

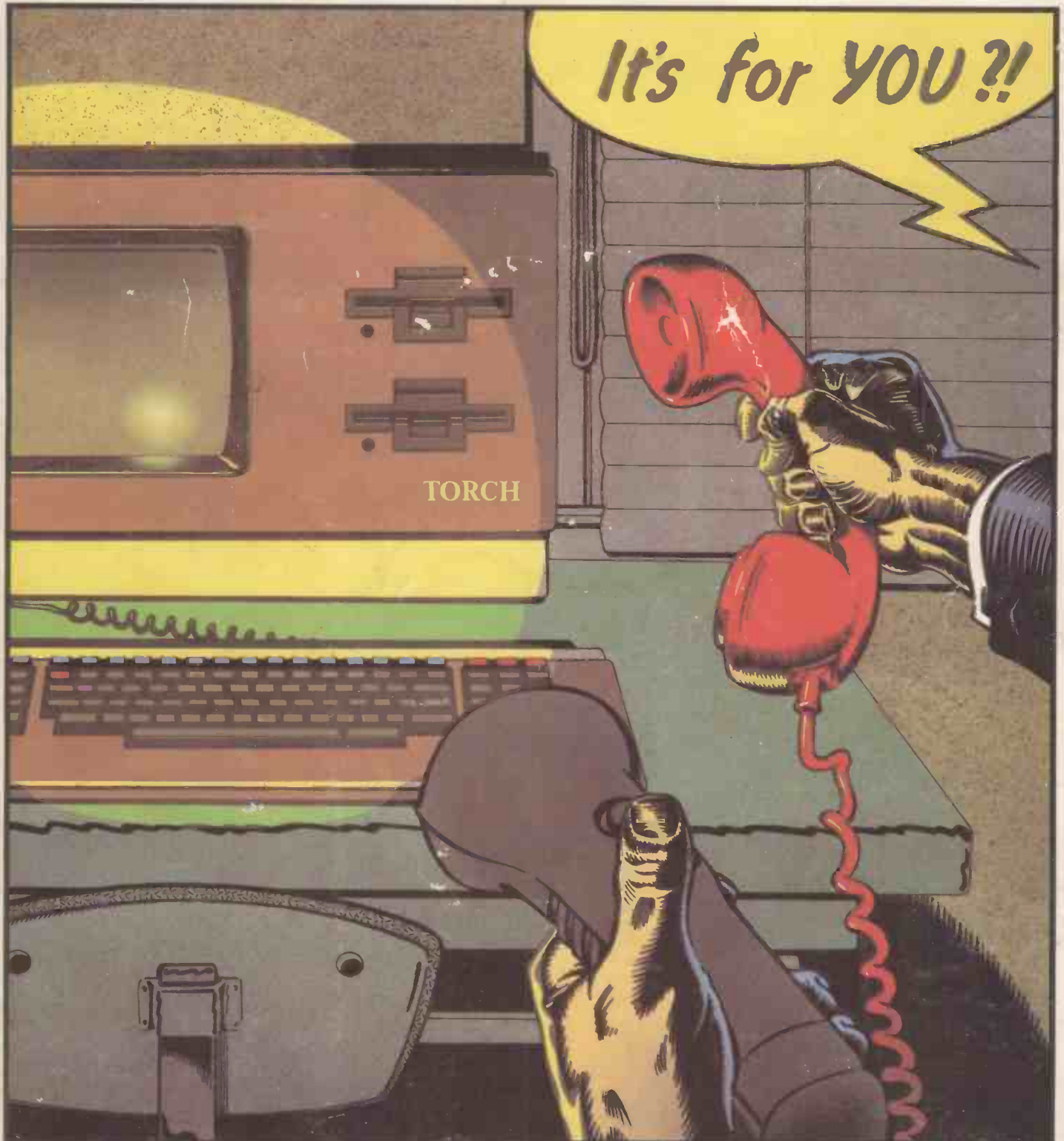
Personal Computer

NEW
JUPITER
ACE TESTED

Canada \$2.75/US \$2.50/FF 8.80/FL 4.00/SFr 7.20/IR £1.12/
8FR 90.00/SKr 12.80/Dkr 21.00/Lire 4200

World JANUARY 1983 85p

BRITAIN'S LARGEST SELLING MICRO MAGAZINE



KEEPING IN TOUCH WITH A TORCH
Colour communicating computer Benchtested

**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**

Everything you ever wanted in micros but didn't know who to ask

Digitus SYSTEMS

The 80/20 Solution

Eighty per cent of our customer needs are satisfied by matching requirements to packaged programs and machines.

Business Systems Group offers a comprehensive range of packages for both the Sophisticated User and New User.

Office Systems Group covers wordprocessing and record management needs, with single and multi-workstation systems.



Personal Systems Group helps managers and professionals with Micro Aided Management tools including: financial planning, modelling, linear programming, PERT and personal productivity aids.

Special Systems Group supplies packages to suit particular professions and industries including agencies, printers, manufacturers, distributors, dentists etc.

The Systems Groups Install complete solutions, arrange training and hand hold you through to comfortable operation of your system.

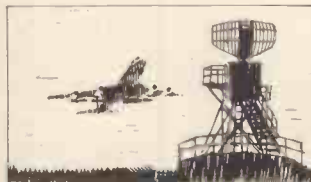
The 20/80 Solution

Twenty per cent of our customers needs are satisfied by tailored design, programming, engineering and project management.

Digitus has a five-year record of fulfilling small and large microcomputing projects, e.g.

Technical Projects to take data from (1) solar heating panels (2) weighing machines and (3) oil tankers.

Administrative Projects to organise (1) 2000 bottles of urine per week (2) £1 million of barley receipts and (3) 6000 graduate applicants for 27 sites.



Multi-Machine Projects for (1) the complete computerisation of a City commodity broker and (2) a flight information system in an International Airport to drive 300 information receivers, staff monitors, passenger displays and flapperboards.

The Project Groups take turnkey responsibility and use as many standard software and hardware components as requirement and technical constraints allow.

Digitus PROJECTS

Digitus TRAINING

The 100% Solution

Everyone needs some education and training in micros. Digitus modular training programme provides for executives, managers, technicians, computer and office personnel.

No. Next date

Introductory Courses

1	Introduction to Microcomputers	Feb 14
2	Business Systems	15
3	Information Management	16
4	Management Aids	17

Skills Training

5	Fundamentals of BASIC	Feb 22/23
6	Improve your BASIC	24/25
7	Wordprocessing with WordStar	Jan 18
8	DataStar/SuperSort MailMerge	Feb 1

Computer Professionals Courses

9	Hardware for Software People	Mar 14
10	Operating Systems and Languages	15
11	Communications & Networks	16
12	Applications Design & Products	17
13	System & Program Generators	18

Computing Management Seminars

14	Micro Technology & Strategy	Jan 25
15	Local Area Networks	26
16	Micro DataBase Managers	May 19

All courses include practical work and advice on microcomputers. Course fees: 1-8 £95 per day; 9-16 £125 per day + VAT, including luncheon and detailed course notes. You save £10 per day by booking more than one day's training at one time.

Request for:

- Quotation
- Response to tender
- Course booking
- Training information
- General information

Company _____
 Address _____
 _____ Phone No _____
 Name _____ Position _____
 Requirement _____ pcw

DIGITUS LTD
 LADING HOUSE
 10-14 BEDFORD ST
 COVENT GARDEN
 LONDON WC2E 9HE
 Telephone (01) 379 6968
 Telex 27950 Ref. 3005

CONTENTS



BRITAIN'S LARGEST SELLING MICRO MAGAZINE

Vol 6 No 1 January 1983

Cover Illustration: Mark Thomas

FEATURES

INVASION FROM TOKYO 106
Peter Rodwell reports on this year's Tokyo Data Show.

EXPERT SYSTEMS 118
Read all about them from Robin Webster, who's an, er, expert on the subject.

FORTH BENCHMARKS 122
With Forth becoming ever more popular, Dick Pountain has devised a suite of Forth Benchmarks.

THE NEARLY MAN 160
The story of Charles Babbage, the man who almost invented the first computer.

WARNIER-ORR TECHNIQUES 164
Paul Overaa gives further advice on the use of this handy program design technique.

DIGITAL VIDEO 168
How to use your micro to capture images from the outside world.

SCREENPLAY 112
Dick Olney tests the latest batch of ZX Spectrum games software.

MICRO CHESS 116
Our popular chess series returns (at last!) in the capable hands of Tony Harrington.



Jupiter Ace

BENCHTESTS & REVIEWS

JUPITER ACE BENCHTEST 128
Now you know why Dick devised those Forth Benchmarks! This new British micro only runs Forth.

TORCH BENCHTEST 136
David Tebbutt gets to grips with a communicating colour computer.

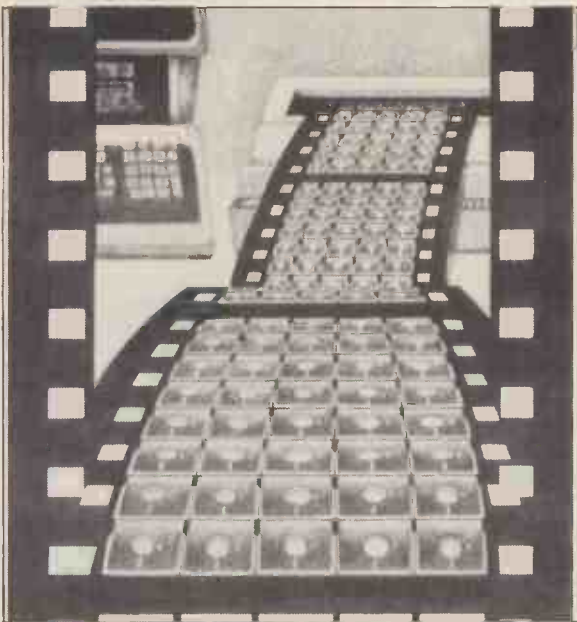
DATABASE BENCHTEST 148
Kathy Lang continues her series of database evaluations.



Torch

Founder Angelo Zgorelec Managing Editor Dick Pountain Editor Peter Rodwell Deputy Editor Jane Bird Programs Editor Maggie Burton Sub Editor Steve Mann Editorial Secretary Tracy Dear Consultant Editor David Tebbutt Art Editor Phoebe Creswell-Evans Design Assistants Richard Gadsby, Safu-Maria Gilbert, Jonathan Sellars Typesetters Jane Hammell, Anne Ashby Publishing Manager Fiona Collier Group Advertisement Manager John Cade Advertisement Manager Patrick Dolan Assistant Advertisement Manager Peter Goldstein Sales Executives Herbert Wright, Jan Martin, Gill Harrison, Gail Thompson, Micael Clarke Micromart Gaye Collins Advertisement Assistant Priscilla Senior Advertisement Production Robert Buggs, Tony Keefe

REGULARS



Banks' Statement

NEWSPRINT 94

He's sometimes wrong, he's often opinionated, he's always interesting. Who else but Guy Kewney?

CTUK! NEWS 104

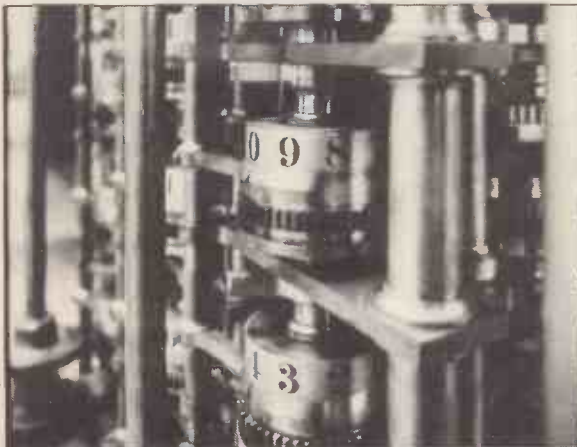
Latest info on ComputerTown UK!

COMMUNICATIONS 110

This is where you get your chance to have your say!

BANKS' STATEMENT 132

This month Martin Banks rambles on about ... well, you figure it out.



The Neary Man

COMPUTER ANSWERS 141

Gotta problem? Sheridan Williams and his team can help.

SUBSCRIPTIONS 144

Save shoe leather — get *PCW* delivered to your door.

1982 FEATURES INDEX 150

A complete rundown of last year's stuff.

TJ's WORKSHOP 154

Terminal Junkies get their monthly micro fix here!

PORTABLE COMPUTER WORLD 158

'Calculator Corner' is dead; long live 'Portable Computer World'! We've changed the name to reflect its broadening scope but calculator freaks need not despair: Dick will still look after you.

PCW SUB SET 172

More useful assembler language sub-routines to get to grips with.

BEGINNERS START HERE 177

Our monthly quick intro for those new to microcomputing.



Invasion from Tokyo

DIRECT ACCESS 178

Includes In Store, ACC News, Transaction File, CTUK! Centres, User Groups update, Network News and Diary Data.

PROGRAMS 192

More listings with which to while away your time. And from this month, we're giving a 'Program of the Month' prize.

LEISURE LINES 209

J J Clessa, recovering nicely from a barrage of Manhunters, poses another of his famous brain bursters.

BLUDNERS 209

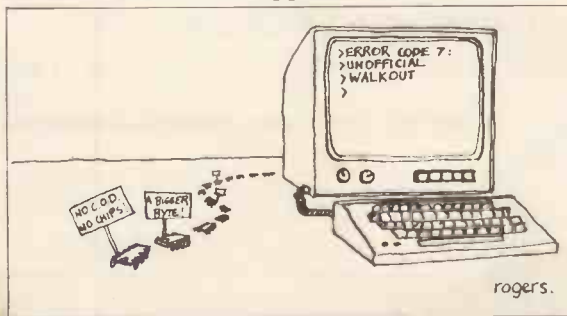
We try not to make them but when we do at least we're honest to admit them (sometimes)!

BACK ISSUES ~~210~~ 212

Find out what you've missed and how to catch up.

CHIP CHAT 304

Scandal, gossip, lies, libel ... none of these are *ever* allowed to appear in this column!



rogers.

Subscriptions Enquiries Stuart Cruickshank Subscription rates UK: £11.50. Overseas £25.00 Subscription and mail order address 53 Frith Street, London W1A 2HG, tel 01-439 4242. © Computing Publications Ltd. 1983. Editorial and advertising address 62 Oxford Street, London W1A 2HG, tel: 01-636 6890. No material may be reproduced in whole or in part without written consent from the copyright holders. Printed by Chase Web Offset, St Austell, Cornwall. Distributed by Seymour Press, 334 Brixton Road, London SW9. Tel: 01-733 4444.

SUPERBRAIN II

—THE BEST THING
SINCE SUPERBRAIN I!

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

ALL AT REDUCED COST!

Choose From:

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

FROM **£1458**

MAINTENANCE CONTRACTS
AND SOFTWARE AVAILABLE

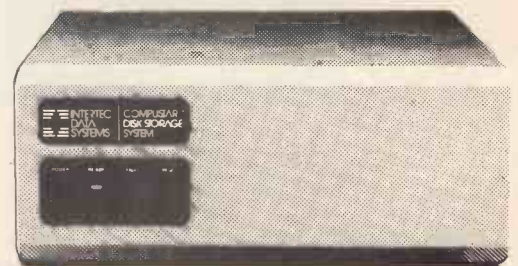
EXCL. VAT

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

+ COMPUSTAR

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

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



KCB
MICROS LIMITED

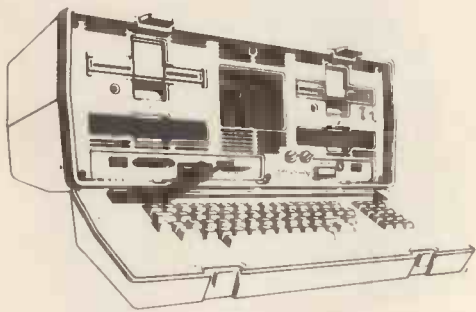
word processing + accountancy + financial modelling + calculation
record keeping + sales office management + accounts + payroll + graphics
engineering + communications + languages + solicitors + CAD

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

Part Exchange Bonanza!

Part Exchange **any** computer/accessorie or calculator
against a **new style** Osborne 1 or an IBM Personal
Computer!

But hurry this offer must close when stocks are exhausted



Osborne 1. Recommended
price £1250, plus VAT.

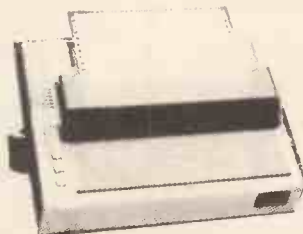


IBM Personal Computer.
Recommended Price £2800
plus VAT

Call us now you never know what we might offer (eg £100
for any calculator, £125 for a ZX81, £200 for a
Spectrum, £??? for an Apple).

OR

An Epson MX80T-3 printer for £99 when you buy an
Osborne 1 or IBM for cash (no part exchange).



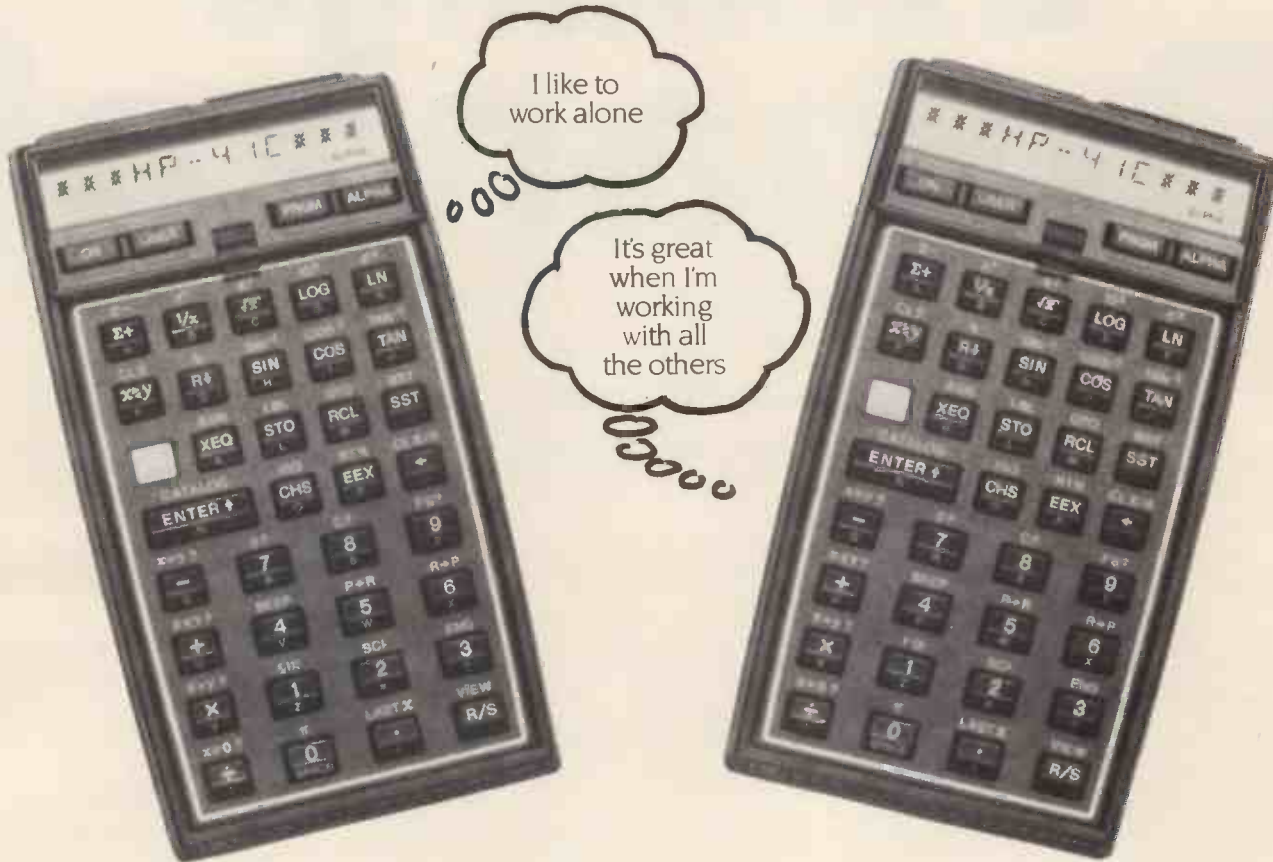
Telephone 01 Computers on 01-228 2207. (6 lines)

**Southampton House 192-206 York Road
Battersea London SW11 3SA**

NORTHERN SALES: YORK (0904) 470013

SUMLOCK BONDAIN LTD.

presents the CALCULATOR PERSONALITIES



The HP-41C by itself could easily be all the calculator you'll ever need. Even though it is Hewlett-Packard's most powerful personal calculator, it is remarkably easy to use... it communicates in familiar words so that even the novice can operate it. If you are new to programming or your needs do not require full memory capabilities immediately, start with the HP-41C. As your need for memory increases, add a Quad Memory Module or up to 4 memory modules to meet your expanding computational needs.

