG, SGN, SIN, SQR, TAN	●			●	●		●
	ARCSIN, ARCOS	●						
STRING	CHR$	●	●		●	●		●
FUNCTIONS	LEN	●		●	●	●		●
	ASC(CODE), STR$, VAL, INKEY$	●				●		●
NUMBERS	FLOATING PT $\pm 10^{\pm 38}$	●			●	●	●	●
	INTEGERS		●	●	●	●		●
NUMERIC	A-Z			●			●	
VARIABLES	AA-ZØ				●	●		●
	An-Zn, n=any alphanumeric string	●	●					
STRING	A$ & B$						●	
VARIABLES	A$ to Z$	●	●	●				
	An$ to Zn$ n=any alphanumeric character				●	●		●
NUMERIC	SINGLE DIMENSIONAL		●	●			●	
ARRAYS	MULTI DIMENSIONAL	●			●	●		●
DISPLAY	ROWS	24	24	16	24	25	16	16
	COLUMNS	32	32	32	40	40	64	64
	LOW RES GRAPHICS (<7000 pixels)	●	●	●	●	●	●	●
	HI RES GRAPHICS (>40000 pixels)			●	●			
SPECIAL	USR (CALL, LINK)	●	●	●	●	●		●
FEATURES	PEEK, POKE (OR EQUIV)	●	●	●	●	●		●

Sinclair software on cassette.

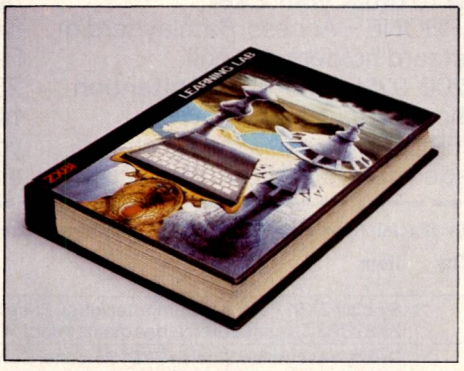


The unprecedented popularity of the ZX Series of Sinclair Personal Computers has generated a large volume of programs written by users.

Sinclair has undertaken to publish the most elegant of these on pre-recorded cassettes. Each program is carefully vetted for interest and quality, and then grouped with others to form single-subject cassettes.

Software currently available includes games, junior education, and business/household management systems. You'll receive a Sinclair ZX Software catalogue with your ZX81 – or see our separate advertisement in this magazine.

The ultimate course in ZX81 BASIC programming.



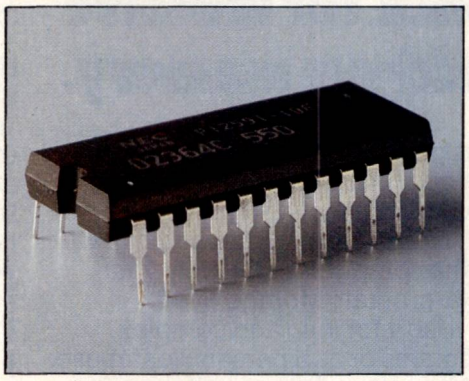
Some people prefer to learn their programming from books. For them, the ZX81 BASIC manual is ideal.

But many have expressed a preference to learn *on* the machine, *through* the machine. Hence the new cassette-based ZX81 Learning Lab.

The package comprises a 160-page manual and 8 cassettes. 20 programs, each demonstrating a particular aspect of ZX81 programming, are spread over 6 of the cassettes. The other two are blank practice cassettes.

Full details with your Sinclair ZX81.

If you own a Sinclair ZX80...



The new 8K BASIC ROM used in the Sinclair ZX81 is available to ZX80 owners as a drop-in replacement chip. (Complete with new keyboard template and operating manual.)

With the exception of animated graphics, all the advanced features of the ZX81 are now available on your ZX80 – including the ability to drive the Sinclair ZX Printer.

sinclair
ZX81

6 Kings Parade, Cambridge, Cambs., CB2 1SN.
Tel: (0276) 66104 & 21282.

PATTERNS

This month Alan Sutcliffe reveals a little known solution to the 'hidden surfaces' problem in graphics.

So far in Patterns I have written about abstract arrangements and designs. Representing reality—by which is meant the appearance of things—presents many problems that do not arise in making two-dimensional non-representational patterns. One such problem—or rather a whole group of problems—is to do with the removal of hidden lines and surfaces in showing a three-dimensional scene. What bits of the picture lie behind which other bits and so should not be drawn, or should be drawn and then overwritten by what lies in front of them?

How the problem presents itself and how it can be solved depends a lot on the type of output display used and the way objects are shown. When I did a short animated sequence of an imaginary landscape for the film 'Alien' a few years ago I was able to use a simple approach —there was no time for anything else. A vector graphics device was used, so the scene was made up of a set of straight lines. I chose to show the form of the land by having a series of more or less horizontal lines going across the screen, those further up representing points further away from the viewpoint. Any bump in a line appears as a hill, and any dip as a hollow. Figure 1 shows the method. Each line can only obscure those above (behind) it, and be obscured by those below (in front of) it. Each line represents a horizon up to that level.

The rules for drawing the lines should now be clear, given a set of three-dimensional coordinates for the terrain at a number of grid points, and the position of the viewpoint:

* Calculate the first, bottom line, and draw it. Nothing is in front of this so it is all visible. It establishes a horizon.
* Calculate the next line, and determine which parts of it, if any, fall below the horizon: ignore any that do and draw the rest. This establishes a new horizon. Repeat this last step until all the lines are drawn and the scene is complete.

There is an article in the June 1981 issue of *Creative Computing*, reprinted in *Video* in September 1981, that describes the method and the program in detail. The basis is obviously nearest first.

Hidden surfaces

In a picture composed of areas rather than lines, a similar approach can be used. This is the form most suitable for most micro-systems. Plotting areas rather than lines has one big advantage: it is not necessary to compute just which parts of an area are hidden. If the areas are drawn in the order from furthest first to nearest last the plotting process takes care of this by overwriting any areas that are hidden.

This approach of drawing surfaces in the order of their distance from the point of view is often given as the best, or even the only, way of solving the hidden surface problem. It is certainly not the only method, and it may not be the best. It has two possible disadvantages.

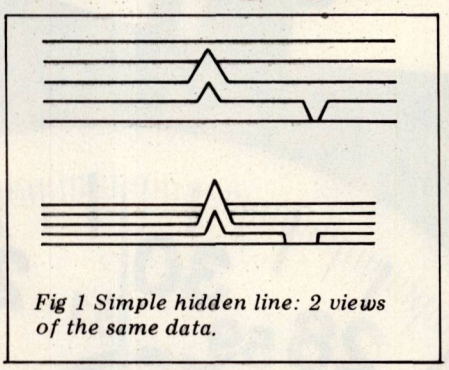


Fig 1 Simple hidden line: 2 views of the same data.

1. The order in which surfaces are to be plotted depends on the distance from the point of view, and so must be computed afresh for each new viewpoint.
2. The notion of which of two surfaces is nearer to a given point in three dimensions can be ambiguous: a long strip of surface may extend both nearer and further from the viewpoint than a small patch. It is then necessary to go into just which little bit of the long strip is in line with the small patch in the direct line of sight, and then which of these is nearer. That is complicated and time-consuming, and can entail drawing rays out from the viewpoint in all directions to see in which order they skewer the surfaces.

The rest of this article describes a way of dealing with hidden surfaces in which much or even all of the computation about the order of plotting the surfaces is independent of the viewpoint and can be carried out once and for all at the beginning of the program for each fixed scene—say the model of a city—rather than for each different viewpoint in an animated sequence.

This may seem contrary to your intuition—it certainly did to mine when I first found this method—and that may be one reason it does not seem to be much discussed. It is also what makes it particularly interesting. Even in the excellent 'Horizon' programme on American computer graphics shown on TV at Christmas, one of the foremost experts in California said that hidden surface removal depends on distance from the point of view. It does not.

Assumptions and definitions

This part of the article deals with the background to the method, the theory, while next month I will present a program to implement it on a micro. First there are some assumptions and definitions to give.

* Each surface of the scene is flat, and lies entirely in one plane.
* Each surface may have any shape of outline, and may even have holes in it, like windows in a wall.
* Each surface is one-sided, that is it has a front and a back and can only be seen from the front.
* If a surface is wanted that can be seen from both sides, like the inside and outside of a wall, then these sides must appear separately in the catalogue of surfaces: they will differ only in sign, + or -. Often it is enough to keep only the outside surfaces, as in the model of a city where the buildings do not have windows through which the insides can be seen (quite normal in architectural models), and where the city is only to be seen from outside the buildings—the view from inside a windowless block is pretty dull, anyway.
* The sign of a surface may be thought of as indicating whether it faces towards or away from the origin of the coordinate system in which the model is stored. More of that when we come to details of the program.

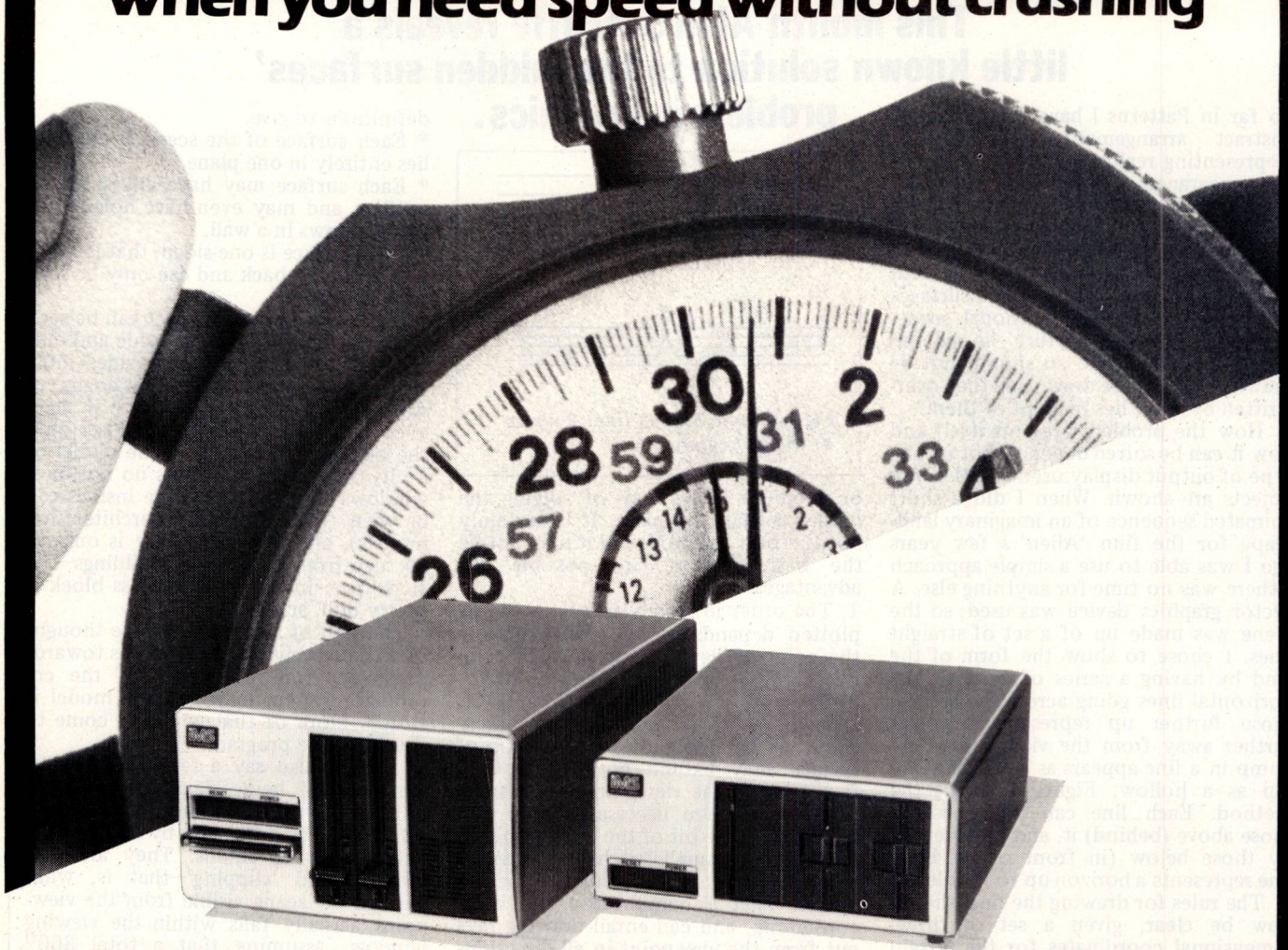
I must also say a few words about what is *not* being dealt with in this article. Two important aspects are assumed to be dealt with by the program without giving details. They are perspective and 'clipping'—that is, what part of the scene visible from the viewpoint actually falls within the viewing window, assuming that a total 360^0 panorama is not being presented. These are both matters that depend on the point of view, and I am concerned with what can be sorted out before that is decided.

A simple example

Here then, is the basis of the method: imagine two surfaces, a patch of ground and a wall nearby but not on the patch. Remember that both surfaces are one-sided and invisible from the back. The underside of the ground can be ignored because we are not going to look at the scene from below ground. So the patch of ground can never obscure any part of the wall. The wall may or may not obscure some part of the patch of ground, depending on which way it is facing. But it will always be safe to draw the ground first and then the wall, and the order of plotting will take care of any part of the patch of ground that is obscured by the wall.

But, you may say, these aren't all the possibilities—because the viewpoint is restricted to above ground. Assume a point of view below ground, then—down a well, for example. From here the patch of ground cannot be seen at all, so there is no question of it obscuring anything. What might obscure the wall is the underside of the ground—a

TURBOCHARGED PERFORMANCE:
when you need speed without crashing



Start a stopwatch on our new Turbocharged Series 5000SX and Series 8000SX microsystems and watch them run rings around other systems.

Built to the highest standard of reliability, they support a mixture of 5in and 8in floppy and Winchester drives with tape back-up units. In other words, a storage capability extending from 400KB to 130MB.

But what makes the Series 5000SX and Series 8000SX really pull away from the rest of the field is their unique and exceptionally powerful disk operating system – TURBOdos. Written specifically for the Z80, TURBOdos loads programs up to six times quicker than CP/M*. And processes files up to five times faster.

TURBOdos gives the new systems many of the features available only on minicomputers. In multi-user mode, it allows multi-processor network users to share mass storage, printers and other peripherals. And its advanced failure detection and recovery facility makes a TURBOdos system virtually crash-proof! Other features include:

- Full CP/M compatibility even in multi-user/network systems.
- Up to 30% more data can be stored on each floppy disk, compared to CP/M.
- Support for up to 2000MB of hard disk storage.
- Random access to files up to 67MB.
- Up to 16 users supported in multi-processor mode.
- Automatic concurrent print-spooling support for up to 16 printers.
- File and record-locking facilities.
- Complete diagnostic self-test is performed at every start-up.
- Read after write verification of all disk update operations.
- When errors are detected, operator is given clear diagnostic messages and a variety of recovery options.
- User-defined program auto-load at cold or warm start.
- Disks can be changed at any time without warm start delays.
- Command files may be nested to any depth.
- User programs may activate command files for execution.
- Communications channel interface.
- Real-time clock support.
- Systems are easy to configure due to modular construction.

*CP/M is a trademark of Digital Research

EQUINOX

TURBO SX range

Kleeman House, 16 Anning Street, New Inn Yard, London EC2A 3HB. Tel: 01-739 2387 & 01-729 4460 Telex: 27341

OEM, system house and dealer enquiries are invited.

different surface—or more likely the sides of the well. Thus, returning to the wall and patch of ground, the order of plotting them is determined once and for all, for any viewpoint. The steps needed for this simple case are as follows. Make the fixed list Ground, Wall, for all points of view.

As the scene is to be plotted, for each surface in turn and for each point of view, determine if the point of view is in front of the surface, if so draw it, otherwise ignore it.

The distance of the point of view from the wall and ground are not computed or considered at all. The determination of which side of a surface a point is on is simple: put the coordinates of the point in the equation of the surface, and test the sign of the result. For a one-sided surface this must then be multiplied by the sign of the surface, but if the equation is stored in the right form this will all be part of the same step. If the equation of a surface is $x + 2y + 3z + 4 = 0$, this can be taken as the equation of the upper surface; while that for the lower surface is simply $- x - 2y - 3z - 4 = 0$. The point (1,1,1) for example gives $1+2+3+4 = 10$, which is positive when substituted in the first surface, so it is in front of this. In the second equation it gives -10, and so is behind it.

A zero value would indicate that the point of view was in the same plane as the surface in question, and the convention is that the surface is then invisible, having no thickness. Zero is lumped with negative: in the plane but behind it. But this is taking us too far into the detail of implementing the method before its validity has been established.

Analysis of cases

In many cases the order in which the surfaces are plotted does not matter at all. Consider a cube which is seen from the outside only. It has 6 one-sided surfaces. There is no point of view from which any of them obscures any other. All they can do is get in front of the backs of some of the other surfaces, but these are invisible anyway. So in a scene consisting of only a single cube the list of surfaces can be in any order. The same is true of any convex object, such as a near-sphere composed of hundreds of small facets each too small to see. Every outside surface is back-to-back with every other outside surface.

If the cube had windows and inside walls, and could be viewed from both

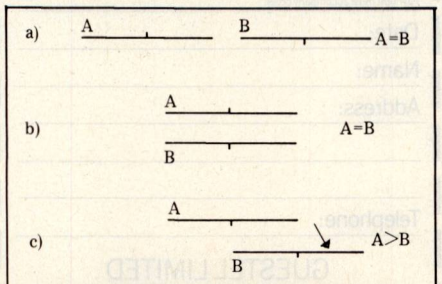


Fig 2 Two areas in the same plane or in parallel planes.

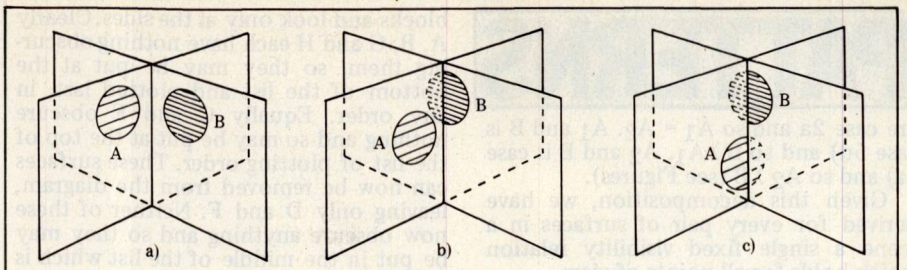


Fig 3 Three cases of areas on intersecting planes.

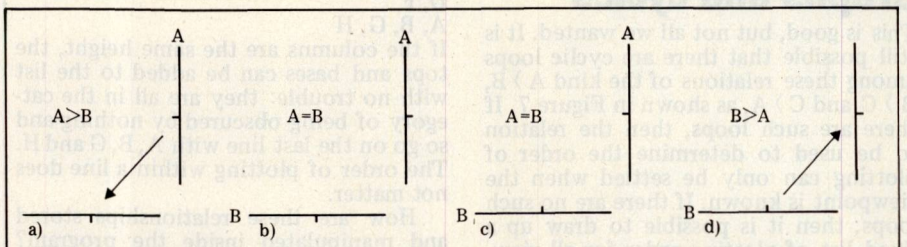


Fig 4 Four sub cases corresponding to 3 a). Arrow indicates line of sight

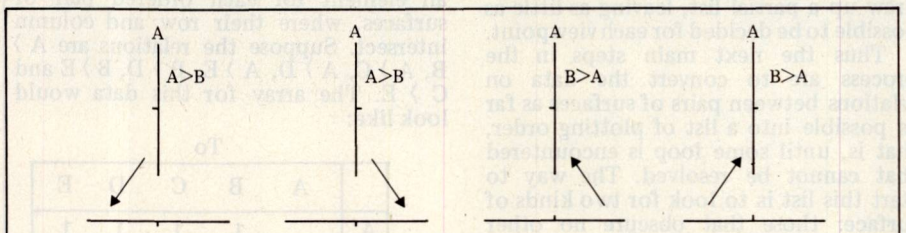


Fig 5 Four sub cases corresponding to 3 b).

inside and outside, the situation is not much more complicated. No inside surface can get in front of an outside one, or in front of another inside surface. Each outside surface can obscure some inside surfaces but no outside ones, as noted above. The order of plotting is therefore all (visible) inside surfaces in any order, then all (visible) outside surfaces in any order. Again this applies to any convex body.

For concave bodies and for more complex scenes the situation is more complicated, but in many cases the order of plotting can be decided for all viewpoints. To show this we must abandon this study of particular cases and launch into more basic analysis. This consists of considering in turn all possible relationships between a pair of surfaces. Most of these are straightforward, but there is one set of awkward cases at the end. This is best explained with a set of diagrams in which each of the 2 surfaces is seen end on and so just appears as a line.

A little bit of notation. The two surfaces are A and B.

A $\rangle$ B means that A can obscure B

A $\langle$ B means that B can obscure A

A = B means that neither can obscure the other.

Now refer to the diagrams in turn.

2a) A and B are in the same plane, so neither can obscure the other: A = B.

2b) A and B are in parallel planes and face in opposite directions, either both inward or both outwards. A = B.

2c) A and B are in parallel planes and both face the same way. A $\rangle$ B.

In the diagrams the convention is that the plain side of the line is the front, visible side of the surface, and the one with the small mark is the back, invisible side.

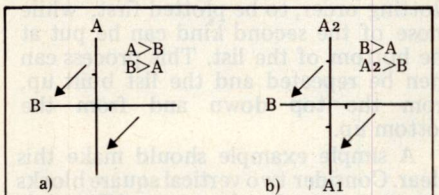


Fig 6 The awkward case and its resolution

If the surfaces are in skew planes—that is planes that intersect—they do so along a line. There are 3 possible arrangements to consider, shown in Figure 3.

3a) The line of intersection passes through neither surface.

3b) The line of intersection passes through one surface, say B, but not the other.

3c) The line of intersection passes through both A and B. This is the awkward case.

Now we must look at each of these cases in more detail, returning to the edge-on view, looking down the line of intersection of the planes. Figure 4 shows the four sub-cases from 3a and the resulting visibility relation in each cases. There is no other way in which two such surfaces can be arranged. Figure 5 shows the detail for 3b, and is again complete. Figure 6 shows the awkward case, and the reason for it is that part of A can obscure B, and part of B can obscure A. Our system breaks down because there is not a single fixed relation between A and B. In fact, this case is a problem for any method, because both relations can hold even from a single viewpoint; plotting A then B may fail, and plotting B then A may fail. The solution, in any method, is to split one of the surfaces into two parts along the line of intersection. This decomposes the case into three surfaces which can be taken in pairs. A_1 and A_2

are case 2a and so $A_1 = A_2$. A_1 and B is case 5d) and so $B > A_1$. A_2 and B is case 5a) and so $A_2 > B$ (see Figures).

Given this decomposition, we have derived for every pair of surfaces in a scene a single fixed visibility relation which holds for all points of view.

Graphs and cycles

This is good, but not all we wanted. It is still possible that there are cyclic loops among these relations of the kind A > B, B > C and C > A, as shown in Figure 7. If there are such loops, then the relation to be used to determine the order of plotting can only be settled when the viewpoint is known. If there are no such loops, then it is possible to draw up a fixed list of plotting order for all viewpoints. In any case it will be possible to draw up a partial list, leaving as little as possible to be decided for each viewpoint.

Thus the next main steps in the process are to convert the data on relations between pairs of surfaces as far as possible into a list of plotting order, that is, until some loop is encountered that cannot be resolved. The way to start this list is to look for two kinds of surface: those that obscure no other surface, and those that are obscured by no other surface. Those of the first kind can be put at the head of the list of plotting order, to be plotted first, while those of the second kind can be put at the bottom of the list. This process can then be repeated and the list built up, from the top down and from the bottom up.

A simple example should make this clear. Consider two vertical square blocks arranged as in the plan view of Figure 8. Forget the tops and bases of these blocks and look only at the sides. Clearly A, B, G and H each have nothing obscuring them, so they may be put at the bottom of the list and plotted last, in any order. Equally C and E obscure nothing and so may be put at the top of the list of plotting order. These surfaces can now be removed from the diagram, leaving only D and F. Neither of these now obscure anything and so they may be put in the middle of the list which is complete:

C, E
D, F
A, B, G, H

If the columns are the same height, the tops and bases can be added to the list with no trouble: they are all in the category of being obscured by nothing and so go on the last line with A, B, G and H. The order of plotting within a line does not matter.

How are these relationships stored and manipulated inside the program? There is a two-dimensional array with an element for each ordered pair of surfaces, where their row and column intersect. Suppose the relations are A > B, A > C, A > D, A > E, B > D, B > E and C > E. The array for this data would look like:

From \ To	A	B	C	D	E
A		1	1	1	1
B				1	1
C					1
D					
E					

A helpful way of thinking about this data is as a directed graph. Each surface is represented by a point, and the relation A > B is represented by a line from A to B with an arrow indicating its direction. The same data is shown in this form in Figure 9. Here are the rules for converting this data on relations into a list of plotting order, expressed in terms of the directed graph.

1. A point which has only lines leading to it can be placed at the head of the list —but below any already put at the head —and erased from the graph.
2. A point which only has lines leading from it can similarly be placed at the bottom of the list, but above any already put at the bottom.
3. A point with no lines leading to or from it can be dealt with either as for 1 or for 2 above.

In every case, the point and all the lines connected to it can be removed from the graph when the point is put on the list. This may well bring other points into one of the categories 1, 2 or 3 which can be dealt with even though until this stage they were in the fourth category of having lines leading both to and from them, and so not capable of being transferred to the list under the rules above.

It is this process of peeling off successive layers from the top and bottom that makes it difficult, looking at the data for all but the simplest graphs, to tell whether it is going to be possible to complete the plotting list or whether some loops will turn up to frustrate the process.

GOTO page 189

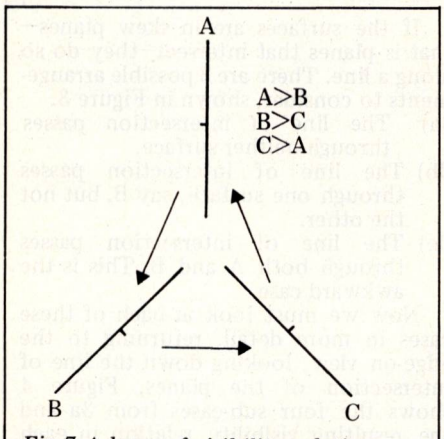


Fig 7 A loop of visibility relations.

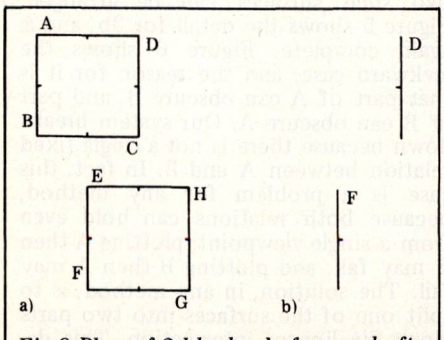


Fig 8 Plan of 2 blocks, before and after transfer of the first set of surfaces.

GUESTEL THROUGH THE POST

Apple III System	2545:00
Apple II	P.O.A.
Disk Drive with controller (DOS 3.3)	349:00
Disk Drive	289:00
BMC 12" Green Monitor	149:00
NEC 12" Yellow monitor	170:00
OKI Microline 80 printer	275:00
Epson MX 80T printer	349:00
Silentype Printer	195:00
Centronics 737	325:00
Centronics Parallel Interface	69:00
16K RAM card	89:00
Visicalc 3.3	105:00
Colour card (inc. modulator)	92:00
Disks (10)	21:00
DOS Tool Kit	39:00
Apple World	35:00
40 Disk lockable tray	20:00
Upgrade Kit	39:00
Gorgon	21:00
Olympic Decathlon	15:50
Monopoly	16:50
Pool	19:00
Space Eggs	15:50
GUESS WHO? Guestel Sweat Shirt	5:00

All prices exclusive of VAT.

GUESTEL ORDER FORM

Goods required:

Total cost £

VAT at 15% £

Add £1 P&P to orders under £10

Total £

Payment must accompany order

Date:

Name:

Address:

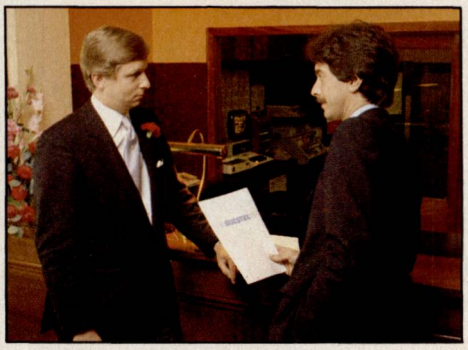
Telephone:

GUESTEL LIMITED
15 GRAND PARADE BRIGHTON
EAST SUSSEX BN2 2QB

FOUR GOOD REASONS FOR CHOOSING GUESTEL

1. **The Systems –** Whatever your micro computer hardware or software requirements, Apple systems can meet them and we can supply them to rent or buy. Visit our showrooms in London, Brighton and Bristol or use our nationwide mail order service – one of the largest and most efficient in the country.
Guestel provide sales, service and an in depth knowledge of Apple systems. We buy bigger so you can buy cheaper.

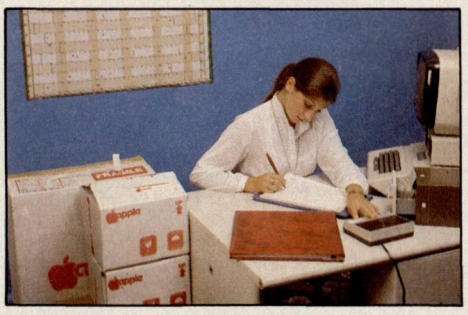




2. **The Consultancy –** Micro computer systems are simple to use once you know how. But how do you learn when so much of the so-called advice is in confusing computer jargon? Come to us. We talk plain English. Quite simply, we will help you to identify your particular needs for hardware, software and support services – then we'll match them with Apple systems.



3. **The Service –** Immediately you come to us with your needs you'll get a personal service. Whatever your requirements, we respond right away. And once your equipment is installed our reliable back up service ensures that help is aways on hand when you need it. We operate a two tier maintenance agreement, with a 24 hour call out service. We also have an in house engineering facility and a telephone enquiry service to cope with emergencies.



Our fast, efficient mail order service will take care of your additional requirements and our offices are within easy reach.



4. **The Know How –** Some of Britain's leading companies have come to us for help in developing major custom built micro computer linked systems – your guarantee that we have the depth of technical knowledge and the experience to help with your needs, large or small.

GUESTEL

EXPANSION THROUGH EFFICIENCY

8-12 NEW BRIDGE STREET LONDON EC4V 6AL TELEPHONE 01 583 2255

37 QUEENS SQUARE BRISTOL 1

15 GRAND PARADE BRIGHTON EAST SUSSEX BN2 2QB TELEPHONE 0273 695264

AUTHORISED APPLE DEALER AND LEVEL ONE SERVICE CENTRE

apple® **APPLE III NOW AVAILABLE**

® Apple is a trademark of Apple Computer Inc., Cupertino, CA, USA.

INTRODUCING

Performance

to the microcomputer-based small business system

PBM-1000



Extra Performance/Increased Capability

- 80K memory system as standard
- 20-30% more RAM for user programmes
- Back-up to 6 discs in less than 10 minutes
- Full interupt capability
- Software security
- Designed for system expansion

In one word-Performance.

Low Cost

- Comparable in size to an 8' floppy disc
- Out-performs available 8' or 14' hard disc systems

The PBM-1000 can be purchased as a stand-alone unit. Alternatively it can be supplied integrated with a Televideo TV1 910/950 VDU and OK1 dot matrix or a daisy wheel printer and various software options.

It provides a comprehensive solution to your office automation needs.
We invite you to compare
PERFORMANCE, CAPABILITY, COST.

A microcomputer to the user is the software

Software options

- Milestone
- Plan 80
- Sales, Purchase and Nominal Ledgers
- Order Processing
- Wordstar
- Spellstar
- Mailmerge
- Datastar
- Infostar and Supersort

PBM-1000 is a trademark of Perfomance Business Machines (A MicroPro Company). CP/M is a trademark of Digital Research Inc. Wordstar, Spellstar, Mailmerge, Datastar, Infostar & Supersort are trademarks of MicroPro International Corporation. Milestone is a trademark of Organic Software Inc. Plan 80 is a trademark of Business Planning Systems Inc.

TERODEC
Terodec Limited
Unit 58, Suttons Park Avenue
Earley, Reading, Berkshire.
RG6 1AZ
Telephone (0734) 664343/6
Telex 849758 TERDEC G

Dealer and OEM inquiries invited

The MicroPro™ software family



MicroPro produces an entire family of versatile, user-friendly business software for microcomputers. Programs that help you get a lot more work done with a lot less time and effort. Programs that in many cases can join together to multiply your problem-solving power.

WordStar™

Easy, powerful, incredibly versatile — WordStar is the way word processing should be. With WordStar software, from MicroPro, what you see is what you get — the screen shows you exactly what will be printed. And WordStar's numerous onscreen instructions make it simple to use its many capabilities. WordStar now comes with a completely rewritten, easier to understand manual. Also available are a Training Guide for beginners, a Reference Card listing WordStar commands and a customisation manual for OEM's.

SpellStar™

SpellStar is MicroPro's "proof-reader" on a disk. A spelling checker program that works with WordStar software, saving you countless hours of proof-reading. Spell Star checks your text against its 20,000 word dictionary-on-a-disk. You can add your own words to SpellStar's dictionary, or create any number of supplemental dictionaries. Because SpellStar software operates within the WordStar program, you get to see your mistakes highlighted in context, and you're always only one keystroke from full word processing.

MailMerge™

MailMerge from MicroPro, is a powerful multi-purpose file merging program, used with WordStar software. One of its most popular applications is producing personalized form letters, at a fraction of the time and expense of individually typed letters. MailMerge software lets you combine a file of names and addresses with a WordStar file containing a form letter. You can even insert special words and phrases unique to each addressee into the body of each letter. Other uses for MailMerge include creating invoices, printing mailing labels, and producing "boilerplate" legal documents out of many different standard paragraphs.

CP/M is a trademark of Digital Research Corp.
TM is a trademark of MicroPro International Corp.

CalcStar™

CalcStar is MicroPro's electronic spread sheet and financial modelling program — a sophisticated, yet easy to use, calculating and planning tool. CalcStar software calculates solutions to complex numerical problems in business and finance. And it projects figures into the future to answer the "what if" questions you face in business. CalcStar is useful for projects such as budget plans, sales forecasts, cash flow analysis, and for evaluating the potential effect of financial decisions with speed and accuracy. And CalcStar has an unique MicroPro bonus: It joins with WordStar to combine spread sheet and word processing capabilities in several powerful ways.

DataStar™

DataStar is MicroPro's high-powered data entry and retrieval program-comprehensive, versatile, and quick. DataStar software features power and faciltities usually found only on large key-to-disk systems. And it gives you remarkable flexibility by letting you design your own data forms to match your exact needs before entering data. The program includes sample forms to guide you.

SuperSort™

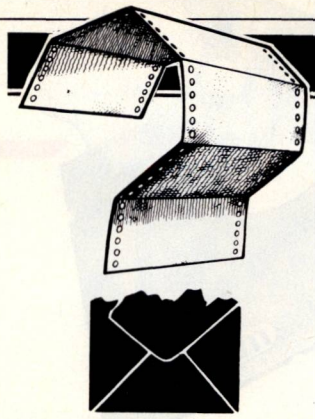
SuperSort from MicroPro, lets you sort, merge, and select with tremendous speed and convenience. SuperSort software accepts just about any kind of record you can imagine. It can sort and merge up to 32 files into a single file, up to 10 times faster than a BASIC language sort program. Sort and merge instructions are easy to enter. Errors are pointed out on the screen and easy to correct.

As well as being the largest distributor of MicroPro software in the U.K., we are also the most competitive and hold the largest stock. Contact us now for a free 16 page booklet on MicroPro Products and details of our extensive product range.

TRADE ENQUIRIES WELCOME

Interam Computer Systems Ltd.
46 Balham High Road, London, SW12 9AQ
Telephone: 01-675 5325/6/7
Telex: 925859

INTERAM



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.

Map guide

Would somebody please explain what memory mapping is?
R Gilmore, Manchester

Memory mapping is the method in which ports are addressed as memory locations. This means that they are addressed (selected) by the address bus and their data is transferred along the data bus. The advantage of this system is, on an 8-bit processor, up to 65,535 individual 8-bit ports can be addressed. This is compared with the 255 ports available using the I/O lines provided on such processors as the 8080A and the Z80.

Another advantage of memory-mapped I/O is ports can be read by PEEK statements and set by POKE statements. This means that their controlling software can be written in Basic with the exception of applications where speed is important.
D Stocqueler

Which WP?

I am a professional writer, with a high-speed two-finger typing ability. Unfortunately, the process generates a lot of garbage which means I spend a fortune in having copy retyped so as to have a clean presentation for editors and publishers. Obviously I'm a good candidate for a word processor. Could you recommend suitable equipment and estimate what it might cost me?

One essential requirement is that the printed copy is of a quality high enough to present to editors, etc.
Robin Clarke, Bishop's Castle, Shropshire

There are many microcomputer systems for which word-processing program/software is available. The critical feature in any word processing system is the printer, the cost of which depends on the quality of print and the facilities available for complex word-processing operations. Of the systems available, the following reflect the general cost: PET 4000 series with disk drive (32k only) £1525; Apple II standard system with disk £1623; TRS-80 Level II with expansion interface £1535; Sorcerer standard system (single disk) £1494;; to these costs, the cost of the software must be added. On systems which can use CP/M, ie, Apple II (with Softcard), TRS-80 and Sorcerer, the Wordstar system can be used at a cost of £255 plus the cost of the CP/M system itself.

Additionally, the Sorcerer has a word processing ROM PAC which, with a disk drive, would cost £145. The word processing software for the PET is Wordpro and costs £75. There is also a separate word processing system for the Apple at £42. Finally, the cost of the printer which may double the total system cost. These range from a simple dot-matrix printer, like the Epson TX-80B at £359.00, to a Spinwriter at £1500. Perhaps the best compromise in your situation would be a converted IBM Selectric typewriter at an average cost of £350. At least the print quality will be acceptable since it produces a typewriter style.
SW

'Brain help

As a SuperBrain owner, I would be grateful if you could help me with the following.

How do I create the contents of a file 'DATES. COM' such that, by switching on, inserting the disk, and typing 'DATES', the Basic program 'DATES. BAS' will be run?

I should be able to cope with assembler programming as I was a machine-code programmer for many years. The SuperBrain user's manual is no help at all. Can you please recommend a suitable book?
Barbara Sanders, London SW20

I contacted the CP/M user group, (which you should join: write to CP/M User Group, MML, 11 Sun Street, Finsbury Sq, London EC2M 22D) to ask them your question. They said that the routines in BIOS need changing and that although there is a method, they would not openly publish it. There is, however, a very simple solution to your problem — rename your version of Basic to 'GO' and then all you need to do is type GO DATES.

There are several suitable books which provide an introduction to machine-code programming. Since you don't say which language you require, I will give you several titles: *Z80 Assembly Language Programming* Lance A Leventhal, Osborne & Associates Inc. ISBN 0-9311988-21-7; *Programming the Z80*, Rodnay Zaks, Sybex Inc. ISBN 0-89588-013-X; *The Z80 Microcomputer Handbook*, William Barden Jr, Howard W. Sams. ISBN 0-672-21500-4; *Microprocessors and Microcomputers*, Barry G Woollard, Mc Graw-Hill ISBN 0-07-084640-5; *8080/Z80 Assembly Language*, Alan R Miller, John Wiley and Sons. ISBN 0-471 08124-8.
Ian Pardington and SW

AtomIC break

I own an Acorn Atom and I've expanded the memory to 12k, put in the floating point ROM and the VIA, and added a printer. When the memory grew beyond my Acorn PSU's abilities, I took out the regulator and heat sink according to Acorn's instructions. However, right in the middle of writing or running a program, or even when the machine is idling, all the keys lock, including the 'break' key, and I have to sit there tapping the key until the machine comes to life. One person suggested that an IC may not be in its socket properly and advised me to ease each one out and in again — no change, though. Can you help?
C Nelson, Harrow, Middlesex.

The symptoms you describe could be caused by a number of different faults. The least likely, and the easiest to test, is that the power supply regulator(s) are shutting down due to overwork. If this were the case you would lose any picture on the screen, and a voltmeter check would reveal zero output from the PSU. This seems quite unlikely in the circumstances but is worth getting out of the way.

The fact that the machine locks up could be caused by just about anything; but the fact that it will not restart when you hit 'break' narrows things down a little. First of all, test that the break key actually *does* reset the 6502. Do this by measuring the voltage on pin 40 of the CPU (IC 22). As you hit 'break' this should drop to zero. If it does then the fault is in the CPU, the ROM or the address or data lines (or possibly in the system RAM — the bottom 1k). The two most likely contenders are: a bad contact on the IC socket of CPU ROM or system RAM; or a short circuit in the address or data bus. For the former, remove the relevant four or five ICs, clean their pins with methylated spirit (using a cloth *not* made from artificial fibre) and replace them. You could also test the contact electrically (with the power off) by using a multimeter between each IC pin above board and the solder blob on the appropriate pin of the IC socket on the underside of the board. To test for the short circuit, use a multimeter (again with the power off), checking that none of the address or data lines that run close to each other, or close to other pins (anywhere on the board) actually touch. You can sometimes spot a fault of this nature by close visual inspection, and even if you can't see a short you can sometimes clear it by brushing the printed circuit board with an implement such as a (disused?) toothbrush. A drop of meths on the brush may assist matters here.

Finally it would be worth testing for an open circuit in an address or data line between CPU, ROM and RAM (though test for the short circuit *anywhere* on the board). To check the system RAM, simply replace the bottom 1k of RAM with RAM from elsewherein the machine.
D E Graham

Vic Galaxian

Please could you tell me how much the VIC-20 game 'Galaxian' costs and whether it comes as a tape, disk or plug-in cartridge?
Timothy Bowern, Heathfield, E Sussex.

As far as I can tell, 'Galaxian' is not available for the VIC-20, but a similar game, 'Avenger', is available as a ROM pack for £19.95.
Ron Geere, Editor, IPUG.

Corrupted Commodore

To provide the greatest number of systems for our students at the least cost, we have chosen the Commodore 4000 series computer. We have six of these linked to one 4000 series disk and an Anadex DP8000 printer, all linked via a Mupet system. We only went for this system because we were told that it

would fulfil our needs at a reasonably competitive price. However, we are having considerable trouble with: slow response because the system takes so long to print; system sometimes has to be switched off to get disks to work again; and files become corrupted when more than one person is processing a file.

Is there any solution to the problems?
David Lee, Enfield, Middlesex.

Yes, the solution is to go to the person who recommended the system and ask them to show you how to overcome the problems. Obviously, they know how to do it otherwise they wouldn't have recommended it, would they?

I am being a bit cruel, but there are many people around who are recommending equipment on hearsay only, and have no first-hand comparative experience of it. I had a very similar system at the last college I taught in, except that it was based on the Commodore 8000 series. I *do* think that the Mupet set-up provides a reasonable cheap system, but you do have to know how to get around its limitations. Answers to your problems are as follows:

1. Buy as much extra buffer store as the Anadex will hold, I think you can extend it to 3k. This is fairly cheap (say £5) and will probably eliminate the problem entirely. The average student program is unlikely to be much longer than 3k of source code, and it will only take one or two seconds to fill the buffer, hence releasing the system immediately.
2. This is probably because the students have not been told that an error condition locks up the system. Getting the offender to type 'CATALOG' is a simple way to release the system.
3. The problem here is that if the Mupet does not detect any activity for three seconds it will release the system for someone else to use. If your file is still open, all the next person's data will happily rush into your file. The solution is simple: whatever happens, don't let the system wait three seconds. The only place this is likely to happen is if you DOPEN the file, then wait for an INPUT or series of INPUTs before writing to the file. This is fatal. The easiest solution is to use direct access files (which are easy in Basic v4) and then open, write, close immediately.

```
200 DOPEN£10, "STOCK
    DATA",L126
210 RECORD£10, (N):
    PRINT£10,R$
220 DCLOSE£10
```

But, most important, you must explain to the students the reasons behind everything that you tell them; explain the dangers of failing to obey.

To conclude, I found the Mupet very reliable provided it is the *last* item to be switched on. It will easily support two printers and a host of other items. That is not to say that it is the system that I would consider best value for money — I would need a more detailed specification for its uses before I'd say that.
SW

Portable poser

I am looking for a small computer similar to the Sinclair ZX81, but fully portable with at least a two line-read-out built in and provision for connection to a TV and a printer.
N M Clements,

The machine that might almost have been designed for you would have been the NewBrain; but there are still (as of November 1981) none of these on the market. This leaves the Sharp PC1211 (and the Tandy equivalent) and the newly introduced Casio FX702P. Both of these are 'pocket computers', are battery operated, and have built-in displays, so they meet your requirement for portability. Neither of the displays provides more than one line, and this was also the one part of your specification not met by the NewBrain. However, both machines will scroll through lines, and more than one statement can be displayed at a time if the statements are short and you use multiple statement lines.

Both machines have compatible portable printers connect to a TV. Neither machine is fast in performing calculations, even by microcomputer standards. This is not really due to the use of interpreted Basic, but is essentially related to the type of components used to obtain the very small size and low power drain of these machines.

If you are used to normal Qwerty keyboards you will probably prefer the Sharp (or Tandy) as they use this standard layout. If you are daunted by the thought of learning this layout, then the Casio, with its alphabetic order layout, may suit you better.
P L McIlmoyle

Model III m/c code

At present I find I have two problems with the programming of a TRS-80 Model III.

The first involves the saving of machine code programs. As I don't have either a T-Bug or an editor-assembler tape, I have written my programs by POKEing in the code via a Basic program and run them using SYSTEM. But how can I save these on tape so that they can be loaded using SYSTEM?

The second involves programs listed in *PCW* and the like. They are invariably written to run on a specific machine. I am quite sure that the majority could be converted if only one knew the meaning of some of the more obscure commands encountered, such as VTAB, VLIN, HLIN and GET. What do the symbols printed as white character on a black background mean, to say nothing of the many codes involved with PEEK, POKE & CHR$?
H Muten, Crawsborough, E Sussex

1. The best idea to save your programs would be to save your money up and buy T-Bug (under £10 — I think).
2. If you want to know the codes used by PET, Apple etc, it would be a good idea to look up back issues of *PCW* that have, for example, a PET program with comments about the various symbols. Converting from one machine to another is, however, a lengthy and difficult process and, ideally, requires a good knowledge of both machines involved.
Stephen Bird, Oxfordshire Micro Club

PET measures up

I am attempting to measure irregular areas on a 32k PET. I have seen the Apple Versawriter Graphics Tablet which will perform this function. Do you know of an equivalent for the PET, preferably not requiring a disk system?
Dr T G Smith, Brunel University.

I am surprised that no one at the University can help you on this as it is a very simple matter. There are dozens of graphics tablets or 'bit-pads' on the market, and your choice will simply depend on such features that you require. For example: the physical size of the graphics area; the resolution that can be detected (ie 100 points per inch); the means for locating a point, which can be a simple pen or a magnifying cursor with several buttons; whether you need a power supply or not.

I have recently bought a model called the Summagraphics Bitpad from a company called TDS in the Midlands. A glance through *PCW* will give you a few more local suppliers. It is nearly double A4 size and has sufficient resolution (about .01 inch) for me to wonder why anyone would want any better. The cost was £600 including a power supply, I am very pleased with it indeed and it allows me to use the 'wondrous' graphics package called Jackson on the RML 380Z.

A point worth mentioning is that for the PET you must get a bit-pad that has an IEEE interface — virtually all will have one available as an option. Some suppliers can even supply some software to enable you to use it directly in Basic. On a system running under CP/M you will need to patch CP/M so that you attach it to the serial port (say) and read it via the OPEN£10, "RDR:" file channel. I have a simple one-statement POKE for the RML 380Z which I can give if required (SAE please).

So, to summarise, get one from a supplier who can also let you have some software for your PET.
SW

Word power failure

I have typed out (with the aid of a magnifying glass) Wordpower as listed in Sept *PCW* and tried to run it on my PET 8032. The author, Kevin Pretorius, states that it runs on a 3032 PET. The problem is that one gets '?Syntax error in 80'. This doesn't happen on a PET 2000 series so I assume that the statement at 80 DS=TS is the problem. What is the reason/cure?
C Monk, University College of Wales

I feel that Kevin Pretorious, and for that matter anyone who submits listings for *PCW*, should check that the program works on the manufacturer's latest models. If 2000 and 3000 series PET users can afford to upgrade to 4000 series then they should, as there are a host of extra features; plus the *essential* 'direct access file' capability. In a nutshell, the problem is that some two-letter variables contain reserved words and DS is a reserved variable (like TI) that holds the disk status. Change all occurrences of DS to something else. Any graphics used may also appear strange.
SW

Vic update

Could you please tell me when the VIC-40 will be available and how much will it cost approximately?
Chan Fai Yuan, Congleton, Cheshire.

It is anticipated that the VIC-40 will not appear on the market for about a year. No price has been fixed, but one can guess that it will not differ much from the VIC-20 price.
Ron Geere, Editor, IPUG.

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.

PACKAGES

DIRECT ACCESS

PCW's 'Packages' section is produced bi-monthly, alternating with our 'In Store' hardware guide. We have confined coverage to business packages which are available and supported at national level and which have been in use for at least six months in a minimum of five sites. Producers of packages which fall within these constraints should send details or updates to: **Dick Olney,** *PCW,* **14 Rathbone Place, London W1P 1DE.**

The layout has been designed to allow you to discover which packages are available for the application you have in mind and to show you which packages are available for your computer if you already have a machine. In either case the code enables you to look up the supplier's name and telephone number in the table below.

All details published are the latest made available — some may have changed since this issue went to press.

Code	Company	Telephone
A1	ACT/Petsoft	021-454 8585
A2	Arden Data Processing	0533 22255
B1	B + B Computer Ltd.	0204 26644
B2	Beam Business Centre	061-831-7292
B3	Benchmark Computer Systems	0726 61000
B4	Bristol Software Factory	0272 23430
B5	Byte Soft Systems Ltd	0533 531441
B6	Business Solutions Ltd	01-554-5985
C1	CAP-CPP Products Ltd.	01-404 0911
C2	Commodore	01-388 5702
C3	Compsoft	0483 39665
C4	Comput-a-crop	0507-604271
C5	Computastore Ltd.	061-832-4761
C6	Computech	01-794 0202
C7	Compass	Standish 426252
C8	CWP Computers	01-828 3127
C9	C4 Computer Services	0632-664313
D1	Data Bank	0509 217671
E1	Engineering Sciences	01-437-4894
G1	Graffcom Systems Ltd.	01-727 5561
G2	Grama (Winter) Ltd.	01-636 8210
G3	Great Northern	0532 589980
G4	Alan Greenhalgh Ltd	01-520-0218
G5	Grade One	Glossop 63819
H1	A.J. Harding	0424 220391
H2	Hartford Software	0606 76265
H3	H.B. Computers	0536 83922
H4	Wordcraft Systems	0332 760127
I1	Intereurope Software Design	0734 786644
I2	Intex Datalog Ltd	0642 781193
J1	T.V. Johnson	0276 20446
K2	Keen Computers	0602 412777
L1	Lifeboat Associates	01-836 9028
L2	Liveport (Exidy Sorcerer Firmware)	0736 798157
L3	Ludhouse (Computing) Ltd.	01-679 4321
M1	Micro Computer Applications Ltd.	0734 470425
M2	Microteck.	Orpington26803
M3	Microsys Ltd	051 426 7271
M4	Microsave	0272 737555
P1	Padmede Computer Services	0251 421892
P2	Personal Computers Ltd.	01-626 8121
R1	Rockliff	051-521 5830
S1	SMG Micro Computers	0474 55813
S2	The Softwarehouse	01-637 2108
S3	Stage One Software	0202 23570
S4	Systematics International	0440 61121
S5	Sumlock Bondain	01-250 0505
S6	Stemmos	01 602 6242
S7	Software Aids Int	01-204 9396
T1	Tridata Micros Ltd.	021 622 6085
T2	Templeman Software	0789 66237
T3	The Micro Solution	0608 3256
V1	Vlasak Electronics Ltd.	0494-448633
W1	Wisbech Computer Services	0945 64146
X1	Xetal	061 682 7555

Applications

Application	Machine	Price	Code
Appointments planner	PET/CBM	£100	S3
	Challenger	£25	C7
Assembler dev	PET/CBM	£50	L2
Bank accounts	Apple II	£10	D1
	PET/CBM	£100	S3
	PET/CBM	£10	D1
Bill of materials	CP/M	£850	B5
	Cromemco	£850	B5
	Superbrain	£450	T3
Bonds/pension quotations	PET/CBM	£100	S3
	PET/CBM	£100	S3
Budgeting package	Apple II	£125	P2
	Apple II	£125	T2
	CP/M	£95	B5
	Cromemco	£95	B5
	North Star Horizon	£95	B5
Bureau de change	PET/CBM	£8	H3
Cash flow	Apple II	£125	P2
	Apple II	£80	V1
	Apple II	£100	C8
	CP/M	£250	L3
	CP/M	£95	B5
	Cromemco	£95	B5
	North Star Horizon	£95	B5
	PET/CBM	£8	A1
Cash register	Apple II	£10	D1
	PET/CBM	£10	D1
Company secretary	CP/M	£450	C4
Contract costing	Apple II	£500	P1
	CP/M	£2000	L3
CP/M & utilities	Tandy Model II	£150	M1
Credit control	Apple II	£98	P2
	PET/CBM	£650	B4
Customer file	Famos	£1000	M2
Database management/Information retrieval	ACT800	£225	H4
	Apple II	£150	A2
	Apple II	£150	K2
	Apple II	£60-140	S2
	Apple II	£150	S5
	Apple II	£75	P2
	Apple II	£100	S4
	Apple II	£100	C8
	Apple II	£125	T2
	CP/M	£150-750	C4
	CP/M	£100	G3
	CP/M	£350	B3
	CP/M	£400	C3
	CP/M	£600	G5
	Famos	£1500	M2
	North Star Horizon	£250	B3
	PET/CBM	£250	C3
	PET/CBM	£325	A1
	PET/CBM	£225	H4
	PET/CBM	£75	B1
	PET/CBM	£50/150	C2
	PET/CBM	£150	J1
	PET/CBM	£150	G2
	PET/CBM	£45-250	S3
	Superbrain	£300	S6
	Tandy Model 1	£25-80	M1
	TRS-80	£60	S2
	TRS-80	£150	J1
	TRS-80	£32.50	H1
	8000 Series	POR	C2
Dental Records	Apple II	£395	M4
Disk operating system	PET/CBM	£150	B1
Double glazing costing	North Star Horizon	£750	W1
Estate agent	Apple II	£850	A2
	Apple II	£850	S5
	Apple II	£850	K2
	Apple II	£175	P2
	Apple II	£130	C8
	Apple II	£750	S4
	PET/CBM	£30	H3
	PET/CBM	£250	S3
	CP/M	£750	C4
	CP/M	£700	B5
	PCC 2000 Simpelec Triton 3	£350	B3
	MZ-80K	£195	W1
	PET/CBM	£25	A1
	Superbrain	£600	S6
Equipment lease/rent/HP	CP/M	£400	G1
File Handling	PET/CBM	£225	H4
Financial modelling	Apple II	£450	P2
	Apple II	£424-535	A1
	Apple II	£360	C8
	CP/M	£400	G1
	CP/M	£95	B5
	CP/M	£425-535	A1
	CP/M	£400	B6
	Cromemco	£95	B5
	North Star Horizon	£95	B5
	PET/CBM	£425-535	A1
Financial planning	Apple II	£250	S4
	Apple II	£125	A1
	CP/M	£125	A1
	PET/CBM	£125	A1
General ledger/NL	Apple II	£300	A2
	Apple II	£300	S5
	Apple II	£300	K2
	Apple II	£455	P2
	Apple II	£225	V1
	Apple II	£295	C6
	Apple II	£250P	S4
	Apple II	£600	T2
	CP/M	£500	L3
	CP/M	£375	L1
	CP/M	£500	C4
	CP/M	£400	G1
	CP/M	£400	M3
	CP/M	£400	B5
	CP/M	£275	S6
	CP/M	£275	S7
	CP/M	£350	B3
	CP/M	£300	W1
	CP/M	£425	B6
	Cromemco	£400	B5
	North Star Horizon	£250	B3
	North Star Horizon	£400	M3
	PCC 2000 North Star Horion	£400	B5
	PCC 2000 Simpelec Triton 3	£350	B2
	PET/CBM	£200	C2
	PET/CBM	£200	H3
	PET/CBM	POR	S3
	Sharp PC3201	£450	P2
	Superbrain	£400	M3
	Superbrain	£400	S6
	Tandy Model I	£90	M1
	Tandy Model II	£90	M1
	TRS-80	£225	H1
	TRS-80 I	£225/325	T1
	TRS-80 II	£425	T1
	Vector	£400	C5
	8080/Z80	£357	L1
	8080/Z80	£275	G3
Hotel management	Apple II	£525	M4
	CP/M	£525	M4
Incomplete records	Apple II	£250	S2
	Apple II	POR	K2
	Apple II	£425	P2
	Apple II	£450	P1
	CP/M	£750	M3
	CP/M	£250	B5
	CP/M	£975	B3
	CP/M	£750	W1
	Cromemco	£250	B5
	North Star Horizon	£750	M3
	North Star Horizon	£250	B5
	North Star Horizon	£975	B3
	PET/CBM	£750	S3
	Superbrain	£750	M3
	Tandy Model 1	£40	M1
	TRS-80	£40	H1
Industry Factory loading	Apple II	£360	X1
	CP/M	£360	X1
	PET/CBM	£300	X1
Industry work study	Apple II	£990	X1
	CP/M	£990	X1
	PET/CBM	£750	X1
Integrated accts	Altos (CP/M, MP/M)	£300	B1
	Apple II	£450	P1
	Apple II	£300	P2
	Apple II	£855	V1
	Apple II	£600	T2
	CP/M	£950	L1
	CP/M	£1500	C4
	CP/M	£1100	G1
	CP/M	£990	M3
	CP/M	£690	B5
	CP/M	£850	S7
	CP/M	£900	B5
	CP/M	£1450	B3
	CP/M	£1200	B6
	Cromemco	£690	B5
	Cromemco	£900	B5
	Famos	£2000	M2
	MZ-80K	£150	P2
	North Star Horizon	£950	B3
	North Star Horizon	£690	B5
	North Star Horizon	£900	B5
	PET/CBM	£300	B1
	PET/CBM	POR	S3
	North Star Horizon	£990	M3
	PET/CBM	(£50)	C2
	PET/CBM	£650	J1
	PET/CBM	£650	G2
	Superbrain	£990	M3
	Superbrain	£1200	S6
	Superbrain	£1000	T3
	Tandy Model I	£350	M1
	Tandy Model II	£350	M1
	TRS-80	£75	J1
	Vector	£1000	C5
	8000 Series	POR	C2
	8080/Z80	£950	L1
	8080/Z80	£995	G3
Investment portfolio	TRS-80	£20	S2
Invoicing	Apple II	£295	S2
	Apple II	£300	P1
	Apple II	£300	P2
	Apple II	£140	V1
	Apple II	£300	T2
	Challenger	£25	C7
	CP/M	£325	L1
	CP/M	£150-350	C4
	CP/M	£250	M3
	CP/M	£150	S7
	CP/M	£100	B5
	CP/M	£200	B3
	CP/M	£300	W1
	Cromemco	£100	B5
	North Star Horizon	£100	B3
	North Star Horizon	£250	M3
	North Star Horizon	£100	B5
	PET/CBM	£350	A1
	PET/CBM	£25-50	B1
	PET/CBM	POR	J1
	PET/CBM	POR	S3
	Superbrain	£250	M3
	Superbrain	£150	S6
	Tandy Model I	£90	M1
	Tandy Model II	£90	M1
	TRS-80	£25	H1
	TRS-80I	£75	T1
	TRS-80II	£125	T1

PACKAGES

Application	Machine	Price	Code
	8080/Z80	£325	L1
Job costing	Apple II	£300	P1
	Apple II	£990	X1
	CP/M	£700	C4
	CP/M	£350	M3
	CP/M	£990	X1
	North Star Horizon	£350	M3
	PET/CBM	£750	X1
	Superbrain	£350	M3
	Tandy Model I	POR	M1
	Tandy Model II	POR	M1
Job order control	8080/Z80	£275	G3
Legal precedents	CP/M	£1100	C4
Letter writer	Apple II	£80	V1
	CP/M	£150	M3
	North Star Horizon	£150	M3
	Superbrain	£150	M3
Lotteries	PET/CBM	£45	H2
Mailing List	Altos (CP/M. MP/M)	£75	B1
	Apple II	£300	A2
	Apple II	£50-150	S2
	Apple II	£300	S5
	Apple II	£300	K2
	Apple II	£40	P2
	Apple II	£50	D1
	Apple II	£100	S4
	CP/M	£50-150	C4
	CP/M	£250	G1
	North Star Horizon	£195	W1
	PET/CBM	£45	H2
	PET/CBM	£50	D1
	PET/CBM	£15	A1
	PET/CBM	£75	B1
	PET/CBM	£35	H3
	PET/CBM	£100	S3
	CBM/8032	£75/150	S1
	Superbrain	£140	C9
	Tandy Model I	£40	M1
	Tandy Model II	£75	M1
	TRS-80	£50-150	S2
	TRS-80	£25/38/55	H1
Mail shot	Apple II	£14	S2
	Apple II	£40	P2
	Apple II	£25	T2
	Challenger	£25	C7
	CP/M	£200-360	C4
	CP/M	£90	M3
	CP/M	£75	S7
	CP/M	£50/150	G5
	MCZ Zilog	£250	I1
	North Star Horizon	£90	M3
	PCC 2000 Simplec Triton 3	£450	B2
	PET/CBM	£125	S3
	Superbrain	£90	M3
	Tandy Model I	£75 +	G4
	Tandy Model II	£75	M1
	Tandy Model II	£75 +	G4
Membership accting	Apple II	£75	P2
	MCZ Zilog	£250	I1
	PET/CBM	£85	H2
Motor Dealer	Famos	£5000	M2
Order entry/invoicing	CP/M	£350	G1
Order processing	CP/M	£550	L1
	8080/Z80	£550	L1
Office admin	Apple II	£100	S4
Pad to plotter systems	Apple II	£250	P2
	Apple II	£180	C8
Payroll	Apple Ii	POR	A2
	Apple II	£200	S2
	Apple II	POR	S5
	Apple II	POR	K2
	Apple II	£200	P2
	Apple II	£375	V1
	Apple II	£375	C6
	Apple II	£10	D1
	Apple II	£250P	S4
	Apple II	£400	T2
	Challenger	£24	C7
	CP/M	£450	L3
	CP/M	£475	L1
	CP/M	£495	C4
	CP/M	£500	G1
	CP/M	£390	M3
	CP/M	£500	B5
	CP/M	£450	B3
	CP/M	£425	B6
	CP/M	Lease	W1
	Famos	£1500	M2
	North Star Horizon	£350	B3
	North Star Horizon	£390	M3
	North Star Horizon	Lease	W1
	PET/CBM	£200/350	C5
	PET/CBM	£200/25/195	A1
	PET/CBM	£50/195	I2
	PET/CBM	£10	D1
	PET/CBM	£150	G2
	PET/CBM	£150	J1
	PET/CBM	£150	C2
	PET/CBM	£10	H3
	Scorcerer	£250	L2
	Superbrain	£390	M3
	Superbrain	£400	S6
	Superbrain	£250 +	T3
	Tandy Model I	£249	M1
	TRS-80	£200	H1
	TRS-801	£218	T1
	TRS-8011	£375	T1
	8000 Series	£250	C2
	8080/Z80	£475	L1
	8080/Z80	£275	G3
	PET/CBM	£150	G2
	PET/CBM	£150	J1
	PET/CBM	£150	C2
	Sorcerer	£250	L2
	Tandy Model I	£249	M1
	TRS-80	£200	H1
	TRS-80I	£218	K1
	TRS-80I	£218	T1
	TRS-80II	£375	T1
	8000 Series	£250	C2
	8080/Z80	£475	L1
	8080/Z80	£275	G3
Perpetual Inventory	CP/M	£150	B5
	Cromemco	£150	B5
Personnel records	Apple II	£98	P2
	CP/M	£450	C4
	MCZ Zilog	£400	I1
	PET/CBM	£85	H2
Petaid report generator	PET/CBM	£125	S3
Petsoft programs	PET/CBM	£160	J1
Planning/Maintenance	CBM/8032	£595	S1
Postal advertising response package	Apple II	£350	S2
PR/advertising package	PET/CBM	£1000	S3
Price lister	PET/CBM	£12	H3
Printers job control	PET/CBM	£250	S3
Production analysis	Apple II	£75	P2
	CP/M	£700	C4
	PET/CBM	£300	B1
Prof appts groups	8080/Z80	£275	G3
Prof appts individ	8080/Z80	£220	G3
Prof client billing	8080/Z80	£330	G3
Programming aids	Apple II	£40	P2
Property management	CP/M	£450-1000	C4
	CP/M	£400	M3
	North Star Horizon	£400	M3
	Superbrain	£400	M3
Purchase ledger	Apple II	£300	A2
	Apple II	£300	S5
	Apple II	£300	K2
	Apple II	£295	C6
	Apple II	£300	P1
	Apple II	£300	P2
	Apple II	£315	V1
	Apple II	£250P	S4
	Apple II	£300	T2
	Challenger	£25	C7
	CP/M	£500	C4
	CP/M	£450	G1
	CP/M	£500	L3
	CP/M	£425	L1
	CP/M	£400	M3
	CP/M	£400	B5
	CP/M	£275	S7
	CP/M	350	B3
	CP/M	£300	W1
	CP/M	£425	B6
	Cromemco	£400	B5
	North Star Horizon	£250	B3
	North Star Horizon	£400	M3
	North Star Horizon	£400	B5
	Superbrain	£400	M3
	Superbrain	£300	S6
	PCC 2000 Simplec Triton 3	£350	B2
	PET/CBM	£300	B4
	PET/CBM	£95/120/350	A1
	PET/CBM	£200	C2
	PET/CBM	POR	J1
	PET/CBM	£350	H3
	PET/CBM	POR	S3
	CBM/8032	£395	S1
	Sharp PC3201	£300	P2
	Tandy Model I	£90	M1
	Tandy Model II	£90	M1
	TRS-80	£225	H1
	TRS-80I	£225	T1
	TRS-8011	£375	T1
	Vector	£400	C5
	8000 Series	£250	C2
	8080/Z80	£275	G3
	8080/Z80	£425	L1
Quotation estimating	Apple II	£300	P1
Sales ledger	Apple II	£300	A2
	Apple II	£300	S5
	Apple II	£300	K2
	Apple II	£295	C6
	Apple II	£300	P1
	Apple II	£300	P2
	Apple II	£315	V1
	Apple II	£250P	S4
	Apple II	£300	T2
	Challenger	£25	C7
	CP/M	£500	C4
	CP/M	£450	G1
	CP/M	£500	L3
	CP/M	£425	L1
	CP/M	£400	M3
	CP/M	£400	B5
	CP/M	£275	S7
	CP/M	£350	B3
	CP/M	£300	W1
	CP/M	£425	B6
	Cromemco	£400	B5
	North Star Horizon	£250	B3
	North Star Horizon	£400	M3
	North Star Horizon	£400	B5
	PCC 2000 Simplec Triton 3	£350	B2
	PET/CBM	£12/25/350	A1
	PET/CBM	£10	D1
	PET/CBM	£195	I2
	PET/CBM	£300	B4
	PET/CBM	£15	A2
	PET/CBM	£300	B1
	PET/CBM	£150	C2
	PET/CBM	£150	J1
	PET/CBM	£150	G2
	PET/CBM	£250	R1
	PET/CBM	£35/25	H3
	PET/CBM	£100/250	S3
	CBM/8032	£395	S1
	Sharp PC3201	£300	P2
	Superbrain	£900	M3
	Superbrain	£300	S6
	Superbrain	£450	T3
	Tandy Model I	£30-50	M1
	Tandy Model II	£300	M1
	TRS-80	£48	S2
	TRS-80	£200	H1
	TRS-80	£115	J1
	TRS-80I	£200	T1
	TRS-80II	£375	T1
	8080/Z80	£275	G3
	8080/Z80	£325	L1
TAP business system	PET/CBM	£125	H2
Text file librarian	Apple II	£125	S4
Time/cost recording	Apple II	£450	S2
	Apple II	£300	P1
Salesman	Apple II	£10	D1
	PET	£10	D1
S/L, P/L & stock control	Apple II	£900	P2
	Apple II	£1000	T2
	CP/M	£1000	L3
	CP/M	£900	B5
	Cromemco	£900	B5
	North Star Horizon	£900	B5
Solicitor's complete record accounting	Apple II	£3000	S2
Solicitor's package	CBM/8032	£750	S1
Statistics	Apple II	£150	G3
	Apple II	£100-195	P2
	Apple II	£140	C8
	TRS-80	£45	S2
Stock control/ recording	Altos (CP/M, MP/M)	£300	B1
	AppleII	POR	A2
	Apple II	POR	K2
	Apple II	POR	S5
	Apple II	£150	G3
	Apple II	£80	S2
	Apple II	£75/300	P2
	Apple II	£10	D1
	Apple II	£285	V1
	Apple II	£300	P1
	Apple II	£500	S4
	Challenger	£25	C7
	CP/M	£325	L1
	CP/M	£500-1500	C4
	CP/M	£350	G1
	CP/M	£900	M3
	CP/M	£700	B5
	CP/M	£550	B5
	CP/M	£550	B3
	CP/M	£300	W1
	Cromemco	£700	B5
	Famos	£1500	M2
	MZ-80K	£150	P2
	North Star Horizon	£450	B3
	North Star Horizon	£900	M3
	PCC 2000 Simplec Triton 3	£350	B2
	PET/CBM	£12/25/350	A1
	PET/CBM	£10	D1
	PET/CBM	£195	I2
	PET/CBM	£300	B4
	PET/CBM	£15	A2
	PET/CBM	£300	B1
	PET/CBM	£150	C2
	PET/CBM	£150	J1
	PET/CBM	£150	G2
	PET/CBM	£250	R1
	PET/CBM	£35/25	H3
	PET/CBM	£100/250	S3
	CBM/8032	£395	S1
	Sharp PC3201	£300	P2
	Superbrain	£900	M3
	Superbrain	£300	S6
	Superbrain	£450	T3
	Tandy Model I	£30-50	M1
	Tandy Model II	£300	M1
	TRS-80	£48	S2
	TRS-80	£200	H1
	TRS-80	£115	J1
	TRS-80I	£200	T1
	TRS-80II	£375	T1
	8080/Z80	£275	G3
	8080/Z80	£325	L1

PACKAGES

DIRECT ACCESS

Application	Machine	Price	Code
	CP/M	£400	G1
	CP/M	£200	M3
	CP/M	£350	B3
	North Star Horizon	£250	B3
	North Star Horizon	£200	M3
	North Star Horizon	£450	W1
	PCC 2000 Simpelec Triton 3	£350	B2
	PET/CBM	£300	B1
	PET/CBM	POR	S3
	Superbrain	£200	M3
	Tandy Model I	POR	M1
	Tandy Model II	POR	M1
Travel agency accts	Superbrain	£800	S6
	Tandy Model I	£225	G4
	Tandy Model II	£225	G4
Travel Agents Dairy	Tandy Model I	£100	G4
	Tandy Model Ii	£100	G4
Travel Ticket Sales	Tandy Model I	£225	G4
	Tandy Model II	£225	G4
Utilities	Apple II	£40	P2
	Apple II	£20	C6
	CP/M	£50	B5
	ITT 2020	£20	C6
Utility set	PET/CBM	£78	H3
Various engineering	Tektronix		E1
VAT	PET/CBM	£17.50	A1
VAT master	PET/CBM	£25	H3
VAT register	TRS-80	£15	H1
Vet package	CBM/8032	POR	S1
Video message	Apple	£200	G3
Warehousing	CBM/8032	POR	S1
Word processing	ACT 800	£375	H4
	Apple II	£60	S2
	Apple II	£75	K2
	Apple II	£75	S5
	Apple II	£75	A2
	Apple II	£150-300	P2
	Apple II	£75	J1
	Apple II	£120	V1
	Apple II	£40	D1
	Apple II	£180/95	S4
	Apple II	£30	C8
	Apple II	£500	T2
	CP/M	£150-260	C4
	CP/M	£400	G1
	CP/M	£250	M3
	CP/M	£250	B6
	Famos	£500	M2
	North Star Horizon	£250	M3
	PET	£85/65/40/20	H2
	PET/CBM	£40	D1
	PET/CBM	£375	H4
	PET/CBM	£25/325	A1
	PET/CBM	£325	C5
	PET/CBM	£75/150	C2
	PET/CBM	£75/150	J1
	PET/CBM	£75/150	G2
	PET/CBM	£35	H3
	PET/CBM	£120	S3
	Superbrain	£250	M3
	Tandy Model I	£50/75	M1
	Tandy Model II	£175-240	M1
	TRS-80	£30/60/90	S2
	TRS-80	£45/95	J1
	TRS-80	£15	H1
	Vector	£400	C5
	8000 Series	£250	C2
Work In Progress	CP/M	£850	B5

Machines

Machine	Application	Price	Code
ACT 800	Database management/	£225	H4
	Word processing	£375	H4
Altos (CP/M, MP/M)	Integrated accts	£300	B1
	Mailing list	£75	B1
	Stock control/recording	£300	B1
Apple II	Bank account	£10	D1
	Budgeting	£125	T2
	Cash flow	£80	V1
	Cash flow	£75	P2
	Cash flow	£100	C8
	Cash register	£10	D1
	Contract costing	£450	P1
	Database management/ information retrieval	£150	K2
	Database management/ information retrieval	£150	A2
	Database management/ information retrieval	£60-140	S2
	Database management/ information retrieval	£150	S5
	Database management/ information retrieval	£98	P2
	Database management/ information retrieval	£100	S4
	Database management	£75	P2
	Database management	£100	C8
	Database management	£125	T2
	Dental records	£395	M4
	Estate agent	£850	S5
	Estate agent	£850	A2
	Estate agent	£850	K2
	Estate agent	£750	S4
	Estate agent	£130	C8
	Financial modelling	£360	C8
	Financial modelling	£425-535	A1
	Financial planning	£250	S4
	Financial planning	£125	A1
	General ledger/NL	£300	K2
	General ledger/NL	£300	A2
	General ledger/N/L	£450	P2
	General ledger/NL	£300	S5
	General ledger/NL	£225	V1
	General Ledger/NL	£295	C6
	General Ledger/NL	£250P	S4
	General Ledger/NL	£600	T2
	Hotel management	£525	M4
	Incomplete records	POR	K2
	Incomplete records	£250	S2
	Incomplete records	£450	P1
	Incomplete records	£450	P2
	Industry factory loading	£360	X1
	Industry work study	£990	X1
	Integrated accts	£885	V1
	Integrated accts	£450	P1
	Integrated accts	£300	P2
	Integrated accts	£600	T2
	Invoicing	£295	S2
	Invoicing	£300	P2
	Invoicing	£140	V1
	Invoicing	£300	P1
	Invoicing	£300	T2
	Job costing	£450	S2
	Job costing	£990	X1
	Job costing	£300	P1
	Mailing list	£300	K2
	Mailing list	£300	A2
	Mailing list	£40	P2
	Mailing list	£50-150	S2
	Mailing list	£300	S5
	Mailing list	£50	D1
	Mailing list	£100	S4
	Mailing List	£25	T2
	Mail shot	£14	S2
	Mail shot	£225	P2
	Pad to plotter system	£250	P2
	Pad to plotter system	£180	C8
	Payroll	POR	S5
	Payroll	POR	K2
	Payroll	POR	A2
	Payroll	£200	S2
	Payroll	£375	V1
	Payroll	£200	P2
	Payroll	£375	C6
	Payroll	£10	D1
	Payroll	£250P	S4
	Payroll	£400	T2
	Personal records	£75	P2
	Postal advertising response package	£350	S2
	Production analysis	£75	P2
	Programming aids	£40	P2
	Purchase ledger	£300	K2
	Purchase ledger	£300	P2
	Purchase ledger	£300	A2
	Purchase ledger	£300	S5
	Purchase ledger	£315	V1
	Purchase ledger	£300	P1
	Purchase ledger	£295	C6
	Purchase ledger	£250P	S4
	Purchase ledger	£300	T2
	Quotation estimating	£300	P1
	Sales ledger	£300	A2
	Sales ledger	£300	K2
	Sales ledger	£300	S5
	Sales ledger	£300	P2
	Sales ledger	£315	V1
	Sales ledger	£300	P1
	Sales ledger	£295	C6
	Sales ledger	£250P	S4
	Sales ledger	£300	T2
	Salesman	£10	D1
	SL, PL stock control	£1000	T2
	Solicitor's complete record accounting	£3000	S2
	Statistics	£150	G3
	Statistics	£100/195	P2
	Statistics	£100-195	P2
	Statistics	£140	C8
	Stock control/recording	£150	G3
	Stock control/recording	POR	K2
	Stock control/recording	£300	P2
	Stock control/recording	POR	A2
	Stock control/recording	£80	S2
	Stock control/recording	POR	S5
	Stock control/recording	£285	V1
	Stock control/recording	£300	P1
	Stock control/recording	£10	D1
	Stock control/recording	£500	S4
	Text file librarian	£125	S4
	Time/cost recording	£450	S2
	Time/cost recording	£300	P1
	Utilities	£20	C6
	Video message	£200	G3
	Word processing	£75	K2
	Word processing	£75	A2
	Word processing	£60	S2
	Word processing	£300	P2
	Word processing	£75	S5
	Word processing	£120	V1
	Word processing	£40	D1
	Word processing	£75	J1
	Word processing	£180/95	S4
	Word processing	£30	C8
	Word processing	£500	T2
Challenger	Appointment Planner	£25	C7
	Invoicing	£25	C7
	Mail Shot	£25	C7
	Payroll	£25	C7
	Purchase Ledger	£25	C7
	Sales Ledger	£25	C7
	Stock Control	£25	C7
CP/M	Bill of materials	£500	B5
	Budgeting package	£95	B5
	Cash flow	£250	L3
	Cash flow	£95	B5
	Company secretary	£450	C4
	Contract costing	£2000	L3
	Database	£350	B3
	Database management/ information retrieval	£150-750	C4
	Database management/ information retrieval	£100	G3
	Database management/ information retrieval	£400	C3
	Database management/ information retrieval	£600	G5
	Equipment lease/rent/ HP	£400	G1
	Estate agents	£750	C4
	Estate agent	£700	B5
	Financial modelling	£400	G1
	Financial modelling	£95	B5
	Financial modelling	£425/535	A1
	Financial modelling	£400	B6
	Financial planning	£125	A1
	General ledger/NL	£500	L3
	General ledger/NL	£500	C4
	General ledger/NL	£400	G1
	General ledger/NL	£375	L1
	General ledger/NL	£200	B5
	General ledger/NL	£275	S7
	General ledger/NL	£400	M3
	General ledger/NL	£350	B3
	General ledger/NL	£300	W1
	General ledger/NL	£425	B6
	Hotel management	£525	M4
	Incomplete Records	£250	B5
	Incomplete Records	£750	M3
	Incomplete Records	£975	B3
	Incomplete Records	£750	W1
	Industry factory loading	£360	X1
	Industry work study	£990	X1
	Insurance brokers	£995	W1
	Integrated accts	£1500	C4
	Integrated accts	£1100	G1
	Integrated accts	£950	L1
	Integrated accts	£690	B5
	Integrated accts	£850	S7
	Integrated accts	£990	M3
	Integrated accts	£900	B5
	Integrated accts	£1450	B3
	Integrated accts	£1200	B6
	Invoicing	£325	L1
	Invoicing	£150-350	C4
	Invoicing	£150	S7
	Invoicing	£250	M3
	Invoicing	£100	B5
	Invoicing	£200	B3
	Invoicing	£300	W1
	Job costing	£700	C4
	Job costing	£990	X1
	Job costing	£350	M3
	Legal precedents	£1100	C4
	Letter Writer	£150	M3
	Mailing list	£50-150	C4
	Mailing list	£250	G1
	Mailing list	£75	S7
	Mail shot	£200-360	G4
	Mail shot	£90	M3
	Mail shot	£50/150	G5
	Order entry/invoicing	£350	G1
	Order processing	£550	L1
	Payroll	£450	L3
	Payroll	£495	C4
	Payroll	£500	G1
	Payroll	£475	L1
	Payroll	£500	B5
	Payroll	£390	M3
	Payroll	£450	B3
	Payroll	Lease	W1
	Payroll	£425	B6
	Perpetual Inventory	£150	B5
	Personnel records	£450	C4
	Production analysis	£700	C4
	Property management	£450-1000	C4
	Property management	£400	M3
	Purchase ledger	£500	L3
	Purchase ledger	£450	G1
	Purchase ledger	£425	L1
	Purchase ledger	£500	C4
	Purchase ledger	£200	B5
	Purchase ledger	£275	S7
	Purchase ledger	£400	M3
	Purchase ledger	£350	B3
	Purchase ledger	£300	W1
	Purchase ledger	£425	B6
	Sales ledger	£500	L3
	Sales ledger	£500	C4
	Sales ledger	£450	G1
	Sales ledger	£425	L1
	Sales ledger	£200	B5
	Sales ledger	£275	S7
	Sales ledger	£400	M3
	Sales ledger	£350	B3
	Sales ledger	£300	W1
	Sales ledger	£425	B6
	S/L, P/L + stock control	£1000	L3
	S/L, P/L + stock control	£900	B5
	Stock control/recording	£325	L1
	Stock control/recording	£500-1500	C4
	Stock control/recording	£350	G1
	Stock control/recording	£500	B5
	Stock control/recording	£900	M3
	Stock control	£550	B3
	Stock Control	£300	W1
	Time/cost recording	£400	G1
	Time/cost recording	£200	M3
	Time ledger	£350	B3
	Utilities	£50	B5
	Word processing	£400	G1

THE SHARP MZ-80K HAS GOT IT ALL

STOP PRESS... NOW AVAILABLE
BASIC COMPILER
PASCAL (CASSETTE BASED)
DOUBLE PRECISION DISC BASIC
FDOS INCLUDES EDITOR AND Z-80 ASSEMBLER



Since its introduction the Sharp MZ-80K has proved to be one of the most successful and versatile microcomputer systems around.