The unique difference between the HP-41C and the HP-41CV is that the HP-41CV has 5 times more memory built in. Specifically, it contains 319 storage registers versus 63 storage registers in the HP-41C. For those of you who have programming experience, the HP-41CV gives you the memory capacity to store a host of programs continuously. And with all this memory built-in, you have 4 ports free to add the peripherals of your choice.

These plug-in peripherals augment the power and usefulness of the HP-41 without compromising portability.

And because you have complete freedom in the options you choose, you can select the combination that suits your needs now, and extend them in the future.

Sumlock Bondain stocks the entire range of HP calculators and accessories. Please contact us if you would like more information. The prices quoted here are U.K. Mainland prices inc. VAT.

HP41C	£138.95
HP82104A Card Reader	£138.95
HP82143A Printer	£273.95
HP82153A Wand	£94.50
HP82170A Quad RAM	£64.76
HP41CV	£195.95
HP82160A Interface Loop	£94.50
HP82161A Cassette Drive	£395.75
HP82162A Thermal Printer	£355.95
HP82095B 80 col. Printer	£622.50
HP82912A 9" Video Monitor	£208.25

SUMLOCK BONDAIN LTD. 263-269 City Road, London EC1V 1JX. Telephone: 01-250 0505 Telex: 299844.



I am interested in I would like to order

Please debit my Access/Barclaycard No
or Cheque/PO Enclosed

Name: Address:

Telephone:

SUPERFAST 16 AND 18 BIT MICROCOMPUTERS FOR OEM'S

TALOS 2

Single Board Microcomputer
 ★ Z80A 4MHz CPU ★ 64K RAM ★ Z80A DMA
 ONLY £375 + £5 P&P + VAT



- ★ Z80A 4MHz
- ★ 64K RAM
- ★ 24 x 80 video
- ★ 6845 CRT Controller
- ★ ASCII KB port
- ★ 2 x RS232C
- ★ Centronics port
- ★ 8" Drive interface
- ★ Interface for new 5 1/4" high density 1.6Mbyte drives such as YD380T or BASF 6120
- ★ Z80A DMA
- ★ Size: 310mm x 210mm

TALOS 2 PLUS

Single Board Microcomputer
 ★ Z80B 6 MHz CPU ★ 192K RAM ★ Z80A DMA
 ONLY £475 + £5 P&P + VAT



- ★ Z80B 6MHz
- ★ 192K RAM
- ★ 24 x 80 video
- ★ ASCII KB port
- ★ 2 x RS232C
- ★ Centronics port
- ★ 8" drive interface
- ★ 6845 CRT Controller
- ★ Interface for new 5 1/4" high density 1.6Mbyte drives such as YD380T or BASF 6120
- ★ Z80A DMA
- ★ Size: 310mm x 210mm

TALOS 3

Single Board Microcomputer
 ★ Z80B 6MHz CPU ★ 64K RAM ★ Z80A DMA
 ★ HD Interface ONLY £425 + £5 P&P + VAT



- ★ Z80B 6MHz
- ★ 64K RAM
- ★ HD interface for Fujitsu M230K drive (up to 80 Mbyte)
- ★ 3 Multuser capability when used with a TALOS 2 Board
- ★ 6845 CRT Controller
- ★ 24 x 80 video
- ★ ASCII KB port
- ★ 2 x RS232C
- ★ Centronics port
- ★ 8" Drive interface
- ★ Interface for new 5 1/4" high density 1.6Mbyte drives such as YD380T or BASF 6120
- ★ Z80A DMA
- ★ Size: 310mm x 210mm

TALOS 88 With 512K RAM Board

★ 16 Bit 8088 8MHz CPU ★ 512K RAM with Parity ★ Connects to 8 Bit TALOS 2/2 PLUS/3 Boards
 ONLY £695 + £8 P&P + VAT



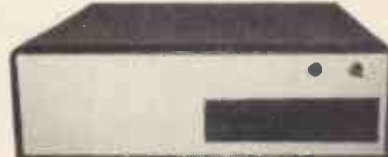
- ★ 8088 8MHz
- ★ 512K RAM + Parity
- ★ 2 x RS232C
- ★ 3 parallel ports
- ★ RAM Board can be used as fast "RAM DISK"!



- ★ 8 interrupt level
- ★ 4K ROM
- ★ Connects to TALOS 2, 2 PLUS or TALOS 3 Board via one parallel port
- ★ Size: 115mm x 252mm (same size both boards)

21 MBYTE HARD DISK SYSTEM

Super Fast Microcomputer
 ONLY £4,200 + Carriage + VAT



- ★ Uses TALOS 3 Board
- ★ Z80B 6MHz
- ★ 20 Mbyte HD - expandable to 80 Mbyte
- ★ 64K RAM
- ★ One 8" thin drive for back-up expandable to 4!

NEC 8023BE-C

NEW LOWER PRICE

Now only £292 plus £8 carriage plus VAT @ £345 inc.



- 100CPS print speed
- Bi-directional logic seeking - increment mode
- 80, 136 column
- High resolution dot graphics - 144 x 160 dots/inch
- proportional spacing
- 7 x 9 dot matrix for alphanumerics & symbols
- 8 x 8 dot matrix for character generator graphics
- Output to printer on character by character or dot by dot basis
- Auto reversal (up to down) of ribbon maintains clarity for long period
- ASCII 96 characters - JIS 160 characters - character generator graphics 64 characters - European 14 characters
- Horizontal & vertical tabbing

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

The Most Advanced Low Cost Printer Outstanding Graphics, Print Quality & Performance
 Recommended Price £399 + VAT

Our price only £292 plus £8 carriage & VAT @ £345 inc.

Stand Alone Serial Interface (to 9,600 baud) with PSU & 4K buffer £80 + VAT = £92 inc.

- Lower case descenders
- Superscript subscript, underlining
- Several character sizes & styles (Pica, elite, proportional, reduced, enlarged, enhanced etc)
- 5 unique alphabets
- Greek and Math symbols
- Adjustable tractors
- Single sheet friction feed
- Powerful programmable paper feed
- Special ribbon cartridge
- Backward carriage return
- 4.5" to 10" paper width
- Original plus 3 copies
- Centronics type parallel interface (standard)
- 2K Buffer

As an official BASF distributor we are pleased to offer special low prices on BASF range of Winchester and Floppies!

5 1/4" WINCHESTER HARD DISK DRIVES (Seagate ST506 compatible). All Winchester are fully guaranteed for 12 months

6182 5 Mbyte formatted (6.38 Mbyte unformatted)
 6183 7.5 Mbyte formatted (9.57 Mbyte unformatted)

ONLY £455 + £10 carriage + VAT
 ONLY £513 + £10 carriage + VAT

6184 11 Mbyte formatted (14.4 Mbyte unformatted)
 6185 20 Mbyte formatted (25 Mbyte unformatted)

ONLY £567 + £10 carriage + VAT
 ONLY £737 + £10 carriage + VAT

Please telephone for quantity prices

FLOPPY DRIVES. Full 6 months guarantee!

6105 8" Slimline - half height DS/DD 1.6 Mbyte Direct Drive, DC Motor - no belts - no AC power - requires only +5V and 24V

ONLY £350 + £5 carriage + VAT
 ONLY £225 + £5 carriage + VAT

Please telephone for quantity prices



Vincelord Ltd

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

BASF MEDIA

Part No:

1S/SD SSSD per box of 10

1SD/DD SSSD per box of 10

2SD/DD per box of 10

1/96 TPI DS/DD 80 track ONLY 5 1/4"

2/96 TPI DSDD 80 track ONLY 5 1/4"

5 1/4" 18"

£15 + £1 P&P + VAT = £18.40 inc.

£20 + £1 P&P + VAT = £24.15 inc.

£25 + £1 P&P + VAT = £29.90 inc.

£35 + £1 P&P + VAT = £41.40 inc.

£40 + £1 P&P + VAT = £47.15 inc.

RABBIT SOFTWARE



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

Tel: 01-863-0833



Rabbit-Calc

'Rabbit-Calc is an Electronic Worksheet that will replace the old fashioned pencil, paper and calculator methods of before. You can do complex financial models and then at a touch of a button, change the entire model to suit future trends. Has many built in functions for fast calculation plus utilities for saving, loading, replicating etc..

RETAIL PRICE £19.99

Night-Crawler



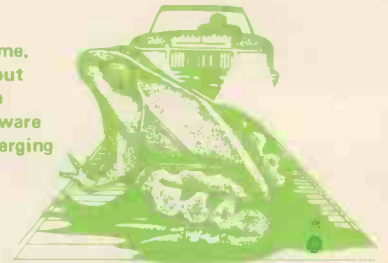
Venture into the "Green Forest" but beware of the alien creatures especially the Night Crawler! 39 levels: The fastest game you'll ever see on your VIC-20

RETAIL PRICE £9.99*

Frogger

Bring the famous pub game home. First cross the motorway without getting run over and then home across logs and turtles. But beware of snakes, crocodiles and submerging turtles. incredible multi-colour mode graphics written in machine code. (3K)

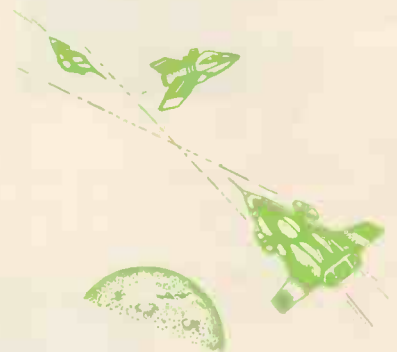
RETAIL PRICE £9.99



Space Phreeks

Your mission:- colonize a new planet but to do so you must face a universe full of strange creatures known only as Space Phreeks. 15 alien attack patterns, great graphics, you've got to be good to play this game.

RETAIL PRICE £9.99*



Skramble



Fight your way across the rugged terrain to your home base while fighting off attacks from the aliens. 8 different phases: Tunnel, Cavern, City etc.. just like the popular arcade game and just as difficult.

RETAIL PRICE £9.99*

All machine code for fast, smooth action.
* For the unexpanded machine.

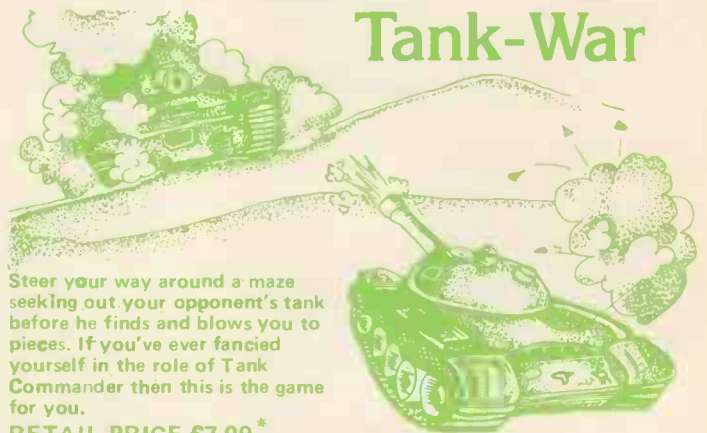
Rabbit Software Ltd.
380 Station Road,
Harrow, Middlesex HA1 2DE.

Telephone: 01-863 0833
Credit Cards Accepted



RABBIT SOFTWARE

Tank-War



Steer your way around a maze seeking out your opponent's tank before he finds and blows you to pieces. If you've ever fancied yourself in the role of Tank Commander then this is the game for you.

RETAIL PRICE £7.99*

Please send me _____
I enclose cheque/PO for _____
OR Please debit my Access 5224 _____
Barclaycard 4929 _____ Expiry date _____
Name _____
Address _____
Code _____

Dealers discount available
ACCESS, BARCLAYCARD ORDERS WELCOME
Mail to: RABBIT SOFTWARE LTD.
380 STATION ROAD, HARROW,
MIDDLESEX HA1 2DE



How to increase the size of your memory.

Anyone with even a limited knowledge of home computers will instantly recognise the very large advantages of owning a Lynx.

And anyone who truly understands the considerable differences between home computers is likely to have spotted The Lynx a mile off.

With 48K of memory to start with, The Lynx far outweighs the majority of home computers on the market.

And it is precisely that size of memory which makes The Lynx a superior animal in its field.

What's more, 48K of memory is not the end of its capacity, but merely the beginning.

Your Lynx can grow. To 96K, to 128K, or to 192K. All inboard.

All of a sudden your Lynx home computer has assumed the size of memory usually associated with business machines.

Its increased capacity will mean you can have an impressive word processor.

Disk drives and printers, mono or colour monitors can be added on.

With an RS232 port, your Lynx home computer is compatible with a wide range of other manufacturers' equipment.

And CP/M® compatibility opens the door to a comprehensive selection of business software.

Furthermore, your Lynx home computer has high resolution colour graphics.

In other words, you are free to draw in all 8 colours anywhere on the screen.

For the full story about The Lynx home computer, call in at your nearest Laskys or Spectrum Computer Centre.

®CP/M is the registered trade mark of Digital Research Inc.

COMPUTERS
LYNX



Two new additions to the Microline Family



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

MICROLINE
80

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

£199

MICROLINE
82A

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

£349

MICROLINE
92

- 80 column, bi-directional
- mode 1-160 cps
- mode-2 near letter quality
- high-resolution graphics
- subscript and superscript

£449

MICROLINE
83A

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

£499

MICROLINE
84

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

£799

MICROLINE
93

- full 136-column carriage
- bi-directional
- mode 1-160 cps
- mode-2 near letter quality
- high-resolution graphics
- subscript and superscript

£649

X-DATA

The authorised OKI distributor

X-Data Limited, Equipment Wholesalers.

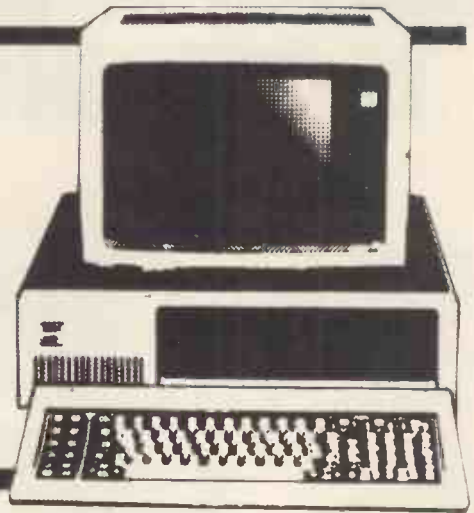
750-751 Deal Avenue, Slough Trading Estate, Slough, SL1 4SH

Telephone: Slough (0753) 72331; Telex: 847728

BEFORE YOU BUY

^{NEW}
THE OSBORNE 1

THE IBM PC



PRAXIS DAISY WHEEL, EPSON PRINTERS

telephone

D O ✓ N E S S

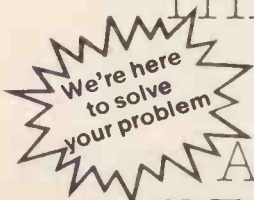
*Now the
Epson HX20*

for the best price/business
solution around on

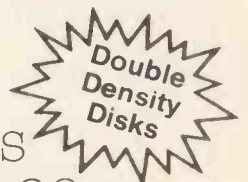
01-800 8268



CREATE YOUR OWN PROGRAMS WITH
THE BEST DATABASE AVAILABLE



dBASE II & 350



Also full range of utility programs
P.F.S. for APPLE New Improved £75.00

Box of 10 Accuttract Diskettes (inc. hard case) £18.20

Plain listing paper 11½" x 9½" 2,200 £12.50

(local deliveries)

All prices plus VAT at 15%

88 FAIRVIEW ROAD, LONDON N15 Callers by appointment please

TELEPHONE 01-800 8268

D O ✓ N E S S make things easy

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

PRICES EXCL. VAT

COMMODORE VIC 20

Top selling home computer with enough facilities to interest the hobbyist or serious programmer. **130.00 ex. VAT**



COMMODORE VIC

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

DRAGON 32

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

SINCLAIR

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

CROMEMCO C-10 PERSONAL COMPUTER

A full feature personal business computer system including software — for the price of a VDU. Also the entry point into the renowned Cromemco range. **1195.00 ex. VAT**



CROMEMCO

C-10 SP Personal Computer Superpak inc. Z80A Processor, 64K Memory, Single 5 1/4" 390K Byte Floppy Disk, 24 x 80 Screen, CKBA Keyboard, CP/M Compatible Operating System, plus Word Processing, Financial Planning & 32K BASIC Software 1195.00
Additional 5 1/4" Floppy Disk Drive 450.00
120 Word/Min Daisy Wheel Printer 675.00



EPSON HX-20

PORTABLE COMPUTER

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

OSBORNE

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

PRINTERS — IMPACT

Anadex DP9500A 132 Cols., 150CPS Matrix Printer with Graphics. 10, 12.5, 13.3, 16.4 Char/In, Low Noise 1150.00
Anadex DP9501A 132 Cols., 150CPS Matrix Printer 10, 12, 15, 16.4 Char/In, Low Noise 1150.00
Anadex DP9620A 200CPS Printer, Low Noise, 10, 12, 15, 16.4 Char/In 100 CPS in Double Pass Enhanced Mode 1250.00
Anadex DP8000 Dual Mode Printer 132 Cols., 150/180CPS Correspondence Quality, 300/330CPS Draft and Graphics Mode. Diablo 630 Protocol Emulation 1950.00
Epson MX801/3 Tractor only 80CPS 349.00
Epson MX801F/3 Friction and Tractor 389.00
Epson MX100F1/3 Friction and Tractor 100CPS 499.00
Seikosha GP100A 300CPS, 80 COL 199.00
Interfaces and cables for all popular micros available — contact your nearest shop.

PRINTERS — DAISY WHEEL

Diablo 630R0 1575.00
Crown Ranker — Brother 19CPS 795.00
Brother 8300 458.00

NORTH STAR ADVANTAGE

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

From 2095.00 ex. VAT



NORTH STAR ADVANTAGE

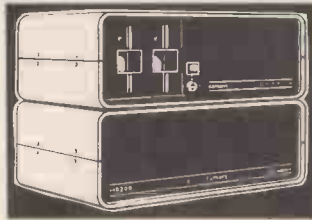
Advantage Desk-Top System inc. Keyboard, Graphics, Screen (Green), 64K Byte RAM, Z80A Processor, Serial Interface, Dual 350K Byte Diskette Drives and Busigraph Software 2095.00
Advantage Desk-Top System, as above except single 350K Diskette Drive + 5M Byte 5" Winchester Hard Disk 2995.00
Advantage upgrade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

NORTH STAR HORIZON

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

COMART COMMUNICATOR

Clearly the most price competitive modular computer system on the market with built-in expandability — inside and out. **Inc. CP/M From 1895.00 ex. VAT**



COMART COMMUNICATOR Z80A MODULAR SYSTEMS

Comart CP100 Communicator Micro Computer: Z80A Processor, 64K Byte Memory, Dual 5 1/4" Floppy Diskette Drives each storing 390K Bytes of Data. Dual Serial and Parallel Ports. 10 Slot S100 Bus. CP/M Version 2 included 1895.00
Comart CP200 as CP100 except Dual 790K Byte Diskette Drives 2195.00
Comart CP500 as CP100 except one 790K Byte Diskette Drive and one 5" Winchester Drive having 4.8M Bytes of Formatted Data 2995.00
Comart CP520 as CP100 except one 790K Byte Diskette Drive and one 5" Winchester Drive having 19M Bytes of Formatted Data 3995.00

COMART COMMUNICATOR 8086 MODULAR SYSTEMS

Comart CP1100 Communicator Micro Computer: 6MHz 8086 Processor, 128K Byte Memory with Parity, Dual 5 1/4" Floppy Disk Drives each storing 390K Bytes. Dual Serial and Parallel Printer Ports. 10 Slot S100 Bus inc. CP/M86 & MS-DOS 2295.00
Comart CP1102 CP1100 with 256K Byte Memory 2445.00
Comart CP1200 as CP1100 except Dual 790K Byte Diskette Drives 2595.00
Comart CP1202 CP1200 with 256K Byte Memory 2745.00
Comart CP1500 as CP1100 except Single 790K Byte Diskette Drive and Single 5" Winchester Hard Disk Drive having 4.8M Bytes of Formatted Data 3395.00
Comart CP1502 CP1500 with 256K Byte Memory 3545.00
Comart CP1520 As CP1500 except 5" Winchester Disk having 19M Bytes of Formatted Data 4395.00
Comart CP1522 CP1520 with 256K Byte Memory 4545.00

UPGRADE KITS

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

COMART MULTI USER CONFIGURATIONS

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

COMART SUBSYSTEMS

Comart CB200 Cartridge Tape Back-Up Subsystem for Hard Disk 2495.00
Comart HD200 8" Hard Disk (18M Byte) Subsystem (including HD10 Controller) 3895.00
Comart HD520 5" x 20M Byte Hard Disk Subsystem (requires HDCONT or can be added to a CP520 or CP1520) 1995.00
Comart HD522 Dual 20M Byte Winchester Hard Disk Subsystem (requires HDCONT) 3495.00
Comart HDCONT Winchester Disk Controller for 2, 20M Byte Drives 595.00
Comart FB800 8" Floppy Single Disk Drive Subsystem; Single Sided, Single Density IBM 3740 Compatible (requires C-IFDC) 995.00
Comart FB802 8" Floppy Dual Disk Drive Subsystem 1495.00
Comart MP/MSUB Hardware & Software to Upgrade Communicator to MP/M. Includes MP/M, two 48K Byte CRAM 48 Memory and 4SIO Serial Interface Card 1150.00

S100 BOARDS

Comart CRAM64 64K Byte Dynamic RAM with Bank Select 200.00
Comart CRAM48 48K Byte Dynamic RAM with Bank Select 180.00
Comart CRAM256 256K Byte Dynamic RAM with Parity, 8 and 16 Bit Data, IEEE696 Compatible. Also supports 8 Bit Bank Switching 550.00
Comart CRAM128 128K Dynamic RAM with Parity, 8 and 16 Bit Data, IEEE696 Compatible. Also supports 8 Bit Bank Switching 400.00
Comart C-CPU86 8086 Processor Card, with Dual Serial and Parallel Ports, Monitor in 8K EPROM and 4K RAM 300.00
Comart C-IFDC Intelligent Diskette Drive Controller with Z80A Processor 295.00
Comart C-CPU Z80A system Processor Board incl. 2 Serial/1 Parallel Port 200.00
Comart 4SIO 4 Channel Synch/Asynch Interface Board 250.00
Dual Systems CLK24 Battery Supported Real Time Calendar Disk 295.00
Dual Systems CMEM32 32K CMOS Battery Supported Memory 1195.00
Dual Systems CMEM16 16K CMOS Battery Supported Memory 895.00

CROMEMCO 68000/Z80A SUPER MICRO SYSTEMS

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

PRICES EXCL. VAT

Cromemco CS3D5E System 3 including Dual 1.2M Byte Floppy Disk Drives, 21 Slot Card Cage, DPU, MCU, 512MSU, 16FDC.....6585.00
Cromemco CS3HD5E as CS3D5E but with 5" 5.5MB Winchester Disk and WD18230.00

CROMEMCO Z80 COMPUTER SYSTEMS

Cromemco CS-1H System One including Z80A Processor, 64K Memory, 390K Byte 5" Floppy, 5.5M Byte 5" Winchester Disk and VDU/Printer Interfaces.....4595.00
Cromemco CS-1B Slot S100 Bus. Computer System One, with Z80A Processor, Dual 5" Diskette Drives, 64K Memory, VDU/Printer I/F.....2630.00

Cromemco CS-2.21 Slot S100 Bus. Computer System Two, Z80A Processor, Dual 5" Diskette Drives, 64K Memory, VDU/Printer Interfaces (19" Rack Mount).....3095.00

Cromemco CS-3.21 Slot S100 Bus. Computer System Three: Z80A, 64K Memory, Dual High Speed 8" Diskette Drives (1.2M Byte each), VDU/Printer Interfaces (19" Rack Mount).....4495.00

Cromemco Z-2H 12 Slot S100 Bus. Hard Disk Computer System with Z80A Processor, Dual 5" Diskette Drives, 10M Byte Winchester Drive, 64K RAM & VDU/Printer Interfaces.....6585.00
Cromemco Z-2H/6S Cromemco Graphics System based on Z-2H, together with additional Dual Ported 96K Byte Video Memory, High Resolution Graphics I/F and Bit Pad Interfaces CDOS and SGS Software Included.....8560.00

CROMEMCO GRAPHICS OPTION

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

VDU'S & MONITORS

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

BUG - BYTE SOFTWARE

All Tapes Available For Acom, VIC, BBC, ZX81. Spectrum. Call for availability.

BOOKS

Very wide range of computer books stocked at all shops.

DISKETTES

Wobash 5 1/4" Single Sided, Single Density.....1.70ea
Wobash 5 1/4" Single Sided, Double Density.....2.13ea
Dysan 5 1/4" Double Sided, Double Density.....3.90ea
Dysan 8" Double Sided, Double Density 4.40ea
Full range of 5 1/4" & 8" Diskettes in stock

CP/M SOFTWARE

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

SYSTEM SPOTLIGHT

OSBORNE MICRO SYSTEM



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

1650⁰⁰ ex. VAT

Optional Double-density version now available

BASIC-80 Microsoft Basic Interpreter.....205.27

BAZIC Micromikes Basic Language.....120.00

BSTAM BYROM Software Communications Package between CP/M based machines. Both machines require BSTAM.....115.00

BSTMS BYROM Software Communications Package. A commercially orientated, TTY Emulation Facility for CP/M Systems.....115.00

BT-80 Digital Research Programming Tool.....126.00

CALOSTAR Micropro Financial Planning/Budgeting, Electronic Spread Sheet Package.....169.00

CARDBOX Caxton Fast Store and Search System.....155.00

CB80 Digital Research Basic Compiler.....314.00

CBASIC Digital Research Basic Language.....94.00

CBASIC/86 Digital Research Basic Language for 16 BIT Micro's (CP/M 86).....204.00

CIS COBOL Microfocus COBOL Language.....425.00

COBOL TRAIN Microcal Training Package for CIS COBOL.....350.00

COBOL-80 Microsoft COBOL Compiler.....421.63

CP/M Digital Research Operating System.....94.00

CP/M for SBC Digital Research Operating System.....126.00

CP/M-86 Digital Research Operating System for 16 Bit Micro's.....157.00

CP/M-86 DISPWR Digital Research Operating System.....204.00

CP/M-86 + CB86 DW Digital Research Operating System + Language.....350.00

CP/NET Digital Research Networking Operating System.....126.00

CPFILET Jarogate Operating System Simulator.....55.00

DATASTAR Micropro Database Package.....200.00

DBASE II Ashton-Tate Relational Database + ZIP (ZIP is a Screen and Printout Form Writer for DBASE II).....435.00

DESPOOL DR Utility.....31.00

DISPLAY MNGR Digital Research Programming Tool.....251.00

EDIT-80 Microsoft Editor.....72.12

EXTEND Jarogate Utility.....55.00

FILESHARE Microfocus Utility.....250.00

FILESTAR Microsec's Disk Reformatter CP/M to IBM, DEC, Motorola and Intel Formats.....195.00

FMS-80 DJR Assoc. Database/FM.....650.00

FMS-81 DJR Assoc. Database/FM.....350.00

FMS-82 DJR Assoc. Database/FM.....350.00

FORMS 2 Microfocus Table Maker. Useful with CIS COBOL.....110.00

FORTAN-80 Microsoft FORTRAN Compiler.....288.48

GBS Bytesoft General Business System.....810.00

ISL Bytesoft Accounting Package.....1110.00

ITC CP/M Intelligent Terminals Corporation CP/M Operating System for Cromemco.....215.00

KSAM80 EMS Database.....350.00

LINK-80 Digital Research Programming Tool.....63.00

MAC Digital Research Programming Tool.....57.00

MACRO-80 Microsoft Macro Assembler.....116.50

MAILMERGE Micropro Wordprocessing Enhancement to link with WORDSTAR.....86.00

MARS Sapphire Business System.....400.00

MICROSTAT Ecosoft Statistics Package.....195.00

MILESTONE Organic Software Critical Path Package.....225.00

MP/M II Digital Research Multi-User Operating System.....283.00

MP/M 86 Digital Research Multi-User Operating System for 16 Bit Systems.....409.00

MSORT Microsoft Sort Utility.....83.21

PASCAL MT+ & SPP Digital Research Pascal Language with Speed Programming Tool.....314.00

PASCAL/MT+ Digital Research Pascal Language.....220.00

PASCAL/MT+ & 86 Digital Research Pascal Language for 16 Bit Systems.....377.00

PEACHTREE Basic Accounting System per module.....325.00

PEACHTREE Business Management System per module.....600.00

PERSONAL PEARL Pearl Data Base/FM.....185.00

PLANNERCALC Comshare Financial Planning Package.....39.00

PL/I-80 Digital Research Language.....314.00

REFORM/DEC Microtech Disk Reformatter CP/M to and from Dec.....120.00

REFORM/IBM Microtech Disk Reformatter CP/M to and from IBM.....120.00

RMAC, LINK Digital research Programming Tool.....126.00

SID Digital Research Programming Tool.....50.00

SID-86 Digital Research Programming Tool.....94.00

SIM22 Wheatcraft Hards Operating Systems Simulator CP/M Simulator for CROMIX Version II.....55.00

SPELLSTAR Micropro Proofreading Utility to link with WORDSTAR.....143.00

SUPERCALC Sorcim Financial Planning/Budgeting Electronic Spread Sheet Package.....190.00

SUPERSORT Micropro Sort Utility.....143.00

SUPERVYZ Epic Application Control.....86.00

T/MAKER II Lifeboat Associates Financial Planning/Budgeting Electronic Spread Sheet Package.....195.00

W/S TRAINING Micropro Training Guide for WORDSTAR.....17.00

WORDSTAR Micropro Wordprocessing Package.....283.00

WORDMASTER-86 Micro Pro W/P Package.....86.00

WP WORKSHOP MAC Ltd Training Guide for WORDSTAR or MAILMERGE.....75.00

X1802 Avocet Cross Assembler.....130.00

X3870 Avocet Cross Assembler.....130.00

X6502 Avocet Cross Assembler.....130.00

X6800 Avocet Cross Assembler.....130.00

X8048 Avocet Cross Assembler.....130.00

X BASIC Xitan Language.....185.00

X COPY Xitan Utility.....50.00

X CP/M Xitan/DR Operating System.....118.00

XLB6 Digital Research Programming Tool.....94.00

ZSID Digital Research Programming Tool.....63.00

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

CROMEMCO SOFTWARE FOR 68000/Z80A SERIES

Cromemco CRO-D Cromix (Multi-User/Multi Tasking) Unix Based Operating System.....395.00
Cromemco FOR-D Fortran '77.....395.00
Cromemco PAS-D ISO Pascal.....395.00
Cromemco ASM-D 68000 Macro Assembler.....395.00
Cromemco STB-D 32K Structured BASIC @.....395.00
Cromemco CCC-D C-Compiler @.....395.00
Cromemco COB-D Cobol Compiler @.....395.00

Note: All 68000 Languages (Suffix D) require Cromix (CRO-D). All Software is available on 5" or 8" Floppy Disks - Please Specify. @ = Availability early '83

CROMEMCO OPERATING SYSTEMS

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

CROMEMCO LANGUAGES (Z80A)

Cromemco FDB 16K BASIC Interpreter.....130.00
Cromemco FDF Fortran IV Compiler.....195.00
Cromemco FDC Cobol Compiler.....395.00
Cromemco STB 32K Structured BASIC (includes KSAM).....130.00
Cromemco FDR RATFOR- Rational Fortran IV Compiler & Pre-Processor.....260.00
Cromemco FDA Z80 Macro Assembler.....195.00
Cromemco CCC C Compiler (Requires Cromix).....395.00
Cromemco RPG RPLII Report Generator.....395.00
Cromemco LSP LISP List Processor.....260.00
Cromemco COD Overlay Link Editor.....260.00
Cromemco IDS I.O.P. Development Software.....395.00
Cromemco CDS Diagnostic Systems Software.....130.00

All software is available on 5" or 8" Diskettes - please specify.

ALL PRICES EXCLUSIVE OF VAT

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

* Some items may be subject to a dollar surcharge if the dollar exchange rate changes more than 5 cents. Prices will be adjusted in line with the rate prevailing at the time of purchase.
* Prices subject to change without notice E. & O.E. and are valid for the cover date life of this magazine.

- * Whilst we carry a vast range of stock, we cannot guarantee that every advertised item will be available in each shop.
- * All goods are new and include factory warranties.
- * No refunds on opened software.
- * Orders from Government Depts. & Colleges etc. welcome.
- * Leasing & HP facilities available - apply for written details.
- * Detailed prices available on request.



THE BYTESHOP

Your Specialist Computer Centre

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


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

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

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

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

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

Members of the  Comart Group of Companies

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

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

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

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

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

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

Could you run Tomorrow's Office Today?

You must have considered microcomputers as a solution to some of your business problems.

Why not run the office on one?

Stage One Software has developed a program which will do just that: allowing you to carry out all your filing, correspondence, report writing, diary updating and basic financial work in the same way as you have always run your office routines.

But using the Administrator on the Commodore microcomputer your filing is automatic. Retrieval, even of vaguely remembered records, is fast and accurate.

And unlike some other office database management programs, Administrator allows you to control it in English via the screen. You do not need specialist programming knowledge to tailor Administrator to your precise requirements.

Use the Administrator to run your mailing lists in conjunction with a word-processing link; for invoicing; personnel records; stock control; valuations; analyses; control reports on projects; and even for narrative files where each record needs to hold a large amount of written information.

Administrator really scores here.

It is able to accept any length of narrative text on any of its records. You have no space limits other than the capacity of your disk storage equipment.

Try that on a comparable system and see how far you get.

We know your business is unique. You or your predecessors set up the systems in one particular way. Administrator will accept that way. You tell it what you want. You set up the system.

When you have astonished yourself by finding out how clever the Administrator is you will probably think of improvements in your own system. So Administrator allows you to amend the system which you originally set up, so that, for example, you can add one item of information to all previously stored records which in turn will allow you to extract more informative management reports.

Administrator is flexible.

It is also mathematically inclined and can total your analytical columns, provide grand totals and make comparisons of targets and performance to provide you with the selective information you specify.

Dates can also be compared. Your aged debtors will be printed out, plus the reminders you require each day to keep your projects on target.

System cost, including a Commodore 8000-series computer, twin floppy disk drives and one of a selection of printers depending on your needs, is between £3300 and £4000. The latter figure would include a letter-quality daisywheel printer. Both prices include the cost of Administrator and word-processing program, but do not include VAT.

We can't tell you all about the system in one advertisement. Fill in the coupon below and we will arrange a demonstration for you by one of the dealers in our nationwide network.

It will take about an hour. That hour will revolutionise the concepts you have on running your business. Whatever that business is.

Clip the coupon. Now.

Administrator - Tomorrow's Office Today.

Send to Stage One Computers, 300 Ashley Road, Parkstone, Poole, Dorset.

Yes, please send me details of Administrator.

Name _____

Company Name _____

Address _____

Tel. No. _____ Ext. _____

STAGE ONE COMPUTERS

300 ASHLEY ROAD, PARKSTONE, POOLE, DORSET.

TEL: 0202 735656

 **commodore**
COMPUTER



Value - MicroValue - Micro

Why buy British?

Britain has a unique opportunity to establish itself alongside the United States and Japan as a major producer of microcomputers and microcomputer software. In particular, the UK has a tremendous advantage in this field when looking at the markets of the remainder of Western Europe. The continental people have begun to look to Britain for innovative and competitive computer products. Also, it is obviously much easier for them to communicate with this country rather than California or Japan. The recent Compec Exhibition held in London underlines the importance of the UK to the European market.

It is not easy to analyse the reasons for this situation arising. Obviously, the fact that we are an English-speaking country has had significant influence since the industry has been led from its early days by the Americans. Next, we do appear a naturally ingenious people. The number of inventions generated from within these islands is out of proportion to the population when compared to some of our other trading partners. Regrettably however, these opportunities slipped through our hands and were developed elsewhere. Finally, there has been a very strong hobby electronics market and this has possibly been the most important single influence since so many microcomputer companies owe their origins to the dedicated enthusiast.