Sharp now have a comprehensive range of products ready to make the powerful MZ-80K with its Printer and Disc Drives even more adaptable.

Products include:- Universal Interface Card, Machine Language and Z-80 Assembler packages, CP/M* plus a comprehensive range of software.

You'll find all the help and advice you need about the MZ-80K at your Specialist Sharp Dealer in the list below.

*Trade mark of Digital Research Ltd.

If there is no dealer in your area, or if you require any further information write to:- Computer Division, Sharp Electronics (UK) Ltd., Sharp House, Thorp Road, Newton Heath, Manchester M10 9BE.

SHARP

First, and foremost

AVON
BCG Computer Systems Ltd.,
Bristol. Tel: 0272 425338
Decimal Business M/Cs Ltd.,
Bristol. Tel: 0272 294591
Target Electronics,
Bristol. Tel: 0272 421196
BERKSHIRE
Computer 100,
Bray. Tel: 0628 35619
Newbear Computing Store Ltd.,
Newbury. Tel: 0635 30505
BIRMINGHAM
Camden Electronics,
Small Heath. Tel: 021 773 8240
Electronic Business Systems Ltd.,
Birmingham. Tel: 021 384 2513
Jax Rest Ltd.,
Birmingham. Tel: 021 350 4555
Newbear Computing Store Ltd.,
Birmingham B26.
Tel: 021 707 7170
BUCKINGHAMSHIRE
Curry's Microsystems,
High Wycombe. Tel: 0494 40262
Interface Components Ltd.,
Amersham. Tel: 02403 22307
CAMBRIDGE
The Avery Computing Co Ltd.,
Bar Hill. Tel: 0954 80991
CHESHIRE
Bellard Electronics Ltd.,
Chester. Tel: 0244 380123
Charlesworth of Crewe Ltd.,
Crewe. Tel: 0270 56342
Chandos Products,
New Mills. Tel: New Mills 44344
CR Technical Services,
Chester. Tel: 0244 317549
Fletcher Worthington Ltd.,
Hale. Tel: 061 928 8928

Holdene Limited,
Wilmslow. Tel: 0625 529586
Newbear Computing Store Ltd.,
Stockport. Tel: 061 491 2290
Ors Group Ltd.,
Warrington. Tel: 0925 67411
Sumlock Software,
Warrington. Tel: 0925 574593
CLEVELAND
Hunting Computer Services Ltd.,
Stockton-on-Tees. Tel: 0642 769709
Intex Datalog Ltd.,
Stockton-on-Tees. Tel: 0642 781193
DERBYSHIRE
Malison Electronics Ltd.,
Derby. Tel: 0332 38066
DEVON
Plymouth Computers,
Plymouth. Tel: 0752 23042
DURHAM
Neecos (DP) Ltd.,
Darlington. Tel: 0325 69540
ESSEX
Prorole Ltd.,
Westcliff-on-Sea. Tel: 0702 335298
Wilding Office Equipment,
Ilford. Tel: 01 514 1525
GLOUCESTERSHIRE
Gloucestershire Shop Equipment Ltd.,
Gloucester. Tel: 0452 36012
The Computer Shack,
Cheltenham. Tel: 0242 584343
HAMPSHIRE
Advanced Business Concepts,
New Milton. Tel: 0425 618181
Xitan Systems Ltd.,
Southampton. Tel: 0703 38740
HEREFORD
Market Logic Ltd.,
Little Dewchurch. Tel: 0432 70279

HUMBERSIDE
Commercial Systems Ltd.,
Hull. Tel: 0482 20022
Silicon Chip Centre,
Grimsby. Tel: 0472 45353
KENT
Technolink Europa Ltd.,
Tunbridge Wells. Tel: 0892 32116
Video Services (Bromley) Ltd.,
Bromley. Tel: 01 460 8833
LANCASHIRE
Nelson Computer Services,
Rawtenstall. Tel: 0706 229125
Sumita Electronics Ltd.,
Preston. Tel: 0772 51686
LEICESTERSHIRE
Gilbert Computers,
Lubenham. Tel: 0858 65894
G.W. Cowling Ltd.,
Leicester. Tel: 0533 553232
Leicester Computing Centre,
Leicester. Tel: 0533 556268
Mays Hi-Fi,
Leicester. Tel: 0533 22212
LINCOLNSHIRE
Howes Elect & Autom. Servs.,
Lincoln. Tel: 0522 32379
Z.R. Business Consultants,
Lincoln. Tel: 0522 31621
LONDON
Bridgewater Accounting,
Whetstone. Tel: 01 446 0320
Butel-Comco Ltd.,
Hendon. Tel: 01 202 0262
Central Calculators Ltd.,
London EC2. Tel: 01 729 5588
Deans,
London W8. Tel: 01 937 7896
Digital Design and Development,
London W1. Tel: 01 387 7388
Euro-Calc Ltd.,
London EC2. Tel: 01 729 4555

Henry's Radio Ltd.,
London W2. Tel: 01402 6822
Lion Computing Shops Ltd.,
London W1. Tel: 01 637 1601
Scope Ltd.,
London EC2. Tel: 01 729 3035
Sumlock Bondain Ltd.,
London EC1. Tel: 01 253 2447
MANCHESTER
The Byte Shop,
Manchester M1. Tel: 061 236 4737
Electrovalue,
Manchester. Tel: 061 432 4945
Sumlock Electronic Services Ltd.,
Manchester M3. Tel: 061 834 4233
MERSEYSIDE
Microdigital Ltd.,
Liverpool. Tel: 051 227 2535
NORFOLK
Sumlock Bondain (East Anglia)
Norwich. Tel: 0603 26259
NORTHAMPTONSHIRE
Computer Supermarket,
Corby. Tel: 05366 62571
HB Computers,
Kettering. Tel: 0536 520910
NORTHERN IRELAND
Bromac (UK),
Co. Antrim. Tel: 023831 3394
O & M Systems,
Belfast. Tel: 0232 49440
NOTTINGHAMSHIRE
Almarc Business Systems Ltd.,
Nottingham. Tel: 0602 62251
Mansfield Business M/C Ltd.,
Mansfield. Tel: 0623 26610
OXFORDSHIRE
Oxford Computer Centre,
Oxford. Tel: 0865 45172
REPUBLIC OF IRELAND
O'Connor Computers Ltd.,
Galway. Tel: 0009 61173

Sharptext,
Dublin 2. Tel: 0001 764511
Tomorrows World Ltd.,
Dublin 2. Tel: 0001 776861
SCOTLAND
A & G Knight,
Aberdeen. Tel: 0224 630526
Business and Electronics M/Cs,
Edinburgh. Tel: 031 226 5454.
Micro Centre,
Edinburgh. Tel: 031 556 7354
Micro Change,
Glasgow. Tel: 041 554 1462
Microforth,
Dunfermline. Tel: 0383 32071
Moray Instruments Ltd.,
Elgin. Tel: 0343 3747
Pointer Business Equipment Ltd.,
Glasgow. Tel: 041 332 3621
SOMERSET
Norset Office Supplies Ltd.,
Cheddar. Tel: 0934 742184
SUFFOLK
C.J.R. Microtek Co. Ltd.,
Ipswich. Tel: 0473 50152
SURREY
3D Computers,
Surbiton. Tel: 01 337 4317
Croydon Micro,
Carshalton. Tel: 01 643 4290
Datalect,
Croydon. Tel: 01 680 3581
Datalect,
Woking. Tel: 04862 25995
Microlines Ltd.,
Kingston. Tel: 01 546 9944
R.M.B. Ltd.,
Croydon. Tel: 01 684 1134
Saradan Electronic Services,
Wallington. Tel: 01 669 9483

SUSSEX
Crown Business Centre,
Eastbourne. Tel: 0323 639983
Gamer,
Brighton. Tel: 0273 698424
M & H Office Equipment
Brighton. Tel: 0273 697231
WALES
Limrose Electronics Ltd.,
Wrexham. Tel: 097 883 5555
Morriston Computer Centre,
Swansea. Tel: 0792 795817
Sigma Systems Ltd.,
Cardiff. Tel: 0222 21515
Welsh Computer Centre,
Bridgend. Tel: 0656 58481
WARWICKSHIRE
Business & Leisure Microcomputers,
Kenilworth. Tel: 0926 512127
WILTSHIRE
Everyman Computers,
Westbury. Tel: 0373 823764
YORKSHIRE
Bits & P.C.'s
Wetherby. Tel: 0937 63744
Datron Micro-Centre Ltd.,
Sheffield. Tel: 0742 585490
Huddersfield Computer Centre,
Huddersfield. Tel: 0484 20774
Leeds Computer Centre,
Leeds. Tel: 0532 458877
Omega Systems Ltd.,
Leeds. Tel: 0532 704499
Ram Computer Services Ltd.,
Bradford. Tel: 0274 391166
Superior Systems Ltd.,
Sheffield. Tel: 0742 755005

Also at selected Lasky's and Wildings Office Equipment Branches.

PACKAGES

DIRECT ACCESS

Machine	Application	Price	Code
	Word processing	£150-260	C4
	Word processing	£250	M3
	Word processing	£250	B6
	Work in progress	£850	B5
Famos	Customer file	£1000	M2
	Data base	£1500	M2
	Integrated accts	£2000	M2
	Motor dealer	£5000	M2
	Payroll	£1500	M2
	Stock control	£1500	M2
	Word processing	£500	M2
MCZ Zilog	Mail shot	£250	I1
	Membership accting	£250	I1
	Personnel records	£400	I1
MZ-80K	Estate agent	£195	W1
	Integrated accounts	£150	P2
	Stock control/recording	£150	P2
North Star Horizon	Budgeting package	£95	B5
	Cash flow	£95	B5
	Database management/ information retrieval	£250	B3
	Double glazing costing	£750	W1
	Estate agent	£750	B5
	Financial modelling	£95	B5
	General ledger/NL	£250	B3
	General ledger/NL	£400	M3
	General ledger/NL	£400	B5
	Incomplete records	£750	M3
	Incomplete records	£250	B5
	Incomplete records	£975	B3
	Integrated accts	£950	B3
	Integrated accts	£990	M3
	Integrated accts	£690	B5
	Integrated accts	£900	B5
	Invoicing	£100	B3
	Invoicing	£250	M3
	Invoicing	£100	B5
	Job costing	£350	M3
	Letter writer	£150	M3
	Miling List	£195	W1
	Mail shot	£90	M3
	Payroll	£350	B3
	Payroll	£390	M3
	Payroll	Lease	W1
	Property Management	£400	M3
	Purchase ledger	£250	B3
	Purchase ledger	£400	M3
	Purchase ledger	£400	B5
	Sales ledger	£250	B3
	Sales ledger	£400	M3
	Sales ledger	£400	B5
	SL, PL + stock control	£900	B5
	Stock control/recording	£450	B3
	Stock control/recordng	£900	M3
	Time/cost recording	£250	B3
	Time/cost recording	£200	M3
	Time/cost recording	£450	W1
	Word processing	£250	M3
PCC 2000 Simpelec Triton 3	Estate Agent	£350	B2
	General ledger/NL	£350	B2
	Mail Shot	£450	B2
	Purchase ledger	£350	B2
	Sales ledger	£350	B2
	Stock control/recording	£350	B2
	Time/cost recording	£350	B2
PET/CBM	Appointment planner	£100	S3
	Assembler dev	£50	C2
	Bank account	£10	D1
	Bank acounts	£100	S3
	Bonds/pension quotations	£100	S3
	Bureau de change	£8	H3
	Cash flow	£8	A1
	Cash register	£10	D1
	Credit control	£650	B4
	Database management/ information retrieval	£75	B1
	Database management/ information retrieval	£50/150	C2
	Database management/ information retrieval	£150	G2
	Database management/ information retrieval	£150	J1
	Database management/ information retrieval	POR	C1
	Database management/ information retrieval	£325	A1
	Database management/ information retrieval	£225	H4
	Database management/ information retrieval	£250	C3
	Database management/ information retrieval	£45-250	S3
	Disk operating system	£150	B1
	Estate agent	£25	A1
	Estate agent	£30	H3
	Estate agent	£250	S3
	File handling	£225	H4
	Financial modelling	£425-535	A1
	Financial planning	£125	A1
	General ledger/NL	£200	C2
	General ledger/NL	£1000	C1
	General ledger/NL	£200	H3
	General ledger/NL	POR	S3
	Incomplete records	£750	S3
	Industry factory loading	£300	X1
	Industry work study	£750	X1
	Integrated accts	£300	B1
	Integrated accts	£(50)	C2
	Integrated accts	£650	G2
	Integrated accts	£650	J1
	Integrated accts	POR	S3
	Invoicing	POR	J1
	Invoicing	£25-50	B1
	Invoicing	£350	A1
	Invoicing	£400	C1
	Invoicing	POR	S3
	Job costing	£750	X1
	Lotteries	£45	H2
	Mailing list	£75	B1
	Mailing list	£15	A1
	Mailing list	£50	D1
	Mailing list	£45	H2
	Mailing list	£35	H3
	Mailing list	£100	S3
	Mail shot	£125	S3
	Membership accting	£85	H2
	Payroll	£150	G2
	Payroll	£150	J1
	Payroll	£150	C2
	Payroll	£50/195	
		195	I2
	Payroll	£10	D1
	Payroll	£50/25/ 195	A1
	Payroll	POR	C1
	Payroll	£200/350	C5
	Payroll	£10	H3
	Personnel recors	£85	H2
	Petsoft programs	£160	J1
	PR/advertising package	£1000	S3
	Printers job control	£250	S3
	Prise lister	£12	H3
	Production analysis	£300	B1
	Purchase ledger	£200	C2
	Purchase ledger	POR	J1
	Purchase ledger	£95/120	
		350	A1
	Purchase ledger	£1000	C1
	Purchase ledger	£300	B4
	Purchase ledger	£350	H3
	Purchase ledger	POR	S3
	Sales ledger	POR	J1
	Sales ledger	£200	J1
	Sales ledger	£300	B4
	Sales ledger	£800	C1
	Sales ledger	£95/350	A1
	Sales ledger	£350	H3
	Sales ledger	POR	S3
	Salesman	£10	D1
	Stock control/recording	£150	C2
	Stock control/recording	£300	B1
	Stock control/recording	£150	G2
	Stock control/recording	£150	J1
	Stock control/recording	£195	I2
	Stock control/recording	£10	D1
	Stock control/recording	£12/25/ 350	A1
	Stock control/recording	£15	A2
	Stock control/recording	£300	B4
	Stock control/recording	£35/25	H3
	Stock control/recording	£100/250	S3
	TAP business system	£125	H2
	Time/cost recording	£300	B1
	Time/cost recording	POR	S3
	Utility set	£78	H3
	VAT	£17.50	A1
	VAT master	£25	H3
	Word processing	£75/150	J1
	Word processing	£75/150	G2
	Word processing	£75/150	C2
	Word processing	£40	D1
	Word processing	£85/65	
		£40/20	H2
	Word processing	£375	H4
	Word processing	£25/325	A1
	Word processing	£325	C5
	Word processing	£35	H3
	Word processing	£120	S3
PET/ Computhink	Stock control/recording	£250	R1
CBM/8032	Mailing list	£75/150	S1
	Planning maintenance	£595	S1
	Purchase ledger	£395	S1
	Sales ledger	£395	S1
	Solicitor's package	£750	S1
	Stock control/recording	£395	S1
	Vet package	POR	S1
	Warehousing	POR	S1
Sharp PC-3201	General ledger	£450	P2
	Sales ledger	£300	P2
	Purchase ledger	£300	P2
	Stock control	£300	P2
Sorcerer	Payroll	£250	L2
Superbrain	Bill of materials	£450	T3
	Database	£300	S6
	Estate agent	£800	S6
	General ledger	£400	M3
	General ledger	£400	S6
	Incomplete Records	£750	M3
	Integrated Accts	£1200	S6
	Integrated Accts	£990	M3
	Integrated accts	£1000	T3
	Invoicing	£250	M3
	Invoicing	£150	S6
	Job costing	£350	M3
	Letter writer	£150	M3
	Mailing list	£140	C9
	Mail shot	£90	M3
	Payroll	£400	S6
	Payroll	£390	M3
	Payroll	£250+	T3
	Property management	£400	M3
	Purchase ledger	£300	S6
	Purchase ledger	£400	M3
	Sales ledger	£300	S6
	Sales ledger	£400	M3
	Stock control	£300	S6
	Stock control	£900	M3
	Stock control	£450	T3
	Time recording	£200	M3
	Word processing	£250	M3
	Travel agency accts	£800	S6
Tandy Model I	Database management/ information retrieval	£25-80	M1
	General ledger/NL	£90	M1
	Incomplete records	£40	M1
	Integrated accts	£350	M1
	Invoicing	£90	M1
	Job costing	POR	M1
	Mailing list	£40	M1
	Mail shot	£75+	G4
	Payroll	£249	M1
	Purchase ledger	£90	M1
	Sales ledger	£90	M1
	Stock control/recording	£30-50	M1
	Travel Agency Accts	£225	G4
	Travel Agents Dairy	£100	G4
	Travel Ticket Sales	£225	G4
	Time/cost recording	POR	M1
	Word processing	£50/75	M1
Tandy Model II	General ledger/NL	£90	M1
	Integrated accts	£350	M1
	Invoicing	£90	M1
	Job costing	POR	M1
	Mailing list	£75	M1
	Mail shot	£75	M1
	Mail shot	£75+	G4
	Purchase ledger	£90	M1
	Sales ledger	£90	M1
	Stock control/recording	£300	M1
	Time/cost recording	POR	M1
	Travel Agency Accts	£225	G4
	Travel Agency Diary	£100	G4
	Travel Ticket Sales	£225	G4
	Word processing	£175-240	M1
Tektronix	Various engineering Packages		E1
TRS-80	Database management/ information retrieval	£60	S2
	Database management/ information retrieval	£32.50	H1
	Database management/ information retrieval	£150	J1
	General ledger/NL	£225	H1
	Incomplete records	£40	H1
	Integrated accts	£75	J1
	Investment portfolio	£20	S2
	Invoicing	£25	H1
	Mailing list	£25/38/ 55	H1
	Mailing list	£50-150	S2
	Payroll	£200	H1
	Purchase ledger	£225	H1
	Sales ledger	£225	H1
	Statistics	£45	S2
	Stock control/recording	£200	H1
	Stock control/recording	£48	S2
	Stock control/recording	£115	J1
	VAT register	£15	H1
	Word processing	£45/95	J1
	Word processing	£15	H1
	Word processing	£30/60/ 90	S2
TRS-80I	General ledger/NL	£225/325	T1
	Invoicing	£75	T1
	Payroll	£218	T1
	Purchase ledger	£225	T1
	Sales ledger	£225	T1
	Stock control/recording	£200	T1
TRS-80II	General ledger/NL	£425	T1
	Invoicing	£125	T1
	Payroll	£375	T1
	Purchase ledger	£375	T1
	Sales ledger	£375	T1
	Stock control/recording	£375	T1
Vector	General ledger/NL	£400	C5
	Integrated accts	£1000	C5
	Purchase ledger	£400	C5
	Sales ledger	£400	C5
	Word processing	£40	C5
8000 Series	Database management/ information retrieval	POR	C2
	Integrated accts	POR	C2
	Payroll	£250	C2
	Purchase ledger	£250	C2
	Sales ledger	£250	C2
	Word processing	£250	C2
8080/Z80	General ledger/NL	£275	G3
	General ledger/NL	£375	L1
	Integrated accts	£950	L1
	Integrated accts	£995	G3
	Invoicing	£325	L1
	Job order control	£257	G3
	Order processing	£550	L1
	Payroll	£475	L1
	Payroll	£275	G3
	Prof appts groups	£275	G3
	Prof appts individ	£220	G3
	Prof client billing	£330	G3
	Purchase ledger	£425	L1
	Purchase ledger	£275	G3
	Sales ledger	£275	G3
	Sales ledger	£425	L1
	Stock control/recording	£325	L1
	Stock control/recording	£275	G3

DIRECT ACCESS

USER GROUPS INDEX

Here's a complete listing of all the clubs and user groups of which we're aware. The next full listing will be published in July, with updates appearing in the meantime. Send your alterations/ updates to: User Groups Index, PCW, 14 Rathbone Place, London W1P 1DE.

INTERNATIONAL

Apple Users' Group Europe.
President: K Giese, Hackstucker
11, D-4320 Hattingen 15, West Germany.
Tel 02324 52240.

Central Program Exchange. Full membership (£25 Europe, £40 overseas) provides 30 free programs pa. Small user service (£10 Europe, £20 overseas) provides 10 free programs pa. Contact: Mrs Judith Brown,The Polytechnic, Wulfruma St, Wolverhampton WV1 1LY.

Comp 80 User Group. Monthly newsletter. Annual subscription £6.50 UK, £8.00 overseas. Contact: Philip Probetts, 50 Cromwell Road, Wimbledon, London SW19 8LZ.

GP/M. IRL. Irish CP/M Users' Group. Meets monthly in Dublin area, membership IR £5 pa. Newsletter: CP/M.MAG. Contact: Doug Notley, Gardner House, Ballsbridge, Dublin 4. Tel: 01-686411.

DENSPET: group specifically for exchange or original programs for MTU 200x320 dot matrix hi-res PET add-on. Send sample of your work or £2.50 ($2.50) & receive sample in return plus newsletter sub & lists of available programs. Contact: DENSPET, Rock House, Ballycroy, Westport, Co Mayo, Eire.

DA Inamic: European DAI personal computer users' club. Has over 500 members, publishes a bi-monthly newsletter with most articles in English. Contact: DA Inamic, Heide 98, 3171 Westmeerbeek, Belgium.

European Sorcerer Club. For sample newsletter contact Colin Morle at 32 Watchyard Lane, Formby, Nr Liverpool L37 3JU. Annual sub UK £5, Overseas £12.00.

Group/380. Recently established for information interchange on microsystems equivalent to IBM 360/370 main frames, newsletter, access to a computerised database listing relevant software. Annual sub: $10 for individuals, $25 for organisations. Contact: Mokurai Cherlin, PO Box 111, Mokurai Cherlin, PO Box 1131, Mount Shasta. CA96067. USA.

International Sharp User Group. 1400 members in 31 countries £3 sub includes MZ-80K Internaional Sharp User Group. 1400 members in 31 countries £3 sub includes MZ-80K Space Invaders cassette and newsletters. Contact: Graham Knight, 108 Rosemount Place, Aberdeen. Tel: 0224 630526.

Irish ZX80/81 Users' Club, the first club in Ireland. Open for all owners of Sinclairs. For info send two 22p stamps (six counties 40p). Users Club, c/o M Cronsten, 73, Cnoc Crionain, Baile Atha, Cliath 1.

Ithaca Intersystems and S100 Bus Users' Club. Formed to 'organise the construction and design of software and hardware based on Ithaca or other S100 systems.' Contact: George Brooke, Sebastian Baverstrasse 20c, 8000 Munich 83, W Germany.

KAOS — the official 6502 Users' Group of Australia. Has a range of projects within special interest groups: hardware, software, amatuer radio, Pascal, education, Publishes monthly newsletter. Contact: Mr Ian Eyles, 10 Forbes St, Essondon, Victoria, Australia 3040.

Microcomputer Users' Club. Recently establishd for program writing and exchange, emphasis on 6502/Z80 users. Contact: c/o Synthetronics Microcomputers PO Box 151, 1322 Hoevik Norway.

Pascal Z User Group (Europe) Affiliated with Pascal Z USA. 12 user disks available plus newsletter. Contact: George Brooke, Sebattian Bauerstrasse 20c, 8000 Munich 83, West Germany.

Post Sharp: International exchange and contact club on the Sharp MZ-80K. Has over 100 members. Contact: Mr Daniel Joly, 207, Rue sur les Thiers, B-4400 Herstal, Belgium.
Powertran Users' Club. Annual subscription £6.50 UK membership, £8.00 for members abroad, which includes a monthly newsletter. Contact Philip Probetts, 50 Cromwell Road, Wimbledon, London SW19 8LZ.
Tel: 01-540 3713.

Powertran Users' Club. Annual sub. £6.50 UK, £8.00 overseas which includes monthly newsletter. Contact: Philip Probetts, 50 Cromwell Road, Wimbledon, London SW19 8LZ. Tel: 01-540 3713.

Tangerine Users' Group (International), recently formed for users of the Microtan 65, the TUG will act as a central information clearing house, including exchange of programs, etc. Annual membership £5.00. Details from TUG at 16 Iddesleigh Rd, Charminster, Bournemouth, Dorset BH3 7JR.

USCD System User Society. Existing special interest groups include industrial application, word processing, real time, business applications and forward planning. UK contact: John Ash, Dicoll Data Systems Ltd, Bond Close, Kingsland Estate, Basingstoke, Hants RG24 0QB.

ZX80/81 Users' Club. Low cost software. Technical support, newsletter. Subscription £6.00 UK, £10.00 overseas. Contact: D Blagen, PO Box 159, Kingston-Upon-Thames, Surrey KT2 5UQ (sae for further information).

NATIONAL

6502 Users' Club. Holds regular meetings and welcomes new members. Contact: Walter Wallenborn,21 Argyll Avenue, Luton, Beds or Joe Manifold, 16 Bunyan Close, Pirton, Hitchin, Herts.

80 UK — User group for all TRS-80 owners, including VG/Colour/Level 1. Bi-monthly magazine. Write for details to: N Rushton (ref 80 UK), 123, Roughwood Drive, Northwood, Kirkby, Merseyside L33 9UG.

9900 Users'Group. Contact: Chris Cadogan, Dept. Computer Science, University of Manchester, Manchester M13 9PL.
11s Users' Group. A sort of help service only. No meetings, no newsletter. Contact: Pete Harris, 119 Carpenter Way, Potters Bar, Herts, EN6 5QB. Tel: 0707 52091 or 01-248 8000 ext 7065.

11's User Group. A sort of help service only. No meetings, no newsletter. Contact: Pete Harris, 119 Carpenter Way, Potters Bar, Herts EN6 5QB. Tel: (0707) 52091 or 01-248 8000 ext 7065.

77/68 Users' Group. Quarterly Newsletter. Free membership for 1st year if you buy the 77/68 instruction manual, £1.50 thereafter. Contact: Newbury Computing Store, 40 Bartholomew St, Newbury, Berkshire.

Amateur Computer Club. National organisation with seminars, local group meetings. Bi-monthly newsletter 'ACCUMU LATOR'. 6800, Z-80, and 2650 libraries. Founded 1972. Fee £4.50 sae Jim McDonald, 1 Carlton Court, Studley Grange Road, London, W7 2LU.

Amateur Computer Club, 2650 Library. 2650 related data and technical assistance only. No meetings, no newsletter. Contact: Roger A Munt, 51 Beechwood Drive, Feniscowles, Blackburn, Lancs. BB2 5AT.
Tel: (0254) 22341.

Apple Music Synthesis Group. Interested in ALF, Mountain Hardware, Alpha Syntauri and Soundchaser systems. Contact: Dr David Ellis, 22 Lennox Gardens, London SW1 enclosing an SAE.

Atom User Group. Quarterly newsletter, software library, technical help when possible. Some local groups. Membership £4.00 pa including newsletter. Contact: Richard Meredith, Sheerwater, Yealm View Road, Newton Ferrers, S Devon, PL18 1AN.

BEEBUG — BBC Micro Independent National User Group. Regular magazine with programs feature in each issue, hardware tips, software library, advice clinic and reviews. Membership £4.50 (6 months) £8.50 (full year) all inclusive. SAE for further details. Contact: Sheridan Williams/D E Graham, 35 St. Julian's Road, St. Albans, Herts AL1 2AZ.

British Apple Systems User Group For Apple II and ITT 2020 users. Meets 1st Tues eve & 3rd Sun afternoons monthly at The Old School, Branch Rd, Park St, St. Albans (on A5 about 2 miles south of city centre). Contact: John Sharp, Garston. Tel: (09273) 75093; or David Bolton, Park Street. Tel:(0727) 72917.

Commodore Pet Users' Group publishes a monthly magazine — the official voice of Commodore. For membership details contact: Margaret Gulliford. Tel: (Slouth) 74111.

Compucolor II User Group (UK). Quarterly newsletter: Hardware and software advice: Program library and exchange; links with other CCII national groups. Contact: Bill Donkin, 19 Harwood Avenue, Bromley, Kent. Tel: 01-460 2626 (evenings).
Compukit User Club. Details, contact: P. Crabb Esq., 21 Jones Close, Yatton, Avon. Tel: (0934) 834808.

Compukit User Club. Details contact S H Grisvenor Esq., 11 Bernard Rd, Oldbury, Warley, West Midlands. Tel: 021-422 3298.

Compukit User Club. Contact: P Crabb, 21 Jones Close, Yatton, Avon.
Tel: (0934) 834808.

Cosmac Users' Club (proposed). For people using the RCA 1802, Cosmac ELF, ELFII, Super ELF etc. Those interested contact James Cunningham at 7 Harrowden Court, Harrowden Road, Luton LU2 0SR (enclosed sae, please).

CP/M Users' Group (UK). Annual sub £6.00. S/ware library, newsletters, meetings, 'help' service. Contact: 11 Sun Street, Finsbury Square, London EC2M 2PS. Tel: 01-247 0691.

Educational Users' Group for TRS-80 & Video Genie. Offshoot of Nat TRS-80 UG, other TRS-80/Vid Genie users welcome. Contact: D J Fatcher, Head Teacher Beaconsfield First & Middle School, Beaconsfield Rd, Southall, Middx.

EZUG: Educational ZX80/1 Users' Group. Annual sub £2.50 (UK), £3.00 (rest of Europe), £6/$12 elsewhere Bi-monthly newsletter Large SAE for sample newsletter (UK & Eire only). Contact: Eric Deeson, Highgate School, Balsall Heath Rd, Highgate, Birmingham B12 9DS.

FX500-P Users' Association. for Casio FX501-P & FX502-P users to communicate with each other and to work together. SAE to Max Francis, 38 Grymsdyke, Gt. Missenden, Bucks HP16 0LP.

The Home Computing Special Interest Group of British Mensa Ltd. Six eight-page newsletters per annum, subscription £2.00. Circulation is restricted to Mensa members. Details may be obtained from Gordon Grant, Flat 3, 63, Cleveland Rd, Crumpsall, Manchester M8 6GT. Please send sae.

Independent PET Users' Group. Contact: IPUG, 57 Clough Hall Rd, Kidsgrove, Stoke-on-Trent. Staffs.

Ithaca Audio S-100 bus UK User Group. Contact: Dave Weaver, 16 Etive Place, Bumbernauld, Glasgow G67 4JE.
Tel: (02867) 36570.

Mk 14 Club. Bi-monthly magazine called 'Complement and Add'. Contact: Geoff Phillips, 8 Podsford Rd, London NW9 6HP.

MUSE is an organisation for co-ordinating activity in schools and colleges. Meetings are held regionally and nationally. Full details from Muse, Freepost, Bromsgrove, Worcs B61 0JT.

National Acorn Atom User Group. Publishes monthly program magazine. For free copy and club details send large SAE (15½p) to Alan Carr, 105 Fairhole Avenue, Gidea Park, Romford, Essex.

National Personal Computer Users Association. Cassette/SAEs supplied for continuous program exchange. ALL PERSONAL COMPUTERS. Subscriptions £12.00 (£15.00 overseas) with computer details to NPUCA 11 Spratling Street, Manston, Ramsgate, Kent.

National RML User Group, c/o RML Ltd., PO Box 75, Oxford.

National TRS-80 Users' Group. Activities include a computerised bulletin board service (see 'Network News'). Contact: Brian Pain, National TRS-80 UG, 40A High Street, Stony Stratford, Milton Keynes. Tel: (0908) 566660 (office) 564271 (home).

National T158/9 Club: bi-monthly newsletter, program exchange etc. Annual sub £5.50 or, if you include a program with your cheque then it's £3.50. Contact: R M Murphy, Dept. of Electronic Engineering, University College Swansea, S. Wales.

National ZX80 and ZX81 Users' Club. Publishes monthly magazine *Interface*. For free copy and club details send a large SAE (15½p) to 44-46 Earls Court Road, London W8 6EJ.

Ohio Scientific UK User Group. Independent of OSI, an important role will be the disentangling of poor documentation. There will be regular newsletters and membership is at present £5.00 per year. The group will initially be concerned with the practical aspects and applications of OSI systems — rather than with games. Contact: Tom Graves, 19a West End, Somerset, BA16 0LQ.

Sharp MZ-80k User Group. Contact: Joe LP Seet, 16 Elmhurst Drive, Hornchurch, Essex RM11 1PE. Tel: 04024 42905.

Sharp MZ-80K User Group (and shortly PC3201/00 and 80B) £3.00 per annum for three newsletters. Send cheque/POs tips, articles and sales to Mr R Erdine, 271 Meadow Rd, Sheffield S8 7UN.

Sharp MZ-80 Users Club. Free membership: Extensive library and facilities. Details on meetings & Newsletters (SAE please) from: Paul Chappell, Computer Centre, Yeovil College, Yeovil, Somerset. BA21 4AE.

Sharp PC-1211 Users' Club for all PC-1211/TRS-80 Pocket Computer users. Membership of £5.00 p.a. includes newsletter containing programs etc. Contact: Johnathan Dakeyne, 281 Lidgett Lane, Leeds LS17 6PD.

TI 99/4 Users' Group — TIHOME offers access to a software library and sends out a monthly newsletter. Contact: P M Dicks, 157 Bishopsford Road, Morden, Surrey.

Transducer. The club for those interested in robotics, micro's and micro hardware. Send 25p to D Stockqueler 66 Waterloo Rd, Penylan, Cardiff for sample newsletter and details.

Tangerine Users' Group (TUG), 16 Iddesleigh Rd, Charminstre, Bournemouth, Dorset BH3 7JR. Tel: (0202) 294393.

TRS-80 Level 1 User Group. Software library and quality newsletter (write for details and free copy). £5.00 p.a. N Rushton (LIUG), 123 Roughwood Drive, Northwood, Kirkby, Merseyside L33 9UG.

TRS-80 Medical & Laboratory Users Newsletter. Free quarterly newsletter detailing interests, programs & applications. Send SAE & details of interests to: Dr N Robinson, The Residency, Northwick Park Hospital, Harrow, Middx.

UK Apple Users' Group. Contact: (Keen Computers) 5 The Poultry, Nottingham.
Tel: 0602 583254/5/6.

UK101/Superboard User Group (Computer User Aids). Newsletter, software library and technical service. Membership £4.60 inc VAT per 6 months — £5.00 overseas. Apply to Adrian Waters, 9 Moss Lane, Romford, Essex Tel: (Romford) 64954.

UK Intel MDS Users' Group. Contact: Lewis Hard, Space Intelligence, The Old Coach House, Court Row, Upton-Upon-Severn, Worcestershire WR8 0NS.

UK Pilot Users' Group — SAE for fact sheet on Pilot versions available Common Pilot Reference Manual £5.00. Contact: Alec Wood, Wirral Grammar School for boys, Cross Lane, Bebington, Wirral, Merseyside L63 8AQ.

USUS (UK) — British arm of the UCSD p-system Users Society. An international organisation created to promote the UCSD p-system (which includes Apple Pascal) and other machine independant software systems. Contact: Malcolm Harper, PRG, 45 Banbury Road, Oxford OX2.

ZX80/81 National Software Association. Annual sub £6.00, incs cassette of software. Bi-monthly newsletter, software available on cassette. Send SAE for details. Contact: 15 Woodlands Rd, Wombourne, Staffs WV5 0JZ.

REGIONAL

ACC (Merseyside 380Z Users Group). Contact: Alan Pope, Paal Enterprise, 37 Stuart Road, Crosby, Liverpool L23 0QE.

Anglia Computer User Group. Contact: Jan Rejzl, 128 Templemere, Sprowston Road, Norwich NR3 4EQ.

Central Scotland Computer Club. Meets the first and third Thursdays each month in Falkirk College of Technology, Grangemouth Road, Falkirk. Secretary, J Lyon, 78 Slamannan Road, Falkirk, FK1 5NF.
Tel: 22430.

USER GROUPS INDEX

DIRECT ACCESS

Computer Education Society of Ireland. A voluntary organisation that consists of a national body and an expanding number of local branches. Their brief is to monitor computer education in Ireland. *National CESI* (£3.00 p.a.). Contact: Dairmuid McCarthy, 7 St Kevin's Park,

East Anglian Computer Users' Group. Meets: Crane Community Centre, Telegraph Lane East, Norwich. Contact: Gill Rijzl, 88 St Benedict's Street, Norwich NR2 4AB. Tel: (0603) 29652.

Grampian Amateur Computer Society. Meets 2nd Monday every month. New pemises are in Thistle Lane, Aberdeen. Contact: Alan Hird, 20 Harcourt Road, Aberdeen. Tel: (90224) 33102.

IPUG South East. Meet 7.30 3rd and 4th Thursday. Charles Darwin School, Jail Lane, Biggin Hill. Bi-monthly newsletter. Contact: M Ryan, 164 Chesterfield Drive, Sevenoaks. Tel: (0732) 53530.

MACC (Midlands Amateur Computer Club) meets every Friday evening 7.00 p.m. onwards — no sub, no magazine. Contact: John or Roy Diamond. Tel: Coventry (0203) 454061.

Manchester Computer Club (formerly the Amateur Computer Club (Northwest Group). Meets 1st and 3rd Thursdays monthly at St Peter's Chaplaincy, Precinct Centre, Oxford Road, Manchester. Contact: David Wade, 28 Hazel Road, Altrincham, Cheshire WA14 1JL. Tel: 061-941 2486.

Merseyside Nascom Users' Group. Now independent, with 150 members. Meets 1st Monday monthly, 7.30 p.m. at Mona Hotel, James Street, Liverpool. Contact: T Searle, 14 Hawkeshead Close, Maghull, Liverpool L31 9BT.

Merseyside TRS-80/Video Genie Users' Group. Contact: Peter Tootill, 101 Swanside Road, Liverpool L14 7NL. Tel: 051-220 9733.

Merseyside Microcomputer Group. Special interest groups: PET, Apple, 380Z, SC/MP, Education (Mr M Trotter, tel: 051-652 1596). Contact: Fred Shaw, 14 Albany Avenue, Eccleson Park, Prescott, Merseyside L34 2QW. Tel: 051-426 5436.

Kilmacud, Blackrock, Co. Dublin. *Cork branch* (£1.00 extra) — Michael Moynihan, Colaiste an Spioraid Naomh, Bishopstown, Cork. *Dublin branch* (£1.50 extra) — Jim Walsh, CBS Naas, Co Kildare. *Limerick branch* (£1.00 extra) — Sr Lourda Keane, Convent FCJ, Laurel Hill, Limerick. *Waterford branch* (£1.00 extra) — Mr Hugh Dobbs, Newtown School, Waterford. *Kilkenny branch* (£1 extra) — Sr Helen Lenehan, Presentation Secondary School, Kilkenny.

Northeast PETs. Contact: Jim Cocallis, 20 Worcester Road, Newton Hall Estate, Durham. They meet the 2nd Monday of each month for software tuition and the 3rd Monday for hardware tuition (both in addition to normal activities). They start at 7.00 p.m. and meet in the PET Lab, Newcastle Polytechnic, Ellison Building, Newcastle upon Tyne.

North-East RML 380Z Users' Group. Meets monthly at Micro-Electronics Education Centre, The Polytechnic, Newcastle upon Tyne. Contact: M Hatfield or R Reed, Computer Unit, Northumberland Building, The Polytechnic, Newcastle-upon-Tyne NE1 8ST. Tel: 26002 ext. 268 office hours.

Northwest Computer Club. Fortnightly meetings 25p attendance fee. No subscriptions. Contact: John Lightfoot, 135 Ashton Drive, Frodsham, Warrington, Cheshire WA6 7PU. Tel: (0928) 31519.

Pennine & District Computer Club. Open at both 26 and 51 Mill Hey, Haworth, W. Yorks. each Saturday and Sunday 10 a.m. to 10 p.m. Systems books, magazines, members' shop. Contact: club at weekends on Haworth 43007 or chairman, Douglas Bryant, on Bradford 569660.

A PET group is being formed on the Sussex/Surrey border, presently centred on Crawley & Horsham. Aims to meet monthly and produce a monthly newsletter. Contact: Richard Dyer, 33 Parham Road, Ilfield, Crawley RH11 0ET.

Scottish Amateur Computer Society. Meetings 1st Wednesdays monthly, Claremont Hotel, Claremont Crescent, Edinburgh from 7.30 onwards. Meetings include talks and demonstrations. Contact: P Lindsay, (Top Right Flat), 1, Lower Gilmore Place, Edinburgh. Tel: 031-229 6841.

Scottish TRS-80 Users' Group. Meetings on 2nd Thursdays monthly at 7.30 p.m., normally in the Mansion House Hotel, West Milton Road. Software library and monthly newsletter. Contact: Dick Mackie on 031-229 6032 or at 3 Warrender Park Crescent, Edinburgh EH9 1DX.

Southern Users of PETs Association, free membership, meet first Wednesday each month. £1.50 for monthly newsletter. Contact 42 Compton Road, Brighton BN1 5AN.

Surrey Microprocessor Society. (SUMPS) Coventry Surrey plus bits of South London and other adjacent countries. Anyone interested in joining, call Mike on 01-642 8362.

Thames Valley Nascom User Group. Newsletter to be published for novice and expert alike. Regular meetings in Slough/Staines/Windsor planned and we need support! Interested? Contact: Mike Rothery, 37 Eton Wick Road, Windsor, Berks, and enclose SAE. Tel: Windsor 56106.

TRS-80 — North West Group, (for 6 issues). Meetings last Wednesday monthly (not December). Contact: Melvyn D Franklin, 40 Cowlees, Westhoughton, Bolton BL5 3EG. Tel: (0942) 812843.

West Sussex — Rustington, Littlehampton. Is anyone interested in starting a computer club in this area? Contact: Chris Evans, 115 Worthing Road, Rustington, W Sussex. Tel: Rustington 74998.

Wirral Microcomputer Users' Group. Meets at Mons at Birkenhead Technical College. Contact: J Phillips, 14 Helton Close, Nocturum, Birkenhead, Merseyside L43 9HP. Tel: 051-652 0268.

380Z User Group Northern Home Counties: inc Herts, Cambs, Oxon. Contact: Sheridan Williams, 35 St Julian's Road, St Albans, Herts AL1 2AZ.

6502 User's Club (Southern Region). Welcomes all 6502 Users — Acorn, Aim, Apple, Atari, Atom, Kim, Microtan, PET, SYM, Superboard, UK101, etc. Regular Newsletter. Contact: Steve Cole, 70 Sydney Road, Gosport, Hants.

COUNTY

Would anyone interested in setting up an Apple Users' Group in the Bucks/Berks area contact: Steve Proffitt. Tel:01-759 5511 ext 7298 day, or Marlow 73074 evenings or weekends.

Cornish Radio Amateur Club — Computer section meets on the second Monday of every month at the SWEB Social clubroom, Pool, Redruth. New members welcome. Contact: Bob Reason, 24 Mitchell Road, Camborne, Cornwall TR14 7JH.

South East Essex Computer Society, holds monthly informal computer evenings plus lectures. Open to anyone over 14. Contact: R Knight at Southend-on-Sea. Tel: 218456.

Gwent Amateur Computer Club. Covering the Gwent and Cardiff areas, the club has its own computer room and technical library. Meetings are held once a week on Wednesdays at 10 Park Place, Newport. Contact: Ian Hazell. Tel: (0633) 277711 office hours.

N Herts area CBM/PET/VIC Users' Group. Regular meetings, talks, affiliated to IPUG. Contact: P Mortiboy, 2 Spurr's Close, Hitchin, Herts SG4 9OE. Tel: Hitchin (0462) 54435.

West Herts 80 User Group. Membership not restricted to Herts residents — many members are also in National TRS-80 User Group. Meetings fortnightly at St Stephens Parish Centre, Station Road, Bricket Wood, North of Watford. Contact: Terry Bradbury, 20 Spruce Way, St Albans. Tel: Park Street 73633. Or Reg Smith, 24 Sempill Road, Hemel Hempstead. Tel: Hemel Hempstead 60085.

Mid Kent TRS-80 User Group. Users and potential users of TRS-80 and Video Genie welcome. Meetings fortnightly at Kent Micro Services, 53 High Street, Maidstone, Kent. Contact: Mike Mariott also John Rayfield, 22 Beaconsfield Road, Sittingbourne, Kent.

North Kent Amateur Computer Club. Meetings first Thursday of each month, usually in Biggin Hill. New members and visitors always welcome. Contact: Barry Biddles (sec). Tel: Biggin Hill 71742.

North Lancs User Group. Contact: John Robinson, 12 Harold Avenue, Blackpool, Lancashire.

PET Users' in West Lancashire. Meetings on the third Thursday of each month at Arnold School, Blackpool. Contact: David W Jowett, 197 Victoria Road East, Thornton, Blackpool FY5 3ST. Tel: Cleveleys 869108.

The Leicestershire Personal Computer Club. Meetings held the 2nd Monday in each month, at Leicester University and Loughborough University alternately. They start 7 p.m. Membership is £2.00 p.a. £1.00 for under 16s. Contact: Ms Jill Olorenshaw (Club Secretary) c/o Arden Data Processing, Minicipal Buildings, Charles Street, Leicester. Tel: (0533) 22255. Or Mr Dick Foden (Club Chairman) at 11 Gaddesby Lane, Rearsby, Leicester.

Lincolnshire Microprocessor Society. Various meeting places. For up-to-date information contact: Hon. Sec. Mr Eric Booth, Senior Common Room, Bishop Grosseteste College, Newport, Lincoln.

LPRINT is the newsletter of the East Midlands TRS-80/VG User Group. For a FREE sample copy send large SAE to: Mike Costello, 17 Langbank Avenue, Rise Park, Nottingham NG5 5BH.

MACRO (Medway Amateur Computer & Robotics Organisation). Meets monthly, sub £3.00. Contact: Ms Christine Webster, 13 Ladywood Road, Cuxton, Rochester, Kent. Tel: (0634) 78517.

Merseyside Microcomputer Group. Several sub-groups including: 380Z Users Group (Alan Pope on 051-924 2470): Computer Education Society (Mr M Trotter on 051-652 1596): SC/MP Special Interest Group (Bob Perrigo on 051-677 6716): PET Special Interest Group: 6800 and 77/68 Special Interest Group: Apple Special Interest Group: The secretary is John Stout of the Dept. of Architecture, Liverpool Polytechnic, 53 Victoria Street, Liverpool L1 6EY. Tel: 051-416 5536.

ACC (Merseyside 380Z and BBC Atom Users Group). Contact: Alan Pope, Paal Enterprise, 37 Stuart Road, Crosby, Liverpool L23 0QE.

Manchester area TRS-80 Users' Group. Contact: Francis Glenister, 13 Pridmouth Road, Withington, Manchester M20 9GN. Tel: 061-445 7191.

West Midlands Amateur CC. meet 2nd and 4th Tuesdays each month at Elmfield School, Love Lane, Stourbridge. Further details contact: John Tracey, 100 Booth Close, Brierley Hill, West Mid. Tel: (0384) 70097.

West Midlands RML User Group, c/o BECC, The Bordesley Centre, Camp Hill, Stratford Road, Birmingham B11 1AR.

NE RML 380Z Users' Group. Meets monthly at MEC, Newcastle-upon-Tyne Polytechnic, Coach Lane Campus. Contact: M Hatfield or R Reed. Tel: 26002 ext 268 (office hours).

Oxford Microcomputer Club. £5.00 p.a. Contact: S C Bird, 139 The Moors, Kidlington, Oxford OX5 2AF. Tel: Kidlington (08675) 6703.

South Shropshire: Ludlow & Dist Microcomputer Club. Meets 7.30 p.m. 2nd Monday monthly at Diocesan Education Centre, Lower Galdeford, Ludlow. Contact: David Pauli, 32 High Street, Leintwardine, Craven Arms, Shropshire. Tel: 05473 287.

Amateur Computer Club of North Staffordshire. Call or write to Mr M Turner (chairman) ACCNS, 542 Lightwood Road, Lightwood, Stoke-on-Trent ST3 7EH. Tel: (0782) 324639 evenings.

Suffolk Microcomputer Club. Meets monthly, produces newsletter, sub £5.00 p.a. Contact: Mr S Pratt, c/o Microtek, 15 Lower Brook Street, Ipswich, Suffolk IP4 1AQ. Tel: (0473) 50152.

Anyone interested in forming a Suffolk Computer Users' Club should contact Ian on Ipswich 831353 evenings/weekends.

Thames Valley Amateur Computer Club. Meetings 1st Tuesdays monthly. From November on at the Southcote, Southcote Lane off the Bath Road, Reading, Berks. Start 7.00 p.m. Contact: Brian Quarm (Camberley 22186) or Brian Steer (Slough 20034).

South Yorkshire Personal Computing Group. Meets 7.30 p.m., second Wednesday each month. St George's Building, Mappin Street, Sheffield. Visitors always welcome. Contact: Paul Sanderson, 8 Vernon Road, Totley Sheffield. Tel: (0742) 351895.

West Yorkshire Microcomputer Group. Formed following an inaugural meeting on October 23rd, a varied diary of events has been drawn up. For details contact: The Chairman, Philip Clarke, Care Computers Services, 15 Wellington Street, Leeds LS1 4DL. Tel: (0532) 450667. Or the Secretary, Keith Knaggs, Price Waterhouse & Co., Leeds Tel: (0532) 448741.

TOWNS

Aylesbury ZX Computer Club. Regular meetings at Aylesbury College 1st Tuesday monthly 7.30 p.m. – 9.30 p.m. Contact: D P Nowotnik (secretary). Tel: Aylesbury 630867.

Ashfield Computer Club. Meets 1st and 3rd Thursdays each month at Carsic Junior School, membership £3.00 p.a. Contact: Deric Ellerby. Tel: (0380) 75376. Or Derrick Daines. Tel: (0380) 56198.

BAUD (Bristol Apple Users and Dabblers). Contact: Geoff Smythe, Datalink Microcomputer Systems Ltd., 10 Waring House, Redcliffe Hill, Bristol BS1 6TB. Tel: (0272) 213427.

Bedford Amateur Computer Club. Recently started, no further details as yet. Contact: Mr R Bird, 7a High Street, Great Barford, Bedford MK44 3LB. Tel: (0234) 870763.

Bournemouth Area Computer Club. Meets monthly at the Kinson Community Centre. Contact: Peter Hills, 54 Runnymede Avenue, Bournemouth, Dorset BH11 9SE. Tel: Northbourne 6547.

Bristol Computing Club. £4.00 p.a. Meetings 3rd Wednesday monthly. Contact: Leo Wallis, 6 Kilbirnie Road, Bristol BS14 0HY. Tel: Bristol 832453.

Brunel Computer Club. Meets alternate Wednesdays, 1900 – 2200 hours at St Werburgh's Community Centre. Contact: Mr R Sampson, 4 The Coots, Stockwood.

Brunel Technical College Computing Club. The Club divides into two sections — the "skilled" and the "not skilled". They share alternate Wednesdays at the College. Contact: S W Rabona at 18 Castle Road, Worle, Weston-Super-Mare, Avon BS22 9JW. Tel: (0934) 513068.

Birmingham Computer Club. To be formed shortly, catering for all micro users. Fortnightly meetings planned but venue not yet fixed. Contact: Dr M Bayliss. Tel: 021-743 7197.

Brighton, Hove & District Computer Club. First meeting held on Friday 31st October. We are interested in corresponding with other societies, exchanging software and attracting new members. Many existing members have access to hardware. Contact: Rod Phillippe at Hobbyist, 3 The Broadway, Southwick, Brighton BN4 4ND.

Cambridge Microcomputer Club. Meets 3rd Wednesday monthly at Portland Arms, Cambridge. Contact: Duncan Mackay, 4 High Street, Waterbeach. Tel: 63137 (day).

Cheltenham Amateur Computer Club. Meetings 4th Wednesday monthly. 7.30 p.m. start. Contact: Mr M Pullin, 45 Merestone Drive, The Park, Cheltenham GL50 2SU. Tel: (Cheltenham) 25617.

Anyone interested in forming a computer club in Cornwall, catering mainly for PET, ZX80 and UK 101 computers should contact: M F Grove, 35 Causeway Head, Penzance, Cornwall.

A Crawley computer club has recently been formed, open to anyone interested in personal computing, with or without computing facilities. Contact: Mr J Fieldhouse, 18 Seaford Road, Broadfield, Crawley, West Sussex. Tel: Crawley 542509. Or, Mr J M Clarke, 31 Hyde Heath Court, Pound Hill, Crawley, West Sussex. Tel: Crawley 884207.

Crewe Computer Users' Group. Meetings monthly (Thursdays) at Crewe Library. Details of meetings in local press. Contact: Bram Knight. Tel: Nantwich 623375.

Croydon micro/small computer group. Contact: Vernon Gifford, 111 Selhurst Road, London SE25 6LH.

The Colchester Microprocessor Group. Meetings held at the University of Essex on the second and fourth Wednesdays of each month — 7.30 p.m. start. Membership is open to all, on payment of £5.00 annual sub (£1.00 for full-time students). Contact: The Information Centre at the University on the evening of the meeting.

TRS80 User Group (Chelmsford). Now part of the National TRS80 User Club. Contact: Michael Dean, 22 Roughtons, Galleywood, Chelmsford, Essex.

Computer Club. Business & Word Processor section meets Fridays 7.30 p.m.; Scientific & Recreational Saturdays 10.00 a.m. Contact: L Boxell, 8 Vane Terrace, Darlington. Tel: (0325) 67766.

Dalton-In-Furness Computer Club. Recently formed. Contact: A H Gay, 24 Rusland Crescent, Ulverston, Cumbria LA12 9LX. Tel: (0229) 52854.

Derby & District Branch of IPUG meets monthly in Derby. For details contact: Raymond Davies, 105 Normanton Road, Derby DE1 2GG. Tel: 41025 (day) 514016 (evening).

Derby Microcomputer Society. Meets fortnightly at Derby Lonsdale College, Uttoxeter Road, Derby. Contact: Mike Riordan, 172 Blagreaves Lane, Littleover, Derby. Tel: (0332) 769440.

DIRECT ACCESS

USER GROUPS INDEX

Exeter & District Amateur Computer Club. General meetings 2nd Tuesday monthly, specialist meetings 3rd or 4th Tuesday. £7.50 adults p.a. Contact: Ian Hodgson, 21 Dean Street, Exeter EX2 4HH.
Tel: Exeter 50812.

Folkestone needs a computer club. I am willing to start one but I need some help. Please write or call any evening. Contact: Ray Milton, 94 Linden Crescent, Folkestone, Kent.

Grimsby Computer Club. Meets fortnightly on Mondays at 7.30 p.m. Contact: Jenson Lee, 29 Park View, Cleethorpes. Tel: 32559.

Glasgow area ZX80/81 User Group, presently being formed. Main aim is to promote computer literacy. Will eventually include BBC Micro. Contact: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW. Tel: 041-638 1241.

Glossop (Derbyshire) — is anyone interested in forming a computer club in this area? If so, please contact: Neil Jenkinson.
Tel: (Glossop) 66027.

Harpenden Microcomputer Group. Informal meetings are held on alternative Monday evenings. Contact: David James, 5 Ox Lane, Harpenden, Herts AL5 4HH.
Tel: (05827) 5366 (evenings).

Harrow Computer Group meets on alternative Wednesdays at 7 p.m. in room G43 of Harrow College of Higher Education. Summer meetings in the 'Plough', Kenton. Contact: B Butcher. Tel: 01-950 7068.

Hartlepool, Cleveland. Is anyone interested in starting a TRS-80 Users' Group in this area? If so, please contact: Ian Nicholson, 3 Thirsk Grove, Hartlepool, Cleveland TS25 1LT.

IOW TRS-80 Users' Club. Meets last Friday in every month at 7.30 p.m. at the London Hotel, Ryde. Contact: Mr M Collins, 11 Star Street, Ryde, Isle of Wight.
Tel: (Ryde) 614589.

Leeds Microcomputer Users Group. Meets fortnightly on Thursday evenings in Leeds, new members welcome. Contact: Paul O'Higgins, 20 Brudenell Mt, Leeds 6.
Tel: (0532) 742347 (after 6).

The SOBAT Computer Club (Leyton). Meets in first week of each month at 12 Calderon Road, London E11 4EU. Anyone (including beginners) is welcome. Membership fee only £1.00 p.a. including newsletter. Specialised information and access to several different kinds of microcomputers. Contact: Mr T Tayani. Tel: 01-556 5423 (evenings).

East London Amateur Computer Club. Meets 7 – 10 p.m. on 2nd & 4th Tuesdays monthly at Harrow Green Library, Leytonstone, London E11. Contact: Fred Linger.
Tel: 01-554 3288.

East London Computer Club. Meets every Friday at 7.30 p.m. in term at North East London Polytechnic, Romford Road Precinct, Stratford E15. Contact: John Grieve.
Tel: 01-553 4761.

North London Hobby Computer Club. Workshops four evenings a week during term time. General meetings open to all last Wednesday of each month. Contact: Secretary DELE, Polytechnic of North London, Holloway Road, London N7 8DB. Communications Group — interfacing personal computers with Prestel/teletext and Networks like PC Net and The Source. Every Thursday 6.30 – 9 p.m. Room 2/5, Tower Block, Holloway Road. ZX81 User Group every Monday during term-time 6 – 9 p.m. Room 3/4, Tower Block, Holloway Road.

North London VIC-20 Users' Group to be formed. People interested please contact: Jim Chambers. Tel: 01-387 7050 (day).

SELMIC (South East London Microcomputer Club). Meets fortnightly at Thames Polytechnic, Woolwich. Contact: Peter Phillipps, 61 Craigerne Road, London SE3.
Tel: 01-853 5829.

London-based Atom/Proton User Group. Regular newsletter including software and hardware tips, listings, reviews. Problems answered when possible. Meetings arranged. Membership £3.50 p.a. Details from M Jaffer, 71, Mill Farm Close, Pinner, Middx.
Tel: 01-429 8042 or C Holt 01-427 6088.

Local IPUG Group meet other PET users and make friends. Contact: G Squibb initially. 108 Teddington Park Road, Teddington, Middx.

Manchester Atom Users' Group. Meets last Tuesday monthly during school terms at Abraham Moss Centre, Crescent Road, Manchester 8. Contact: John Ashurst.
Tel: 061-370 5121 ext 27 (day), 061-681 4962 (evenings).

Manchester Computer Club. Meetings 1st and 3rd Thursday monthly in the Computer Science Building, Manchester University, Oxford Road. Contact: D Wade, 28 Hazel Road, Altrincham, Cheshire WA14 1JL.
Tel: 061-941 2486.

North Manchester. Anyone interested in a ZX81 Users' Group? Contact: Jon Harvey, 93 Glebelands Road, Prestwich, Manchester M25 5WF.

MKMUG-Milton Keynes Microcomputer Users' Group. Weekly meetings Tuesdays 7.30 – 10.00 p.m. Lectures, etc, frequently arranged. For further information contact: Brian Pain, 40a High Street, Stony Stratford, Milton Keynes. Tel: (0908) 566660 (w) or 564271 (h).

Medway Atom Users' Group. Meets last Tuesday monthly during school terms at St John Fisher School, Ordnance Street, Chatham. Contact: Clem Rutter.
Tel: (0634) 42811 (day).

Newcastle-upon-Tyne Personal Computer Society. Meets first Tuesday each month in Room D103, Newcastle Polytechnic. Over 60 members sub £5.00. Several sub-groups inc. PET, TRS-80 and S100 (last one meets weekly). Contact: Pete Scargill, Secretary.
Tel: (0632) 573905.

Nottingham Microcomputer Club. Lectures arranged by visiting speakers. Meetings 1st Tuesday monthly at the Friends Meeting House, Clarendon Street, Nottingham. Subs £5.00 p.a., reduced for students and OAPs. Non-members pay 50p entrance fee to meetings. Contact: Geoffrey Jago.
Tel: Nottingham (0602) 621453.

Orpington ZX80381 Computer Club. Meeting each Friday. Contact: R A Pyatt, 23 Arundel Drive, Orpington, Kent BR6 9JF.
Tel: 66 20281.

Microsoc the Oxford University micro group holds shared meetings with the Oxford Microcomputer Club. Contact: M Bourla, St. John's College, Oxford.

Oxford University Microcomputer Society. Meets weekly in Clarendon laboratory, Oxford, visiting speakers, micros available for programming. Contact: Richard Ash, Christchurch, Oxford.

South Oxford Computer Club. Covers Wantage, Abingdon, Didcot, Wallingford and Newbury. Meets 1st Tuesday monthly at The Star, East Ilsley. Contacts: Mike — Tel: (0235) 834402; Malcolm — Tel: (0235) 816949; Paul — Tel: (0235) 815305; Rocky — Tel: (0635) 34456.

Peterborough Computer Club. Recently formed, meets on first and third Mondays each month at Adult Education Centre, Brook Street, Peterborough. Contact: T Marchant.
Tel: (Peterborough) 76681 after 8 weekdays, anytime weekends.

Plymouth and District Amateur Computing Club. Subscription £5.00 p.a. Meetings last Wednesday monthly. Contact: Mr S A Bell, Secretary, Plymouth and District Amateur Computing Club, 31 Victoria Place, Stoke, Plymouth, Devon.

Would anyone interested in forming a computer club in the Portsmouth area please contact: Dave Cocker.
Tel: (Portsmouth) 751156.

Richmond Computer Club. Meets 8.00 p.m. 2nd Monday monthly, Richmond Community Centre. Contact: Bob Forster.
Tel: 01-892 1873 (evenings).

TRS-80 Independent User Group. Recently formed in Birmingham. Contact: Mike Bayliss,
Tel: 021-743 7197.

Salisbury. Is anyone interested in forming a microprocessor and computer society in this area? SAE to David Bone, Flat 2, 24 St. Mark's Road, Salisbury, Wilts.

Shipley College Computer Group (Sorcerer/6800). They meet Tuesdays (software) and Wednesdays (hardware/advanced) between 7.00 & 9.00 p.m. Contact: Paul Channell.
Tel: (Shipley) 595731.

Sunbury Amateur Computer Club. Meets 1st Friday monthly whenever possible, 20p per meeting. Contact: S Taylor, 8 Priory Close, Sunbury-on-Thames TW16 5AB.
Tel: (Sunbury) 86649.

Scunthorpe & District Microprocessor Society. Contact: G Hinch, 21 Old Crosby, Scunthorpe, S Humberside DN15 8PU.

Southgate Computer Club. The club recently held its AGM and adopted a formal constitution. Annual subscription will be £2.50 from January 1981, including a club newsletter; full-time students under 18 pay half-cost. The club now has 83 members. Contact: Panos Koumi, Southgate Computer Club, 33 Chandos Avenue, London N14.

Southampton Amateur Computer Club. Meets 8 p.m. 2nd Wednesday each month (not July – September) at Medical Science Building, Bassett Cres. East, Southampton. £3.00 p.a., OAPs & students £2.00. Newsletter and special int. groups; 2 years old, 80 members soon setting up another club in Portsmouth area. Contact: P G Dorey, Dept. Physiology, The University, Southampton SO9 3TU, or Andy Low. Tel: (0703) 555 605 ext 34.

Springfield Computer Club. Special interest in Sorcerer but beginners and others welcome. Meetings 1st Friday monthly. Contact: Stephen Cousins, 1 Aldeburgh Way, Springfield, Chelmsford, Essex CM1 5PB.
Tel: (0245) 50155.

Taunton Computer Club. Meets weekly at Somerset College of Art & Technology (Tuesdays 18.00 p.m., term time). Other occasional general meetings outside, eg, visits, demonstrations. Beginners welcome. Contact: Mrs D Walker, Glenleigh, Whiteball, Sampford Arundel, Wellington, Somerset.

Anybody interested in forming a microcomputer users' club in the Towcester (S. Northants) area, please contact: R J Wellsted, 20 Hampton Court Close, Abbey Chase, Towcester. Tel: (Towcester) 51354 (evenings).

TRS-80 User Club (Chelmsford). Now part of the National TRS-80 User Club. Contact: Michael Dean, 22 Roughtons, Galleywood, Chelmsford, Essex.

Would anyone interested in joining an informal Computer Club in the Tonbridge or Tunbridge Wells area please contact: Chris Wallwork. Tel: (Tunbridge Wells) 37682; or, Ray Szatkowski. Tel: (Tonbridge) 355960.

Worle Computer Club. Meets alternate Mondays 19.00 – 22.30 p.m. at Woodsprings Inn Function Rooms. Contact: S Rabone, 18 Castle Road, Worle, Weston-Super-Mare, Avon. Tel: (0934) 513068.

Worcester & District Computer Club. Meets 2nd Monday monthly at 8 p.m., Old Pheasant Inn, New Street, Worcester. Contact: D Stanton, 55 Vauxhall Street, Rainbow Hill, Worcester WR3 8PA.

West London Personal Computer Club. Meets first Tuesday each month at Willesden Technical College. Also visits, special int. groups, demos, problems surgeries. Contact: Graham Brain, 81 Rydal Cres., Perivale Middx. Tel: 01-997 8986.

York Computer Club. Meetings 8 p.m. Mondays at Holgate WMC New Lane, Acomb, York. Contact: K Thomas.
Tel: (York) 38239.

Anyone interested in forming a micro group in the Doncaster area, contact: Mr P Flinders.
Tel: (Doncaster) 78954 or (Doncaster) 868 379, (6 – 9 p.m.).

TRANSACTION FILE

We know when we're beaten! The volume of readers using Transaction File is escalating beyond our resources to cope. Regrettably, therefore, we are increasing the flat fee to **£2.50** *per advertisement. Each ad must be printed on the form below, using a maximum of* **30** *words. We cannot accept Transaction File ads unless they are sent to us on this form. (If you don't want to damage your copy of PCW by cutting out the form then please use a photo-copy.) All ads must be accompanied by a cheque or PO for* **£2.50** *made payable to* **Sportscene Publishers (PCW) Ltd.** *Ads are accepted only from non-commercial readers. We cannot repeat an ad unless a new form is sent in, nor can we guarantee to place an ad in a particular issue. Ads are printed on a strict 'first-come-first-published' rota basis. Please mark your envelope very clearly:* **Transaction File (PCW) 14 Rathbone Place, London W1P 1DE.** *Thank you for your co-operation.*

WANTED

Complete novice requires cheap ZX80. . . to start to learn on with extras if possible. R Whitworth, Tresco, Goldhill, Tansley, Derby DE4 5FG

PPC ROM. . . required desperately, for HP-41. Contact Martin, Tel 0482 (Hull) 441104.

Cash available. . . for TRS80 expansion interface with or without memory and, if reasonably priced, one disk drive, Swansea 290668.

Wanted. . . Program listings of MIX simulator and Mixal assembler transportable high level language, preferably Cobal. Name your price, inc post & packing. Mr Leigh, Rochdale 354291 eve.

Will swap my wife's colour telly for your video monitor. If you haven't got a monitor either, I'll take your ZX81 instead. Ring John, Kirkham (Lancs) 683504 after 6.

Wanted. . . 32k PET system. Will pay, 4000 series up to £1300, 3000 series up to £1100. Tel: Colnbrook 3854 eve/wends.

FOR SALE

TRS80 Model 1 LII. . . 16k CPU with leads, manuals, PSU, and £100 + of s/ware, inc chess, editor/assembler, and adventures. Also printer interface £300 ono. Tel: 061 330 4615 after 6.

Casio fx-501P. . . complete with overlay, case, box, manual and programme library. £30, 01-802 8487.

TRANSACTION FILE

DIRECT ACCESS

American Computer Magazine . . . 1978—1981, available/ wanted. (Byte, Kilobaud, Micro 6502, 80 Microcomputing, etc) SAE for list to: Smith, 84 Edenfield Gardens, Worcester Park, Surrey..

Casio fx-8100. . . calculator with professional stopwatch, alarms, two countdowns, clock, and 50 scientific functions. As new with manual and leatherette wallet. Boxed. £20 ono. Tel: Harwich 6420 after 5pm.

TRS80/PC1211. . . pocket computer, with cassette interface. Manual & s/ware inc. £69. Brighton 561 829 eve & w/ends. (Kim).

Nascom 1. . . with NAS-SYS, unexp, all documentation, little used £125. Tel: 061 928 2715 eve.

Research machines. . . 380Z with 32k RAM, Basic, assembler and utilities, cassette controller and 1 cassette recorder, £650. Contact Alistair Stewart. Thornhill, Uplawmoor, Glasgow G78. Tel: (Uplawmoor 624).

Superboard 2. . . 8k cased, 300/ 600 Baud, Marick sound generator, Wemon chip (gives full cursor control), joystick + cassette player and software. All for £250. N Redmayne, 4 Sandcroft, Penrigh, Cumbria. Tel: Penrith 64518.

Nascom. . . RAM board with 16k runs at 4MHz, offers around £60, Selectric terminal base from 2741, all electronics and manuals (inc Logic Diagrams) £50 ono. Ring Ian on Ebchester 560421 eve.

UK101. . . 8k cased, cassette recorder, software inc. Super Invaders and Adventure, new monitor, £200 ono. Tel: 0244 545622 (Buckley Clwyd).

ITT 2020. . . 48k, disk drive, DOS 3.3, DOS tool kit, paddles, software, colour. New last Xmas, games, assembler, editor etc. Original documentation and packing. As new. Cost £1250. Sell £695. (0432) 58127 eve or w/ends.

ZX80. . . new 16k pack, new PSU, all leads and manual; g. cond. £95. ring Blackburn (0254) 56911, after 4.30.

Sharp MZ80k. . . 48k, 10 months old, with £100 worth of software, inc machine language, Space Invaders, Star Trek, also dust cover £450 ono. Will separate, Southend (0702) 612921.

TRS80. . . 16k L2, inc. Editor/ assembler, micro chess, backgammon, black jack tapes, and learning level 2 book. Only £330. Tel: 346 7289.

Superboard II. . . enhanced version, 7k RAM, PSU, Video swap tape + manuals, 11 m old, £140, b/w TV, 12 inch £35. 01-205 9084. Colin

Teletypes Data Dynamics 390 KSR. . . complete with stands RS232 interface, paper tape reader and punch, auto start motor £220, one almost new £380 ono. Tel: 0753 (Slough) 42301 after 6.

Exidy Sorceror. . . 16k with all manuals and cables. £390 ono. Also ZX80 complete £40. Both only £420. Reason: cash. Contact Yaacob: (Cardiff) 43556 after 8.

Acorn Atom. . . 12k ROM, 12k RAM, PSU, tape leads, manual, magic book, getting acquanited with your AA 4 m onths old. £220. Owner purchasing bigger machine. Office hours: 01-478 3727/8 Mr R Menon.

Sharp MZ80k. . . 48k Xtal Basic, Toolkit, Sharp Assembler, Fortran, Machine language, software to value of £200. £400 ono. Sheffield 685652.

ZX 16k RAM. . . Sinc 16k RAM pack, brand new, never used, in original box. Unwanted gift. Immediate delivery, £45. Phone Gordon on 021-356 6911 ext. 274 during working hours.

Acorn Atom. . . 12k RAM, 12k ROM: inc floating point, 3 Amp power supply, leads, books & manuals, £200. Tel: Chelmsford 440520.

ZX80. . . new ROM, 16k, Sinc built, Comp Shop Kit (not yet installed), machine language made simple, mains adaptor, £75 ono. G Newman, 12 Malden Park, New Malden, 01-949 4623

TRS-80. . . L2 16k. 1 year old, VGC, bargain at £385. Tel Strood (0634) 721672. D Taylor.

Apple/ITT 2020. . . disk drive with controller. Unused with manual £290. Tel: 01-521 7733.

HP 41-C Card Reader. . . complete, unused £100. Mem Module, new unused, £15. Four Mem Modules, used, in exc. condition £10 each. Phone 0705-825695.

UK101. . . 8k, cased, Cegmon, 16k part finished expansion board, software £200. New APF 9" b/w monitor £90. New Sanyo cassette £20 or £300 the lot. Tel: 01-554 6636.

TRS-80 L2. . . 16k, little used, inc leads, power supply, modulator, numeric keypad and manuals. Few programs pyramid, invasion forceetc. Must sell £240 ono. Tel: Poole (0202) 5550.

ZX81. . . 16k RAM pack, Sinc built, still under guarantee and in perfect working order, manual, leads, adaptor, software, cassette are all included. Only £100. Tel: Castleford (0977) 553183

TRS-80. . . Level II 16K with numeric keypad. Hardly used and with all manuals etc. Software inc. instruction course parts 1 and 11, T-short plus and flight simulator £325. Ian Edmunds, Tel: 0438 811082 (Datchworth, Herts)

Acorn Atom. . . 6mnths old, fully expanded 12k RAM, 12k ROM, power supply, leads and manual. £200 ono. 01-467 0255

ZX81. . . 16k, Sinc built, leads, manual, adaptor. Cassettes 1,3,4 — N/M Park, Getting acq. with 2,3 Gateway guide and 30 programs for ZX81. . . £130 ono. Tel: 02432 66250

UK101. . . built, cased, 8k RAM, 48x32 video, CEGMON: £200, WEMON: £16, programs: £1 each, new modified highly versatile character set, gives great diagrams: £7. Harrogate (0423) 879438

Triton PCB. . . half completed, requires some components to finish. Tel: 0767 81644. £30

Acorn Atom. . . 12k + 12k, Acorn built, new PSU, leads, manual + magic book, software colour encoder fitted. £250 ono. Phone Leighton Buzzard 376872

TRS-80 L2. . . 16k little used, manuals, books, micro-80 magazines, cassettes — EDTSAM+, Model 1 to 3, & others. £290. Phone Ray: 0924-272480 (day), 0924-251797 (eve).

ZX81. . . with all leads, cassettes (some with software/some blank) manual, cassette box and guarantee. All complte with original box and mains adaptor. No offers less than £55. Tel: Newport (Salop) 810235.

PET 2001 8k. . . New ROM, Green screen, integral cassette + manual. As new £350. Contact Phil Todd 384 Perth Rd, Dundee. Tel (0382) 541771 (eve) 23181 ext 567 (daytime).

Nascom 1. . . 32k RAM, Nas-sys, Naspen, Nascom + chess graphics, toolkit, 5amp PSU. Cased in 19" rack frame. Zeap, Nasdis + others on tape. Full documentation £350 Tel: Hailsham 846254.

ZX81. . . Sinc built with 16k RAMpack, 9V adaptor, leads and manual, 5 Sinc cassettes, new cond, £155 new but only £130, write: T Lowrie, 25 Muirpark Rd, Tranent, EH33 2AT.

Teletype 43. . . computer printer, with keyboard, good quality print, near new, £450 ono. To include cable, spare ribbon, paper roll holder, 11"x8½" fan-fold paper. 01-943 2040/01-399 9022 (Surbiton, Surrey)

Microtan 65 and Tanex. . . (unexpanded). Hex. keypad, leads, PSU Tanbug. Plays Space Invaders. Offers 505-2131.

48K Sorcerer. . . £550 ono, manuals, all back copies of ESC, cables, tapes (inc. word processor, toolkit, machine code totorial, Galaxians, Cadas, ESC games tape) Taylor 01-272 5895 after 6.

Hewlett-Packard 38C Business. . . continuous memory, programmable calculator, mains adaptor, manuals £75 ono: as new condition. Taylor 01-272 5896 after 6.

32k Sorcerer. . . all manuals, 2 motor-controlled cassette, cables/ Modem connection. Good quality cassette recorder, 3 adventures, Startrek, Space Invaders + various s/ware, Bargain £395 ono. Perfect cond, ring 01-670 1828.

Video Genie. . . 32k RAM — 4 months old and as new. Complete with £100 monitor, leads and manuals. Will accept £340 for the lot. Tel: 0484 89 6481 after 7.

Centronics Microprinter P1. . . three print sizes, 20, 40 and 80 cpl. 150 cps, £150 ono. Tel: 01-393 7989.

PET 8k 2001. . . hardware and software manuals + 36 cassettes of software inc microchess and assembler monitor, graphics etc. £300 ono. Tel: Horsham (0403) 790368.

Commodore PET . . . 8032 with 4040 disk drive, 8027 daisy-wheel printer and word processor. Four months old, as new, cancelled project. £2100 ono. Tel: 01-954 3707.

Superboard II. . . 8k, PSU + modulator, 4k Wemon monitor (cursor control, improved tape handling). Pye cassette recorder plus software (Star Trek etc) documentation, £240. Details Penrith 66712.

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), 14 Rathbone Place, London W1P 1DE.

Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.

DIRECT ACCESS TRANSACTION FILE

TRS80 . . . 48k Green screen £495. Also disk drives £295, ring 01-445 0745.

UK101. . . 1yr old, 8k, 32x48, Cegmon improved Basic 1,3,4,5 Eprom board, case, k/pad, psg, pcg, Fan, 300/600 baud, manuals, software, 4amp PSU, £250. Phone Barking 01-591 5224 before 9pm.

HP 41C. . . 3 memory modules plus a card reader (20 magnetic cards + holder) in exellent cond. only £235 ono. Please write to V Prevelakis Eliot College, Kent University, Canterbury, Kent CT2 7NS.

ZX81. . . Sinc built, PSU, leads, manual, mains adapter — perfect cond. £55, will arrange postage. Tel: 041 638 5292 after 6.30.

HP-41C. . . Hewlett Packards Astronaut quality Alpha Calculator plus one memory module. Never used. Selling for sentimental reasons. £120. Stuart 0607-34120 (Nottingham).

PET. . . upgraded to Basic 4.0. For sale 1 Basic 2 toolkit £15; Superchip £20; Decrasher £6; Papermate Wordprocessor £20; + other programmes. D Milnes, 13 Delmont Close, Whitelee Rd, Batley, West Yorkshire. Send cheque/PO + self SAE.

ZX80. . . 16k RAM, 8k ROM ZX80+81 manuals, 2 books of programs. Cost £180 ono. Tel: Wargrave 4650.

ZX81. . . Sinc built. Compete with all leads, mains adaptor, manual etc. Brand new complete with sinc games cassette. £65. J Benfield, Story House, Culford, Bury St Edmunds, Suffolk. Sorry no phone.

Acorn Atom. . . 12k RAM + 12k ROM, inc floating point & colour ROM, with manual, leads & cassette recorder, boxed as new, £220. Tel: Hemel Hempstead 62194.

ZX80. . . 1k complete with operating manual, leads, 30 programs on tape, good working order, £45 ono. Write or call 28 Curson Rd, Poulton-Le-Fylpe, Lancashire.

Apple II + 48k. . . Autostart ROM. UHF modulator, 16" Phillips TV cassette recorder with rev counter and VU meter. All manuals and programs, inc. relocated interger Basic. £595.00. Basildon (0268) 412545.

ZX80. . . 16k RAM, Sinc built, PSU, manual, all leads plus 2 extra books. All as new £80. Ring 01-864 0231.

PET 2001. . . 8k, integral cassette, old ROM, good cond. dust cover, introduction book, users handbook, PET tutorial cassettes, pontoon, space invaders, chess, £295. Tel: Wilmslow (0625) 524 747.

Acorn Atom. . . 12k + 12k, PSU, Atom books and games magazines, software inc. Invaders, Star Trek etc, £200 ono. Tel: Leamington Spa (0926) 312805.

ZX81/80. . . expansion board, 8k; £25; Space Invaders ROM (hi-res graphics); £10: for ZX80 only: 2k Invaders; £2: ZX80 handbook (Linsac 2nd edition); £4: Phone Harrogate 503079 after 6.

ZX80. . . 8k ROM, £50, 16k RAM pack £40, ZX printer £40, or £120 the complete system inc PSU, manuals, books and sample programs. P Fisher Wolverhampton (0902) 341333.

T158. . . prog calc inc master module, manuals, coding sheets, case, charger, as new in original box. £30. Tel: Flitwick (0525) 714634.

ZX81 . . . Sinc built, with leads and mains adaptor, book of progs, manual, games cassette, £65. Tel Leeds 684148. After 6pm or weekends.

Video Genie 16k. . . 8 months old — hardly used £245 ono. Tel: 098 389 319.

Nascom Castle. . . Interface with DOCs, new un-used £16. Data dynamics RO £390. Teletype £120 ono, can deliver 100 mls rad. Micro type case, 101 cut out £8.00. Ring Michael 0782 311573.

PET . . . 8k 2001 (new rom) internal cassette, sound box, lots programs, little used £350. Tel: Hapenden 62503.

CMB 4032. . . with cassette and dust cover. 6 months old, hardly used. Tel: Windsor 61975 eve.

Video Genie. . . 16k, perfect con. sound box, tab keys, VU meter. various manuals, still under warranty. Several progs (eg, renumber, tiny Pascal, Supernova) £265. Tel (0533) 883658.

UK101. . . in microtype case with 8k RAM and programmable sound generator. Lots of software inc. Chess, Invaders and Asteroids. 6 months old, only £160. Phone Norwich (0603) 618995.

ZX81. . . Sinc built, complete with all leads, manual, mains adaptor, in box, £55, Tel: 01-801 2644 after 5.

Video Genie. . . 16k manuals, lead and lots of software, One year old. £270 ono. Portable b/w TV £60 ono. Cassette recorder £25 ono. Tel: Shepshed 8411. Loughborough, Leics.

Acorn Atom. . . Immac cond. Acorn built, 6k RAM, 8k ROM + B/W TV monitor; all leads, cassette deck; many progs inc. Space battles; manual + Atom Magic. Kent (0474) 872546 Price £210 ono.

Video Genie. . . 16k has right arrow key. Exc cond. with many programmes. eg. Galaxy, Microchess, Editor Assembler, TBug etc. and TRS-80 books £250. Tel Fleet: 7367.

HP 41C. . . calculator complete with 3 memory modules all in perfect cond. £227 value yours for £150. Tel: 01-730 9600 ext. 257 office hours.

PET 2001. . . 24k, old ROMs, large key board, computhink disk drives, Anadex DP8000 printer. Everything works and used daily. A complete business system for £1500. Ring 0823 69399.

TRS-80. . . level II 4k, very good cond, complete with PSU, leads, tapes, books and recorder. £300 Tel: 0522 690528.

Microtan 65. . . with keypad, PSU and manual, all in perfect cond, fully working as new, £75 ono. Tel: 051 525 4283.

TRS80. . . 16k Level II, numeric keypad, green screen monitor, cassette, PSU, covers, manuals, books, some software. £340 ono. Tel: Potters Bar (0707) 58743.

Profesionally assembled fully expanded Acorn Atom. . . 12k ROM + 12k RAM, PSU, printer interface, cassette recorder and over 60 programs inc Space Invaders. £325 ono. Tel: Eston Grange (0642) 454300.

Why pay more. . . and have to wait months for a 16k ZX81 when you can buy mine with games cassettes and recorder NOW for only £125. Tel: Blandford (0258) 54653.

Offers please for. . . 16 4k dynamic RAMs, 16 pin DIL type MK4096P. Also for S100 static RAM memory board using 64 21L02. Tel: 0989 2715.

Compak2. . . by Molimerx, tiny Pascal compiler, 350 page Tiny Pascal Book (inc programs) full instructions, cost £39, sell £21 ono. Phone Ron 733 2251 eve.

Anadex DP8000 Printer. . . recent overhaul by Anadex. Exc cond. £280 ono. Must sell! 01-640 6777.

Commodore 3022 Tractor printer. . . just 1yr old. Must be sold so that I can up-grade. £295 ono. Tel: 01-953 1823.

ZX81 Microprocessor. . . Factory built, complete with 16k RAM package, Sinc Basic manual, mains adaptor, all leads, and Sinc cassettes, only £100. Tel: 0376 515220.

Microsoft EDTASM+ with ZBug. . . m/c book by H Howe, Z80 opcode book, Tandy beginners assembly book cost £41. Sell £22 ono. Phone Rom 733 2251 eve.

Apple Software — surplus to requirements: Supertext II Word Processor, complete with manual, absolutely unused: £70. Unused games in original packs: Galaxian, Galaxy Wars, Space Eggs: £7 each. Tel: 031-669 6430.

Intellivision. . . with 18 cartridges (inc. Horse racing). Superb colour and graphics and exc sound effects. Cost £530, first £400 secures. (has just been serviced). Phone 031-664 3879.

PET 2001. . . 8k, ex cond. (Reason for sale up grade to 32k). Large collection of software, games, educational and many more, sound box, joy stick, light pen, D — A converter, buffer for user port, light & sound detecting circuits, manuals. Offers around £300. Ring Danny 01-680 5939 after 4.

ZX81. . . Sinc built, still under guarantee, included also a games tape. £57.

ZX81. . . 16k RAM, Sinc built inc manual, PSU all leads, 2 Sinc cassettes (games + business), 30 prog book, all packaging. £120 ono. Tel: 01-751 0280 after 6.

PET 4008. . . 8k new ROM, 5 months old, green screen, large keyboard, Commodore cassette deck, instruction manual, many magazines, many games tapes. Cost £550. Will accept £330 ono for quick sale. Will deliver. Phone (039 17) Fleetwood 2706 eve.

ZX81. . . with 16k RAM, PSU, leads and manual, all in original packaging plus five ZX80/81 books and Sinc business cassette. £120 ono. Phone 021-444 7982.

ZX81. . . 16k RAM and printer, Games cassette, manuals plus 20 inch b/w TV monitor, £130. Tel: Rowlands Castle 2353.

Sharp MZ-80K. . . 48k, as new. Inc Toolkit, Pascal, Assembler, M/C tape, Asteroids, Invaders, Backgammon, Othello, Pontoon & many others — marriage forces reluctant sale. £450. Tel: 0245 73057.

Sinc built ZX80. . . 3k RAM pack with full complement of IC's for sale. Little used. £20. Phone Blackburn (0254) 886 523.

ZX81. . . Sinc built, 16k RAM pack, 4 months old, and printer, only 1 month old. Complete with leads, mains adaptor, manual, cassettes, books etc. Only £150 the lot. Tel: 02594 2645.

ZX81. . . with Sinc 16k RAM pack, hardly used. Inc all leads, PSU, and manual. Some tapes and books. £110 Armstrong, 3 Chagford Villas, Netherton, Maryport, Cumbria, Tel: Maryport 3044.

ZX81. . . Sinc built, housed with leads for easy connection, manual, hints & tips book, exc cond. £55. Phone 01-989 6246 (Wanstead, London).

ZX81. . . Brand new, perfect cond. All leads, Sinc built. Available now. Only £50. Tel: Jeremy at Mogador 833205.

Casio FX502P. . . £50 as new. 256 step non-volatile memory programmable calculator. Also Sony pocket cassette recorder (ideal for storing prog. calc programs on!) £30. Boxed. 2 Brooms Close, Wilwyn Gdn City, Herts.

16k ZX81. . . RAM pack, £25; Sharp CE-121 cassette interface, unwanted gift. £10; Videomaster 3 game colour TV game, £10. All inc postage. R Woodcock, 46 Palgrave Rd, Gt Yarmouth, Norfolk.

Monitor 3. . . by Molimerx (gives assembler output) etc, Fun House Adventure and Seven issues of 80-Microcomputing Mon3, great for machine code, cost £57 sell £24. Phone Ron 733-2251 eve.

Complete TRS80. . . 16k, LII system. inc: quick printer II, s/paper, Hatachi 9" monitor, all manuals, power supply, TV modulator, cables. +50 programs. inc: Sargon, Tbub, Othello, etc. Books: Into TRS-80 Graphics', TRS-80 Assembler Programing'. Everything mind! +140 top quality mags. inc: PCW, CT, PC, TRS-80, etc. £499. Tel: 01-986 4245 eve.

OSI Challenger IIP. . . 32k RAM. 610 expansion board. 3 channel sound, high resolution by Char. Generator — Segmon — 300, 4800 baud cassette, 32x48 screen, cooling fan — 12" monitor — professional case, all manuals £460. Tel: 542 7593 (Allen).

Sharp MZ-80K. . . 36k RAM; MZ-8010 Interface, MZ-80P3 printer plus interface card — all mind cond. Plus toolkits 1&2, many games and much software. Owner emigrating. £750 ono everything. Tel Croydon 01-656 0945.

PET 2001. . . 8k old ROM small keyboard, with Strathclude Basic course £250 ono. Tel: 031-663 5625.

Acorn Atom. . . 12k + FL point plus MZ70 printer. Five amp PSU games and printer paper and word pack. Tel: West Drayton, 41224. Owner leaving country.

UK101. . . 8k professionally built; inc Cegmon monitor, Easicomp sound generator, 300/600 baud, fan, case, over 90 programs inc M/C Invaders, complete documentation ideal, £230. Telephone 0473 685341 Ipswich.

Video Genie EG3003. . . latest model, new type keys and tape level meter, mint, under guarantee (1 year), 16k RAM, games also for sale, £299 ono. Tel: 01-654 4361 (eve).

Nascom IMP. . . printer with TRS-80 interface, perfect, £200 ono, also JPC fast cassette systems for TRS80, £50. Sinc, Hedingham (0787) 61004.

PET 8k. . . new ROM, green screen, small keyboard, programmable music, many games, books etc. All as new £300 ono. Phone Ruislip 37283 eve.

UK101. . . cased, 12k RAM, only 4 months old, still under guarantee, Great software inc. Asteroids, invaders etc. Great machine. Genuine reason for sale. Bargain £195. Tel: Meopham 814654.

Microtan 65, 8k RAM, Tanex, XBug, ASCII kyboard, Hexpad, Large case, PSU, Basic, graphics, lower case, manual, software; cost £350, Bargain only £179. Phone 01-394 0394.

PET 32k. . . model 2001, with games software inc Space Invaders and chess. Price £300. Tel: Khalid Khan, Romford 070 845553.

Tandy printer. . . Line lprinter 7, serial and parallel interfaces. Used twice only, cost £239, accept £205. Phone Colchester 841293.

TRANSACTION FILE

DIRECT ACCESS

DAI. . . 48k RAM, 24k,ROM, 16 colour graphics + sound, BRAND NEW, replacement guarantee, + cassette recorder, leads, manual, newsletters, software, word processor, lunar lander, forced to sell — £670 ono. Contact 01-794 2767.

UK101, . . 24k RAM, Cegmon monitor, 10k Basic, toolkit in EPROM, 300/6004800 baud cassette enhanced power supply all in custom case. Lots of professional software, £400. Phone Oxted 5380 after 5.

PET 2001. . . 8k old ROM integral cassette deck; software inc. space invaders, Basic course; £275 ono. Ask for John on Brentwood (0277) 223328, after 4.

ZX81. . . Sinc built, with adaptor, etc and one cassette. Virtually unused (dup gift). Available right now with no waiting for only £62. Call Derek 01-673 0219 (eve Thur to Fri/w.ends) Now!

Sharp MZ-80K. . . 48k, new, boxed, C/W guarantee, 64,000 DOT hi-res graphics board, Basic, toolkit, forth, Fortran, Pascal, Sharp assembler and machine code, 120 programs, Asteroids, Chess, Payroll. Worth £875, due to difficult circumstances willing to accept £560 for quick sale. Tel: office hours 01-628 0071.

TRS-80. . . 16k level 2 keyboard unit with PSU and modulator with new ROM to debounce keyboard. £285 ono. R Kitchin. Tel: (0792) 460638 9am to 5pm.

Video Genie. . . 16k, plus TRS80 green screen monitor, EXTASM (microsoft), Tiny Pascal, manuals, books: Pascal and TRS80 Assembly Language Programming. £350. Tel: 01-575 5863 eve.

ZX81 . . . Sinc built, complete outfit; adaptor, leads, 2 books, sound equipment, 6 software cassettes and 6 listings for the expanded machine. £145. Southend-on-Sea (0702) 66742.

Sharp MZ80K. . . 48k, 2 weeks old, unwanted gift, games progs etc. Brand new, 2 year guarantee £350 ono. Phone Cliff 01-577 0323 (Hounslow)

Nascom 2. . . 16k RAM on 32k board, 8k Basic, NAS-SYS, graphics, PSU, case, documentation and software. £290 ono. Phone Hitchin 33895.

Creed7B. . .a GPO reconditioned printer in exc cond and working order , with RS232 interface £25. Purbeck Oscilloscope perfect working order, with probe £60 tel (0628) 30494.

TRS80. . . 16k level II, monitor, recorder, power supply, leads, cassettes, manuals, offers please. Tel: Tewin (Herts) 7496.

Computer bits for sale. . . Acorn Atom 12+13k £200, TV monitor £40, Apple/TRS80 compatible minidisks £150 each, Acorn backplane, rack, Ramcard (empty) £75. Private sale. Phone Ian 01-903 4311.

Acorn Atom. . . 12k+12k VIA, colour encoder, PSU, all leads, box, two books, much software, manual etc. Worth £400. 4 months old. Want £300. 01-567 8607 after 6.

ZX80. . . 8k ROM, Sinc built with 16k RAM pack, all leads, both manuals, and adaptor. Perfect working order. £110 ono. Phone Haslemere (0428) 2467 after 5.

Teletype 43. . . printer with keyboard and paper tray, as new, very reliable, £650 ono, phone: 01-794 1340.

16k ZX81. . . with printer, full sized keyboard and cassette recorder, over £100 worth of software: Invaders Eprom, m/c programs, 2 books and 22 basic programs. Will sell all for £199. Tel: 0903 42013.

16k ZX81. . . Sinc built and boxed. All leads mains adaptor and manual. Two additional ZX81 books and many tapes. Exc cond bargain at £100. Tel: 01-360 0458.

Apple II 48k. . . as new, two disk drives and controller, Hitachi vdu, game paddles, full documentation, TV modulator and dust cover. £1395 ono. Tel: (01)-588 7871 Ext 2 (day).

Atom 12 + 12. . . Acorn built, with PSU, all leads, much software inc. Invaders, pinball. Magic book, manual. £240, will negotiate. 0783 227969 after 5.

PET 2001. . . 32k RAM, cassette unit, monitor and latest ROM. Many programs that include Invaders, mathematics, chess and 20 lessons in Basic. £440 01-997 1410.

32k Commodore Pet 3032 . . . complete with cassette £375. Phone 0244 (Chester) 36529. Could possibly deliver.

TRS80. . . L2 16k complete system CPU with num. pad, cassette, green VDU, manuals, software (APL-80, Galaxy Invasion, Othello + many others). All perfect cond. £420 ono. Welwyn Garden 07073 22993.

ACC NEWS

News from the Amateur Computer Club, the national club for all amateur and personal computer users.

Hints on setting up a local club

The ACC is often asked for advice on setting up local clubs, so here are some points gathered from established clubs and the ACC's own experience in starting clubs.

Before you start to set up a club, it is worth checking that there isn't a club in your own area that you don't know about. Some ComputerTowns and clubs either restrict their advertising deliberatelywhile they build their foundations, or else they just aren't any good at publicity. If you do find another club nearby, then there must be really good reasons if you want to still go ahead and form your own.

Consult the ACC Club database, the last six months' magazines (try a library if you haven't got them all) and local computer shops and libraries, in order to find the details of clubs near you. Also check the addresses on letters in magazines. Experience shows that about one adult in 10,000 is seriously interested in personal computers, although the advent of machines such as the VIC and ZX81 along with the BBC project is likely to double that figure (ie, to one in 5000). This means that you can guess the likely number of members in your catchment area and decide whether to go ahead. Note that ComputerTowns often co-exist with clubs, as the former cater more for beginners and that seasonal university or college clubs can often supplement and enhance a local group.

Before you do anything, you will need some people to help. Apart from your friends, one good source is neighbouring clubs, so it is well worthwhile to go to some of these, even as far away as 30 miles, and see what they do. You may meet one or two people who could form a steering committee with you to help get the thing off the ground. Providing you are diplomatic about it and don't seem to be poaching their members, a neighbouring club may give you substantial support; perhaps you could invite somebody to come and speak at one of your early meetings.

Once you have a steering committe, you (the committee) should decide what kind of club you want. Is it just a meeting place, a source of free computing facilities or a teaching centre? Businessman and children require more organisation and support than hobbyists do; ideally, you will have separate groups for these, but this will have to wait until you have a few more people around to help. You should also decide at this point whether the club should be a full affiliate of the ACC (ie, take part in the block membership scheme) from its inception; if so get in contact with me (Rupert Steele) for the details.

The next requirement is a meeting place. Aim for somewhere free or extremely cheap, or you may end up with a £100 membership fee just to pay for the venue. Start by trying the Technical College; some will provide free access to a room and perhaps computers, while others see it as an easy source of revenue. The best person to approach is the head of the electrical or computing department. However, don't forget that they spend half the year closed for holidays. Then try community centres, church halls, libraries, schools and lastly public houses as their rooms tend to be expensive. Libraries are popular with ComputerTowns, but you may run into problems of noise disturbing other users.

Once you have a meeting place set up, you can start on the publicity. This should be started cautiously; although it may seem attractive to go for a splash in the local paper(s), this may result in 200 or more people with no knowledge of computers who will not appreciate the fact that alone you cannot instantly mend all their ZX81s. It is better to start (fairly) slowly to build up your capability and expertise. Inform the ACC and the major computing magazines, bearing in mind the long lead times; possibly also put something in the local computer shops (if they'll take your publicity). This approach ensures that the people who come initially have a significant interest in computers. Later on, contact local libraries, more computer shops and local newspapers. Control the rate of your publicity so that you have a steady flow of new recruits.

It is unfortunately true that people are greatly influenced by the first meeting that they happen to attend, and expect to be immediately provided with the answer to all their (computing!) desires. For example, a couple who came to a meeting of the Harrow Computer Group and were not straight away introduced to other PET users left within five minutes and were not seen again for five years. Others assumed that, because the first three meetings were all on Pascal (the only speaker available), nothing else would ever be discussed. You will always have the problem of trying to appeal to all tastes simultaneously and should therefore inject variety, not only between meetings, but within them. Local shops will often be prepared to give a presentation of their wares, but mostly you will have to rely on the more expert of your club members for lectures (if that is, indeed, what you want

ACC NEWS

to do in the club).

Once there are a few active members, you should try to formalise the set-up of the club. You may already have co-opted people to supplement the original two or three of the steering committee, but you should aim, as soon as possible, to hold your first Annual General Meeting (AGM) at which a constitution will be adopted and a committee formally elected. Don't worry, there is no chance that they won't re-elect you, at least the first year.

The officers that you require are chairman, secretary and treasurer but I would strongly advise a membership secretary be also elected to handle membership records and to distribute meeting lists, etc, to the membership. If you require a bank account, you will have to fill out a 'mandate' form (obtainable from your chosen bank), and a photocopy of the completed form should be stuck in the minute book. Choose a bank that one of the committee has an account at, and good relations with, if possible; this can save a lot of red tape with references, etc. The bank will require a copy of the club's constitution (I hope to publish a sample constitution in a future issue of ACC news), although they may let you open the account first if they like you. The bank will want you to specify what signing arrangements you want on the account. A common arrangement is two out of three officers (eg, treasurer, secretary and chairman) required to sign each cheque; this saves embarrassment if the treasurer goes on holiday (but if he takes the cheque book with him. . .). You may prefer to only require one signature on each cheque (eg, either the treasurer or the chairman may sign).

Good luck, and *don't forget to tell the ACC!*

Rupert Steele

USER GROUPS INDEX

Here is a list of all British (and one Dutch) personal computer networks. As more networks appear — and as more facilities are added to existing ones — we'll report them in this section, which appears monthly.

Forum-80 Hull. . . Operator: Frederick Brown, tel 0482 856169. Facilities: electronic mail, software up/down loading, Forum-80 Users' Group, PET users' section, shopping list. Hours: 7 days/week, midnight-0800, Tues & Thurs 1900-2200, Sat & Sun 1300-2200.

Forum-80 London. . . Operator: Leon Jay, tel 01-286 6207. Facilities: electronic mail, program downloading. Hours: Tues, Fri, Sat & Sun 1900-2300.

80-NET . . . Operators: Leon Heller & Brian Pain, National TRS-80 Users' Group, tel 0908 566660. Facilities: electronic mail, software for downloading, newsletter, TRS-80 information. Hours: 7 days/week, 1900-2200.

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.

Forum-80 Holland. . . Operator: Nico Karssemeyer, tel 010 313 512 533. Facilities: electronic mail, program up/downloading, shopping list. Hours: Tues-Sat 1800-0700 nightly, continuous from 1800 Sat — 0700 Tues.

CTUK! CENTRES

Here's an updated list of people organising ComputerTowns. Don't forget to enclose an SAE if you write to your nearest 'Town for details.

Lyn Antill,
1 Defoe House,
Barbican,
London

Peter J Kiff,
52 Stone Road,
Broadstairs,
Kent CT10 1DZ

Patrick Colley,
52 Queensway,
Caversham Park Village,
Reading,
Berks RG4 0SJ

Pete Shaw,
15 St Vincent Road,
Clacton-on-Sea,
Essex C015 1NA

Steven Christian,
51 Burnstones,
West Denton,
Newcastle-on-Tyne NE5 2DF

Derek Moody,
2 Victoria Terrace,
Dorchester,
Dorset DT1 1LS

David Tebbutt,
7 Collins Drive,
Eastcote,
Middx HA4 9EL

Vernon Gifford,
111 Selhurst Road,
Croydon,
London SE25 6LH

John Stephen Bone,
2 Claremont Place,
Gateshead,
Tyne & Wear NE8 1TL

Mike Baker,
5 Edinburgh Road,
Hanwell,
London W7 3JY

Vernon Quaintance,
50 Beatrice Avenue,
Norbury,
London SW16 4UN

R L Saunders,
14 St Nicholas Mount,
Hemel Hempstead,
Herts.

Pete Rowan,
10 Lambton Road,
Jesmond,
Newcastle-on-Tyne NE2 4RX

Steve Haynes,
5 Guinea Street,
Kingsholm,
Gloucester GL1 3BL

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.

Susan Kelly,
Head of Reference Services,
PO Box 4,
Civic Centre,
Harrow,
Middlesex.

Bill Gibbings,
3 Longholme Road,
Retford,
Notts DN22 6TU

Philip Joy,
130 Rush Green Road,
Romford,
Essex.

Richard Powell,
22 Downham Court,
South Shields,
Tyne & Wear

Derrick Daines,
18 Cuttings Avenue,
Sutton in Ashfield,
Notts

Keith Taylor,
Carter Hydraulic Works,
Thornbury,
Bradford BD3 8HG

Roger Shears,
18 Woodmill Lance,
Bitterne Park,
Southampton SO2 4PY

Alan S Waring,
50 Drayton Gardens,
Winchmore Hill,
London N21 2NS

Alan Northcott,
Rushmoor,
464 Reading Road,
Winnersh,
Wokingham,
Berks RG11 5ET

Alan Sutcliffe,
4 Binfield Road,
Wokingham,
Berks RG11 1SL

Tony Cartmell,
54 Foregate Street,
Worcester WR1 1DX

Tom Graves,
19a West End,
Street,
Somerset BA16 0LQ

DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making travel arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

London	(West Centre Hotel) Microsystems Exbn. Contact : IPC Exbns Ltd, 01-643 8040	24-26 Feb.
County Down	(Alexander Hall) Business Equipment Exbn & Conf Contact : WHC Industrial Promotions Ltd, 0247-812577	8-11 March
Glasgow	(Albany Hotel) Scottish Computer Show Contact : Couchmead Communications Ltd, 01-653 1101	16-18 March
San Fransisco USA	West Coast Fair	19-21 March
Ipswich	(Gt. White Horse Hotel) Computer Open Day Exbn Contact : Couchmead Communications Ltd, 01-653 1101	24 March
Guildford	(Metropolitan Exbn Hall) Computer Aided Design Exbn & Conf. Contact IPC Science & Technology Press 0483-38085	30 March-1 April
London	(Polytechnic of North London) London Computer Fair	15-17 April

LEISURE LINES

By JJ Clessa

December's problem was to find the smallest number with exactly 104 factors excluding unity (ie, 105 factors if we include unity). This can be done analytically, although it would call for an interesting bit of programming if a computer were used. The analytical proof is as follows:

Express the required number n in terms of powers of prime factors, ie $n=p_1^a . p_2^b . p_3^c . . .$ where p_1, p_2, p_3 etc are prime factors. Then the number will contain exactly (a+1) (b+1) (c+1) factors (excluding unity and n). Now 105=3x5x7, and so if we choose three prime factors and a=2, b=4, c=6, then, reagrdless of the prime factors chosen, a number, $n=p_1^2 . p_2^4 . p_3^6$ will contain exactly 105 factors.

The smallest number is obtained by using the three lowest prime factors, ie, 2, 3, and 5 and gives the answer $n=2^6 . 3^4 . 5^2 = 129{,}600$. The smallest odd number is $n=3^6 . 5^4 . 7^2 = 22{,}325{,}625$.

Less than 100 entries were received, mostly correct. Quite a few were from far afield — Greece, Norway, Belgium — and one or two entrants submitted wrong answers and included rigorous mathematical proofs as to why the answers were correct. One entrant *proved* that there was no smallest number but the proof was too complex for us to understand, and so instead we chose the winning entry from those giving the answers shown above. Congratulations, Mr Fiddy of Cricklewood, London NW2, who solved this problem with a calculator. Your prize is on its way.

Quickie

The big hand of Big Ben weighs 1,200 pounds, the hour hand weighs 700 pounds. What is the total weight of the hands? The answer is *not* 1900 pounds.

Prize puzzle

Slightly more difficult than usual, and, although it can be solved analytically, most people will probably prefer a programmed solution.

What is the largest number whose prime factors (excluding unity) add up to exactly 100? Just to be sure we're all on the same system, the prime factors of 12 are 2x2x3— their sum is 7. The prime factors of 90 are 2x3x3x5— their sum is 13 and so on.

Answers on *postcards*, please, to March Prize Puzzle, *PCW*, 14, Rathbone Place, London W1P 1DE to arrive by the last day of March 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 one 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, 14 Rathbone Place, London W1P IDE

Sincere thanks to everyone who has volunteered to join PCW's referee scheme. Although I wasn't 'deluged with replies by New Year's Day', they came flooding in afterwards! I must now inform you that the number of volunteers is beginning to exceed demand and the register is closed to further applications.

While on the subject of thanks, due mention must go to a certain very patient Tandy Store (Centre Point, London W1) just around the corner from *PCW* which has provided me with most of the TRS-80 listings published in the last few months. They have also let me use their machines to test programs and have been helpful in sorting out at least one program bludner. . .

I hope that before too long I'll be seeing more programs written for new machines such as the Ataris, VIC-20 and TRS-80 Color. You've read the tests, been to the shows, seen the adverts, now write the programs! There must be at least a few ardent keyboard bashers hiding one or another of the afore-

MICROMART

DISKS — DISKS — DISKS

LOWEST PRICES FOR THE BEST
BOXES OF 10 MINI DISKS (5.25")

MEMOREX	
S/S – S/DENSITY S/SECTOR	£14.00
D/S – D/DENSITY S/SECTOR	19.70
VERBATIM DATALIFE	
Single or Double Density	
S/S – S/SECTOR (40 TR CERT)	14.30
D/S – S/SECTOR (40 TR CERT)	21.30
S/S – S/SECTOR (77 TR CERT)	27.30
BASF	
S/S – S/DENSITY S/SECTOR	17.15
S/S – D/DENSITY S/SECTOR	20.65
D/S – D/DENSITY S/SECTOR	25.41
DISKETTE DRIVE HEAD CLEANING KIT	16.30

– ADD £1/BOX P.P & 15% VAT ON TOTAL

Pinner Wordpro

34 CANNONBURY AVENUE, PINNER, MIDDX. HA5 1TS.
TELEPHONE 01-868 9548 ANYTIME

OKI PRINTERS £269

Microline 80 £269

OKI Serial Interface Buffer 2K £73

OKI Serial Interface with Current Loop plus £22

Epson MX80 F/T £339

RS 232C Serial Interface £45

Plus VAT

Marlow Supplies, Regency House, Dedmere Road, Marlow, Bucks.
Tel. (06284) 74511

BUSINESS & COMPUTER SERVICES

292 Caledonian Rd, London N1 1BA
Tel: 01-607 0157 (24-hour Answering Service)

We are Micro-computer Consultants & Programmers

– and specialise in industrial & commercial programs written to clients' specifications.

	VAT & Post incl.
Cash Analyser	£20.00
Vehicle Cost Analyser	£25.00
Book Keeping (min 48k & 2 drives)	£150.00

Please ask us for fuller details of the above. All are disk based for the TRS-80 Model I or III. Please state your DOS when ordering. Apple II versions soon.

AT LAST!!!

A STOCK CONTROL SYSTEM FOR THE SHARP MZ80-K WITH:
*Instant point of sale stock enquiry/update
*8000 stock items
*Stock list in alternative number sequence
*All normal stock control facilities
£250+vat (requires 48k+discs+pritenr)

ALPHA • BETA COMPUTER SYSTEMS
33 West Grove Merthyr Tydfil Mid Glam (0685) 3426

VIC SOFTWARE

COLOUR GAMES, EDUCATION ETC.
'NEW' FOR XMAS 'SPOT THE TUNE' ONLY £4.50. ALSO BREAKOUT, NIM ETC. SAE. FOR LISTS.

SERVICE, REPAIRS

MAINTENANCE ON ALL MICRO'S, PET, APPLE, TRS 80, ETC. CONTRACTS AVAILABLE.

TRADE ENQUIRIES WELCOME

M & J ELECTRONICS
64, MANOR ROAD,
OLDHAM
LANCS

nascom + ATOM EPROM PROGRAMMER
2516 2716 TMS2532 2732 (+5v)

Fully built c/w mains P.S.U., quality Z.I.F. Soc., Doc., all cables & connectors and software on cassette inc. V.A.T. and p&p.

PRICE ATOM £40, NASCOM £40 TO 'M. M. Microcomputers' 24 MEADOW WAY, MELTON MOWBRAY, LEICS. LE13 1DT.
FOR DETAILS WRITE OR PHONE 0664 67854

MICROMART

TRS-80 16k LEVEL II

Horse Racing: Marshals the data available in most newspapers, evaluates it and makes a betting recommendation. On last season's hurdles, over 126 races, we ended 84.89 units up! £7.50
Football Pools Forecaster: Performs a similar function to the above. Sifts through the league tables, applying your weighting factors, to recommend your pools entry. Entry of weekly results updates the data. £7.50
Portfolio: Keeps up to date record of your investments — gains, losses, yields dividends by stock and by portfolio total. £7.50
Cash Flow: For home budgeting — shows your cash status during each month throughout the next year after all anticipated expenses and income. £2.95
Leaderless C12 Cassettes. No more lost programs and data. Specially made for us. @ 40p + 5p for library case. £1 postage regardless of quantity.

SIDELINES, 19 Lovelace Road, OXFORD

SHARP MZ-80K software

£5 – **FOOTBALL MANAGER.** Brilliantly original, complex football management simulation. Provided with a mediocre third division side, your objective is clear. Just gain promotion and eventually a place in Europe! How is up to you. Obviously you will buy and sell individual players and decide the tactics every game. However, you will also have to cope with injuries, low gates, the Bank manager and the Directors! How will you make out? Can you even survive in the riskiest profession of all? (14K available RAM)

£5 – **DUST COVERS** for MZ-80K computer or MZ-30P3 printer. Black, waterproof.

£5 – **MOONLANDER.** Complex real time lander. Superlative graphics/sound (10K RAM)

£6 – **HEAD ON.** Basic/Machine code arcade game, gobble up dots but avoid suicidal robot cars intent on your destruction Very Very fast.

£5 – **COMPOSER.** Play tunes via the keyboard. Replay your compositions. Print music strings for future use.

£5 – **COMBAT.** Superb 2 person tank battle. Move and fire on opponent's tank and guns.

£4 each – **BIORHYTHMS, MASTERMIND, ADDRESS BOOK, BANK ACCOUNT.**
£5 each – **CHASE, MANIAC.**
COMPUTER ASSISTED LEARNING. Superb suite of programs for 3 – 7 year olds. £5 each – **WORD MATCH, COUNT & ADD, PICTURE COUNT, CHAPES.** £4 each – **CHARACTER MATCH.** All 22K RAM.
Write or phone for full catalogue. Cash with order, or ACCESS. All prices fully inclusive. Orders despatched by return.
FREE machine code **SPACE INVADERS** with orders of £15 +

HIGHLIGHT SOFTWARE
3 Nether Court Halstead Essex CO9 2HE
Telephone (0787) 475714

MAINTENANCE PROBLEMS? Then call for our 01-250 1481 for first class service on PET, APPLE and other micros.

AD100: A single board 4-channel A/D converter with on-board power supply. Works on any PET or computer with a parallel port. Comes complete with instruction manual. Price £55.00

AD50: A 1-channel single-board AD/DA converter which is designed to work on any computer with a parallel port. 50,000 samples/sec. Requires power supply. Comes as a kit. No software included. Price: £27.50

PET TV INTERFACE: This well-built unit connects to either your domestic TV or monitor. Nothing to adjust. Connects to the PET user port and a second cassette port. For 40 to 80 column PETs. Price: £35.00

RL100: A 6-channel relay switching unit with on-board supply. Relay rating is 1A at 30V DC/100V AC. Price: £50.00
We also supply higher ratings and solid state switches.
Phone or send s.a.e. for details.

CB-2 Soundbox: Ideal soundbox for your PET. Comes complete with programming instructions and demo tape. Plugs into PET user port and cassette port. Price: £17.50

VC100: This is a random access video controller. VC100 enables your computer to keep an index of the recordings you have on your video recorder. You can then under software control rewind or fast forward to any position on your video tape. Send s.a.e. for details.

THE DR. WATSON BOOK OF ASSEMBLY LANGUAGE PROGRAMMING: This is a NEW teach-yourself guide to machine language programming for 2-3-4-8000 PETs. Price: £10.00

APPLE	
APPLE ROM Expansion Card	£50.00
Dual DOS in ROM	£45.00
APPLESOFT UTILITY IN ROM	£35.00
APPLESOFT Renumber & Merge	£35.00
APPLE Copy Disk in ROM	£35.00
APPLESOFT Edit ROM	£35.00
APPLE BRAIN SURGEON	£30.00

We also supply a selection of VIC computer games and hardware. Please send s.a.e. for details. Carr. £1.50 P&P per item. Dealer enquiries welcome.

PCS PEDRO COMPUTER SERVICES
4 Cowcross Street
London EC1
01-250 1481

PROGRAMS

Nascom Business Documents

by A Hetherington

Now that I've finished being frivolous, here is something which would be of help to a small businessman, a newsagent say, who has to deal with small orders and accounts. It is meant to cut down the paperwork involved in this kind of work.

It's written for a 32k Nascom II and Epson MX-80f/t printer, but adaptation should not be too difficult if your printer is different. As listed, the program uses 8k.

When run, the program presents the user with a menu of options. After making the appropriate choice the user can print out a sales invoice, delivery note or, if required, a remittance note. Account statements could be added to produce two copies of any document unless a list of addresses is requested, in which case one is supplied. Information necessary for printing out a document is collected via input from the user.

All the records in the program (the ones in this listing are dummy addresses) are actually stored as DATA statements because Nascom does not facilitate string storage on cassette. These commence on line 3000. Each line of a particular address is coded with a number which is entered by the user when requested by the program. These numbers do not appear on the document and if more addresses are needed each one must be given a new number and be added before the program is run, as they are effectively part of it. Line 2780 will need altering in accordance with the total number of addresses in the program and line 620 sets the number of copies to be printed.

```
5 CLS
10 REM ** BUSINESS DOCUMENTS
20 GOSUB 2690
30 CLEAR 2000
40 CLS
50 PRINT "                  *****  MENU  *****
60 PRINT
70 PRINT "SELECT YOUR REQUIREMENT BY TYPING THE ";
80 PRINT "NUMBER
90 PRINT "NEXT TO THE FOLLOWING:"
100 PRINT
110 PRINT "      1. INVOICE AND DELIVERY NOTE
120 PRINT "      2. REMITTANCE ADVICE
130 PRINT "      3. ORDER
140 PRINT "      4. LIST OF NAMES & ADDRESSES" : PRINT
150 PRINT "WHEN PRINTED EACH OF YOUR SELECTIONS ";
160 PRINT "WILL GIVE
170 PRINT "TWO COPIES, EXCEPT FOR ITEM 4 WHICH ";
180 PRINT "WILL ONLY"
190 PRINT "GIVE ONE
200 PRINT
210 E=0
220 INPUT "YOUR SELECTION"; Q
230 PRINT " ON ERROR TYPE '999' AND PRESS RETURN";
240 INPUT E : IF E=999 GOTO 210
250 IF Q>4 GOTO 40
260 IF Q=4 GOTO 2330
270 GOTO 280
280 CLS
290 Z=0
300 WIDTH 80
310 IF Q=2 THEN GOTO 1750 : IF Q=3 THEN GOTO 1820
320 IF Q=3 THEN GOTO 1820
330 E=0
340 INPUT "CUSTOMERS ORDER NO"; CO$
350 INPUT "DATE OF ORDER"; DO$
360 INPUT "INVOICE NO"; IN$
370 INPUT "DATE"; D$
380 INPUT "NUMBER OF ITEMS"; N
```

ONE PCB by Cemeche gives you ALL the following facilities for your ZX81: fully buffered 8K memory; 8 output — 13 input lines; 8-bit D/A + A/D conversion; wire-wrap area for your own circuits.

Quality fully documented pre-drilled silk-screened fibreglass board. PCB, circuit diagram and example software — £12.95 from Cemeche Ltd., 136 Cromwell Rd., London SW7. Access/Barclaycard accepted.

APPLE II DISK DRIVES. STOCK CLEARANCE SALE.

Limited quantity of Apple II disc drives (without controller) available at £199 each (£231.15 inclusive of U.K. carriage & VAT). For use with DOS3.2/3.3 and Pascal. 6 month warranty. First come first served. Access & Visa cards accepted.

TIMEDATA Ltd.
57 Swallowdale, Basildon, Essex.
Te. (0268) 411125

PROGRAMS

```
390 PRINT " ON ERROR TYPE '999' AND PRESS RETURN";
400 INPUT E : IF E=999 GOTO 330
410 FOR J=1 TO N
420 E=0
430 PRINT "DESCRIPTION, ITEM"J : INPUT DES$(J)
440 PRINT "QUANTITY, ITEM"J; : INPUT Q(J)
450 PRINT "UNIT PRICE, ITEM"J; : INPUT P(J)
460 PRINT " ON ERROR TYPE '999' AND PRESS RETURN";
470 INPUT E : IF E=999 GOTO 420
480 T(J)=P(J)*Q(J)
490 Z=Z+T(J)
500 NEXT
510 E=0
520 INPUT "TYPE IN ADDRESEES' NUMBER "; R
530 PRINT " ON ERROR TYPE '999' AND PRESS RETURN";
540 INPUT E : IF E=999 GOTO 510
550 R1=R
560 V1$="TEL XXXXX ******"
570 V$="VAT REG No *** **** **"
580 INPUT "DO YOU WISH TO PRINT Y OR N"; Y$
590 IF Q=1 THEN K=4
600 IF Y$<>"Y" GOTO 580
610 IF Q=2 OR Q=3 THEN K=2
620 FOR I=1 TO K : GOSUB 1230
630 PRINT CHR$(12)
640 SI$="SALES INVOICE"
650 IF I=3 OR I=4 THEN SI$="DELIVERY NOTE"
660 W=AD : GOSUB 2000
670 IF Q=2 THEN SI$="REMITTANCE ADVICE"
680 IF Q=3 THEN SI$="PURCHASE ORDER"
690 PRINT CHR$(14)CHR$(27)CHR$(69)SI$;
700 GOSUB 1710
710 GOSUB 2780
720 R=1
730 RESTORE
740 FOR J=1 TO D
750 READ P$
760 IF VAL(LEFT$(P$,2))=R THEN GOSUB 2610
770 NEXT
780 RESTORE
790 PRINT
800 PRINT TAB(48)V1$
810 PRINT "To"; TAB(48)V$
820 PRINT
830 GOSUB 1730
840 R=R1 : GOSUB 2100
850 IF I=1 OR I=2 THEN C$="INVOICE No "
860 IF Q=2 THEN C$=""
870 IF Q=3 THEN C$="ORDER No  "
880 IF I=3 OR I=4 THEN C$="DELIVERY NOTE No  "
890 IF Q=1 THEN T$="TAX POINT  "
900 IF Q=2 OR Q=3 THEN T$="DATE       "
910 IF Q=1 THEN CU$="CUSTOMERS ORDER No "
920 IF Q=2 THEN CU$="YOUR REFERENCE  "
930 IF Q=3 THEN CO$=""
940 IF Q=1 OR Q=2 THEN GOSUB 2310
950 PRINT : PRINT CU$; CHR$(32); CO$; TAB(48)C$; IN$
960 IF Q=1 THEN DT$="DATE OF ORDER      "
970 IF Q=2 OR Q=3 THEN DT$=""
980 PRINT DT$; CHR$(32)DO$; TAB(48)T$; CHR$(32);
990 PRINT D$
1000 PRINT : PRINT
1010 IF Q=2 GOTO 1400
1020 PRINT : PRINT
1030 IF Q=3 GOTO 1510
```

MICROMART

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.

TWIN 8" DISK DRIVES for NASCOM 2

OR OTHER COMPUTERS WITH SHUGART COMPATIBLE INTERFACE

£985.00

PLUS CARRIAGE & VAT

DEALER ENQUIRIES WELCOME

HOLTAIN ELECTRONICS LIMITED
CROSSWELL CRYMYCH DYFED
Tel: 02 3979656

NASCOM SOFTWARE

We offer the following quality software for NASCOM systems:

NASPAS – a 12K PASCAL compiler which produces Z80 code directly. i.e. no P-code. The compiler offers floating point and integer arithmetic, arrays, sets, strings and all major Pascal statements together with fully recursive functions and procedures with value and variable parameters. The object program runs very quickly. Price: **£35.00.**

NASMON – A new monitor for NASCOMs. Occupies **4K** and includes a sophisticated screen editor, a 'front panel' mode, blocked and buffered tape routines and powerful debugging commands. Price **£30.00 in EPROM**

BASI12K – a 12K BASIC interpreter offering 11 digit precision arithmetic, PRINT USING, IF...THEN... ELSE and other advanced features. Price: **£25.00**

NASGEN – a fast 3K assembler generating a full symbol table and with many assembler directives and commands. Price: **£15.00** on tape. **£25.00** in EPROM.

NASNEM – a 2½K disassembler which interfaces to NASCOM's front panel to produce single step disassembly Optionally it produces labels and o/p may be directed to a text buffer suitable for NASGEN. Price: **£10.00** on tape. **£15.00** in EPROM.

All the above software runs under **NASMON** except **NASPAS** which can run under **NASMON** or **NAS-SYS.**
All prices are fully inclusive.
FREE: a free **CHESS** program with every order of **NASMON.**

GEMINI DISK OWNERS: HISOFT offer a Z80 development package to run under CP/M 1.4 on the Gemini Floppy Disk System. Included in the package are:
– a powerful screen editor.
– a fast Z80 assembler with conditional assembly.
– a debugger based on the Front Panel on NASMON together with a labelling Z80 disassembler. All this for the inclusive price of: **£50!** Send for details NOW.
Full details may be obtained from:

HISOFT 60 HALLAM MOOR
LIDEN, SWINDON, WILTSHIRE

PASSAGE

4K ROM
PET ASSEMBLER PACKAGE
2/3/4/8000 SERIES

THE EASY ROUTE TO ASSEMBLY LANGUAGE PROGRAMMING FEATURES: ASSEMBLER/DISASSEMBLER/AUTO/RNUM/ DELETE/COPY/REPEAT KEY COMMANDS, SOURCE CODE SYNTAX CHECKING ON ENTRY. VERY FAST ASSEMBLY SPEEDS PLUS MUCH MORE. FULL DOCUMENTATION.

ONLY £30 INCLUSIVE
PHONE OR SEND SAE FOR FURTHER DETAILS
GEMINI ELECTRONICS
1 RADFORD AVE, KIDDERMINSTER
WORCS. TELE. KIDD 754484

ABERSOFT

CHESS 1.4 — 10 Levels Hardcopy
Change sides during game
10 pounds
Adventure. As near the Crowther
Version as is possible in 16K
10 Pounds
Reversl. M/C. Very fast.
6 pounds
Startrek. 6 pounds

All for the 16K ZX81

7, MAESAFALLEN, BOW ST.,
DYFED SY24 5BA

MICROMART

NASCOM 1&2

Quality Software

Extension Basic enhances Nascom ROM BASIC with 30 new keywords used as an integral part of BASIC. NO mucking about with USRs! EB can be used as a superb toolkit or an interpreter in its own right & includes: AUTO, DELETE, RENUMBER, FIND, TRACE, XREF, INKEY, LINE, WRAP, IF..THEN..ELSE, REPEAT..UNTIL etc. Extension Basic is relocatable and uses 4K. With 25 page manual, EB costs £15 or £25 in ROM:(2*2716 or 4*2708, state start address)

Q-DOS is a high performance file system for G805 drives. Q-DOS is comparable with CPM, but smaller (4K+4K buffer), faster (11 secs to save 32K), and allows use of existing programs. Q-DOS is £25 or £35 in ROM:(2*2716 or 4*2708, state start/buffer)

Missile Defence is our latest fast action,'arcade' type game. Fire ABMs from your 3 bases to shoot down ICBMs, cruise missiles & bombers, and defend the population. 2 player WW3 option. 16K mc: £8.

P&P FREE. NO VAT. FULL DOCUMENTATION. (Nascom 1s need Nas-Sys & Cottis B.) Send order, questions or a large SAE for our ILLUSTRATED CATALOGUE to:

LEVEL 9 COMPUTING

229 Hughenden Road, High Wycombe, Bucks. HP13 5PG

a must for your ZX81



Authors:
Ian Stewart & Robin Jones

The reader-friendly guide to getting started with the Sinclair ZX81. Includes an introduction to looping and branching, graphics, subroutines, and debugging techniques, with over 50 programs designed to run on the standard 1K memory.

110 pages — Paperback £4.95 ISBN 0 906812 17 8

Published by: Shiva Publishing Ltd. 4, Church Lane, Nantwich, Cheshire. CW5 5RQ. Telephone: (0270) 628272

Order from your bookseller or fill in the coupon

Please supply me with ..... copy/copies of PEEK,POKE,BYTE & RAM. For 1st Class Postage please add 25p

Price: £4.95 per copy. Cheques payable to Shiva Publishing Ltd.

NAME (Capitals please)_____

Full Postal address _____

_____

For payment by Access/American Express

Card No._____ Signature _____

SIMPLY WRITE!

FOR PET

Super Word Processor at a silly price!

All you'd expect for ten times the price, PLUS re-define keyboard, graphics printing, tape or disk files, old or new ROMs, PET or ASCII printers, AND 40 or 80 column (same tape or disk). We didn't believe it either! £37 tape (can save to disk); £40 disk (sample files etc). Manual £1 refundable. Specify drive.

and now . . .

'SIMPLY-FILE' database manager to match. Robust, versatile, self-calculating. £65 + VAT. Disk only. Specify drive.

LIGHT PEN + SOFTWARE plugs in. £22

PROGRAMMER'S TOOLKIT - 16/32K new ROM: makes programming less like work! £28 (£30 4.0).

ADVENTURE 1 & 2: authentic Scott Adams 24K classic games. Each £7 (both £13).

NEW! ASTEROIDS-81 Fast action £6

Add VAT to all prices please, but post/insurance included. Unconditional instant Refund Guarantee on hardware, also software if not up to description. Write for more details, more items, newsletter.

SIMPLE SOFTWARE LTD.
15 HAVELOCK ROAD
BRIGHTON SUSSEX BN1 6GL
(0273) 504879

We welcome Access

PROGRAMS

```
        :PRINT@Z+20,C$;
        :A$=""
        :K=K+1
        :GOTO18004
 18003 IFA$>CHR$(47)ANDA$<CHR$(57)ANDJ<1THENC$=C$+A$
        :PRINT@Z+20,C$;
        :A$=""
        :J=J+1
        :GOTO18004
 18010 IFK=1ANDJ=1THEN18012ELSE18004
 18012 PRINT@Z+20,C$;
        :A$=""
        :J=7
        :K=0
        :A$=LEFT$(C$,1)
        :B$=RIGHT$(C$,1)
        :Z=Z+64
 18014 IFA$<B$THENA=VAL(A$)
        :B=ASC(B$)-65ELSEA=VAL(B$)
        :B=ASC(A$)-65
 18016 A$=""
        :B=327+(3*B)
        :P=B+(64*A)
        :X=0
        :M=Z
 18018 IFPEEK(P+15360)<>42ANDPEEK(P+15360)<>191THENPRIN
       T@Z+64,"NO COUNTER";
        :FORT=0TO750
        :NEXT
        :RESTORE
        :T1=1000
        :GOTO 16000
 18019 IFPEEK(P+15360)=191THENPRINT@Z+64,"OFF BOARD";
        :FORT=0TO750
        :NEXT
        :RESTORE
        :T1=1000
        :GOTO16000
 18020 IFM<Z+(5*64)THENREADA$
        :PRINT@M,A$;
        :M=M+64
        :GOTO18020
 18022 A$=""
        :K=0
        :J=0
 18024 A$=INKEY$
        :IFA$=CHR$(91)THEN18026
 18025 IFA$>CHR$(10)ORA$<CHR$(8)THEN18024
 18026 IFA$=CHR$(91)ORA$=CHR$(9)ORA$=CHR$(8)ORA$=CHR$(1
       0)ORA$<>""THEN18027ELSE18024
 18027 IF ASC(A$)=91 THEN READ J ELSE READJ
        :FORK=8TOASC(A$)
        :READJ
        :NEXT
 18030 K=0
        :K=PEEK(P+J+15360)
        :K1=PEEK(P+(J/2)+15360)
 18032 IFK=191ORK1=191THENPRINT@M+64,"OFF BOARD MOVE";
        :RESTORE
        :T1=2000
        :FORT=0TO750
        :NEXT
        :GOTO16000
 18034 IFK=42THENPRINT@M+64,"INVALID MOVE";
        :RESTORE
        :T1=1000
        :FORT=0TO750
        :NEXTT
        :GOTO16000
 18036 IFK1<>42THENPRINT@M+64,"MUST JUMP A PIECE";
        :RESTORE
        :T1=2000
        :FORT=0TO750
        :NEXT
        :GOTO16000
 18038 PRINT@P,CHR$(32);
        :PRINT@P+J,CHR$(42);
        :PRINT@P+(J/2),CHR$(32);
        :N=N+1
```


SUSSEX

SUPERBRAIN FROM £1550*
NEW TELEVIDEO SYSTEMS
multi-user, multi-tasking and communications
RANGE OF CP/M SOFTWARE
PRINTERS FROM EPSOM TO SANDERS
WE ARE ALSO A WORD PROCESSING BUREAU
*Subject to $ Surcharge

THE ELECTRONIC OFFICE
Phoenix Buildings
Regency Road . 32 West Street
Brighton . Tel. (0273) 722248/9

SALE

Paper Tape Punches and Readers, Cassette Drives, Printers, Voltage Stabilisers, VDU'S, PDP8M, PDP8E, Memory and Modules. Send S.A.E. for list or call and see.

GILINSKY
15 THORNHILL PARK,
SUNDERLAND SR2 7LA
0783 44770

PROGRAMS

```
        :G=G+1
        :PRINT@66,"MOVE NO.";G;
        :PRINT@77,D$;
        :RESTORE
        :IFG<20THEN16000ELSES=15687
        :FORX1=0TO24STEP3
        :FORY1=0TO8
        :Q1=S+Y1*64+X1
18104 IFPEEK(Q1)=42THENQ2=Q2+1
        :IFPEEK(Q1-64)=42ORPEEK(Q1+64)=42ORPEEK(Q1-3)=42ORPEEK
        (Q1+3)=42THENGOTO18200
18106 NEXTY1,X1
        :IFQ1=1THENCLS
        :PRINT@130,"CONGRATULATIONS YOU HAVE SOLVED THE PROBLE
        M IN ";G;" MOVES"ELSECLS
        :PRINT@130,"HARD LUCK, NO MORE MOVES AND STILL NOT SOL
        VED THE PUZZLE"
18108 PRINT@130+128,"PRESS << SPACE-BAR >> TO RE-RUN"
18110 IFINKEY$<>" "THEN18110ELSERUN
18200 FORX=6TO128STEP122
        :IF(PEEK(Q1+X)=32ANDPEEK(Q1+X/2)=42)OR(PEEK(Q1-X)=32AN
        DPEEK(Q1-X/2)=42)THEND$=" YOU CAN STILL MOVE"
        :GOTO16000ELSENEXT
18210 GOTO18106
18500 DATA"OBJECT OF THE GAME IS","TO MOVE COUNTERS (*
        'S ",") IN VERTICAL JUMPS,OR ","HORIZONTAL JUMPS, OVE
R  ","ADJACENT COUNTERS INTO  ","A VACANT SPOT ONLY (A
        S  ","IN DRAUGHTS),UNTIL ONE  ","COUNTER ONLY IS LEFT
          "
18510 DATA"IN CENTRE SPOT,IN THE  ","LEAST NUMBER OF M
        OVES.  ","FROM KEYBOARD PRESS  ","KEYS REPRESENTING TH
E  ","GRID CO-ORD (A LETTER  ","& NUMBER COMBINATION)
         ","THAT YOU WISH TO MOVE  ","AND THE DIRECTION OF  "
18520 DATA"THE JUMP USING THE 4  ","KEYS MARKED WITH V
        ERT  ","& HORIZ ARROWS. ENTRY  ","WILL THEN BE TESTED
          ",-128,-6,6,128
```

ZX81 Graphplot

by N Angell

This runs in 1k and will plot a graph for a large variety of equations of the form y=2x; y=x² +4; y=1/x (y in terms of x). It requests the equation and then works out maximum values for x and y thereby dividing the screen appropriately. This done, it will plot the graph using the previously deduced volumes as limits so that the graph does not run over the edge of the screen. It is useful for handling negative values in plotting graphs. The number or range of x values can easily be altered — see lines 110 and 120 — according to the equation used or the accuracy of plotting required.

```
 10 REM "GRAPHPLOT"
 20 LET I = Ø
 30 LET H = I
 40 LET P = I
 50 LET M = I
 60 LET C = -1
 70 PRINT "INPUT EQUATION NOW"
 80 INPUT A$
 90 CLS
100 PRINT "Y = ";A$
```


ZX81 MINI INVADERS

ALL THE THRILLS OF ITS BIG BROTHER ON A 24x16 DISPLAY ALL IN 1K RAM. £4 for M/C CODE CASSETTE

16K CASSETTES

Games 1. ZX81 Invaders (M/C)
Games 2. Galaxy Wars/Tawil Battle/ Yahtzee
Games 3. Life/Dodgems/Othello

Sent by return on C12 computer cassette £3.95 each. SAE for Details.

EDMONDS, 29 Chestnut Ave. Grays, Essex

+CODA+ +CODA+ +CODA+

Z80 MICRO DATA SECURITY
For TRS80 I&III & Video Genie
Provides security for data
In Computer Storage.
In Printed Form.
During Transmission.
+CODA+ has a scrambler type code — decode programme in machine language and an input output section in Basic which can be user modified; to suit individual requirements.
For details send S.A.E. to
D.S. Brown.
17, Douglas Avenue,
Newcastle upon Tyne. NE3 4XD

+CODA+ +CODA+ +CODA+

MICROMART

ACORN - ATOM UTILITY ROM £29.90

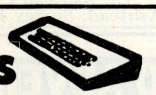
The Willow Software 4K Utility ROM simply plugs into the spare utility ROM socket in your Atom and provides 18 powerful new commands and facilities including: Renumber, Range delete, Find, Auto line numbers, Program compression, Disassembler, True keyboard scanning, Memory dump, Variable dump, Register dump, Keyboard sounder, and much more. The Utilities make the Atom easier to use, and provide a 'toolkit' of facilities for program development in both Basic and Assembler. The ROM Utilities are professionally written and fully tested. All standard Atom facilities are unaffected and no textspace memory is used.

Due to increased demand, we are now able to offer the Utility ROM with full instruction manual at th the reduced price of only £29.90 inclusive – post free. Send cheque/PO now for delivery by return of post, or write for further details. Official orders and Dealer enquiries welcome.

WILLOW SOFTWARE
PO BOX 6, CREDITON, DEVON EX17 1DL

ZX81 owners

Protos



Keyboard is here!

At last! A real, full size keyboard in a top quality case for your ZX 81.
Simply unscrew your ZX 81 printed circuit board from its black Sinclair case and plug into Protos.

FULLY BUILT £64.95 inc. VAT.

- More accurate, faster typing with bigger and **real** keys.
- 40 colour coded key-tops for easy reading
- Robust, 'big' computer construction
- PCB prepared for more add-ons to come
- New edge connector provided for Sinclair and other manufacturers' peripherals
- Key legends can be changed for future new ROM functions
- Sinclair PCB fully enclosed – and room for much more

If you feel you've outgrown your ZX 81 don't sell it for peanuts and move to another system. Add it to Protos and make your ZX 81 grow.

For details, large SAE, please. For orders add £2.50 post and packing. Cheques to 'Frome Computing'.

Protos Computer Systems
Frome Computing, 20 Ashtree Road, Frome, Somerset, BA11 2SF.

TRS-80 Compiler Work-Station

Model I and III, and Video Genie

Speed up your Basic Program Development

EDIT – Full-screen BASIC editor with floating cursor and auto repeat. 30 commands and functions let you find, change, insert, delete, replicate, copy, or move BASIC text at the character, string, line, or block level. Improved program visibility, fewer errors. £17.50

EXEC – Command-list processor. Speeds up and simplifies repetitive procedures such as power-up, file reorganisation. £9.50

Speed up your Basic Program Execution

ACCEL2 – Compiler for Model I and III BASIC (disk and non-disk). Execution speed-ups of 20-30 times for integer operations, 5-7 times for string handling, less if I/O limited. Very easy to use. Professionals note: Full instructions for selling derived code on tape or disk. No royalties! Ask for more details. £39.95

TSAVE – Writes compiled code to SYSTEM tape. Makes core-image backups of any machine-language programs. £4.95

Southern Software
PO Box 39, Eastleigh, Hants, England, SO5 5WQ

MICROMART

SOFTWARE
TRS-80 MODEL I
LII AND GENIE

CLUSTER CONFLICT is a one player space strategy wargame. A large fleet of Alien Ships has invaded Human Space, can you survive long enough to defeat them and time itself? Very tough wargame needing thought and planning. At the higher levels each game can provide many hours of battle. Gamesave is included to allow return to family life. A snip at £14.00, needs 16k.
SYSTORE is a m/code package that will save you money by producing copies of your expensive software. Will copy m/code and basic programs (with variables) and write any Ram block to tape. **SYSTORE** programs can be loaded in different memory locations to avoid clashing with residen residentprograms. Check your system with the **RAM DIAGNOSTIC** provided. No knowledge of M/Code needed, full instructions supplied. An essential addition to your library at £15.00, 16k and 4k versions.
GAMESAVER is a m/code program that loads below basic text for use with programs that need all 16k of memory, ie **DUNJONQUEST** series. Full instructions to allow **GAMESAVER S** to return as if they never left. Hellfire warriors can now return retaining Dunjon position, magical items, character, treasures etc, one continuous quest. Get the best from your complex games for only £5.00.
All items are double recorded on high quality cassettes and are guaranteed. All prices include VAT & postage, please state computer system. Send cheque/PO to

J.K. Gosden (Software — W),
13, Ashtead Common,
Ashtead, Surrey KT21 2ED.

TO ADVERTISE IN MICROMART
RING GORDON SLATER ON 631-1433

SILVERSOFT
16K ZX81 SOFTWARE
"STARTREK"
"SUPER-WUMPUS"
"GOLF"
"HOME-ACCOUNTS"
"GAMES PACK 1"
"GAMES PACK 2"
Prices £4.95 first cassette any two £8.95 inclusive
Send S.A.E. for details.
To SILVERSOFT (Dept PCW)
40 EMPRESS AV
ILFORD, ESSEX

BIG EARS
STOP GO! LEFT! RIGHT!
SPEECH INPUT FOR ANY COMPUTER

Hugely successful Speech Recognition System, complete with microphone, software and full instructions.
BUILT TESTED & GUARANTEED ONLY £49
PLEASE STATE COMPUTER: UK101, SUPERBOARD, NASCOM2, ZX80/81, PET, TRS80, MZ80K, APPLE II

ZX80 ZX81
MUSIC SYNTHESISER + 16 LINE CONTROL PORT

Play 3-part music, sound effects, drums etc. Full control of attack, decay and frequency. Input/Output lines provide control and monitor facility for Home Security, Robot Control, Model Railway, etc. etc. Works with or without 16K RAM.
Add keyboard to make a live performance polyphonic synthesiser! Full instructions/software included.
AMAZING VALUE AT ONLY £19.50 (KIT) £25.00 (BUILT)

COLOUR MODULATOR — RGB in, PAL/UHF out — KIT £12 BUILT £18
UK101/NASCOM COLOUR GRAPHICS — Inc. Modulator. Still the best selling system! — KIT £45 BUILT £60
Please add VAT at 15% to all prices.
Barclay/Access orders accepted by telephone
WILLIAM STUART SYSTEMS Ltd
Dower House, Billericay Road, Herongate, Brentwood, Essex CM13 3SD
Telephone: Brentwood (0277) 810244
BARCLAYCARD VISA

PROGRAMS

```
110 FOR X = -3 TO 3 STEP .5
120 IF X = Ø THEN LET X = .ØØ1
130 LET Y = VAL A$
140 IF C = -1 THEN GOTO 5ØØ
150 LET N = 4Ø / J
160 PLOT M , (Y + ABS I) * N
170 LET M = M + (6Ø / P)
180 PRINT INT Y
190 NEXT X
200 STOP
500 LET P = P + 1
510 IF Y> H THEN LET H = Y
520 IF Y< I THEN LET I = Y
530 LET J = Ø
540 IF SGN I = -1 THEN LET J = ABS I + H
550 IF SGN I = 1 THEN LET J = H - I
560 IF SGN I = Ø THEN LET J = H
570 NEXT X
580 LET C = Ø
590 GOTO 11Ø
```

MZ-80K Race Chase

by D Denholm

This game is very like the arcade game 'Space Chaser' (which you hardly ever see nowadays). The player attempts to score as many points as he can by hitting and obliterating dots placed around a maze-type track before he is hit by a homing missile rushing around in the opposite direction replacing dots as it goes. If used exactly as listed, the program is quite easy, but you can make it almost impossible by changing line 610 to simply GET PM$. This means that you have to press the controls exactly when you want to turn out of a lane otherwise you keep going in a straight line and have to hope for the best. It uses 4k in memory.

```
250 PRINT"■■■■■■■■■■■■■■■■RACE CHASE":PRINT"■■■■■■■■■■■■■■■■
```

PROGRAMS

```
390 FOR X=1 TO 1000:NEXT X
400 USR(60):POKE 4466,12:PRINTTAB(11):"     Get set ! "
410 FOR X=1 TO 1000:NEXT X
420 USR(60):POKE 4466,12:PRINTTAB(16):"  G  O  ! "
430 FOR X=1 TO 200:NEXT:USR(60):POKE 4466,12:PRINTTAB(15):"RACE CHASE"
440 REM
450 REM -+- START LOOP -+-
460 REM
470 REM +-+ MOVE MISSILE -+-
480 REM
490 POKE B1,0
500 B1=B1+B2
510 IF (PEEK(B1)=121)+(PEEK(B1)=120) THEN 720
520 IF(PEEK(B1+B3)=0)*(PEEK(B1+B2)=0)+(PEEK(B1-B3)=0)*(PEEK(B1+B2)=0)
    THEN 730
530 IF PEEK(B1)=68 THEN 810
540 IF B4<>0 THEN POKE B4,219:B4=0
550 IF PEEK(B1)=219 THEN B4=B1
560 POKE B1,106
570 REM
580 REM -+- MOVE ♦ YOU -+-
590 REM
600 POKE P1,0
610 GET PM$:PM$=CHR$(PEEK(17828))
620 IF (PM$="M")*(PEEK(P1-P3)=0)+(PM$="Z")*(PEEK(P1+P3)=0) THEN 910
630 P1=P1+P2
640 IF (PEEK(P1)=120)+(PEEK(P1)=121) THEN 800
650 IF PEEK(P1)=219 THEN NT=NT+10
660 IF NT>1400 THEN GOSUB 970:TN=NT+TN:NT=0
670 IF PEEK(P1)=106 THEN 810
680 POKE P1,68
690 GOTO 470
700 REM   --- ^^subroutines (???)^^

720 B1=B1-B2:SB=B2:B2=B3:B3=-SB:B1=B1+B2:GOTO 530
730 R=INT(RND(1)*5)+1:ON R GOTO 540,540,740,770,540
740 IF PEEK(B1+B3)<>0 THEN 540
750 POKE B1,0
760 B1=B1+B2+B3+B3:GOTO 540
770 IF PEEK(B1-B3)<>0 THEN 540
780 POKE B1,0
790 B1=B1+B2-B3-B3:GOTO 540
800 P1=P1-P2:SB=P2:P2=P3:P3=-SB:GOTO 630
810 REM     C R A S H !!!
820 POKE B1,107:POKE 4466,12:PRINTTAB(15):"  CRASH !   "
830 FOR X=1 TO 1000:NEXT
840 PRINT"■■■■■■■■■■■■■■YOU SCORED ":NT+TN:" POINTS BY HITTING"
850 PRINT"■■■■■":(NT+TN)/10:" TARGETS "
860 PRINT"■■■■■■■■WANT ANOTHER GO ?"
870 GET AG$:IF AG$="" THEN 870
880 IF AG$="Y" THEN CLR:RUN 340
890 IF ASC(AG$)<>78 THEN 870
900 END
910 IF PM$="M" THEN 930
920 P1=P1+P3+P3:GOTO 630
930 P1=P1-P3-P3:GOTO 630
940 REM ---+  RACE TRACK  +---
950 PRINT"■Z...in          RACE CHASE        M...out"
960 PRINT"■■■■■■■■■■■■■■
```

MICROMART

SPECIAL PCW READERS OFFER

THE NEW LOOK GREEN SCREEN SHARP MZ 80K
48K MEMORY
£399.00 (VAT INCLUDED)

Sumlock Manchester
Royal London House
198 Deansgate
Manchester M3 3WE
Tel: 061 834 4233

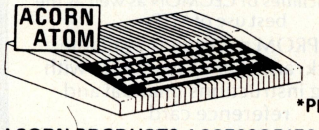
DISKS

Memorex box of ten 5¼" single sided, single density £16.80 plus £1.10 post & packing + V.A.T.

Apple II, Apple III information analyst. A.B.M. calculators and cash registers. Please telephone to discuss your requirements.

Barclaycard/Access cardholders may phone or send your orders & quote your card number.

Electronic Office Supplies Ltd.,
1 Shute End,
Wokingham
Tel: 0734-782288



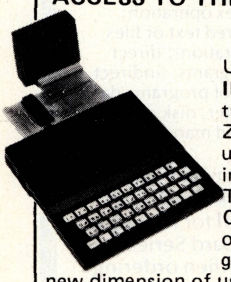
From £120* Ex-stock
***Plus 15% VAT**

ACORN PRODUCTS-ACCESSORIES-SOFTWARE
REPAIR SERVICE AND SPARES
ECONET COMMUNICATIONS INTERFACE
Please call or write for more information, lists, order forms etc.
2114L R.A.M. £1.25 each
D.A. Computers Ltd. 184 London Road

LEICESTER

ZX81 OWNERS

ACCESS TO THE OUTSIDE WORLD



Using our programmable **INPUT/OUTPUT** controller based on the Z80APIO you can use upto 16 programmable input/output lines, all T.T.L. compatible. Control of port is carried out from within programmes giving a whole new dimension of uses for your ZX81 computer. The port can be used **WITH** or **WITHOUT** the 16K **RAM PACK & PRINTER.** Available in kit form or assembled, & comes complete with instructions, a pack of software notes and circuit ideas.
£10.99 IN KIT FORM or £13.99 assembled (add 50p post & packing and 15% VAT);

Snap on Analogue card and relay board available shortly. Send S.A.E. for details.

THURNALL (ELECTRONICS) ENG.
DEPT P. 95 LIVERPOOL RD.,
CADISHEAD, MANCHESTER.
M30 5BG TEL: 061-775 4461

BARCLAYCARD VISA

PROGRAMS

mentioned under their TV's; there is a little evidence of this, but it's rather scarce. I realise that there's a slight problem with printers. If you either haven't got a printer or can't fit one to your machine then a carefully typed or, at last resort, hand-printed listing will be quite acceptable.

TRS-80 Solitaire

by D Ensor

I'm including this program not so much for the game it plays as for the way the whole thing is presented. Lines 10-1030 are a subroutine for displaying the author's name and the title in decorative lettering on the screen for about five seconds. This is not unusual, but what makes this one stand out is that these line are deleted from memory the rest of the program is run — see line 1030. This would be useful for anyone who wanted to give a program trimmings and save memory at the same time. It means that you have to re-execute the program at line 1030 and the program tells you this. Although something like this could possibly be done better using assembler language, it is making good use of Basic in spite of the fact that the program is temporarily halted by using it. Good use is also made of PRINT AT commands. Solitaire needs 5k and TRS-80 model I level II to run. Finally, advice is provided during play on the number of moves made at any stage in the game and the player can find out if no more moves or a win are possible.

```
10 DATA200,191,329,176,342,150,223,191,281,191,273,131
   ,201,131,593,176,537,140,542,140,613,159,615,191,463,1
   31,465,131,204,189,276,175,352,144,284,131,337,176,332
   ,159,340,130,534,191,528,191,605,179,609,175,551,191,5
   53,140,595,176,334,175,339
20 DATA144,349,176,343,129,264,191,286,131,347,191,535
   ,140,607,191,611,176,548,140,555,183,546,140,530,140,3
   35,176,274,189,271,131,202,131,279,159,351,191,330,176
   ,602,191,549,182,604,179,464,191,466,131,554,140,540,1
   88,348,176,345,191,277,144
30 DATA270,190,328,191,341,169,285,131,538,188,596,176
   ,545,184,598,191,547,140,592,191,552,184,272,131,268,1
   91,278,160,283,191,331,176,338,191,350,176,606,179,467
   ,131,610,176,536,140,543,140,529,140,594,176,203,131,3
   36,176,287,191,541,140,612
40 DATA176
1000 CLS
     :FORX=0TO127
     :SET(X,0)
     :SET(X,47)
     :NEXT
     :FORX=0TO47
     :SET(0,X)
     :SET(127,X)
     :NEXT
     :FORX=0TO88
     :READA,B
     :PRINT@A-134,CHR$(B);
     :NEXT
     :FORX=596TO852STEP64
     :PRINT@X,STRING$(30,42);
     :NEXT
     :PRINT@670," PRESENTS ";
     :PRINT@798," SOLITAIRE ";
     :FORT=0TO1000
     :NEXT
     :CLS
1010 PRINT@21,CHR$(23);S$;
     :PRINT@128,"PRESS << ENTER >> TO CONTINUE";
1020 D$=INKEY$
     :IFD$=""ORD$=CHR$(1)1020
1030 IFD$<>CHR$(13)S$="I SAID ,"
     :RESTORE
     :GOTO1000ELSECLS
     :PRINT@0,CHR$(28);
     :PRINT@390,"AFTER PROGRAM DELETES HEADINGS";
     :PRINT@518,"AND  '  >  '  SYMBOL APPEARS ,";
     :PRINT@646,"THEN TYPE  R U N  << ENTER >>";
     :PRINT
```


CSS CHRISALID SYSTEMS AND SOFTWARE
TRS80/GENIE SOFTWARE:

POOLPLAN — the ultimate in football analysis and pools prediction. YOU set the forecast parameters, based on your own results analysis. Keeps the league records. Works for Aussie and amateur teams. Min system: 16k+printer. 2 tapes and manual: **£29.50.**

FREEZER MANAGER — a must for all hoteliers, caterers, schools and the large family. Can save ten times its cost, avoiding "past-date" food. Tape and manual: **£15.75.**

LUNAR LANDER — but with a big difference! Psuedo real-time and very exciting graphics. Tape: **£5.50.**

BUSINESS AND HOBBY SOFTWARE
GENIE DEALERS - ALL ACCESSORIES ETC.

Cheques/PO's to: "Chrisalid",
15, Kestrel Close, BERKHAMSTED,
HP4 2HY.

NASCOM 1 & 2

Micro Power — the magazine devoted to NASCOM

Articles and series articles on hardware and software. News from clubs, letters, points of view, questions and answers.