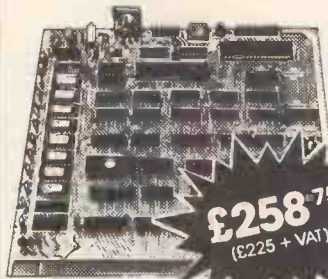
There is a wide range of machines available from British manufacturers. In most cases, the products are very competitive and, for this reason, it should not be difficult for the potential customer to find a British-made solution for his particular requirement. However, I believe that this attitude should be extended and that the Government, local authorities and other bodies should do their utmost to ensure that they buy British and they should try to influence other people to buy British. For instance, there seems little benefit to anyone if a Government body actively or passively promotes overseas' manufactured equipment. Unfortunately, this is the case. What everybody should remember is that buying British means generating jobs here.

Few people realise that for some strange reason, the Government of this country and its EEC partners have rigged import duties to the disadvantage of the UK manufacturer. Manufactured computer systems attract duty of between 6-7%. Many of the components needed to build computer systems are only manufactured overseas and in particular, the 17% duty on semi-conductors gives the importers virtually a 10% edge on their domestic rivals. Whilst I acknowledge the fact that it would be difficult to force through changes rapidly, there must be a way of giving temporary relief to our industry. The Government have the authority to waive duty in certain instances on an ad hoc basis and this could be considered. It really makes no sense for the tax payer's money to be spent on foreign products or the import duty paid by manufacturers on their component supplies.

If all prospective microcomputer customers gave very careful consideration to the UK manufacturers' machines instead of imported ones, the sheer volume of business available would provide the profits that are needed to pay for the large R&D programmes we all have to sustain. Successful development mean lower prices and even more competition for our foreign counterparts. I believe that the manufacturers in this country have proven that they have the capability of manufacturing and designing the equipment which the market place wants. What we need now is recognition and support.

JOHN MARSHALL
MicroValue Group/Gemini Microcomputers Ltd

MULTIBOARD



GM813 - CPU/64K RAM Board

- ★ 4 MHz Z80A CPU
- ★ 64K Dynamic RAM
- ★ RS232 Serial Interface
- ★ Two 8-Bit I/O Ports
- ★ 1200 Baud Cassette Interface
- ★ Extended and Page Addressing Modes

£258⁷⁵
(£225 + VAT)

The Gemini GM813 is a new 80-BUS compatible CPU card incorporating 64K dynamic RAM and utilising the powerful Z80A microprocessor running at 4MHz. Extended addressing and page mode facilities allow for future memory expansion up to 2 megabytes. Input and output capabilities include both programmable serial and parallel interfaces - RS232, 1200 baud CUTS cassette interface and the Z80A PIO. When used with the GM812 video card, the GM813's unique RP/M monitor allows the creation of cassette or EPROM based programs or files which are upwards compatible with a disk based CP/M system.

GM811 - CPU Board

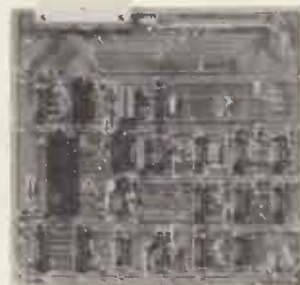
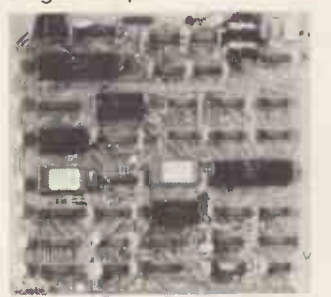
- ★ 4MHz Z80A CPU
- ★ Four 'Bytewise' Memory Sockets
- ★ Two 8-Bit Input/Output Ports
- ★ 8 Bit Input Port
- ★ RS232 Serial Interface
- ★ 1200 Baud CUTS Cassette Interface

£143⁷⁵
(each inc. VAT)



GM812 - IVC Board

- ★ 80x25 Display Format
- ★ On-board Z80A Microprocessor
- ★ Buffered Keyboard Input
- ★ Programmable Character Generator
- ★ 160x75 Pixel Graphics
- ★ Light Pen Input



GM809 - FDC Board

- ★ Disk Controller Board
- ★ Single/double density
- ★ Single/double sided
- ★ 8" or 5.25" Drives

Other boards available in the Multiboard range include :

GM802	64K Dynamic RAM Board	£143.75 inc. VAT
GM803	EPROM/ROM Board	£ 74.75 inc. VAT
GM816	MULTI-I/O Board	£143.75 inc. VAT
MP826	32K Static RAM Board	£212.75 inc. VAT
PLUTO	Colour Graphics Board	£458.85 inc. VAT

Send for latest catalogue for full details.

MicroValue

REAL value - from the Professionals

Value - MicroValue - Micro

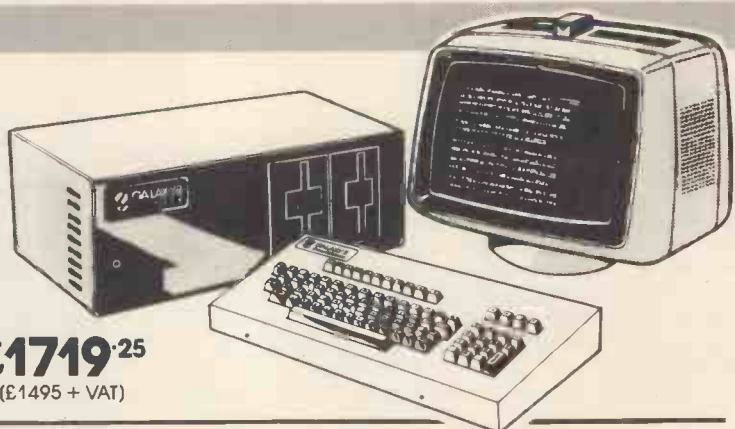
COMPUTERS

New from Gemini

Gemini Galaxy 2

- * Twin Z80A Processors
- * CP/M 2.2 Operating System
- * 64K Dynamic RAM
- * 800K Disk Capacity
- * 80x25 Video Display
- * Serial and parallel printer interfaces
- * Cassette and light pen interfaces
- * User definable function keys
- * Numerical key pad
- * 12" Monitor Included

£1719^{·25}
(£1495 + VAT)



Total support for Gemini & nascom Products

nascom 3 available from MicroValue

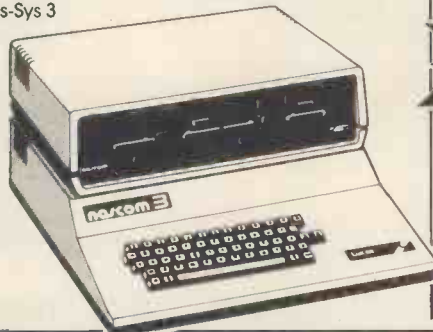
Based around the successful Nascom 2 computer, this new system can be built up into a complete disk based system. Supplied built and tested complete with PSU, Nas-Sys 3 and Nas-Gra.

48K System
£631^{·35} (£549 + VAT)

CP/M 2.2
£115 (£100 + VAT)

NASCOM 2 KIT
£258^{·75} (£225 + VAT)

Built & Tested
£327^{·75} (£285 + VAT)



80x25 Video for nascom

NEW LOW PRICE

Nascom owners can now have a professional 80x25 Video display by using the Gemini G812 Intelligent Video Card with on-board 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. Software supplied on Gemini system disks. Built and tested.

£143^{·75}
(£125 + VAT)

Nascom 1 Printed Circuit
(inc. parts list)

£28^{·75} (£25 + VAT)

GM802 64K RAM Card
£143^{·75} (£125 + VAT)

GM802K 16K RAM Kit
£92 (£80 + VAT)

Disk System for Gemini & nascom

GM825 Disk Drive Unit - The GM825 floppy disk housing is supplied with either one or two 5.25" single sided, double density, 96PI high capacity Micropolis 1015F5 disk drives. These provide 400K bytes of formatted storage per drive. (Gemini QDSS format). The CP/M2.2 package available 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 4, it includes an editor and assembler and extends the Nascom BASIC to include disk commands.

Single Drive System POLYDOS 4
GM825-1S for Nascom

£402^{·50} (£350 + VAT)

£103^{·50} (£90 + VAT)

Dual Drive System
GM825-2S

£661^{·25} (£575 + VAT)

GM809 Disk Controller Card
for 8" and 5.25" drives

£143^{·75} (£125 + VAT)

CP/M2.2 Package
(Q513) for Gemini

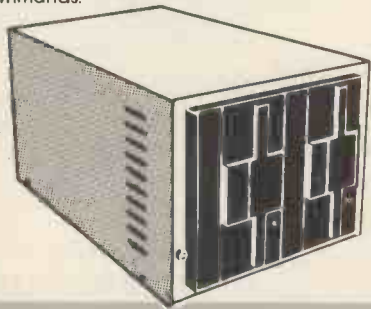
£103^{·50} (inc. VAT)

GM829
for 8", 5.25" and Winchester Drives

£166^{·75} (£145 + VAT)

CP/M2.2 Package
(Q513) for Nascom

£115^{·00} (inc. VAT)

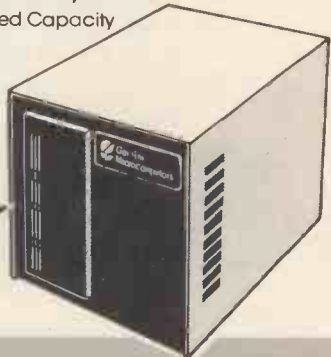


At last - a Winchester Drive for your Gemini / nascom System!

GM835 Winchester Drive Sub-system.

- * 5.4 Megabyte Formatted Capacity
- * Rodime Drive
- * Industry Standard SASI Interface
- * Integral Controller and power supply

£1450^{·00}
+ VAT



SOFTWARE

CP/M Software Compas

is totally different from other compiler based Pascal systems, as it allows you to create, edit, run, and debug Pascal programs in a highly interactive manner.

£138^{·00}
(inc. VAT)



'The Last One'

is used in conjunction with Microsoft's MBASIC*. No knowledge of BASIC programming is required since all input is performed using question and answer routines written in plain English.

£379^{·50}
(inc. VAT)

*MBASIC - MicroValue Price if purchased with 'The Last One' - £178.95 inc. VAT

Gemini Software:

- GEM PEN** Text Editor **£51.75 inc. VAT**
- GEM ZAP** Assembler **£51.75 inc. VAT**
- GEM DEBUG** Debugging Utility **£34.50 inc. VAT**
- WORDSTAR** Word Processor **£247.25 inc. VAT**
- GEM GRAPHIC** Links with MBASIC **£40.25 inc. VAT**

VIZ:APL is a high level language system. It can be used to develop small programs faster and large programs in limited memory. The language can be enhanced almost indefinitely and the user's own operators and functions can be built up.

£293^{·25}
(inc. VAT)

A wide range of software for Nascom also available.

When ordering disks, please specify format.

Value - MicroValue - Micro

LOW COST SYSTEMS

Dragon 32

A powerful colour computer for under £200.

- * 32K RAM
 - * 6809E Microprocessor
 - * Extended Microsoft Colour BASIC
 - * 9 Colour, 5 Resolution Display
 - * Sound through TV 5 octaves, 255 tones
 - * Advanced Graphics
- Full range of Dragon software available.

FREE
cassette with
every Dragon
purchased.



£199.50
(£173.47 + VAT)

Sinclair ZX81

Now available through MicroValue—a real computer for less than £50!

- * Sinclair ZX81 Computer **£49.95** (£43.43 + VAT)
 - * Sinclair ZX Printer **£59.95** (£52.13 + VAT)
 - * 16K ZX RAM PACK **£29.95** (£26.04 + VAT)
 - * ZX81 Learning Lab **£19.95** (£17.35 + VAT)
- from **£3.95 inc VAT**



THE NEW



SHARP MZ80A

FREE SOFTWARE!

Home budget, bank reconciliation, SPACE INVADERS, STAR TREK, SCRAMBLE, bank loan calculator, mortgage calculator + 7 other games.

Educational—Geography, Maths., Spelling + 4 part BASIC tutorial.

Electronic magnificence from Sharp

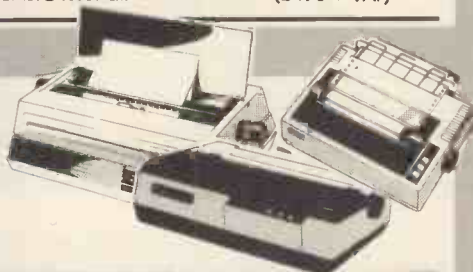
Z80A C.P.U. · 48K RAM · 4K ROM · Industry standard Qwerty keyboard with numeric pad · 9" GREEN C.R.T. · 1200 baud cassette · Music and sound · Real time clock · Enhanced BASIC · Full editing facilities · Internal expansion.



£546.25 (£475 + VAT)

PRINTERS

- Epson MX80 Type III **£399.95 inc. VAT**
- Epson MX80 FT Type III **£445.95 inc. VAT**
- Epson MX100 Type III **£569.95 inc. VAT**
- NEC 8023A **£389.95 inc. VAT**
- SEIKOSHA GP100A **£246.95 inc. VAT**

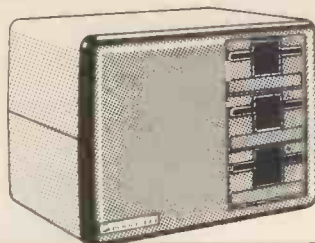


Daisy Wheel Printer:

Smith-Corona TP-1 **£557.75 inc. VAT**

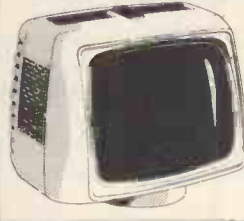
Quantum QM 2000 COMPUTER SYSTEM

- * Twin Z80A Microprocessors
- * 64K Dynamic RAM
- * 2.4 megabytes of formatted disk storage capacity
- * 80 x 25 screen format
- * 160 x 75 pixel graphics
- * Programmable character generator
- * Cassette interface
- * RS232 serial printer interface
- * Centronics parallel printer interface
- * Light pen interface
- * 128 Character buffered keyboard input
- * CP/M 2.2
- * Extensive in-built expansion capability
- * Modular design for reliability and ease of maintenance



£2250
+ VAT

Phoenix P12 Monitor



A high quality data display monitor, ideal for all Nascom and Gemini systems. 20MHz resolution. Available in amber or green phosphor.

£126.50
(£110 + VAT)

MICROVALUE DEALERS:

AMERSHAM, BUCKS

Amersham Computer Centre, Oakfield Corner, Sycamore Road. Tel: (02403) 22307

BIRMINGHAM B5

Skytronics MBM, 80 Bristol Street, Tel: 021-622 6436

BRISTOL

Target Electronics Ltd., 16 Cherry Lane. Tel: (0272) 421196

COLCHESTER

Emprise Electronics Ltd., 58 East Street. Tel: (0206) 865926

EGHAM, SURREY

Electrovalue Ltd., 28 St. Judes Road, Englefield Green. Tel: (07843) 3603

IPSWICH

MDW (Electronics), 47/49 Woodbridge Road East. Tel: (0473) 78295

LEEDS

Bits and P.C.'s Computer Products Ltd., Leeds Computer Centre, 60/62 Merriion Centre. Tel: (0532) 458877

LONDON W2

Henry's Radio, 404 Edgware Road. Tel: 01-402 6822

LONDON SW11

OFF Records, Computer House, 58 Battersea Rise, Clapham Junction. Tel: 01-223 7730

MANCHESTER M19

EV Computing, 700 Burnage Lane. Tel: 061-431 4866

NOTTINGHAM

Computerama, (Skytronics Ltd.) 357 Derby Road. Tel: (0602) 781742

Telephone orders welcome



**JOIN THE
COMPUTER
PROFESSIONALS**

MicroValue
REAL value — from the Professionals

UK101 – OHIO SUPPORT

Premier Publications provides a wide range of add-ons for UK101 and OHIO owners, from manuals to full disc systems. Below is a small part of our range. A full catalogue is available on receipts of an A5 SAE.

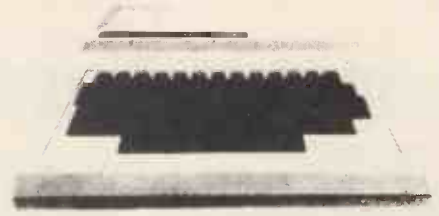
Product	Price inc VAT
SCREEN ENHANCEMENT KIT – 32 x 64, + 19 other screen sizes, all software selectable!	£55.95
BASIC 4 EPROM – cassette filenames, verify, crash recovery etc	£13.95
BASIC 5 EPROM – 17 new BASIC words inc. PRINTUSING, PRINTAT, GETKEY, HLIN, VLIN	£19.95
BASIC X EPROM – tape data handling, sound, printer, IF... THEN... ELSE, REPEAT... UNTIL	£19.95
CODEKIT EPROM – Assembler/disassembler. Address transparent	£19.95
TOOLKIT II EPROM – renumber, find, delete, view, controlled list, replace, etc	£19.95
WORD WIZARD EPROM, disc or tape – multi-featured Word Processor	POA
CEGMON – our standard upgrade monitor	£17.25
MINI EPROM BOARD – used to fit any of our EPROMS (kit)	£16.95
FLOPPY DISC CARD – takes up to four 5.25in drives, OS1 compatible (kit)	£49.95
J1 Buffer Board – provides essential buffering for expansion (kit)	£19.95
32K DYNAMIC RAM CARD – superb value (built only)	£69.00
Motherboard – gives 8 slot expansion capability, 5a PSU, (kit)	£29.95
TEAC Disc Drive – cased with PSU	£229.95
Dual TEAC Drives – enclosed in single case with PSU	£379.95
ROM DOS – DOS using BASIC-IN-ROM for fast, economical results (2 disc set)	£19.95
LINK 65 – vital routines for 65D users, DUMP, CREATE, etc	£19.95
SOUND/VIA Board – includes sound chip and 2 VIA chips!	£53.95
Daisywheel printers – RS232, superb print quality	£885.00
SOFTWARE – many programs available	POA
FORTH – disc an extremely versatile language	£49.95

NEW ADDITIONS

High Resolution Graphics Board – 512 x 256 resolution, takes no USER RAM	POA
Colour Board – 16 colours, stable display	£59.95
Programmable Character Generator – 256 characters, 3 software selectable EPROM slots	POA
ENCODER EPROM – Advanced Assembler/Disassembler	£24.95
DISKS – 10 top quality diskettes in box	£17.95
VORTEX – advanced full feature DOF	£49.95

DRAGON 32 MAIN AGENT AND SERVICE AGENT

The superb
new
DRAGON 32
features



£199.50 including free cassette lead

- * 32K RAM, with 26K still available with HRG. Expandable to 64K.
- * 256 x 192 High Resolution Graphics, three other graphics modes.
- * 6809E – a thoroughly modern processor.
- * Nine colour display – monitor or T.V. output.
- * Advanced 16K Microsoft Colour BASIC.
- * Games cartridge slot from £18.95
- * Facilities for Joysticks.
- * Disks coming soon.

POSTAGE & PACKING:

**SOFTWARE 75p. EPROMS/DISCS 95p.
HARDWARE £1.75 per item, max. £5.00.
ALL PRICES INCLUDE VAT.**

Prepaid or credit card orders normally despatched by return.

TURBO

BASIC COMPILER

for TRS80 and Genies

Premier's WORD4WORD word processing program has been a best-seller since the day of its release. It's author David, has now produced his latest masterpiece which exceeds even W4W's incredibly high standards, **T U R B O**.

TURBO will compile any standard TRS80/GENIE disk BASIC program.