Now available:	
Issues 1 to 4	**£3.95**
Europe	**£6.60**
other overseas	**£7.90**
1982 subscription (6 issues)	**£5.90**
Europe	**£9.80**
other overseas	**£11.80**

PROGRAM POWER
5 Wensley Road, Leeds LS7 2LX
Tel: (0532) 683186

PROGRAMS

```
        :PRINT
        :PRINT
        :PRINT
        :DELETE10-1030
 10500 CLEAR105
        :DEFINTA-Z
        :CLS
        :PRINT@0,"============= SOLITAIRE ================ D.F.
        ENSOR == 01/01/82 =="
 11000 FORX=0TO38
        :A$=A$+CHR$(191)
        :NEXT
 11500 FORX=0TO12
        :PRINT@192+(X*64),A$;
        :NEXT
 12000 A$=""
 12500 FORX=0TO3
        :A$=A$+CHR$(32)+CHR$(X+65)+CHR$(32)
        :NEXT
 13000 PRINT@198,A$;
        :PRINT@966,A$;
        :A$=""
 13500 FORX=0TO8
        :L=320+(X*64)
        :A$=CHR$(32)+STR$(X)+CHR$(32)
        :PRINT@L,A$;
        :PRINT@L+36,A$;
        :NEXTX
        :A$=""
 14000 FORX=0TO2
        :A$=A$+CHR$(32)+CHR$(42)+CHR$(32)
        :NEXT
 14500 FORX=0TO8
        :PRINT@335+(X*64),A$;
        :NEXT
 15000 FORX=0TO2
        :L=518+X*64
        :PRINT@L,A$;
        :PRINT@L+18,A$;
        :NEXT
 15500 PRINT@595,CHR$(32);
        :A$=""
        :L=0
        :X=0
        :PRINT@128,"GRID BOARD";
        :PRINT@104,"RULES";
        :T1=3000
 16000 X=169
        :N=808
        :Z=0
        :K=0
        :J=0
 16250 FORQ=169TO1001STEP64
        :PRINT@Q,CHR$(214);
        :NEXT
        :Q=0
 16500 IFX<NTHENREADA$
        :PRINT@X,A$;
        :X=X+64
        :GOTO16500
 17000 IF X>808 AND N=808 THEN FORT=0TOT1
        :NEXT
 17500 IFN<>424+64THENN=424+64
        :X=169
        :T1=100
        :GOTO16500
 17550 IFN=424+64ANDX<808THENA$=CHR$(215)
        :PRINT@X,A$;
        :X=X+64
        :GOTO17550
 18000 Z=N+65
        :PRINT@N+65,"COUNTER COORDINATES=    ";
 18002 X=0
        :A$=""
        :C$=""
 18004 A$=INKEY$
        :IFK>10RJ>1THEN13002
 18006 IFA$>CHR$(64)ANDA$<CHR$(74)ANDK<1THENC$=C$+A$
```


TRS 80 VIDEO GENIE SOFTWARE

Games and educational software at a fraction of the usual prices. Send a large s.a.e. for comprehensive lists.
J. Wilson (Dept. PCW), 9 Cotswold Terrace, Chipping Norton, Oxon.

The Time Machine™
FOR YOUR
apple®

£77.95 + VAT **REAL TIME CLOCK AND CALENDAR**

Introducing an intelligent real time clock and calendar peripheral for the Apple II:

- Read and set time routines in 2K EPROM driver.
- Counts seconds, minutes, hours, days, days of week, month and years.
- Six date formats including: 12-JUN-1981
- Two interrupt programs in EPROM.
- Nicad battery and applications diskette.
- Basic, Pascal, and Machine language compatable.

PROTOCOL COMPUTER PRODUCTS 01-460 2580
Apart 3, 114 Widmore Road, Bromley, Kent BR1 3BE

MICROMART

MEMOREX 5¼" DISCS

100% certified.
soft sectored.-Box of ten.

SS SD	£16.50
SS DD	£18.00
DS DD	£20.00

OTHER TYPES AVAILABLE.
Please add 15% VAT to all prices.
Plus £1.00 per box post and packing

FORTE DATA SYSTEMS LTD.,
5 DRYDEN STREET,
W.C.2 E9NW
Tel: 01-240 2430 Ext. 71

ATOM — TRS80 — GENIE
ACCESSORIES AND SOFTWARE

PHOTOPEN — a British made Light Pen for the TRS80 Models I & III and the Genie. Complete with four excellent programs on cassette, full operating instructions, programming hints and a 9 volt battery. Buy the best — 400 users can't be wrong! £14.99 + 50p p&p

TANDYSTIK — at last a joystick controller for the Model I TRS80! Complete with a cassette of three programs and full instructions and programming hints. Compatible with Big Five machine code games. £26.50 + £1.00 p&p

ATOMSTIK — a joystick controller for the Atom. Plugs into expansion connector. Needs VIA and Integer Basic only. Complete with cassette of two programs and full instructions and programming hints. £26.00 + £1.00 p&p

SOFTSTIK — a machine code utility for use with the Tandystik. Allows existing software to utilise the joystick without any modifications. State memory size when ordering. £11.00 + 50p p&p

MICROPATH — Critical Path Analysis for the Model I & III TRS80 and Genie. Works with cassette or disk systems and supports printers output. A very powerful program. Don't be fooled by the price! £1.50 extra if supplied on disk. £13.50 + 50p p&p

VISIFORM — produces a detailed harcopy listing of Visicalc model structure on model I TRS80. Invaluable for developing complex models! Supplied on disk. £15.00 + 50p p&p

ACCESS TELEPHONE ORDERS ACCEPTED — RING ANYTIME

CSL MICRODATA
4 Greenbarn Way, Blackrod, Lancashire BL6 5TA
(0204 694265)

TO ADVERTISE IN MICROMART
RING GORDON SLATER
01-631 1433

DISCS ETC

VERBATIM double-density 40-track	£18.00
VERBATIM double-density 77-track	£25.00
ACCUTRACK double-density 40-track	£16.00
Ribbons for CBM 3022/Epson TX80	3 for £ 4.90
Cartridge for CBM 4022/Epson MX80	£ 8.50
Refill for above	3 for £ 9.00
Disk library cases (hold 10 disks)	£ 2.75
Disk storage pages (hold 2 disks)	£ 0.50
Dustcover for small screen PET/CBM	£ 4.50
Dustcover for large screen PET/CBM	£ 5.75
Dustcover for 3022/4022/3040/4040/8050	£ 3.50
PET to IEEE 2-metre cable	£32.00
IEEE to IEEE 2-metre cable	£32.00
Perspex green screen for PET	£ 7.50
As above, for large screen models	£ 9.50
Cassette cleaner & demagnetiser kit	£ 7.50
Basic 4.00 Commodore Users Manual	£ 5.00
Power on/error indicator 3040/4040	£17.50
PET REVEALED or LIBRARY OF SUBROUTINES	£10.00
PET GRAPHICS (book) £12.00 (disk)	£10.00
PETMASTER SUPERCHIP (state model)	£45.00
ARROW fast loading chip (state model)	£30.00

PET GAMES

SUPER GLOOPER, METEORITES 8k	each	£ 8.00
ASTEROIDS, SPACE RESCUE 8k	each	£ 8.00
HITCH-HIKERS GUIDE TO THE GALAXY 32k		£16.00
CRACKS OF DOOM (Lord of the Rings) 32k		£16.00
HALLS OF DEATH 16k		£14.00

ADD 15% VAT (except books) — POST FREE IN UK

SUPERSOFT
Dept. P3, 10-14 Canning Road
Wealdstone, Harrow, Middlesex
Tel: 01-861 1166

MICROMART

PET HI-RES

The new HR-40 board offers —

- 8k of its own RAM
- 64,000 individually addressable points
- 320 by 200 resolution
- machine code utility software in EPROM
- existing PET features unaffected
- easily fitted, no soldering necessary
- low price of £149 plus VAT

There's no limit to what you can do when you have the HR-40 board fitted to your PET. The single dot resolution allows you to draw smooth curves, accurate diagrams and much more. If you've got one of the new 4000 machines with a 12 inch screen then you'll need the HR-40B, but it won't cost a penny more.

The HR-80 board for the 8032 is now available at the same low price £149.00 plus V.A.T.

SUPERSOFT are PET/CBM software specialists. Other top quality products include MIKRO, the assembler in a chip (£50) and SUPERCHIP, the biggest selling British chip (£45).

Our catalogue is available free to PET owners.

SUPERSOFT

Dept. P3, 10-14 Canning Road,
Wealdstone, Harrow, Middlesex.
Tel: 01-861 1166

ZX80 & ZX81
16K RAM & I.O. BOARD

Gives 16K of RAM and 3 x 8 bit programable I.O. ports, complete.

Uncased £53.00
4116-4 ..... £ 0.85
23+23 edge conn ..... £ 3.20

S.A.E. with enquiries

And also suitable for Nascom

All including P&P
Access & Barclaycard (+6%)

Ground Control
Alfreda Ave, Hullbridge,
Essex SS5 6LT
Telephone Southend
(0702) 230 324

'Second Hand Stock Clearout'

Protechnic computers Ltd.
264 Newmarket Road,
Cambridge, CB5 8JR.
Tel. 0223—314855

Texas 810 Printer	£650
Two CT-64 visual display units	£250
Two Southwest Technical Products 6088 inc 40K	£550
Two SWTPC DMAF-1A 8" Dual Disc Drive	£450

Plus VAT

GREEN SCREEN
C24 Filter Sheet

Reduce glare, particularly for reverse video e.g. ZX 81

Improve legibility

13" x 12" (up to 16" screen) £ 3:00
18" x 23" (up to 26" screen) £ 5:00
p&p vat inc.

trim to size, fixers supplied

Mesotec
204 Harrogate Road
Leeds LS7 4QD
send sae for sample

PROGRAMS

```
1040 PRINT TAB(9)"DESCRIPTION", TAB(41)"QTY";
1050 IF I=3 OR I=4 THEN GOTO 1070
1060 PRINT TAB(49)"UNIT PR"; TAB(65)"TOTAL"
1070 PRINT : PRINT
1080 FOR J=1 TO N
1090 W=P(J) : GOSUB 2000
1100 IF I=3 OR I=4 THEN GOTO 1140
1110 PRINT DES$(J); TAB(41)Q(J); TAB(56-LEN(W$))W$;
1120 W=T(J) : GOSUB 2000
1130 GOTO 1150
1140 PRINT DES$(J); TAB(41); Q(J)
1150 IF I=3 OR I=4 THEN GOTO 1170
1160 PRINT TAB(71-LEN(W$)); W$
1170 PRINT : NEXT
1180 IF I=3 OR I=4 GOTO 1350
1190 FOR F=1 TO 15 : PRINT : NEXT
1200 W=Z : GOSUB 2000
1210 PRINT TAB(46); "NET"; TAB(71-LEN(W$))"£"; W$
1220 PRINT : GOTO 1260
1230 DOKE 3189,1921
1240 DOKE 3187,1918
1250 RETURN
1260 NV=INT((Z*.15)*100+.5)/100 : W=NV : GOSUB 2000
1270 PRINT TAB(46); "VAT @ 15%"; TAB(71-LEN(W$))"£"; W$
1280 AD=NV+Z
1290 W=AD : GOSUB 2000
1300 PRINT
1310 PRINT TAB(46); "AMOUNT DUE"; TAB(71-LEN(W$))"£"; W$
1320 PRINT "          ";
1330 PRINT : PRINT : PRINT : PRINT : PRINT "
     PAYMENT DUE WITHIN 30 DAYS OF ";
1340 PRINT "INVOICE DATE"
1350 GOSUB 1460
1360 NEXT
1370 GOSUB 1230 : FOR X=1 TO 32 : PRINT : NEXT
1380 GOSUB 1460
1390 END
1400 PRINT : PRINT : PRINT
1410 W=CHQ : GOSUB 2000
1420 PRINT "Please find enclosed our cheque value ";
1430 PRINT "                          £"W$
1440 GOSUB 1460
1450 GOTO 1360
1460 DOKE 3189,1922
1470 DOKE 3187,1919
1480 RETURN
1490 PRINT TAB(48)
1500 RETURN
1510 PRINT TAB(9)"QTY"; TAB(20)"DESCRIPTION"
1520 PRINT
1530 FOR J=1 TO N
1540 PRINT TAB(9)Q(J); TAB(18)DES$(J)
1550 NEXT
1560 FOR X=1 TO 10-N : PRINT : NEXT
1570 PRINT TAB(9)RE$
1580 PRINT : PRINT
1590 PRINT TAB(9)"DELIVERY REQUIRED     ";
1600 PRINT DR$
1610 FOR X=1 TO 5 : PRINT : NEXT
1620 GOSUB 1490
1630 PRINT "Signed
1640 GOSUB 1490
1650 PRINT "For PONGO LTD.
1660 PRINT : PRINT : PRINT : PRINT
1670 GOSUB 1490
```


ARTIC COMPUTING

ON THE MOVE WITH ZX SOFTWARE

PROGRAMS FOR THE ZX 80/81 INCLUDING:
ZX CHESS - Machine Code Program £10-00
ADVENTURES - From £7-00 To £9-00
ZX BUG - Machine Code Debugging £7-00
EDUCATIONAL GAMES For Children.

AND MANY OTHERS

FOR A CATALOGUE GIVING DETAILS OF ALL PROGRAMS PLEASE SEND A S.A.E. TO:
ARTIC COMPUTING,
396, JAMES RECKITT AVENUE,
HULL, HU80JA.

ZX 81 16K RAM EXPANSION PACK

Quite simply good value for money at £34.50 including VAT plus £1.50 p+p. Junior maths pack one to run on 1K Ram 2 x 81. Five helpful programmes on cassette for £5.75 inclusive.

CEL Customised Electronics Limited,
Winker Green Mills, Stanningley Road,
Armley, Leeds, LS12 3BB —
Telephone 0532 792332.
155 Marton Road, Middlesbrough,
Cleveland TS4 2EN
Telephone 0642 247727.

'VIC 20 — RAM Expansion Pack — prices on application.

PROGRAMS

```
1680 PRINT "..................
1690 GOSUB 1460
1700 GOTO 1360
1710 PRINT TAB(25)
1720 RETURN
1730 PRINT TAB(7);
1740 RETURN
1750 E=0
1760 INPUT "CUSTOMERS REFERENCE"; CO$
1770 INPUT "DATE OF REMITTANCE ADVICE"; D$
1780 INPUT "CHEQUE VALUE"; CHQ
1790 PRINT " ON ERROR TYPE '999' AND PRESS RETURN";
1800 INPUT E : IF E=999 GOTO 1750
1810 GOTO 520
1820 E=0
1830 INPUT "DATE OF ORDER"; D$
1840 PRINT " ON ERROR TYPE '999' AND PRESS RETURN";
1850 INPUT E : IF E=999 THEN GOTO 1820
1860 INPUT "ORDER NUMBER"; IN$
1870 INPUT " NUMBER OF ITEMS"; N
1880 PRINT " ON ERROR TYPE '999' AND PRESS RETURN";
1890 INPUT E : IF E=999 GOTO 1820
1900 FOR J=1 TO N
1910 E=0
1920 PRINT "DESCRIPTION ITEM"J; : INPUT DES$(J)
1930 PRINT "QUANTITY ITEM"J; : INPUT Q(J)
1940 NEXT
1950 PRINT "REMARKS"; : INPUT RE$
1960 INPUT "DELIVERY REQUIRED"; DR$
1970 PRINT " ON ERROR TYPE '999' AND PRESS RETURN";
1980 INPUT E : IF E=999 GOTO 1910
1990 GOTO 520
2000 W$=STR$(W)
2010 L=LEN(W$)-2
2020 IF L=0 THEN 2060
2030 IF MID$(W$,L,1)="." THEN 2090
2040 L=L+1
2050 IF MID$(W$,L,1)="." THEN 2080
2060 W$=W$+".00"
2070 GOTO 2090
2080 W$=W$+"0"
2090 RETURN
2100 FOR J=1 TO D
2110 READ P$
2120 IF VAL(LEFT$(P$,2))=R THEN GOSUB 2650
2130 NEXT
2140 RETURN
2160 GOSUB 1730
2170 PRINT CU$(1); TAB(48)V1$
2180 GOSUB 1730
2190 PRINT CU$(2), TAB(48)V$
2200 GOSUB 1730
2210 PRINT CU$(3)
2220 GOSUB 1730
2230 IF I=1 OR I=2 THEN C$="INVOICE No"
2240 IF I=3 OR I=4 THEN C$="DELIVERY NOTE No"
2250 PRINT CU$(4), TAB(48)C$; IN
2260 GOSUB 1730
2270 PRINT CU$(5), TAB(48)"TAX POINT"; CHR$(32); D$
2290 PRINT TAB(48)
2300 RETURN
2310 PRINT : PRINT
2320 RETURN
2330 CLS : PRINT " DO YOU WISH TO PRINT Y OR N";
2340 INPUT Y$
2350 IF Y$<>"Y" GOTO 2370
```


PET UPGRADE

We can upgrade your large keyboard PET at a fraction of the 'New Price' difference.

8K to 16K £44.00
16K to 32K . . . . . from £56.00
8K to 32K £69.00

NO EXTRA CHARGE

If expansion area drilled with quarter inch holes . . .

All new RAMs fitted with sockets
Fast 2 hours while you wait service.

Tel: Mick Bignell
01-953 8385.

ZX81 M.A.B.S.

MULTIPLE ACCOUNT BUDGET SYSTEM
Crammed into 16k – an 80 account financial database with update, search, merge and listing facilities backed up by an analytic package with forward projection of financial trends.
Cassette £9.50

ELEPHANT AND CASTLE
A dynamic graphics adventure game. Can you find the treasure and the castle, avoid the hazards of the jungle, especially the charging elephant, solve a few problems on the way and score enough points to get your name in the top player position? Toroidal endless array, midgame saves, action replays etc.
Cassette £5
£13 for the two

DOCIMODUS
161 Walmersley Road, Bury, Lancashire BL9 5DE

MICROMART

A+G COMPUTERWARE

P.O. BOX 34, CHEADLE, SHESHIRE.SK8 4PT TEL: 061 428 2014

TOP QUALITY WABASH DISKS
5¼" SSSD PER BOX 10 – £20.50
5¼" DSDD PER BOX 10 – £30.50
FREE LIBRARY BOX WITH EVERY TEN DISKS
FREE POSTAGE AND PACKING

TEAC 5¼" FLOPPY DISK DRIVES
DIRECTLY COMPATIBLE WITH TRS-80 I & III
AND VIDEO GENIE EXPANSION INTERFACES
CS50A SINGLE DRIVE SS 40 TRACK – £216 EACH
CD50A TWIN DRIVE SS 40 TRACK – £400 EACH
POSTAGE AND PACKING EXTRA – £12
TWIN CABLE CONNECTOR –£15.50 EACH

NEW!
THE AMAZIN CX80 COLOUR PRINTER!!!
SOFTWARE DRIVEN!!! SEVEN COLOURS!!!***
GREAT GRAPHICS!!!*** INTERFACES TRS-80, APPLE
RS232*** SWITCHABLE BAUD RATE!!!
ONLY £875 + £18 FOR DELIVERY BY CARRIER
SEND S.A.E. FOR FREE BROCHURE AND PRICE LISTS.
PLEASE ADD V.A.T. TO ALL TOTALS

SHARP MZ80K HARDWARE

ADC 8 BIT, 16 CHANNEL X11 £85.00
add joysticks, Monitor temperatures etc.
APROM PROGRAMMER 2716/2732/
2764 X10 £89.00
Read, copy, verify
I/O 8 RELAY O/P 8A 240V X08
+ 12 opto I/P 2-50 AC/DC £98.00
BI-DIRECTIONAL SERIAL I/O
X05 £99.00
RS 232 or TTL with "dumb terminal"
S/ware
EXTENDER BOARD X02 £19.00
Converts to 0.1 inch for your breadboards

Available soon:–
Memory storage board 32K X04 £P.O.A
Keep programs in Eprom, save loading from tape
All board are supplied fully assembled, tested & with software.
X series bords plug directly into MZ80 I/O unit.
Y series boards available soon to plug|direct onto MZ80K 50 way connecter.
Post & packing free. Please Add 15%
VAT S.A.E. for details

PETERSON ELECTRONICS LTD.,
ACADEMY STREET, FORFAR,
ANGUS DD8 2HA. Phone 0307 62591

MONOPOLY

The computer will challenge you or the whole family at the worlds most successful board game, Monopoly. No need to enter your skill rating at the beginning, the program features an unique system whereby the computer detects who is the best player and adjust itself accordingly. The better you play so will the computer. Another feature for those long exciting marathons of the game but not the time to finish them, is that the game can be saved" on tape to be continued at another time. **On tape for the Video Genie and TRS-80 Model I & III Level 2 16k £9.95inc.**

COMPUTICS MICROSOFT
1 BELL LANE
WHEATLEY
OXFORD OX9 1XY

ZX81 SOFTWARE

Cassette 1:
DATABASE For serious users. Menu driven program to create, update, search and delete your own personal database. Full documentation and demonstration cassette. £10

Cassette 2:
BANK ACCOUNT Record all your income/expenditure and use for home or office budgeting.
TELEPHONE DIRECTORY Set up your own personal directory of names addresses and telephone numbers, including extension numbers.

Cassette 3: OTHELLO/MASTERCODE

Cassette 4: BREAKOUT

Cassettes 2–4 all £4 each.

Send SAE for full details of these and other programs.

J PURVES 12 Stobhill Road
Gorebridge Midlothian EH23 4PL

MICROMART

SHARP MZ80K
BASIC PLUS

Uses no extra memory, adds many new commands. Two versions are supplied on cassette, the second is compatible with 'Basic Extensions'. ERROR pinpoints your mistakes and displays the faulty line, with cursor positioned ready for fast correction Use your graphics keys as a NUMERIC PAD, or speed entry of Basic words with SINGLE-KEY. Unlike inferior versions, full graphics are still available as required. AUTO line numbering speeds program entry PAUSE controls your line scrolling! LINK the programs together after debugging. REPEAT on all keys as required. All these commands can be turned on/off at will, and can be used in program lines too!
Both versions are supplied on cassette, complete with a set of printed labels and extensive documentation, either from selected Sharp dealers, or direct by sending

£13.80 (inclusive) to: **C.P. Electronics**

51, Fairholme Road, Withington, Manchester M20 9SA

TRS80 & GENIE OWNERS STILL PAYING HIGH SOFTWARE PRICES? THEN CLOAD MAGAZINE IS FOR YOU!!

THE AMERICAN MONTHLY PROGRAM TAPE OF AT LEAST SIX PROGRAMS. GAMES, ADVENTURES, ARCADE GAMES, UTILITIES, TUTORIALS, AND MUCH MORE.
SOME PROGRAMS FOR DISK USERS
ALL PROGRAMS MODEL 1 MOST FOR MODEL 3. MANY BACK ISSUES AVAILABLE, PLUS MANY FOR LEVEL 1
TRIAL CASSETTE £4.95
SIX MONTH SUBSCRIPTION £25.00
TWELVE MONTH SUBSCRIPTION £47.50
SEND FOR LIST OF BACK ISSUES OVER 40 AVAILABLE.
COLOUR COMPUTER OWNERS SEND FOR DETAILS OF CHROMASETTE MAGAZINE

MICRODEAL DEAL HOUSE
LUXULYAN
BODMIN
TEL: 0726 850821 CORNWALL PL30 5EF

GAMER

SHARP MZ80K (48K)	£347 + V.A.T.
SHARP MZ80B	P.O.A.
ATARI 400 (16K)	£285 + VAT
ATARI 800 (16K)	£525 + VAT
TEXAS TI99/4	£250 + VAT
VIDEO GENIE I (16K)	£289 + VAT
ATOM (assembled)	£150 + VAT

+ software, books, chess computers
+ Intellivision + Ace TV games
+ SF, Fantasy & Wargames

BRIGHTON 24, GLOUCESTER RD
TEL 0273 698424

SHARP MZ80K

1. **GALAXY** – 6000-48K – SUPER SPACE AGE GAME.
   Destroy the alien enemy before they get you. Protect yourself from their five fold attack with lazer beams, anti-matter pods, photon torpedoes, deflector shields, warp drive and hyperspace. Real time graphics – £6.00.
2. **LANDER** – Any MZ80K – Land your continuously moving ship on the landing pad without hitting the mines. Two erros and you are blown up. £6.00.
3. **DESTROY** – Any MZ80K – Blow up the devious alien spaceship before it wipes you out – frustrating – £3.00.
4. **DAMBUSTERS** – Any MZ80K – Fabulous computer version of Barnes Wallace's famous bouncing bomb – see how good a pilot you would have been for him and destroy the dam – £3.00.

ALL THREE GAMES TOGETHER – £12.00
2, 3 and 4 together – £8.00

C. NEEDHAM,
469 STOCKPORT ROAD,
DENTON,
LANCS M34 1EG

PROGRAMS

```
2360 GOSUB 1230
2370 GOSUB 2780
2380 FOR J=1 TO D
2390 M=VAL(LEFT$(P$,2))
2400 READ P$
2410 IF VAL(LEFT$(P$,2))=M+1 THEN PRINT
2420 PRINT MID$(P$,3)
2430 NEXT
2440 GOSUB 1460
2450 END
2610 Q$=RIGHT$(P$,LEN(P$)-2)
2620 PRINT CHR$(14)CHR$(27)CHR$(69)Q$
2630 GOSUB 2290
2640 RETURN
2650 Q$=RIGHT$(P$,(LEN(P$)-2))
2660 PRINT Q$
2670 GOSUB 1730
2680 RETURN
2690 SCREEN 1,4
2700 PRINT "              ****************************
2710 PRINT "              *   BUSINESS DOCUMENTS     *
2720 PRINT "              *          BY              *
2730 PRINT "              *     A HETHERINGTON       *
2740 PRINT "              *     JANUARY  1982        *
2750 PRINT "              ****************************
2760 FOR I=1 TO 2000 : NEXT
2770 RETURN
2780 D=15
2790 RETURN
2800 PRINT
2810 RETURN
2820 IF VAL(LEFT$(P$,3)>1 THEN VAL(LEFT$(P$,3))=0
2830 RETURN
3000 DATA 01PONGO LTD
3010 DATA 01NEWGATE
3020 DATA 01WESTOWN
3030 DATA 01EAST YORKSHIRE
3040 DATA 01ZZ14 8PP
3050 DATA 02OTHER FIRM LTD
3060 DATA 02PO BOX 30
3070 DATA 02NORTHSEA
3080 DATA 02GUMSHIRE
3090 DATA 02YY15 9TT
3100 DATA 03HARPOON WHALE CO LTD
3110 DATA 03WHALE PARK WORKS
3120 DATA 03VICTORIA STREET
3130 DATA 03NEWTOWN
3140 DATA 03MIDSHIRE
```

TRS-80 Ducks

by Marie Byatt

For parents trying to teach young children to count, Ducks might well be a useful aid. The adult sets a maximum limit on numbers used and the computer will display a random number of ducks on the screen which the child has to count and work out the correct number to be rewarded with a smile face on the screen. The program wisely gives no reply for a wrong answer as a very young child would tend to consider this a reward also. It was written on a TRS-80 model I and should run in about 2k.

ZX81 16K FOPOL

POOLS FORECASTING AID.
* KEEPS LEAGUES AND SHORT TERM FORM
* RUNS IN BASIC, EASILY ALTERED TO PROVIDE YOUR OWN UNIQUE FORE-CAST.
* PUT IN YOUR OWN IDEAS FOR FORECASTING.
* TEST HOW GOOD YOUR IDEAS ARE.
* FUN, EVEN IF YOU DON'T WIN A FORTUNE.
* CASSETTE, FULL LISTING, INSTRUCTIONS AND IDEAS PROVIDED.
* £9.00 DR. M.A. BOURNE
  31 ARUNDEL AVE. LIVERPOOL 17.
  051-734 2430

BBC MICROCOMPUTER

Don't be frustrated, the BBC Micro does not come with a cassette lead and the cassette socket is for a 7 pin Din plug which can be very difficult to obtain. Order your plugs or ready made leads now.

7 Pin Din Plugs 2 for 65p p&p 35p.
Ready made leads £4.65 p&p 35p.

Just specify the sockets/plugs on your cassette for Mic, Ear & Remote (Minijack/Phone/3or5 pin Din)
Carrying Case's for your Micro
Suitcase style, shaped for your Micro with room for Cassette recorder or Disk, and leads.
£18.50 p&p £2.50.
Programs for the BBC Micro wanted.

C.J.E. MICROCOMPUTERS 25 HENRY AVE, RUSTINGTON WEST SUSSEX BN16 3LX
TEL. 09062 74998

PROGRAMS

```
 5 CLS
10 INPUT "PICK A MAXIMUM NUMBER, 1TO 15";N
11 IF N>15 THEN 10
12 CLS
15 REM DUCK DISPLAY
20 LET V=RND(N)
30 FOR S=1 TO V:W=3:A=S
40 IF S>5 THEN A=S-S;IF S>5 THENW=W+9
50 IF S>10 THEN A=S-10:IF S>10 THEN W=W+9
60 X=14*(A-1)+10
70 SET (X+3,W): SET(X+4,W): SET(X+5,W)
80 SET(X+1,W+1): SET(X+2,W+1): SET(X+3,W+1): SET(X+5,W+1)
90 SET (X+3,W+2): SET(X+4,W+2): SET(X+5,W+2):
   SET(X+11,W+2)
100 FOR Y=5TO11: SET(X+Y,W+3): NEXT Y
110 FOR Y=5TO10: SET(X+Y,W+4): NEXT Y
120 FOR Y=6TO9: SET(X+Y,W+5): NEXT Y
130 NEXT S
140 REM RESPONSES
150 PRINT AT 645, "HOW MANY DUCKS ARE SHOWING": INPUT D
160 IF D=V THEN 300
200 REM ERROR RESPONSE
210 PRINT AT 715,"WRONG!!!---TRY AGAIN"
220 FOR R=1TO200: Y=Y+R: NEXT R
230 PRINT AT 704, "            (25 BLANKS)   "
240 GOTO 150
300 REM CORRECT ANSWER
310 PRINT AT 715, "RIGHT!!!___VERY GOOD!!!!!"
340 PRINT AT 173, "XXX---XXX"
350 SET(98,10): SET(99,10)
360 SET(90,12): SET(91,12): SET(106,12): SET(107,12)
370 SET(91,13): SET(92,13): SET(105,13): SET(106,13)
380 FOR Q=92TO105: SET(Q,14): NEXT Q
500 PRINT AT 135, "IF YOU WANT TO PLAY AGAIN, PRESS A KEY"
510 GOTO 12
```

PATTERNS

Continued from page 158

Processing an array

The rules above can be reformulated in terms of the data in an array. Compare the array above and figure 9.

1. A point that only has lines leading to it (a surface that obscures no other) has its row blank in the array. D and E in the example.
2. A point that only has lines leading from it (a surface that is obscured by no other) has its column blank in the array. A in the example.

Removing D, E and A from the array leaves only B and C with no line connecting them.

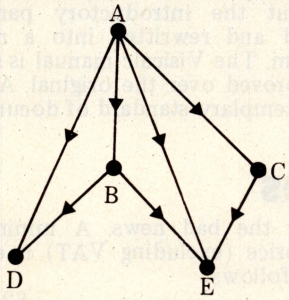


Fig 9 Directed graph representing data in the array.

From \ To	B	C
B		
C		

These can be added to the middle of the list completing it:

D, E
B, C
A

Continued over

ATARI GAMES

Outstanding value for ATARI 400 and 800 16k.

ARCADE CHALLENGE £9.95
An arcade with fruit machine, horserace and pontoon. Your task is to break the brank. Really compulsive.

MOONBASE £4.95
Moon-lander with graphics.

CODEBREAKER £4.95
Hangman but with spaceship and missiles Compare with ATARI version.

BLAST-OUT £4.95
A game for two players. Use the random missiles to blast through your wall before your opponent.

CATCH £4.95
Two versions for one or two players. Catch as many dots as you can but you must avoid the mines laid by your opponent or the computer.

All games written in Basic with sound and colour. On cassette one copy either side. Prices include VAT, post and packing. Immediate delivery.

All 5 games £24 (Save almost £10)

WEAVER ASSOCIATES
13 Dawn Gardens Sleepers Hill Winchester Hampshire SO22 4NS.

16K-ZX81 PROGRAMMING AIDS

Write better programs more easily and faster with these aids specially written for the 16K-ZX81.

PROGMERGE – Store BASIC programs or in part. Load a second program and insert the stored material anywhere. Then renumber the composite program with GOTO, GOSUB etc. correctly altered. Use PROGMERGE to insert into your program useful routines from other programs.

PROGSTORE – Store a 2.5K within the RAM. Then load a second program. Run them independently or let one call the other.

PROGSTORE TOOLKIT – Four useful programs specially written to operate from PROGSTORE. Comprises hex loader, hex lister, PROGSTORE expansion and the renumbering routine from PROGMERGE.

DISC-ACSEM – Read the ROM with the best disassembler program available for the ZX81. Can be used with PROGSTORE to reach any machine code program.

On cassette £3.75 each inc p&p or two on one cassette for £6.00 (overseas customers please add 50p). Dealer enquiries welcome.

ACS Software, Dept PCW, 7, Lidgett Crescent, Roundhay, Leeds LS8 1HN

MICROMART

COMPLETE NESTAR SYSTEM

8" Controller with 1.26 KB Clusterbus system. Power supplies, cooling and system software. Clusterbus communication cards.

NEAREST OFFER TO RETAIL PRICE SECURES

Inventory Controller
Personal Computers Limited
Masters of Personal Computer Technology
194-200 Bishopsgate London EC2M 4NR Tel: 01-626 8121

SEARCHING FOR 'BEST PRICE'
FOUND 'BEST PRICE' GOTO

PET		RRP	OUR PRICE
4008N	8K	£450	**£382**
4016	16K	£550	**£467**
4032	32K	£695	**£590**
8032	32K	£895	**£760**
DISK DRIVE			
4040	343K	£695	**£590**
8050	950K	£895	**£760**
PRINTERS			
4022	80COL	£395	**£335**
8024	132COL	£1160	**£986**
8026	DAISY	£995	**£845**

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 STREET,
WALLINGFORD, OXON.
OPEN 6 DAYS PER WEEK
Telephone – Wallingford 0491-35529

SS ENTERPRISES Announce their NEW UK101 SUPER TOOLKIT

Add 19 NEW COMMANDS to BASIC + AUTOLIST on error.
Package comprises
GRAPHICS:
Ease of coordinates . . .
(0, 0 is bottom left corner)
Speed of machine code.
Automatic out-of-range checking.
You can now: PLOT any character, BLANK any Pixel, TEST any Pixel. CLEAR SCREEN DISPLAY STRING OR VARIABLE AT X, Y
And:
* DRAW LINES – ANY DIRECTION ANY CAR.
* CREATE A BLOCK – ANY CHAR, ANY SIZE, AT X, Y

UTILITIES:
To let you:
RECOVER NEW ed PROGRAMS
BLOCK DELETE code
AUTO LINE NUMBER
Also includes:
FINDER: Locates a specified string and lists its WHOLE LINE. Does NOT have to be line 0.
= specify START and END lines.
TRACE ON/OFF
Traces LINE NUMBER and SELECTED VARIABLES.
OTHER FACILITIES:
* RESTORE to a line number
* GOTO or GOSUB using a variable as the destination.
* CALL a m/c routine.

ALL THIS IN UNDER 1.25K
****
SPECIAL INTRODUCTORY PRICE ONLY £14.95 incl.
****
TAPE ONLY SPECIFY MONITOR AND SCREEN SIZE

Please make cheques/POs payable to:

SS ENTERPRISES
12/6 CRAIG AVENUE
ALEXANDRIA, DUNBARTONSHIRE

MICROMART

PRINTERS

01·989·3259

Centronics
Epson
OKI
AT LOWEST
PRICES

L.R.COMPUTERS

CHURCHILL CHAMBERS
92 GEORGE LANE LONDON E18 1JJ

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

Ex hire equipment with guarantee usually available; 32K from £425. Part exchange your old 8K PET.

NOW LOWEST EVER PRICES FOR NEW PRODUCTS

4016N	12" screen	£455.00	
4032N	12" screen	£555.00	
8032N	80 columns	£795.00	
4040	Dual Disk	£625.00	
2031	Single Disk	£355.00	
4022	Printer	£355.00	
C2N	Cassette Deck	£ 44.95	(inc VAT)
VIC20	Colour Computer	£189.95	(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

COMPUTER PARK 82

JULY 31 – AUGUST 6 1982

INTERESTING, FUN, EXCITING, EDUCATIONAL

INTERESTED IN MICRO-COMPUTERS?
then
COMPUTER PARK '82

is the holiday for you. Join other computer enthusiasts for a week of fun and fascination with micros. Catering for all interests, we have assembled a wide range of computers and peripherals to create an exciting computer holiday.
Experiment with:

ROBOTICS PROGRAMMABLE RAILWAY
LAYOUT GRAPHICS UNITS

UNITS SPEECH SYNTHESIS LIGHTING
CONTROLLERS ELECTRONIC MUSIC

Our excellent computing facilities are supplemented by a wide variety of other interesting indoor and outdoor activities. Suitable for all ages from 10 yrs upwards. Residential from 31 July to 6 Aug. in a beautiful Northants country house.
For further details write to:
EDSOFT, 9 Little Oakley, Corby,
Northants. NN18 8HA.

PATTERNS *contuned from previous page*

The rules can therefore be restated in the following terms.

Rule 1: Remove from the array any surface with a blank row and put it at the top (inner) of the list.

Rule 2: Remove from the array any surface that has a blank column and put it at the bottom (inner) of the list.

Any isolated surface with both blank row and column will get dealt with by one of these rules and a third rule for them is not needed.

Continue applying these rules in turn until either all the surfaces have been transferred to the list and none is left in the array, or until all that can be have been transferred and further progress is frustrated by a loop of relations in the array. To recap, the stages in the whole procedure are as follows:

1. Take each pair of surfaces in turn:
a) If the plane of each surface cuts the other surface (the awkward case), divide one of the surfaces along the line of intersection.
b) When all such divisions have been carried out, for each pair of surfaces determine the visibility relation and record it in the array.
2. Transform the array as far as possible into a list of plotting order. This is a fairly heavy load of computing, but the savings can be considerable over computing the relations and distances for each viewpoint. Even if the list can only partially be set up there should be some saving in reducing the work needed for each view. The following further stages are needed for each viewpoint.
3. Remove any surfaces from the list not visible from this viewpoint.
4. a) If there are points still left in the array, remove any not visible from this point of view.
b) For those remaining, transform them using the same rules as before into further items in the list.
5. With the list complete, draw the surfaces in the order of the list. This order of plotting will take care of what obscures what. That which should be hidden will be hidden and that which should show will show.

Next month I will present the code that implements some of these stages, particularly the part dealing with the conversion of the array into the list, and give an example of its application to a particular set of data representing a small model. END

HP-125

Continued from page 111

A variety of HP printers (dot matrix, thermal or daisywheel) and plotters may be attached via HP-IB, or any other make via RS232. An HP 300 baud modem is available but any other compatible device could be used.

Other HP implemented languages promised are Pascal and Cobol, though neither is currently available.

The potential for networking is a bit of a mystery; no mention is made in the manuals and no call exists in the CP/M BIOS for input from an HP-IB device, so HP doesn't appear to be pushing this mode of use.

Documentation

The manuals, as might be expected by those familiar with HP's products, are excellent. In addition to a 'Getting Started' booklet, HP provides an owner's manual, a systems reference manual and a separate manual for each software package, all of which fit into a single large ring binder.

'Getting Started' details (with diagrams) how to set up the hardware and install and back up your programs.

The owner's manual is pitched at a non-specialist (but intelligent) end-user and is sufficiently comprehensive to cover all eventualities of everyday use and the operation of all the features, including a potted but readable guide to CP/M utilities.

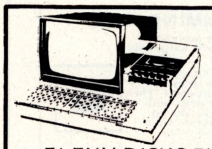
The system reference manual is for the programmer; a well laid-out, detailed account of the guts of the beast, including listings and explanations of all escape codes and function calls; unlike most US manufacturers HP has completely rewritten the CP/M manuals in a far clearer form than the originals.

The Basic manual follows Microsoft's exactly for its instruction definitions, but the introductory part is expanded and rewritten into a more lucid form. The Visicalc manual is similarly improved over the original. All in all, an exemplary standard of documentation.

Prices

Now for the bad news. A minimum system price (excluding VAT) is composed as follows:

HP-125	£2,479
Dual 5in drive (82901M)	£1,693
Dot-matrix Printer (82905B)	£639
Total	£4,811



SHARP
MZ-80K
36K
£460 inc VAT
20K and 48K available

FLEXY DISKS 5¼" (8" also available)

TOP MAKES	SINGLE	BOX 10
S/S S/Density	2.65	21.48
S/S D/Density	3.14	26.42
D/S D/Density	3.37	28.72

Our prices include VAT and carriage

COMPUTER SERVICES (MANSFIELD)
19 Baldwin Close Tel:
Forest Town 0623
Mansfield 25761
Notts NG19 0LR

ATOMIC TOOLKIT
BASIC PROGRAMMER'S UTILITY ROOM

*A new 2K ROM for your Acorn Atom
*Fits utility ROM socket
*Adds thirteen commands, including
Data, read and restore
Find, auto line numbering, delete
Renumber (including GOTOs)
Keyboard scanning
Auto load and run any BASIC program
Audio indication of program loading
Plus dump, chain and clear
*Send SAE for more details

INCREDIBLE VALUE AT ONLY £9.95

Orders to:
M.D. Bates, Dever Barn, Micheldever,
Winchester, Hants, SO21 3DB

To this the following options could be added:

Dual 8in drive	£4,515
Internal printer	£800
Basic/125	£201
Visicalc/125	£124
Word/125	£309
Link/125	£77
Graphics/125	£124
Plotter (7225B)	£2115

This brings a top line system price to over £11,000 with 2 Mbytes.

The 125 is being marketed by both the Computer and Calculator divisions of Hewlett-Packard so that it can be obtained either through an HP-approved micro dealer or from the manufacturer. Several different schemes for on-site maintenance are offered.

Conclusions

On paper, the HP-125 is just another 64k CP/M computer (a species which now provokes excuses like 'I'd *love* to test it but my grandmother just died again' around our office). In practice, it is a peep into the future as regards ergonomics and user friendliness, achieved by painstaking attention to detail in the user interface. To be sure, it doesn't have an 8088 or 68000 or a winchester and it doesn't run Unix or anything else to cause excitement among journalists. To users who can afford it, I suspect it will set a standard of convenience which could be habit-forming. It would be nice to think that other manufacturers are working towards this standard and not just to harder hardware; don't bet on it, though. In short, if you can afford it go ahead; if you can't afford it don't have a demo — it would just upset you.

I should like to thank David, Bill and Alan at Caxton for the use of the test machine, without which this test might have been delayed for several months; that's quite enough plugs for this month, isn't it?

END

Benchmark timings

BM1	1.7
BM2	5.0
BM3	12.5
BM4	12.5
BM5	14.0
BM6	26.0
BM7	40.0
BM8	6.0

Technical specifications

Processor:	Twin Z80A (3.6 MHz)
Memory:	64k system RAM, 16k terminal RAM 32k ROM
Display:	12in b/w CRT, 80x24 chars, 9x15 dots/char, Softkey labels in lines 25-26.
Keyboard:	97 keys, ASCII standard main plus numeric, cursor, editing, and help pads.
Disks:	2x5in double sided double density 35 tracks 16 sectors (soft) 256k per drive. 2x8in 77 tracks 30 sectors (soft) 1.12Mb per drive.
Ports	2xRS232C serial, 1 HP-IB (IEEE 488)
Operating system:	CP/M 2.2
Languages:	Basic/125, Assembler

BLUDNERS

Not a lot to report. The printers did their favourite trick of swapping two pages in last month's issue — pages 187 and 178, in fact.

Oh, and the editor Himself made a goof in his reply about PEEKing and POKEing on the BBC Computer. As with the Atom, the facilities exist but they're called '?' instead of PEEK and POKE. When asked to explain this colossal failure, Ed replied: 'Just testing!'

MICROMART

SEVENTY ZX81 PROGRAMS

An amazing seventy program listings for the 1K ZX81 for only £4.95, Barclaycard/Visa accepted, includes dozens of games, home finance, mortgage, telephone index, call timer, reaction tester, machine code loader, chequebook, Invaders, large word display, perpetual caldendar and more. Also includes hints 'n' tips.

SUSSEX SOFTWARE
(DEPT PCW4), WALLSEND HOUSE,
PEVENSEY BAY, SUSSEX

MICRO FACILITIES

ANNUAL STOCK CLEARANCE

SALE OF EX-DEMO, EX-HIRE & SECOND HAND EQUIPMENT AMAZING PRICES!

Used Equipment On Special Offer	Price Ex.VAT	Save Over
3016/4016 PET Computers	£399.00	£150.00
3032/4032 PET Computers	£499.00	£195.00
3040/4040 Disk Drives	£499.00	£195.00
3022 PET Printer (80 Col)	£199.00	£200.00
4022 PET Printer (80 Col)	£325.00	£ 70.00
8032 PET Computers	£699.00	£195.00
8050 Disk Drive (950K)	£699.00	£195.00
8024 PET Printer (132 Col)	£749.00	£410.00
8026 PET Typewriter (Olympia)	£749.00	£245.00
8027 PET Daisy Printer (Olympia)	£639.00	£210.00
Paper Tiger 560 Printer	£650.00	£200.00
Epson MX80 FT/1 Printer	£325.00	£ 70.00
Dolphin BD80P Printer	£399.00	£150.00
Apple II 48K Computer	£599.00	£210.00
Apple Accessories & Software		
Televideo VDU - TVI 912C Terminal	£499.00	£150.00

BARGAIN OF THE YEAR
SHARP PC 3201 — Complete system with screen, keyboard, disks and printer. Condition as new — used in our showroom.
ONLY £1999.00

LIMITED STOCKS: SUBJECT TO AVAILABILITY
ALL GOODS COVERED BY 90 DAYS WARRANTY
— PRICES EXCLUDE VAT AND DELIVERY —
— MAIL ORDER, ACCESS, BARCLAYCARD —
FINANCE ARRANGED (subject to status)
NOTE: THE ABOVE EQUIPMENT IS NOT NEW

Micro-Facilities Limited
129 High Street
Hampton Hill
Middlesex TW12 1NJ

01-979 4546 & 01-941 1197

CASSETTE ONE

"I had your Invaders/React cassette . . . I was delighted with this first cassette" –P. Rubython, London NW10

"Thanks for your Cassette One you sent me – some excellent games at a very cheap price!" –P. Rushton, Leeds

"I have been intending to write to you for some days to say how much I enjoy the games on 'Cassette One' which you supplied me with earlier this month. Please let . . . into the secret of your first time load every time!" –E. H., London SW4

CASSETTE ONE SIDE ONE 1K MACHINE CODE PROGRAMS
React, Invaders, Phantom aliens, Maze of death, Planet lander, Bug splat, Bouncing letters

CASSETTE ONE SIDE ONE 1K BASIC PROGRAMS
I Ching, Mastermind, Basic hangman, Robots

CASSETTE ONE SIDE TWO has large screen versions of Invaders and Maze of Death, ready for when you get 16k.

CASSETTE ONE costs £3.80

CASSETTE TWO
–just out, ten 16k Basic games.

OTHELLO	CRASH
AWARI	ROULETTE
LASER BASES	PONTOON
WORD MASTERMIND	PENNY SHOOT
RECTANGLES	GUN COMMAND

All on Cassette Two for £5
Recorded on quality cassettes, sent by first class post. From:
Michael Orwin, 26 Brownlow Rd, Willesden, London NW10 9QL.

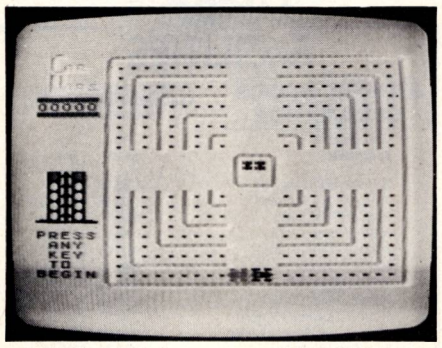
DAI SOFTWARE
FROM IQ SERVICES
VAULTS OF THE VAMPYRE
A48K hires colour graphics!
Sound game demanding skill, a good memory and a strong nerve.
Supplied with complete documentation including a detailed explanation of the various program parts.
£10.50 including VAT and PP
Export orders and dealer enquiries welcome.
CANAL HOUSE, ARDRISHAIG, ARGYLL, SCOTLAND
Tel. 0546 3212

NASCOM WAGES
- SIMPLE ENTRY OF HOURS WORKED GIVES
- WAGE SLIP, TAX & INS. DETAILS, MANAGEMENT
- INFORMATION & COIN ANALYSIS.
- ALL PAY, TAX & INS. RATES, WEEK NUMBER, NAMES, PAY & TAX TO DATE ETC.
- UPDATED & STORED ON TAPE.
- £65.00
- I. GRAY. 6, SANDRINGHAM ROAD, FAREHAM, HANTS. PO14 3DW.

Continued from page 107

yourself in by firing at the morgs jostling to get at you. The trick is to rush out from the centre and turn to shoot the morgs before they leap on you. Although morgs are very quick they are also quite dumb and will invariably present themselves right in your line of fire. The space bar immediately returns you to the central sanctuary and is aptly described as the panic button. The game is very well presented, although the horrible little tune which plays at the beginning and end of each game made me thankful for the volume control.

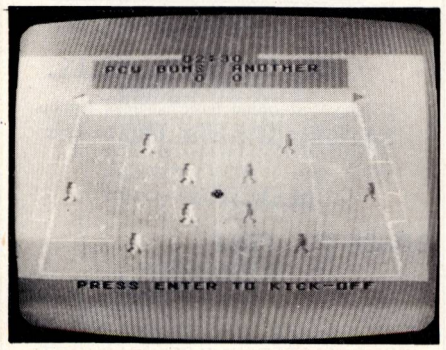
ADDICTIVE QUALITY: ****
USE OF GRAPHICS: ****
RESPONSE SPEED: *****
VALUE FOR MONEY: ***



GAME: Carwars
PRICE: £25.00
SUPPLIER; TI

Another ex-arcade game, also to be released shortly, this involves driving a car around a rectangular track with five lanes. At four points on the track it is possible to change lanes; the idea is to avoid collision with a computer-controlled kamikaze car driving in the opposite direction. Points are accumulated by knocking out dots along the track; thus, to win each round you must drive each length of all the lanes. Your car can be slightly speeded up by pressing the enter or fire button. Although a high degree of skill is required to play this game, I've always found it rather limited. It does, however, tend to appeal — for a while at least — to younger players.

ADDICTIVE QUALITY: **
USE OF GRAPHICS: ****
RESPONSE SPEED: ***
VALUE FOR MONEY: **

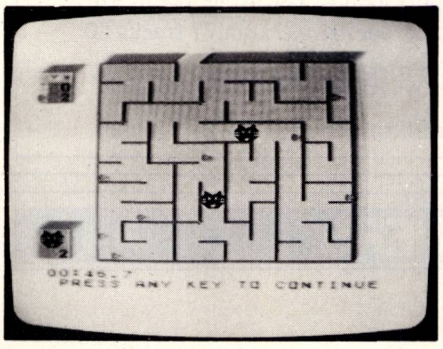


GAME: Five-A-Side Football
PRICE: £24.95
SUPPLIER: TI

This again uses the joystick in true 8-way motion, though movement is rather slow and I found myself pressing harder and harder on the joystick in a vain attempt to speed things up. It takes some time to get the hang of, demanding that you keep a sharp eye out for the player you are controlling (marked with a small white circle). After a bit of practice, however, I played some good games. I should point out that this is a two-player game — you cannot play the computer. All the features of the real thing are there; tackles, interceptions, fouls, penalties and saves, each one punctuated by a cheer or a song from the electronic crowd.

The players don't actually kiss each other after scoring, but they do throw their hands in the air and if they won the match even give a little jump. You choose the length of your own game — so that half and full time are called automatically — and also get to give your team a name (up to eight characters) . The only slight problem I had with this one was a disconcerting tendency for players (or bits of players!) to dissappear for a few seconds every so often, but this proved innocuous. All in all an attractive game with plenty of mileage in it.

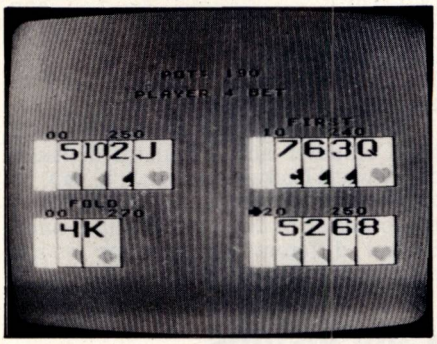
ADDICTIVE QUALITY: ****
USE OF GRAPHICS: **
RESPONSE SPEED: *
VALUE FOR MONEY: ****



GAME: Amazing
PRICE: £24.95
SUPPLIER: TI

Out of all the games I tried on the 99/4, this one was the most popular with children (and groups of juvenile adults). You control a mouse let loose on a square maze to escape and/or eat lumps of cheese while being chased by cats. Choosing the options is almost as much fun as actually playing the game; with one or two players, several speeds for both cats and mice, zero to two cats — dumb or smart and standard or pouncing (three pouncing frequencies) — oh yes, and standard, complex, visible or invisible mazes with obstacles or mouseholes. Mouse motion is controlled by the joysticks and really is 8-way. One word of warning: because the mice are so small, you'll definitely need a fairly sizeable TV if you're to play a complex maze without damaging your eyesight; my 14in portable was simply not adequate. Nevertheless I firmly recommend this one as a good family game.

ADDICTIVE QUALITY: ****
USE OF GRAPHICS: ****
RESPONSE SPEED: ***
VALUE FOR MONEY: ****



GAME: Blackjack & Poker
PRICE: £24.95
SUPPLIER: TI

In Blackjack (Pontoon), the computer always plays the bank. The (stud) poker is four-handed with the computer playing any hands not designated to a human player. It plays a reasonably good but rather predictable game. Although these games (particularly the poker) may be interesting from a programming point of view, personally at this price I'd rather use a standard pack of cards to actually play them; and the computer is a poor substitute for a human companion in a card school.

PRESENTATION: **
SPECIAL FEATURES: *
PLAYING SKILL: ****
VALUE FOR MONEY: *

General conclusion

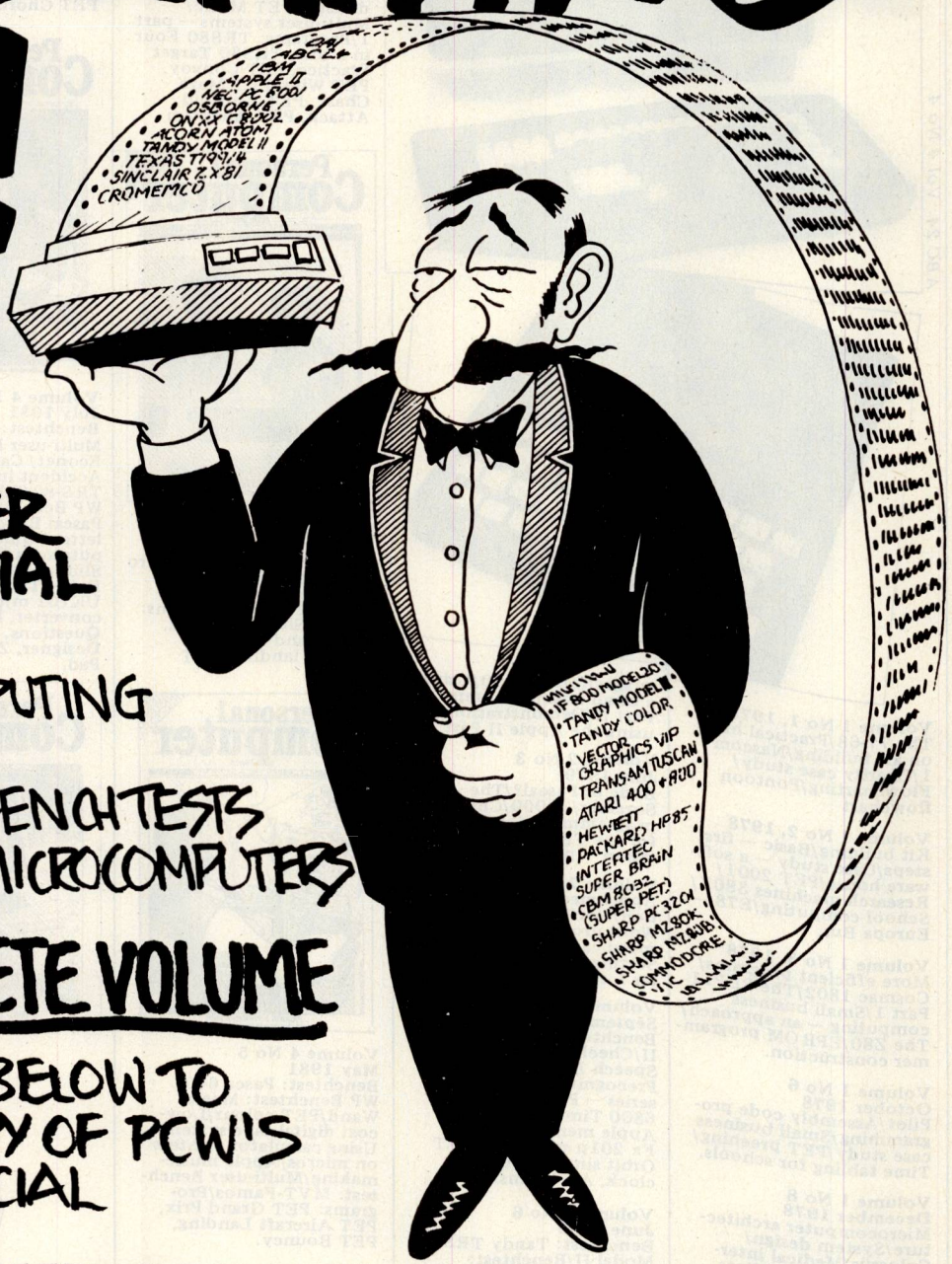
As you can see, Texas Instuments offers a varied selection of games for its micro. At present, however, there is no external software source for this machine except the 99/4 Users Club (see insert). The TI games are clearly aimed at a family audience rather than 'arcade freaks' and if you're thinking of buying any you should carefully weigh up the mileage you're liable to get against your finances. If you're looking for a microcomputer to use predominantly as a games console, you can probably do better than the TI. The quality of the Invaders, however, suggests we may see more sophisticated offerings in the future. TI games modules are available through dealers.

Next month I shall be taking a look at some of the many games available for the popular Atari 400 microcomputer.

99/4 Users Club
TI HOME
157 Bishopsford Rd
Morden
Surrey

Membership costs £9.50 a year, which entitles you to news sheets, etc, and access to a stock of over 150 programs, many of them games. Each program will cost a further £1 (you supply the cassette or disk) or you can get listings for 50p. If you submit a program to the library you are given four in exchange.

THE ONE YOU'VE BEEN WAITING FOR!



Personal Computer World
SPECIAL ISSUE

MICROCOMPUTER BENCHTEST SPECIAL

BRITAIN'S LARGEST SELLING MICROCOMPUTING TITLE BRINGS YOU COMPREHENSIVE BENCHTESTS ON 25 LEADING MICROCOMPUTERS

IN ONE COMPLETE VOLUME

USE THE COUPON BELOW TO ORDER YOUR COPY OF PCW'S BENCHTEST SPECIAL

YES, I'VE BEEN WAITING FOR IT. PLEASE SEND ME _____ COPIES OF PCW'S BENCHTEST SPECIAL. I ENCLOSE £1·80 TO BENCHTEST SPECIAL OFFER, 14 RATHBONE PL. LONDON W1P 1DE. CHEQUES SHOULD BE MADE PAYABLE TO— 'PERSONAL COMPUTER WORLD'

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 1 No 8
December 1978
Microcomputer architecture/System design/Colossus/Medical interviewing machine/Hints for the business beginner/Cromemco Z2D/School computing/3rd Noughts & crosses/Low cost/High speed cassette interface

Volume 1 No 11
March 1979
SYM-1/Mk14/IEEE-488 Bus/Motorola 6809/Small computer networks/TMS-9900 homebrew.

Volume 2 No 1
May 1979
Chess programming/Using a small business computer Part 1/Smart 1/In defence of PET/3D 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 3
July 1979
Basic or Pascal?/The Sorcerer/Z8000/Chess programming/Graphics for the TRS-80/Applevision — part II/

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 2 No 5
September 1979
Benchtest: Compucolor II/Checkout: Heuristics Speech Lab/Testing Precognition/Pascal series — Part I/Programs: 6800 Time response, Apple memory test, Fx 201p spaceship, PET Orbit sim, PET digital clock, Acronyms.

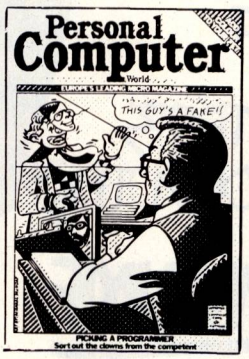
Volume 3 No 6
June 1980
Benchtest: Tandy TRS-80 Model II/Benchtest: Sintrom Periflex 630/48 / Staff case study/Checkout: Softy Intelligent EPROM Programmer/Checkout: Exatron Stringy Floppy/Practical examples of the IEEE-488 bus use/Programs: Naming Nascom files, 380Z Pictures, Fuel tank calculations — PET, PET large numeral generator, PET tank battle, Basic string handling routines/Pascal: Final instalment.

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 Alligator Swamp, PET Connect, UK101 Minefield, PET Simon

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



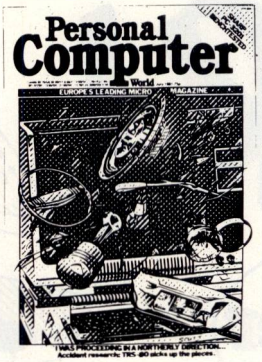
Volume 4 No 3
March 1981
Benchtest: Onyx C8002/Benchtest: Bigboard/Micro music software package/ALC circuit/Commons report/HP 34C/Programs: TRS80 Show Jumping, PET Grand Prix, PET Aircraft landing, PET Bouncy.



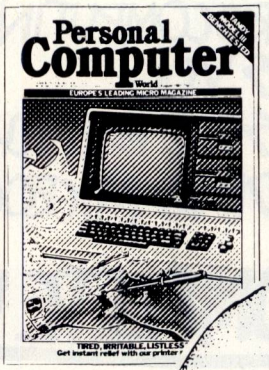
Volume 4 No 5
May 1981
Benchtest: Pasca 640/WP Benchtest: Magic Wand/PET colour/Low-cost digital tape system/Using calculator printers on micros/Apple music-making/Multi-user Benchtest: MVT-Famos/Programs: PET Grand Prix, PET Aircraft Landing, PET Bouncy.



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, ZX81 Sketch Pad.



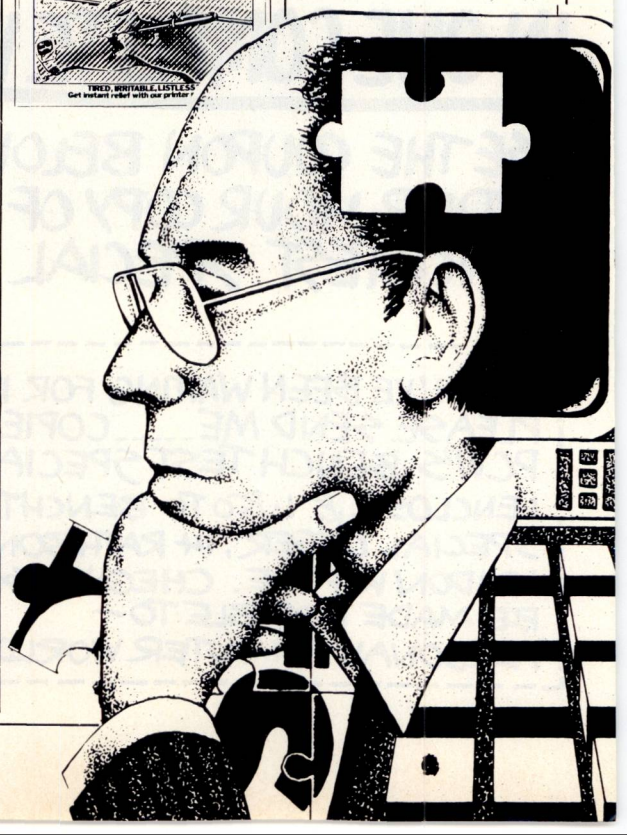
Volume 4 No 8
August 1981
Benchtest: Tandy Model III/Viewdata update/WP Benchtest: Spellbinder/Printer survey/Microholism/Programs: ZX80 Othello; Easter Sunday; Apple Mondrian; MZ-80K Duck Shoot; PET Gomoku; MZ-80K Football.

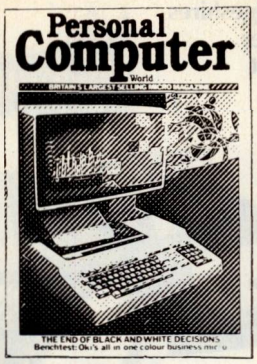


Vol 4 No 9
September 1981
Benchtests: Tandy Color Computer, Commodore VIC/Checkouts: Hi Tech Speakeasy, Tantel/Multi-user Benchtest: HMSOS/WP Benchtest: Memorite III/Word proc program for PET/Apple dealership run by spastics/Printerfacing extra/Calc Corner: Casio fx602p review/Programs: PET Arithmetic test, ZX80 Eldorado, 380Z Memory test.

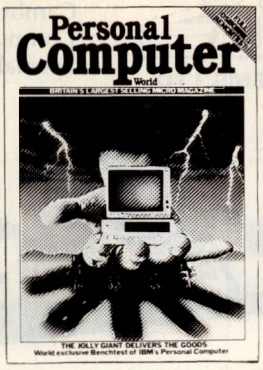
PHOTO COPIES

are now available on benchtests, articles and programs. Please state which issue the article was featured in. £1.00 per article includes P&P.

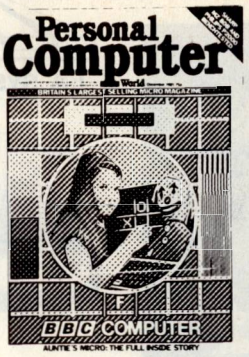




Volume 4 No 10
October 1981
Benchtest: OKI if-800/ Checkouts: Heuristics speech link, Softy 2/Calc Corner: Texas TI51-III/ Jeff Taylor on computer literacy projects/Introducing TJ's Workshop/ Control Your Own Substation pt 1/Programs: TRS-80 Sailing



Vol 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.



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.



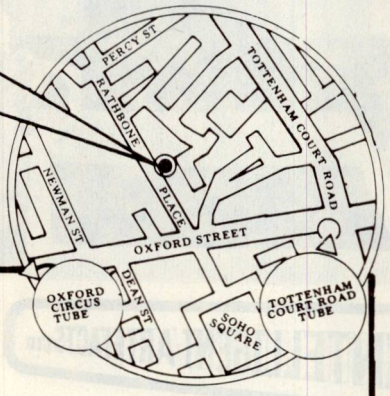
Vol 5 No 1 January 1982
Benchtests: BBC Micro, Xerox 820/Frames of Reference (new series)/ ZX81 Printer Checkout/ Digital Drummer for PET/ Calc Corner: Benchmarks/ Programs: MZ-80K Fortune, TRS-80 Reaction Timing, ZX80 Laybrinth, Apple Letters.



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.

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. And any new issue is usually on sale in the Back Issues Centre several days before it reaches your local newsagent. Our receptionists will also be happy to sell you a set of binders or 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 W1.



COME UP AND SEE US..



NOW OPEN SATURDAY!! 11.00AM-5.00PM / MON-FRI 10.00AM-6.00PM

DESK TOP COMPUTING

A COMPREHENSIVE GUIDE TO SUCCESSFUL BUSINESS AND PROFESSIONAL MICROCOMPUTING

Send £2.25 to Desk Top Computing Offer, 14 Rathbone Place, London W1P 1DE. Cheques should be made payable to *Personal Computer World*.

PCW BINDERS

Strong, durable, attractive yellow *PCW* binders — £3.25 each, including postage and packing. See coupon below.

Any one issue £1.50; all additional issues £1.00 each. Binders £3.25 each. All prices include post and package. *Overseas orders requiring Air Mail postage add £1.00 per copy. Cheques/P.O. payable to (PCW) Sportscene Publishers Ltd. 14, Rathbone Place, London W1P 1DE. 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☐ 3☐ 6☐	1☐ 2☐ 3☐ 4☐ 5☐	6☐	1☐ 3☐ 5☐ 6☐ 11☐	1☐ 2☐
8☐ 11☐	Binder☐ DTC☐	12☐	7☐ 8☐ 9☐ 10☐ 12☐	

Name_____ Address_____

I.A. SMALL ARM ROBOT



INTELLIGENT ARTEFACTS LTD

Microcomputers and Microsystems

Cambridge Road,
Orwell, nr. Royston, Herts.
Tel: Cambridge (0223) 207689

A wholly owned subsidiary of Sands-Whiteley Research and Development Ltd.

I.A. SYSTEMS LTD.

Cambridgeshires Computer Specialist





- ★ OFF THE SHELF TURNKEY SYSTEMS BASED ON THE NORTH STAR HORIZON.
- ★ OVER 200 APPLICATIONS SOFTWARE TITLES INCLUDING WORD PROCESSING, ACCOUNTS, STOCK CONTROL, PAYE, DATALOGGING ETC.
- ★ DEVELOPMENT SYSTEMS WITH FULLY DOCUMENTED HARDWARE.
- ★ NORTH STAR DOS, CPM 2.2 AND FORTH READY CONFIGURED.
- ★ TRAINING AVAILABLE.
- ★ TOP QUALITY TERMINALS, DAISY WHEEL OR LETTER QUALITY DOT MATRIX PRINTERS.
- ★ RELIABLE PROVEN HARDWARE AND SOFTWARE GUARANTEED AND SUPPORTED FOR ONE YEAR.
- ★ MAINTENANCE CONTRACTS CAN BE ARRANGED.

CONTACT:
I.A.S., CAMBRIDGE ROAD, ORWELL, ROYSTON, HERTS.
TEL: 0223 207689.

A SUBSIDIARY OF SANDS WHITELEY RESEARCH AND DEVELOPMENT.

SPOCK: "Computer! Calculate the value of Pi to ten thousand decimal places"
COMPUTER: "Working . . ."

CAN YOUR COMPUTER SPEAK?

The WIDEBAND SPEAKEASY speech synthesiser adds voice response to any computer with a parallel port including PET, APPLE, expanded ATOM, HORIZON etc.

for Only £69 + VAT



- ⁜ **UNLIMITED VOCABULARY**
- ⁜ **EASY TO PROGRAM**
- ⁜ **LOW MEMORY OVERHEAD**
- ⁜ **COMPLETE MANUAL WITH DICTIONARY, SAMPLE SOFTWARE AND TUTORIAL ON SPEECH PRODUCTION.**

Also includes high flux speaker and power supply, all housed in high quality wood cabinet, with volume control and rear pitch control.

Programmed with simple phonetic codes. Apart from the obvious applications of voice response in manufacturing, testing, blind terminals etc., this product also teaches a great deal about linguistics and speech production.

Software is available in BASIC and Z-80 and 6502 assembly for direct input in PHONETIC SPELLING closely related to the ARPABET international phonetic alphabet.

For your nearest dealer contact:

WIDEBAND PRODUCTS, CAMBRIDGE RD.,
ORWELL, ROYSTON, HERTS. TEL: 0223 208017

A subsidiary of Sands-Whiteley Research and Development

INTELLIGENT ARTEFACTS LTD

JOIN THE FORTH REVOLUTION.

INTELLIGENT ARTEFACTS ARE **THE** UK SPECIALISTS IN FORTH SYSTEMS

Forth available for:

COMMODORE PET	£56 + VAT
TRS 80 (MMS FORTH)	£95 + VAT
NORTH STAR HORIZON (compact, fast, romable code)	£95 + VAT
NORTH STAR ADVANTAGE	£95 + VAT
CPM BASED MACHINES from	£95 + VAT
FORTH EVALUATION SYSTEM COMPRISING PET 4016 + 2031 DISK DRIVE + FIGFORTH — Bargain (Limited number available)	£699 complete + VAT

Books

USING FORTH	£25
STARTING FORTH	£16
FIG FORTH INSTALLATION MANUAL	£15
6809 FIG FORTH SOURCE LISTING	£15
BYTE — AUGUST 1980 FORTH SPECIAL ISSUE	£5

GIVE YOUR PET 300K OF VIRTUAL MEMORY AND SPEED UP PROCESSING BY A FACTOR OF 10, Z80 MACHINES BY A FACTOR OF 40.

INTELLIGENT ARTEFACTS LTD.
Cambridge Road,
Orwell, nr. Royston, Herts. Tel: Cambridge (0223) 207689

FREE
LIBRARY BOX with every TEN-PACK
PLUS
NEW DISK DIRECTORY & DISK-WRITER when ordering two packs or more
PLUS
BRUSHED CHROME PAPERMATE PEN when ordering 5–9 TEN-PACKS
PLUS
GOLD PLATED PAPERMATE PEN when ordering 10+ TEN-PACKS

DISKING

FOR THE FINEST MINIDISKS & ACCESSORIES

All disks are factory fresh and individually certified 100% error-free.

DISKING INTERNATIONAL FREEPOST LIPHOOK HANTS GU30 7BR UK TEL(0428)722563

5¼" MINI DISKS

Datalife minidisks Verbatim

VERBATIM The World's favourite media 'Datalife' are all double density with hub ring reinforcement

	EXC VAT
MD525 S/Sided 40 track	£18.95
MD550 D/Sided 40 track	£24.95
MD577 S/Sided 77 track	£26.95
MD557 D/Sided 77 track	£34.95

10 & 16 Hard Sector at same prices

MEMOREX Mini Flexible Discs

MEMOREX The Ultimate in Memory Excellence based on many years of experience with recording media.

		EXC VAT
MEMX 1	S/S S/Density	£18.45
MEMX 1D	S/S D/Density	£21.45
MEMX 2D	D/S D/Density	£23.95

10 & 16 Hard Sector at same prices

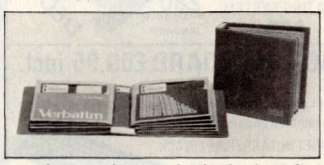
BASF FlexyDisk®

BASF cross-linked Oxide coating for long media life and special lubricants minimize head wear.

		EXC VAT
BASF 1	S/S S/Density	£17.95
BASF 1D	S/S D/Density	£21.45
BASF 2D	D/S D/Density	£25.95

10 & 16 Hard Sector at same prices

DISKING SUPERLUXE DISK LIBRARY



Manufactured exclusively for us to our own design, the SDL keeps your valuable disks flat & dust free, while at the same time allowing you instant visual selection of any single disk. The standard SDL holds 20 disks, while the SDLX holds 28 disks. The SDL may be uprated to an SDLX retrospectively.

SDL only £8.65
SDLX only £10.39

DISKING DISKMAILERS

This product also exclusively ours, is a strong plastic envelope for making one, two or three disks, in safety and comes complete with warning labels & address labels.

DM only 50p

DISK DRIVE HEAD CLEANING KITS



Prevent head crashes and ensure efficient error-free operation. Enough for 26 bi-monthly cleans & a lot cheaper than a service call!

CK5 only £16.50

ALL PRICES ARE EXCLUSIVE OF VAT, PLEASE ADD 15%

SUPERBRAIN SOFTWARE

'DATAKING' coming soon: will mathematically massage any Datastar or Wordstar data file, and columnate with report writer. Instant Sales, Nominal or Purchase ledger or Comprehensive Sales/Purchase Reporting for Datastar users.

DATAKING only £49.00
DATAKING User Manual £2.50

PLASTIC LIBRARY BOXES

The genuine Egly Box that stores and protects your disks in tens – Unbeatable – (FREE with every ten disks ordered)

LB only £1.90

ATTENTION THE TRADE

Please write to us on your letter headed paper, and ask for our special trade prices and offers. Give your software and ultimate in presentation. We can make the SDL and SDLX in your colour PVC, with your Logo. Sample plastics swatch available free by request.

U.K. P&P RATES EXC VAT

Disks (1-5 packs) each pack	@ 95p
Disks (6+ packs) each pack	@ 65p
SDL or SDLX	@ 95p
DM,	each @ 25p
	Tens @ 80p
LB	@ 45p
CK5	@ 75p
DATAKING SOFTWARE	post free
DATAKING USER MANUAL	post free

URGENT ORDERS

Either post your cheque not forgetting to stamp it first class, or telephone your order with credit card no. mentioning in either instance that your order is URGENT. You may then pay FIRST CLASS POST for your goods, if required.

FIRST CLASS RATES EXC VAT

First 10-PACK	£1.80
Second and subsequent	£1.30

NORMAL ORDERS

We accept Armed Forces and all Ministry of Defence Establishments orders over £50.00 in value. All other customers cheques with order please payable to DISKING. If you are a large establishment, and can not raise cheques without an invoice please post or telephone us your order, and we will send a pro-forma invoice by return, for your accounts department to pay against.

CREDIT CARD ORDERS

We accept Barclaycard and Access card, and make a small surcharge of 6% on the total order value. You may write your c/card No. on your order or telephone the order day or night, 365 days a year. You may speak for as long as you like, and don't forget to give full details of what you wish to purchase, your credit card number, credit card holder's name & address, and delivery or invoice address if different.

TO DISKING
FREEPOST, Liphook, Hants. GU30 7BR. England.

QTY	DESCRIPTION	PRICE EXC. VAT

TOTAL GOODS VALUE EXC. VAT £ _____
TOTAL DELIVERY AND INSURANCE £ _____
SUB TOTAL EXC. VAT £ _____
VAT £ _____
VALUE OF CHEQUE PAYABLE TO DISKING £ _____

Name: _____
Address: _____
PCW 82 _____ **Tel No:** _____
My Access/Barclaycard* Number is: _____

**Please delete that which is not applicable.*

HENRY'S COMPUTER KIT DIVISION

TANGERINE COMPUTER SYSTEMS
LONDON & HOME COUNTIES STOCKISTS

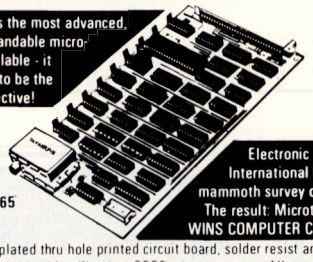
ALL PRE-PAID ORDERS POST FREE

RETAIL SALES & DEMONSTRATION **404 EDGWARE RD. LONDON, W2 1ED TEL: 01-402 6822**

TANGERINE • TANGERINE • TANGERINE • TANGERINE • TANGERINE • TANGERINE

MICROTAN 65

Microtan 65 is the most advanced, powerful, expandable micro-computer available - it also happens to be the most cost effective!



Electronic Today International held a mammoth survey of kits. The result: Microtan 65 WINS COMPUTER CLASS!

MICROTAN 65 CONTENTS

High quality, plated thru hole printed circuit board, solder resist and silk screened component identification. 6502 microprocessor. 1K monitor TANBUG. Now with 'V' Bug. 1K RAM for user programme, stack and display memory. VDU alphanumeric display of 16 rows by 32 characters. MICROTAN 65 system file binder. 136 page, bound, users hardware/software manual with constructional details and sample programmes. Logic and discrete components to fully expand MICROTAN 65.

The MICROTAN 65 kit has won widespread acclaim for its superb presentation. We pay attention to detail!

KIT FORM £69.00 + £10.35 V.A.T., total £79.35.

MICROTAN 65 assembled and tested.
Specification as above, but assembled and fully bench tested by ourselves.
£79.00 + £11.85 V.A.T., total £90.85.

TANBUG V2.3 KIT (separately) £21.95 incl.

MICROTAN 65 OPTIONS

LOWER CASE PACK
Two integrated circuits which connect into locations on MICROTAN allowing 128 displayable characters.
£9.48 + £1.42, total £10.90.

MINI MOTHER BOARD
Used to connect Microtan to Tanex
Built **£10.00** + VAT

GRAPHICS PACK
Five integrated circuits which connect into locations on MICROTAN allowing the display of chunky graphics (64 x 64 pixels). What are chunky graphics? Well, imagine a piece of graph paper with 64 squares vertically and 64 squares horizontally, a total of 4096. Each square can be made black on white.
£6.52 + V.A.T. 98p, total £7.50.

20 WAY KEYPAD
Inexpensive means of getting up and running. Uses 'Schoeller' key-switches, and connects to MICROTAN through a 16 pin D.I.L. plug on ribbon cable. Black anodised escutcheon, with TANGERINE legends, finishes off what must be the best value for money keypad available. Available assembled and tested.
£10.00 + V.A.T. £1.50, total £11.50.
*Space Invaders game (for use with keypad only)
£15.22 + V.A.T. £2.28 total £17.50.

POWER SUPPLIES

MPS 1. Input 120 or 240V AC. Output 5 Volts at 3 Amps Regulated. MPS 1 will power both MICROTAN and TANEX fully expanded. Built on the same size printed circuit board as MICROTAN etc. Available as a fully built and tested unit.
£23.00 + V.A.T. £3.45, total £26.45.
X MPSZ +5V 6A, +12V, −5 and −12V switch mode system PSU.
£69.13 + V.A.T.

MINI-SYSTEM RACK

We have produced a mini-system rack which accepts MICROTAN 65, TANEX and our mini-mother board. It has an integral power supply, just plug it into the mains and away you go! Finished in TANGERINE/BLACK, it gives your system the professional finish. Front panel access for I/O cables. **AVAILABLE AS AN ASSEMBLED UNIT.**
£56.35 INCL.

FULL SYSTEM RACK

For the man that has everything! 19 inch wide system rack which accepts: MICROTAN 65, TANEX, TANRAM, SEVEN FURTHER EXPANSION BOARDS, TANDOS and THE SYSTEM POWER SUPPLY. Available in many formats, e.g. Individual front panels, full width hinged front panel, back panel with or without connectors.
£49.00 + V.A.T. £7.35, total £56.35.

MICRON COMPUTER



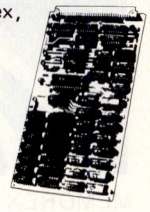
FULLY BUILT, TESTED, and housed

£395 inc V.A.T., P&P

System Rack Micron £550.00 incl.
6502 based microcomputer VDU alpha numeric display. Powerful monitor TANBUG. 8K RAM. 32 parallel I/O lines. 2 TTL serial I/O lines. Four 16 Bit counter timers. Cassette interface. Data bus buffering. Memory mapping contol. 71 key ASCII Keyboard, including numeric keypad. Includes power supply. Also includes the first "10K MICRO-SOFT BASIC" available in the U.K. All the usual BASIC commands.

Full manuals. Microtan, Tanex, Basic, X Bug All £5.00 each.

TANRAM



AVAILABLE NOW. TANRAM - 40K Bytes on one board!! Single board of bulk memory offering: 7K Static RAM (2114), and 32K Dynamic RAM (4116). Onboard refresh is totally transparent to CPU operation and is unaffected by normal DMA's. TANRAM fully expands the available address space of the 6502 microprocessor. MICROTAN, TANEX and TANRAM together provide 16K RAM, 48K RAM, and 1K I/O - that's a lot of memory and a lot of I/O! Built and tested. TANRAM ASSEMBLED.

40K RAM CARD with 16K DYNAMIC RAM £76 +VAT
CONTENTS: High quality plated thru hole printed circuit board, solder resist and silk screened component identification. Full complement of I.C. sockets for maximum expansion. 64 way D.I.N. edge connector. 1K RAM (2114). Data bus buffering. TANRAM users manual.

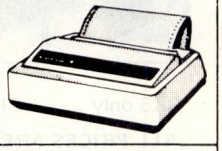
EXTRA RAM:
1K STATIC (2114) **£2.95** each. 16K DYNAMIC (4116) £1.50 each.

MEMORIES
EXPAND YOUR SYSTEM WITH OUR TANGERINE APPROVED CHIPS.
Discounts 10% for 4, 15% for 8, 20% for 16.

2102 1K x 1 Static RAM **80p**
2708 **£3.50**
2716 **£6.50**
MK 4116 16K x 1 Dynamic RAM **£1.50**
All plus VAT
IM 6402 UART **£4.50**
2114 1K x 4 Static RAM **£2.95**
4118 1K x 8 Static RAM **£7.50**

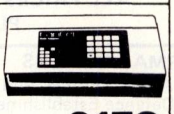
MONITORS (PROFESSIONAL)
RECONDITIONED AND NEW - FROM **£35.00** to **£129.95**

CENTRONICS Ideal for Tangerine PRINTERS



SHEIKOSHA **£199** + VAT
Model 730 **£350** + VAT
Model 737 **£395** + VAT

NEW MICROTANTEL
POST OFFICE APPROVED PRESTEL - VIEWDATA



• FULL COLOURGRAPHICS • • CAN STORE PRESTEL • CAN BE USED AS AN EDITING TERMINAL • CAN BE INTERFACED WITH PET, APPLE etc.

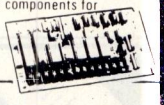
£170 + VAT

Just connect to the aerial socket of any colour or black and white domestic T.V. receiver and to your Post Office installed jack socket and you are into the exciting world of PRESTEL. Via simple push button use you are able to view 170,000 pages of up to the minute information on many services, order goods from companies - all this without leaving your armchair!

TANEX £43.00

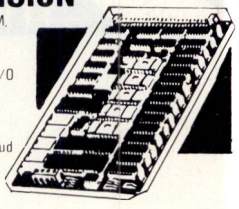
Minimum Config Kit
+ V.A.T. £6.45, total £49.45.

CONTENTS
High quality plated thru hole printed circuit board, solder resist and silk screened component identification. I.C. sockets for maximum expansion. 64 Way D.I.N. edge connector. 1K RAM, cassette interface, 16 parallel I/O lines, a T.T.L. serial I/O port, two 16 bit counter timers, data bus buffering, memory mapping, logic and discrete components for maximum expansion. TANEX users manual.



TANEX (Minimum configuration) Assembled
£53.00 + V.A.T. £7.95, total £60.95.

TANEX EXPANSION



Expanded, TANEX offers: 7K RAM locations for 4K EPROM (2716), locations for 10K extended MICROSOFT BASIC, 32 parallel I/O lines, two TTL serial I/O ports, a third serial I/O port with RS232/20mA loop, full modem control and 16 programmable baud rates, four 16 bit counter timers, cassette interface, data bus buffering, and memory mapping.

EXPANDED TANEX KIT (Excludes ROM, XBUG and BASIC)
£89.70 + V.A.T. £13.46, total £103.16.
EXPANDED TANEX ASSEMBLED
£99.70 + V.A.T. £14.96, total £114.66.
OPTIONS TO FULLY EXPANDED TANEX
10K Extended MICROSOFT BASIC in EPROM (with manual) **£49.00** + V.A.T. £7.35, total £56.35.
Extra RAM: 1K (2 x 2114) **£5.20** + V.A.T. 78p, total £5.98.
SERIAL I/O KIT **£17.25**
6522 VIA **£8.00** + V.A.T. £1.20, total £9.20.
XBUG £17.35 + V.A.T. £2.60, total £19.95.
± 12V KIT **£9.20 incl.**
AS YOU CAN SEE THE PRICES OF OUR EXPANSION COMPONENTS ARE VERY, VERY COMPETITIVE!

TANGERINE DISC SYSTEM



Z80 CONTROLLER CARD **£150.00** +VAT
DOUBLE SIDED DOUBLE DENSITY DRIVE **£215.00** +VAT
CP/M DISK OPERATING SYSTEM **£80** +VAT
Z80 AVAILABLE JANUARY
DEC 81

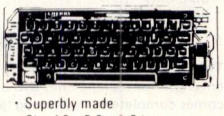
71 KEY ASCII KEYBOARD £69.95 incl.

NO EXTRAS NEEDED.
Uses gold crosspoint keys. Includes numeric keypad and ribbon cable. Available as fully assembled and tested.



SUPER METAL CABINET IN TANGERINE/BLACK
£20.00 + V.A.T. £3.00, total £23.00.

PROFESSIONAL ASCII KEYBOARDS
Ideal for Tangerine



£29.95 + VAT

- 52 key 7 bit ASCII coded
- Positive strobe +5V-12V
- Full ASCII characters
- Parallel output with strobe
- Power light on control
- Chip by General Instrument (G.I.) TTL output
- Superbly made
- Size 13 x 5.5 x 1.5 ins.
- Black keys with white ledgens
- Escape shift return & reset keys
- Control repeat & bell
- Complete with DATA

ADD-ON KEYPAD



A compact 12 button keypad suitable for use with above keyboard to extend its functions plus four extra keys. Supplied brand new with with data. A 4 x 4 non-encoded single mode keyboard.

LIST PRICE £22.00
OUR PRICE **£7.95** + VAT

PLUS MANY NEW EXCITING PRODUCTS IN DEVELOPMENT AUTOMATICALLY AVAILABLE FROM US WHEN RELEASED BY TANGERINE LTD.

All products are available

FULLY GUARANTEED * BUY WITH CONFIDENCE

BRITISH DESIGN & MANUFACTURE AND ON DEMONSTRATION IN OUR COMPUTER DEPT.

NEW PRODUCTS (all inc. VAT)

System Motherboard (4 connector)	44.85	Parallel I/O Board Min (16 Lines)	54.63	Controller Card Full	138.00
System Motherboard (12 connector)	72.85	Parallel I/O Board Max (128 Lines)	99.48	Controller Card Min	69.00
Extra Edge connectors	3.50	32K Ramcard 16K Version	87.40	Cbug, Combined Tanbug & Xbug	T.B.A.
System Rack Front Panel	15.64	32K Ramcard 32K Version	115.00	2 Port Serial I/O Kit	T.B.A.
Serial I/O Board Min (2 Ports)	66.70	32K Romboard (Excl. Rom)	54.65	High Resolution Graphics	90.85
Serial I/O Board Max (8 Ports)	135.70	Aim/Kim Buffer	54.64	Aim TV Interface	79.35

TANGERINE • TANGERINE • TANGERINE • TANGERINE • TANGERINE • TANGERINE • TANGERINE • TANGERINE

Stockist Enquiries on headed notepaper to:
COMPUTER KIT LTD. (Principal Distributors in U.K.)
11/12 Paddington Green, London, W2. Tele: 01-723 5095
Telex: 262284 Ref. 1400 TRANSONICS

All orders pre-paid and official advertised here to be forwarded DIRECTLY to
COMPUTER DEPT., 11/12 PADDINGTON GREEN, LONDON W2

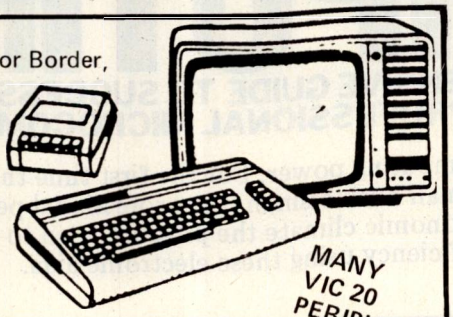
SEND FOR FREE BROCHURE

CHROMASONIC electronics

48 JUNCTION ROAD, ARCHWAY, LONDON N19 5RD 100 yds from Archway Station & 9 bus routes
TELEPHONE 01-263 9493 01-263 9495 TELEX : 22568

YOUR SOUNDEST CONNECTION IN THE WORLD OF COMPUTERS

VIC 20



*24 Colours, 8 for Characters, 8 for Border, 16 for screen mixed as you wish.
*3 tone Generator for sound.
*Uses Pet Basic *Plugs into T.V.
*Memory expandable to 32K
*VIC complete with T.V. Modulator and Power Supply

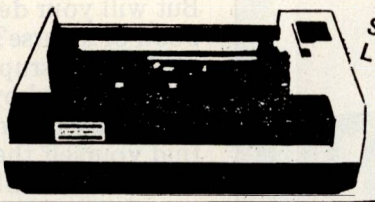
ONLY £165.00

VIC Cassette Deck

ONLY £38.00

Available soon
VIC Dot Matrix Printer 80 Column, 30 CPS, Tractor Feed

ONLY £199.95



MANY VIC 20 PERIPHERALS AVAILABLE SEND FOR LIST

UK 101

DOWN IN PRICE

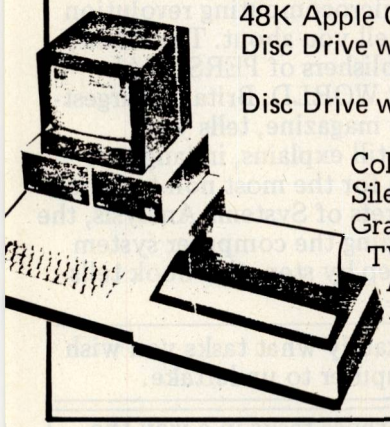
UK101 Kit inc 8K memory	£125
Ready Built inc 8K memory	£175
4K Expansion 8x2114	£10
Parallel Printer Interface	£24.50
Chromasonics Sound Kit	£24.50
Colour Kit	£69.95

NEW NEW NEW

32K Dynamic Memory Board only	£89.95
P.I.O. and Eprom Programmer Kit only	£24.50

APPLE II PLUS

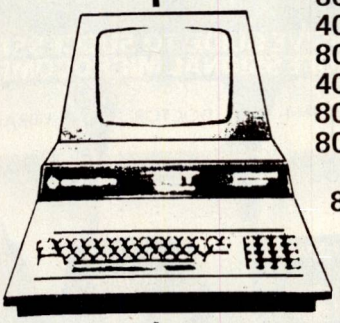
AUTOSTART "EUROPLUS"



48K Apple Computer	649.00
Disc Drive with Controller	349.00
Disc Drive without Controller	299.00
Colour Card	69.00
Silentype Printer	199.00
Graphic Tablet	425.00
TV Modulator	14.00

A range of Apple Accessories and Software are available

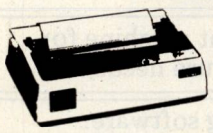
PET



4016 16K RAM	445.00
4032 32K RAM	569.00
8032 32K RAM	755.00
8096 96K RAM	960.00
4040 Disk Drive	585.00
8050 Disk Drive	755.00
4022 Printer 80 Col	357.00
8024 Printer 132 Col	975.00
8026 Printer/Typewriter	835.00
8027 Daisy Wheel	735.00

A range of PET Accessories and Software are available

PRINTERS



INTERFACES AND CABLES FOR APPLE II, PET, TRS80, RS232, UK101, SHARP SUPERBOARD ALL AVAILABLE

EPSON MX80 £359
Dot-matrix printer with Pet graphics interface. Centronics parallel and serial. Pet and Apple compatible. True bidirectional, 80 cps.

EP80 MX82 £389
As MX80 plus high Resolution Graphics.

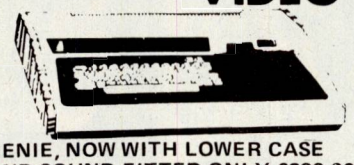
JUST PHONE FOR FURTHER DETAILS

EPSON MX80 FT/1£399
Dual single sheet friction and tractor feed, 9 wire head, true descenders.

EPSON-MX80 FT/2 £440
An FT/1 with high An FT/1 with high resolution graphics.

SEIKOSHA GP80A£199
Dot matrix 5 x 7, 80 columns, 30 cups graphics, double width characters.

VIDEO GENIE



GENIE, NOW WITH LOWER CASE AND SOUND FITTED ONLY £299.00

Utilises Z80, 12 K level II Basic, Integral Cassette Deck, UHFO/P, 16K RAM, all TRS80 features. Simply plugs into monitor or UHF TV, With V.U. Meter.

PARALLEL PRINTER INTERFACE INC CABLE	38.00
CHROMASONICS PROGRAMABLE SOUND KIT	84.50
SOUND KIT (FITTING EXTRA)	8.20
LOWER CASE KIT (FITTING EXTRA)	29.80
COLOUR KIT (FITTING EXTRA)	36.00
EXPANSION BOX WITH/WITHOUT RS232	199
16K/32K RAM CARD	94/129

MONITORS

		HITACHI PROFESSIONAL	
9" Green Screen	£99.00		
12" Green Screen	£125.00	9"	£99.95
12" BMC Green Screen	£159.00	12"	£149.00

TANTEL

PRESTEL BY TANTEL

COMMUNICATION AT YOUR FINGER TIPS FOR BUSINESS & HOME. UP TO DATE INFO

180,000 pages of information on Travel, News, Investment, Holidays, Hotels Etc., Etc.,

£159

TANTEL IS POST OFFICE APPROVED. SEND FOR DETAILS. DEMONSTRATION AVAILABLE AT OUR SHOWROOM

ALL ITEMS CARRY A ONE YEAR GUARANTEE

BARCLAYCARD VISA

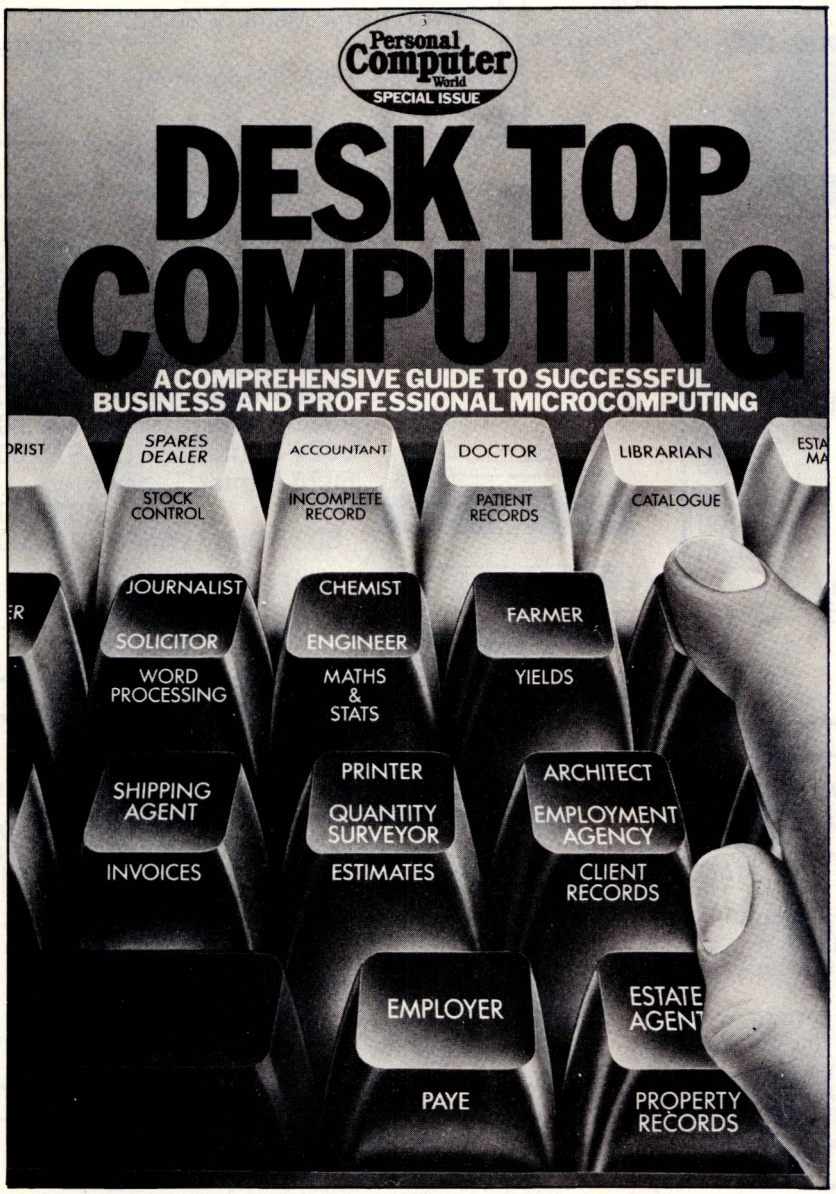
Please add VAT 15% to all prices. Postage on computers, printers and cassette decks charged at cost, all other items, P&P 30p. Place your order using your Access or Barclaycard (Min. tel order £10). Trade and export enquiries welcome. Official orders welcome.

We welcome Access

DESK TOP COMPUTING

A COMPREHENSIVE GUIDE TO SUCCESSFUL BUSINESS AND PROFESSIONAL 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 person or the private citizen. And in the present economic climate the pressure is on to increase productivity and efficiency using these electronic aids.



Also included are several case studies covering the installation of desk top computers in small businesses and for professional use together with a comprehensive listing of virtually every hardware and software system currently available in the UK.

But will your desk top computer be a boon or a curse? Will it increase your profits or disrupt your workplace? Will you be misled by salesmen's patter, baffled by programmers' jargon and find yourself the unhappy owner of a totally unsuitable system?

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. This book, from the publishers of PERSONAL COMPUTER WORLD, 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, the key to obtaining the computer system you need. Step by step, this book tells you how to:-

- Define exactly what tasks you wish your computer to undertake.
- Interpret those tasks in a way the computer can handle.
- Choose the right machine for 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 smoothly with minimal disruption.
- Maintain and modify programs.

AVAILABLE NOW PRICE £1.95 FROM YOUR PCW NEWSAGENTS, THE PCW BACK ISSUES CENTRE OR BY MAIL ORDER. SEE COUPON ON PAGE 195.

Personal Computer World SPECIAL ISSUE

Software for CP/M™

MICRO PRO		LIST
Wordstar™ 3·X		£250
Mail Merge		£ 60
Data Star		£170
Supersort I		£120
Spellstar (USA dictionary)		£120
Calcstar		£150
NEW Compiler Systems	CB 80 (True Compiler)	£280

MICRO SOFT	LIST
Basic-80 Interpreter	£150
Basic Compiler	£190
Fortran-80	£210
Cobol-80	£310

MISC		LIST
Compiler Systems	CBasic-2	£ 65
Sorcim	Pascal/M	£120
Sorcim	Supercalc	£170
Ashton Tate	d Base II	£380
NEW Ecosoft MicroStat		£150
Organic	Milestone (critical path)	£160

CP M is TM of Digital Research.WORDSTAR is TM of Micro Pro

Other Products constantly being added to our range.
Send *large* s.a.e. for latest list

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

PO BOX 11 CRANBROOK KENT
TN17 2DF Tel: (058 080) 310

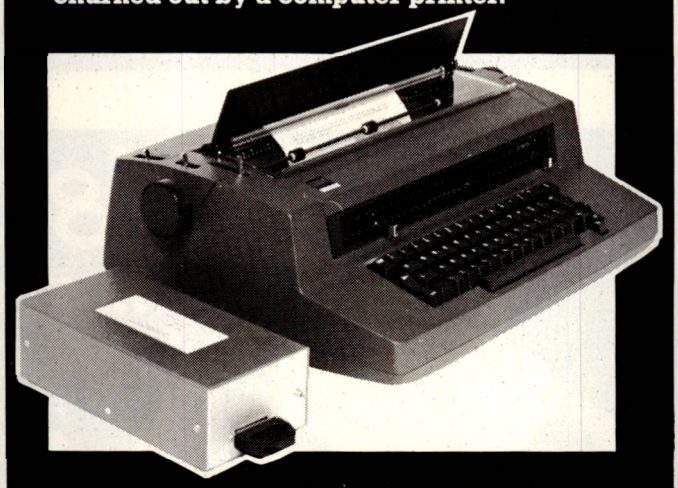
ESCON INTERFACE SYSTEM

MAKES YOUR IBM GOLFBALL TYPEWRITER INTO A TOP QUALITY COMPUTER OUTPUT PRINTER.

Add our Escon Interface System to your IBM office golfball typewriter and it becomes a computer printer. Yet its appearance, or function as a typewriter, has not been affected. So you're doubling the usefulness of your typewriter and at the same time getting the best possible print quality from your computer. And there's a bonus for your budget, too. The Escon Interface System is inexpensive — about a third of what you'd pay for most word processing printers.

What can be better than that?

With Escon, your golfball typewriter and a word processing program for your computer, you're all set to produce error-free letters and reports that still look as if they were carefully typed and not just churned out by a computer printer.



Full compatability with most micros and minis.

RS-232C or Parallel Interface — Switch Selectable.

Does not affect eligibility for IBM warranty or service.

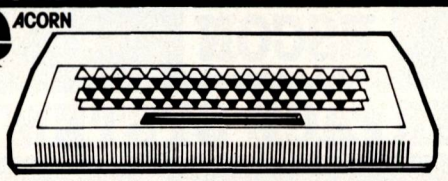
High reliability design — gives years of service.

For IBM Model 72, 82 and Selectric III, Sperry SR-101	—£415
For IBM Electronic Models 50, 60 and 75	—£365

DATARITE

Datarite Terminals Ltd, Caldare House,
144-146 High Road Chadwell Heath, Essex RM6 6NT
Tel: 01-590 1155

MICROAGE ELECTRONICS
LONDON'S BIGGEST ACORN STOCKIST



OFFICIAL BBC STOCKIST

ATOM KITS
In our books the best computer kit available. Build yourself an Acorn Atom for **only £135.**

ATOM SOFTWARE
Games Packs 1–8, Database, FORTH, Atomcalc, everything in stock.

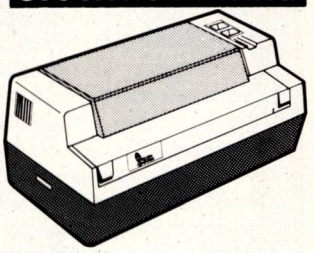
BBC ROM
Update your Atom to the BBC operating system.

Atom Discpack. £345
5¼ discpack only £345, operating manual, cables.

DAI Personal Computer. £684
48K RAM 24K ROM

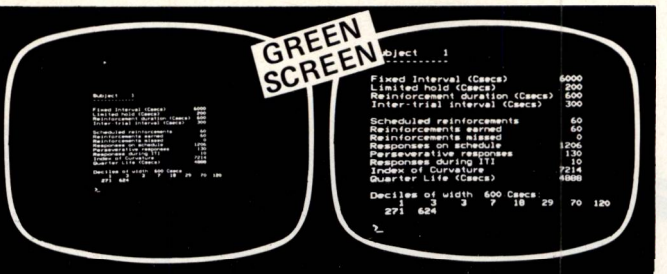
The BBC Cassette Recorder £24
As chosen by the BBC, but cheaper! DIN Control Motor, leads.
If it's not in the advertisement, send for our mail order lists.

EVERYTHING IN STOCK NO WAITING



THE GP–80 dot matrix printer.
LOWEST EVER PRICE
ONLY £199
Dot Matrix, Full 96 ASC11 character

ZX81 Owners £20 off
Bring us your working ZX80 or 81 and get £20 off any Atom – kit or built.



FROM THIS —— TO THIS
AT THE FLICK OF A SWITCH

With the new ZENITH Monitor. Choose between small or large format depending on what you're doing. Small format for definition, large format for display. Full 12" GREEN screen. Only £104.95. It doesn't change the output from your computer, just changes the size of the display.



Blank Cassettes 40p each, **£3.50 for 10.**

Also available:
2114 IC's, Paper for most printers, Enormous selection of Books, Leads, etc, etc, etc,

ATARI VIDEO SYSTEM GAMES
Warlords ——— **£19.95**
Missile Command ——— **£22.50**
plus many, many more

ACTIVISION GAMES
Skiing ——— **£18.95**
Kaboom! ——— **£18.95**
plus many, many more

ALL PRICES INCLUDE VAT
ABSOLUTELY NO MORE TO PAY.

MICROAGE ELECTRONICS
135 HALE LANE EDGWARE MIDDLESEX HA8 9QP
TEL: 01-959 7119 TELEX 881 3241

The RX 8000 Printer
A HOST OF OUTSTANDING FEATURES AT A GREAT FINANCIAL SAVING!



Features ● Low Cost ● Excellent Printing Quality
● Logic Seeking Carriage Control for Faster Output
● 96 ASCII Character Set plus block graphics characters
● Long Life Print Head 100 million characters minimum
● Variety of Interfaces ● Paper Roll Carrier Optional
● Tractor Feed Version includes friction feed facility
● Centronics Version available now ● RS 232C Version available in February

Order Code Friction Feed Version RX 8000 FF-CENT **£228**
Tractor Feed Version RX 8000 TF-CENT **£247** VAT & CARRIAGE EXTRA

For complete Specifications or demonstrations, Write or call today.
NAME _____
ADDRESS _____
_____
_____
_____
_____
_____
PEC 82/3

Data Display Monitor



● Reliable Quality
● High Revolution picture tube shows 1920 characters (18 x 24)
● Lightweight and compact with controls
● Easy operating for user 12 inch or 9 inch monitor
£125 + VAT and carriage
Quantity discount available

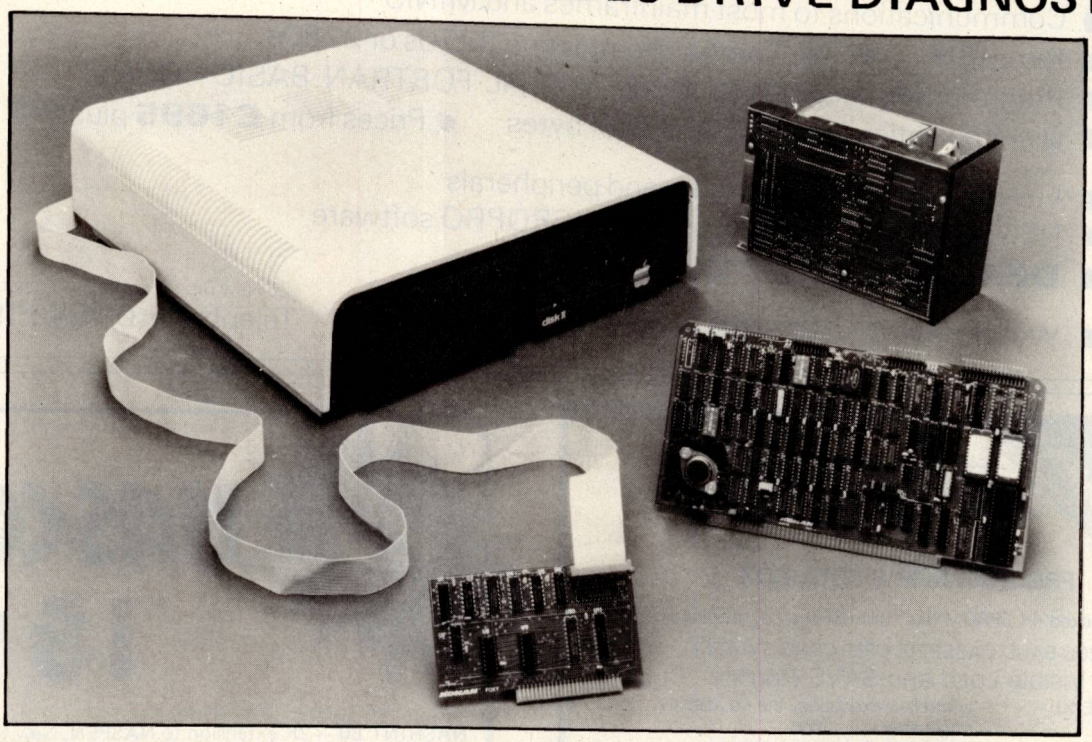
STOTRON
LIMITED
Member of the Roxburgh Group of Companies.
STOTRON LTD., 4A, Shilton Industrial Estate, Bulkington Road, Shilton, Coventry CV7 9JY
Tel: 0203 613521
STOTRON LTD.,
72 Blackheath Road, Greenwich, London. SE10 8DA Tel: 01691 2031
STOTRON (HAYWARDS HEATH) LTD.,
12 Bridge Road, Haywards Heath, West Sussex. RH16 1VA Tel: 0444 52550

INDEPENDENT COMPUTER ENGINEERING LTD

A BRITISH 5 1/4" WINCHESTER DISK DRIVE

INTERFACE-COMPATIBLE WITH YOUR MICROCOMPUTER

* 3.14, 6.28, 9.42, 12.56 MEGABYTE CAPACITIES
* FAST ACCESS TIMES
* OPTIMISED SEEK TIMES
* ON-BOARD MICROPROCESSOR CONTROLS DRIVE OPERATION AND PROVIDES DRIVE DIAGNOSTICS



THE ICE WINCHESTER SUBSYSTEM COMPRISES:

* Winchester Drive/s (RODIME), Controller, Cables, Cabinet and Software to support your system.
* Subsystem can be enhanced to provide 2 Winchester drives, or Winchester plus floppy disk drive.
* Your BACK-UP problem solved with 20 Megabyte Streamer Tape Subsystem.
* Whisper Quiet Operation.
* Apple, S100 Bus, IBM Personal Computer, Xerox 820, Superbrain, Direct Z80 Connection. Call us with your Interface Problems.

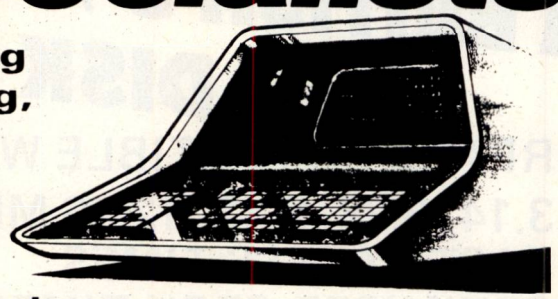
OEM & END USER ENQUIRIES TO: Ashford (STD 07842) 47271 or 47171
ICE – INDEPENDENT COMPUTER ENGINEERING LIMITED
16/18 LITTLETON ROAD, ASHFORD, MIDDLESEX TW15 1UQ, TELEX 8952042

PCW 203

S T Commercial Systems Ltd

Brain Specialists

Simplify all your accounting
Sales, Purchases, Invoicing,
Payroll , Stock control
VAT Reports
Even Trial balances and
P & L Accounts



SuperBrain can work as a word processor
Provide All Tektronix type graphics
and even emulate a Tektronix terminal.

- Communications to most mainframes and MINIS
- Runs IBM "BISYNC" protocol emulating 3270s or 2780s.
- Programming languages include PASCAL FORTRAN BASIC COBOL!
- Disk capacities from 360K to 10M bytes • Prices from **£1695** plus VAT
- Full range of C.P/M. software and peripherals
- NEC spinwriters. EPSON printer MICROPRO software
- **DEALERS BEST DISCOUNTS**
- We also sell CROMEMCO and North Star Hardware.

26 New Broadway, Ealing, London W5
Telephone: 01-840 1926

SPECIAL ANNOUNCEMENT

Acorn Atom

PROGRAMMER'S TOOL-BOX

A packed 4K EPROM (fits Utility Socket) containing:-

1200 BAUD CASSETTE OPERATING SYSTEM
Visible Load and SAVE Routine

PLUS *TRACE(X) — controlled execution, line no. display
* STEP — single step execution
FIND — any string of chars. in program
VAR — list variables
LVAR — print variables
AUTO X,Y — automatic line numbering (any start, any step)
RENUMBER X,Y — any start, any step
DELETE X to Y — any range to line nos.
(*VIA chip required)
HEX — HEX and ASCII dump
1 HEX — HEX dump in instruction format

PLUS Additional BASIC statements
READ,DATA & RESTORE
KEY X — scans keyboard-input to variable
INKEY $X — scans keyboard-input to string variable
IF . . . THEN . . . ELSE
WHILE . . . ENDWHILE
CURSOR X,Y — position cursor as required
ON ERROR
BEEP X,Y — sound a note-any duration, any pitch
ZERO — zeroes all basic variables
POP — close out sub-routine
STOP — useful debugging instructions

Suitable for any memory size. Greatly enhances the Atom's existing facilities.
Real Value at £24.50 + VAT & 25p P&P

5, Wensley Road, Leeds LS7 2LX
Tel. (0532) 683186

Send S.A.E. for details
& full catalogue.
(State Atom)

PROGRAM POWER

VISA

PROGRAM POWER

NASCOM 1 & 2

NASRINT 80 – 2K extension to **NASPEN.** New functions include Pagination, page number & title output, title centering & mid-text re-formatting (eg. change line length, spacing & margins). Supplied in 2x2708 or 1x2716. **SEND** for complete details. £14.95
Graphic GOLF (16K/B)–18 hole course, driver, 9 irons & putter, variable wind speed & dir., swing control, superb graphics £7.95
SPACE PROGRAMS – the 'new ERA'
STARSHIP COMMAND (16K/B/G) – 3D galaxy (9x9x9). 6 levels from Commodore to Space Marshall. Excellent combination of galactic search and M/C code battles. £9.95
MOON RAIDER (MC/G) – 'Scramble' type game with superb **SOUND EFFECTS** thro' Keyboard Port. Raid enemy dumps, blast asteroids & defending ram-ships. Limited fuel. 4 skill levels. £8.95
JAILBREAK IN SPACE (16K/MC/G) – Fast arcade game. Beat off the alien rescue ships attacking your jail. Hold onto your high security prisoners as long as possible. £8.95
NEW FASE (16K/MC/G) – Action packed invaders prog. 4 diff. enemy fleets, indiv. motion, direct & 'truly' angled missiles. £7.95

MICROPOWER – Magazine – (Devoted to NASCOM)
Issue 3 NOV. Issue 4 DEC. Back copies available. **ORDER NOW TO SECURE YOUR COPIES.** Only 95p each (inc. p&p)

** **NASCOM 1** – Cottis Blandford cassette interface – for N2 format, reliability and fast load £14.90

WRITTEN ANY PROGRAMS? WE PAY HANDSOME ROYALTIES!

Please add 55p/order P&P + VAT @ 15% or Sae for FULL catalogue (over 60 items)
BARCLAYCARD VISA
All programs supplied on cassette in Kansas City/CUTS format (listings available)
PROGRAM POWER
5 Wensley Road
Leeds LS7 2LX
Tel. (0532) 683186

SPECIAL OFFER FOR SINCLAIR OWNERS

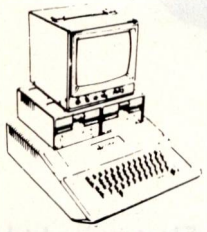
Customised Electronics Ltd
115 Marton Road
MIDDLESBOROUGH
(0642) 247727

The Acorn Dealers Association offer £20 off any ACORN ATOM (kit or built)

in exchange for any working ZX81.
Just take your ZX81 to any of the dealers below and claim your £20 off. Only one ZX81 per Atom eligible.

Broadway Electronics The Broadway, Bedford (0234) 213639	Silicon Centre, 21 Comely Band Road, Edinburgh 031-332 5277	The Centre of Sound, 120 Notting Hill Gate, London W11 01-727 0511	RDS Electrical, 157-161 Kingston Road, Portsmouth (0705) 812478
Mr Pickford Quality Radio & TV Co, 790 Alcester Road, Maypole, Birmingham 14 (021) 444 2889	P J Equipment, 3 Bridge Street, Guildford (0483) 504801	R H Murcott Ltd, Words End, Loughborough (0509) 214444	Carvell Of Rugby 9 Bank Street, Rugby, (0788) 65275/6
Eltec Services Ltd, 231 Manningham Lane, Bradford (0274) 491371	Service Centre 48 Lynedoch Street, Greenock (0475) 20228	NSC Computer Shops Ltd 29 Hanging Ditch Manchester M4 061-832 2269	Computer Facilities, St Vincent House, Normanby Road, Scunthorpe (0724) 63167
Protocol Computers 114 Widmore Road, Bromley 01-460 2580	DA Computers, 184 London Road, Leicester, (0533) 549407	Mansfield Computers & Electronics 79 Ratcliff Gate, Mansfield, Notts.	Q-Tek Systems Ltd, 2 Daltry Road, Old Town, Stevenage (0438) 65385
Cardiff Micro Centre, 46 Charles Street, Cardiff 0222 373072	Customised Electronics Ltd, Winker Green Mills, Stanningley Road, Armley, Leeds (0532) 792332	Customised Electronics Ltd 115 Marton Road, Middlesborough, (0642) 247727	3D Computers 230 Tolworth Rise South, Tolworth, Surbiton 01-337 4317
Computer Shack Ltd, 14 Pittville Street, Cheltenham, (0242) 584343	Mr Calculator, 128/132 Curtain Road, London EC2 729 4555	Newcastle Computer Service, 906-908 Shields Road, Walkergate, Newcastle (0682) 761168	Northern Computers, 128 Walton Road, Stockton-on-Heath, Warrington, (0925) 601683
Vixon Computers Ltd 49 Grimsby Road, Cleethorpes (0472) 58561	PAJ Rentals Ltd, 17 Hampden Square, London N14 368 0572	SP Electronics, 2 High Street, Hucknall, Nottingham (0602) 632467	Computer Plus, 47 Queens Road, Watford, (0923) 33927
Microage Electronics 135 Male Lane Edgware 01-959 7119	Off Records, 58 Battersea Rise, Clapham Junction, London SW11	Arden Data Processing, 166 Park Road, Peterborough 0733 47767	Datex Micros, 193 Tarring Road, Worthing (0903) 39290

LEEDS COMPUTER CENTRE



apple II EUROPLUS

48K ..... **£675** + VAT
Disk with controller ..... **£360** + VAT
Disk without controller ..... **£275** + VAT
Monitors b/w or green.
Full range of Peripherals, Epson and Paper Tiger printers all discounted, Post & Packing £4.

VIC-20 + £150 + VAT

p.p. £3.00

Price includes fully tested unit with fitted plug.
Complete range of Vic-Peripherals.

Sharp MZ80K

48K Model

£345 + VAT

p.p. £5.00

COMMODORE PET

NEW

4000SR. WITH LARGE 12" GREEN SCREEN

32K MODEL
P-P- £5.00 **£520 + VAT**

FULL RANGE OF PRINTERS
RICOH RP160
DAISY EPSON MX RANGE
WALTERS BD80P.

COMPLETE RANGE OF COMMODORE EQUIPMENT EX-STOCK

Official orders welcome: goods dispatched 24hr delivery. Please phone for our lowest prices.

SALES **SERVICE** **SATISFACTION**

ADVANCED COMPUTER EQUIPMENT (LEEDS) LTD

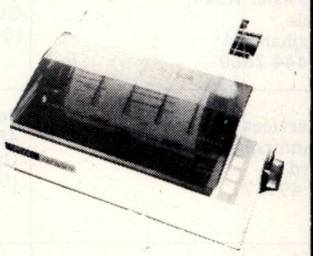
95 MEADOW LANE, LEEDS 11

PHONE: 0532 446960 ACCESS – B/CARD – WELCOME **TELEX: 335909**

Micro General

EPSON MX-80F/T
£399 + VAT

Versatile printer with a variety of interfaces to suit most applications. All other Epson models available.

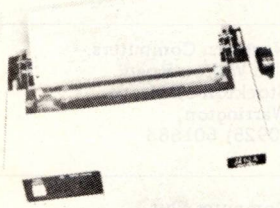


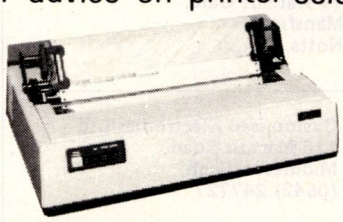
MATRIX PRINTERS ...

Please contact us for advice on printer selection

MICROLINE 82A
£399 + VAT

Fast 120 cps model having true descenders on lower case. Serial/Parallel Interfaces are switch selectable.





MICROLINE 83A
£650 + VAT

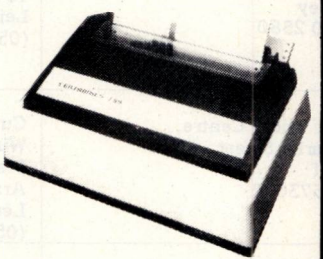
Full width printer with descenders on lower case. Prints at 120 cps and could replace larger printers giving lower costs. Serial/Parallel Interfaces are switch selectable.

MICROLINE 80
£275+VAT

Special low price for this rugged and reliable 80 cps printer. Supplied complete with Roll Paper Holder.

CENTRONICS 739-2
£504 + VAT

Pin addressable graphics plus proportional print capability. Forward and Reverse paper movement, superscript, subscript etc.



APPLE MICROCOMPUTER EQUIPMENT SUPPLIED

Authorised Rank Xerox Microcomputer Dealer.

Call for details of the New Xerox 820

price from £1750+VAT

BARCLAYCARD VISA

FREE DELIVERY to UK Mainland. FREE INSTALLATION in Berkshire.

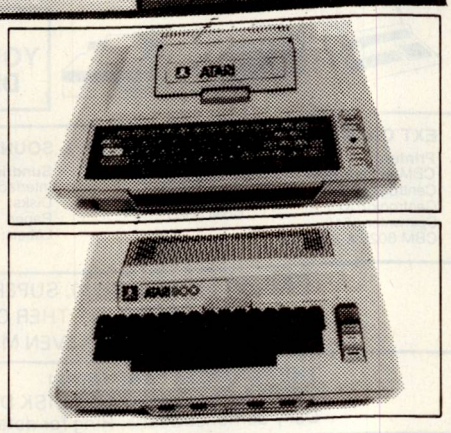
MICRO GENERAL, 6 The Birchwoods, Tilehurst, Reading, Berks. Tel: 0734 25226.

MAPLIN the people for Atari



3 Consoles available:

Atari 400 with 16K RAM(AF36P) £345
Atari 400 with 32K RAM(AF37S)£395
Atari 800 with 16K RAM (AF02C) £645



Lots of other hardware:

Cassette Recorder	(AF28F)	£50.00
Disk Drive	(AF06G)	£345.00
Thermal Printer	(AF04E)	£265.00
Printer Interface for 400	(AF41U)	£49.95
Printer Interface for 800	(AF42V)	£49.95
Interface Module	(AF29G)	£135.00
Versawriter	(AF43W)	£169.00
16K RAM Module	(AF08J)	£64.00
32K RAM Module	(AF44X)	£125.35
32K Upgrade for 400	(AF45Y)	£75.00
Floppy Disk	(YX87U)	£2.75
Le Stick	(AC45Y)	£24.95
Joystick Controllers	(AC37S)	£13.95

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

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

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)	£24.95
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)	£8.95
Kingdom	-C-8K-(YG55K)	£8.95

Teach-Yourself Programs

Conversational French	-5C-16K-(YG44X)	£32.50
Conversational German	-5C-16K-(YG45Y)	£32.50
Conversational Spanish	-5C-16K-(YG46A)	£32.50
Conversational Italian	-5C-16K-(YG47B)	£32.50
Touch Typing	-2C-16K-(YG49D)	£14.95
States & Capitals	-C-24K-(YG56L)	£8.95
European Countries & Capitals	-C-16K-(YG57M)	£8.95

Learn Programming

Invitation to Programming	-C-8K-(YG43W)	£11.95
Basics of Animation	-C-32K-(BQ57M)	£9.95
Basics of Animation	-D-32K-(BQ58N)	£10.95
Player Missile Graphics	-C-16K-(BQ59P)	£18.95
Player Missile Graphics	-D-24K-(BQ60Q)	£19.95
Display Lists	-C-16K-(BQ51F)	£9.95
Display Lists	-D-24K-(BQ52G)	£10.95
Horiz/Vertical Scroll	-C-16K-(BQ53H)	£9.95
Horiz/Vertical Scroll	-D-24K-(BQ54J)	£10.95
Page Flipping	-C-16K-(BQ55K)	£9.95
Page Flipping	-D-24K-(BQ56L)	£10.95
Master Memory Map	-Wallchart-(XH57M)	£4.00

Business Programs

Visicalc	-D-32K-(YL39N)	£119.95
Word Processor	-D-32K-(YG42V)	£85.00
Calculator	-D-24K-(YG50E)	£16.95
Graph—It	-C-16K-(YG51F)	£11.95
Statistics	-C-16K-(YG52G)	£11.95

Arcade Games

Star Raiders	-E-8K-(YG66W)	£29.95
Asteroids	-E-8K-(YG60Q)	£29.95
Space Invaders	-E-8K-(YG70M)	£24.50
Missile Command	-E-8K-(YG64U)	£29.95
Super Breakout	-E-8K-(YG67X)	£29.95
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)	£22.95
Basketball	-E-8K-(YG61R)	£29.95
Tank Trap	-C-16K-(YL34M)	£8.95
Tank Trap	-D-32K-(YL35Q)	£11.95

Home Game Programs

Scram	-C-16/24K-(YG58N)	£12.95
Cypher Bowl	-C-32K-(BQ20W)	£22.45
Thunder Island	-C-16K-(BQ37S)	£10.95
Rotating Tilt	-C-16K-(BQ48C)	£14.95
Lunar Lander	-C-16K-(BQ16S)	£10.95
Jumbo Jet Lander	-C-16K-(BQ46A)	£29.95
Submarine Commander	-C-16K-(BQ47B)	£24.50
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)	£29.95
Microchess	-C-16K-(YL40T)	£15.95
Checker King	-C-16K-(YL41U)	£15.95
Cribbage & Dominoes	-C-16K-(BQ43W)	£14.95
Poker Solitaire	-C-16K-(BQ17T)	£10.95
Blackjack	-C-8K-(YG62S)	£8.95
Fast Gammon	-C-8K-(YL33L)	£9.95
Reversi (Othello-type)	-C-16K-(BQ19V)	£14.95
Gomoko	-C-16K-(BQ18U)	£14.95
Hangman	-C-8K-(YG54J)	£8.95
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)	£8.95

Music Programs

Music Composer	-E-8K-(YG48C)	£32.50
Movie Themes (use with Music Composer)	-C-16K-(BQ34M)	£9.95

Computer Languages

Basic A+	-D-48K-(BQ31J)	£52.50
Operating System A+	-D-48K-(BQ30H)	£52.50
Basic A+ & Operating System A+	-D-48K-(BQ32K)	£99.50
QS Forth	-D-24K-(YL29G)	£44.90
Pilot	-E&2C-8K-(YG69A)	£49.50

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)	£34.50
Assembler	-C-16K-(YL32K)	£14.95
6502 Disassembler	-C-8K-(YL30H)	£8.95
6502 Disassembler	-D-8K-(YL31J)	£11.95
Character Generator	-C-16K-(YL27E)	£9.97
Character Generator	-D-16K-(YL28F)	£12.50
Telelink	-E-8K-(YG59P)	£14.95

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

Send sae now for our new software leaflet with details of all the above programs. Order As XH52G — Issue 2.
Lots of exciting new software titles available soon. Keep in touch with Maplin!
Subscribe now to America's leading Atari-only magazine — Analog — 6 issues per year for just £9.00. Order as GG24B.

MAPLIN

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

Demonstrations at our shops NOW
See the amazing Atari's 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

Note: Order codes shown in brackets. Prices firm until 15th May, 1982 and include VAT and Postage and Packing (Errors excluded).

L & J COMPUTERS

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

THE "PET" SPECIALISTS



GET THE BEST OF BOTH WORLDS!

WE CAN SUPPLY ALL YOUR 'PET' NEEDS AT CASH & CARRY PRICES

4032	40 Col. PET.	£585.00*	8050	IM Byte Disk	£755.00*
8032	80 Col. PET	£755.00*	4022	Printer	£357.00*
4040	347K Disk	£585.00*	8024	Printer	£975.00*

OR WE CAN SUPPLY, INSTALL AND TRAIN YOUR STAFF AT THE NORMAL PRICE WITHOUT ANY EXTRAS!!



TRY US! YOU WILL NOT BE DISAPPOINTED

EXT CASSETTE DECKS (INC COUNTER & SOUNDBOX) ~~£65~~ £55*

Printers	Disk Drives	Sundries	
CBM 4022 & 8024	CBM 8050	Interfaces:	C12 Cassettes
Centronic 779	CBM 4040	Disks:	Library Cases
Centronic 737	CBM 3040	Paper	(roll & tractor feed)
Spinwriter 5510		Labels:	Dust covers
CBM 8026 & 8027			

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

THE "MUPETs" ARE HERE!
3 TO 8 PETs ONLY NEED 1 DISK DRIVE . . .
Daily demonstrations: Ring for details.

*** PRICES DO NOT INCLUDE VAT**

SOFTWARE

As well as a full range of Petsoft and Commodore Software, we have some highly reliable "Home-Brewed" programs available.

STOCK CONTROL & INVOICING **£60**
(Handles up to 500 items — 32K) (180 on 16K). Stock depleted on invoicing, search etc. Cassette, disk (& print option).

3000 item; 4040/8050 £125

CASH BOOK **£90**
Enter daily/weekly amounts — printout and totals, weekly/monthly analysis, totals and balances.

4032 & 8032 versions **£110 & £120**
STOCK TAKING for the licensing trade **£240**
OUTSIDE SERVICES (For Mini-Cabs etc.) **£220**

Sae for free software booklet

VISICALC "OZZ" Commodore Business Programs
COMPSOFT DMSV Bristol Trader, Item & Monitor
ANAGRAM LEDGERS Superpay Word Processing.

COME AND SEE THE NEW VIC 20 at £189 (inc VAT)

FULLY WORKING AND OPERATIONAL
ASK US ABOUT ALL THE ADD-ON-GOODIES THAT GO WITH THE VIC . . . !

PERSONAL SHOPPERS WELCOME
Phone & Mail Orders accepted.

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

BARCLAYCARD VISA

LIVERPOOL COMPUTER CENTRE

Access

BARCLAYCARD VISA

Latest Computer Books

Don't (or How to Care for your Computer) (Zaks/Sybex)	£9.60
50 Pascal Programs (Sybex)	£10.70
32 BASIC Programs for Apple II	£11.85
Beneath Apple's DOS	£12.95
The Book (of Apple Software)	£14.45
How to Get Started in CP/M	£10.95
Some Common BASIC Programs – Apple II	£10.95

and the latest ZX-81 books.

Disks

Accutrack – per box of ten

5¼" SS/DD	£15.50
5¼" DS/DD	£26.50
8" SS/DD	£19.95
8" DS/DD	£28.95

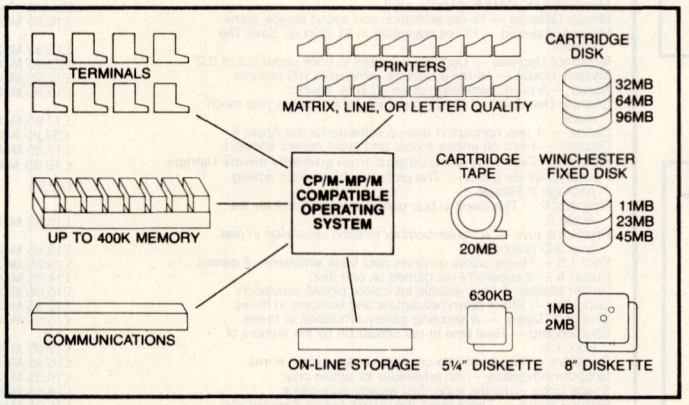
We also supply other formats plus a wide range of Computer Consumables.
Postage & Packing FREE on orders over £10. Orders under £10 add 75p.
Add VAT at 15% to all items except books.

14-16 MANCHESTER ST. LIVERPOOL L1 6ER

051-236 2000

DYNABYTE
FROM
METROTECH





The basic Dynabyte features 64K RAM, a 4MHZ Z80A, and one parallel and two serial ports. All systems run CP/M, MP/M and CP/NET.

A full range of software is available including word processing communications, database, integrated business systems, all standard languages and viewdata.

DYNABYTE
Upgradeable

When you install a Dynabyte system, you're not just buying the system you need today, you're planning for the future. As your business expands and your needs change and grow, you simply add processing power and storage capacity — unit by unit, in a measured building block fashion. The Dynabyte systems provide the total solution for both your data processing and word processing needs.

DYNABYTE
Modularly Expandable

The Dynabyte 5000 Family allows a very wide range of disk storage and can be configured to give multi-terminal and multi-tasking systems, net working and multiple processors. The net result is a system that serves your present needs exactly and is modularly expandable to meet your future demands.

DYNABYTE
Choice of Storage

Choose from nine different members of the Dynabyte Family, and get the amount of storage you require — ranging from 630 thousand bytes to 99 million bytes. Capacity, versatility, and compatibility can all be part of the selection criteria. You don't have to compromise with a Dynabyte.

DYNABYTE
Multi-tasking

Attach up to eight terminals to your micro-computer. Run several jobs from one terminal simultaneously (up to eight at one time). Connect up to 16 printers. Share the processor, share the printers. Add one terminal, one printer, or a block of memory. It is all possible when you install a Dynabyte's Level 4 operating system, a superset of MP/M, on your Dynabyte's equipment.

DYNABYTE
Flexible

The flexibility built into every Dynabyte computer assures you a smooth upgrade path, and it vastly extends the useful life of your equipment. Upgradeability can mean a lot to you — wasted time and disruption are eliminated with a smooth transition to a large Dynabyte system.

Please send more information on the Dynabyte 5000 series

Name .....

Title .....

Address .....

.....

Telephone .....

SEND TO: METROTECH LTD., MARKETING DEPT., WATERLOO ROAD, UXBRIDGE, MIDDLESEX UB8 2YW. TEL: 0895 58111 Exts 265, 287, 247 or 269.

METROTECH IS A MEMBER OF THE GRAND METROPOLITAN GROUP.

JOIN THE HUNT FOR REAL TREASURE!

SOLVE PROBLEMS — DECIPHER CODES — VISIT ACTUAL PLACES — CONSULT LIBRARIES — AND DIG YOUR WAY TO A BURIED £1,000 TOKEN.



It's fun, it's exciting and often exacting. You'll be on the trail of Hadrin — a magician and contemporary of Merlin buried in time and long since forgotten.

Your job will be to discover Hadrin's tomb. It will involve you in all the above, plus even a little witchcraft.

Hadrin is a new concept in games with real treasure at the end.

Part 2 can only be started if you have successfully completed Part 1.

A Mammoth but fun task at only **£36.50.**

Remitttance to:

Holdco LTD

14 Britton St., London EC1M 5NQ Tel: 01-251 3090

ADD FULL COLOUR, TELETEXT, PRESTEL AND VIEWDATA TO YOUR MICRO

* FULL COLOUR
* PRESTEL +
* TELETEXT



* TELETEXT +
* PRESTEL
* Full COLOUR

LION COMBINED PRESTEL TELETEXT VIEWDATA ADAPTOR MXV05

The Lion Combined Prestel Teletext Viewdata Adaptor for Microcomputers MXV05 combines both Teletext and Prestel in one adaptor specifically for most popular microcomputers that are fitted with an RS 232 interface. The unit is extremely versatile and based on the successful Lion AXV03 television add-on adaptor less the infra red remote control but with a bi-directional RS232 interface.

The adaptor has full alphanumeric graphics and editing ability with software available for most micro's to manipulate both Teletext and Viewdata pages. All the normal Prestel and Teletext facilities are available with additional features:- Timed Teletext pages which are essential on the crowded Telesoftware pages planned from TV and satallites, local editing for page preparation with full colour graphics reducing costs in page preparation for information providers, 6 Autodial stored numbers, printer and cassette outputs and optional 8 page memory storage.

Full colour, full Viewdata and Teletext are available to micro's even with RS232 out only, via the adaptor's UHF output; the micro need not have Prestel Teletext character or graphics set and the micro can operate still in its own screen format with the minimum of software. Micro's with the adaptor can directly load Telesoftware from Teletext, software from Prestel databases or private software Viewdata computer databases and then operate directly or save programs, e.g., Lion Viewdata Computer; which as a special offer for purchasers on an experimental basis, will be allowed to market their software through the Lion Viewdata Computer or at reduced rates purchase programs directly from it.

The MXV05 is only £299 incl. add £3.50 P&P

SAE for further details.
LION Viewdata TV, 18 Harcourt Terrace, London, S.W.10
TEL.: 01-373 5218

SPIDER SOFTWARE

APPLE SOFTWARE

A.C.E. — A program line editor with macro facilities	£19.95 **A48K**
Akalabeth — An advanced fantasy role playing game.	£22.95 **M48K**
Apple-Doc — Cross reference utility + Variable replacement.	£22.95 **A48K**
Apple Panic — Chase little apples up and down ladders.	£16.95 **M48K**
AppleWorld — Allows you to produce 3-D animated graphics.	£38.95 **M48K**
Ascii Express II — A complete intelligent terminal package.	£42.95 **A48K**
Asteron — The ultimate Asteroids replica game.	£19.95 **M48K**
Autobahn — Road race game with sound and hi-res graphics.	£14.95 **M48K**
Beer Run — Catch the Artesians before the Guzzlers and Bouncers catch you	£16.95 **M48K**
Both Barrels — 2 hi-res action games on one disk.	£12.95 **A48K**
Castle Wolfenstein — An action adventure game in hi-res graphics with sound.	£18.95 **M48K**
Copts & Robbers — An adventure game in the tombs of ancient Egypt.	£19.95 **M48K**
CPS Multifunction Card — Serial, Parallel and Clock on one card.	£183.95 **Card**
Cranston Manor — A new hi-res adventure like Wizard & the Princess.	£19.95 **Disk**
Cross-Ref — Cross reference Applesoft programmers utility.	£14.95 **A32K**
Cyber Strike — 3-D hi-res action arcade game in space.	£19.95 **M48K**
Crossfire — Stop the aliens from taking over the city.	£16.95 **M48K**
Dark Forest — An adventurous game of strategy and conquest for up to 6 players	£16.95 **M48K**
Dogfight — Hi-res jet combat game for 1 or 2 players.	£18.95 **M32K**
Epoch — Hi-res action game fighting the aliens.	£19.95 **M48K**
E-Z Draw 3.3 — This is the poor man's graphics tablet. Very easy to use.	£28.95 **M48K**
EXPEDITER II — THE APPLESOFT COMPILER AT A LOW, LOW PRICE.	£56.95 **A48K**
Falcons — The best Invaders style game available for the Apple.	£18.95 **M48K**
Fender Bender — Super car game in hi-res colour graphics.	£14.95 **M48K**
Galaxy Wars — Colour graphics + Sound effects + Hi-res arcade game.	£13.95 **M32K**
Galactic Attack — A hi-res Star Trek type game.	£19.95 **M48K**
Gamma Goblins — Yet another superb hi-res action game.	£16.95 **M48K**
Genetic Drift — A departure from the normal arcade style game.	£16.95 **M48K**
Higher Graphics — Hi-res picture drawing utility.	£23.95 **M48K**
Hadron — A 3-D Battle in the midst of a meteor field.	£19.95 **M48K**
Hi-res Cribbage — The title describes it. Even hear the pegs move.	£14.95 **M48K**
Hi-Res Soccer — English football for 1 or 2 players in hi-res.	£16.95 **M48K**
Jawbreaker (Gobbler) — Eat up the dots but watch out for the Gobblers.	£16.95 **M48K**
KRAM — Fast and powerful Keyed Random Access Method for quick disk access.	£58.95 **M32K**
LISA — The assembly language development system for professionals.	£45.95 **M48K**
List Master — An excellent companion product to Apple-Doc.	£22.95 **A48K**
Memory Management System — Enables you to put DOS on a RAM card.	£29.95 **M64K**
Microsoft 16K RAM Expansion card.	£114.95 **Card**
Missile Defense — Hi-res animation and sound arcade game.	£16.95 **M48K**
Mission: Asteroid — Hi-res adventure in 21 colours. Save The World!!	£10.95 **M32K**
MultiBoot Upgrade — Upgrade 3.2 disks to book under 3.2 or 3.2.	£23.95 **M48K**
Mystery House — Hi-res adventure using over 100 pictures.	£12.95 **M48K**
Norad — A hi-res simulation of an I.C.B.M. attack.	£19.95 **M48K**
Olympic Decathlon — Long jump, high jump, hurdles plus much more.	£17.95 **M48K**
Online — A new concept in dial-up software for the Apple II.	£59.95 **A48K**
Orbitron — Fight off enemy forces and avoid meteor showers.	£14.95 **M48K**
Outpost — Save your space outpost from attack by enemy fighters.	£16.95 **M48K**
Pascal Graphics Editor — The professional graphics editing package in Pascal.	£49.95
Pegasus II — The latest in pub games now available for the Apple II.	£16.95 **M48K**
Phantoms Five — A fighter-bomber mission simulation in real time 3-D graphics.	£18.95 **M48K**
Pool 1.5 — Hi-res colour graphics pool table simulation. 4 games.	£19.95 **M48K**
Pulsar II — 2 superb hi-res games on one disk.	£14.95 **M48K**
Raster Blaster. A very realistic full-colour pinball simulation.	£15.95 **M48K**
Sabotage — Shoot down helicopters and bombers in hi-res.	£13.95 **M48K**
Shooting Gallery — A shooting gallery simulation in hi-res.	£15.95 **M48K**
Shuffleboard — Real time hi-res simulation by the authors of Pool 1.5.	£19.95 **M48K**
Sneakers — Waves of little creatures attack you in hi-res.	£16.95 **M48K**
Softporn Adventure — An adventure for adults only.	£16.95 **M48K**
Space Eggs — Hi-res super-fast arcade style game.	£14.95 **M48K**
Space Quarks — Shoot down the quarks before they get you.	£16.95 **M48K**
Space Warrior — Protect your shields from the dreaded drone ram ships.	£13.95 **M48K**
Star Avenger — A fast paced game of guerilla warfare in space.	£19.95 **M48K**
Star Cruiser — Save yourself from the swooping aliens.	£18.95 **M48K**
SuperGraphics — A 3-D game development system in colour.	£23.95 **M48K**
SuperKRAM — As KRAM but with multi-key and multi-index.	£99.95 **M32K**
SUPERSCRIBE II WORD PROCESSOR, TRUE UPPER/LOWER CASE ON SCREEN.	£73.95 **M48K**
TASC — An optimising Applesoft compiler from Microsoft.	£129.95 **M48K**
The Dictionary — Checks spelling of any standard DOS text or binary file.	£54.95 **M48K**
The General Manager — User-friendly hierarchial database package.	£54.95 **M48K**
Threshold — Yet another fast action arcade style game.	£21.95 **M48K**
Time Zone — The largest adventure ever implemented. Hi-res colour graphics.	£54.95 **M48K**
Ulysses & the Golden Fleece — Another superb hi-res adventure.	£19.95 **M48K**
Visicalc 3.3 — The 16 sector version with enhanced manual.	£119.95 **M48K**
Visidex — Store and retrieve information by key words.	£119.95 **M48K**
Visifile — A database from the same stable as Visicalc.	£149.95 **M48K**
Visiplot — A hi-res graphics graph plotting package.	£94.95 **M48K**
Visiterm — Use your Apple as an on-line terminal.	£89.95 **M48K**
Visitrend — Performs maths operations on time series data.	£149.95 **M48K**
Wizard and the Princess. — Hi-res adventure in 21 colours.	£18.95 **M48K**
Wizardry — 3-D adventure. The best we have seen yet.	£28.95 **M48K**
Z-Term — A full feature terminal package for the CP/M Apple.	£65.95 **M48K**

A: Requires Applesoft in ROM. M: Will run on any Apple.

Please specify which DOS you require when ordering. If you don't see what you are looking for please give us a call. WE ALSO OFFER A BESPOKE SOFTWARE SERVICE WHICH IS SECOND-TO-NONE.

PRICES INCLUDE VAT AT 15% **Add 50p P+P for orders under £30 totally.**
Please write or telephone for your free copy of our up-to-date software list.

DEALER INQUIRIES INVITED.
PERSONAL CALLERS BY APPOINTMENT ONLY PLEASE.

SPIDER SOFTWARE

98 AVONDALE ROAD,
SOUTH CROYDON,
SURREY.

We welcome Access

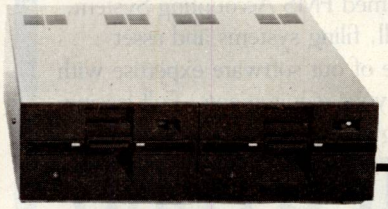
Tel: 01-680 0267 (24 hours a day — 7 days a week)

CUMANA

TRS 80 MODEL III DUAL DENSITY DISK DRIVES



FOR DEPENDABILITY AND QUIET OPERATION



INTERNAL DRIVE PRICES		CAPACITY
1 x 40 Track Drive	£420	184K Bytes
2 x 40 Track Drives	£599	368K Bytes
1 x 80 Track Drive	£460	368K Bytes
2 x 80 Track Drives	£695	737K Bytes
1 x 80 Track Double Sided Drive	£620	737K Bytes
2 x 80 Track Double Sided Drive	£999	1474K Bytes

Internal Drive prices include Disk Controller Board, Power Supply Unit and all Cables and Connectors required for installation.

EXTERNAL DRIVE PRICES	
1 x 40 Track Drive	£219
2 x 40 Track Drives	£399
1 x 80 Track Drive	£285
2 x 80 Track Drives	£539
EXTERNAL 2 Drive Cable	£15

External Drives are directly compatible with the TRS 80 Model I and Video Genie Expansion Interfaces.

You can depend on **Cumana**; we scour the world markets for top quality products to give you efficient, trouble free operating. Like DISKS from TEAC of Tokyo and other leading names. Cumana are alert for the latest proven developments and promise you attentive service. Write or 'phone for Data Sheets.

Call your nearest dealer for a demonstration:

RADIO SHACK LTD.,
188, Broadhurst Gardens.
London NW6.
Tel: 01-624-7174

COMPSHOP LTD.,
14, Station Road.
New Barnet, Herts.
Tel: 01-441-2922

COMPSHOP LTD.,
311, Edgware Road.
London W2.
Tel: 01-262-0387

COMPSHOP LTD.,
19, Herbert Street.
Dublin 2.
Tel: 604165

LONDON COMPUTER CENTRE, 43, Grafton Way, London W1.
Tel: 01-388-5721

N.I.C.
61, Broad Lane.
London N15.
Tel: 01-808-0377

CROYDON COMPUTER CENTRE, 29a, Brigstock Road, Thornton Heath, Surrey.
Tel: 01-689-1280

P J EQUIPMENT LTD.,
3, Bridge Street.
Guildford.
Tel: 0483-504801

R.D.S. ELECTRICAL LTD., 157-161, Kingston Road, Portsmouth.
Tel: 0705-812478

TANDY HASTINGS LTD., 48, Queens Road.
Hastings.
Tel: 0424-431849

MICROWARE COMPUTING SERVICES, 57, Queen Charlotte Street, Bristol.
Tel: 0272-279560

BLANDFORD COMPUTERS, Higher Shaftsbury Road.
Blandford Forum.
Tel: 0258-53737

TAPE SHOP
32i Viaduct Road.
Brighton.
Tel: 0273-609099

PARWEST LTD.,
18, St. Mary Street.
Chippenham.
Tel: 0249-2131

COMPUTER SHACK
14, Pittville Street.
Cheltenham.
Tel: 0242-584343

TANDY GLOUCESTER,
13, Clarence Street.
Gloucester.
Tel: 0452-31323

COMSERVE,
98, Tavistock Street.
Bedford.
Tel: 0234-216749

CLEARTONE COMPUTERS, Prince of Wales Ind. Estate.
Abercarn, Gwent.
Tel: 0495-244555

EMPRISE LTD.,
58, East Street.
Colchester.
Tel: 0206-865926

MAGNUS MICRO-COMPUTERS,
139 The Moors.
Kidlington, Oxford.
Tel: 08675-6703

CAMBRIDGE COMPUTER STORE,
1, Emmanuel Street.
Cambridge.
Tel: 0223-65334

I.C. ELECTRONICS,
Flagstones.
Stede Quarter.
Biddenden, Kent.
Tel: 0580-291816

MICRO CHIP SHOP,
190, Lord Street.
Fleetwood, Lancs.
Tel: 03917-79511

HARDEN MICRO-SYSTEMS, 28-30, Back Lord Street, Blackpool.
Tel: 0253-27590

AMBASSADOR BUSINESS COMPUTERS LTD.,
Ashley Lane Works.
Shipley, W. Yorks.
Tel: 0274-595941

Q-TEK SYSTEMS LTD.,
2 Daltry Close, Old Town, Stevenage, Herts.
Tel: 0438-65385

COMPUTER & CHIPS,
Feddinch Mains House.
St. Andrews, Fife.
Scotland.
Tel: 0334-72569

HEWART MICRO-ELECTRONICS,
95, Blakelow Road.
Macclesfield.
Tel: 0625-22030

KARADAWN LTD.,
2 Forest Way.
Great Sankey.
Warrington.
Tel: 0925-572668

PHOTO-ELECTRICS,
459 London Road.
Sheffield.
Tel: 0742 53865

ARC ELECTRONICS,
54 Heron Drive, Sandal.
Nr. Wakefield.
W. Yorks WF2 6SL.
Tel: 0924-253145

VICTOR MORRIS LTD., 340 Argyle Street, Glasgow.
G2 8LY.
Tel: 041-221 8958

COMPRITE LTD.,
Thorite House.
Laisterdyke.
Bradford.
Tel: 0274-663471

GNOMIC LTD.,
46, Middle Street.
Blackhall.
Hartlepool.
Tel: 0783-863871

BRIERS COMPUTER SERVICES, 1, King Edward Square.
Middlesbrough.
Cleveland.
Tel: 0642-242017

3 LINE COMPUTING
36, Clough Road, Hull.
Tel: 0482-445496

H.C. COMPUTER SALES LTD., 182, Earlsway, Team Valley Trading Estate.
Gateshead.
Tel: 0632-874811

EWL COMPUTERS LTD.,
8, Royal Crescent.
Glasgow.
Tel: 041-332-7642

EVERYMAN COMPUTING,
14 Edward Street.
Westbury, Wilts.
Tel: 0373-864644

CUMANA LTD 35 Walnut Tree Close, Guildford, Surrey, GU1 4UN.
Telephone: (0483) 503121. Telex: 858306

Please add VAT to all prices. Delivery at cost will be advised at time of order.

SYSTEMS FOR BUSINESS...

As business system specialists we're able to offer a full range of software adapted to low cost hardware, so even the smallest business can benefit from computerisation at a comparable cost — and as you grow so can your computer system.

Apple II from £1895
Apple III from £2900
Sharp PC3201 from £2895
Commodore 4000 from £1875
Commodore 8000 from £2995
Systime 500 from £7000

Choose from our comprehensive software packages including the widely acclaimed FMS Accounting System, financial modelling, payroll, filing systems and asset register; or take advantage of our software expertise with a package tailor-made for your requirements. Full leasing facilities available including software.

...COMPUTERS FOR PEOPLE

The same expertise we offer to businesses is also available to our home computer customers. You can select from our range of hardware, accessories, games, books and educational programs — and we'll demonstrate any system before you purchase.

*** VIC 20 COLOUR COMPUTER**
3½K user memory
24 colour variations
3 x 3 octave sound voices
4 programmable function keys

PLUS — games cartridges; extra RAM packs: 3K, 8K, 16K; light pen; games paddles; printer; disk drive

*** SHARP MZ80K COMPUTER**
48K memory
3 octave sound range
Multiple graphic character set

INCLUDES — keyboard, screen with 40 characters & 24 lines, and cassette unit with tape counter.

PLUS — printers, disk drives, interface cards and choice of BASIC, FORTH, PASCAL, ASSEMBLER or MACHINE CODE.

2 year guarantee on most products
Ring for current prices!

COD SERVICE AVAILABLE — ring for details

OPEN MONDAY — SATURDAY
9.00 am to 5.30 pm

INSTANT CREDIT UP TO £1,000!

RAM COMPUTER SERVICES LTD
15-17 North Parade BRADFORD BD1 3JL
Tel (0274) 391166

WOODLAND SOFTWARE

MAIL ORDER MICROCOMPUTER SUPPLIES FOR THE APPLE

WIZARDRY 48K P	£29.90	Epoch 48K M	£20.75
Galactic Attack 48K P	£14.95	Copts & Robbers 48K M	£20.75
Doom Cavern 48K I/A	£12.50	Outpost 48K M	£16.75
Odyssey 48K I	£14.75	Beer Run 48K M	£20.75
Tank Attack/Death Run 48K I/A	£12.50	Gorgon 48K M	£22.75
Wilderness Campaign 48K A	£12.50	Sneakers 48K M	£16.75
Wilderness & Dungeon 48K I/A	£20.75	Gamma Goblins 48K M	£16.75
Mission Asteriod 48K M	£11.75	Autobahn 48K M	£16.75
Mystery House 48K M	£14.75	Orbitron 48K M	£16.75
Wizard Princess 48K M	£19.75	Pulsar II 48K M	£16.75
Cranston Manor 48K M	£20.75	Space Eggs 48K M	£16.75
Hi-Res Football 48K M	£22.75	Phantoms Five 48K M	£16.75
Hi-Res Soccer 48K M	£17.75	Cyber Strike 48K M	£21.75
Hi-Res Cribbage 48K M	£14.75	Star Cruiser 32K M	£13.75
Missile Defence 48K M	£17.75	Both Barrels 48K A	£13.75
Sabotage 48K M	£14.75	E-Z Draw 3.3 48K A	£27.75
Gobbler 48K M	£14.75	Higher Graphics II 48K I/A	£20.75
L.A. Land Monopoly 48K A	£16.75	Higher Text 32K I/A	£20.75
Hyperspace Wars 48K A	£16.75	Superscribe 48K M	£50.75
3-D Skiing 48K A	£14.75	Expediter II 48K A	£77.75

A — Applesoft I — Integer
I/A — Integer & Applesoft
M—Runs on any Apple
P — Requires DOS 3.3

TRADE ENQUIRIES INVITED

All software is disk based. All prices are inclusive.
On multiple orders of 3 or more programs P&P is FREE; please add 50p P&P on orders less than 3.
A list of our full range of software is free on request. . . from

WOODLAND SOFTWARE
103 Oxford Gardens, London W10 6NF.
Tel: 01-960 4877

The Diablo 630



£1645.00

Excluding V.A.T.

40cps bi-directional logic seeking.
Metal or plastic daisy wheel, carbon or fabric ribbon.
Full range of accessories, traction and single sheet feeders.
Robust construction. Ideal for letter quality printing.

Full range of matrix printers also available.

KCB MICROS LIMITED
14 Windsor Rd. Slough, Berks. Tel: Slough (0753) 38581/38319

HAYDEN BOOKS

New and Recent Titles:

THE BASIC CONVERSIONS HANDBOOK FOR APPLE™, TRS-80™, and PET™ USERS

The Brain Bank (David A. Brain, Philip R. Oviate, Paul J.A. Paquin, and Chandler D. Stone, Jr.)