It will cope with any TRS Disk BASIC command, including full random and sequential file access. TURBO recognises and compiles almost all TRS/GENIE BASIC words (with several very minor exceptions), except for a few immediate mode words such as LIST, SYSTEM, DELETE, etc, which shouldn't be in your program anyway!! It can handle all usual programming techniques (jumping out of incomplete FOR...NEXT loops, for example), and, more importantly, all disk file words.

TURBO compiles the entire BASIC program – it does not 'avoid' difficult parts of the program and leave the user with several routines to access from the remaining BASIC (as some so-called 'compilers' do). Nearly all your BASIC programs will compile WITHOUT ANY ALTERATION WHATSOEVER, to give a fantastic improvement in running time. Graphics will now appear instantly to screen! TURBO contains its own 'garbage collection' routine, making its ability to manipulate strings for sorts, etc, very impressive.

Many BASIC compilers require that you go through the program first and alter parts they are unable to interpret. With TURBO, the only changes you are likely to have to make is to move DEFINT, DEFSTR, and DIM statements to the beginning of your program – not very difficult!!!

TURBO will compile all BASIC programs using double precision arithmetic – many comparable compilers cannot even do single precision arithmetic – TURBO can!!

Operation of TURBO is simple type in its filename, the filename of the BASIC program, then sit and watch as it rapidly lists through your program, compiling as it goes along. If TURBO finds something it cannot interpret (syntax errors in your coding, illegal use of BASIC words, etc), compiling halts and an error message is generated under the line in question. As well as being an excellent compiler, TURBO can also be used to check for correct syntax through an entire BASIC program in seconds!

TURBO is flexible. Options allow direct spooling from disk (thus saving memory space), memory protection for machine code programs, and integration of the run-time package with the compiled program. A special VARS facility allows you to print out variable values during a halt in the compiled program – invaluable for debugging!!

TURBO is available NOW at a special introductory price of £59.95 inc VAT (+95p P&P). It requires at least one disk drive, and a minimum 32K RAM. An application form is below.

Please send me TURBO as soon as possible!

NAME

ADDRESS

Machine (TRS80 Model I or III or GENIE), and DOS used

I enclose £60.90 CREDIT CARD/CHEQUE No Signed

PREMIER BUSINESS SYSTEMS

208 CROYDON ROAD, ANERLEY, LONDON SE20 7YX

Telephone: 01-659 7131.

ACCESS/BARCLAYCARD ORDERS WELCOME



OLIVETTI M20 16-BIT MICRO

- Engineering
- Business
- Education
- Science



LEASE from £16.24 per week.

EPSON HX-20 MICROCOMPUTER

Portability for programmability anywhere. Built-in printer and LCD screen. Ask us about EPSON HX-20 accessories.



only
402.00

SHARP PC-1211 POCKET COMPUTER

■ Ideal for school, office and home use, with easy-to-understand BASIC language programming. Optional Cassette Interface allows connection to almost any tape recorder. Printer also available.



only
49.95

RANK XEROX 820-II

Wordprocessing
Forecasting
Budgeting
Planning



For the businessman looking for a superb business-oriented microcomputer system.
LEASE from £13.14 per week.

PRINTERS

EPSON MX-80 T/3 Dot Matrix P.O.A.
EPSON MX-20 FT/3 £320.00
EPSON MX-100/3 100 c.p.s. £420.00
SEIKOSHA GP100 £195.00
Paper Tiger 450 £399.00
APPLE Interface Cable P.O.A.
RS232 Interface P.O.A.
BBC Microcable P.O.A.

SHARP PC-1500 COLOUR COMPUTER

16K ROM, Extended BASIC, with 3.5K usable RAM, expandable to 11.5K.

PC-1500 £139.95 CE152 £34.75
CE150 £124.95 CE153 £69.55
CE158 RS232 £130.45 CE155 8K £69.55



APPLE ///

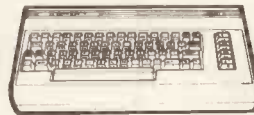
128K Computer
Green-Screen
APPLE ///
Monitor
System
Software



LEASE from £14.77 per week only
1995.00

COMMODORE VIC-20

Colour and sound at our lowest price yet!



VIC 20 Software P.O.A. only
COMMODORE 64 P.O.A. 121.75

SHARP MZ-80A COMPUTER

Z80A CPU, 48K RAM,
4K ROM, 9" Green CRT



FREE SOFTWARE !
Home budget,
banking, etc only
479.95

APPLE II BUSINESS SYSTEM



- 48K Computer
- 12" Green Monitor
- Disk Drive with Controller

LEASE from £6.35 per week only
859.95

ATARI 400 COMPUTER



16K Computer + BASIC Cartridge only
195.70

SINCLAIR ZX81

A real computer for under £50.00

ZX81 £43.43
ZX Printer £52.13
64K RAM £79.00
32K RAM £49.95
16K RAM £26.04
Hi-Res £52.00
Software £3.95



IBM PERSONAL COMPUTER



64K RAM
(Expandable to 768K)
Internal Disk Drive
BASIC, PASCAL,
COBOL, FORTRAN

LEASE from £20.64 per week only
2795.00

ATARI 800 COMPUTER



16K Computer + BASIC Cartridge only
347.95

CASIO

FX702P £69.55
FX700P £69.55
PC-100 £60.85
FX3600P £19.95
FX801P £303.85



FX702P
only
69.55

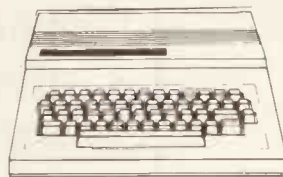
BOOKS

At DEANS we stock a complete range of books for computer users. Whether you want to learn about machine-language or BASIC, games programs or business programs, we probably have the book for you.

Why don't you come in and have a look at our fine selection? If you're out of town, or can't get to Kensington, then send us an S.A.E. and we'll rush you our books catalogue.

Remember: it's books for learning, and it's DEANS for the best in computer books!

DRAGON 32



only
169.20

HEWLETT PACKARD

HP-11C £61.95 Printer ... £290.95
HP-15C £82.95 Cassette £329.95
HP-12C £91.95 HP-32C £39.95
HP-16C £91.95 HP-75 P.O.A.
HP-41CV £189.95
HP-41CV £145.95

DEANS
of Kensington

191, Kensington High Street
London W8
200 Yards from High Street Kensington
Underground Station

Send orders with cheque payable to
DEANS. State goods required.
SECURICOR delivery add £6.00

Prices are subject to change without
notice. Add 15% VAT.

Tel 01-937-7896/938-1588

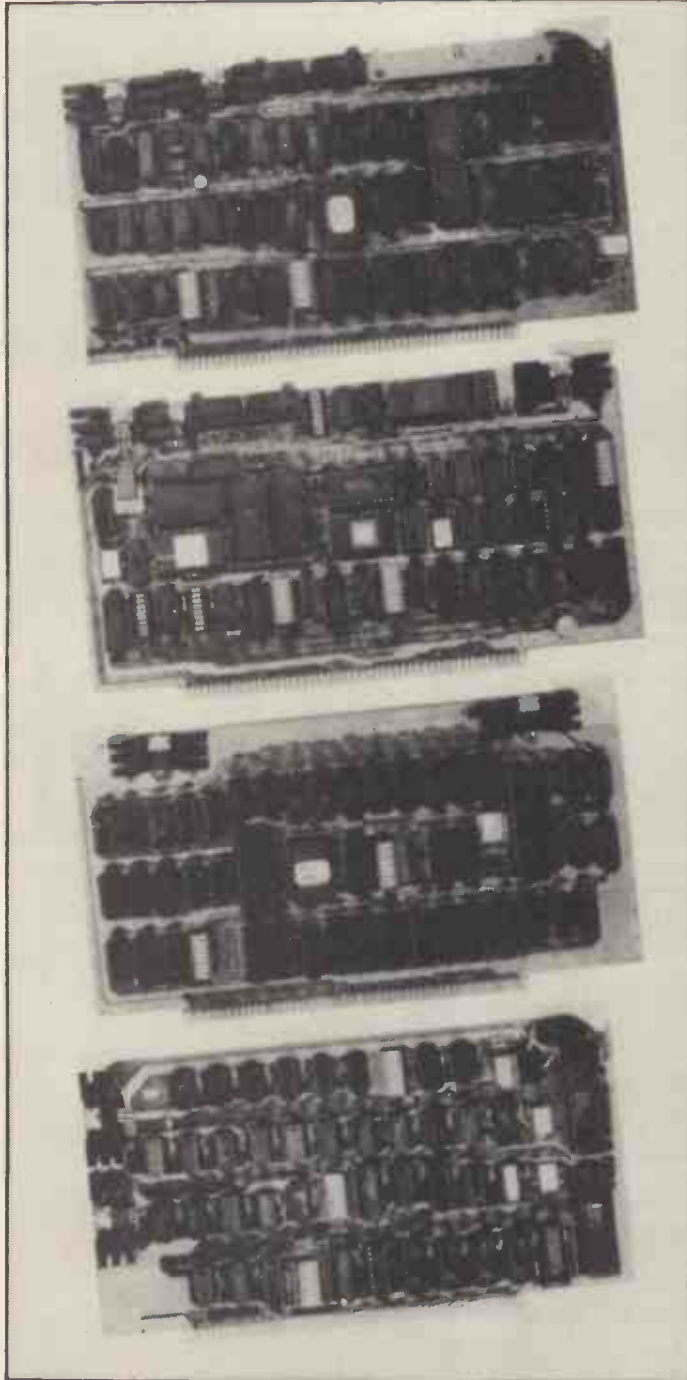
The best range of S-100 boards available

CompuPro
SYSTEMS

CompuPro
SYSTEMS

CompuPro
SYSTEMS

CompuPro
SYSTEMS



CPU 68K 68000 to IEEE 696/S-100 specifications and works with 8 and/or 16 bit memory. CPU 68K also includes a socket for the optional MMU.

CPU 86/87 IEEE 696 S100 board with 8086 chip, sockets for 8087 and 80130 firmware.

CPU Z S100, 6MHz Z80 processor board under £160 (+ vat).

Interfacer 1 Two RS-232C serial ports.

Interfacer 2 Three parallel ports plus RS-232C serial ports (2 sync/async).

Interfacer 3-8 Eight RS-232C serial ports (2 sync/async, 6 async).

Interfacer 4 Three RS-232C serial ports, one parallel port, one Centronics/Epson parallel port.

System Support 1 Clock/calendar; RAM/ROM; math processor options; RS-232C serial port interval timers and interrupt controllers.

Motherboards High performance; Shielded with active termination; 6 Slots; 12 Slots.

MPX 1 Multi user system front end processor with 16K on board RAM.

DISK 1 High Speed DMA floppy disk controller.

DISK 2 High Speed DMA hard disk controller for SA4000/Fujitsu F2300 interface.

DISK 3 High Speed DMA hard disk controller for SA1000/ST506 interface.

RAM 16 64Kx8 or 32Kx16 — works automatically with 8 or 16 bit systems.

RAM 17 64Kx8; ultra low power.

RAM 21 128Kx8 or 64Kx16 — works automatically with 8 or 16 bit systems.

M DRIVE The first "solid state disk drive" can increase operating speed up to 3500%. M DRIVE software with 128K or static RAM.

DESKTOP Enclosures with shielded 20 slot motherboard, power supply, fan, dust filter, rugged all metal construction.

DUAL FLOPPY DISK SUB SYSTEM available with double sided/density drives.

Contact Comcen for more details & price list.

Dealer terms available.

CompuPro
SYSTEMS

EUROPEAN DISTRIBUTOR

COMCEN
TECHNOLOGY LTD

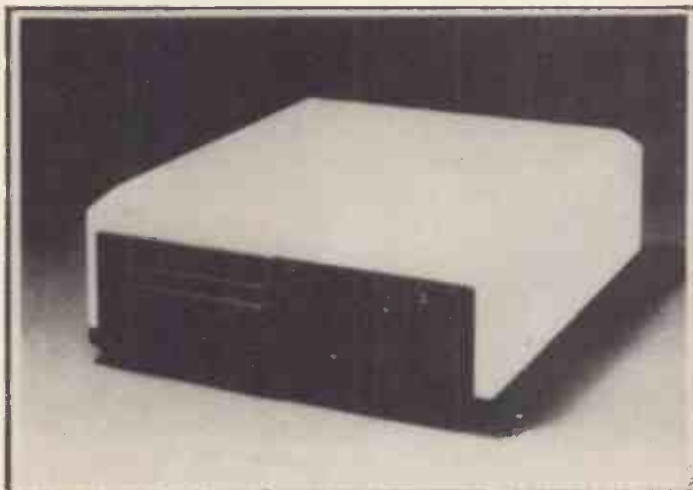
Comcen Crystal 8 Micro-Winchester

Desktop micro-computer with technology plus features ...

COMCEN CRYSTAL 8

- 5 Megabytes fixed Micro winchester
- 8 inch floppy disc backup
- S100 mainframe
- CP/M and TurboDOS operating systems
- Serial terminal interface
- Serial and parallel printer interface
- Spare high speed parallel channel
- One year factory warrantee
- On-site maintenance option

£3995 (+ VAT)



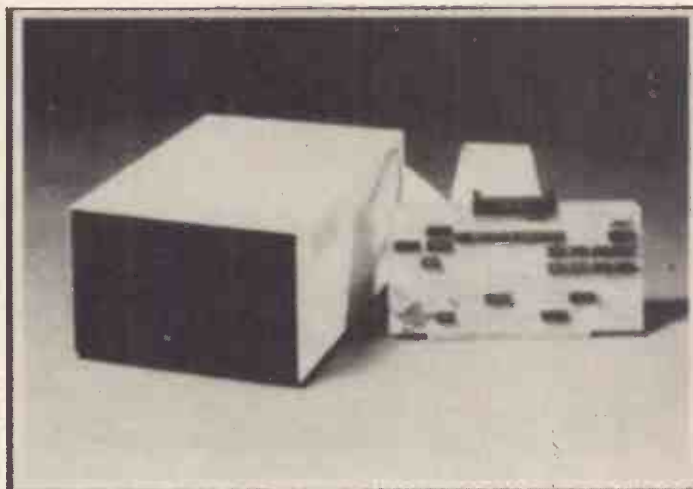
Sub System

5 megabyte add on
for all S100
mainframes

- S100 card
- Connecting interface cable
- 5 megabyte drive and power supply in attractive case
- CP/M installation software on eight inch disc

£1650 (+ VAT)

Call for more details.
Dealer enquiries invited.



COMCEN are EUROPEAN DISTRIBUTORS for

CompuPro™

Fairbell
Electronics

SD
SYSTEMS
A SUBSIDIARY OF THE MICHIGAN GENERAL CORPORATION

45/46 WYCHTREE ST.,
MORRISTON,
SWANSEA SA6 8EX

Tel: (0792) 798337 (24 hours) 796000 (day)

COMCEN
TECHNOLOGY LTD

CP/M-86 TOOL BOX

**SPECIAL
OFFER
WORTH £845
FOR £500**



**for
software
developers**

FIVE FREE STANDING MODULES

(1) BASE

ASMT0A86, BASTOASC, CPN, DISKMAP, DUMP, DX, FILEDIT, FILM, GETFILE, MACT0A86, MAP, PROFILE, REPLAY, SECEDIT, SHUTTER, SNAP, TXTCPN, DIRECTORY EXTENDER **£249.00+VAT**

(2) SOURCERER

£149+VAT

(3) TRX

£149+VAT

(4) SCREENWRIGHT +KEYBASE

£149+VAT

(5) SCREENPLOT MANUAL ONLY

**£149+VAT
£25 (NO VAT)**

NB If all 5 modules purchased, a special price of £500+VAT for the complete set will apply plus a special Programmer's Document Case will be supplied FREE.

CP/M86 Toolbox is a product of Island Software

To:
EXPORT SOFTWARE INTERNATIONAL LTD
23 South Oswald Road
EDINBURGH EH9 2HH (Phone 031-667 6000)

PLEASE SEND ME: (tick appropriate box)

THE COMPLETE TOOL BOX (special price £500+VAT)
(Plus my free Document Case worth £25)

or MANUAL

BASE SOURCERER TRX

SCREENWRIGHT SCREENPLOT

I enclose a cheque for £_____ payable to ESI Ltd
or

Please send me more information on the
CP/M-86 Tool Box

Name: _____

Company: _____

Address: _____

PCW

The XEROX 820 series needs _ _ _



_ professional software for business

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

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

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

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

ISBS-F is available as individual modules or bundles so that configurations can fit the exact business environment. Each

module is supplied on floppy disk with comprehensive documentation.

ISBS-F can be used on either the 5 $\frac{1}{4}$ " or 8" versions of the Xerox 820 microcomputer. The system runs under CP/M* with a minimum of 48k memory, dual floppy disks and 132 column printer.

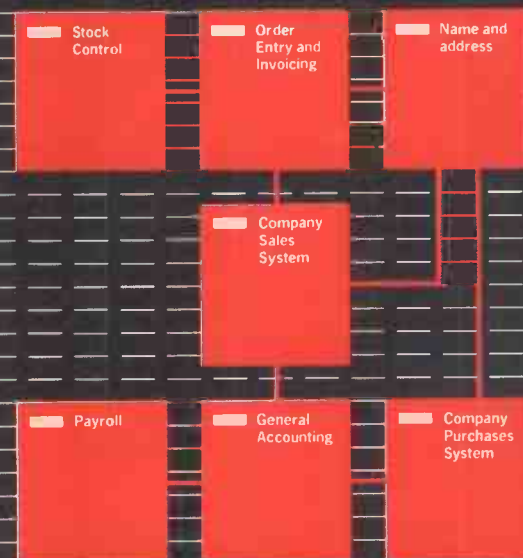
In addition to ISBS-F, to provide for the larger business user, we have the ISBS-W suite. ISBS-W is an advanced integrated business system for users of hard disk microcomputers, operating in a single or multi-user environment.

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

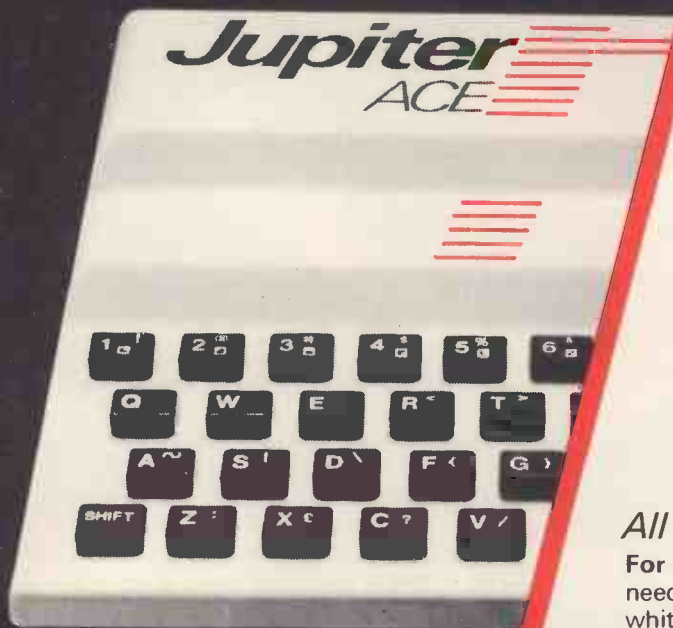
Graffcom Business Applications
102 Portland Road London W11 4LX 01-727 5561

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

G R A F F C O M



Jupiter ACE



"The Ace is an excellent way of using FORTH"

Popular Computing Weekly

"FORTH is an easy language"

Byte

The Jupiter Ace personal computer runs in FORTH, an easily understood language, typically four times as compact and ten times as fast as BASIC. Before the Ace all personal computers used BASIC and FORTH was only available to a privileged few.