Now you can convert a BASIC program for the TRS-80, Apple II, or PET to the form of BASIC used by any other one of those machines. This is a complete guide to converting Apple II and PET programs to TRS-80, TRS-80 and PET programs to Apple II, and TRS-80 and Apple II programs to PET. Equivalent commands are listed for TRS-80 BASIC (Model I, Level II), Applesoft BASIC and PET BASIC, as well as variations for the TRS-80 Model III and Apple Integer BASIC. Also described are variations in graphics capabilities, PEEK, POKE, and CALL statements, cursor and control characters, memory locations, etc.
In addition to a complete listing of equivalent commands, the book contains helpful advice on the methodology of converting programs, explanations of machine peculiarities, and detailed explanations of Applesoft commands. Appendices provide useful subroutines, sample programs, and charts showing screen coordinate conversion.

5534X 88 pages Jan'82 approx. £5.95

THE SOFTSIDE SAMPLER: TRS-80™ ENTERTAINMENT PROGRAMS

Edited by **Joan Witham**

A sampling of SoftSide Magazine's more exciting game programs are compiled in a single book. Twenty-nine stimulating programs in TRS-80 BASIC provide hours of amusement. Test your nautical skills with programs like Sound the Horn and Battleship, partake in a nine-man wrestling contest or jump a motor cycle over ten barrels at a time! Many other thrilling programs are included.

54963 128 pages Feb'82 approx. £6.60

SPEAKING PASCAL

by **K.A. Bowen**

The author employs top-down structured analysis and key examples to illustrate each new idea and encourages the reader to construct programs in an organized manner for complete understanding. After a brief introduction to the structure of computers and the problems of programming languages, the text discusses various components of PASCAL. Elementary and complex data types are covered, as well as the use of control structures, procedures, and functions.

51646 246 pages Dec'81 £9.30

AN INTRODUCTION TO MICROPROCESSORS:
Experiments in Digital Technology

by **N.T. Smith**

Written for the hobbyist or professional who wants to learn how to design digital circuits using integrated circuits, it follows a building block design beginning with the simple inverters and gates and progressing to the highly sophisticated microprocessors.
Design principles are included and are illustrated in the simple projects described.

08678 184 pages Dec'81 £8.50

Z-80 and 8080 ASSEMBLY LANGUAGE PROGRAMMING

by **K. Spracklen**

An extensive introductory look at assembly language programming for the 8080 and Z-80 processors. It is intended to provide just about everything the applications programmer needs to know to get the most out of his or her machine.

51670 192 pages 1979 £7.55

MY MICRO SPEAKS BASEX (AND LOVES IT)

by **Paul Warme**

An in-depth examination of BASEX, a versatile new language for 8080 type microcomputers. It combines the best features of BASIC and executable machine language code. The major advantage of BASEX is speed — programs run up to 20 times faster than similar programs in BASIC. And after typing in your program, you can begin by just typing RUN and giving the starting line number. BASEX is similar to BASIC, and just as easy to learn, but has added features which will benefit the programmer.

51875 168 pages Sept'81 £7.75

PROGRAMMER'S GUIDE TO THE 1802
(with an Assembler for your Machine)

by **T. Swan**

The only assembly language primer that has an assembler! This text teaches assembly language for the 1802 microprocessor. Coverage includes everything from the binary number system and the fundamentals of machine language, to the development of a working 1802 assembler.

51832 166 pages Aug'81 £5.85

USING MICROCOMPUTERS IN BUSINESS:
A Guide for The Perplexed

by **S.S. Veit**

Written by the owner of one of America's largest computer stores selling systems to small businesses, this book is an essential background briefing for any purchaser of a microcomputer system or software. Veit answers the most often asked questions in an easy to read style avoiding technical jargon.

51522 150 pages Nov'81 £7.75

MUSICAL APPLICATIONS OF MICROPROCESSORS

by **H. Chamberlin**

" . . . this book is a milestone in microcomputer history. Its publication marks the progression — from novelty to serious instruments of expression — of musical applications of small computer systems. With little modification, the book could serve as a reference source on generalized data collection, signal processing, and process control using microcomputers."
BYTE Magazine

57539 661 pages Dec'81 £21.00

Please write to John Wilson at the address below for a complete catalogue of all Hayden Books and Software.

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

AT LAST!

THE COMPLETE SINCLAIR ZX 81 BASIC COURSE

At last, a comprehensive text for your Sinclair ZX 81! The complete BASIC Course is a manual which will immediately become an indispensible work of reference for all your ZX 81 programming.

Whether you have never done any programming or whether you are an experienced microcomputer user, the Complete BASIC Course will provide itself to you as an invaluable aid.

The Complete BASIC Course is designed to teach you to write and develop BASIC programs for the Sinclair ZX 81 – no other books or aids are necessary. All is revealed in our easy step-by-step guide with programs and "test yourself" exercises all the way through.

As you become more proficient with computing, the Complete BASIC Course will continue to be an essential guide, giving you finger tip references, numerous advanced programming techniques and memory saving devices specifically for the Sinclair ZX 81.

HOW TO WRITE PROGRAMS:

Even if the idea of writing programs is completely mystifying to you, the Complete BASIC Course will show you just how easy it is. In no time you will be able to write and enjoy complex programs for whatever use you desire.

Using the proven "TOP-DOWN" approach, the Complete BASIC Course will show you systematic and simple ways to write programs. Even experienced programmers will benefit from this Course, making programs easier to write and less prone to error!

NUMEROUS EXAMPLES:

Every concept, every function is fully described by simple programs that you can enter on your Sinclair ZX 81 in minutes.

The Complete BASIC Course contains over 100 programs and examples! These programs illustrate the use and possibilities of the Sinclair ZX 81:

- Home use
- Financial analysis and planning
- Educational applications
- Games
- Mathematical applications
- Displays of 'Artificial Intelligence

EVERY FUNCTION COVERED:

No matter what your application, what your confusion about any function, you will find it covered in the Complete BASIC Course.

A full and detailed discussion is included of even traditionally taboo topics such as USR, PEEK and POKE.

A handy alphabetical summary section lists all functions, and provides a short description and example programs of all topics.

A PERMANENT WORK OF REFERENCE:

The Complete BASIC Course is an excellent reference work for experienced programmers (including tips on using special techniques) as well as a comprehensive step-by-step guide for complete beginners.

The Complete BASIC Course has over 240 pages filled with information in an attractive durable ring binder – this is a lay-flat work of reference that deserves a place next to every Sinclair ZX 81 microcomputer.



OTHER TITLES AVAILABLE:

Melbourne House is the world's leading publisher c books and software for the Sinclair ZX 81.

The following titles are also available if you wish to expand your horizons:

BASIC Course Programs on Cassette -

All major programs in the BASIC Course are available pre-recorded in this set of cassettes. This is a valuable adjunct to the Course, saving you time and effort.

Not Only 30 Programs for the Sinclair ZX 81: 1K -

Not only over 30 programs, from arcade games to the final challenging Draughts playing program, which all fit into the unexpanded 1K Sinclair ZX 81 but also notes on how these programs were written and special tips! Great value!

Machine Language Programming Made Simple for the Sinclair -

A complete beginner's guide to the computer's own language – Z80 machine language. Machine language programs enable you to save on memory and typically give you programs than run 10-30 times faster than BASIC programs.

Understanding Your ZX 81 ROM -

A brilliant guide for more experienced programmers by Dr. Ian Logan, this book illustrates the Sinclair's own operating system and how you can use it. Includes special section on how to use machine code routines in your BASIC p+rograms.

Order Form:

Orders to Melbourne House Publishers
131 Trafalgar Road, Greenwich London SE10

(Correspondence to
Glebe Cottage, Station Road, Cheddington, Leighton Buzzard, BEDS LU7 7NA)

NAME:.....

ADDRESS:.....

.....

.....Postcode.....

The Complete Sinclair ZX 81 BASIC Course	@ £17.50	
Basic Course Programs on Cassette	@ £ 2.50	
Not Only 30 Programs/Sinclair ZX 81:1K	@ £ 6.95	
Machine Language Programming Made Simple	@ £ 8.95	
Understanding Your ZX 81 ROM	@ £ 8.95	
Postage and Packing		£ 0.80
Remittance enclosed		£

PLUG INTO RADIO & ELECTRONICS WORLD

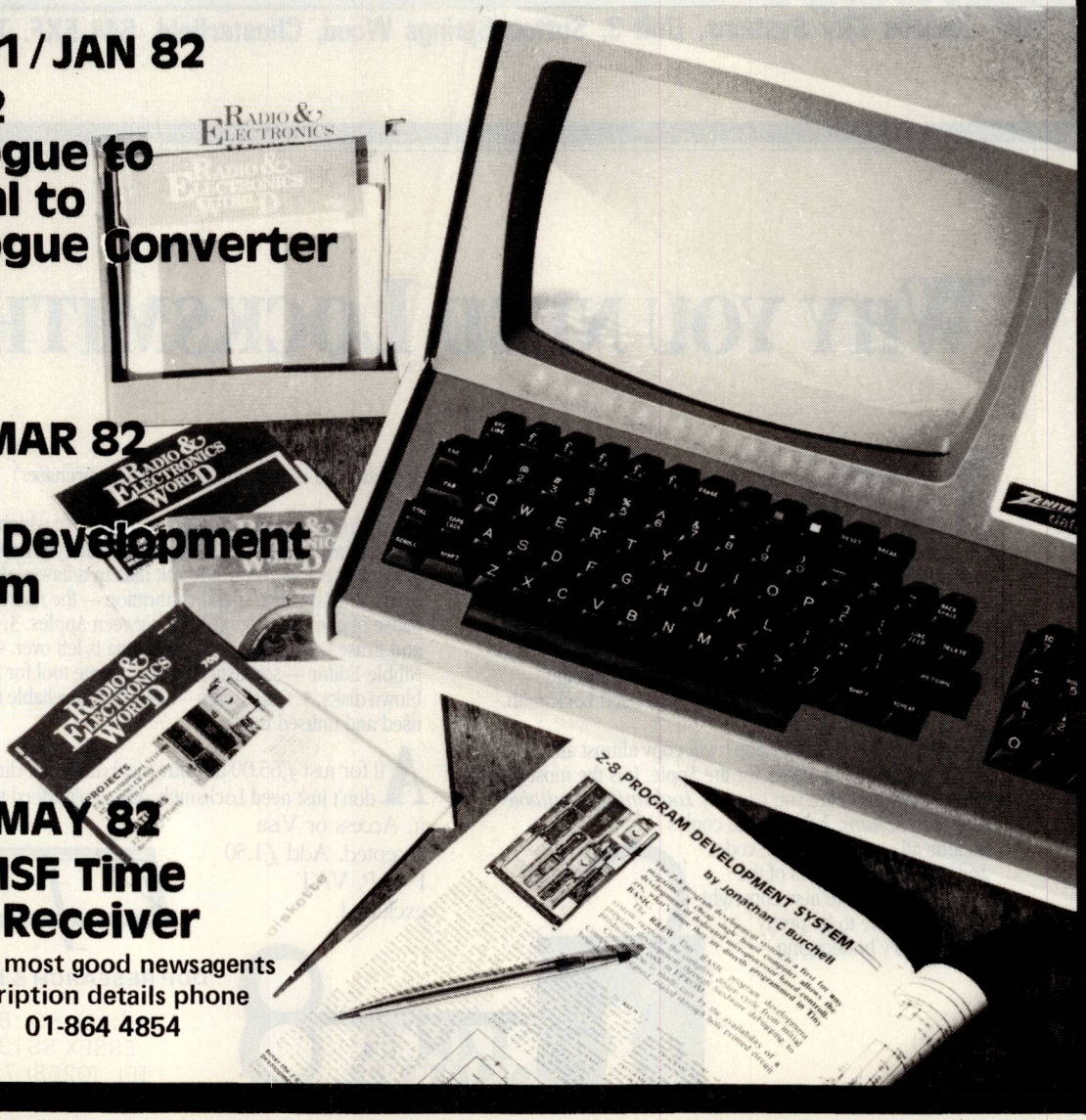
Do your programmes disappear into ever diminishing software loops?

Find the way out into the real world with R&EW's hardware application projects:

DEC 81 / JAN 82
RS232 Analogue to Digital to Analogue Converter

FEB / MAR 82
Z8 Basic Development System

APR / MAY 82
Z80 MSF Time Code Receiver



Available at most good newsagents or for subscription details phone 01-864 4854

SOS Missile Command...Multihead Destructors destroyed city...SOS Missile Command... Cluster Mines sighted... ...SOS Missile Command...Plasma Projectile assault...SOS Missile Command...Satellite Bombs in range...SOS Missile Command...Megon Annihilator destroyed further city...SOS

Kansas £350 'COMMAND' CONTEST
Computer Fair—Earls Court April 23—25

Missile Command

Together, Mike Chalk and Kansas bring you not just another Arcade game

. . . an EXPERIENCE !



YOU command the ground-to-air missiles to save the cities from total Alien destruction, progressing to TEN levels of difficulty from not-to-easy to bloody impossible! Multiple displays with five types of Aliens and Satellite Bomber. Infinite missile 'sight' control.

Based on the Arcade game of the same name, this is easily the finest computer game of its kind available today. It demands quick responses and no small amount of skill to overcome the Aliens even at the lower levels of play. As the game proceeds, so does the risk of total ahiliation, giving at last, a very, very competitive game indeed, and one which will satisfy even the very skilled gamesman.

Available only from Kansas—**£9.50**

Kansas

Programs for the TRS-80 and Video Genie. All prices are Vat paid and post free. Same-day first class return post service. All software in stock and fully guaranteed as we are the actual publishers. Free catalogue upon request. ACCESS & BARCLAYCARD WELCOME

Kansas City Systems, Unit 3, Sutton Springs Wood, Chesterfield, S44 5XF. Tel. 0246 850357

WHY YOU NEED LOCKSMITH.

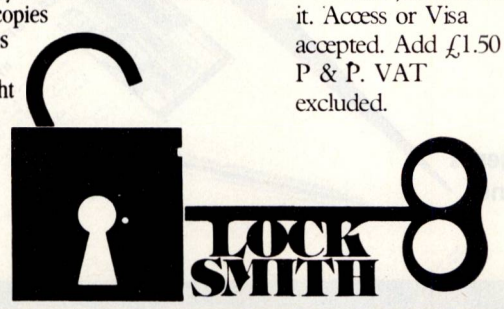
You've invested some money and a lot of time in a commercial software program for your Apple. It works well, to the point that you are *dependent* on its day-to-day functioning. But the disks are copy-protected. So you are also dependent on the vendor's back-up (if furnished), on his living up to vague promises of support, even on his ability to stay in business.

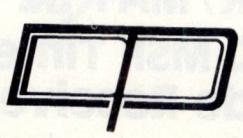
No computer user can live with that. So until the situation changes (and it will), you need Locksmith.

Locksmith (new 4.0 version) will copy almost all "protected" diskettes for the Apple. It is the most reliable nibble-copy program you can buy. *Locksmith is suitable only for backups,* because the copies include all serial numbers, codes and protection features of the original (under the new copyright law, you'd have to be pretty foolish to try bootlegging software that is traceable back to the purchaser).

Locksmith includes nine other utilities, of which these five are vital to the integrity of your system: 1. Media surface check — Never commit data to a flawed diskette again. 2. Disk-drive speed calibration — the most frequent cause of communication bugs between Apples. 3. Degauss and Erase — Make sure no stray data is left over. 4. Nibble-Editor — sophisticated read/write tool for repairing blown disks. 5. Quickscan — Check for unreliable data, find used and unused tracks.

All for just £65.00 at your local dealer or direct. You don't just need Locksmith. You can't afford to be without it. Access or Visa accepted. Add £1.50 P & P. VAT excluded.





DDP RESEARCH & MARKETING
17 NOBEL SQ., BASILDON
ESSEX SS13 1LP.
TEL: (0268) 728484

Apple is a registered trademark of Apple Computer, Inc.

apple '82

® 1st National Apple User Convention

Reserve these dates now!

Apple User Convention – June 5-6	Apple User Exhibition – June 4-6

It's going to be the biggest Apple event ever held – and a MUST for all Apple users.

From Friday, June 4 to Sunday, June 6, the whole of the ultra-modern Fulcrum Centre in Slough will be completely devoted to the Apple.

And it will be an action-packed weekend. Some of Britain's top Apple experts will be revealing their secrets. There will be hands-on demonstrations of Apple programs. Plus a comprehensive exhibition of all the latest Apple hardware and software.

There's bound to be a big demand for Apple '82 – so early booking is advisable.

DELEGATE APPLICATION FORM

I wish to attend Apple '82, the First National Apple User Convention.

Please reserve ..... delegates places at £12 per delegate £ .....

I would like you to arrange accommodation for the following nights:

Friday June 4 ☐ Saturday June 5 ☐

for ..... adults and ..... child(ren). Accommodation costs £17.00 per night for a single bed in a twin room. Single rooms are available for £21.00.
Children under 5 years free.
Children over 5 and under 14 years £1.00.
Accommodation includes bed, Continental breakfast, VAT and service charge.
All extras to be paid for separately on departure. £ .....

Please give preference of hotel in order of choice:

Post House Hotel ☐ Excelsior Hotel ☐
Ariel House ☐ Skyway Hotel ☐

I would like to reserve a car parking space for the duration of the Convention. (£2.00). £ .....

TOTAL £ .....

I enclose my cheque as payment, or debit my Access/Barclaycard/American Express account No.

Signed .....
Company .....
Name .....
Position .....
Address .....
.....
Tel: .....

Please tick appropriate box if interested in any of the following:

Coach trips to London for shopping ☐
Coach trips to London for theatre ☐
Choice of play or show .....
Coach trip to Windsor Safari Park ☐
Coach trip to Windsor Castle ☐
Coach trip to Oxford ☐

The above will of course depend on sufficient people being interested in particular trips.

PCW/3

POST TO: Apple '82, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

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 our 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

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 + VAT + P&P
TRS80 £34.50 + VAT + P&P (80p)

48K RAM–internal
TRS80 & VG £70 + 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.

HIGH SPEED CASSETTE
Plug onto **5700** Baud–11 times normal!! Galaxy in 17 seconds. Full load and save facilities–uses external cassette recorder –very reliable. £55 + VAT + P&P

ELECTRIC PENCIL (modifications)
Uses no control key–works with Genie.
£25.00 + VAT + P&P

TELEPRINTER interface and software to drive Creed 7E. **VG £35.00 + VAT**

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.

Access and Barclaycard accepted.

General Northern Microcomputers [GNOMIC]

46 Middle Street, Blackhall, Hartlepool, Cleveland. Tel. Peterlee (0783) 863871

★ NEW BROOM FOR EPROMS ★

TEX ERASER SWEEPS CLEAN!

EPROMPT is Prompt Enough!



Eproms need careful treatment to survive their expected lifetime. Rushing it could burn their brains out. So cop-out of this helter-skelter world; take it easy the TEX way and give your chips a well-earned break. Cool, gentle and affordable; EPROMPT does it properly.

★ 16-chip basic economy EPROMPT EB: £33 nett; £40 c.w.o. ★
★ 32-chip interlocked de-luxe EPROMPT GT: £40 nett; £49 c.w.o. ★



TEXTIME is Tea-Break Time!

Our EPROMPT needs just half-an-hour to finish its job; this is the proper erase time for all Eproms. While it's busy you may as well take a break yourself, but don't take too long without a timer on the job; over-erasing can shorten data storage time. So our TEXTIME will remember to turn out the light and your chips will forget nothing new.

★ 30-minute solid-state TEXTIME M30: £15 nett; £19 c.w.o. ★
★ ★ ★ Special Offer EB + M30: £47 nett; £57 c.w.o. ★ ★ ★
★ ★ ★ Special Offer GT + M30: £54 nett; £66 c.w.o. ★ ★ ★

★ We also stock SOFTY 2 Intelligent Eprom Programmer at £169 or less ★
We manufacture in the U.K. and sell direct. Write post-free to: Room 11

TEX MICROSYSTEMS LTD. FREEPOST
ST. ALBANS, HERTS. AL1 1BR ST. ALBANS 64077/TRING 4797 ANYTIME

PETSPEED
Life in the fast lane

If you're thinking of buying a Basic Compiler let us first show you exactly what we mean by 'Life in the fast lane'.

Oxford Computer Systems (Software) Ltd., suppliers of the first Basic Compiler for the Pet, have prepared an enlightening demonstration disk giving direct speed comparisons between Pet Basic, Petspeed and the alternative Basic Compiler.

Petspeed is the only **optimising** Basic Compiler available for any microcomputer, which is only one of its **other** advantages.

FASTER – Petspeed is capable of double the speed of the DTL Basic Compiler and up to 40 times the speed of Pet Basic.

SHORTER PROGRAM SIZE – the size of long programs is considerably reduced.

COMPATIBLE – Petspeed will compile ANY Pet Basic program.

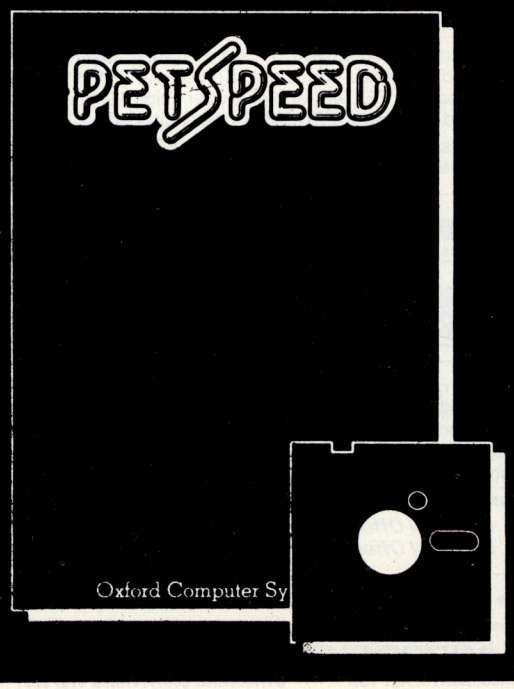
OPTIMISATION – Petspeed is the only optimising Basic Compiler available for any microcomputer, because of its optimisation, programs run much faster.

SECURITY – Your programs belong to YOU. Oxford Computer Systems (Software) Ltd. makes no claim on Petspeed Compiled programs. No dongle or security device is required for compiled programs and users can build in their own protection. Petspeed code is unlistable and compiled programs cannot be tampered with.

PRICE – we will leave you to compare prices.

Also available **COMPILED INTEGER BASIC** – 150 to 200 times the speed of Basic Compiled. Compiled Basic is for those applications where the speed of the machine is required without the inconvenience of assembly level programming. Ideal for scientific and educational users. Compatible with Petspeed.

OFFICIALLY APPROVED BY COMMODORE



Petspeed for 8000 series £240
Compiled Basic £165

Special Offer: Petspeed for 8000 series PLUS Compiled Basic for just £320.

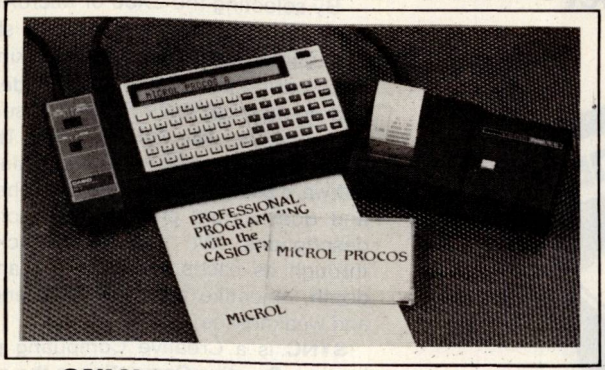
Write or phone today for a free copy of the 'Life in the fast lane' demonstration disk.

Oxford Computer Systems (Software) Ltd.
7 & 8 Park End Street, Oxford OX1 1HH
Telephone Oxford (0865) 49597

£100 COMPUTER

"Can do the job of a micro costing four times as much."!
Personal Computer World

CASIO FX-702P POCKET COMPUTER



ONLY £86.91 + VAT, Total £99.95
Plus FREE MiCROL Professional Programming Pack (RRP £9.95)
Or we will beat any lower advertised price by **5%**

Eat your hearts out, H—P, Sharp and Texas!
The Casio FX-702P features: The biggest program storage capacity (up to 1680 steps), the biggest data storage capacity (up to 226 memories), the widest range of math, science and statistics functions (55 in all, including Regression and Correlation), the most powerful English-like BASIC program-writing language and the fastest operation, for results without waiting! Subroutines; 10 levels, FOR:NEXT looping; 8 levels. Comprehensive edit, debug and trace modes. 240 hours battery life. 17 x 165 x 82mm.

FA-2. Cassette adaptor for bulk storage of programs and data, with powerful file name and remote control options. **ONLY £17.35 + VAT, Total £19.95.**

FP-10. Permanent hard copy printer; full 20 character line width, fast 40 character per second print speed. 2,600 lines per roll. (Low cost replacement rolls, £2.50 for five). 6,000 to 9,600 lines battery life. Rechargeable battery pack, **NP-4M,** prints 13,000 lines **(£6.90).** Mains adaptor, **AD-4150, £5.**

FP-10 Printer ONLY £39.09 + VAT, **Total £44.95**
Plus FREE Pack worth £5, or we will beat any lower price by **5%.**

SYSTEM PRICES — Save up to £50 on RRP

PACK A:	FX-702P + MiCROL Professional Programming Pack	£99.95
PACK B:	FX-702P + FA-2 cassette interface + PPP + PROCOS	**£155.00**
PACK C:	FX-702P + FP-10 Printer + FA-2 + PPP + PROCOS	**£194.50**

CASIO FX-702P USER SUPPORT

Produced by **MiCROL** exclusively for **TEMPUS**

Professional Programming Pack. Get the best from your FX-70 2P with: PROFESSIONAL PROGRAMMING — practical 702 programming from the ground up **plus** 702 REFERENCE MANUAL — definitive guide to every 702 programme command — INVALUABLE!

MICROL 702 PPP. Price **£9.95**

MiCROL PROCOS for PROFESSIONAL USERS
Now you can create powerful, reliable programs in just minutes, even if you have never programmed a computer before!
MiCROL PROCOS is an advanced integrated operating system that cuts programming time by 80-90% in most applications areas, saving many hours of valuable time. PROCOS A and PROCOS B are supplied together on a ready-to-run cassette, with a fully detailed User Manual offering features to suit every application. PROCOS A is ideal for complex multi-variable calculations, while PROCOS B provides many of the features of a 'Visicalc' type modelling system — answers 'what if' questions and analyses trends. Both systems feature easy-to-use commands and support FP-10 print options. Brochure on request.

MICROL PROCOS (A+B) Price **£24.95**

MiCROL 702 Basic: Plus. Add the power of up to 20 new commands to your programs! Custom-made to ease advanced programming — features include: String — number conversions; single-shot, await, timed KEY with user-controlled return values; programmable RAN // generator; DATA-PACKING — up to 2000 single digit, single name variables; INTEGRATED DISPLAY COMMANDS — display data and test with extra-low memory overheads. Modular design uses minimum memory; easy to customise. Full-detail User Manual plus Program List for direct entry.
Available February 1982 **MiCROL 702B:P** Price **£10.95**

CASIO FX-602P The World's Fastest Programmable?
Alpha/numeric scrolling display. From 32 program steps with 88 memories, to 512 steps with 22 memories, all non-volatile. **ONLY £65.17** + VAT, = £74.95
FA-2 £19.95 incl. **FP-10** £44.95 incl. (Compatible with FX-501/2P, & 601P)

CATALOGUE of latest CASIO calculators, watches and keyboards, including the **Revolutionary Casiotone 701** fully programmable polyphonic keyboard, available on request. 14p stamp appreciated.

PRICE includes VAT, P&P. Delivery normally by Return of Post.
Send your Company Order, cheque, Postal Orders, or phone your ACCESS VISA or B'CARD number to the UK's leading CASIO Specialists:

TEMPUS
Dept. PCW
38, Burleigh Street, Cambridge,
CB1 1DG. Tel: 0223 312866

SPECIAL OFFERS

PETS — 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

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
Rioch 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, Programmers Aids & Tutorials.

INTELLIVISION — Free soccer game with unit.
Superb TV Game for your TV. Vartridges include:- Space Battle, Skiing, Boxing, Poker, Golf, Tennis, Roulette, Horse Racing, Basketball, Backgammon & many others.

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
Instruction & Training

2'ND HAND — We have a constant changing range of 2.nd 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

COMPUTER PLUS

WATFORD

A smart new computer store with a very wide range of products. Staff experienced in computers and in business systems are available to discuss your requirements — for a stock-control system, a word-processor, a file-retrieval system, a home computer — or just a book. Among the systems on display:

COMMODORE — as full commercial systems dealers for CBM, we handle the 4000 and 8000 series machines — with a vast range of business, scientific & engineering software. We have the VIC-20, too.

SHARP — MZ-80K (at a special low price) and the super new MZ-80B, with CP/M, high res. graphics, etc. The PC1211 pocket computer is also in stock.

ACORN — the amazing Atom — over 20,000 installed — the ideal first computer for the home. Ring to hear about our low prices.

TEXAS — the new TI-99/4A home computer, faster, new keyboard, 16 colours, 5 octaves music, over 400 software modules.

We also have a wide range of software, computer books and supplies. We're situated in the Queen's Road, opposite Trewins department store — and we're near the car-parks!

COMPUTER PLUS
47 Queens Rd., Watford, Herts WD1 2LH
Telephone 0923 33927

The Sinclair ZX80 is innovative and powerful. Now there's a magazine to help you get the most out of it.

Get in sync



SYNC magazine is different from other personal computing magazines. Not just different because it is about a unique computer, the Sinclair ZX80 (and kit version, the MicroAce). But different because of the creative and innovative philosophy of the editors.

A Fascinating Computer

The ZX80 doesn't have memory mapped video. Thus the screen goes blank when a key is pressed. To some reviewers this is a disadvantage. To our editors this is a challenge. One suggested that games could be written to take advantage of the screen blanking. For example, how about a game where characters and graphic symbols move around the screen while it is blanked? The object would be to crack the secret code governing the movements. Voila! A new game like Mastermind or Black Box uniquely for the ZX80.

We made some interesting discoveries soon after setting up the machine. For instance, the CHR$ function is not limited to a value between 0 and 255, but cycles repeatedly through the code. CHR$ (9) and CHR$ (265) will produce identical values. In other words, CHR$ operates in a MOD 256 fashion. We found that the "=" sign can be used several times on a single line, allowing the logical evaluation of variables. In the Sinclair, LET X=Y=Z=W is a valid expression.

Or consider the TL$ function which strips a string of its initial character. At first, we wondered what practical value it had. Then someone suggested it would be perfect for removing the dollar sign from numerical inputs.

Breakthroughs? Hardly. But indicative of the hints and kinds you'll find in every issue of **SYNC**. We intend to take the Sinclair to its limits and then push beyond, finding new tricks and tips, new applications, new ways to do what couldn't be done before. **SYNC** functions on many levels, with tutorials for the beginner and concepts that will keep the pros coming back for more. We'll show you how to duplicate commands available in other Basics. And, perhaps, how to do things that can't be done on other machines.

Many computer applications require that data be sorted. But did you realize there are over ten fundamentally different sorting algorithms? Many people settle for a simple bubble sort perhaps because it's described in so many programming manuals or because they've seen it in another program. However, sort routines such as heapsort or Shell-Metzner are over 100 times as fast as a bubble sort and may actually use less memory. Sure, 1K of memory isn't a lot to work with, but it can be stretched much further by using innovative, clever coding. You'll find this type of help in **SYNC**.

Lots of Games and Applications

Applications and software are the meat of **SYNC**. We recognize that along with useful, pragmatic applications, like financial analysis and graphing, you'll want games that are fun and challenging. In the charter issue of **SYNC** you'll find several games. Acey Ducey is a card game in which the dealer (the computer) deals two cards face up. You then have an option to bet depending upon whether you feel the next card dealt will have a value between the first two.

In Hurkle, another game in the charter issue, you have to find a happy little Hurkle who is hiding on a 10 X 10 grid. In response to your guesses, the Hurkle sends our a clue telling you in which direction to look next.

One of the most ancient forms of arithmetical puzzle is called a "boomerang." The oldest recorded example is that set down by Nicomachus in his *Arithmetica* around 100 A.D. You'll find a computer version of this puzzle in **SYNC**.

Hard-Hitting, Objective Evaluations

By selecting the ZX80 or MicroAce as your personal computer you've shown that you are an astute buyer looking for good performance, an innovative design and economical price. However, selecting software will not be easy. That's where **SYNC** comes in. **SYNC** evaluates software packages and other peripherals and doesn't just publish manufacturer descriptions. We put each package through its paces and give you an in-depth, objective report of its strengths and weaknesses.

SYNC is a Creative Computing publication. **Creative Computing** is the number 1 magazine of software and applications with nearly 100,000 circulation. The two most popular computer games books in the world, *Basic Computer Games* and *More Basic Computer Games* (combined sales over 500,000) are published by Creative Computing. Creative Computing Software manufactures over 150 software packages for six different personal computers.

Creative Computing, founded in 1974 by David Ahl, is a well-established firm committed to the future of personal computing. We expect the Sinclair ZX80 to be a highly successful computer and correspondingly, **SYNC** to be a respected and successful magazine.

Order SYNC Today

Right now we need all the help we can get. First of all, we'd like you to subscribe to **SYNC**. Subscriptions are posted by air directly from America and cost just £10 for one year (6 issues), £18 for two years (12 issues) or, if you really want to beat inflation, £25 for three years (18 issues). **SYNC** is available only by subscription; it is not on newstands. We guarantee your satisfaction or we will refund the unfulfilled portion of your subscription.

Needless to say, we can't fill up all the pages without your help. So send in your programs, articles, hints and tips. Remember, illustrations and screen photos make a piece much more interesting. Send in your reviews of peripherals and software too—but be warned: reviews must be in-depth and objective. We want you to respect what you read on the pages of **SYNC** so be honest and forthright in the material you send us. Of course we pay for contributions—just don't expect to retire on it.

The exploration has begun. Join us.

The magazine for Sinclair ZX80 users
SYNC

27 Andrew Close
Stoke Golding
Nuneaton CV13 6EL, England

TWICKENHAM

COMPUTER CENTRE LTD

With the best microcomputers available

VIC 20 commodore apple II

ANADEX – EPSON – RICOH – ACCESSORIES – SOFTWARE – TANTEL

NO VAT TO PAY

Yes! We will pay your V.A.T. on all cash sales from most of our range.

01 – 892 7896
01 – 891 1612

TWICKENHAM COMPUTER CENTRE LIMITED
72, Heath Road Twickenham Middlesex TW1 4BW

VISA

ALL PRODUCTS FULLY GUARANTEED

data-assette

TRADE ENQUIRIES WELCOME

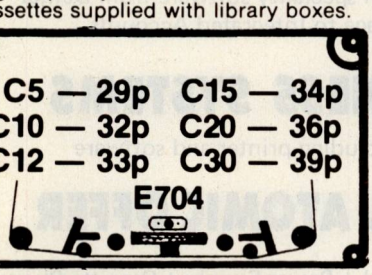
EVERYTHING YOU NEED FOR CASSETTE BASED SYSTEMS

COMPUTER CASSETTES

High quality 5 screw assembled cassettes supplied with library boxes.

C5 — 29p C15 — 34p
C10 — 32p C20 — 36p
C12 — 33p C30 — 39p

E704



ANY LENGTHS AVAILABLE
DISCOUNTS ON LARGE ORDERS

ORDER FORM PCW2

Item/Code	No.	at	Total
Postage (5% — min. £1.00)			
Total Due			

Mr/Mrs/Miss .....
Del. Address .....
..... Postcode .....
Access/Visa No.
Signature .....

Please make cheques payable to Storkrose Ltd., 44 Shroton Street, London NW1 6UG (Tel: 01-723 0141)

5 STAR CASSETTE RECORDER

E302



£17.00

Ideal for recording and loading your programs. Features: Din socket, tape counter, tone control, built in mic, autostop, mains/battery operation, automatic record level and FREE head cleaner. **12 MONTH GUARANTEE**

SAVE 5p. ON EACH CASSETTE WHEN ORDERED WITH THE STAK-PAK INSTEAD OF LIBRARY BOXES (MIN. 1 DRAWER OR 2 CASSETTES.)



STAK-PAK

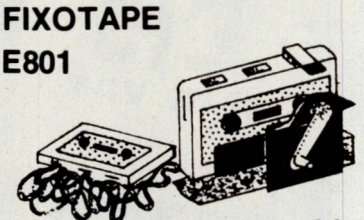
5 drawer. **£2.50**

E691 Each drawer. **60p**

Interlocking drawers holding 2 cassettes each.
Add on as many as you need.
Supplied with index cards
A real space saver!

CASSETTE WORKSHOP

FIXOTAPE
E801



£1.99

SAVE THAT PROGRAM!

Semi-automatic, helps untangle, edit and repair damaged cassettes.

E613	**Screwed case empty cassettes including leader**	**25p each**
E611	**Empty library cases**	**36p for 4**
E615	**Head cleaner cassette**	**49p each**
E614	**Cassette joining tape**	**45p per reel**
E616	**Self-adhesive labels**	**35p for 20**

ARE KNIGHTS MAD? — SHARP MZ-80B £899

Dear Microfans,

At a recent Sharp Dealers meeting it was suggested that Knights were mad to sell the MZ-80B at £899. Only one dealer supported us by indicating that he too wanted to cut the price — the other seventy plus wanted to get the full £1045 + VAT. OK we confess Knights are mad. Mad enough to sell the B for £899. Mad enough to have written our KNIGHT COMMANDER for the B (it adds renumber, trace, dump variables, single step etc to Basic), mad enough to be just back from our second visit to Sharp Japan in 6 months thus ensuring our customers have exclusive Sharp items. Mad enough to sell the MZ-80K at £345 with Basic and Pascal or at £399 with Basic, Pascal, Forth, Fortran, and machine code. Mad enough to have sold Sharp for eight years and never ever to have charged for any servicing to any of our Sharp customers.

Write for our latest price lists and software catalogue. Our latest newsletters detail the new Sharp single floppy, the PC1511 hand held micro and colour printer and all the latest news from Japan which the sane dealers are waiting to hear.

Happy Computing, from Graham Knight
All prices exclude VAT but include delivery. ACCESS + VISA welcomed.

Knights T.V. & COMPUTERS

108 ROSEMOUNT PLACE ABERDEEN

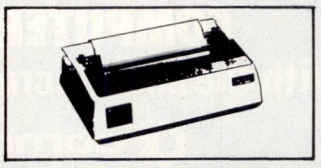
Telephone 0224 630526 telex 739169

SINCLAIR ZX81

ZX81 built + mains adaptor £60.83 (Post £2.95 extra).

PRINTERS

Buy any of the below and get a free interface kit and word processor program for UK101 or Superboard. Seikosha GP80A £199. Centronics 737 £335. OKI Microline 80 £295. OKI Microline 82A £399. Epson MX70T £259. Epson MX80T £359. Epson MX80F/T1 £399. Epson MX80F/T2 £449.

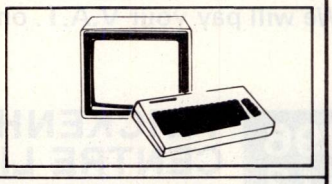


SHARP COMPUTERS

MZ80K 20K £380, 36K £394, 48K £408. PC1211 £82. 46 sample programs for £15. We can supply any Epson printer to run direct from the MZ80K without i/o box for £39 plus printer price.

VIC 20 COMPUTER

VIC 20 £165. Cassette recorder £39.09. Kit to allow the use of a normal cassette recorder £6.3k RAM £26.04. 8k RAM £39.09. 16k RAM £65.17. High resolution cartridge 1211M £30.39. Vic printer £199.



5V POWER KITS

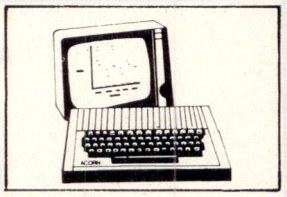
Fully stabilized 5V computer and TTL power kits. Short circuit and over-voltage protection 1.5A £7.83, 3A £12.17, 6A £20.

UK101 AND SUPERBOARD

UK101 with 1K and free power supply and modulator built £149. The below accessories suit both the UK101 and Superboard:— Extra ram £2.70 per K. 16K memory expansion complete kit £50, built £58. 32K memory expansion kit £74, built £82. Case £27. Cassette recorder £19. Cesmon £22.50. Wemon £19.95. Assembler/Editor tape £25. Word processor program £10. Centronics interface kit £10. 610 expansion board £179. Cased minifloppy disc drive with DOS £275. Cassette recorder £19. The below suit only Superboard:— Colour adaptor board built £45. Guard band kit £10. Series 1 only 30 lines × 50 characters display expansion kit £14. UK101 display expansion kit £14.

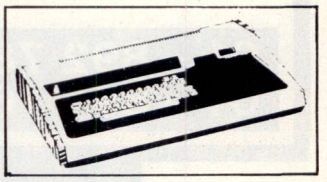
ACORN ATOM

8k ROM +2k RAM kit £120. built £150. 12k ROM + 12k RAM kit £168. built £198. 4k extension ROM £25. Power supply £8.87.



NEW GENIE 1 £299

EG3014 Expansion box with 16k/32K RAM £199/213. Disk drive £220. Colour board £36. Parallel printer interface £36. Monitors: EG 00 white £69. OVM9PGR green £99.



SWANLEY ELECTRONICS

Dept PCW, 32 Goldsel Rd, Swanley, Kent BR8 8EZ.
Tel Swanley (0322) 64851

Postage £3.50 on computers, £4.50 on printers and 45p on other orders. Lists 27p post free. Please add VAT to all prices. Official credit orders welcome.

ZX81 Workstation...



. . . is a stylish and ergonomic plinth for the ZX81. It raises and tilts the TV to avoid eyestrain, holds the 16KRAM in place and hides the wiring and power supply. This very professional unit costs £15, a built-in power switch is £3, plus postage at £1.50, inc. VAT.

Peter Furlong Products, 125 Catford Hill, London SE6 4PR. Callers by appointment, please. Tel 01690 7799. Visa, Access.

ACORN ATOM BBC MICROCOMPUTER	SUPERBRAIN TRANSAM
SHELTON SIGNET	RAIR BLACK BOX

Business sytems with speciality software from Dental Appointments Package to Integrated Accounts.

CPM BUSINESS SYSTEMS

FROM £2,750 including printer and software

SPECIAL ATOMIC OFFER

Acorn Atom (8 + 11) + Power Supply + Cassette Player + Acornsoft Games Pack + Leads Plugs etc.

All for £255 including VAT (allow £5 post & packing)

*£20 trade-in on a working sinclair ZX80 or ZX81

VIXON COMPUTER SYSTEMS

49 GRIMSBY ROAD
CLEETHORPES
TEL. GRIMSBY (0472) 58561



WATFORD ELECTRONICS

33/35, CARDIFF ROAD, WATFORD, HERTS, ENGLAND
Tel Watford (0923) 40588. Telex: 8956095

MAIL ORDER CALLERS WELCOME

ALL DEVICES FULL SPEC. AND FULLY GUARANTEED. TERMS OF BUSINESS: CASH/CHEQUE/P.O.S. (OR ACCESS) WITH ORDER. GOVERNMENT AND EDUCATIONAL INSTITUTIONS OFFICIAL ORDERS ACCEPTED. TRADE AND EXPORT INQUIRIES WELCOME. (P&P ad 50p on all orders under £10.00).

VAT ALL PRICES ARE EXCLUSIVE OF VAT. PLEASE ADD 15% TO THE TOTAL COST INCLUDING P & P.

SHOP HOURS: 9.00am - 6.00pm MONDAY TO SATURDAY.
AMPLE FREE CAR PARKING SPACE AVAILABLE.

COMPUTER IC's

1702	299
1802CP	700
2101-2	110
2112-2	250
2114L-3	87
2114L-3	87
2118-3	250
2118-4	200
2147-3	425
2532-450n	450
2564	20
2708	175
2716-5V	210
2732-450n	400
2764	19
4027	240
4116-150n	95
4116-200n	75
4118-250	400
4164-200	620
4315-4K	795
4334-3	325
(CMOS2114)	785
4864-3 64K	270
5101	580
6116-3	399
6502 CPU	600
6503	550
6504-250	600
6505	175
6520 PIA	350
6522 VIA	1350
6530 RRIOT	670
6532 RIOT	1450
6545 CRTC	785
6551 ACIA	20
6592 PC	300
6800	400
6802	2
6803	160
6804	670
6805	520
6808	999
6809	120
6810	175
6820	125
6821	420
6840	14
6843	975
6845	850
6847	150
6850	255
6852	500
6875	00
8039	350
8080A	550
8085A	00
8155	90
81LS95	90
81LS96	90
81LS97	00
8166	125
8123	25
8202	170
8212	425
8214	170
8216	200
8224	250
8226	250
8228	360
8243	320
8251	799
8253	295
8255	800
8257	00
8279	99
8T26A	150
8T27	115
8T28A	350
8T31	99
8T95N	99
8T97N	550
9364AP	125
AN26L531C	125
AN26L532A	350
AY-3-1015	600
AY-3-8910	625
AY-3-8912	300
AY-5-1013	600
AY-5-2376	18
FD1771	380
IN6402	55
MC1488	55
MC1489	695
MC14411	795
MC14412	695
MM5280D	700
RO-3-2513L	600
RO-3-2513U	800
SFF96364E	820
TMS2716-3V	875
TMS6011	365
ULN2003	100
ULN2004	150
Z80CPU 2.5	360
Z80ACPU4M	385
Z80P10	290
Z80AP10	320
Z80 CTC	300
Z80A CTC	325
Z80DMA	999
Z80S10-1	15
Z80AS10	23
Z80 DART	726
Z80A DART	725
ZN419CE	190
ZN423E	138
ZN424E	130
ZN425E	345
ZN426E	300
ZN427E	600
ZN428E	478
ZN429E	210
ZN1034E	200
ZN1040E	675
74S132	138
74S138	210
74S188	210
74S189	158
74S194	360
74S201	350
74S241	540
74S262	850
74S287	325
74S288	210
74S470	325
74S471	620
74S472	1150
74S475	825
74S571	620
75150	140
75107	95
75108	350
75110	115
75150	125
75154	150
75182	115
75183	115
75188	65
75189	65
75322	165
75450	95
75451/2	70
75454	225
75491/2	70

TTL 7400 (TEXAS)

7400	11
7401	11
7402	11
7403	14
7404	14
7405	18
7406	28
7407	28
7408	16
7409	16
7410	14
7411	20
7412	20
7413	24
7414	32
7416	25
7417	25
7420	16
7421	20
7422	20
7423	22
7425	28
7426	30
7427	27
7428	28
7430	16
8432	26
7433	27
7437	27
7438	27
7440	17
7441	68
7442	38
7443	90
7444	90
7445	65
7446	55
7447	50
7448	50
7450	16
7451	16
7453	16
7454	16
7460	16
7470	35
7472	30
7473	30
7474	25
7475	40
7476	30
7480	48
7481	120
7482	70
7483	50
7484	80
7485	95
7486	26
7489	205
7490	28

7491	45
7492	30
7493	30
7494	34
7495	50
7496	45
7497	120
74100	85
74104	54
74105	55
74107	32
74109	35
74110	40
74111	55
74112	170
74116	88
74118	80
74119	90
74120	75
74121	30
74122	45
74123	50
74125	42
74126	40
74128	42
74132	48
74136	35
74141	70
74142	190
74143	250
74144	250
74145	70
74147	99
47148	75
47150	80
74151	45
74153	45
74154	75
74155	75
74156	75
74157	45
74159	99
74160	60
74161	60
74162	62
74163	64
74164	64
74165	62
74166	65
74167	185
74170	168
74172	290
74173	65
74174	72
74175	72
74176	55
74177	75
74178	95
74179	68
74180	65
74181	140
74182	75
74184	99
74185	99
74188	290
74190	70
74191	70
74192	70
74193	65
74194	75
74195	65
74196	65
74197	65
74198	99
74199	99
74221	80
74246	150
74247	150
74248	150
74249	150
74251	80
74259	195
74265	65
74273	195
74276	150
74278	160
74279	90
74283	90
74284	199
74285	199
74290	105
74293	125
74297	236
74298	100
74351	195
74365	55
74366	55
74367	55
74368	55
74390	99
74393	99
74490	120

74LS

LS00	12
LS01	13
LS02	14
LS03	14
LS283	45
LS290	57
LS293	46

LS04	15
LS06	15
LS08	15
LS09	15
LS10	15
LS11	15
LS12	15
LS13	30
LS14	48
LS15	15
LS20	15
LS21	15
LS22	15
LS26	18
LS27	15
LS28	20
LS30	18
LS32	15
LS33	16
LS37	16
LS38	16
LS40	16
LS42	35
LS47	40
LS48	80
LS49	60
LS51	15
LS54	15
LS55	30
LS63	150
LS73	25
LS74	25
LS75	28
LS76	20
LS78	24
LS83	50
LS85	70
LS86	38
LS90	35
LS91	80
LS92	36
LS93	36
LS95	45
LS96	120
LS107	43
LS109	30
LS112	30
LS113	40
LS114	35
LS122	44
LS123	55
LS124	105
LS125	30
LS126	30
LS132	45
LS133	35
LS136	28
LS137	35
LS139	38
LS145	75
LS147	199
LS148	99
LS151	39
LS153	39
LS155	39
LS156	39
LS157	35
LS158	36
LS160	41
LS161	41
LS162	41
LS163	41
LS164	48
LS165	145
LS166	85
LS170	170
LS173	72
LS174	72
LS175	58
LS181	130
LS183	275
LS190	58
LS191	58
LS192	58
LS193	65
LS194	40
LS195	40
LS196	58
LS197	85
LS200	345
LS202	345
LS221	60
LS240	96
LS241	96
LS242	85
LS243	85
LS244	80
LS245	90
LS247	40
LS248	65
LS249	68
LS251	40
LS253	40
LS257	48
LS258	40
LS259	85
LS261	195
LS266	25
LS273	90
LS275	290
LS279	88
LS280	250

LS295	215
LS298	130
LS299	420
LS300	157
LS302	175
LS320	270
LS323	270
LS423	200
LS323	270
LS324	200
LS325	320
LS326	330
LS327	315
LS347	150
LS348	190
LS352	185
LS353	185
LS365	37
LS366	37
LS367	37
LS368	90
LS373	75
LS374	75
LS375	48
LS377	90
LS378	69
LS379	65
LS384	250
LS385	378
LS390	62
LS393	60
LS395	199
LS399	220
LS445	140
LS471	620
LS490	245
LS541	135
LS640	225
LS641	225
LS645	210
LS668	175
LS669	150
LS670	175
LS673	550
LS674	750

CMOS

4000	14
4001	14
4002	14
4006	66
4007	18
4008	62
4009	35
4010	40
4011	15
4012	18
4013	34
4014	75
4015	66
4016	32
4017	48
4018	68
4019	42
4020	61
4021	70
4022	66
4023	20
4024	45
4025	19
4026	130
4027	38
4028	58
4029	77
4030	50
4031	170
4032	125
4033	165
4034	195
4035	95
4036	275
4037	115
4038	110
4039	290
4040	59
4041	78
4042	60
4043	70
4044	65
4045	170
4046	75
4047	75
4048	55
4049	30
4050	30
4051	78
4052	78
4053	78
4054	125
4055	125
4056	120
4057	1915
4059	480
4060	90
4061	1225
4062	995
4063	99
4066	36
4067	399
4068	22
4069	20
4070	26

4071	20
4072	20
4073	20
4075	20
4076	60
4077	26
4078	26
4081	26
4082	21
4085	65
4086	70
4089	140
4093	43
4094	168
4095	90
4096	90
4097	320
4098	88
4099	95
4160	95
4161	99
4162	99
4163	99
4174	99
4175	105
4194	105
4408	790
4409	790
4410	725
4411	695
4412	800
4415	480
4419	280
4422	770
4433	770
4435	850
4440	999
4450	350
4451	350
4490	350
4500	675
4501	28
4502	90
4503	50
4504	105
4506	65
4507	40
4508	265
4510	68
4511	68
4512	75
4513	199
4514	195
4515	198
4516	75
4517	415
4518	42
4519	29
4520	78
4521	200
4522	125
4526	95
4527	115
4528	80
4529	150
4530	90
4531	130
4532	110
4534	500
4536	295
4538	115
4539	115
4541	140
4543	135
4544	150
4549	395
4553	299
4554	190
4555	50
4556	55
4557	320
4558	120
4559	395
4560	180
4561	104
4562	495
4566	175
4568	250
4569	175
4572	36
4580	460
4581	250
4582	99
4583	99
4584	48
4585	99
4597	330
4598	290
4599	595
40097	88
40100	215
40101	130
40102	180
40103	175
40104	95
40105	115
40106	75
40107	60
40108	450
40109	100
40110	300
40114	240

ETI/WATFORD'S MICRO EXPANSION SYSTEM

Designed by Watford Electronics, this extremely versatile and economical Expansion System as published in E.T.I., starting from Dec., 1981 issue, offers a low cost flexible expansion system for ZX81, UK101, SUPERBOARD, ACORN ATOM, PET, TANGERINE, etc.

The Motherboard (interfaces with the computer) has capacity to accept upto five daughter Cards and can be paralleled for even more Daughter Cards.

All PCBoards are of computer grade finish and are supplied in Kit form.

Just look at the Expansion possibilities:

MOTHERBOARD — Accepts upto five Daughter Cards. Full Kit: £36.50

SOUND CARD — Utilising upto three AY-3-8910 sound chips. (one supplied with the kit) Full Kit: £24.95

PIO CARD — Using two 6520 PIA chips, this Board offers Centronics parallel printer driver, digital to analogue converter and a host of other output facilities. Full Kit: £19.95

PROM PROGRAMMER — This simple but extremely useful card can blow 2716 or 2732 single rail EPROMS. Full Kit: £19.95

PROM CARD — P.C.B. cards for housing four 2716 or two 2732 EPROMS.
(4 × 2716) Full Kit: £9.95
(2 × 2732) Full Kit: £9.75

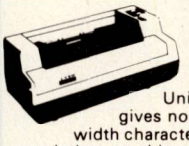
RAM CARD — 8K RAM card. Accepts 16 × 2114 RAMs. Board is supplied fully populated. Full Kit: £28.50

(N.B. PCBs may be bought seperately)

WE MON WATFORD'S Ultimate Monitor IC.

A 4K Monitor Chip specially designed to produce the best from your: Superboard Series I & II, Enhanced Superboard & UK 101. As reviewed by Dr. A.A. Berk in Practical Electronics, June 1981.

Price only £14.95 + 50p P&P.



SEIKOSHA GP80A

Unihammer Printer, gives normal and double width characters as well as dot resolution graphics 8" Tractor feed. Parallel Interface standard. **£195**

SOFTY-2

As reviewed on PE September 1981. The complete microprocessor development system for Engineers & Beginners. New powerful instruction. Accepts any 24 pin 5V single rail EPROM. Supplied fully built, tested & enclosed in a black ABS case. Price incl. encapsulated plug in power supply. **£169**

SPECIAL OFFER

	1+	50+
2114L-300	87p	80p
2114L-200	87p	80p
2708	175p	160p
2532	450p	375p
2716	210p	195p
2732	400p	375p
4116	75p	68p
6116-3	580p	550p
6522	350p	320p

Just phone your order through, we do the rest.

Buy it with Access

EPSON MX Series PRINTERS



Now available from stock at very competitive prices.

- **MX80T** 10" Tractor Feed, 9x9 matrix, 80 column Speed 80 CPS bi-directional Centronics Interface, Baud rate 110-9600 (RS232) **£340**
- **MX80FT** Has Friction & Tractor Feed plus all the MX80T's facilities. **£375**
- **MX80FT2** Has high resolution Graphics option plus all the MX80FT's facilities. **£420**
- **MX100** 132 Column plus all the facilities of MX80FT2. Value for money. **£550**

ACCESSORIES

- **TEX EPROM ERASER.** Erases up to 32 ICs in 15-30 min. **£33**
- **Spare** UV lamp bulbs **£9**
- **5V/5A PSU** Ready built and tested **£25**
- Attractive Beige/Brown **ABS CASE** for Superboard/UK101 or Home Brew **£26**
- **Extra 4K of RAM** (8 off 2114L-300nS) **699p**
- **Space Invaders** for Superboard **£6**
- **Full ASC11** coded keyboard type '756' **£39**
- **NUMERIC** Keypad (Ready built) **£9**
- **4 x 4 matrix keypad** (reed switch assembly) **£4**
- **C12 Cassettes** in Library Cases **40p**
- **8½" Fan fold paper** (500 sheets) (no VAT) **£6**
- **9½" Fan fold paper** (500 sheets) (no VAT) **£6**
- **Teleprinter Roll** (no VAT) **£3.50**
- **15½" Fan fold paper**
- **UHF Modulator 6MH2** **280p**
- **UHF Modulator 8MH2** **450p**

CRYSTALS

32 768K Hz	100
100K Hz	270
200K Hz	295
455K Hz	370
1M Hz	295
1 28M Hz	392
1 6M Hz	395
1 8M Hz	395
1 008M	290
1 8432M	220
2 0M Hz	240
2 4576M	220
3 2768M	220
3 57954M	150
3 6864M	300
4 0M Hz	200
4 032M Hz	290
4 80M Hz	200
4 194304M	200
4 433619M	120
5 0M Hz	200
5 185M Hz	300
5 24288M	390
6 0M Hz	220
6 144M Hz	240
6 5536M Hz	200
7 0M Hz	200
7 168M Hz	250
7 68M Hz	200
8 0M Hz	200
8 867237M	240
9 00M Hz	200
10 0M Hz	200
10 7M Hz	220
10 24M Hz	200
12 0M Hz	290
14 31818M	320
16 0M Hz	275
18 0M Hz	240
18 432M	240
19 968M Hz	325
24 0M Hz	200
26 69M	290
27 648M	330
27 145M	240
38 66667M	290
48 0M Hz	270
100 0M Hz	375
116 0M Hz	300

'D' CONNECTORS (Cannon Type)

(Solder Bucket)

	Plug	Socket	Covers
9way	55p	125p	145p
15way	135p	198p	150p
25way	170p	230p	130p
37way	290p	398p	185p

PCP Pins
25way 200p 245p

PCB Pins (right angle)
25way 210p 275p

DIL Switches

4way	70
6way	85
8way	90
10way	145

HEADERS with Latches

10way	90
20way	145
50way	235

JUMPER LEADS (Ribbon Cable Assembly)

Single Ended DIP Lead, 24" Cable
14pin Plug 145p; 24pin Plug 240p
16pin Plug 165p; 40pin Plug 380p

Double Ended DIP Leads

Length	14pin	16pin	24pin	40pin
6"	185p	205p	300p	465p
12"	198p	215p	315p	490p
24"	210p	235p	345p	540p
36"	230p	250p	375p	595p

DIL PLUGS (Headers)

14 pin	44
16 pin	49
24 pin	88
40 pin	255

Ribbon Cable (Rainbow) ft.

10 way	22p
20 way	40p
24 way	55p
40 way	70p

AMPHENOL PLUGS

24way IEEE	575
36way Cent. Parallel	550

DIL SOCKETS (TEXAS)

	Low profile	Wire wrap
8 pin	8p	25p
14 pin	10p	35p
16 pin	10p	42p
18 pin	16p	52p
20 pin	22p	60p
22 pin	25p	70p
24 pin	25p	70p
28 pin	28p	80p
36 pin	–	105p
40 pin	30p	99p

EDGE CONNECTORS double type

	1	156
2 x 10 way	–	135p
2 x 15 way	–	140p
2 x 18 way	180p	145p
2 x 22 way	199p	200p
2 x 25 way	225p	220p
2 x 30 way	245p	–
2 x 36 way	295p	–
2 x 40 way	315p	–
2 x 43 way	395p	–

VIC 20 MICROCOMPUTER

Connects directly to a colour TV set. 5K RAM expandable to 32K ex-stock **£165**

CASSETTE Deck for above including a free program cassette **£34**

ZERO Insertion Force DIL Sockets

24 way	600p
28 way	850p
40 way	975p

VERO WIRING PEN incl. Wire 310p

Spare wire (spool) 75p

Combs 6p

9" MONITOR B&W Cased Only £69

STEMMOS LTD

344 Kensington High Street,
LONDON W14.
Telephone: 01-602 6242 (3 lines)
Telex: 893003

SOFTWARE WITH SUPERBRAIN MICRO

REASONS FOR CONTACTING STEMMOS

LOWEST MICRO PRICES

Superbrain 360KB	£1895
Superbrain QD 720KB	£2195
Superbrain 1.5MB	£2800

PRINTERS

Oki Microline 82	£390
Anadex DP 9501	£980
NEC-Spinwriter	£1900
+ others	

- Tailoring
- Software support
- Computer accessories

HARDWARE MAINTENANCE

1 – On contract basis
2 – On call basis
We specialise in Intertec technology

WIDE RANGE OF RELIABLE AND WELL-TESTED SOFTWARE

STEMMOS AND OTHERS

Programmers Superscreen	£300
Estimation/Civil eng	£2000
Microsoft range	–
Graphics	–
Data base information	£300
Job costing	£300

STEMMOS – ENGINEERING

SuperFrame 3D	£2000
Demo-kit	£150
Shells of Revolution Analysis	£2000
SuperPipe	£2500
Non-linear Circuit Analysis	£1200

MICROBUREAU

Stock control	£400
Purchase ledger	£400
Sales ledger	£400
Nominal ledger	£500
Payroll	£400
Job costing	£500
Full integrated pkg	£2000

LOW COST

Wordstar	£240
With Merge	£290
Mail Merge	£70
Data Star	£150
Wordmaster	£150
Supersort	£150

GOOD DISCOUNT FOR EDUCATIONAL INSTITUTIONS

DEALERS AND SALES AGENT – GOOD DISCOUNT AND COMMISSION

BASF FlexyDisk

Low cost* storage-medium for all usual drives

Specially developed magnetic coating

Permanent cleaning

Long life (one year guarantee)

Boxes of 10 disks 5.25 or 8"		1x	2x	5x	10x
BASF1X	SS/SD	£19	£36	£85	£160
BASF1D	SS/DD	£23	£43	£100	£180
BASF2X†	DS/SD	£25	£48	£115	£210
BASF2D	DS/DD	£28	£54	£130	£240

† only 8" disk

** inclusive of VAT & pp for 5.25", add 70p per box for 8"*

BASF

Delta I & E Ltd.
12 Risborough Close
Muswell Hill
London N10
Tel: 01 444 6597 Telex: 8813271
(Approved dealer)

TANDY and GENIE Owners

UPGRADE YOUR MEMORY IN THE CASE TO 32K OR 48K. These professionally built boards are made in the USA by Holmes Engineering who have sold over 800. Easily fitted, if you buy a board with the memory RAM fitted in it comes fully tested, or if you prefer we will fit the board and test it for you.

IM1 Upgrade to 32k board only	£59.50
Complete with RAM	£72.50
IM2 Upgrade to 48k board only	£89.50
Complete with RAM	£115.00
Fitting charge if required	£10

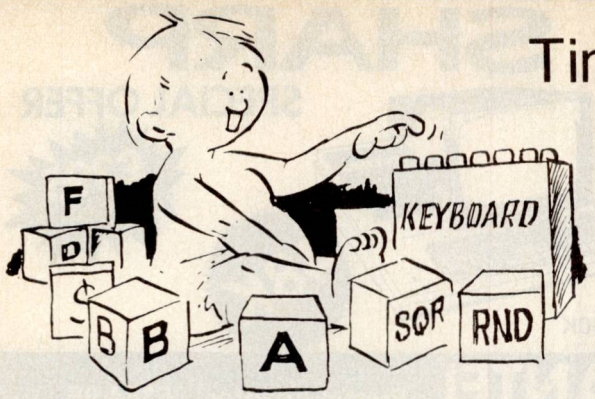
Further details available

JOYSTICKS

For the Tandy Model I level 2 and the Video Genie. We now have available the famous Atari Joystick interfaced for your computer. Now you can play all the Big Five Joystick games with a Joystick! State which computer you have. Single Joystick plus interface ONLY – £19.95

All prices include postage and taxes

MICRODEAL 44 CORN ST. BRISTOL 1. TEL. 0272 276769



Start with BASIC

on the Commodore VIC 20

by Don Monro

Illustrated by Bill Tidy

(At last) the real computer book for the VIC 20, the real computer that real people can afford and use.

£5.80 (inc. p&p). Send cheque or postal order to The Tiny Publishing Company Ltd., 16 Princes Gardens, London SW7 1NE. Please allow 28 days for delivery.

PHOTO ACOUSTICS LTD

THE ONE STOP COMPUTER SHOP

VIC20 COMPUTER	£189.95	CBM 8032	£875.00
EXPANSION BOX	£97.95	CBM 8050	£875.00
3k RAM PACKS	£29.95	CBM 8026	£1006.00
8k RAM PACK	£44.95	CBM 4032	£690.00
16k RAM PACK	£74.95	CBM 4040	£690.00
JOYSTICKS	£10.00	CBM 4022	£399.00
C2N CASSETTE DECK	£44.95		

SOFTWARE AVAILABLE		**SOFTWARE AVAIL.**	
APPLE II COMPUTER	£784.00	GENIE I COMPUTER	
DISK DRIVE + CONT	£384.00	(RING FOR QUOTE)	
DISK DRIVE WITHOUT	£301.00	EG3014 EXPANSION	£228.00
EUROCOLOUR CARD	£70.00	EG3013 EXPANSION	£234.00
9" HI-RES B/W MONITOR	£99.00	EG3013/W EXPANSION	£264.00
9" HI-RES GREEN MONITOR	£110.00	EG400 DISK DRIVE	£243.00
12" B/W MONITOR	£79.00	12" B/W MONITOR	£79.00
12" GREEN MONITOR	£87.00	12" GREEN MONITOR	£87.00

GAMES SOFTWARE AVAIL.

THESE PRICES ARE CASH & CARRY. RING DICK AT WATFORD FOR QUOTE

58 HIGH STREET
NEWPORT PAGNELL
BUCKS.
TEL: 0908 610625

255a ST ALBANS ROAD
WATFORD, HERTS
(entrance in Judge Street)
TEL: 0923 32006

MAIL ORDER CREDIT CHARGE

THE MICRO SOLUTION

GOOD SOFTWARE plus GOOD HARDWARE

'ACTION FILE'

INTEGRATED BUSINESS SOFTWARE WRITTEN IN CIS-COBOL. INCLUDES ACCOUNTING, INVOICING, STOCK CONTROL, PAYROLL & BOMP



- **INTEGRATED (Ledgers, Invoicing, Stock updating etc all tied-in)**
- **FULL DOUBLE ENTRY with audit trail**
- **UP-TO-THE-MINUTE ENQUIRY FACILITY**
- **OPEN-ITEM OR BALANCE FORWARD**
- **MULTI-LEVEL/PERIOD PARTS EXPLOSION**
- **UP TO 15 PAY ITEMS PER EMPLOYEE**
- **CP/M Z80 64K RAM**
- **24 x 80 GREEN SCREEN**
- **DETACHABLE BUFFERED KEYBOARD**
- **DISC OPTIONS — up to 9MB of integral disc storage.**
- **PROGRAMMED FUNCTION KEYS**
- **ENORMOUS RANGE OF PRINTERS**

COMPLETE SYSTEMS FROM £3500

Contact:

THE MICRO SOLUTION LTD

Park Farm House
Heythrop
Chipping Norton
OXFORDSHIRE
OX7 5TW

telephone
CHIPPING NORTON (0608) 3256
ask for: Bill Whaley
or
Virginia Chadwick

Diskwise Ltd

25 Fore Street, Callington
Cornwall, PL17 7AD.
Tel: 05793 3780

Devon & Cornwall

Computer enthusiasts look no further

WE STOCK THE FOLLOWING PRODUCTS:

APPLE II PLUS 48K	£776
ADLER ALPHATRONIC System from	£2,560
APPLE III	£1,825
VIDEO I	£299
COMMODORE VIC	£165
PET 4016	£525
EPSOM MX80 F/T	£399
Plus extra for I/F to Pet, TRS80, etc.	
MICRO LINE 80	£299
TANTEL PRESTEL ADAPTER	£170

.. AND LOTS MORE ..

New range of Avalon Hill Cassette Games for Apple, Pet and TRS80 from £10.95

Above prices plus VAT

Paper, Discs, Books, Games and the largest range of APPLE BUSINESS SOFTWARE in the South West

Plymouth Shop Now Open at:

**DEPTFORD PLACE,
NORTH HILL, PLYMOUTH
TEL: 267000**

BARCLAYCARD VISA

Buy it with Access

SHARP

SPECIAL OFFER



£395 INC. VAT

48K

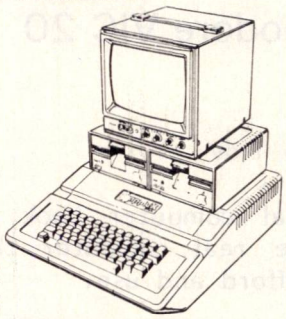
MZ80K

TANTEL Prestel Adaptor £184.95

apple computer Sales and Service

BETTER PRICES!!

COMPLETE SYSTEM FOR £1199



- *48K Apple II Plus
- *Disc Drive w/controller
- *Visicalc or Magic Window
- *Video Monitor
- *Plus 12 months Warranty

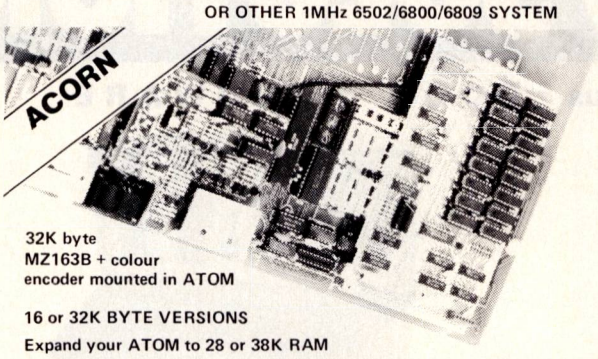
APPLE
I PLUS
APPOINTED DEALERS
LEVEL 1 SERVICE CENTRE

DEANS of Kensington

191 KENSINGTON HIGH STREET, LONDON W8
Tel: 01-937 7896 ext 6. Open MON to SAT (9.30am – 6.30pm)

This memory is made for your Atom

OR OTHER 1MHz 6502/6800/6809 SYSTEM



32K byte
MZ163B + colour
encoder mounted in ATOM

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

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

PRICES: INCLUDING U.K. P&P &15% VAT

MZ163A 16K Built & tested to fit inside ATOM'S case	£59.50
MZ163B 32K ,, ,, ...	£74.00
MZ163C 16K Built & tested, Eurocard rack mounting	£62.00
MZ163D 32K ,, ,, ,, ,,	£76.50
MZ163E Bare PCB to build any of above with data	£23.00
MP100 DC/DC converter; powers any MZ163 board from unregulated 8V supply such as the ATOM mains adaptor	£8.50

S.A.E. for further details.

Access We welcome Access

VISA

ALL PRICES INCLUDE U.K.P&P
+15% VAT WHERE APPLICABLE.
PAYMENT WITH ORDER PLEASE.

TIMEDATA LTD 57 Swallowdale, Basildon,
Essex. SS16 5JG Tel; (0268) 411125 (MON-FRI)

Books and bits for ZX, Atom

The Explorer's Guide to the ZX81

IF YOU'VE GOT A ZX81 THEN YOU NEED THIS BOOK!
Programs for 1K RAM, and programs for 16K RAM. Games, Business and Engineering Applications. RAM & I/O Circuits. Useful ROM Routines. Hints and Tips. And Much Much More, for only £4.95

NEW!

The ZX80 Magic Book

With 8K ROM/ZX81 Supplement

Games programs, computer music, converting programs written in other BASICS, improving the picture RAM & I/O circuits, and much more. £4.75

Getting Acquainted with your ZX81

75 + programs including Draughts; by Tim Hartnell £4.95

Mastering Machine Code on your ZX80/80

180 pages of immense value to beginner and expert alike. £5.95

The Atom Magic Book

A wealth of games and other programs: storing speech in your ATOM, converting programs written in other BASICs tape recoding hints, and many more useful hardware tips. £5.50

Getting Acquainted with your Acorn Atom

By Tim Hartnell and Trevor Sharples.80 programs including Draughts! £7.95

ZX & Atom IC's & Connectors

S.a.e. for list.

TIMEDATA

CREAM
HAVE
E-X-P-A-N-D-E-D

Cream, with its large modern shop centrally situated in Harrow (5 minutes from Harrow on the Hill Tube) has long been recognised as THE Computer Shop in North-West London to see and buy the latest in Apple and Commodore PET computer systems.

— NOW WE HAVE EXPANDED —
More professional demonstrators and consultants and
AN EVEN GREATER PRODUCT RANGE!

PROFESSIONAL SERVICES

* The best demonstrators in town.
* First class consulants to help identify your specific business needs.
* Programming expertise second to none for special software and tailoring.
* Full after sales service and training of your staff.

PRODUCT RANGE

* THE Fullest range of Apple and Commodore Pet computers and the latest peripherals.
* MORE printers to choose from — Qumes, Okis, Epsons, etc.
* Excellent business software.
* **THE NEW VIC 20** personal computer with colour and sound — plugs straight into your TV — **Just £189.95 inc VAT.**
* Disks Tapes Books, Paper Ribbons.

FOR KEEN PRICES PROMPT DELIVERY AND THE BEST SERVICE IN TOWN —

CREAM COMPUTER SHOP

380 STATION ROAD, HARROW, MIDDLESEX HA1 2DE.
Open Tuesday — Friday 10am — 5.30pm — Saturday 10am — 5.00pm Tel: 01-863 0833/4

ACCESS BARCLAYCARD and MAIL ORDERS WELCOMED.

Happy Memories

Part type	1 off	25-99	100 up
4116 200ns	.95	.85	.65
4116 250ns	.90	.80	.60
2114 200ns Low Power	1.25	1.15	.95
2114 450ns Low Power	1.20	1.10	.90
4118 250ns	3.45	3.15	2.65
6116 150ns CMOS	6.95	6.45	5.65
2708 450ns	1.95	1.85	1.65
2716 450ns 5 volts	2.25	2.15	1.95
2716 450ns three rail	6.40	6.00	4.95
2732 450ns Intel type	4.25	3.95	3.35
2532 450ns Texas type	4.95	4.70	4.20

Z80A-CPU £4.75 Z80A-P10 £4.25 Z80A-CTC £4.25

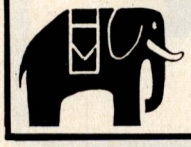
Low profile IC sockets:

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 SSDD £17.00 5 inch DSDD £21.00
8 inch SSSD £21.00 8 inch SSDD £26.65
8 inch DSDD £31.75

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 accepted. 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

ZX81
ATOM
VIC

Make the most of your microcomputer with our popular range of proven books:—

[ ] **GETTING ACQUAINTED WITH YOUR VIC 20,** by Tim Hartnell, with over 60 programs to get your VIC up and running from day one. **£5.95**

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

[ ] **GETTING ACQUAINTED WITH YOUR ZX81,** by Tim Hartnell. Eighty plus programs in this 120-page book, including draughts. **£4.95**

[ ] **MASTERING MACHINE CODE ON YOUR ZX81 OR ZX80,** by Tony Baker. 180 pages, teaches machine code from first principles. **£5.95**

[ ] **THE GATEWAY GUIDE TO THE ZX81 AND ZX80,** by Mark Charlton. Over 60 programs and routines, ZX BASIC explained in detail. **£5.95**

[ ] **49 EXPLOSIVE GAMES FOR THE ZX81,** edited by Tim Hartnell. **£5.25**

[ ] **INTERFACE,** the monthly magazine published by the National ZX80 and ZX81 Users' Club, in conjunction with the Independent Atom Users' Group, is just £9.50 (UK), £12.50 (Europe) for 12 issues. **Sample copy,** with many programs for each machine, book, software and hardware reviews, education, contact addresses, **just £1.**

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

Name: .....

Address: .....

.....

.....

Postcode .....

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**

Are you ready to step into the world of

Wizardry™



The Ultimate Fantasy Experience

Wizardry—a revolutionary game for your APPLE II computer. Never before has a game done so much, so well, so fast! Groups of up to 6 adventurers explore a deep and mysterious maze in search of loot and glory. Brawny fighters, frail mages, nimble thieves, all must cooperate to survive. Not only must you battle hordes of monsters, but you must also solve the secret riddles hidden in the mazes. Starting from the safety of the castle, you must map the 3D maze as you move through it, swiftly running down the corridors and smashing through doors! Suddenly you encounter a group of monsters in their hideous lair! Leaping to the attack, swords swinging, your fighters wreak havoc amongst the monsters! Mages utter spells, causing destruction! Thieves skulk around in the corners, and priests attempt to bring the blessings of the gods upon your party! After the melee, there may be a chest to open, traps to evade, and loot to be divided!

A partial list of Wizardry features includes—A 10 level maze—8 character classes—5 races—20 stored on disk—3D maze display—complete castle—hundreds of monsters and magic items—monsters appear in mixed groups—50 castable spells, usuable by players, magic items and even monsters—44 page illustrated manual and much, much more for all £29.90 (Inclusive price).

(Although it is not Dungeons & Dragons it is the closest to it that we have seen. The first *REAL* fantasy wargame for your computer!).

For the Apple II PLUS Requires PASCAL or DOS 3.3 48K

from

Sir-tech, Inc.

Distributed in UK by

WOODLAND SOFTWARE

TRADE ENQUIRIES INVITED

Woodland Software, 103 Oxford Gardens, London W10 6NF. 01-960 4877

NEW

16K RAM PACKS ONLY £35·00

ZX CHESS & ADVENTURES

PROGRAMS FOR THE ZX 81/80 INCLUDING —

ZX CHESS I
reduced to £8.00
ZX CHESS II
now only £15.00

Very popular machine code program, with six levels of play and an analysis option. Unbeaten except by:

NEW

A new improved version, with a faster response time, seven levels of play, and in addition a recommended move option.

ADVENTURES

Exciting machine code games with instant response, choose from the range below.

ADVENTURE 'A'
£5.00

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 alive. Beware. Includes a cassette save routine.

ADVENTURE 'C'
£7.00

You are unfortunate enough to be drawn to an alien cruiser. Can you reach the control room and free yourself or will they get you first? Includes a cassette save routine.

GALAXY WARRIOR
£3.00

Fast and exciting interactive animated graphics game. Hunt clingons and go through black holes. . .