The Jupiter Ace also features a full-size moving-key keyboard, high-resolution graphics, sound, floating point arithmetic, a fast and reliable cassette interface and 3K of RAM.

If you own a personal computer you will be aware of the limitations of BASIC. You know how slowly your programs run and how quickly your computer's memory gets filled. The Jupiter Ace is your answer.

If you already know FORTH, the Jupiter Ace closely follows the FORTH 79 standard with extensions for floating point, sound and cassette. It has a unique and remarkable editor that allows you to list and alter words that have been previously compiled into the dictionary. This avoids the need to store screens of source, allowing the dictionary itself to be saved on cassette. Comprehensive error checking removes the worry of accidentally crashing your programs.

All inclusive price

For **£89.95** you receive your Jupiter Ace, a mains adaptor, all the leads needed to connect to most cassette recorders and T.V.s (colour or black and white), a software catalogue and a manual.

The manual is a complete introduction to the world of personal computing and a course in FORTH programming on the Ace.

Even if you are a complete newcomer to computers, the manual will guide you step by step from first principles to confident programming.

The price includes postage, packing and V.A.T.

The Jupiter Ace is backed by a full 12 month warranty.

Available soon

Plug-on parallel printer interface.

For around £20.00 this will connect your Jupiter Ace to anything from high-speed dot matrix to letter-quality daisy wheel printers.

Plug-on 16K Memory Expansion

For around £30.00 you will increase the memory of your Jupiter Ace to 19K giving you instant access to enormous amounts of information.

Software

A catalogue will be sent with every machine, and includes, initially, programs for education and entertainment.

FORTH Finishes First!

Speed Comparison Chart showing times in seconds to perform one thousand operations.

Type of Operation	Jupiter Ace	BBC Micro	Vic 20	Spectrum	ZX81
Empty loop	0.12	0.67	1.3	4.2	17.7
Print a number	7.5	13.5	26	19	430
Print a character	0.62	1.3	3.1	7.5	24
Add two numbers	0.45	1.4	5.5	7.5	28
Multiply two numbers	0.9	1.6	6.5	7.5	32

Because of the difficulty in devising exactly equivalent programs, these measurements should only be taken as a guide.

only £89.95

Designed by Jupiter Cantab

Computer Designers Steven Vickers and Richard Altwasser played a major role in creating the ZX Spectrum and then formed Jupiter Cantab to develop advanced ideas in personal computing. The Ace is the result, another all-British computer to lead the world.

Technical Information

Hardware

Z80A running at 3.25 MHz.
8K bytes ROM
3K bytes RAM

Keyboard

40 Moving-key keyboard with auto repeat on every key and Caps Lock.

Screen

Memory mapped 32 column x 24 line flicker-free display with upper and lower case ascii character set.

Graphics

Chunky graphics (64 x 46 pixels) may be plotted, un-plotted or over-plotted (XOR operation). Also, the entire character set (128 characters and their video inverses) may be redefined allowing intricate shapes to be drawn with a resolution equivalent to 256 x 192 pixels.

Control Structures

IF-ELSE-THEN, DO-LOOP DO-+LOOP, BEGIN-WHILE-REPEAT, BEGIN-UNTIL, all may be mixed and nested to any depth.

Programming in FORTH

Programming in FORTH

FORTH programs are constructed without line-numbers, as words which are defined in terms of other words that already exist. Consider the following definition of the word STARS. Comments are in parenthesis and have no action.

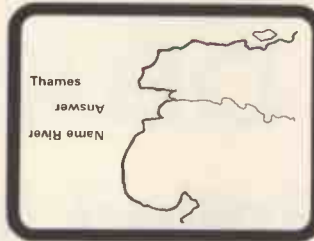
```
STARS      (: starts word definition)
" *** "   (print 3 asterisks)
200 100 BEEP (play a note for
           100 mSecs)
```

The semi colon at the end finishes the word definition. Now, whenever you say STARS the computer will print out 3 asterisks and sound a short tone. (Notice how the word BEEP comes after the numbers it uses, 200 and 100. This characteristic occurs throughout FORTH so that you write, for instance, 28 76 + instead of 28 + 76.)

The Jupiter Ace already has 140 FORTH words defined in ROM.

The Jupiter Ace is available only by mail order. Please allow up to 28 days for delivery.

Send cheque or postal order with the form to:—
JUPITER CANTAB, 22 FOXHOLLOW, BAR HILL,
CAMBRIDGE CB3 8EP



In Schools Teachers already know how quickly children take to computing, and the Jupiter Ace is an ideal introduction. FORTH is an easy and important language to learn and by making learning fun, the Ace can help to teach science, music and many other subjects.



In Laboratories For monitoring and controlling experiments, the Jupiter Ace has many advantages. The language is perfect, even the Jodrell Bank Radio Telescope is controlled in FORTH. The Ace expansion port enables it to be interfaced to almost anything, and the built in quartz timer allows experiments to run all weekend.



At Home The Jupiter Ace is powerful enough to play games as complex as Chess and with sound and high resolution graphics, action games written in FORTH will stretch your reaction speeds to their limits.



In the Office Stock control, Accounts and Financial forecasts are all possible on the Jupiter Ace. With a printer and extra memory attached you can do word processing as well.

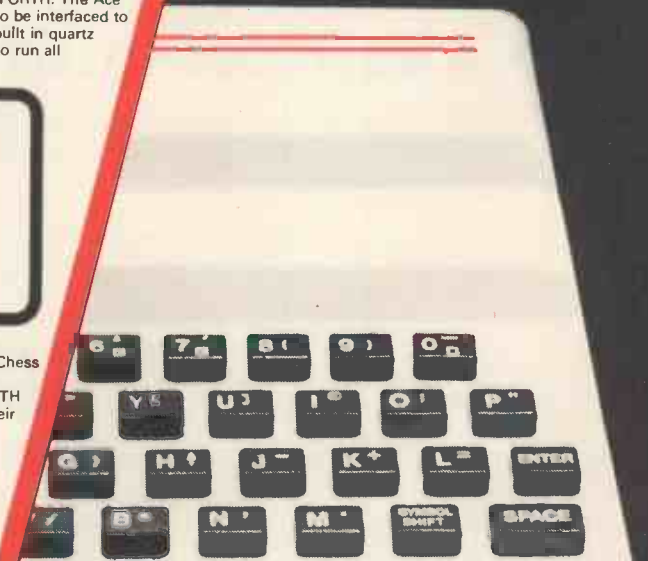
"FORTH is very flexible"

"FORTH is compact"

Electronics and computing

"FORTH is in general very much faster than BASIC"

Computing Today



ORDER NOW!

Please send me:—

JUPITER ACE MICROCOMPUTER(S) @ £89.95.

Name. Mr/ _____
Mrs/Miss _____
Address _____

_____ E

TABS PEACHTREE DBASE II

Rolled into one
gives you

UNIQUE

A BUSINESS SOLUTION WITH A DIFFERENCE !

"Unique" offers you one of the most comprehensive suits of CP/M based integrated business systems. Only with "Unique" can you customise a package to any degree without one programme change.

Using the "Unique Modifier", systems can be totally tailored or created in a matter of hours; in fact you'll wonder why you ever bothered with other software.

"UNIQUE" TURNS YOUR SOFTWARE NIGHTMARES INTO DREAMS

APPLICATIONS COVERED:

PRICES FROM: £250

Sales Ledger with Invoicing
Purchase Ledger
Nominal Ledger
Management Accounts
Incomplete Records
Sales Order Processing
Stock Control
Clothing Import/Export
Motor Dealers Package
Freight Forwarding Accounting

TELEPHONE 01-486 7498

SGS SOFTWARE PRODUCTS LIMITED 66 MARYLEBONE LANE,
LONDON W1

**NOW AVAILABLE
UNDER 16 BIT
MS DOS**

ARBORCRAFT

Micro Computer Mobile Work Stations

High quality 'no glare' melamine finished work surface with post formed long edges. Reinforced polyester coated steel support frames and large twin wheeled castors for ease of movement. Keep your micro off the dining room table and always available.

Choice of 3 models from £98.85 plus VAT. (Access).
 Money back guarantee.
 Allow 21 days delivery.
 Business enquiries welcomed.
 Phone or send for detailed brochure and order form.



Arborcraft Limited, 137 Watling Street, Radlett, Herts WD7 7NQ
 Telephone Radlett (09276) 3126, 24 hour answering service.

Please send me your illustrated brochure and order form for the Arborcraft Micro Computer Mobile Work Stations.

Name _____

Address _____

Post code _____

Buyers' Guide



**NOW
 Oume/Diablo
 Compatible!**

Manufacturer: Olivetti

Model: DY 311/SI
 Daisywheel printer

Features: 32 cps – high speed skip –
 shortest path seeking –
 quiet operation – bi-directional
 – range of paper handling
 devices – plus more

After Sales Service: Supported nationally

Availability: Ex-stock – RS232 Serial Interface

Price: Only £1150.00 (ex VAT)

Recommendation: Best buy.

Distributor: Millbank Computers Ltd.

Millbank Computers Limited
 Millbank House, Amyand Park Road
 Twickenham TW1 3HN.
 Tel: 01-891 4691.

NEW

Double Duty... Single Price Low Cost, Daisy Wheel Quality Typing & Printing BEST PRICES AVAILABLE

FEATURES

- **Interchangeable Daisy Wheel**
- **Automatic Correction** (10 Char Memory)
- **Foreign Keyboard Selection**
- **Interchangeable Ribbon Cartridge**
- **11 Inch Printing Line Length**
- **Standard RS-232C Serial Interface**
- **Hardware Handshake & Software Protocols**
- **Selectable Baud Rates** (110, 300, 1200)
- **165 Character Buffer**
- **Approx 12 CPS Printing Speed**
- **UNIVERSAL, SERIAL COMPUTER INTERFACE**
 (adapts to any RS-232C computer port)

Praxis 35 plus Olive 80 £435.

Olive 80 plus instal kit £145

All prices plus VAT

Tel: 045 088 297



OLIVETTI PRAXIS 35

OLIVE-80

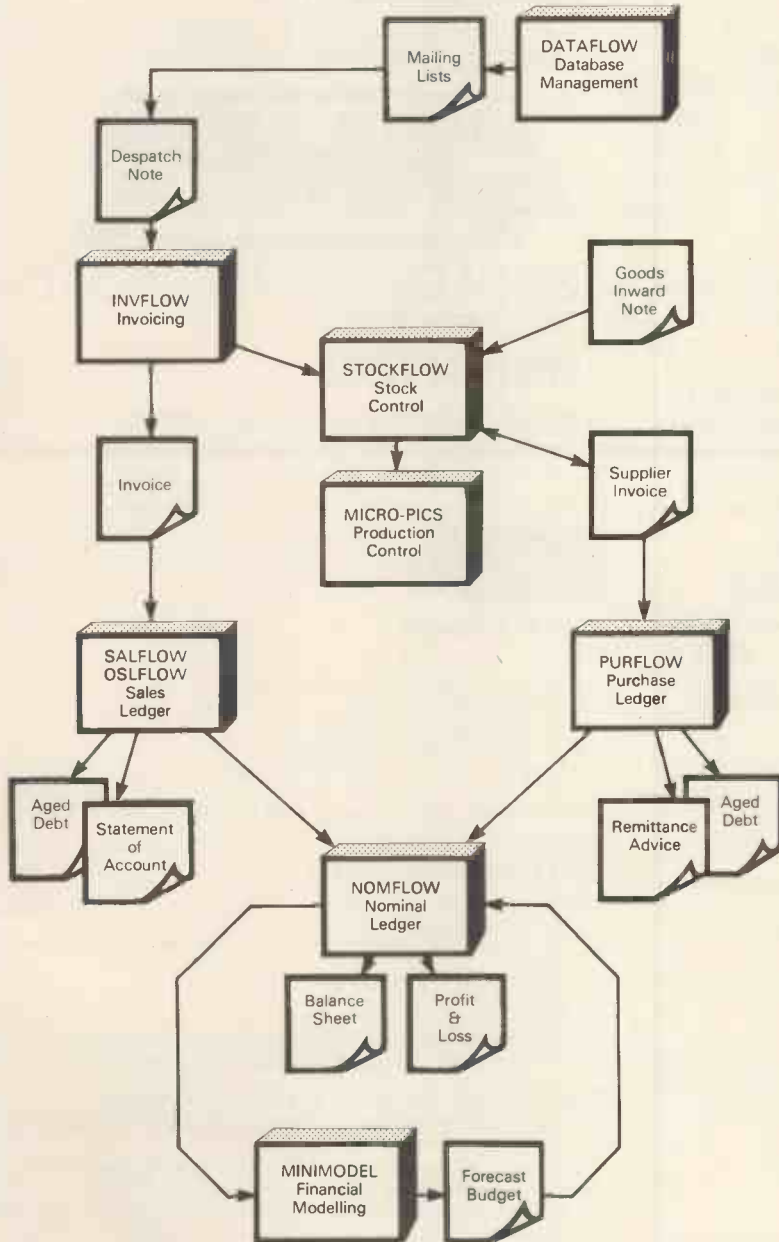
YOUR COMPATIBLE COMPANION

olive branch
 Association, Ltd.

A BETTER WAY TO DO BUSINESS

GREAT NORTHERN Computer Services was founded in 1979 to provide users and dealers of Apple II and CP/M based micro-computers with a source of first-class software, consultancy and support. Since then we have provided software packages, training courses and consultancy to more than 150 leading micro-computer dealers and major organisations like ICI, Plessey, Post Office, North Eastern Gas Board, British Steel etc.

DIAGRAM OF GREAT NORTHERN PACKAGES AS USED BY A SMALL BUSINESS



Amongst the software packages we supply are:-

For CP/M based micro-computers

SALFLOW	Balance Brought Forward type Sales Ledger package	£250.00
OSFLOW	Open Item type Sales Ledger package	£300.00
INVFLOW	Invoicing package	£295.00
PURFLOW	Purchase Ledger package	£250.00
NOMFLOW	Nominal Ledger package	£250.00
STOCKFLOW	Stock Control package	£250.00
BILLFLOW	Professional Client Billing (Invoicing & Sales Ledger) package	£375.00
MINIMODEL	Financial Modelling system	£299.00
DATAFLOW	Database Management and Information Processing package	£ 99.95
MICRO-PICS	Production and Stock Control with Bill of Material explosion	£595.00
BASKAM	Index Sequential routines for use with MBASIC	£ 95.00
MAGSAM	Index Sequential routines for use with CBASIC	£110.00
MAILFLOW	Automatic Mailing System (Interfaces to DATAFLOW)	p.o.a.

For Apple based micro-computers

IAS	Inter-Stat Statistical package	£150.00
AMR	Advanced Mathematical routines	£150.00
IFO	Information File Organiser Database Manager package	£120.00
VMD	Video Message Display system	£150.00
MIN	Micro Inventory stock control package	£150.00
MGL	Micro-General Ledger Nominal ledger and accounting system	£150.00
COLOURING BOARD	Paddle drawing & graphics system	£ 75.00

So - whatever your micro-computer software needs - Contact

GREAT NORTHERN

Computer Services Limited

16 TOWN STREET, HORSFORTH, LEEDS LS18 4RJ TELEPHONE 0532-589980

it's a better way to do business **Tel. 0532 589980**

ATARI



**NEW LOW
PRICES**

400 (exc BASIC)	£173.04
400 (inc BASIC)	£216.52
800 (exc BASIC)	£282.60
800 (inc BASIC)	£326.00

ATARI PACKAGE DEALS

400 (16k) + BASIC + Recorder + Joystick + 5 Blank Cassettes + Free Programs	£251.30
400 (32k) + All above items	£307.83
800 (48k) + All above items	£460.00
800 (48k) + Disk Drive + Joystick + 3 Blank Disks + Demo Disks + 3 Apx Programs	£745.00

SHARP

MZ80A	£434
MZ80B	£899

VIC 20 Now only	£129.95
GENIE 1 & 2	£289
EPSON HX	£402

+ PERIPHERALS + SOFTWARE + BOOKS + MAGAZINES + CHESS COMPUTERS + GAMES FOR ZX81 and APPLE



DRAGON 32

32K + COLOUR + HIGH RES. GRAPHICS + SOUND + TYPEWRITER KEYBOARD + SLOTS FOR JOYSTICKS + CARTRIDGES EXPANDABLE TO 64K
ALL FOR **£173.00 + VAT**

NEW ATARI SOFTWARE

Tumblebugs, Canyon Climber, Shooting Arcade, Pacific Coast Highway, Clowns and Balloons, Protector, Chicken, Slime, Apple Panic, Track Attack — ALL AT **£17.35**

Micropainter £19.56

Shamus (16K/cass) £17.35

+ ATARI, INTELLIVISION & HANIMEX TV GAMES + CARTRIDGES BY IMAGIC & ACTIVISION



24 GLOUCESTER ROAD

Tel: (0273) 698424

BRIGHTON

PLEASE ADD 15% VAT TO ALL PRICES

**ZX SPECTRUM & ZX81
EDUCATIONAL SOFTWARE**

Spectrum Junior Education £5.50

Use your Spectrum to help your children with their school work. This cassette contains eight attractive, easy-to-use programs for the 7 to 11 age group.

Topics include English comprehension, spellings, homophones, junior science, maths and history.

* Entering your own questions and answers allows you to adapt two of these programs for exercises in any subject area.

* Moving colour graphics and sound are extensively used to improve motivation.

* Use the "draw" program to produce pictures, maps and diagrams.

Suitable for the 16K or 48K Spectrum. Program notes are supplied.

O-Level Chemistry (C1) £5.50

This cassette contains four clearly presented revision/tutorial programs. The subject matter has been carefully structured to cover the most important aspects of:

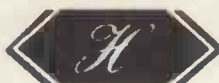
- * Elements, compounds and mixtures.
- * Structure, bonding and properties.
- * Redox, electrolysis and the activity series.
- * Acids, bases and salts.

48K Spectrum and 16K ZX81 versions of the cassette are available. Please specify which you require.

ALL PROGRAMS ALSO AVAILABLE FOR THE BBC MODEL B

CALPAC COMPUTER SOFTWARE
108 Hermitage Woods Crescent, St Johns,
Woking, Surrey GU21 1UF

Overseas orders: £6.50 (\$11.60) per cassette;
includes AIRMAIL postage.



Hilderbay Limited
PROFESSIONAL SOFTWARE

APPLE II Payroll £60

- * All tax codes, all N.I., all rates of pay
- * Monthly, weekly, hourly
- * Up to 50 employees at a time
- * Meets inland revenue specification
- * Very easy to use — no specialists needed!
- * Fast
- * Usual features, and will also compute gross pay backwards from net!