1K GAMES PACK
£3.00

and many more. For a catalogue giving full details, please send a SAE to:

ARTIC COMPUTING

ARTIC COMPUTING
396 JAMES RECKITT AVENUE,
HULL, HU8 0JA

VIGIL

VIC PET/CBM

Exciting, new games interactive language.
- ★ Easy to learn with 60 - powerful commands
- ★ Double density graphics, large number display, sound!
- ★ 9 complete programs including - Breakout, SpaceWar, Anti, U.F.O., Maze
- ★ PET/CBM version for OLD/NEW/4.0 ROMs and 8K of memory
- ★ VIC version has color and enhanced sound (req. 3K memory expander)
- ★ Comprehensive 50 - page manual

	U.S. & CANADA	FOREIGN
VIGIL for PET/VIC w/9 games on cassette (diskette add $3.00)	$35	$40
VIGIL User's Manual (refundable with software order)	$10	$12
VIGIL Interpreter Listing (6502 Assembler Language)	$25	$30

TINY BASIC COMPILER - PET

A true compiler that turns your BASIC program into fast machine code.
- ★ Subset of PET BASIC compiles to 6502 machine code. Req. only 8K memory
- ★ Has full floating point capabilities and functions
- ★ Compiler listing available with 16K version (included)
- ★ Can load compiled machine code anywhere in memory
- ★ On cassette (add $3.00 for diskette)

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

PET & APPLE II USERS TINY PASCAL

Structured language alternative to BASIC for PET or APPLE II includes:
- ★ LINE EDITOR - creates, modifies and maintains source language
- ★ COMPILER - converts your source to an executable P-code format
- ★ INTERPRETER - executes compiled P-code. Features built-in TRACE
- ★ CASE-OF, WHILE-DO, IF-THEN-ELSE, REPEAT-UNTIL, FOR-TO/DOWNTO, PROC, FUNC
- ★ Graphics version has more: GRAPHICS, PLOT, POINT, TEXT, INKEY, ABS, SQR

APPLE II has lores & hires-COLOR, HGRAPHICS, HCOLOR, HPLOT, PDL and TONE

	U.S. & CANADA	FOREIGN
TINY Pascal PLUS - GRAPHICS PET 32K NEW/4.0 ROMS/8032/diskette	$50	$55
TINY Pascal PLUS - GRAPHICS PET 32K NEW/4.0 ROMS/8032/cassette	$55	$60
TINY Pascal PLUS - GRAPHICS APPLE II 48K and DOS 3.2/3.3	$50	$55
TINY Pascal NON-GRAPHICS PET 16K/32K NEW/4.0 ROMS diskette	$35	$40
TINY Pascal NON-GRAPHICS PET 16K/32K NEW/4.0 ROMS cassette	$40	$45
TINY Pascal User's Manual (refundable with software order)	$10	$12
TINY Pascal 6502 Interpreter Listing-GRAPHICS version	$25	$30

PIPER-THE MUSIC MACHINE

Here's the simplest way yet to compose, conduct and play music on your VIC/PET. Complete music capability — play all note values, list and edit your music, easily handles repeats and rests. Written in fast machine language. Includes sample compositions and manual. VIC version does not require additional memory. PET version requires external CB2 speaker.

	U.S. & CANADA	FOREIGN
PIPER of PET/VIC on cassette (add $3.00 for diskette)	$25	$30
PIPER User's Manual (refundable with software order)	$ 5	$ 7
PIPER 6502 Assembly Listing	$25	$30

PET MACHINE LANGUAGE GUIDE

Now in its ninth printing. Learn the hidden talents of your OLD, NEW or 4.0 ROM PET/CBM with this easy to follow manual. Details 30 of the PET's builtin routines.

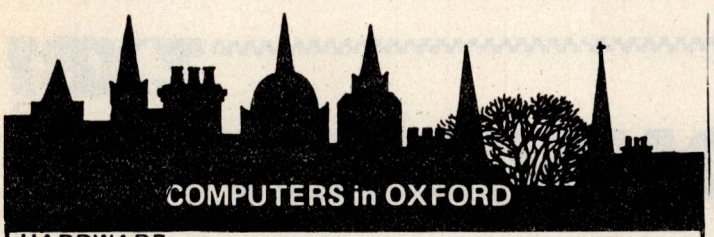
	U.S. & CANADA	FOREIGN
PET MACHINE LAGUAGE GUIDE for OLD, NEW or 4.0 ROMS	$9	$11

Orders prepaid in U.S. Dollars, VISA, MC, ACCESS, etc. Prices include postage.

ABACUS SOFTWARE
P. O. Box 7211
Grand Rapids, Michigan 49510
616 / 241-5510

VISA

master charge



HARDWARE

VIDEO GENIE MICRO only £299 with 12 month warranty. We supply the full Genie System, including single disc drive:-£215; Twin 40 track:-£395; Twin 80 track:-£545. 12'' Monitor £65.00. (Free with every Genie, 120 page Software Catalogue).

PRINTERS
Epson MX80 FT £399 (High Quality Bi-Directional)
Centronics 737 £349 (with proportional spacing)
Seikosha GP80A £210 (Economical Matrix Printer)
Microline 80 £299 (quiet and reliable).

SUPERBRAIN-STATE OF THE ART BUSINESS MICRO Tremendous Price/Performance Ratio. CP/M Based, Masses of Software. Lease a Superbrain from around £12 per week! or a complete Business system, including Software and 136 Column Printer from only £29 per week.

TANTEL We can now demonstrate the Tantel Adapter, giving access to over 180,000 pages of Data with any Television, only £169.00

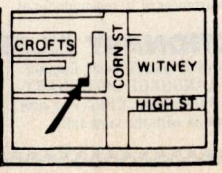
SOFTWARE (ask for full list)

FOR GENIE/TRS 80		SUPERBRAIN	
Visicalc	£65.00	Wordstar	£215.00
Newdos 80	£69.00	Mailmerge	£ 65.00
L.Dos	£85.00	Datastar	£170.00

Complete Integrated Business systems, from under £1000, Ask for details.

GOOD RANGE OF ACCESSORIES AND COMPUTER BOOKS FINANCE LEASING AVAILABLE

Open 9.00 – 5.30 Monday - Friday
9.30 – 1.00 Saturday.
All prices VAT extra.
MICRO BUSINESS SYSTEMS
C.T. MADDISON LTD
EAGLE INDUSTRIAL ESTATE THE CROFTS
WITNEY OXFORD TEL: WITNEY (0993) 73145



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: (P&P INCLUDED IN U.K.)

LINSAC (PCW)
68 Barker Road, Linthorpe,
Middlesbrough, Co. Cleveland TS5 5ES

What has CP/M, a 5 meg hard disk, a 750k floppy disk, 6 spare S100 slots, serial and parallel I/O, 64k RAM, detachable keyboard, integral monitor and graphics? All for £3999 + VAT
The new ARCHIVE III of course, the microsystem that means business.

from
MICROTEK Ltd



where SOFTWARE meets HARDWARE

15 Lower Brook St.
Ipswich, Suffolk
tel. (0473) 50152

MICRO-PRINT LTD.,

BARCLAYCARD VISA (Members of the Booksellers Association)

59, Church Street, Stoke-on-Trent, Tel: (0782) 48348

60	Programming the 6502 (Zaks)	10-25
200	Programming the Z80 (Zaks)	11-95
181	Artificial Intelligence	1.25
178	Vol.1 (Knuth) Fundamentals Algorithms	10.95
179	Vol.2 (Knuth) Semi-Numerical Algorithms	15.60
180	Vol.3 (Knuth) Searching and Sorting	16.50
327	Basic Computer Programs for Business Vol.1.	8.55
344	CP/M Primer	8.45
335	Microsfot BASIC Decoded	19.45
250	Sorting and Sort systems Lozin	15.25
367	Pract. Progs. for Scientists and Engs.	12.70
217	Z80 Micro Design Projects	8.95
51	Z80 Programmes for Logic Design	8.35
408	Getting Acquainted with the VIC20	5.95
413	Getaway Guide to ZX81	5.95
385	Getting Acquainted with your ZX81	4.95
417	Hints and Tips for the ZX81	4.25
409	Mastering Machine Code ZX81	5.95
402	Machine Language made simple for the ZX81	8.95
412	Not only 30 Programmes for the ZX81	6.95
416	Sinclair ZX81 Prog/real Appl.	6.95
401	ZX81 Companion	7.95
404	ZX81 Pocket Book	5.95
434	Understanding your ZX81 ROM (Logan)	8.95
436	49 Explosive Games ZX81 (Hartnell)	5.25
295	CRT Controller Handbook	5.95
383	CP/M Users Guide (Osborne)	10.10
279	CP/M Handbook (Zaks)	11.50
437	Apple BASIC Data File Programming	8.95
381	Data File Programming in BASIC	6.50
414	Apple Pascal	10.00
365	Apple 11 Users Guide	11.10
422	Software Tools in Pascal (Kernighan and Lauger)	9.95
444	Make a Success of Micro Computing in your Business	4-95
443	WORD STAR made easy (Osborne)	7.60
	Algorithms Writers Guide	4.00
	Software Secrets (MZ80K)	5.95
	Apple Machine Language	9.70
	Apple BASIC for Business 11-20	11.20
	Pascal Programming for the Apple	9.70

HARDWARE
VIC 20, Nascom, Tuscan, Video Genie, Printers etc.
Cassettes MP12 5-20 per ten incl. postage
S.A.E. envelope for catalogue
Postage 80p. per book.
24 hours ordering service

DATABOOKS

Data Conversion Aquisition	5.60
Memory Databook	3.80
T.T.L. Databook	5.50
Linear Applications	4.00
CMOS Databook	4.50
Linear Databook	6.00
N.E.C. Electronics Europe Catalogue	4.00

ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

MICRO-PRINT LTD.,

BARCLAYCARD VISA (Members of the Booksellers Association)

59, Church Street, Stoke-on-Trent, Tel: (0782) 48348

ZX81 ZX81

HEWSON CONSULTANTS

HINTS AND TIPS FOR THE ZX81 £4.25

"Good value and quite fascinating . . . a very inexpensive way of aquiring months of programming experience".
YOUR COMPUTER Nov 1981

"Excellent . . . very good value for money". SYNC

80 pages explaining clearly how to squeeze a computing quart out of a Sinclair pint pot.
Saving Space – vital reading for all ZX81 owners.
Understanding the Display File – using the display file as memory, clearing a part of the display, using tokens in PRINT statements.
Converting ZX80 programs – explaining simply but comprehensively how to convert the hundreds of published ZX80 programs.
Chaining programs – revealing techniques for passing data between programs, calling subroutines from cassette and establishing data files.
Machine Code Programs – all you want to know about Z80 machine language.
Explained how to write, load, edit and save machine code and how to debug your routines.
Routines and programs are scattered liberally throughout the text and the final chapter consists of twelve useful, interesting and entertaining programs such as LINE RENUMBER, BOUNCER, SHOOT, STATISTICS etc.

16 K RAM PACK £37.50

A top quality add-on 16K dynamic memory specially designed for the ZX81. Simply plugs into the port at the back of your Sinclair. Can be used in conjunction with the ZX printer. Neatly packaged in a black plastic shell to match your ZX81.

48 K RAM £148.35

Are you finding 16K of Ram is not enough, do you wish to write or use programs with large arrays? Yes! Then this is what you have been looking for the 48K RAM (made by Memotech Ltd). Up to 15K of Basic program area and 32K of Variable area (includes those large arrays). Comes with it's own built in power supply and can be used in conjunction with the ZX printer.

Z80 OP CODES £1.45

A must for the beginner and the experienced programmer alike. This handy ready reckoner lists all 600 plus Z80 machine code instructions in decimal and hexadecimal with their mnemonics. Each Op Code is succinctly explained and cross-referenced. Supplied in a protective transparent wallet for easy reference and durability.

MINI SPACE INTRUDERS FOR THE 1K MACHINE £3.95

An incredibly fast moving game. Dodge left and right to avoid the falling missiles. Fire salvo after salvo at the attacking alien squadron. More aliens join the squadron all the time. Count how many laser bases you lose before you have cut them down.

16 K SOFTWARE SPACE INTRUDERS £4.95

Not to be missed. All action display. 40 alien ships in each squadron. Automatic option, the machine plays itself. Squadron after squadron attack your position. Three laser bases. Full score display. Written in machine code for super fast fun.

PROGRAMMERS TOOLKIT £6.50

Are you writing your own programs for your ZX81? Then use our TOOLKIT to do the donkey work. Copy into RAM before you start work and then you will have it at your fingertips.
Comprehensive LINE RENUMBER including GOSUBs and GOTOs; LOAD, EDIT, and RUN machine code programs; INSPECT the ZX81 system routines; COPY them into RAM and PATCH and/or EXTEND them; FIND a given piece of Basic code and Replace all occurrences of it; move blocks of Basic lines with EDIT.

LANGUAGE DICTIONARY £3.75

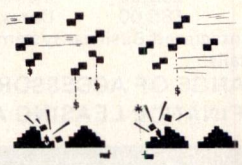
Now you can construct your own English/French, English/Anything dictionary with our LANGUAGE DICTIONARY. UPDATE the entries, SEARCH for a word, CREATE a new dictionary and SAVE it on tape all with the same fully-detailed program.

STATISTICS 1K SOFTWARE £3.75

Three programs on the one cassette.
1) i) Statistics – prints the current mean and standard deviation after each value is entered.
   ii) Regression – prints the current mean and standard deviation of the x, y values and the intercept and slope of the regression line.
   iii) Trend – prints the current mean and standard deviation of the x, y values and the intercept and slope of the trend line.
2) CHI SQUARED TEXT – prints the current value of the Chi squared satistic and the current sample size.

PLANET LANDER £3.75

Four programs on one cassette.
1) PLANET LANDER – Burn your fuel wisely to make a safe landing. If you are careless you could run out of fuel and crash, or hit the surface too hard and be smashed.
2) SPACE DOCKING – Dock your spacecraft with the space station, watching your fuel and speed all the time so as not to crash or go drifting off into space.
3) STOPWATCH – Measure elapsed time with stopwatch.
4) CLOCK – Watch time pass on your Sinclair.



Cheque with order or quote Access or Barclaycard number to:
HEWSON CONSULTANTS Dept PCW,
7 Grahame Close, Blewbury, Oxon, OX11 9QE
Tel: (0235) 850075

PROTECT YOUR SOFTWARE INVESTMENT

APPLE®
COPY II PLUS
version 3.0

– the newest and fastest bit-copier

Apple Copy II Plus gives you the power to make back-up copies of nearly all the "protected" software packages currently available. Several thousand Apple users have already recouped their investment many times over with Copy II Plus.

RELAX
With the Apple Copy II Plus in your top drawer you can stop worrying about accidental damage to your valuable diskettes. The Copy II Plus allows you to make back-up copies for normal use, so you can keep your originals safely locked away – away from the dangers of spills or stray magnetic fields, or just the wear and tear of everyday usage.

EXTREMELY VERSATILE
Version 3.0 of Copy II Plus is an advanced bit-copier which can defeat nearly every protection system now in use. It will copy most DOS 3.2 and 3.3 diskettes including: Visicale 3.3, Desk Top Plan, Magic Window, DB Master (2.4) Dataplan, the Apple Special Delivery Software range and many, many more.

UNIQUE
- Copy II Plus is the *only* bit-copier that allows you to make back-up copies of itself – for complete peace of mind.
- Copy II Plus is the fastest bit-copier by far. It copies 5 tracks at a time and makes a complete disk copy in only 35 seconds, while ordinary bit copiers take 5–7 minutes!

FEATURES
- easy to use menu.
- comprehensive instructions.
- copy with 1 or 2 drives.
- track-by-track copy program report.
- copies half-track and irregular track spacing.
- variable search parameters – for non-standard sync or header nibbles.
- "display" option shows data being copied.
- "examine buffer" option helps identification of protection system used.

HOW TO GET YOUR COPY II PLUS
Copy II Plus needs 48K DOS 3.3, and at least one disk drive.

Send £45.00 + VAT to:-
Apple Orchard Ltd
7a Church Lane
Loughton
Milton Keynes MK8 0AS
or: Phone 0908 53595 and quote your Access or Diners Club card to our 24-hour answerphone.
Please allow 7–14 days for delivery – or tell us to rush if that's too long.

apple orchard

Access

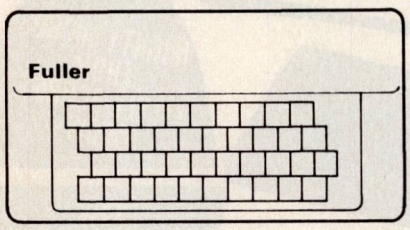
DINERS CLUB INTERNATIONAL

Apple® is a registered trademark of Apple Computer Inc.
Desk Top Plan and Visicalc are registered trademarks of Personal Software Computer Systems.
Dataplan is a registered trademark of Eurnplan Ltd.
Magic Window is a registered trademark of Artic Ltd.
D.B. Master is a registered trademark of Stonewater Micro Computer Products Inc.
Copyright Apple Orchard Ltd. 1981

FULLER FD SYSTEM FOR ZX80/81

THE MOST VERSATILE SYSTEM FOR EXPANDING YOUR ZX

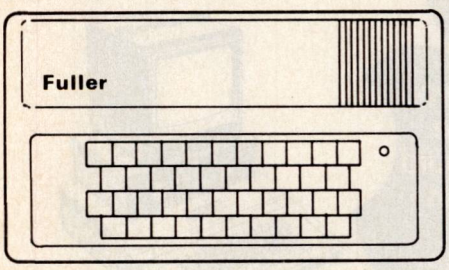
STANDARD KEYBOARD AND CASE



This splendid keyboard and case houses your ZX81 printed circuit board, which is simply screwed into place, the keyboard plugs into the ZX. You can now enter data with ease. The 40 key switch board is a custom unit not made up out of other manufacturers parts. The keytops are our own design and have the ZX Qwerty and functions foil printed onto them. Access to the user port, TV, MIC, and ear sockets are as per the ZX case.

Built keyboard and case £36.70 or £30.70 as a kit plus £2.10 postage and packing.

EXTENDED KEYBOARD AND CASE

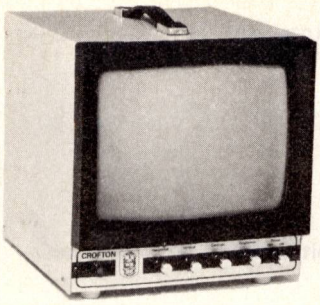


The case is designed to house not only the keyboard and ZX but also our motherboard, power supply, RAM cards and two other boards, not necessarily of our manufacture. The injection moulded case measures 200 mm x 350 mm x 60 mm and houses a 42 keyswitch board, the extra keys can be assigned to other functions. The case is supplied with a "Power On" LED.

Built keyboard and case £39.95 or kit £33.95 plus £2.50 postage and packing. Motherboards £15.95 plus 80p postage and packing. 16k RAM board £35.95. 64k RAM board £79.95.

Keyboard Only Available!
Built £24.95
Kit £18.95 (+P.P. 80p)

Send SAE for details to:-
FULLER MICRO SYSTEMS, The ZX Centre, Sweeting Street, Liverpool 2.



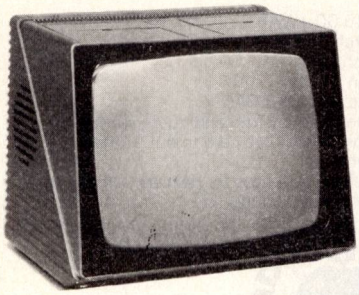
Metal cased 9"

CROFTON MONITOR

10 MHZ Bandwidth
P4 Standard
£72.50 + VAT (£83.37)
plus carriage £3.00
For P31 (green) high
resolution tube add £12.50 + VAT (£14.38)

Plastic cased 12"

NEW PRINCE MONITOR



High resolution
24 MHZ Bandwidth
P31 (green) Standard
for only
£110.00 + VAT
(£126.50) plus
carriage £3.00

ALL MAJOR CREDIT CARDS ACCEPTED — Small surcharge

CROFTON ELECTRONICS LTD
35 Grosvenor Road, Twickenham, Middx TW1 4AD
01-891 1923/1513

CRYSTAL ELECTRONICS
CC ELECTRONICS

FOR YOUR SHARP MZ80K CP/M 2.21 (XTAL)

BASIC CP/M FACILITIES INCLUDE:

- Dynamic file management Fast assembler
- General purpose editor • 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 ELECTRONICS

CP/M SOFTWARE HOUSES — XTAL CAN HELP YOU ESTABLISH YOUR SOFTWARE ON THE SHARP.

XTAL BASIC (SHARP)

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 MZ80I/O **£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.

Members of Computer Retailers Association & Apple Dealers Association
Shop open 0930 — 1730 except Saturday & Sunday
40 Magdalene Road, Torquay, Devon, England. Tel: 0803 22699
Access and Barclaycard welcome

COMPUTERS AND COMPONENTS

SHARP MZ80K
Personal Computer

BETTER THAN EVER VALUE

48K RAM with BASIC (cassette) **£335**

Many extras can be added such as discs, printer, CP/M operating system, PASCAL, FORTH, games and business software, etc.
Phone or S.A.E. for current list.

PC1211 POCKET COMPUTER **£74**

CE122 PRINTER for PC1211 **£60**

ORDER NOW
01-643 4290

Add V.A.T. at 15%

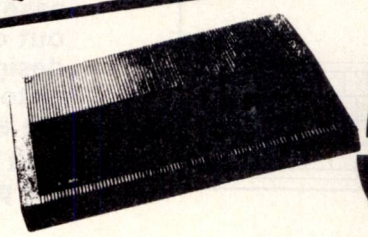
Delivery extra.

VISA Access AMERICAN EXPRESS

Croydon Micros

202 Stanley Park Road, Carshalton, Surrey SM5 3JP

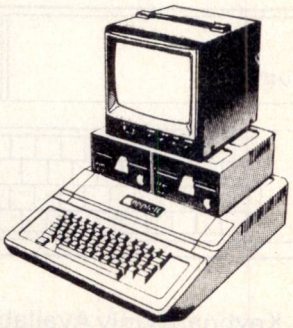
YOUR LOCAL FRUIT & NUT SHOP



MIGHTY MICROS FROM LITTLE ACORNS GROW

The Acorn Atom

Whatever you do, imagine what you could do with an Apple Computer



DISCS – PAPER – RIBBONS ETC. FOR ALL MICROS

CARDIFF micro COMPUTERS

46 CHARLES STREET, CARDIFF, SOUTH GLAMORGAN. CF1 4EE. Tel.(0222) 373072

AMERICAN MAIL ORDER SOFTWARE

Please tick the programs you require and use this page as your order form. Including your name, address & machine type. All prices include VAT, postage & packing.

Send 50p for full catalogues of software available.

DEALER ENQUIRIES INVITED

DYNACOMP	**ATARI**	
☐ Stud Poker	16K(C)	10.99
☐ Moonprobe	16K(C)	9.99
☐ Alpha Fighter	24K(C)	11.99
☐ Intruder Alert	16K(C)	15.99
☐ Giant Slalom	16K(C)	11.99
☐ Monarch	16K(C)	10.99
☐ Crystals	24K(C)	9.99
☐ Nominoes	24K(C)	15.99
☐ Chomp Othello	16K(C)	10.99
C. E. SOFTWARE		
☐ Helicopter Battle	16K(C)	9.95
☐ Tractor Beam	8K(C)	9.95
☐ Kend	8K(C)	9.95
☐ Horseracing	16K(C)	9.95
☐ Supermaster	8K(C)	9.95
☐ Mad Marble	8K(C)	9.95
☐ Lightning Bolts & Reaction	16K(C)	9.95
☐ Musigame	16K(C)	9.95
☐ Tag	16K(C)	9.95
☐ War at Sea	16K(C)	14.95
U.S.A. SOFTWARE		
☐ 3-O Supergraphics	40K(C)	39.99
CRYSTALWARE		
☐ House of Usher		19.99
☐ Galactic Quest		19.99
☐ Sumer		11.99
☐ Laser Wars		19.99
☐ World War 3		19.99
☐ Beneath the Pyramids		19.99
☐ Sands of Mars		26.99
☐ Little Crystal		26.99
☐ Fantasy Land 2041		34.99
☐ Waterloo		32.99
☐ Quest for Power		26.99

ADVENTURE INTERNATIONAL	**ATARI**	**TRS-80**	
☐ Adventureland	24K(C)	16K(C)	16.50
☐ Pirate's Adventure	,,	,,	,,
☐ Mission Impossible	,,	,,	,,
☐ Voodoo Castle	,,	,,	,,
☐ The Count	,,	,,	,,
☐ Strange Odyssey	,,	,,	,,
☐ Mystery Fun House	,,	,,	,,
☐ Pyramid of Doom	,,	,,	,,
☐ Ghost Town	,,	,,	,,
☐ Savage Island Part 1	,,	,,	,,
☐ Savage Island Part 2	,,	,,	,,
☐ Golden Voyage	,,	,,	,,
☐ Star Trek 3.5	32K(C)	,,	16.50/12.50
☐ Lunar Lander	16K(C)	,,	12.50
☐ Galactic Trader	32K(C)	,,	16.50/12.50
☐ Galactic Empire	32K(C)	,,	16.50/12.50
☐ Galatic Revolution	32K(C)	,,	16.50/12.50

AVALON HILL			
☐ B-1 Nuclear Bomber	16K(C)	16K(C)	12.50
☐ Midway Campaign	32K(C)	16K(C)	12.50
☐ North Atlantic Convoy Raider	16K(C)	16K(C)	12.50
☐ Planet Miners	24K(C)	16K(C)	12.50
☐ Lands of Karma	40K(C)	48K(C)	17.50
☐ Computer Acquire	N/A	16K(C)	17.50
☐ Conflict 2500	32K(C)	16K(C)	12.50
☐ Empire of the Evermind	40K(C)	48K(C)	24.95
☐ Tanktics	24K(C)	16K(C)	19.95

The Avalon Hill games include the programs for TRS-80, Atari, Apple & Pet on the same tape.

ADVENTURE INTERNATIONAL	**TRS-80**	
☐ Curse of Crowley Manor	16K(C)	16.50
☐ Escape from Traam	16K(C)	16.50
☐ Balrog Sampler	32K(D)	24.95
☐ Stone of Sisyphus	32K(C)	24.95
☐ Morton's Fork	32K(D)	24.95
☐ Little Red Riding Hood	16K(C)	12.50
☐ Match Maker	16K(C)	12.50
☐ Old McDonald's Farm	16K(C)	12.50
☐ Six Micro Stories	32K(D)	12.50
☐ Local Call for Death	32K(D)	16.50
☐ Two Heads of the Coin	32K(D)	16.50
☐ His Majesty's Ship "Impetuous"	32K(D)	16.50
☐ Dragons of Hong Kong	32K(D)	16.50
☐ Missile Attack	16K(C)	12.50
☐ Frog	,,	12.50
☐ Planetoids	,,	16.50
☐ Showdown	,,	12.50
☐ Silverflash	,,	12.50
☐ Tunnels of Fahad	,,	12.50
☐ Musical YAT-C	,,	12.50
☐ Maxi Manager	48K(D)	84.50
☐ Starfighter	16K(C)	20.95
☐ Zossed in Space	,,	12.50
☐ Star Scout	,,	12.50
☐ Treasure Quest	,,	12.50
☐ Slag	,,	12.50
☐ FOM	,,	17.50
☐ Conquest of Chesterwoode	,,	16.50
☐ Mean Chicken Machine	,,	12.50
☐ Back-40 III	,,	12.50
☐ Z-Chess III	,,	20.95
☐ Project Omega	,,	12.50
☐ Sinutek	,,	12.50

ATARI programme exchange.
Complete range of progs now in stock.

TRS-80 trademark of Tandy Corp Apple trademark of Apple Inc. PET trademark of CBM Inc.
Atari trademark of Atari

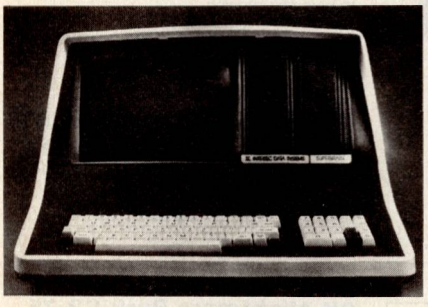
CALISTO COMPUTERS LIMITED

SPECIALISTS IN MICROCOMPUTER HARDWARE/SOFTWARE
119 John Bright Street
Birmingham B1 1BE
Phone: 021-632 6458

BARCLAYCARD VISA — Buy it with Access

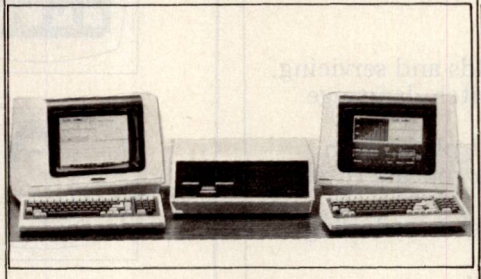
CITY MICROSYSTEMS LIMITED
65 LONDON WALL, LONDON EC2M 5TU
01-588 7272

SUPERBRAIN®



320K, 680K and 1.5MB Diskdrives.
Full graphics available.
Wide range of standard packages.

TELEVIDEO



Multi-user, Multi-task, Multi-processor
Televideo reliability with
complete expandability
one to sixteen users

VIDEO GENIE with VISICALC



Complete system £1275 inc Computer, Monitor
Expander 1 Disk Drive & Software
Vast library of standard software

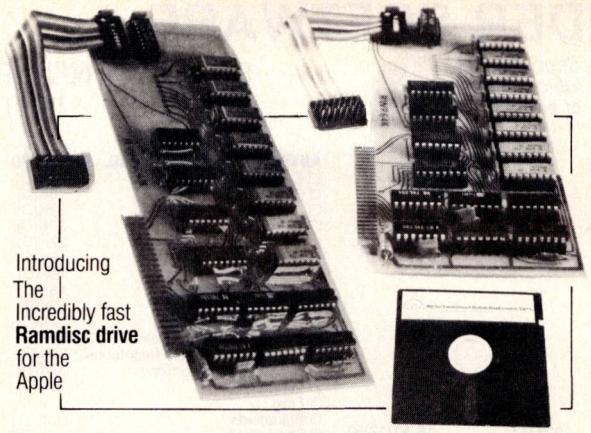
COMPLETE BUSINESS ACCOUNTING SYSTEMS FROM £2000 WORD PROCESSORS FROM £1420

ADVICE, TRAINING AND MAINTENANCE

ALL YOUR COMPUTER REQUIREMENT READILY AVAILABLE

IN THE CENTRE OF THE CITY- LONDON EC2

VISITORS TO OUR OFFICES MOST WELCOME 10.30am – 4.30pm



Introducing
The
Incredibly fast
Ramdisc drive
for the
Apple

- Uses two 64K RAMCARDS and RAMDISC software to simulate a disc drive.
- Appears exactly like a real disc drive with a slot number given by the slot into which the lower 64K RAMCARD is plugged.
- Allows use of any DOS 3.3 command.
- Provides up to two thousand per cent (2000%) increase in speed during disc intensive computing.
- Compatible with *all* existing software which uses DOS 3.3
- No controller required.
- Saves on disc head and drive wear.
- One single real disc drive only is required for saving finished files.
- Up to four 64K RAMCARDS may be plugged into any one Apple giving 2 RAMDISC drives.
- The 64K RAMCARDS may be used directly as banked memory in other applications.

The RAMDISC package of two 64K RAMCARDS and RAMDISC software costs £345.
Dealer enquiries invited.
Please add 15% VAT.

Merton Electronics 8 Rutlish Road London SW19 Telephone 01-543 3533

io systems ltd.

A/D BOARD FOR NASCOM

★ 8 Bit resolution
★ 8 Input channels
★ 30 microsecond conversion
★ Prototyping area
★ Sample and hold
★ Overvoltage protection
★ Full flag/interrupt control
★ Built and tested

Price £135 + 15% VAT (post free)

EPROM PROGRAMMER

★ Programs 3 rail: 2708/2716
single rail: 2508/2758, 2516/2716, 2532/2732
★ Zero insertion force socket
★ Built and tested

Price £63 + 15% VAT (post free)

GRAPHICS BOARD FOR NASCOM

★ 384 (H) x 256 (V) very high resolution graphics display
★ Fully bit-mapped
★ Full software control
★ Graphics software supplied
★ Mixed text and graphics
★ NASCOM 2 or 4mhz NASCOM 1
★ Built and tested

Price £55 + 15% VAT (post free)

GRAPHICS BOARD SOFTWARE

★ Lunar lander: £6 + VAT (post free)
★ Graphdraw: £8 + VAT (post free)

DUNCAN

★ Fast real time interpreter/control language for NASCOM 1 or 2 (please specify machine)

Price £12 + 15% VAT (post free)

MONITORS

★ BMC 12" green phosphor
★ 18 mhz bandwidth

Price £175 + 15% VAT (carriage extra)

MEMORIES

★ 4116 - 150ns 95 pence each + VAT (min order 8)
★ 64K - 200ns £10 each + VAT

SEND SAE FOR FUTHER INFORMATION

6 LALEHAM AVE, MILL HILL, LONDON NW7 3HL
TEL: 01-959 0106

IBM SELECTRIC GOLFBALL PRINTERS AND INPUT, OUTPUT 735 TYPEWRITERS

PRINTERS FROM	£195.00
735 TYPEWRITERS FROM	£245.00
WIRING AND COMMISION TO SUIT ACULAB INTERFACE	£48.00
ACULAB INTERFACES EX STOCK	£155.00

ALSO AVAILABLE
IBM 71, 72, 82 typewriters.
Full workshop facilities for rebuilds and servicing.
Keyboard ASCID-ASCII, 10-12 pitch, language conversions undertaken.
11", 13", 15" platen lengths, split platens pin feed platens. Operational keylever repeats fitted on request.
Full IBM range of 10-12* pitch heads including language, symbol and metric.
Language keybuttons blue or grey

WE BUY SELL OR EXCHANGE ALL IBM SELECTRIC TYPEWRITER MODELS

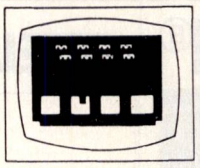
For further details phone Stuart Kirby or Louis Baker Prices excl VAT @ 15% carriage & packing, callers by appt only please

KEYTRONICS

Unit 3A, Eastington Trading Estate,
near Stonehouse, Gloucester
045 382 4004

MACRONICS

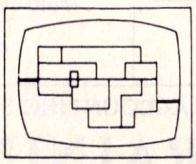
ZX81 26 Spiers Close
Knowle, Solihull
West Midlands
B93 9ES England **ZX80**



1K Space Intruders £5.00
3K Super Version £6.00
Written in machine code to give fast moving 'Flicker Free' graphics. A superb achievement.
Supplied on cassette with listing



16K High Resolution £4.00 (192 x 184) graphic pictures
Never before achieved on the ZX. Create your own artwork.
Supplied on cassette with listing and demonstration picture



9K Nightmare Park £3.75
The park of DEATH — can you get through this nightmare. No human has yet succeeded. Confronted by all sorts of 'Happenings' you'll be taken to your wits end.
Supplied on cassette only

Specify 4K, 8K ROM or ZX81 when ordering.

NEW INTERACTIVE GRAPHICS for the 16k ZX81

DRAGON MAZE... are you cunning enough to evade the dragon? you are impeded by darkness; the walls are only displayed when you make a bad move, this gives the dragon an advantage. You have to play by the rules - the dragon breaks them when he gets angry. Fun for all ages!
Cassette and listing..... £5.00 *(for ZX 81 only)*

SIMPLICALC

NEW!

FOR EVEN 8K PETS.....FROM CRONITE

For the first time, you can have a visual electronic calculator on even the smallest Commodore Pet, with no need for a disk drive.

You can move your screen around on your electronic worksheet, adding and deleting and recalculating . . . and if you think that sounds familiar, you're right. SimpliCalc was written to provide the main facilities of programs like VisiCalc™ on machines which do not have the 32K and disk drive required for VisiCalc™. Now the real power of your micro can be harnessed at a quarter of the cost of larger programs.

- ★ **Runs even in 8K**
- ★ **Writes figures or alphabetic characters on your sheet**
- ★ **Allows easy change or deletion**
- ★ **Can save your sheet for future use**
- ★ **Lets you print out your sheet on PET printers**
- ★ **Uses cassette or disk**
- ★ **Allows formulae to be set up for rapid recalculation**
- ★ **Shows you your sheet on the screen all the time**
- ★ **Allows replication of columns and rows**

What can you use it for? It's limited only by your imagination; any tabular computation, especially where you want to adjust and recalculate, is ideal. The Cronite Group uses it for costing, modelling, consolidation and capital investment appraisals. Try these:

- ★ **Education — business studies and economics**
- ★ **Investment analysis**
- ★ **Household budgeting**
- ★ **Financial modelling and cash flow**
- ★ **Costing**
- ★ **Tax computations — personal or business**

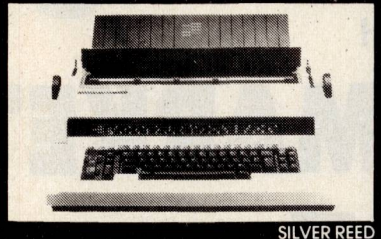
To obtain your copy of this versatile numeric tool, with comprehensive manual, send cheque with order, specifying whether your CBM is ★ 2001/3000/early 4000 (PEEK (144) = 46) ★ late 4000 series ★ 8032 and whether you want cassette **£29.90 inc. VAT** or disk **£36.80 inc. VAT** (specify drive) to:
SIMPLICALC — The Cronite Group Limited, Montgomery Street, Birmingham B11 1DT.

Further versions for other popular micros e.g. VIC 20 are planned; enquiries welcome.

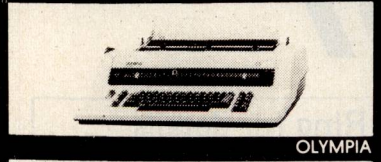
Further details from Mark Turner on 021-773 8281 — telex 338247

VisiCalc is a trade mark of Personal Software Inc.

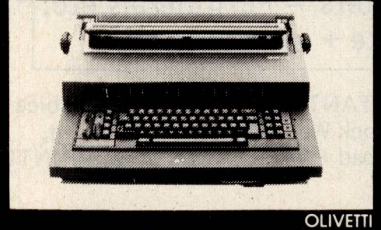
WE TURN ELECTRONIC TYPEWRITERS INTO COMPUTER PRINTERS



SILVER REED



OLYMPIA



OLIVETTI

If you have one of these, your local typewriter/computer dealer can arrange for the upgrade.
The discom upgrade enables most popular electronic typewriters to communicate with any micro computer.
Interfaces fitted as standard on each machine are: RS 232, Centronics IEEE.

** Interfaced machines are available from your local dealer.*

discom

Old Manor Farm, Ashton under Hill
Worcestershire
Telephone (0386) 881962

Please send me more details

Name _____

Address _____

_____

Telephone _____

ATTENTION

NASCOM USERS

ATTENTION

Ikon Computer Products pioneers in product development have broken the £100 barrier in data storage systems.

The HOBBIT CASSETTE system is available at only £99 plus VAT. This ready built, but unboxed, data storage system is based on a Phillips Mini Cassette with drive unit, interface board, firmware (in 2 2708's), manual, cassette with 100K storage, transfer speed of 750 bytes/sec The Hobbit is compatible with all Nascom Computers and Monitors.

£99 IKON – Sophistication at a realistic price **£99**

£113.85 (incl. VAT) for the Hobbit Unit available from:
IKON Computer Products
Kiln Lake
Laugharne
Carmarthen
DYFED
Tel: (099 421) 515

?

SELLING YOUR COMPUTER.
UPGRADING – PART EXCHANGE YOUR SYSTEM.
LOOKING FOR A NEW OR USED COMPUTER.
SEARCHING FOR A SUITABLE SUPPLIER.

?

COMPUTE A COMPUTER WITH

KELLYS COMPUTER MARKET

01-659-7997

New APPLE 48k £595
Refurbished ITT2020
Used 5¼ floppies

New ACORN ATOM – Ring for details
Used Computers – printers – Peripherals etc.
Software for all. Bespoke + off the shelf.

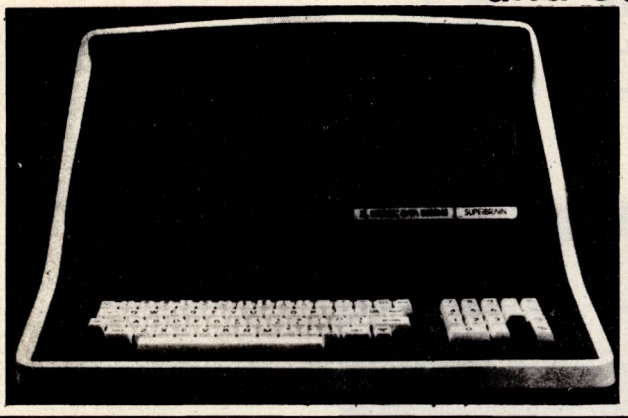
NEW ELECTRONIC TILL. Everything for the small BUSINESS. INSTANT STOCK UPDATE, Invoice printer, daybook, VAT Calculations, Posting, Accounts, Low Stock Warning, Reorder printing, Visual verification of Inputs, Transactions analysis, Remote keypad + VDU. INCLUDING PRINTER from £2700.

All prices exclude VAT and Carriage

PARAGON HOUSE, 46 KENT HOUSE LANE, Beckenham, KENT

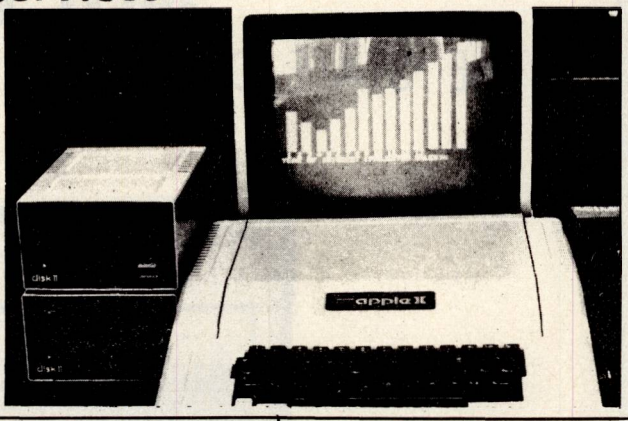
SALES - LEASE

and other services



SUPERBRAIN 64K

APPLE CPM Z80



SUPERBRAIN 64K
£1680 SUPERBRAIN STANDARD MODEL
(350KB DOUBLE DENSITY DISK DRIVE)
£2070 SUPERBRAIN QUAD MODEL
(700KB QUAD DENSITY DISK DRIVE)

APPLE 48K £590
£320 DISK DRIVE WITH 3.3 CONTROLLER

LANGUAGES
PASCAL
FORTRAN
CIS-COBOL
COBOL 80
FORTRAN 80
MBASIC
CBASIC
APL
MPM
PLI

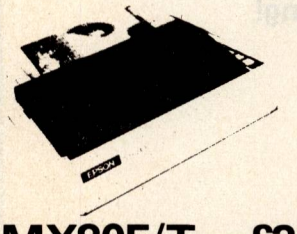
STANDARD
WORDSTAR
MAGIC WAND
SPELLBINDER
MAILMERGE
DATASTAR
SUPERSORT 1
IBM 3780 EMU
STATIONERIES

ACCOUNTANCY
INCOMPLETE RECORDS
INTEGR. ACCOUNTS
SALES LEDGER
PURCHASE LEDGER
NOMINAL LEDGER
INVOICING
PAYROLL
STOCK CONTROL
DBMS

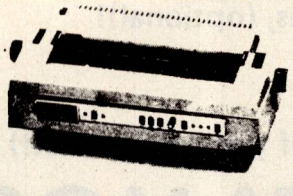
ADVENTURE GAMES
14 ODDESSY
16 ZORK
16 SANDS OF MARS
8 STELLAR INVADERS
17 TEMPLES OF ARSHAI
10 MISSION ASTEROID
12 MYSTERY HOUSE
15 WIZARD AND THE PRINCESS

BOARD GAMES
18 SARGON II
12 FAST GAMMON
12 BRIDGE PARTNER
12 CHECKER KING
10 WINDFALL
6 TANK COMMAND
12 FRACAS

EPSON Unbelievable quality from the world's largest print head manufacturer.



Qume £1395



MX80F/T$_1$ = £340
MX80F/T$_2$ = £380 **MX100 - £525**

£	SOFTWARE
95	APPLE DESK TOP PLAN
60	CCA DATA MANAGEMENT SYSTEM
10	DISC UTILITY PACK
300	APPLE BUSINESS CONTROLLER PROGRAM
25	APPLE POST PROGRAM
35	3.3 DISK OPERATING SYSTEM
100	APPLE FORTRAN PACKAGE
100	VISIPLOT VISI-TREND
70	VISITERM
110	DB MASTER
100	VISICAL DISK & BOOK COMPLETE 3.3
50	MICROBASE MAILING LSIT
100	MICROCHASE STOCK CONTROL
20	3D SUPER GRAPHICS
8	CIRCUIT ANALYSIS
	DOCUMENTATION
12	FORTRAN
9	APPLE II REFERENCE MANUAL
10	6602 HARDWARE MANUAL
8	6502 SOFTWARE MANUAL
3	APPLE II BASIC PROGRAM MANUAL
4	APPLESOFT II REFERENCE MANUAL
4	DOS 3.2 MANUAL 3.3
4	APPLE II BASIC TUTORIAL MANUAL
4	AUTOSTART ROM MANUAL
11	PASCAL MANUALS
14	BENEATH APPLE DOS

WAR GAMES
17 WARP FACTOR
10 LORDS OF KARMA
25 BISMARK
25 AMBUSH
16 CONFLICT
25 AIR COMBAT
25 NAPOLEONICS
17 BASEBALL

	VIDEO MONITORS
100	9" HIGH RESOLUTION B/W MONITOR
100	9" BLACK & WHITE VIDEO MONITOR
165	12" BLACK & WHITE VIDEO MONITOR CABLE FOR VIDEO MONITOR
120	12" VIDEO MONITOR GREEN DISPLAY MONITOR CABLE FOR VM12G
250	12" COLOR MONITOR
	HARDWARE
590	APPLE 48K VIDEO OUTPUT ONLY
260	DISC DRIVE WITHOUT CONTROLLER
320	DISC DRIVE WITH CONTROLLER
25	16K ADD ON
150	Z80 SOFTCARD/CPM/MANL

	CARDS & ACCESSORIES
120	ALF MUSIC SYNTHESISER CARD
10	TIMING MODE INPUT BOARD
7	ALF MUSIC ALBUM 1
7	ALF MUSIC ALBUM 2
7	ALF MUSIC ALBUM 0 (CHRISTMAS)
180	ANALOG OUTPUT BOARD 4 CHANNEL
280	ANALOG OUTPUT BOARD 8 CHANNEL
200	A1-O2 DATA ACQUISITION CARD
200	AD-DA 16 CH 12 BITS
11	PROTOTYPE/HOBBY CARD
40	PARALLEL PRINTER INTERFACE CARD
100	COMMUNICATIONS CARD
80	HIGH SPEED SERIAL INTERFACE CARD
90	LANGUAGE CARD
50	CENTRONICS CARD
80	RAM CARD 16K
150	Z80 CARD CRM OP
75	EUROCOLOUR CARD
120	SPEECH LAB
120	GRAPHICS TABLET
90	CONTROLLER CARD APPLETEL SYSTEM
160	80-COL DISPLAY CARD FOR BASICS
10	DISC TO CONVERT DV80 TO PASCAL
180	APPLE JUICE POWER SUPPLY
5	APPLE BLACK & WHITE MODULATOR
58	HEURISTICS CONTROLLER 70
168	HEURISTICS SPEECHLINK 200
219	IEEE INTERFACE
160	CLOCK/CALENDAR CARD
180	SUPERTALKER
110	ROM-PLUS CARD
100	ROMWRITER
30	COPYPLUS ROM
300	MUSIC SYSTEM COMPLETE
220	PASCAL LANG SYST.
	PRINTERS
	SILENTYPE 80-COL GRAPHICS PRINTER
25	10 ROLLS THERMAL PAPER FOR A2M0034
9	DUST COVER FOR SILENTYPE PRINTER
	CENTRONICS 737 PRINTER C/W ADAPTOR
20	11x9.5' PAPER FOR CENT. 737
32	½ ZIPPACK RIBBONS FOR CENT. 737
9	DUST COVER FOR CENT. 737 PRINTER
8	SERIAL CABLE FOR TIGER PRINTER
18	GRAPHICS SOFTWARE FOR TIGER/G
18	2000 SHEETS 11x9.5 PAPER 1 PART RE-INKING RIBBON & ROLLER SET
1395	QUME 5/45 RX
110	QUME FORM TRACTOR
400	CENTRONIC 739
460	PAPER TIGER 445
560	PAPER TIGER 460
650	PAPER 560
750	ANADEX DP9000
780	ANADEX DP9500
810	ANADEX DP9001
845	ANADEX DP9501

MAIL ORDER TO CENTRAL OFFICE
SEND FOR FURTHER DETAILS ON REST OF OUR EXCELLENT RANGE OF SOFTWARE HARDWARE

***All prices ex. V.A.T.** ***Our own low cost maintenance 24 hrs. service** ***Please ask for other brands of software and hardware**

MICROCOMPUTER HIRE SERVICE

A TRIAL PERIOD FOR YOUR COMPUTERISATION
A COMPREHENSIVE SERVICE FOR RENTALS

Superbrain with application packages · Apple System · PET Tandy Sorcerer Horizon Printers

CENTRAL OFFICE: Microcomputer Spacedrome, 3 Westholm, London NW11. 01-458 5845
Promglow Ltd., 12 Dene Road, New Southgate.

MICROTEK COMPUTER SERVICES

MICROTEK INTRODUCE THE

`MICOM 81´

THE `STATE OF THE ART´ MICRO-COMPUTER SYSTEM.



- **4 MHZ Z80A CPU!**
- **18 Slot S100 Mainframe!**
- **32 MB or 96 MB CMD Hard Disk Storage!**
- **Up to 768K Dynamic or 384K Static RAM with Bank Switching!**
- **2, 4 or 8 port Serial and Parallel I/O boards!**
- **8" Double Density Floppy Disk Drives, (optional)!**
- **IBM Compatable Communications!**
- **Rugged and Reliable Rack Housing!**

The 'MICOM 81' system will run CPM, (if you really must!) or

`MVT FAMOS´

The most powerful and versatile multi-tasking, multi-user 8-bit operating system currently available! You don't believe us? Well we have a large international bank using this system with 6 terminals and 2 printers in a 'Real Time' trading application!

Do you know of a UNIX, MPM, MBOS, OASIS or any other 8-bit 'multi-user' operating system, that you can get demonstrated doing the same? Well neither do we!

The 'MICOM 81' system is also currently being used in one of this country's leading universities, and in many other different types of industrial and commercial applications.

Prices start from as little as £7,000 and OEM enquiries are welcome.

For further details phone Orpington 26803/36228 or write to Microtek Computer Services, 50 Chislehurst Road, Orpington, Kent, BR5 ODJ.

TRS-80 OWNERS!

BARCLAYCARD VISA

Buy it with Access

MODELS I & III

LEVEL II CASSETTE

GAMES

Adventures:-
- Special Sampler* £6.50
- Adventureland* £12.50
- Pirates Adventure* £12.50
- Mission Impossible* £12.50
- Vodoo Castle* £12.50
- The Count* £12.50
- Strange Odyssey* £12.50
- Mystery Fun House* £12.50
- Pyramid of Doom* £12.50
- Ghost Town* £12.50
- Kid Venture £12.50
- Savage Island* I £12.50
- Savage Island* II £12.50
- Golden Voyage* £12.50
- Escape from Traam* £12.50
- Crowley Manor* £12.50

Air Raid* £7.50
Air Traffic Control* £8.50
Amazin' Mazes £5.50
Android NIM £7.50
Asylum* £9.50
Attack Force* £10.50
Backgammon £6.50
Barricade* £7.50
Battle Bastogne £10.50
Battle St. VIth £10.50
Battleship £7.50
Bee Wary £7.50
Bingo £5.00
Bowling (Ten Pin) £6.50
Bridge Partner £13.50
Bridge 2.0 ..... £13.50
Chess Partner* £9.50
Cosmic Fighter* £10.50
Cribbage Player £9.50
Datestones of Ryn £15.00
D-Day £10.50
Death Dreadnaught* £10.50
Deathmaze* £9.50
Duel & Droids £10.50
The Empire Strikes £10.50
End Zone II £6.50
Fastgammon* £14.00
Flippy* £9.50
Flight Simulator* £17.00
Galactic Empire £10.50
Galactic Revolution £10.50
Galactic Trader £10.50
Galaxy Invasion* £10.50
Game of Life* £6.50
Gammon Challenger* £10.50
Hangman £4.50
Hellfire Warrior £19.00
I Ching £5.00
Interlude* £12.00
Invasion Orion £17.00
Invaders from Space* £10.50
Kamikaze £5.00
Kreigspiel II £10.50
Labyrinth* £9.50
Life Two £9.50
Lost Dutchman's Gold £9.50
Lunar Lander* £10.50
Mean Checkers* £11.00
Meteor Mission* £10.50
Morloc's Tower £13.50
Noughts & Crosses £5.00
Othello III £6.50
Olympic Decathlon* £17.50
Pentominoes £6.50
Pinball* £10.50
Pork Barrel £6.50
Planetoids* £10.50
PR Dogfight £6.50
Rescue at Rigel £15.00
Robot Attack* £10.50
Round The Horn £6.50
Sargon II* £20.50
Snake Eggs £7.50
Space Battles £7.50
Starfleet Orion £17.00
Startrek III.5 ..... £10.50
Super Nova* £10.50
Taipan £6.50
Temple of Asphai £17.00
Time Trek* £10.50
Turret & Track £6.00
Up Periscope £10.50
Warfare I £6.00
Warpath £10.50
X-Wing Fighter II £7.50

EDUCATIONAL

Spelling Builder £13.00
All other PDI Pgms £10.50
Teachers Assistant I £9.50
Teachers Assistant II £9.50
Teachers Assistant III £9.50
Semi Conductor Theory £9.50
9 Games for Preschoolers £7.50

BUSINESS & UTILITIES

Amateur Astronomer £9.50
APL-80* £10.50
Basic 1P* £11.50
Basic Toolkit* £12.50
Biorythms £5.50
Calendar Functions £7.50
Debug* £13.50
Direct Function Graph £9.50
Editor Assembler Plus* £20.50
Electric Pencil* Vers 2.0 ..... £50.00
Electronics Assistant £7.50
EMU 02* £17.00
ESP Tester £5.00
File Handling £7.50
Finance Pack £7.50
Finplan £35.00
Forth* Vers 2.0 ..... £65.00
GSF* £19.50
General Accounting £8.50
Ham Radio £7.50
Histograph/Scattergram £8.50
Home Finance £6.50
Infinite Basic* £34.00
Infinite Business* £20.50
Instant Calculator £8.50
Inventory Control £11.00
Inventory 'S' £17.00
IRV* £15.00
Keyboard 80* £7.50
KVP* £10.50
Level III Basic* £34.00
Linear Programming £6.50
Magic Paper Calculator £9.50
Mathdrill £5.50
Memdump* £6.50
Mortgage Calculator £5.00
Pascal* £16.00
Periodical X-REF £10.50
Personal Finance £7.50
Pilot 2.2* £10.50
Pre-Flight £7.50
Remodel & Proload* £25.00
Renumber* £7.50
RPN Calculator £7.50
RSM 2 Monitor* £16.00
Scientific Calculator £13.50
Scripsit* £42.95
Screen Hold* £6.00
Statistics £6.50
S.T.A.D.* £17.00
ST-80* £34.00
Super Pims Data Base £10.50
Super Simon £7.50
Super T-Legs* £7.50
T-Step* £7.50
System Copy* £9.50
T-Short+* £14.00
Tarot Cards £6.50
Timser* £10.50
Tiny Compy £14.00
TRS80 Opera* £7.50
Typing Tutor £12.00
Ultra Mon* £17.00
X-Ref* £9.50
Y-Y Bar £10.50
76 Basic Programs £23.00
Manual for Above £8.00
Library 100 ..... £40.00

DISK

Accounts Receivable II £40.00
Advanced Personal Finance £17.00
Amateur Radio System £17.00
APL 80 ..... £30.00
Auto Disk Directory £10.50
Basic Compiler £120.00
Beamcalc £130.00
Cash Register + Inventory £40.00
Comproc £13.50
Data Base II £30.00
DCV-1 ..... £9.50
Dosort £25.00
Dynamic Data Base £22.50
Electric Pencil Vers 2.0 ..... £65.00
File Manager 80 ..... £30.00
Floppy Disk Diagnostic £14.50
Forth Vers 2.0 ..... £92.50
Forth Datahandler V 2.0 ..... £45.00
Forth Utilities Disk V 2.0 ..... £29.50
Inventory Control £50.00
Inventory 'S' £40.00
KVP Extender £17.00
Mailist IV £45.00
Mychess £25.00
Newdos 80 V2.0 ..... £97.50
Newdos + ... £47.50
Office Accounting £20.00
Pascal £35.00
Penpatch £11.00
Pencil PAL £17.00
Roots £17.00
RSM 2D Monitor £20.00
Sargon II £25.00
Scripsit* £75.00
Simplify It £15.00
Space Intruders £20.00
ST80D* £45.00
ST80D III* £95.00
Superscript* £20.50
Visicalc* £75.00
Taranto & Associates Conversion of Osbourne & Associates Business Programmes
Accounts Payable £90.00
Accounts Receivable £90.00
Invoicing for above £70.00
General Ledger includes Cash Journal £90.00
Manuals for above (3) £32.00
Complete Co-ordinated System with Manuals £300.00

MODEL II

CPM 2. 2. X £155.00
CBasic (CPM) £70.00
Disk Sort Merge £95.00
Development System £80.00
G.S.F. £35.00
Pascal ..... from £125.00
Reference II £35.00
RM Cobol ..... from £350.00
RSM II Monitor £35.00
Utility Package £95.00
Hard Disk Operating Sys £300.00

WORD PROCESSORS

Electric Pencil II (CP/M) £185.00
Electric Pencil II TRSDOS £200.00
Magic Wand (CP/M) £200.00
Wordstar (CP/M) £250.00

BUSINESS SYSTEMS

Accounting ..... from £150.00
Mailist ..... from £100.00

CP/M USERS GROUP
23 Volumes ..... Each £7.00

APPLE OWNERS!

HAYDEN & MICROSOFT SOFTWARE PRODUCTS AVAILABLE FROM STOCK AT KEEN PRICES.

ALL PRICES INCLUDE VAT AT 15%, PACKAGING & RETURN POSTAGE TO U.K. ADDRESSES. PRICES TO OVERSEAS ADDRESSES INCLUDE RETURN AIRMAIL. SEND £1.00 FOR NEW DESCRIPTIVE CATALOGUE.

*Denotes Machine Language
TRS-80 Trademark of Tandy Corp.
CP/M Trademark of Digital Res.
C-Basic Trademark of Compiler Systems.

ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE

MICROCOMPUTER APPLICATIONS
42A CHURCH STREET, CAVERSHAM, READING RG4 8AU, ENGLAND.
TEL: (0734) 470425

nascom

SPECIAL PRICE

FULLY BUILT AND TESTED SYSTEMS

64K Nascom 2 in Kenilworth Case with Nas-Sys 3, graphics and sound
£499 + V.A.T.

8K Nascom 2 in Microtype Case with graphics and sound
£ 375 + V.A.T.

Now available, ✱Nascom Discs with Nasdos or CP/M. ✱PHG Soundbox, Arfon Speech Synthesizer, Pascal and Forth. ✱Epson MX80 F/T2 Printer with high resolution graphics. ✱Kenilworth Cases for Nascom 2 and Gemini Multiboard.

BYTE SOFT GENERAL BUSINESS SYSTEM...

Integrated Nominal, Purchase and Sales Ledgers with optional Invoicing and Stock Packages, using the Comart Communicator, a British Computer, with up to 1.5 MBYTE of floppy discs, or 750K and a 5 MBYTE hard disc. From as little as £3915 Ex. V.A.T. for complete system including onsite installation.

Business & Leisure Micro Computers

16, The Square, Kenilworth Tel: (0926) 512127

'C F A C C'

Pronounced "Seefack"

"THE BEST ACCOUNTS PROGRAMME ON THE MARKET " — £1200

(FULLY TAILORED TO YOUR OWN REQUIREMENTS + £300 IF YOU BUY THE HARDWARE FROM US, OTHERWISE + £600)

MAIN MENU

1. ADDRESS PROGRAMME
2. SALES INVOICES
3. PURCHASE INVOICES
4. STOCK CONTROL
5. ORDER CONTROL
6. PAYROLL
7. PAYMENTS MADE
8. PAYMENTS RECEIVED
9. CREDITORS
10. DEBTORS
11. SUPPLIER STATEMENTS
12. CUSTOMER STATEMENTS
13. AGENTS STATEMENTS
14. PRINT CUSTOMER INDEX
15. PRINT SUPPLIER INDEX
16. BANK RECONCILIATION
17. PURCHASE LEDGER
18. SALES LEDGER
19. END OF MONTH PROCEDURE
20. VAT STATEMENTS
21. MANAGEMENT FINANCIAL REPORTS
22. PROFIT & LOSS ACCOUNT
23. BALANCE SHEET
24. CAPITAL ASSETS
25. DEPENDING ON VERSION
26. DISK DIRECTORIES
27. ALTER IN CORRECT FILE ENTRIES
28. PRINT LEDGER CODES
29. PRINT STOCK LIST
30. FINISH USING 'CFACC'

'CFACC' Accounts Programme — Copyright Computers for All Ltd.

'CFACC' ACCOUNTS PROGRAMME — COPYRIGHT COMPUTERS FOR ALL LTD

1. The Programme resides totally "in core" leaving BOTH DISKS FREE for files and enabling disks to be changed during use.
2. Every Programme issued is "PERSONALISED" with your Company's details. Our "After Sales Service" is positive, giving you constant access to the Author of "CFACC". We arrange Nationwide hardware support.
3. You need only enter invoices and other payments in and out and "CFACC" will produce all the DATA for the MENU Programmes (it will ask the user for any other information it needs).
4. All relevant information is stored for CUSTOMERS, SUPPLIERS, EMPLOYEES and Others.
5. Automatic VAT Calculations.
6. Automatic calculations of WAGES and SALARIES. — This section alone would normally cost £500
7. INVOICES can be produced automatically using Customers' names and addresses from file and Stock Items from file — all calculations are automatic.
8. INVOICES are automatically printed on plain paper or on your own stationery. Invoices entered are retained for automatic printing at the end of the day, lunchtime etc.
9. STOCK FILE is automatically UPDATED whenever a Purchase or Sales Invoice is entered and the User's attention is drawn to any item which has reached RE-ORDER LEVEL.
10. Customer and Supplier Statements printed on demand showing Current, 1 Month, 2 Months, and 3 Months and over figures. These are automatically updated as payments are entered. The User's attention is automatically drawn to any Customer exceeding his CREDIT LIMIT. REMITTANCE NOTES are produced of invoices selected for payment — CHEQUE PRINTING optional.
11. "Open Item" ledgers retain all invoices until they are paid (Purchase & Sales).
12. Outstanding Orders are retained on file until invoiced (Purchase & Sales).
13. Automatically calculates COMMISSION due to Agents and Salesmen.
14. DEBTOR and CREDITOR lists available on demand. With individual Aged Debt Analysis
15. PROFIT & LOSS ACCOUNT, BALANCE SHEET and TRIAL BALANCE printouts on demand.
16. MANAGEMENT FINANCIAL REPORTS include:
    1) GROSS PROFIT RATIO
    ii) RATE OF STOCK TURNOVER
    v) AGE OF DEPT ANALYSIS
    iii) NET PROFIT as a PERCENTAGE OF SALES
    iv) INCOME STATEMENTS.
17. CAPITAL ASSETS STATEMENT on demand.
18. INCOMES & EXPENDITURE is analysed into 70 ledger classifications and the amounts in any one of these can be called at any time. Classifications can be changed by the User
19. ENVELOPES or ADDRESS labels can be printed from Address Files.
20. Full Random Access to any record in any file — No Limit on Record Lengths.
21. Ledgers are automatically updated after every transaction.
22. All sections of the Programme and files are fully integrated.
23. Some Programmes on the market claim to be easy to use with no need for a manual (BUT TO THE LAYMAN THEY SIMPLY ARE NOT). "CFACC" really is USER ORIENTATED — WE ARE PREPARED TO LET YOU PROVE THIS FOR YOURSELF. MONEY RE-FUNDED IN FULL IF YOU CAN SHOW US A BETTER MICROCOMPUTER ACCOUNTS PROGRAMME WITHIN 7 DAYS OF USE.
24. The PRICE makes "CFACC" the best VALUE FOR MONEY on the Market.
25. Fully tested and debugged. You will receive Free of Charge any Improvements or Modifications we make in the future.
26. All equipment is fully tested by us prior to installation — Normal Guarantees on all Equipment and we only recommend the most able. Service Contracts available. Finance and Leasing a speciality.
27. DELIVERY and INSTALLATION FREE of Complete Packages within the UK.
28. We have examples of other Accounts Programmes on the market which you are welcome to try and to compare them with 'CFACC'.
29. PETs, APPLEs and TANDYs taken in PART EXCHANGE against Complete Packages.
30. AUTOMATIC LOADING — You simply insert the disk
31. 'CFAACC' will run on any CP/M Micro with a true 64K
32. Special versions available with Back Order Files, Job Cost Files, Raw & Finished Stock Files for manufacturers, client account files with time allocation for Service Industries
33. We also stock other software such as Calcstar, Datastar, various languages etc.

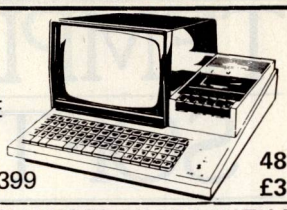
64K 'SUPERBRAIN' (350K DISK STORAGE) — DAISYWHEEL PRINTER — "CFACC" ACCOUNTS — "WORDSTAR" Word Processing.

★★ ALL FOR ★★ £4,286.00

Computers For All Ltd. Stratford on Avon (0789) 840064

RING FOR OUR INFORMATION FOLDER which will tell you the questions to ask the others

SHARP
MZ80K



THE BEST VALUE IN HOME & BUSINESS COMPUTERS

WITH DISCS & PRINTER £1399

48K £339

MZ80B

THE ADVANCED MICRO WITH BIG FEATURES
64K HIGH RES GRAPHICS

£2250 WITH DISCS, PRINTER, CP/M & WORDSTAR

THE QUALITY BUSINESS MICRO **PC3201**

SUPERB SHARP ENGINEERING
ELEGANT STYLING. UP TO 128K
BIG CLEAR SCREEN FOR ACCOUNTS
WORK & WORD PROCESSING
MANY EXCELLENT PACKAGES AVAILABLE OR
WE CAN DEVELOP SYSTEMS FOR YOU.

THE AMAZING POCKET MICRO
MANUAL CONTAINS UP TO 150
ENGINEERING, SCIENTIFIC & OTHER PROGRAMS.

PC1211
£69.00

CASSETTE I/F 9.95 PRINTER £55

SOME MZ80K ACCESSORIES	
DUST COVER	4.37
10 CASSETTES	5.00
10 GAMES	5.00
PASCAL	39.00

CP/M S/W	
RING FOR FULL UST	
WORDSTAR	269
MAILMERGE	82
SPELLSTAR	136
CIS-COBOL	425
FINANCIAL PLANNING	

COMPUTER AIDED INSTRUCTION FOR MZ80K, B & PET £48

WE AIM TO OFFER YOU THE BEST DEAL, AND IF OUR PRICES AREN'T THE LOWEST CALL US FOR OUR LATEST OFFERS.

PLEASE ADD VAT TO ALL PRICES

BARCLAYCARD VISA

THE COMPUTER COMPANY
78 LOWER ADDISCOMBE RD.
CROYDON Tel: 656-7715 & 654-4147

We welcome Access

Compare & Save

apple europlus



£ call + VAT

Complete 48K with Games
Paddles – 12 Months Warranty
Disc Drive with 3.3 Controller £ call
Disc Drive without Controller £ call

EPSON MX-80F/T



£359 + VAT

80 CHARACTERS / SECOND
3-WAY PAPER HANDLING
CORRESPONDENCE QUALITY PRINTING
VERSATILE INTERFACE OPTION
FULL 96 ASCII WITH DESCENDERS

Epson MX80F/T2 Hi-Res	£399
Epson MX100 Hi-Res Printer	£517

12" GREEN MONITORS

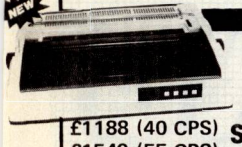


UNBEATABLE VALUE AT £95

* Green display
* Stable display – Low Distortion
* Video Response – over 11MHZ
* Instant action – fast warm-up
* Complete with video cable + 13 amp plug

VisiCalc II (Dos 3.3)	£99
VisiPlot	£89
VisiDex	£99
VisiFile **NEW**	£130
DB Master Data Base	£109
Data Plot	£49
SuperText II Word Processor	£125
Address Book Mailing List	£40
Form Letter Module (S/Text+Add Bk)	£80
CIS-COBOL with Forms-2	£450
Apple Pascal Language System	£225
Apple FORTRAN	£99

NEW



TEC STARWRITER

£1188 (40 CPS)
£1549 (55 CPS)

• 40 or 55 Chrs/sec Bidirectional

* 2k BUFFER STANDARD
* AUTOMATIC PROPORTIONAL SPACING
* LOGIC SEEKING AND SPACE SKIPPING
* DOUBLE PRINT, BOLD PRINT, AUTOMATIC UNDERLINING, HORIZONTAL TABULATION, REVERSE PLATEN FEED, GRAPHICS
* STANDARD 96 CHARACTER SET, DIABLO OR QUME PRINT WHEELS
* SERIAL RS232C or 8 BIT PARALLEL (CENTRONICS)

U-RAM 16k-RAM Card	£86
U-Z80 Processor Card	£86
Microsoft Z80 Softcard/Disks etc	£175
Games Socket Extender	£9
GAMES	
Anti Ballistic Missiles	£17
Global War	£17
Three Mile Island	£25
Gallactic Wars	£16
Apple Adventure	£18
Send for list of games for Apple II Disks (Wabash/BASF) per 10	£17.50

PLEASE REMEMBER TO ADD 15% VAT

Buy with Access VISA

MICROSAVE

FREEPOST, 68 ALMA RD,
BRISTOL BS8 2YY
TEL: 0272 - 737555

Hard Disks for the PET

The Small Systems **HARDBOX** acts as an intelligent controller for up to 4 Corvus Winchester drives or one SSE Mini Winchester drive unit.

- PET DOS 1 and 2 compatibility
- Multi user capability on Corvus Drives
- 16 Megabyte max file size
- 65535 max records per relative file
- Over 2000 files on 5 MB drive

CORVUS DRIVES

Well proven systems with nationwide support and maintenance.

- 5, 10, 20MB capacity
- Up to 4 drives can be daisy chained
- Backup onto standard video cassette using the Mirror unit
- Up to 64 users with the Constellation multiplexer unit.

5MB Corvus drive	£2295
10MB	£3595
20MB	£4495
Mirror back up unit	£495
Constellation	£495

SSE MINI WINCHESTER

Drive and Hardbox or Softbox housed in one small desktop unit. Single user.
Prices inc. Integral Hardbox

3MB	£2300
6MB	£2500
12MB	£2800

Add £120 for Integral Softbox

SOFTBOX and CP/M SOFTWARE

SOFTBOX allows the PET to run the worlds most popular operating system for micros. Operates with PET floppies and/or a Hard disk system.

Comprehensive range of CP/M software available – ask for our Catalogue

Softbox	£550
RS232 Option	£45
Corvus Option	£65

IEEE-488 INTERFACES

Comprehensive range for PET and HP-85
e.g. B300 RS232 Bi-directional 40 char buffer, full hand shake £186

RICOH DAISY WHEEL PRINTERS

Letter quality, 60CPS with integral IEEE, RS232 or Centronics Interfaces.

RP1600	£1450
Flowriter	£1795

Large Buffer. Qume/Diablo compatible
Bidirectional printing

S100-CP/M SOFTWARE DEVELOPMENT TOOLS FOR INDUSTRY

8048 family in circuit emulator	£ 50
8748 programmer	£395
Prom emulator	£295
Range of cross assemblers for most popular micros	£95
8048 BASIC compiler	£195

COMPLETE PET and HP-85 SYSTEMS

Telex 264538

small systems engineering limited

2-4 Canfield Place · London NW6 3BT
Telephone 01-328 7145/6 Telex 264538

S.B.D. SOFTWARE
15, Jocelyn Road, Richmond TW9 2TJ.
Tel: 01-948 0461. Telex: 22861

PURCHASE YOUR COMPLETE APPLE II COMPUTER SYSTEM FOR THE LOWEST PRICE IN THE U.K.

1 APPLE II EURO PLUS 48K
1 DISK DRIVE WITH CONTROLLER
1 DISK DRIVE WITHOUT CONTROLLER
1 HITACHI 10" MONITOR
1 EPSON MX-80FT PRINTER + INTERFACE
1 MAGIC WINDOW WORD PROCESSOR
1 BASIC MAILER
1 VISICALC 3.3
1 DAN PAYMAR LOWER CASE ADAPTOR
1 BOX OF DISKETTES

ALL ITEMS GUARANTEED 1 YEAR
ALL MANUALS INCLUDED
LIMITED QUANTITIES AVAILABLE! HURRY!

ALL FOR ONLY £1,975.00
CREDIT CARD SALES ADD 3%

BUSINESS SOFTWARE

MAGIC WINDOW, BASIC MAILER, DAN PAYMAR – All 3 for £145.00.
MAGIC WINDOW will instantly convert your Apple system into a word-processor, no modification or fancy gadgets to buy. Magic Window's 4-way scrolling allows you to type up to 80 CHARACTERS per line, will show you exactly how your letter will be printed. Inserting, deleting, centering, you can see it all on the screen. **£79.95**
BASIC MAILER is a mailing list merge system design to take **MAGIC WINDOW** documents, files and replace names, addresses or any other sections of the document with individual data, creating customised letters, invoices, etc. **£49.95**
DAN PAYMAR lower case adaptor. **£39.95**
VISICALC 3.3 THE UPGRADED VERSION **£99.00**
VISIDEX A most useful cross-reference of information. **£99.00**
VISIPLOT Plot your data onto high-res. graphs. **£75.00**
BRAIN SURGEON Thoroughly test your Apple II. **£30.00**
D.B. MASTER Computed fields, Statistical Analysis **£130.00**

UTILITIES

EXPEDITER II At last you can compile your Applesoft programs into machine code and watch it run 2-20 times faster. **£75.00**
CRAE Co-Resident Applesoft Editor. Anyone writing software on the apple needs this editor. **£19.95**
CRAE & MCAT **£29.95**
SUPER DISK COPY III The most versatile copy program on the market. Initialize a diskette with or without DOS sectors. Copy files one by one or the entire disk. View the catalog and then see a display of the diskettes free and used sectors. Copy DOS 3.2 to 3.3 and visa-versa, many other commands. **£24.95**
APPLEGUARD Protect against bit copiers, protect your software. **£200.00**
AOPT – APPLESOFT OPTIMIZER, remove REM's. Pack as many instructions as possible per line. **£19.95**
APLUS – STRUCTURED BASIC. Write programs in a structured manner with your new additional commands and then compile into a regular APPLESOFT program. **£19.95**
DOS PLUS. Three new DOS Commands built-in 5 commands are user-definable. You can now FLIP easily between DOS 3.3/3.2 from within the program. Also DOS Command Editor. Edit the names of the DOS commands and initialize disks with your own DOS. **£19.95**
DISK RECOVERY Scan your disks and mark faulty tracks so they are not used. Also able to **REDO VTOC** which may re-cover your messed-up disk. **£24.94**
BACK-IT-UP Bit copier to back-up your protected software. **£50.00**

ARCADE GAMES

Space Warrior	£12.95	Star Mines	£14.95
Alien Rain	£12.95	Apple Panic	£14.95
Snoggle	£12.95	Sneakers	£17.95
Demon Derby	£12.95	Raster Blaster	£17.95
Galaxy Wars	£12.95	Star Thief	£17.95
Gobbler	£12.95	Space Quarkes	£17.95
Star Cruiser	£12.95	Missile Defence	£17.95
Alien Typhoon	£13.95	Pegasus II	£17.95
Space Eggs	£14.95	Threshold	£19.95
Autobahn	£14.95	Epoch	£19.95

ADVENTURE GAMES

Mission Asteroid	£9.95	Ulysses & the golden fleece	£17.95
Mystery House	£12.95	Oldorf's Revenge	£11.95
The Wizard & The Princess	£17.95	Tarturian	£14.95
Cranston Manor	£17.95	Creature Venture	£14.95
Soft Porn Adventure	£17.95	Wizardry	£25.00

CARD & SPORT GAMES

German Whist	£9.95	Cribbage	£12.95
International Grand-Prix	£16.95	Pool 1.5	£18.95
Draw Poker	£14.95	Hi-Res Soccer	£22.95

STRATEGY GAMES

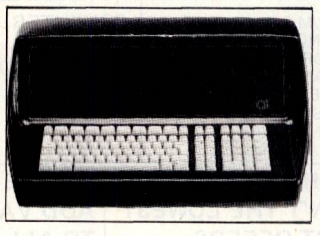
Galactic Empire	£12.95	Tawala's Last Redoubt	£14.95
Galactic Trader	£12.95	Golden Mountain	£9.95
Galactic Revolution	£12.95	Kubic	£9.95

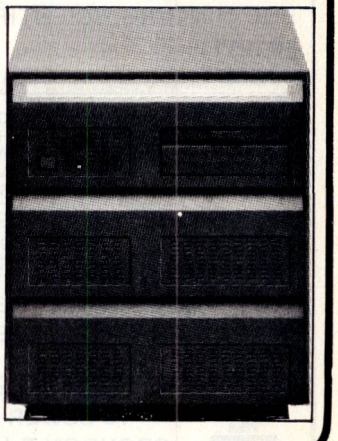
Add 15% VAT. Postage and Packing Free.
Dealer enquiries welcome.
Write or phone for full catalogue of available software.

TEMPLEMAN SOFTWARE LIMITED

Would like to apologise to all those of you who could not get on to our stand at the I.B.S.

To make amends we invite you to our offices at 25 Greenhill Street, Stratford on Avon, for a personal demonstration by appointment on 0789 66237, of our new hardware range. It can be used as a single work station in your sales or accounts office or as part of a multi-terminal chain throughout every part of your office or factory.





6809 is HERE!

HARDWARE
SWPTC and APPLE Distributors.
'77—'68.
A single board 6800 or 6809 system, that can be expanded into a full business system. Sold as bare printed circuit boards, with constructional notes.

'6800'	CPU	12.00
MON 1	Soft Monitor	12.00
MON 2	ROM Monitor	12.00
'6809'	CPU	12.00
CASSETTE	High Speed Interface	6.00
4K RAM	Static Memory	12.00
DYNARAM	32K Dynamic Memory	12.00
VDU	Memory Mapped Screen	12.00
PIO	Parallel Interface	12.00
ROM A	8K-16K EPROM Memory	12.00
PROM PROG	EPROM Programmer	12.00
DISC CTRL	Disc Controller	12.00

Call or send for detailed information sheet and price list. Design Notes £1.00 each.