APPLE II Bookkeeper £30.43 (introductory offer)

- * Keeps cash book, petty cash book, etc.
- * You choose headings
- * Prints date, details, total, VAT: then prints amount under correct heading
- * Totals printed and carried forward
- * Sorts entries in date order

APPLE II Demonstration Disc (Payroll and Bookkeeper) £12
Fully Featured SPECTRUM Payroll £21.74. Stock Control £21.74

TAPE ACCESSORIES for Any Computer:

THE MICROCOMPUTER USER'S BOOK OF TAPE RECORDING £3.15 incl. postage.

TEST AND ALIGNMENT CASSETTE: test and adjust your recorder's head and speed. No instruments required! £4.90.

LOADING AID: If your recorder is basically OK, but you have trouble getting the playback level right, our Loading Aid will solve your problems. £5.95.

TAPE RECORDER, aligned and tested for computer use. A simple, but satisfactory, machine. £22 + £2 postage.

5 1/4" floppy disc, guaranteed for life: £23 for ten discs and permanent library box.

Details on request. Add VAT to prices. Everything post free.

Hilderbay Ltd
Professional Software — Since 1979
8/10 Parkway, Regents Park, London NW1 7AA
Tel: 01-485 1059 Telex: 22870

We have 20 years experience in computing

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.

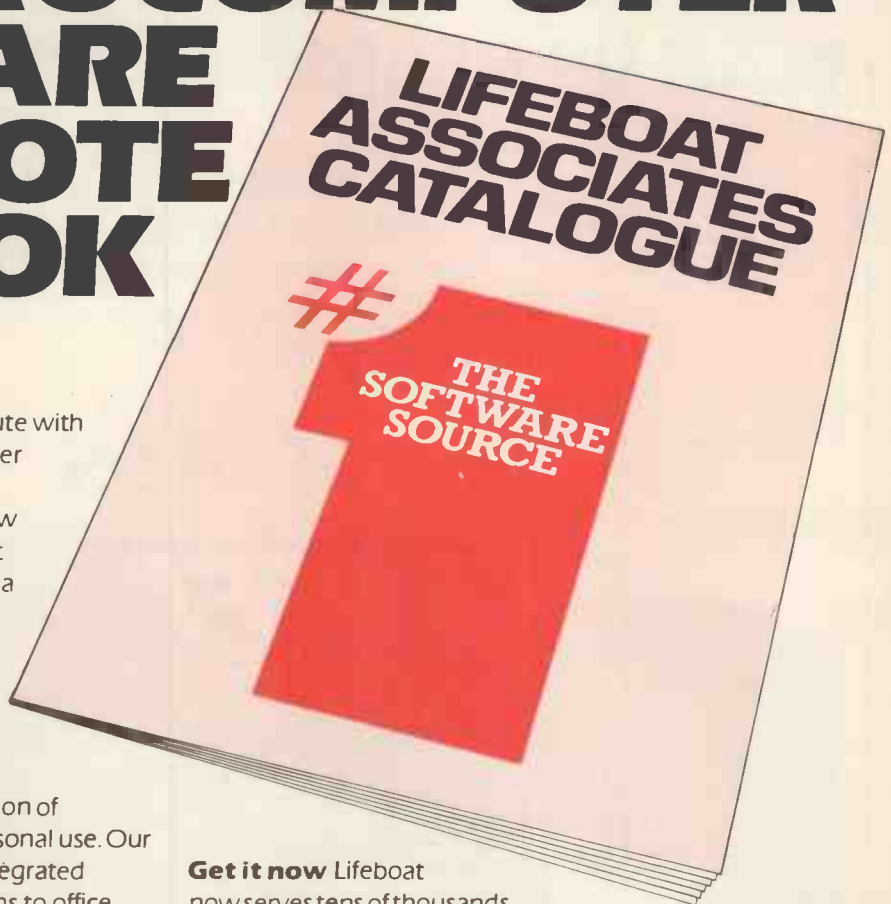
The greatest selection Because Lifeboat is the world's largest publisher of microcomputer software, our catalogue offers you the greatest selection of programs for business, professional and personal use. Our more than 200 programs range from the integrated accounting and professional practice systems 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 LifelinesTM, the monthly magazine that offers comparative reviews, tips, techniques, identified bugs and updates that keep you abreast of change.



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

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

#1 Lifeboat Associates
World's foremost software source

Mail coupon to: Lifeboat Associates

PO Box 125, London WC2H 9LU or call 01-836 9028

Please send me a free lifeboat catalogue.

Name

Title

Company

Address

Postcode

PCW/1/83

Copyright © 1981, by Lifeboat Associates.

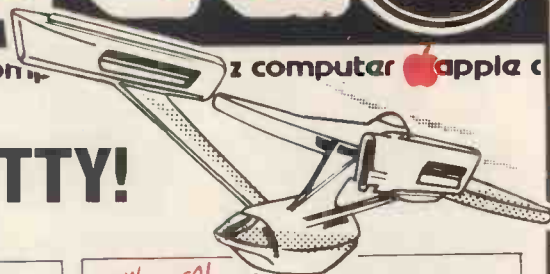
Lifeboat Worldwide offers you the world's largest library of software. Contact your nearest dealer of Lifeboat.

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) **WEST 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)

STARTTECH

Absolutely the lowest prices!

computer apple computer apple computer apple computer z computer apple c



BEAM UP A BARGAIN, SCOTTY!

NEW

pfs™

THE INFORMATION MANAGEMENT SYSTEM WRITTEN IN PASCAL

A powerful, fast, and user-friendly database accounting system now available for your Apple at an incredibly low price.

PFS: DATABASE
£59.95

PFS: REPORT
£49.95

NEW LOW PRICES!

£5 OFF!

16K RAM CARDS
(Pascal CPM: Computer Stop)

WAS ~~£49.95~~ NOW **£44.95**

NEW LOW PRICES!

£5 OFF!

ALL VISI PRICES

	WAS	NOW		WAS	NOW
VISICALC, VISICORP	£105.00	£100.00	VISISCHEDULE, VISICORP	£149.95	£144.95
VISIDEX, VISICORP	£127.95	£122.95	VISITERM, VISICORP	£53.95	£48.95
VISIFACTORY, MICRO	£37.95	£32.95	VISITREND/VISIPLOT, VISICORP	£148.95	£143.95
VISIFILE, VISICORP	£120.95	£115.95	DESK TOP PLAN 11: PERSONAL SOFTWARE	£131.95	£126.95
VISIPILOT, VISICORP	£98.95	£93.95			

NEW LOW PRICES!

MICRO PRO WORDSTAR
SIMPLY THE BEST

WAS ~~£149.95~~ NOW **£135.95**

ADVENTURE

Adventure (Microsoft): Microsoft	£13.95
Ali Baba + 40 Thieves: Quality Software	£17.95
Castle Wolfenstein: Muse	£13.95
Dark Forest: Sirius Software	£15.95
Wizard & Princess: On Line	£14.95
Soft Porn Adventure: On Line	£13.95
Space Adventure: Sierra Software	£14.95
Time Zone: On Line	£40.95
Zork 3: Infocom	£19.95
Zork 2: Infocom	£19.95

BOOK

Beaneath Apple Dos: Quality Software	£9.95
--------------------------------------	--------------

BUSINESS

Address Book (List): Muse	£23.95
Data Factory: Micro Lab	£72.95
Data Factory 5.0: Micro Lab	£139.95
DB Master: Stoneware	£104.95
Magic Window (WP): Artsci	£46.95
Easywriter Pro: Info Unlimited	£115.95
Easy Mailer: Info Unlimited	£87.95
Invoice Factory: Micro Lab	£108.95
DB Utility Packs: Stoneware	£47.95

GRAPHICS UTILITY

Arcade Machine: Broderbund	£19.95
A26E1 Graphics: Sub Logic	£32.95
Hi-Res Secrets: Avant Garde	£60.95

HI-RES ACTION

Alien Rain: Broderbund	£13.95
Anti Ballistic Missile: Muse	£12.95
Apple Panic: Broderbund	£14.95
Flight Simulator: Sub Logic	£18.95
Frogger: On Line	£17.95
Gorgon: Sirius Software	£17.95

Tumble Bug: Datasoft	£17.95
Space Eggs: Sirius Software	£12.95
Space Quarks: Broderbund	£13.95
Swashbuckler: Datamost	£14.95
Hi-Res Soccer: On Line	£13.95

LANGUAGE

Asm Lang: Development Sys: Hayden	£24.95
Expediter 11 Compiler: On Line	£39.95
Fourth 11 (Language): Softape	£31.95
Lisa 2-5 6502 Assembler: On Line	£45.95

STRATEGY GAME

Air Traffic Controller: Avant Garde	£7.95
Robot Wars: Muse	£18.95
Tigers In The Snow: Strategic Simulations	£17.95

UTILITY

Back It Up: Sensible Software	£30.95
Bag of Tricks: Quality Software	£20.95
Deadly Secrets: Broderbund	£17.95
Dossource 3.3 Dos Listing: Lazer	£18.95
Program Line Editor: Synergistic Software	£18.95

HARDWARE

Excel-9 (6809 With "Flex"): ESD Laboratory Co. Ltd	£164.95
23 Key Keypad (Visicalc): Keyboard Company	£101.95
Omnivision 80/24 Video: Computer Stop	£144.95
U Term 80/24 Video Card: U Micros	£151.95
Z80 Softcard: Microsoft	£203.95
10 Meg Hard Disk System: Computer Stop	£1644.95

Z80 CPM (Z80 Softcard Required)

Wordstar: Micropro	£137.95
D Base 11 Manual: Ashton Tate	£33.95
Aids Z80, 8080 Assembler: Microsoft	£57.95
Bstam Micro To Micro: Byrom	£108.95

Please send me:

I enclose cheque/P.O. for

Name:

Address:

Please add V.A.T. to all orders.

Postage paid in U.K. Allow 30 days for delivery. Access & Barclaycard orders welcome on 051-256 8244

PCW.1.83

STARTTECH

63 Lisburn Lane,
Tuebrook, Liverpool L13 9AF

Accounting Business Systems

TABS



SOFTWARE.

THE FIRST CHOICE FOR SOLVING YOUR

BUSINESS PROBLEMS.



With intense competition existing between rival hardware companies, TABS software remains the largest selling accounting business software in the UK.

Few business applications are beyond the scope of this immensely popular, fully integrated, modular system which currently comprises: Sales Ledger, Purchase Ledger, Nominal Ledger, Job Costing, Stock Control, Payroll, Fast Data Entry, Sales Order Processing, Management Accounts, Invoice Compiler, Mail List, Word Processor.

Not only is the system designed to help with all the functions of a busy office but it is also designed to run on most micro-computers including the "new generation" 16 bit machines.

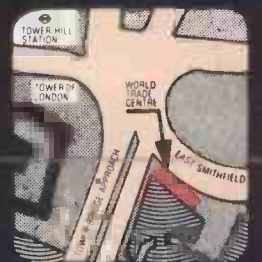
With over 2,500 installations and over 14,000 modules being run in the UK and overseas its unparalleled success has been due not only to the proven quality of the software but also to the friendly, unbiased advice that we give our visitors at our regular free seminars and demonstrations held throughout the country.

Further, great care is taken in training our Accredited Dealers and our end users so that when you choose TABS software you are also choosing a product which is fully supported both by your Accredited Dealer and by TABS own personnel.

To find out how the businessman's number one choice would help you and your business phone Andover (0264) 58933 or fill in the coupon.

PARTICIPATING DEALERS: LONDON: Andrew & Co 01 402 6911; Data Management Systems 01 739 8692; Q.E.D. Computers 01 959 7403/8346. AVON: Colston Computer Centre Ltd 0272 276619. BERKSHIRE: Decision Support Systems Ltd 0628 76887; Thames Valley Systems 0734 581829. BUCKINGHAMSHIRE: Cardinal Computers Ltd 06284 73776/73074. CHESHIRE: Desktop Computing 0925 415415. DERBYSHIRE: FBC Systems Ltd 0332 365280. DEVONSHIRE: Keel Data Systems 054 884 3520. GLOUCESTERSHIRE: Computer Shack 0242 584343. KENT: A.E.C. Business Systems 0732 864829; Page One Systems Ltd 0795 53116; The Data Processing Co Ltd 0303 41618. LANCASHIRE: Mipac Services 0524 62033. LINCOLNSHIRE: ZR (Computers) 0522 31621. MANCHESTER: Sumner Jackson & Co Ltd 061 832 8261. NORFOLK: Synergy Computer Systems Ltd 0603 503015/6/7. NOTTINGHAMSHIRE: Micro People Ltd 06076 69117. SOMERSET: Computer Sales & Marketing 06438 3526; The Computer Room 0935 73023. SURREY: Computron 01 943 1113; Interlex Ltd 01 943 0968; Micro-Engineering Ltd 01 930 5678. SUSSEX: Computaccount 08926 5765. TYNE & WEAR: Microcore 0632 846878; Quality Micro Products 0632 614646. WEST MIDLANDS: Beta Computer Services 0676 34664; Datacraft (Computer Systems) 021 705 1906; I.S.L. Ltd 0922 26282; P.J. New Computers Ltd 021 742 6801. WILTSHIRE: Fyne Computing 0722 20323; J.R.M. Software Ltd 02214 65691. WORCESTERSHIRE: Spinks Computer Systems Ltd 0905 29466. NORTHERN IRELAND: FACS 0662 47618. WALES: DYFED: Aberdata 09745 344. SOUTH GLAMORGAN: Data Plant 0222 40411.

Free London Demonstrations and Seminars are held at the World Trade Centre within a few minutes walk of Tower Hill tube station.



Please complete and return the coupon to TABS Ltd, Sopers House, Chantry Way, Andover, Hants. SP10 1PE.

- 32 page introductory booklet
- User Book (please send £10.00 (inc. P&P))
- Details on Free Seminars and demonstrations
- Dealer plans
- Price List
- Video Training Tapes

Name _____
Address _____
Tel. No. _____
I enclose cheque/postal order for £ _____
Signature _____

Andover (0264) 58933
PCW/1



ORIC-1TM

TIMELESS TECHNOLOGY FROM ORIC PRODUCTS INTERNATIONAL

The Computer Challenge

**16 colours
professional keyboard
full graphics
real sound**

FREE FORTH with every 48K model.

- **Superb styling**
- **Choice of 16K, 32K or massive 48K RAM**
- **Ergonomic keyboard with 57 moving keys**
- **28 rows x 40 characters high resolution**
- **Teletext/viewdata compatible graphics**
- **6 octaves of real sound plus Hi-Fi output**
- **Centronics printer interface and cassette port**
- **Comprehensive user manual**

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

THE REAL COMPUTER SYSTEM FROM
£ 99.95
 incl VAT

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

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

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

In short the ORIC-1 is a must for all businesses large or small.

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

ORIC-1

The Real Computer System

Coworth Park, Marsdon, Coworth Park, London Road, Sunninghill, Ascot, Berks SL5 7SE

Prices	ORIC-1 16K RAM	£ 99.95	
Include VAT	ORIC-1 32K RAM	£139.95	
	ORIC-1 48K RAM	£169.95	
	Postage and Packing	£ 79.95	
	Please charge my Access Barclaycard		
	Amex, Diners Club account no.		
Name		TOTAL £ 5.95	
Address		(Money back if not satisfied)	

*Please delete/complete as applicable.
 *I enclose a cheque/PO payable to:
ORIC PRODUCTS INTERNATIONAL LIMITED
 for £

If you require a brochure please tick PCW1

GREAT GIFTS COME



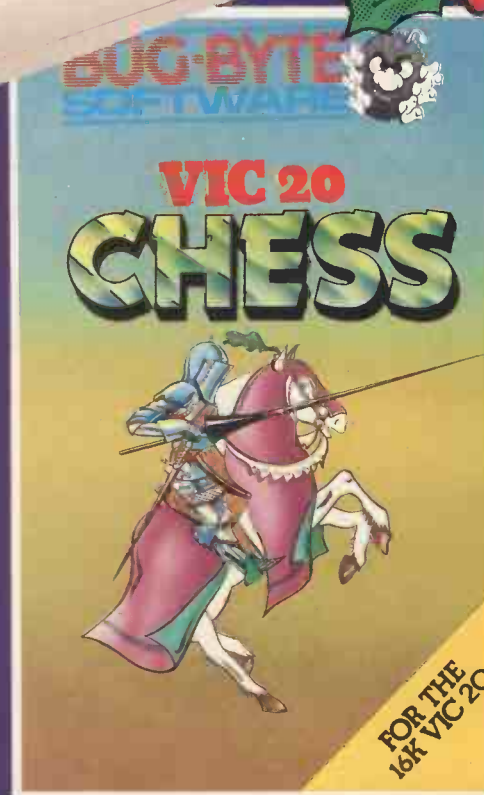
for the
VIC 20



Bug-Byte programs make ideal Christmas stocking fillers! If you have a friend, or member of the family, who already owns a ZX81, Spectrum, VIC, Atom or BBC Micro they will be thrilled by the gift of one of our beautifully packaged, exciting cassettes.

Whats more, Bug-Byte games are the best! Tens of thousands of contented customers testify to that, so do consistently hot reviews in the popular micro-press.

If your game isn't shown, don't worry, we probably have more quality programs for more machines than any other software house, and new ideas are constantly being generated by our young, enthusiastic team of skilled programmers.

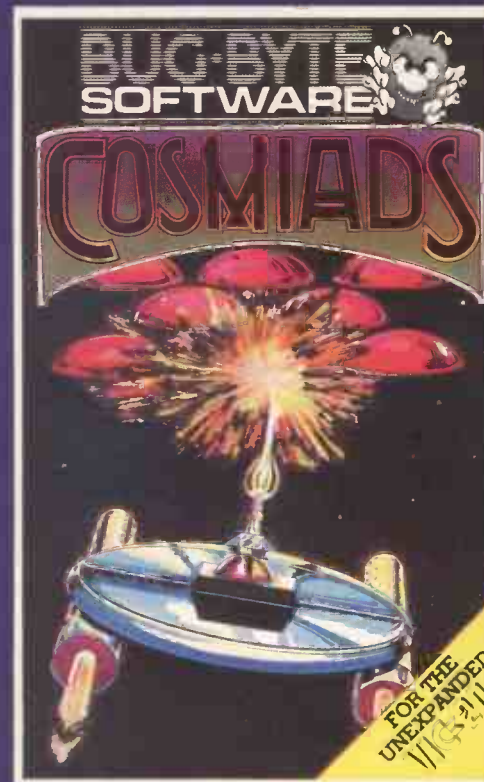
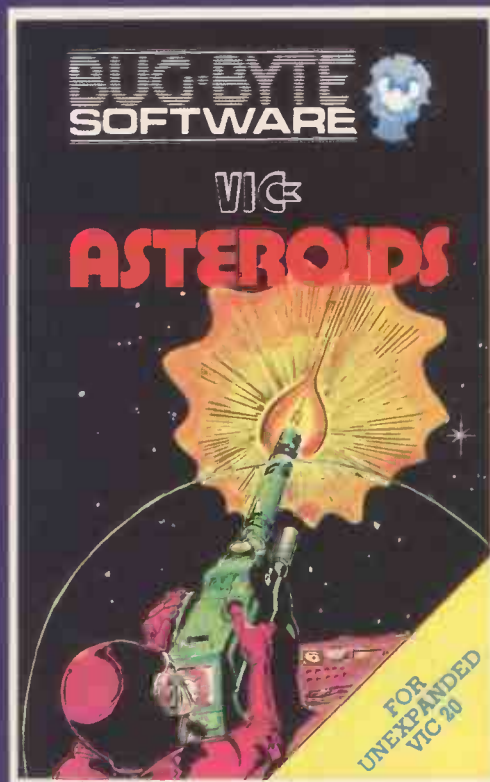


WHERE TO BUY?—

Look for the sign!