SOFTWARE
FLEX 9 for 6809 Systems, 5¼ or 8 inch Disks.

SORT/MERGE PACKAGE	69.00
DEBUG PACKAGE	69.00
UTILITIES	55.00
TEXT PROCESSOR	69.00
BASIC	62.00
EXTENDED BASIC	90.00
XBASIC PRECOMPILER	48.00
FLEX DIAGNOSTICS	62.00
GENERAL FLEX, incl EDITOR and ASSEMBLER	120.00

CASSETTE SOFTWARE for 6800.

SWTPC 4K BASIC	15.00
SWPTC 8K BASIC	20.00
TSC TEXT EDITOR	25.00
TSC ASSEMBLER	25.00
TSC TEXT PROCESSOR	30.00
TSC RELOCATOR	20.00

BUSINESS SOFTWARE
'Visicalc' for the APPLE II. Price £125.00.
'TABULA RASA' for '6809' Price £139.00.

- **Come in and try out any of these systems, or use our Mail Order service.**
- **All prices correct at time of going to press and include VAT at the current rate.**
- **Send for our latest catalogue and price list. Access and Visa accepted.**
- **Store Opening Hours, Monday to Saturday, 9.30 to 5.30.**
- **The '6809' Hardware and Software Specialist Store.**

STERLING MICROSYSTEMS

241 Baker Street, London NW1 6XE. Telephone: 01-486 7671.

MAKE THE MOST OF YOUR CP/M SYSTEM

with a highly productive language designed to improve the reliability of software.

Pro Pascal is a full implementation of the standard language, with extensions such as random-access files, strings and separate compilation of program segments.

The compiler runs on any Z80 micro with CP/M and at least 52k RAM, eg MZ-80B Horizon, Conqueror, MCZ, Superbrain and many others.

Object programs are compact and fast, making full use of the Z80's registers and instruction set.

The software package includes a disc-to-disc linker and a cross-reference program.

new ProPascal runs faster

Developed and supported in the UK, Pro Pascal is available now, at a single-user price of £190 plus VAT. Dealer enquiries are also welcome.

Prospero

Programming Language Specialists

Prospero Software,

37 Gwendolen Avenue,

London SW15 6EP Tel. 01-785 6848

ZX81 16k SOFTWARE

PACK 16/1 includes all of:
AIR TRAFFIC CONTROL: Animated radar screen of busy airport shown, you must bring planes into land; INVADERS SELF PLAY; PHONEBOOK — keep friends' and relatives' numbers on cassette; DATE '81 — computer dating program. Who will it pick for you?
ALL ONLY **£4.95**

PACK 16/2 includes all of:
ADVENTURE ATLANTIC: You may become very rich or you may be marooned forever; BREAKOUT: SQUASH PRACTICE; LANGUAGE TRANSLATOR translates any European language to any other; COMPUTAPRINT — use this program to predict results of horse races, football pools; etc.
ALL ONLY **£4.95**

PACK 16/3 includes all of:
INDI 500; video roadracer; DRAUGHTS; Computer Chequers; BATTLESHIPS — nautical warfare on your own computer.
MASTERMIND — Brain Teaser, see if you can beat a microelectronic mind.
ALL ONLY **£4.95**

The breakthrough you've waited for:
PROGRAM THE ZX81 IN ENGLISH!!!
With GAMAL 81 you can now write adventure programs in hours not weeks and with GAMAL 81 you'll have every adventure you'll ever want for the price of one. Comes on cassette with instruction book, **£7.95**

All our software comes with full instructions and is SAVEd and ready to RUN, no need to spend hours laboriously typing in from books.

CONTROL TECHNOLOGY — PERSONAL COMPUTER SCIENCE

ZX-81

Cassette 1½

A super value cassette of 16K and 1K software written in Machine Code and Basic.
Includes:
React, Invaders, Phantom Aliens, Maze of Death, Planetlander, I Ching, Hangman, Invaders, Laser Base, rectangle plus more.
ALL ONLY **£4.95**

Tapebook 50, Version 3

50 programs for the IKRAM ZX81.
Latest version includes:
SQUASH, BREAKOUT, COLUMBIA, SPLAT, INTEGRATION, CREDIT CARD CALCULATOR, BANK A/C, VATCHECK, TANK BATTLE, TORPEDO, HEXLOADER, BINARY CONVERTER, AND LOTS, LOTS MORE.
Still amazing value at **£6.95** the lot.

ZX AUTOCODER

This program takes your BASIC and converts it into Z80 assembly language. ZX AUTOCODER compiles a sub set of ZX81 BASIC for the following:
PRINT, PRINT AT, PLOT, CLS, PAUSE, GOTO, GO SUB, IFTHEN GOTO, AND LET statements.

£6.95
Including cassette and instruction book.

All prices include VAT and postage and packing

CONTROL TECHNOLOGY,
39 Gloucester Road, Gee Cross,
Hyde, Cheshire SK14 5JG
061-368 7558

MILTECH COMPUTING

Sirius 1 Dealer

Contact for details of the 16-bit micro of the decade



Tel: Andover 53572

ACT sirius 1

39 The Elms, Andover, Hants

CAMBRIDGE LEARNING
SELF-INSTRUCTION COURSES

A PRACTICAL DIGITAL ELECTRONIC KIT FOR ☆ LESS THAN £20 ☆



SUITABLE FOR BEGINNERS

Learn the wonders of digital electronics and see how quickly you are designing your own circuits. The kit contains: *seven LS TTL integrated circuits, breadboard, LEDs, and all the DIL switches, resistors, capacitors, and other components to build interesting digital circuits;* **plus** a very clear and thoroughly tested instruction manual (also available separately). All this comes in a pocket size plastic wallet for only £19-90p inc VAT and p&p. This course is for true beginners:

- needs no soldering iron.
- asks plenty of questions, but never leaves you stuck and helpless.
- teaches you about fault-finding, improvisation, and subsystem checking.
- the only extra you need is a 4½V battery (Ever Ready 1289, or similar), or a stabilised 5V power supply.

Using the same breadboard you may construct literally millions of different circuits.
This course teaches boolean logic, gating, R-S and J-K flipflops, shift registers, ripple counters, and half-adders. Look out for our supplementary kits which will demonstrate advanced arithmetic circuits, opto-electronics, 7-segment displays etc.

Other self-instruction courses from Cambridge Learning Ltd include:

COMPUTER PROGRAMMING IN BASIC	£10.50
DIGITAL COMPUTER LOGIC AND ELECTRONICS	£ 8.50
DESIGN OF DIGITAL SYSTEMS	£14.00

Please send for full details (see coupon below).

GUARANTEE No risk to you. If you are not completely satisfied, your money will be refunded upon return of the item in good condition within 28 days of receipt.

CAMBRIDGE LEARNING LIMITED, UNIT 72 RIVERMILL SITE, FREEPOST, ST IVES, CAMBS, PE17 4BR, ENGLAND.
TELEPHONE: ST IVES (0480) 67446. VAT No 313026022

All prices include worldwide postage (airmail is extra - please ask for prepayment invoice). Giro A/c No 2789159.

Please allow 28 days for delivery in UK

Please send me:

.....SUPERKIT(S) @ £19.90

.....Free details of your other self-instruction courses.

I enclose a *cheque/PO payable to Cambridge Learning Ltd for £..... (*delete where applicable)

Please charge my:

*Access / American Express / Barclaycard / Diners Club Eurocard / Visa / Mastercharge / Trustcard

Expiry Date..... Credit Card No .....

Signature.....

Telephone orders from card holders accepted on 0480 67446
Overseas customers (including Eire) should send a bank draft in sterling drawn on a London bank, or quote credit card number.

Name.....

Address.....

.....

.....

Cambridge Learning Limited, Unit 72 Rivermill Site, FREEPOST, St Ives, Huntingdon, Cambs, PE17 4BR, England. (Registered in England No 1328762).

Fighting your way through the silicon jungle?

We carry a comprehensive selection of microcomputer software, hardware and peripherals

Apple][	Accounting
Apple ///	Stock Control
Sharp 3201, MZ80B	Database Management
Superbrain	Production Control
Altos	Graph Plotting
Millbank System 10	Word Processing

We are to you as Jane was to Tarzan!

Well, perhaps not quite, but please 'phone us for a brochure which explains exactly how we can help

THE AVERY
COMPUTER COMPANY
13, The Mall
Bar Hill
CAMBRIDGE
Tel. Crafts Hill 80991 (24 hours)

ZX81 owners

have you seen

The Cambridge Collection

A book of

30 PROGRAMS

For Only **£4.95**

NO MEMORY EXPANSION NEEDED

Each program has been designed to fit into 1K of RAM

TEACH YOURSELF PROGRAMMING

Comprehensive explanations of each listing will teach you many techniques of **ZX81** programming.

HOURS OF AMUSEMENT

With titles such as FORTRESS, BALLOON, and ODD MAN OUT, you could easily become a **ZX81** addict. Plus, entirely new implementations of well-known favourites; LUNAR LANDING, MASTER CODE, ORBITAL INVADERS, and many others.

CASSETTE AVAILABLE TOO!

If you order the book you can also buy the programs on a quality cassette for only £4.95 extra.

Please send me:

copies of the book at **£4.95** each

copies of the book and cassette at **£9.90** pair

Please send your orders with cheques/PO's to:
Richard Francis, Dept PCW
22 Foxhollow, Barhill, Cambridge, CB3 8EP.



WORDSWORTH

Professional Word Processing

<*> for the TRS-80 Models I and III <*>

FROM PROSOFT, HOLLYWOOD, CALIFORNIA

Powerful editing and formatting features formerly available only on large IBM Time Sharing computers. Full Screen Editing, Typeahead, Headings, Pagination, Text Centring, Global Search and Change, Table of Contents and Indexing.

PLUS: underlining, $_{sub}$scripts, ^{super}scripts and

double-width.

Proportional font right-margin justification on 737, 739, LP IV, DW II, all 12 MX-80 fonts + underlining, italics on the GRAFTRAX-80, and supports Diablo, Microline and Anadex printers. If your printer is capable, Newscript can help you!

160 pages of CLEAR documentation will help you to get the best from your printer, whether you use TRSDOS, NEWDOS, NEWDOS/80, LDOS or DOSPLUS. Requires 48K TRS-80 with one disk drive. Specify Model I or III.

Due to a printer's error in the February issue of PCW the following prices for Wordsworth software were incorrectly printed. We apologise for any confusion this may cause and confirm that these prices are now correct.

NEWSCRIPT only £69.95 inc. p&p.

NEWSCRIPT with MAILING LABELS £79.95 inc. p&p.

FASTER (analyses Basic programs to improve execution times)
£17.95. Model I and III on tape.

QUICK COMPRESS (removes blanks and REM's from sofrware)
£12.95 , Model I and III on tape.

FASTER and QUICK together £27.95

We accept cheques or Access.

6 Grant Road Banchory, Kincardineshire, AB3 3UR. Tel. Banchory (033 02) 4168.

ZX81/80 HARDWARE

New quality peripherals for both professional and personal use; No external power supplies needed.

I/O PORT

16 digital outputs, 8 digital inputs, 6 peripheral selects; programmable input – output port plugs directly into your ZX81, 80.
FEATURING: stackable connector allowing 16K RAM pack and printer to be added.
Experimenter area giving space for relays, I.C.'s etc. Onboard test L.E.D. and buffer.
Assembled and tested £16.50 Kit £13.95
Including manual.

ANALOGUE PORT. . . New low price!
An 8 channel multiplexed analogue to digital converter, 8 line digital output and 6 line peripheral select port. Measure up to 8 input voltages to a resolution of 0.39% (8 bit) enabling the monitoring of almost any transducer voltage.
FEATURING: 100 µs conversion time, and adjustable input sensitivity. On board voltage input amplifier with variable gain, stackable connector, experimenter area and test L.E.D.
Performs all the functions of the I/O Port.
Assembled and tested £29.95
Kit £26.20 including manual.
16 pin D.I.L. header plugs £1

ZX81 EXPERIMENTER KIT

23 + 23 edge connector £4
Stacking strip £1.50
Edge connector + stacking strip + veroboard assembled and with suggested circuits £7.50

SUPERPORT

This single plug in, stackable board performs ALL the functions of the Analogue Port but ALSO has an E.P.R.O.M. and a Real Time Clock option.
REAL TIME CLOCK; auto leap year adjustment, month, day, hour, minute, second and one tenth of a second. Rechargeable battery option.
E.P.R.O.M. SOCKET; for permanent storage of encoded programs.
Option A; Superport and E.P.R.O.M. socket.
Built and tested £39.95 including manual.
Option B; Superport, E.P.R.O.M. socket and real time clock.
Built and tested £59.20
or £65.20 including batteries
Option A to B upgrade kit £23 or £29
(including batteries)

Please add £1 post and packing to cost of order. Delivery normally return of post on I/O, Analogue Port and Kits; up to 6 weeks on Superport. Money back guarantee if not satisfied. Cheques and P.O.'s payable to UNIVERSITY COMPUTERS. Bulk orders, official orders accepted. We offer a free consultancy service to our customers.

UNIVERSITY COMPUTERS
5 St Barnabas Road
Cambridge CB1 2BU

4 & 4 ROM PAGER
FOR CBM/PET™

NEW



Following the success of our 8-slot ROM PAGER, we now introduce a 4 plus 4 ROM PAGER.
This Pager enables you to select from up to four different ROMs, in any two adjacent blocks of PET's memory. All common program or utility ROMs or EPROMs can be used.
Each row of 4 ROMs is under separate software control, so you can choose which ROMs you want with single 'poke' commands. Even from within your programs.

For users who already have extra loading on their PET power supply, or who are using ROMs that consume a lot of power, we have included space on the printed circuit board for separate power supply components.

8 slot ROM Pager.....£45.00
4 plus 4 ROM Pager.....£47.50
VAT extra, Postage Free.

Other Products.....
Business Disk, Business ROM, EPROM programmer, Assemblers, etc.
Most of our products are Commodore Approved.
Further information and catalogues available free. Demonstrations/Advice with pleasure.

JCL SOFTWARE
47 London Road, Southborough,
Tunbridge Wells, Kent.
Tel: (0892) 27454

REPRODESIGN
131 Market Street, Chorley,
Lancashire
Tel: (02572) 78376

TEACH YOURSELF COMPUTING VIA THE BBC SERIES AND HAVE FUN!

Introducing the TEXAS TI99/4A home computer which plugs direct into any T.V. for full colour.

Superior colour, music, sound and graphics – and a powerful extended BASIC – all built in. Plus a unique, new Solid State Speech TM **Synthesizer and TI's special Solid State Software** TM. **Compare it. Pound for pound. Feature for feature. There's a computer in your future. And the future is now . . .**
We've entered a new and exciting era – the age of the home computer. Perhaps you're already quite knowledgeable about computers and are looking for the most programming power and versatility for your money. Perhaps you've just read about it, and want to learn more. Either way, you need to look closely at Texas Instruments TI99/4A Home Computer.
The TI99/4A was designed to be the first true home computer-skilled computer users and beginners alike will be able to put it to effective use immediately.
If you're new to computers, the TI99/4A is for you.
You can begin using the TI Home Computer literally minutes after you unpack it.
Without any previous computer experience or programming knowledge. You simply snap in one of TI's Solid State Software TM Command Modules and touch a few keys.
Step-by-step instructions are displayed on the screen. So you or just about anyone in your family can use the TI99/4A.
Two pioneering technological developments in particular set the TI99/4A apart from the rest.
Solid State Speech TM – This optional speech synthesiser enables the TI99/4A to literally speak-to provide verbal prompts and special messages to the user. Actually reproduces the human voice electronically. Hundreds of words are available, and plug-in word modules will add hundreds more.
TI's exclusive technology lets you call up the words you want by simply typing them in. Outstanding voice clarity and fidelity. Solid State Speech is a proven technology already on the market in TI's unique Speak and Spell TM electronic learning aid for children.
Solid State Software TM Command Modules – Available in a wide range of application areas including many games, (Chess, Blackjack/Poker, Pin Ball, Bingo, Attack From Outer Space,) to name but a few These optional ROM modules actually add application program memory to your TI99/4A. Software now includes Teach Yourself Basic, Extended Basic, Teaching Aids for Young Children etc. etc. ***They let you use the TI Home Computer immediately, with no programming.***

Serious programmers will appreciate the time and effort saved by these pre-programmed modules. Plus, they'll let you introduce your family to the computer in the easiest possible way. Solid State Software was pioneered by TI for use with its powerful programmable calculators.
If you know computers you'll quickly see the difference in the TI99/4A.
Texas Instruments has taken those features you've been wanting-plus some you may not have heard about yet-and included them in one incredible, affordable computer system. The TI99/4A gives you an unmatched combination of features and capabilities, including:

- **Powerful TI-BASIC –** Built-in 13-digit, floating point BASIC. Fully compatible with ANSI Minimal Basic, but with special features and extensions for colour, sound and graphics.
- **Up to 72k total memory capacity –** 16K RAM (Random Access Memory) (Expandable to 48K). 26K ROM (Read Only Memory) plus up to 30K ROM in TI's Solid State Software Command Modules.
- **26K ROM –** Operating system, BASIC, floating point, sound and colour graphics software are contained in ROM.
- **16-colour graphics capability –** Easy-to-access, high resolution graphics have special features that let you define your own characters, create animated displays, charts, graphs . . . and more.
- **Music and Sound effects –** Provides outstanding audio capability. Build three-note chords and adjust frequency, duration and volume quickly and simply. You can build notes with short, straightforward commands. Five octaves from 110 Hz (Hertz) to beyond 40,000 Hz.
- **Built-in equation calculator –** Unique convenience feature helps you find quick solutions to every day maths problems, as well as complex scientific calculations. Directly accessible from the keyboard.

Ideal learning aid for every member of your family – including pre-school children and fun too only

£299.00

FOR MAIL ORDER DELIVERY OR FURTHER INFORMATION TEL: 01-455 9823

MOUNTAINDENE 22 Cowper Street London EC2

THE

BUFFER

MICRO SHOP

(NEXT TO STREATHAM STATION)

★ ★ ★

NEW SOFTWARE SHOP EXCLUSIVELY FOR

ZX81

PROGRAMS, GAMES, "ADD/ONS"

★ ★ ★

MOST OF THE MAIL ORDER ITEMS ADVERTISED IN THIS MAGAZINE AVAILABLE OVER THE COUNTER

★ ★ ★

LOADING PROBLEMS? TRY OUR INTERFACE
BUSINESS & TECHNICAL DATA HANDLING PROGS.
PROPER KEYBOARDS; CONSOLES; VDUS

★ ★ ★

374A STREATHAM HIGH ROAD,
LONDON SW16
Tel: 01- 769 2887
S.A.E. APPRECIATED FOR CATALOGUE

ATARI MICROCOMPUTERS

ATARI PERSONAL COMPUTER SYSTEMS

ATARI



400 & 800

IN MANCHESTER

✸ SOFTWARE ✸ PERIPHERALS
✸ COMPUTER CHESS GAMES

BARCLAYCARD VISA

Access Buy it with Access

MANCHESTER'S ATARI BEST ATARI DEALER

ATARI VIDEO COMPUTER SYSTEM

PUT YOURSELF ONTO OUR NEW ATARI CARTRIDGE INFORMATION MAILING LIST

ACTIVISION

SPECIAL MAIL ORDER SERVICE WRITE OR PHONE FOR FULL DETAILS

FULL RANGE OF CARTRIDGES IN STOCK AT LOWEST PRICES!

GE

Commodore VIC due

GEMINI ELECTRONICS

Dept. PCW 50 Newton St., Off Piccadilly,
Manchester M1 2EA. Tel: 061-236 3083.

WE ARE AT THE CORNER NEWTON ST./ HILTON ST.

MICROLINK MICROLINK MICROLINK

The MICROLINK Interface for your Commodore or Hewlett Packard Computer.



The MICROLINK interface has been designed for use in laboratory environments where acquisition and processing of data from a variety of sources is required. MICROLINK is a modular system consisting of a mainframe incorporating the IEEE-488 interface and a power supply, and a cabinet holding upto 17 modules–this means that the interface can be configured for your precise requirements.

Modules for signal acquisition:

AN-1, AN-1D	single-ended and differential analogue voltage conditioning modules.
A-8D, A-10D	8 and 10 bit analogue to digital converters.
HSC, HSM	high speed clock and multiplexer where rapid sampling is required (up to 10 kbytes/sec).

Modules for experimental control:

RR-8, HDR-4	reed and heavy duty relay outputs.
CC-8	8 contact closure or logic level inputs.
UDC	up/down counter (for counting logic pulses).

Modules for data collection from instruments:

BCD-8	8 decade BCD input.

Modules for signal generation or displays:

8D-A	8 bit digital to analogue converter.
SCOPE	2 channels + trigger for oscilloscope displays.
8D-XY	2 channels + pen lift relay for analogue XY plotter.

Modules for specialist applications:

TIM	millisecond timing.
HR	heart rate monitoring.
NHI	neural pulse histogram data collection.

Biodata

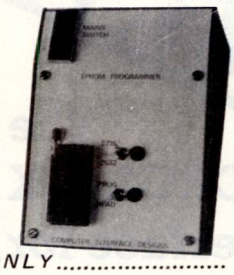
Write or telephone with details of your application and we will be pleased to quote for the appropriate configuration.

6 Lower Ormond St.
Manchester M1 5QF. U.K.
Telephone:
061-236 1283

MICROLINK MICROLINK MICROLINK

PET EPROM PROGRAMMER

SUITABLE FOR ALL PET COMPUTERS
ALSO MAKE YOUR OWN PET GRAPHICS PLUS ½ SIGN



The 2716/2532 model. Please add £1.50 p&p

£46·00

The programmer includes the software tape for reading/programming the 2716/2532 Eproms. Plus a FREE programme for making your own pet graphics on a 2716 Eprom.

ONLY.....

* IEEE-488 Port connector plus cable
* Independently powered.
* Mains switch with neon indicator light, anti surge fuse at rear.
* Zero force insertion socket.
* Indicator light for read and programme
* Switch select for read and programme.
* Switch select for 2716/2532 Eproms.
* The programmer can read and programme 2716 and 2532 eproms. And read any 2716/2532 pin compatible roms. IE. Any pet rom/eproms.
* Software control programme supplied on tape.
* Instantaneous read of Eprom/Roms Verification of data.
* Total Price inc p&p £47.50.
* Remittance with order.

2532 Compatible Eproms £10.50
2716 Compatible Eproms £4.50
inc. p&p.

SUPER BOARD 32 ONLY

INC P&P

£45·50

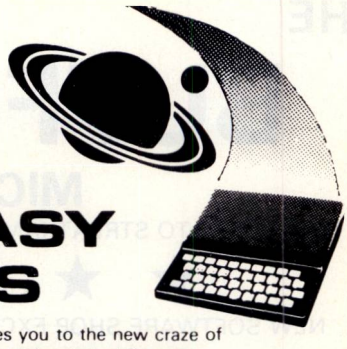
* This board can be plugged into any rom socket from $9000 to F000
* You can plug up to 8 Rom/Eproms into the Board in any combination of 2K or 4K. 2716/2532
* Simply slots onto the expansion port. No soldering or wires required.
* Each chip is programme selectable at a speed of 3y5
* You can now have Viscal, Toolkit, etc plugged into one socket.
* It is possible to run a 32K M/C programme from any single Rom location.
* The board plugs onto the expansion port and is compatible with any other add on board.
* Up to 7 boards could be used simultaneously, giving a maximum of **224k** of on board Rom/Eprom.
* These boards could be used to have several languages residing in the pet permanently.
* Can also be plugged into the character generator socket to run 8 different character sets.

* SAE FOR FURTHER DETAILS

COMPUTER INTERFACE DESIGNS
4 Albert Road. Margate. Kent. CT9 5AN.
Tel(0843) 294648

---

and now for
ZX81 with
16K Ram



SCI-FI FANTASY GAMES

Psion Computers introduces you to the new craze of computer Sci-Fi role-playing adventure-style games. The computer describes your situation (often hopeless) and prompts you with questions to which you reply using plain English words. Using your ingenuity you may escape your present predicament only to be confronted by the next horrifying threat.

Side A PERILOUS SWAMP – your position is displayed on the map of the perilous swamp. Can you thwart the monsters, rescue the princess from the evil wizard and escape alive?

£3.85 including VAT and postage in U.K.

Side B SORCERER'S ISLAND – even more difficult and not for the uninitiated.

To: Psion Computers
20 Clifton Court
Maida Vale
London NW8 8HT

Tel: 01-286 4608

I enclose a postal order, cheque in payment for ☐ FANTASY GAMES

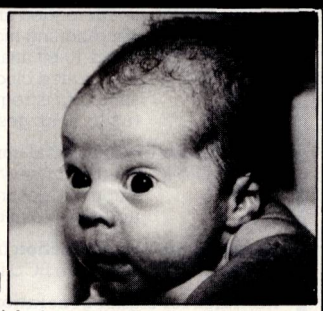
Name .....

Address .....

.....

PHONETIC VOICE SYNTHESIZER

F..A..N..C..Y
S..H..O..W..I..N..G O..F..F



Make your Micro talk – with the help of our baby, EC-01

Our baby is the well trained, sophisticated baby in the Micro market, yet easi to handle.

LOOK & COMPARE THE FEATURES BEFORE YOU BUY

*UNLIMITED VOCABULARY
*A ONE WATT AUDIO AMP
*ON BOARD BUFFER
*ASCII CODE ECHO
*ABOVE ALL TYPE 'N' VOICE
*CONTINUOUS SPEECH
*SPEAKER/AUX OUTPUT
*BUILT IN POWER SUPPLY
*RS232 INTERFACE
*MANY OTHERS

PRICE £149.95 + VAT + P&P & INSURANCE
ORDER NOW FOR XMAS
IEEE INTERFACE AVAILABLE AT EXTRA COST
FOR FURTHER INFORMATION PLEASE SEND S.A.E. OR PHONE

EASI COMP SOUND GENERATORS FOR PET, OSI, UK101. NASCOM, ETC, STILL AVAILABLE. ONLY £43-00 + VAT. FOR FURTHER PRODUCTS PLEASE SEND S.A.E. CREDIT CARD FACILITIES READILY AVAILABLE.

MULTI-FUNCTION EPROM PROGRAMMER/COPIER

This is another Easicomp product which is technically superior to anything in the market on this price range.

FEATURES

*EDITS PROGRAMS
*COPIES PROGRAMS
*CHECKS PROGRAMS
*PROTECTION FROM MISHAP
*LOW COST HIGH QUALITY
*READS PROGRAMS
*VERIFIES PROGRAMS
*CHECKS EMPTY
*UNIVERSAL INTERFACE
*ONE YEAR WARRANTY

DEVICE CAPABILITY 2508, 2758, 2516 2716, 2532, 2732

EXAMPLE EDITING FUNCTION

1. DATA AREA – BYTE 'BLOCK' WHOLE DEVICE TRANSFERS.
2. LOCATION – IN HOST RAM FOR UPLOADING/DOWNLOADING.
3. DISPLAY FORMAT – ASCII, HEX.

FUNCTION MONITORS

*SELF TEST FAILURE
*VCC OVERLOAD
*SHORT CIRCUIT DETECTION
*VERIFY PASS/FAIL
*FUNCTION COMPLETE
*SOCKETS EMPTY
*VPP OVERLOAD
*CHECK PASS/FAIL
*PROGRAMMING IN PROGRESS
*MANY OTHERS

*PRICE ONLY £99-95 + VAT + P&P & INSURANCE

Easicomp 57 PARANA COURT, SPROWSTON, NORWICH NR7 8BH TEL. 0603 416352

Microsoftware

WE'VE TURNED AVAILABLE SOFTWARE UPSIDE DOWN
SELECTED THE BEST
AND DECIDED TO BRING IT TO YOUR ATTENTION

Successful business practice involves financial planning and control together with data and text processing. Through involvement with software development and our own business needs we have tried to develop or acquire application software that would meet modern business requirements.

FINANCIAL & RESOURCE PLANNING SYSTEMS

PLAN80 — A financial modelling system that is easy to use yet powerful enough to replace most timesharing applications. With PLAN80 you define the logic of the model by specifying rows and columns with familiar names such as UNITS, PRICE and SALES=UNITS*PRICE. It's easy to review your assumptions and methods with people who have never seen PLAN80. At any point in the PLAN80 model you may display or print results on your screen or printer, or save all or part of the results on disk for use by another model. You can play "what if?" by inputing new values, recalculating and displaying or printing results. Save the results on disk and use your word processor to incorporate them into any report that requires a financial model. **£295/£30**

MILESTONE — Critical path analysis (CPA/PERT) program for scheduling resources to maximise productivity. Can be used by executives, managers, engineers and small businessmen to determine critical tasks which can't be delayed, discover which tasks are not critical, see how manpower and expenditure vary against time, investigate tradeoffs between resources, produce printed project schedules, change details and immediately see the results on the screen. **£295/£30**

BUSINESS ACCOUNTING SYSTEMS

The complete Graham-Dorian Accounting System consists of six interactive application packages that can be used on a stand-alone basis or selectively merged to form various complete business systems. Applications can be added to existing applications without disrupting routine. GDSS packages require CBASIC2.

NOMINAL LEDGER — Maintains nominal ledger accounts and produces financial statements including Manufacturing, Trading, Profit & Loss, Appropriation and Balance Sheet. Facilities include: enter, lookup or change account; print chart of accounts, journal entries, trial balance and financial statements for current or previous period; monthly closing. Keeps 14 months history. Comprehensive report generator for modification of financial statements. **£500/£30**

SALES LEDGER — Maintains the Sales accounting function. Facilities include: enter, lookup or change a customer; enter invoices, credit notes or payments; prints customer list, journal entries, statements and aged debtors analysis; comprehensive VAT accounting and analysis of sales transactions. **£500/£30**

Software with manual/Manual alone

PURCHASE LEDGER — Maintains the Purchase accounting function. Facilities include: enter, lookup or change a supplier; enter invoices, credit notes or payments; prints supplier list, journal entries, remittance advices and cheques, aged creditors analysis and cheque register; comprehensive VAT accounting and analysis of purchase transactions. **£500/£30**

JOB COSTING — Designed for the general contractor. Facilities include: enter, lookup or change a job with complete job detail available; cost code entry, lookup or change; entry of balance forward, estimate and cost transactions; job cost report giving detailed expenses by job phase, cost code and category, actual expense versus estimated expense for any cost code, phase or job and total job cost for each job. **£500/£30**

ORDER ENTRY & INVOICING — Performs the order entry and invoicing function. Facilities include: enter, lookup or change an invoice; prints picking lists, invoices and invoice register; allows items to be added after invoice entered; handles part orders and part quantity shipments, miscellaneous items and comments; invoices may be printed individually or in batches. **£500/£30**

STOCK CONTROL — Maintains optimum stock accounting function. Facilities include: enter, lookup or change a part with detail of activity; enter purchase orders, receipts, withdrawals or stock adjustments; prints stock master list, status, reorder, on order, out of stock, sales reports and lists for stock taking. **£500/£30**

PAYROLL (MICROPAY) — Designed to meet Inland Revenue and DHSS requirements. Totally parameter driven control. Can be run as a weekly, four-weekly or monthly payroll. Facilities include: parameter file maintenance of 85 user-definable element codes; employee file maintenance: pay/deduction input; up-to-gross and gross-to-nett; costings by employee, department and cost code; preparation of payslips, cheques and credit transfers; period and update; year end update including P9, P11, P35, P60 and accumulator print. **£500/£30**

Graham-Dorian Software Systems also supply a range of vertical application software. Our catalogue currently includes a **DENTAL ADMINISTRATION SYSTEM; INSURANCE BROKERS SYSTEM; HOTELIERS SYSTEM; POINT OF SALE; LAND SURVEYING AND APARTMENT MANAGEMENT.**

WORD PROCESSING SOFTWARE

WORDSTAR — Menu driven visual word processing system. Full text formatting performed on screen. Facilities for text paginate, page number, justify, center, underscore and print. Edit facilities include global search and replace, read/write to other text files, vertical and horizontal scrolling, vertical and horizontal block move, etc. The many features of WordStar have established it as the leading word processing system. **£308/£38**

SPELLSTAR — Compressed 20,000 word dictionary and "proofreader" that exposes spelling and typographical errors. Allows review of mismatched words in context before deciding to ignore it, correct it or add it to the main or a supplementary dictionary. **£156/£16**

MAILMERGE — Powerful file merging tool. It can combine a file containing names and addresses with a file containing letter text, inserting data where variables are specified. It enables "personalised" form letters to be created with a specified salutation and/or closing. The same data file can be used for both form letters and mailing labels. **£95/£16**

DATA PROCESSING SOFTWARE

DATASTAR — Form generation, data entry, verification, retrieval and updating system for key-to-disk data capture. Menu driven with built-in learning aids. Extreme flexibility in the design of data entry forms. Field verification and edit mask features support accurate and fast data entry in either direct or batch mode. Includes arithmetic capabilities using keyed data, constants and derived values. Compatible with all CP/M supported languages. **£218/£38**

INFOSTAR — Report generator for DataStar. **£218/£38**

SUPERSORT — Combines performance and flexibility in sorting, merging and selecting information from data files. It can sort and merge up to 32 files into a single file at the rate of 560 records per minute. Sorts fixed or variable records with data in binary, BCD, packed decimal, EBCDIC, ASCII, floating, fixed point, exponential, field justified, etc. Can specify up to 32 sort keys. **£156/£25**

MISCELLANY

PEARL — The application software generator. Could be described as the first (and only) one. Pearl asks questions that a programmer would have to answer to code the system. You answer the questions and PEARL uses built-in logic to construct both subroutine and mainline programs. The system then compiles and executes your program code. Requires CBASIC2.

- Level 1: For Personal Computing **£85/£20**
- Level 2: The Business Assistant **£220/£25**
- Level 3: Advanced Development System **£405/£30**
- Personal Pearl **£200/£20**

PLAN80 is a trademark of Business Planning Systems.
MILESTONE is a trademark of Organic Software.
CBASIC2 is a trademark of Compiler Systems.
WORDSTAR, SPELLSTAR, MAILMERGE, DATASTAR, INFOSTAR, SUPERSORT are trademarks of MicroPro International Corporation.
PEARL is a trademark of CPU International.

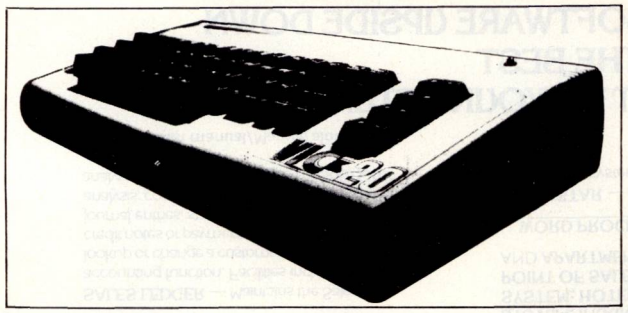
Prices are subject to change without notice and do not include delivery or VAT.

Dealer, Distributor and OEM enquiries invited.

GDS

Graham-Dorian Software Systems Limited,
Unit 58, Sutton's Park Avenue, Earley,
Reading, Berks. RG6 1AZ.
(0734) 664345/6 Telex 849758 TERDEC G

VIC 20
THE HOME COMPUTER
by commodore



For less than £200.00 you can enter the fascinating world of home computing. Whether you want to relax with a game of space invaders in full colour and sound or you have a practical application in mind, e.g. information storage and retrieval, the VIC 20 is for you. Your domestic colour or black and white T.V. is used to display text and graphics and the full-size typewriter keyboard allows you to write your own programs following the step by step manual.

VIC 20 GROWS WITH YOUR NEEDS:

* extra capacity – upt to 29k of added memory
* rapid data retireval – single disk drive
* printer – low cost dot-matrix printer
* control – IEEE 488 interface (allows VIC 20 to use PET/CBM equipment)

commodore VIC 20 – no other computer gives you so much for so little.

Sumlock Manchester
Royal London House
198 Deansgate
Manchester
M3 3WE

FULL RANGE OF COMMODORE COMPUTERS IN STOCK. ADVICE FREELY GIVEN

Ring now for full details: 061-834 4233

A PROMISE AND A GUARANTEE!

To the personal and business computer user.

The most professional service, guidance and help. **Plus** the keenest prices in the business!

Ring us **last** for the best quote of all!

ELFTON LTD
MICROSYSTEMS

(0429) 61770

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** IK 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
SWIX 9AY

Please send me .....copies Educare's 50.
I enclose cheque/postal order for £.....
Name.....
Address.....
.....

Let your child benefit early. Send now.

MICRO SPEECH 2
DOES YOUR COMPUTER SPEAK TO YOU?

MICROSPEECH 2 is a stand alone speech synthesizing unit. It converts phonetic code or any ASCII text into a speech output. MICROSPEECH 2 may be interfaced to any computer system because all the computation necessary to synthesize speech is performed by its own dedicated microprocessor. Up to one thousand phonetic characters, representing about one minute of speech, may be assembled in the units internal buffer before it is commanded to speak.

FEATURES

- Runs from phonetic code, giving unlimited vocabulary and simple operating software.
- Optional English to phonetics translator allows operation directly from ordinary text.
- Uses standard RS232/V24 interface.
- Totally self contained with internal loudspeaker and power supply.
- No need to worry about complex interfacing or support software.



PRICE

Phonetic model **£875.00 + VAT**

Phonetic model plus English to phonetics translator .....**£950.00 + VAT**

COSTRONICS ELECTRONICS 13 Pield Heath Avenue, Hillingdon, Middlesex Uxbridge (89) 38791
TIM ORR DESIGN CONSULTANT
55 Drive Mansions, Fulham Rd, London SW6
(01) 7312077

VIDEO VECTOR DYNAMICS

WE PROVIDE THE COMPLETE MICRO SYSTEMS SERVICE

WE DON'T. . . .

1. Simply sell you hardware and leave you to it.
2. Refuse to answer questions AFTER you have bought equipment.
3. Deliver any system before it has been tested in our own offices.

WE DO . . . .

1. Supply well-proven products such as North Star Horizon, MicroPro WORDSTAR, Volker-Craig VDUs, Epson and Anadex Printers.
2. Match YOUR needs to the configuration we recommend, from single-user, floppy disk up to multi-user, hard disk.
3. Offer maintenance contracts on hardware.

WE CAN. . . .

1. Advise you on commercial and technical problems relating to both hardware and software.
2. Write the software you can't get a package for.
3. Customize hardware and software for YOUR specific requirements.

TYPICAL CONFIGURATIONS

(1) Shelton SIG/NET,
64Kb memory, 2 x 400 Kb discs,
Volker-Craig VC404 VDU,
Epson MX-100 Printer.
Only £2750

(2) Shelton SIG/NET
1 x 400Kb floppy disc,
1 x 5Mb hard disk,
Volker-Craig VC404 VDU,
Anadex DP-9500 Printer.
Only £4700

(3) North Star Horizon, 3-user system,
10 Mb hard disk,
2 x 340Kb floppy discs,
3 Volker-Craig VC404 VDUs,
Anadex DP-9500 Printer.
Only £8000

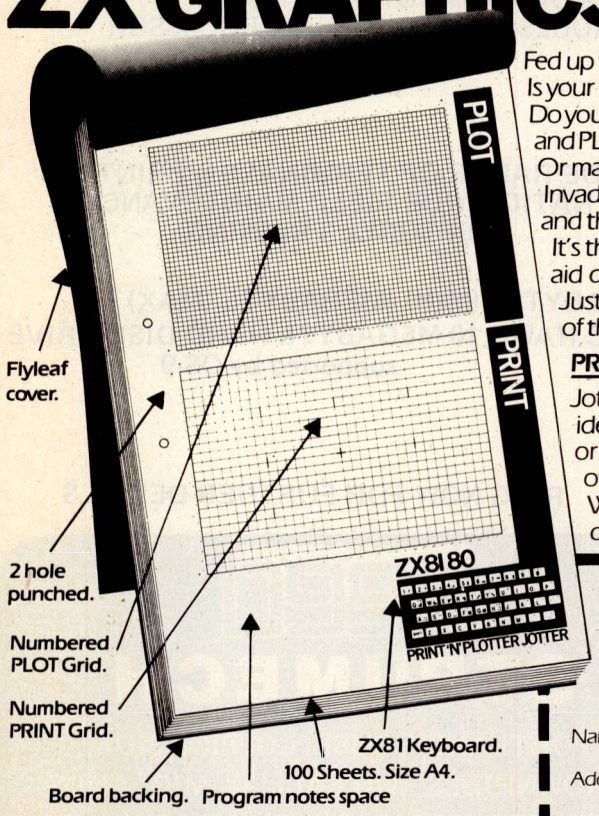
WORD-PROCESSOR SYSTEM

(4) Shelton SIG/NET,
Volker-Craig VC404 VDU,
Olympia Scripta daisy-wheel printer
MicroPro WORDSTAR.
Only £2999

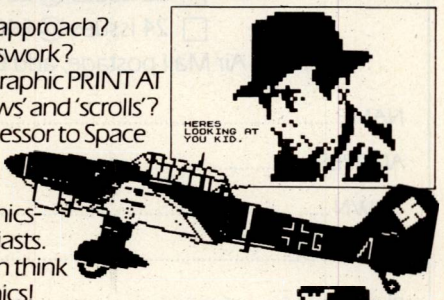
39 HOPE ST., GLASGOW G2 6AE
TELEPHONE 041-226 3481/2

PRICES INCLUDE ALL CABLES AND DELIVERY

HOW TO GET SERIOUS ABOUT ZX GRAPHICS FOR ONLY £3·50



Also available 'over the counter' at
Denny's Booksellers, 2 Carthusian St., London EC1.
Buffer Micro Shop 374a Streatham High Rd. London SW16.



Fed up with listings that ignore the graphic approach?
Is your PRINTING and PLOTTING still guesswork?
Do you want to write data programs with graphic PRINT AT and PLOT and professional looking 'windows' and 'scrolls'?
Or maybe you're still trying to find the successor to Space Invaders! All you need is ingenuity...
and the **PRINT'N'PLOTTER JOTTER.**
It's the professionally-produced ZX Graphics-aid designed by enthusiasts....for enthusiasts.
Just take a look at the specification - then think of the possibilities for **real** graphic graphics!



PRINT'N'PLOTTER FILM TOO — FOR ONLY £2.25!

Jotter 'FILM' is a matt Polyester film version of the "JOTTER" Grids identical in size so you can co-ordinate **precisely** PRINT and PLOT or you can copy photographs, drawings, maps, charts! The surface of the film is ideal for drawing (with pencil) and erasure.
With both JOTTER and FILM the graphics possibilities are enormous — despite low resolution. Isn't it time you got serious about ZX Graphics?

Post to Butler, Currie & Hook, 19 Borough High Street, London SE1 9SE.

Please send me _____ "Jotters" @ £3.50 (inc VAT, P&P)
Please send me _____ "Films" @ £2.25 (inc VAT, P&P)
Please send me your illustrated leaflet — I enclose a stamp.

Please bill my Access/Barclaycard No: _____

Name _____

Address _____

_____ Post Code _____

All goods are despatched within 48 hours of receipt.
If you require 1st Class return post please add 50p to "Jotter" price.



A

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.)

CALL A.P.P.L.E. is ahead of any other APPLE publication for its technical information and evaluation of all hardware and software for the Apple.

For example:–

In the June 1981 issue CALL A.P.P.L.E. had already reviewed the new APPLE III.

In the July/August 1981 issue one of the topics in CALL A.P.P.L.E. was loading DOS 3.3 onto the Language Card.

In the September 1981 issue Word-Processing reviews have begun, they will continue reviewing 5 different word-processors until they run out of software to evaluate.

☐ 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.

THE SEED SYSTEM 19

microcomputer products



6809 BASED SYSTEM
Mini-Floppy/Floppy Disk Drives
Single or Double Headed Drives
Single or Double Density Recording

CHOICE OF TWO POWERFUL DISK OPERATING SYSTEMS

MICROWARES OS-9	SSBs DOS69
Multi-Tasking Multi-User	Single User
BASIC09 Interpreter/ Compiler	BASIC
PASCAL	DOS69 Equivalent
STYLOGRAPH WORD PROCESSOR	TEXT PROCESSOR

WIDE RANGE OF TERMINALS & PRINTERS
NATIONWIDE FIELD MAINTENANCE
PERSONEL TRAINING

32K BYTES (MIN) IMEGABYTE (MAX)
CDC HAWK 10 MEGABYTE HARD DISK DRIVE
supported by OS-9

RING NOW FOR FURTHER DETAILS

Seed
STRUMECH
PORTLAND HOUSE, COPPICE SIDE,
BROWNHILLS, WALSALL, W. MIDLANDS.
TEL 054 33 78151 TELEX 335243 SELG

TECPACS

The reliable technical programs for desktop computers

TECPACS are high-quality, technical software packages, written and tested by professionals for professionals. They can be used in your office, no large centralised computing facilities are needed, and computing experience is unnecessary. With TECPACS, designers and engineers can explore design alternatives with ease and confidence.

TECPACS offer such features as

- ☐ Built-in high technical standard
- ☐ Easy to use, friendly style
- ☐ Data checking facilities
- ☐ Trend facilities
- ☐ Choice of units
- ☐ High-quality presentation of results

Typical TECPACS available

- ☐ GRAPHKIT, graph plotting, curve fitting, non-linear regression £80
- ☐ HISTOKIT, high resolution histograms, univariate statistics £80
- ☐ MULTIVAR, multiple linear regression analysis £100
- ☐ FLANGE-5500, flange design to BS 5500, £350
- ☐ GEARS-1, gear design to Gleeson standards, spur and helical £100

TECPACS add another professional to your team. In your office, or in the design office, just switch on, select your TECPAC program disk, and in minutes you have the answers you need.

For further details, of TECPACS available contact the:
Technical Software Centre
BHRA Fluid Engineering
Cranfield, Bedford MK43 0AJ
England
or telephone Rita Chandler on
0234 750 102

Technical Software Centre
tecpac

For use with PETS and APPLES

If that Apple is just out of Reach....

Rent One!

If you have a short term requirement for a microcomputer system for evaluation, training or just hands-on experience — come to Atlanta Data!

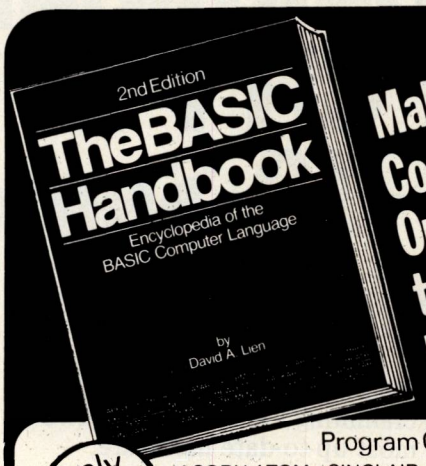
Apart from Apples we have top quality printers, monitors, disk drives and a huge range of software including VisiCalc, Visidex, Wordstar, Format-80, Magic Window, Micromodeller, APM, CIS COBOL and all accounting programs.

A complete system can be working for you within a few days of your enquiry with *no* capital expenditure!

Line plotters now available.

Rental Hotline 01-729 1411/2

Atlanta Data Systems
350/356 Old Street, London, EC1V 9DT. **01-739 5889**



Makes Program Conversion From One Computer to another – EASY!

only £13·95

Program Conversion for:-
ACORN ATOM · SINCLAIR · APPLE · TRS-80 · ATARI
IBM · PET · ABC-80 · SHARP · NEC · HEATH
HEWLETT-PACKARD · SYSTEM 80 · DEC · APF
NORTHSTAR · MAXBASIC · T.I. · WANG · VARIAN
ANSI · OHIO

The computer industry has experienced tremendous change over the last three years. Hundreds of new computers have been introduced since the worldwide top-selling BASIC Handbook was first released.

But the Second Edition meets the challenge head on. Documenting every significant BASIC word used by practically every BASIC-speaking computer.

So if you don't have the BASIC Handbook: You need it.

Get it from your local bookshop or micro-store now! Or, alternatively, write to the address below and we'll send you the name of your nearest stockist.

Dept. PCW,
The Computer Bookshop
30 Lincoln Road, Olton,
Birmingham B27 6PA Tel: 021-707 7544

The Computer Bookshop is the exclusive U.K. Distributor for "The Basic Handbook"

RETAILERS – WE OFFER **FAST** DELIVERY EX-STOCK

MORE ROOM AT THE TOP!

The 5th Personal Computer World Show

BARBICAN CENTRE CITY OF LONDON 9–12 September 1982

If you came to the 4th Personal Computer World Show this year you'll know exactly what we mean.

If you didn't, then you missed the spectacle of over 16,000 people cramming themselves into two halls filled with the most up-to-date hardware, software and peripherals going.

But we won't be caught again. For 1982 we are moving to the Barbican Centre in the City of London — *the* new exhibition venue with everything going for it. Excellent location, superb facilities, and lots of room for more exhibitors and more visitors.

Just like this year there will be one floor devoted to business and professional microcomputing and one devoted to home and hobbyist applications. But overall there will be almost twice as much exhibition space. And we're opening for four days instead of three.

Judging by the level of advance reservations from the 1981 Show, space is still going to be in short supply. So phone or return the coupon to Timothy Collins now. If you don't, you can be sure your competitors will.

Tim Collins Montbuild Ltd, 11 Manchester Square London W1 01-486 1951

Please rush me details of exhibiting at the 5th Personal Computer World Show

Name .....

Position .....

Company .....

Address .....

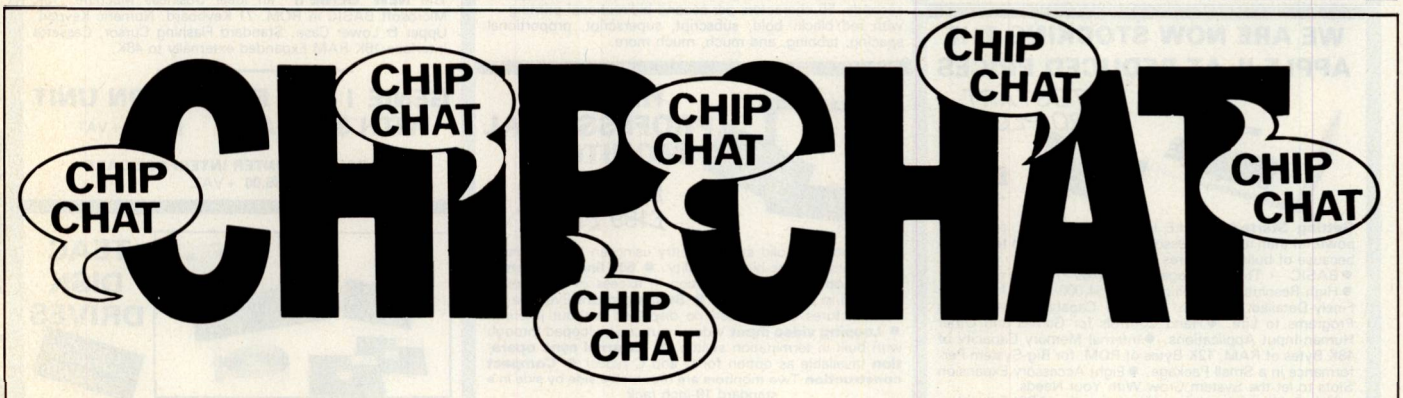
.....

.....

Tel No .....

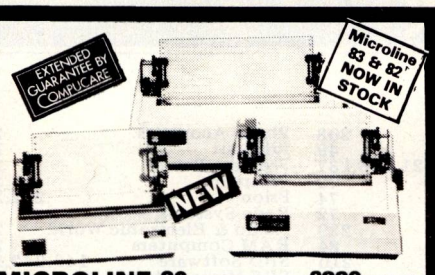
ADVERTISERS INDEX

ACT	128,129	DDP	216	L&J Computers	208	Photo Acoustics	225
Abacus	229	DN Computers	48	LP Enterprises	49	Printout	116
Adda	45	DRG	54	LSI	120,121,136,137	Program Power	204
Algray	80	Datarite Terminals	201	Leicester Comp Centre	70	Prospero	243
Almarc	27	Davinci	219	Level Ltd	74	Psion	212,248
Anadex	15	Deans	226	Lifeboat	72	Rade Systems	96
Apple (UK)	132	Delta	224	Linsac	229	Radio & Electronic World	215
Artic	229	Digico	79	Lion House	84	RAM Computers	212
Atlanta Data Systems	253	Digitek	130	Lion TV	210	SBD Software	143,242,252
Audio Computers	58	Digitus	1	Liverpool Comp Centre	208	SRS Microsystems	50
Avery	244	Discom	235	London Comp Centre	34,35	ST Commercial	204
BHRA	253	Disking	197	Lowe Electronics	11,145	Sharp	122,168
Biodata	247	Diskwise	226	Lucas Logic	18,19	Silica Shop	55
Blythe	39	Display Electronics	51	MPI	49	Sinclair	135,151-154
Buffer	247	EMG	144	Macronics	234	Small Systems	241
Business & Leisure	239	Easicomp	248	Maddison	229	Soft Option	201
Butler, Currie & Hook	251	Educare	250	Maplin	207	Spider Software	210
C/WP Computers	38	Elfton	250	Mass Micros	16	Stemmos	224
Calco	79	Engineering Comp Service	47	Melbourne House	214	Stirling	242
Calisto	233	Equinox	156	Merton Electronics	234	Storkrose	221
Cambridge Comp Store	148	Essential Software	94,148	Metrotech	41,209	Stotron	202
Cambridge Learning	244	Flintdata	231	Microage	202	Strumech	252
Camden	143,206	Richard Francis	244	Microcentre	IFC	Sumlock (Manchester)	250
Caps Ltd	42	Fuller Designs	231	Microcomputer Applications	239	Superior Systems	29
Cardiff	232	Furlong Products	222	Microcomputers at Laskys	7-10	Swanley Electronics	222
Caxton	90	GW Computers	22,23	Microcomputer Spacedrome	237	Systems Logic	48
Chromasonic	199	Gate Microsystems	138	Microdeal	224	Tabs	127
City Microsystems	233	Gemini	247	Microgen	89	Technomatic	70
Comart	97	General Northern	217	Micro General	206	Teletone	34
Commodore PET	62,63	Graham Dorian	68,249	Micro Mail	80	Templeman	242
Commodore VIC	103	Guestel	158,159	Micro Peripherals	48	Tempus	219
Community Computers	47	Hal	140	Micro Print	230	Terodec	160
Comp Shop	256,IBC	Happy Memories	227	Micro Save	241	Texas Instruments	4,5
Compsoft	73	Harding	20,21	Micro Solution	225	Tex Microsystems	217
Computech	57	Henrys	198	Micro Spares	31	Timedata	226
Computer Bookshop	81,253	Hewlett-Packard	12,13	Microstore	44	Tiny Publishing Co	225
Computer Centre (Watford)	74	Hewson	230	Microsystems	16	Torsby Microprocessor AB	33
Computer Company	241	Holdco	210	Microtek (Ipswich)	230	Trader	4
Computers For All	240	IO Systems	234	Microtek (Orpington)	238	Transam	30
Computer Int Designs	248	ISM	98,99	Microvalue	24,25	Twickenham	221
Computer Plus	219	Ikon	236	Miltech	243	University	245
Computer Supermarket	43	Independent Comp Eng	203	Mountaindene	246	Video Software	6
Comshare	59	Intelligent Artefacts	196	NEC	26	Video Vector	251
Control Technology	243	Interam	146,161	Newnes	36	Vixon	222
Crab Software	48	Interface	227	Newtronics	52	Watford Electronics	223
Cream	227	JCL Software	246	Northamber	65	John Wiley	213
Creative Computing	220	KGB Micros	37	On-Line	40	Windfall	217
Crofton	232	Kansas	216	Tim Orr Design	250	Wordsworth	245
Cronite	235	Keen	14	Oxford Computers	218	Xitan	46
Croydon Micros	232	Kellys	236	Peachtree	114	Zenith	53
Crystal Electronics	232	Keytronic	234	Personal Computers	119,OBC		
Cumana	17,211	Knights	222	Personal Computer Palace	56		
Customised Electronics	205	Kuma	28	Pete & Pam	32		



If you saw the first episode of the BBC's computer series, you might have noticed a BBC computer being used to receive Prestel pages. But our spy in the studio informs us that at the time the scene was filmed the Prestel interface for the Beeb Micro wasn't ready and so the shot was faked with the aid of a Tantel unit hidden under the table... Unfortunate names time: Sord, the Japanese micro company which aims to wipe out Apple, has just set up a subsidiary called Orange Computer Products. That, coupled with Sord's intention to open shops called 'Pips Inns', would be bad enough, were it not for the fact that OCP is based in Dublin... We see that 'Inside Trader', the thinly-disguised gossip columnist of *Microcomputer Sprintout*, has had to resort to publishing the contents of the in-tray to fill up space... Industry whispers say that Apple is soon to launch a portable computer... We received a copy of Tandy's *Applications Software Sourcebook* (£3.95 from Tandy dealers and stores). It lists some 500-plus products and on the very last page, at the very end of the listings, is, of course, The Last One. Its entry includes: 'Language: Anglo Saxon (English)'... The *Sourcebook* also details a game from Molimerx called 'Shuttle' which gives a 'very life-like simulation of the first Columbia shuttle flight'. Does this mean your wall tiles fall off when you play it?...An unkind colleague has at last come up with a nickname for the BBC Computer: 'The Late One'... One of our spies reports seeing a Superbrain, Epson printer and other bits being smuggled guiltily into IBM's offices in Wigmore Street, London, recently... David Tebbutt reports receiving some very odd phone calls from 'gentlemen' who were interested to see, in his Jim Warren profile, a mention about taking off clothes and getting into hot tubs... And now, another 'Chip Chat' exclusive: printed here is the first product from Tebbo's new company, Caxton. To run it you need MBasic and an Epson MX-80 printer (yes, David, we spotted the bug and corrected it!).

```
10 REM SNOWFALL BY DAVID TEBBUTT
20 LPRINT CHR$(27);CHR$(49);CHR$(15);
30 FOR N=1 TO 128
40 LPRINT CHR$(INT(RND(1)*(223-166))+166);
50 NEXT N
60 LPRINT " "
70 GOTO 30
```



MICROLINE 80 **£289** + VAT

● 80 cps Uni-directional ● Small size: 342 (W) × 254 (D) × 108 (H) mm. ● 160 Characters, 96 ASCII and 64 graphics ● 3 Character sizes: 40, 80 or 132 chars/line ● Friction and Pin Feed ● Low noise: 65 dB ● Low weight: 6.5 kg

MICROLINE 82 **£449** + VAT

● 80 cps Bi-directional logic seeking ● Small size: 360 (W) × 328 (D) × 130 (H) mm. ● 160 characters, 96 ASCII and 64 graphics, with 10 National character-set Variants. ● 4 Character sizes: 40, 66, 80 or 132 chars/line. ● Built-in parallel and serial interfaces. ● Friction and Pin Feed ● Low noise: 65dB ● Low weight: 8kg

MICROLINE 83 **£649** + VAT

● 120 cps bi-directional logic seeking ● 136 column printing on up to 15in forms ● Small size: 512 (W) × 328 (D) × 130 (H) mm. ● 160 characters, 96 ASCII and 64 graphics with 10 National character-set variants ● 3 Character spacings: 5, 10 and 16.5 Chars/in. ● Built-in parallel and serial Interfaces ● Friction and Pin Feed ● Low noise 65dB ● Low weight: 13 kg

EXTENDED GUARANTEE BY COMPUCARE

THE ANADEX DP9500 and DP9501 A PROFESSIONAL PRINTER



● Bi-directional printing ● Up to 220 chars/line with 4 print densities ● 500 char buffer ● RS232C and Centronics Parallel interface built in ● Full software control of matrix needles allowing graphics capability ● 200 chars/sec ● Adjustable width tractor feed.

DP9500 — ONLY **£845** + VAT
DP9501 — ONLY **£895** + VAT

WE ARE NOW STOCKING THE APPLE II AT REDUCED PRICES



AUTOSTART EURO PLUS

EXTENDED GUARANTEE BY COMPUCARE

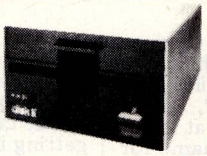
48K **£649** + VAT

Getting Started APPLE II is faster, smaller, and more powerful than its predecessors. And it's more fun to use too because of built-in features like:
● BASIC — The Language that Makes Programming Fun. ● High-Resolution Graphics (in a 54,000-Point Array) for Finely-Detailed Displays. ● Sound Capability that Brings Programs to Life. ● Hand Controls for Games and Other Human-Input Applications. ● Internal Memory Capacity of 48K Bytes of RAM, 12K Bytes of ROM; for Big-System Performance in a Small Package. ● Eight Accessory Expansion Slots to let the System Grow With Your Needs.

You don't need to be an expert to enjoy APPLE II. It is a complete, ready-to-run computer. Just connect it to a video display and start using programs (or writing your own) the first day. You'll find that its tutorial manuals help you make it your own personal problem solver.

APPLE DISC II 3.3 Dos

EXTENDED GUARANTEE BY COMPUCARE



Disc with Controller **£339** + VAT
Additional Drives **£289** + VAT

● Powerful Disk Operating Software Supports up to 6 drives ● Name Access to Files for Ease of Use ● BASIC Program Chaining to Link Software Together ● Random or Sequential File Access to Simplify Programming ● Dynamic Disk Space Allocation for Efficient Storage ● Individual File Write-Protection Eliminates Accidental File Alterations ● Loads an 8K Byte Binary Image in 6.5 sec. (1.2 sec. in Pascal) ● Storage Capacity of 116 Kilobytes (143K Bytes with Pascal) on Standard 5¼" Diskettes ● Powered Directly From the APPLE (Up to 6 Drives) for Convenience and High Reliability ● Packaged in Heavy-Duty, Colour-Coordinated Steel Cabinet

Colour Monitors for Apple — **£295** + VAT

LUXOR 14" COLOUR MONITOR FOR THE APPLE £295 + VAT

EXTENDED GUARANTEE BY COMPUCARE

THE EPSON MX SERIES



EXTENDED GUARANTEE BY COMPUCARE

● 80/132 Column
● Centronics Parallel
● Bi-directional
● Upper & lower case
● True Descenders
● 9x9 Dot Matrix
● Condensed and Enlarged Characters
● Interfaces and Ribbons available

MX80T £339 + VAT
MX80F/T £389 + VAT

EXTENDED GUARANTEE BY COMPUCARE

CENTRONICS DOT MATRIX PRINTERS NEW



737 £369 + VAT
739 £469 + VAT

Standard Features

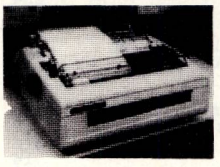
● Proportional Spacing ● Right Margin Justification ● 3 way paper handling ● Upper and lower case ● True Descenders ● Bi-directional Paper Mode ● Underlining capability ● Condensed/Expanded Print ● Sub-Scripts and Super Scripts ● Pin and Friction Feed ● 80/132 Column

739 as above with special feature of Dot Resolution Graphics.

NEC SPINWRITER

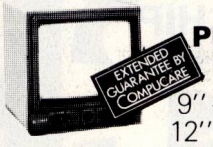
EXTENDED GUARANTEE BY COMPUCARE

only **£1490** + VAT



NEC's high quality printer uses a print "thimble" that has less diameter and inertia than a daisy wheel, giving a quieter, faster, more reliable printer that can cope with plotting and printing (128 ASCII characters) with up to five copies, friction or tractor fed. The ribbon and thimble can be changed in seconds. 55 characters per second bidirectional printing — with red/black, bold, subscript, superscript, proportional spacing, tabbing, and much, much more.

HITACHI PROFESSIONAL MONITORS



EXTENDED GUARANTEE BY COMPUCARE

9" — ~~£129~~ **£99.95**
12" — ~~£199~~ **£149** } + VAT

● **Reliability** Solid state circuitry using an IC and silicon transistors ensures high reliability. ● **500 lines horizontal resolution** Horizontal resolution in excess of 500 lines is achieved in picture center. ● **Stable picture** Even played back pictures of VTR can be displayed without jittering. ● **Looping video input** Video input can be looped through with built-in termination switch. ● **External sync operation** (available as option for U and C types) ● **Compact construction** Two monitors are mountable side by side in a standard 19-inch rack.

NEW

ACORN ATOM

UNIQUE IN CONCEPT — THE HOME COMPUTER THAT GROWS AS YOU DO



Fully Assembled **£157.50** + VAT **inc. PSU**

EXTENDED GUARANTEE BY COMPUCARE

Special features include ● Full Sized Keyboard ● Assembler and Basic ● Top Quality Moulded Case ● Optional High Resolution Colour Graphics ● 6502 Microprocessor

4K FLOATING POINT ROOM **£19.50** + VAT

COLOUR ENCODER £19.00 + VAT

EXTENDED GUARANTEE BY COMPUCARE

We give a full one year's guarantee on all our products, which normally only carry 3 months guarantee.

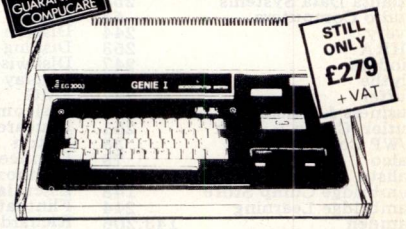
A SELECTION OF APPLE INTERFACES ARE NOW AVAILABLE AT OUR EDGWARE ROAD SHOWROOM

INTRODUCING THE NEW GENIE

Ideal for small businesses, schools, colleges, homes, etc. Suitable for the experienced, inexperienced, hobbyist, teacher, etc.

EXTENDED GUARANTEE BY COMPUCARE

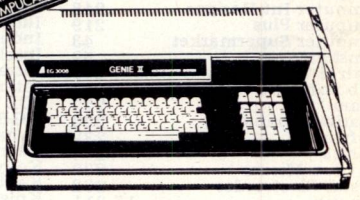
GENIE I



NOW **INCLUDED:** Sound, Upper and lower case, Extended BASIC and Machine Code enabling the Writing and Execution of Machine Codes Programming direct from Keyboard.
16K RAM. 12K Microsoft BASIC
Extensive Software Range.
Self-Contained PSU UHF Modulator Cassette. External Cassette Interface. Simply plugs into TV or Monitor. Complete and Ready to Go. Display is 6 lines by 32 or 64 Characters Switchable. 3 Mannuals included, Users Guide, Beginners Programming and BASIC Reference Mannual. BASIC Program Tape Supplied. Pixel Graphics.

EXTENDED GUARANTEE BY COMPUCARE

GENIE II



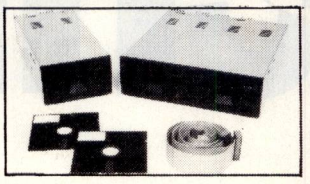
£299 + VAT

The **NEW GENIE II** an ideal Business Machine. 13K Microsoft BASIC in ROM. 71 Keyboard. Numeric Keypad. Upper & Lower Case. Standard Flashing Cursor. Cassette Interface 16K RAM Expanded externally to 48K.

GENIE I & II EXPANSION UNIT WITH 32K RAM **£199** + VAT

PARALLEL PRINTER INTERFACE CARD **£35.00** + VAT

TEAC DISK DRIVES



EXTENDED GUARANTEE BY COMPUCARE

● TEAC FD-50A has 40 tracks giving 125K Bytes unformatted single density capacity.
● The FD-50A can be used in double density recording mode.
● The FD-50A is Shugart SA400 interface compatible.
● Directly compatible with Tandy TRS80 expansion interface.
● Also interfaces with Video Genie, SWTP, TRS80, North Star Horizon, Superbrain, Nascom, etc, etc.
● Address selection for Daisy chaining up to 4 Disks.
● Disks plus power supply housed in an attractive grey case.

40 TRACK
Single Disk Drive **£225** + VAT — Double Disk Drive **£389** + VAT

77 TRACK
Single Disk Drive **£299** + VAT — Double Disk Drive **£499** + VAT

SALE **MEMORY UPGRADES**

16K (8 x 4116) **£12.90** + VAT
4K Compukit (8 x 2114) **£12.90** + VAT

WE HAVE ONE OF THE LARGEST COLLECTIONS OF COMPUTER BOOKS UNDER ONE ROOF, ALONG WITH SOFTWARE FOR THE GENIE, TRS80 AND APPLE.

NOBODY CAN GET NEAR OUR PRICES EXCEPT OUR CUSTOMERS

IF IT WASN'T FOR THE LOWEST PRICES, THE BIGGEST CHOICE AND THE BEST AFTER SALES SERVICE, WE JUST

NOW IN STOCK

THE NEW & EXCITING TRS80 MODEL III



EXTENDED GUARANTEE BY COMPUCARE

48K **£599** + VAT

The Radio Shack TRS-80™ Model III is a ROM-based computer system consisting of:
● A 12-inch screen to display results and other information ● A 65-key console keyboard for inputting programs and data to the Computer ● A Z-80 Microprocessor, the "brains" of the system ● A Real-Time Clock ● Read Only Memory (ROM) containing the Model III BASIC Language (fully compatible with most Model I BASIC programs) ● Random Access Memory (RAM) for storage of programs and data while the Computer is on (amount is expandable from "16K" to "48K", optional extra) ● A Cassette Interface for long-term storage of programs and data (requires a separate cassette recorder, optional/extra) ● A Printer Interface for hard-copy output of programs and data (requires a separate line printer, optional/extra) ● Expansion area for upgrading to a disk-based system (optional/extra) ● Expansion area for an RS-232-C serial communications interface (optional/extra)
All these components are contained in a single moulded case, and all are powered via one power cord.

Disc Drives Kit with 2x40 Track Drives — **£599** + VAT
Disc Drives Kit with 2x80 Track Drives — **£729** + VAT

EXTENDED GUARANTEE BY COMPUCARE



SHARP PC1211 £69.95 + VAT

COMPUTER POWER THAT ONCE FILLED A ROOM CAN NOW BE CARRIED IN YOUR POCKET!

● **Programs in BASIC** ● **"QWERTY" Alphabetic Keyboard** ● **1.9K Random Access Memory** ● **Long Battery Life.**

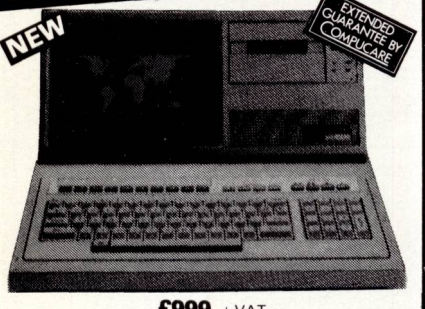
SHARP CE122 PRINTER & CASSETTE INTERFACE £75 + VAT

CASSETTE INTERFACE ONLY £14.90 + VAT

INTRODUCING THE NEW SHARP MZ-80B

NEW

EXTENDED GUARANTEE BY COMPUCARE



£999 + VAT.

● 4 Mhz Z-80CPU ● Dynamic RAM ● 2K ROM ● BASIC is provided ● High Resolution Graphics ● 9" High Focus Green Display ● Upper and Lower Case ● 80/40 Characters x 25 line display ● Electro Magnetic Cassette Deck included ● ASC11 Keyboard ● Numeric Keypad ● Sound Output ● Built-in Clock and Music.

Available Soon-Discs, Printers and other Accessories.

DUE TO IMMENSE POPULARITY SALE CONTINUED UNTIL STOCKS LAST

EUROPE'S FASTEST SELLING ONE BOARD COMPUTER

COMPUKIT UK101



★6502 based system — best value for money on the market. ★Powerful 8K Basic — Fastest around ★Full Qwerty Keyboard ★1K RAM Expandable to 8K on board. ★Power supply and RF Modulator on board. ★No Extras needed — Plug-in and go ★Kansas City Tape Interface on board. ★Free Sampler Tape including powerful Dissassembler and Monitor with each Kit. ★If you want to learn about Micros, but didn't know which machine to buy then this is the machine for you.

COMPUKIT WITH ALL THE FEATURES THAT MADE IT THE MOST PROFESSIONAL COMPUTER KIT ON THE MARKET. Now WITH FREE NEW MONITOR (a saving), which includes Flashing Cursor, Screen Editing, & Save Data on Tape.

Build, Understand and Program your own Computer for only a small outlay.

KIT ONLY **£99.95** + VAT
Fully Assembled — **£149** + VAT
} PLUS **£4.60** Post & Packing

NEW MONITOR IN ROM — available separately at **£7.90** + VAT.
Improved BASIC 3 ROM — revised GARBAGE routine allows correct use of STRING ARRAYS **£4.90** + VAT
This chip can be sold separately to existing Compukit and Super board users.

4K Upgrade Kit **£12.90** + VAT

FOR THE COMPUKIT — Assembler Editor **£14.90** Case for UK101 **£29.50**
GAME PACKS — 1). Four Games **£5.00** 2). Four Games **£5.00**
Super Space Invaders (8K) **£6.50** Chequers **£3.00** Realtime Clock **£3.00**
10 x C12 Cassettes **£4.00** 40 pin Expansion Jumper Cable **£8.50** All Prices exclusive VAT

YOUR ZX80 IS NOW NO LONGER REDUNDANT

Upgrade your ZX80 to the full animated graphics of the ZX81. (No screen flicker).
FOR ONLY **£12.95** + VAT IN KIT FORM
Works only in conjunction with **NEW** 8K ROM from Sinclair (Not Included).

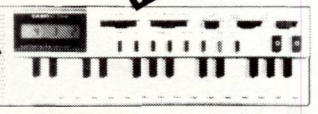
OUR NEW SUPER LOCATION IN IRELAND

19 Herbert Street, Dublin 2.
Telephone: Dublin 604165

HEAR OUR ADS ON RADIO NOVA 88.1 VHF Stereo

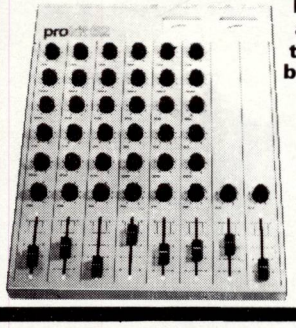
CASIO VL TONE NEW £31.25 + VAT

EXTENDED GUARANTEE BY COMPUCARE



It's a new kind of musical instrument. A computer controlled synthesiser that helps you create, play and arrange compositions that normally take years of music training. Also a calculator.

SECK 62 MIXER



Professional audio mixer that you can build yourself and save over £100.
Only **£99.90** plus VAT for **complete** kit.
Plus **FREE** power supply valued at £25.00

NEW

The PEDIGREE PETS

EXTENDED GUARANTEE BY COMPUCARE



32K ONLY **£569** + VAT
RRP £795 for 32K

Very popular for home & business use. 8K Microsoft Basic in ROM. 32K with new improved keyboard. 12" screen.
Cassette Deck **£55** extra

COMMODORE VIC-20

ONLY **£159** + VAT



EXTENDED GUARANTEE BY COMPUCARE

● **16 foreground colours** ● **8 background colours**
● **Real typewriter keyboard with full graphics**
● **Music in three voices and three octaves**
● **Language and sound effects**

EXTENDED GUARANTEE BY COMPUCARE



8032 80 COLUMN PET

ONLY **£825** + VAT

The reliable value for money system with after sales support, instruction and training facilities and a wide range of programmes.

BBC COMPUTER

Please 'phone for availability and price

COMP SHOP LTD

"Europes Largest Discount Personal Computer Stores"

Delivery is added at cost. Please make cheques and postal orders payable to **COMPSHOP LTD.**, or phone your order quoting **BARCLAYCARD, ACCESS, DINERS CLUB** or **AMERICAN EXPRESS** number.

MAIL ORDER AND SHOP: **CREDIT FACILITIES ARRANGED** — send S.A.E. for application form.
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

NEW WEST END SHOWROOM:
311 Edgware Road, London W2. Telephone: 01-262 0387
OPEN (LONDON) — 10am - 6pm — Monday to Saturday

✸ **IRELAND:** 19 Herbert Street, Dublin 2. Telephone Dublin 604165
✸ **COMPSHOP USA,** 1348 East Edinger, Santa Ana, California, Zip Code 92705. Telephone: 0101 714 5472526

TELEPHONE SALES
OPEN 24 hrs. 7 days a week
01-449 6596

BARCLAYCARD VISA · AMERICAN EXPRESS · DINERS CLUB INTERNATIONAL · We welcome Access

BUYING THE HARDWARE IS ONLY HALF THE STORY...





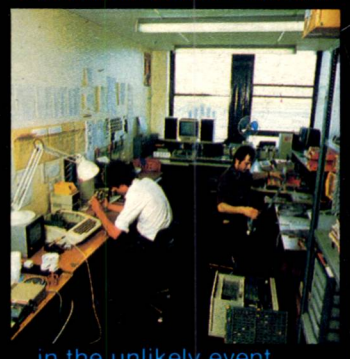


apple III

INFORMATION ANALYST SYSTEM
comprising: 128k Apple III, Disk III, Monitor III, SOS,
(optional) 5 million character Apple/Winchester hard disk

... excellent demonstrations





Come & visit us

... ex-stock items

... in the unlikely event,

...At Personal Computers we'll give it a happy ending.

Personal Computers Limited have been in the personal computing business right from the start — so we've got our values sorted out.

It's important for you to choose the right hardware and vital to select the right software.

To help you make the right choice we offer our highly-trained staff.

They know what makes computers whirr, and they know how to give you the right kind of support and maintenance.

THE BEST AVAILABLE

We stock the best available hardware and software packages in the market.

Such as Apple and Sharp units, with the latest additions like 16K RAM card.

We have I.E.E.E. Interface, low cost serial, parallel interfaces, Doublevision 80 character card, numeric keypads, personal computer plotters, Paper Tiger printers and much more besides.

Whatever you need in computing, we will satisfy your requirements.

FROM PERSONAL COMPUTERS

- **Small Business/Accounting.** We provide low-cost invoicing, purchase, sales and general ledger systems.
- **Financial Planning.** Micromodeller or Visicalc for ad hoc or regular financial reporting.
- **Dow Jones & Prestel** (including I.P. Terminal) services to the city, plus access to city commodities data base.
- **Word Processing.** Our Format 80 system is recognised as the best of its kind.
- **Databases.** State-of-the-art products like Personal Filing Systems and Data Factory.
- **Graphics.** Pad to plotter software and low-cost plotter.
- **Technical Support.** Our knowledge of computer languages and application requirements is unrivalled. And we can supply either on-site or in-house maintenance.

Once again ... Personal Computers Limited give the story a happy ending.

Computers are only as good as the people who use them ... and sell them. Think about that! Then give us a call.

APPLE NATIONAL ACCOUNT SUPPORT DEALER

Personal Computers Limited

Masters of Personal Computer Technology

194/200 Bishopsgate London EC2M 4NR Tel: 01-626 8121