Bug-Byte programs are AVAILABLE NOW from:

All Laskys Stores Nationwide. Large branches of Boots and Curry's Micro-C, plus over 100 independent computer dealers. If you can't find a Bug-Byte dealer near you — then fill in the coupon opposite and order direct by post — and receive your free copy of our 1983, 16 page, full colour brochure, it's packed with lots of enthralling games for the whole family.



Also for your VIC:
Backgammon
Another VIC in the Wall

All VIC Programs — £7.00 each
including post and packing

BUG-BYTE SOFTWARE

N SMALL PACKAGES!



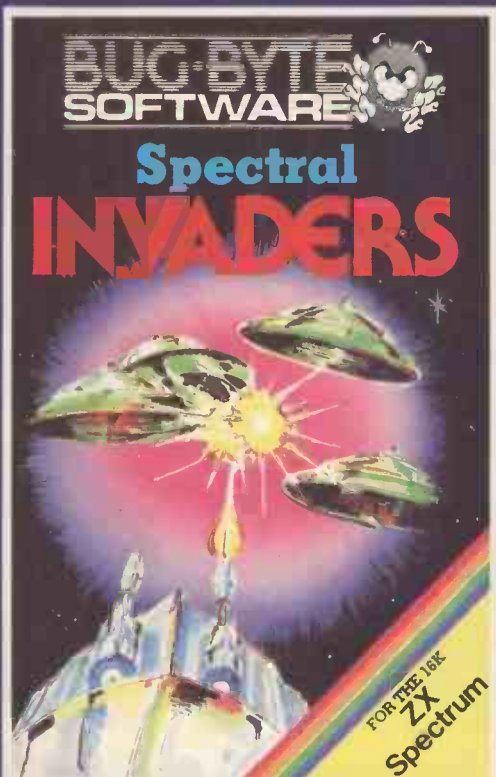
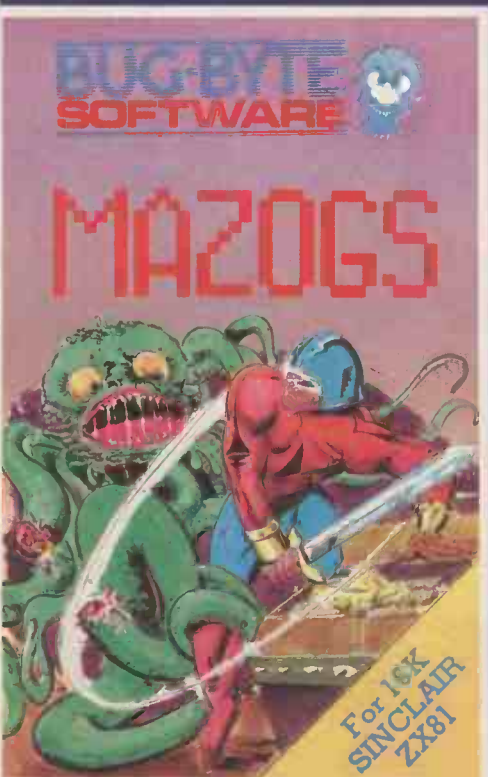
for the
SINCLAIR ZX 81
or
ZX SPECTRUM



BBC Micro

We have a large selection of programs for the BBC Micro (A and B models). Our new brochure gives a complete listing, so send for your free copy today! Also see our huge range of software for the ever-popular Acom Atom!

50^p
VOUCHER
with all orders
of 2 tapes or more



Please send me:
 VIC Panic Spectral Invaders
 VIC Asteroids Spectres
 VIC Chess Mazogs
 VIC Cosmiads ZX AS
 OR the following: _____

I enclose S.A.E. for Catalogue
 I enclose cheque/P.O. for _____
 OR Please debit my Access 5224
 Barclaycard 4929 _____ Expiry Date _____
 Name _____
 Address _____
 _____ Code _____

Dealers Discount Available
**ACCESS, BARCLAYCARD ORDERS
 WELCOME ON 24hr. ANSWERPHONE
 051-227 2642,**
 or mail to:
**BUG-BYTE SOFTWARE,
 FREEPOST (No stamp req.)
 LIVERPOOL L3 3AB.**



ZX81 Prices: Mazogs - £10.00
 ZXAS Assembler - £5.00
 ZXDB Debugger - £6.50
 XTK Tool Kit - £6.00
 ZX Invaders - £4.00

Spectrum Prices:
 Spectral Invaders - £5.00
 Spectres - £8.00
 'Aspect' Assembler - £9.00
 All prices include post and packing

**BUG-BYTE
 SOFTWARE**

Don't let its size fool you.

If anything NewBrain is like the Tardis.

...It may look small on the outside, but inside there's an awful lot going on.

It's got the kind of features you'd expect from one of the really big business micros, but at a price of £269.95 including VAT it won't give you any sleepless nights.

However, let the facts speak for themselves.

You get what you don't pay for.

NewBrain comes with 24K ROM and 32K RAM, most competitors expect you to make do with 16K RAM.

What's more you can expand all the way up to 2 Mbytes, a figure that wouldn't look out of place on a machine costing ten times as much.

We've also given you the choice of 256, 320, 512 and 640 x 250 screen resolution, whereas most only offer a maximum of 256 x 192.

Big enough for your business.

Although NewBrain is as easy as ABC to use (and child's-play to learn to use) this doesn't mean it's a toy.

Far from it.

It comes with ENHANCED ANSI BASIC, which should give you plenty to get your teeth into.

And it'll also take CP/M® so it speaks the same language as all the big business micros, and feels perfectly at home with their software.

NO OTHER MICRO HAS THIS MUCH POWER IN THIS MUCH SIZE FOR THIS MUCH MONEY.



So as a business machine it really comes into its own.

The video allows 40 or 80 characters per line with 25 or 30 lines per page, giving a very professional 2000 or 2400 characters display in all on TV and/or monitor. And the keyboard is full-sized so even if you're all fingers and thumbs you'll still be able to get to grips with NewBrain's excellent editing capabilities.

When it comes to business graphics, things couldn't be easier. With software capabilities that can handle graphs, charts and computer drawings you'll soon be up to things that used to be strictly for the big league.

Answers a growing need.

Although NewBrain, with its optional onboard display, is a truly portable micro, that doesn't stop it becoming the basis of a very powerful system.

The Store Expansion Modules come in packages containing 64K, 128K, 256K or 512K of RAM. So, hook up four of the 512K modules to your machine and you've got 2 Mbytes to play with. Another feature that'll come as a surprise are the two onboard V24 interfaces.

With the aid of the multiple V24 module this allows you to run up to 32 machines at once, all on the same peripherals, saving you a fortune on extras.

The range of peripherals on offer include dot matrix and daisy wheel printers, 9", 12" and 24" monitors plus 5¼" floppy disk drives (100 Kbytes and 1 Mbyte) and 5¼" Winchester drive (6-18 Mbytes).

As we said, this isn't a toy.

It doesn't stop here.

Here are a couple of extras that deserve a special mention.

The first, the Battery Module, means you won't be tied to a 13 amp socket. And, even more importantly, it means you don't have to worry about mains fluctuations wreaking havoc with your programs.

The ROM buffer module gives you a freedom of another sort.

Freedom to expand in a big way. It gives you additional ROM slots, for system software upgrades such as the Z80 Assembler and COMAL, 2 additional V24 ports, analogue ports and parallel ports.

From now on the sky's the limit.

Software that's hard to beat.

A lot of features you'd expect to find on software are actually built into NewBrain so you don't need to worry about screen editing, maths, BASIC and graphics.

However, if you're feeling practical you can always tackle household management, statistics and educational packages. And because NewBrain isn't all work and no play, there's the usual range of mind-bending games to while away spare time.

Waste no more time.

To get hold of NewBrain you need go no further than the coupon at the bottom of the page.

With your order we'll include a hefty instruction manual so you'll know where to start, and a list of peripherals, expansion modules, and software so you'll know where to go next.

© CP/M is the registered trade mark of Digital Research Inc.



Technical Specifications

The NewBrain is a fully specified professional computer built to the highest standards of engineering and reliability. Chosen by leading OEM suppliers. Designed to facilitate easy expansion for use with the CP/M operating system, and the addition of 5¼ flexible and Winchester disks, 12 green phosphor professional standard monitor, 80 cps professional quality dot matrix printer with pin addressable graphics.

Z80A cpu and COP 420M input/output microprocessors. 32K RAM expandable to 2 Mbytes. 29K ROM. Dual Cassette Ports. UHF TV port. CCITT Monitor Port Video 40/80 Character x 25/30 lines. 256, 320, 512, 640 x 250 Pixels. Expansion Port. V24 Bi-directional Port. V24 Printer Port. 16-character display (AD only).

Software: Enhanced BASIC (ANSI x 3.2/78) Independent Operating System (12 device drivers). Multi Page Screen Editor (32 Control Commands). Maths (10 Significant Figures). Graphics (Absolute & Relative Plotting, Line & Arc Drawing, Shading, 20 English Language Commands).

NewBrain,
Grundy Business Systems Ltd., Grundy House,
Somerset Road, Teddington TW11 8TD.

To: NewBrain, Grundy Business Systems Limited, Grundy House, Somerset Road, Teddington TW11 8TD.

Please send me a full-colour leaflet, price list, and name and address of my nearest stockist.

Name _____

Address _____

Postcode _____

£1,350*

The MIMI 802 is a supreme example of high quality British engineering. It is a truly professional microcomputer that really does meet all the criteria of a sophisticated business machine - at a price you can afford.

Our competitors expect you to make do with the basics and then buy expensive extras in order to fulfil your needs. The MIMI 802 has all the 'extras' as standard - so when you buy a MIMI you really are getting a microcomputer that will do the job from the outset.

The MIMI's operating system OS/M[†] is fully CP/M[‡] compatible so you have access to a very comprehensive range of software, extending from word processing to accounting.

During the next few months we will be announcing the availability of TROJAN - a major software innovation that totally simplifies the learning process and use of micros, and dramatically eases the creation of new applications programs. We are using it and generating applications software in record time - so we can guarantee its performance.

Don't settle for less... contact us or one of our dealers now.

Features include:

- Z80A at 4MHz
- 64K Dynamic RAM
- Integral D/S - D/D 5¼ ins floppy discs - 700Kb.
- Full RS232C and Centronics parallel ports.
- 96 Key ASCII keyboard - colour coded.
- 17 programmed function keys.
- Light pen socket.
- Elegant compact and light - 24 lbs.
- OS/M operating system - fully CP/M compatible.
- Disc format conversion facility.
- Wide range of software, utilities and languages.

And now with:

- Winchester disc option.
- Super high resolution graphics option* (802G-512 x 256 pixels).

NOW ALL OTHER MICROS ARE LESS THAN PERFECT

† OS/M is the trademark of Scifax Microsoftware.

‡ CP/M is the registered trademark of Digital Research Inc.

*Monitor extra, from £132. (Choice of orange or green display)
MIMI 802G (graphics version, as illustrated) £1495.

Some of our dealers

Anita Electronic Services
34 Musters Road West Bridgford Notts
Tel: 0602 813204
Contact: Steve Conroy

Apollo Information Systems Ltd.
13 Southend Road Grays Essex RM17 5NH
Tel: (0375) 33088
Contact: Ronald Burrell

Belmondo Research Ltd
68 Maple Road Horfield Bristol BS7 8RG
Tel: 0272 427428
Contact: Roger Banfield

Broadway Systems (BCSS) Ltd
5-7 Mariner Street Swansea W Glam Wales SA1 5BA
Tel: 0792 462279/474598 01-997 4764/0498
Contact: Philip Gittoes

Chris Robinson Consultants
Maple Way Kensworth Dunstable Beds
Tel: 0582 872940
Contact: Chris Robinson

City Microsystems Ltd
65 London Wall London EC2
Tel: 01-588 7272
Contact: Anthony Coulson

Computer Graphics Workshop
38 Ullett Road Sefton Park Liverpool 17
Tel: 0507 604271
Contact: Noel Runnels-Moss

Comput-A-Crop
3 Cornmarket Louth Lincolnshire LN11 9PY
Tel: (0507) 604271/2 Telex: 56332
Contact: Jenny Wilson



BRITISH MICRO

Penfold Works Imperial Way Watford Herts. WD2 4YY Tel: Watford (0923) 48222/43956



A Hegotron Group Company



Derwent Data Systems

18 Norfolk Street Sunderland Tyne & Wear SR1 1EA
Tel: 0783 652026
Contact: Tom Maxfield

Easabee Computing Ltd

133-135 High Street North East Ham London E6 1HZ
Tel: 01-471 4884
Contact: Computer Sales Director

John Elmer Office Equip

105-107 Church Road Burgess Hill Sussex
Tel: 04446 5670
Contact: John Elmer

Leicester Micro Centre

59 Regent Road Leicester
Tel: 0533 551869
Contact: Ray Beresford

Malvern Micro Systems

Wych Cutting Upper Colwall Malvern Worcestershire
Tel: (06845) 68500
Contact: Barry Lewis

Maystar Micro Systems Ltd

62 Peach Street Wokingham
Tel: 0734 789381
Contact: Simon Hart

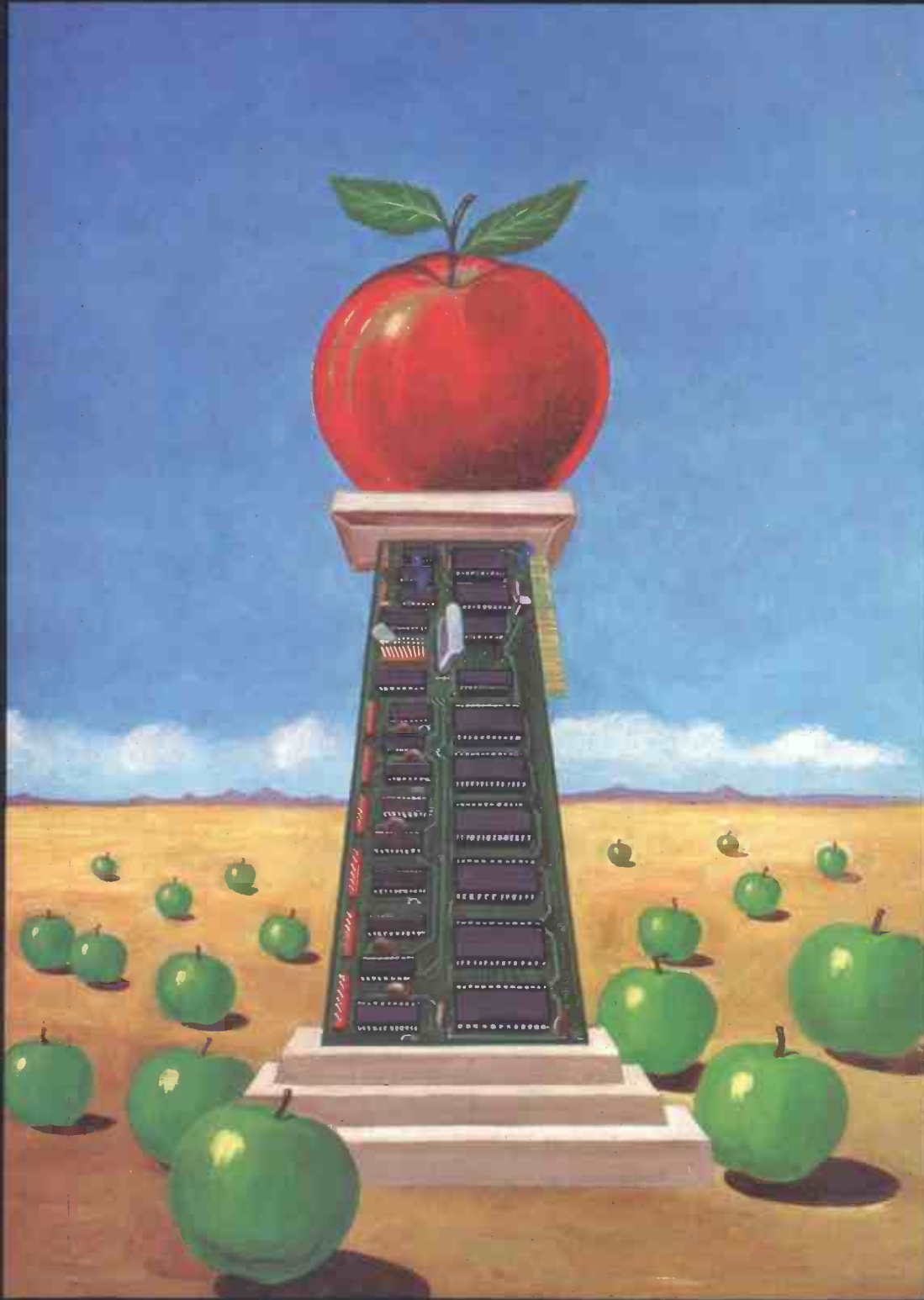
Microcosm Research Ltd.

26 Danbury Street London N1 8JU.
Tel: 01-226 9092
Contact: Peter Cheesewright

Synergy Computer Systems

'E'Block University Village
UEA Norwich NR4 7TJ
Tel: (0603) 503015/6/7
Contact: Sonia Kennedy

'make it easy on yourself'



SPECIAL PROMOTION!
 DECEMBER — JANUARY
 Every Apple should have 80 col
 display! U-TERM £120.00
 Order direct (add £1.00 p&p + VAT
 Access taken) or from your dealer.

U-MICROCOMPUTERS

CONTENTS

Memory Cards
 U-RAM 16 add-on 16K memory card £ 65.00
 U-RAM 32 add-on 32K memory card £ 85.00
 U-RAM 64 add-on 64K memory card £180.00
 U-RAM 128 add-on 128K memory card £275.00

...Memory card software
 MMS memory manager £15.00
 APR applesoft program relocater £10.00
 VVE versatile visicalc expansion £50.00
 VRD versatile RAM disc emulation £50.00

Interfaces
 U-S232 high speed serial interface £ 95.00
 U-PORT 8 serial interfaces £195.00
 U-2PORT dual serial interface £120.00
 U-BCD panel meter interface £ 95.00
 U-A/D 12 bit A/D, digital I/O and timer from £350.00
 U-DT digital I/O and timer £105.00

Enhancements
 U-Z80 processor card for CP/M £ 95.00
 U-TIM timer to one millisecond intervals £ 85.00
 U-TERM 80 column upper and 'lower case display £165.00

Aids
 U-EXT slot extender card £ 9.50
 GSE game socket extender £ 9.00
 U-PROT prototype card £29.00
 U-NSCRUMP software protection £28.00

Prices exclude delivery
 (£1.00 per card) or VAT.

*Prices for Apple III cards on request.



The most extensive range
 of Apple II and Apple III
 expansion cards available.
 At your local dealers Now - Worldwide



U-MICROCOMPUTERS



U-Microcomputers Ltd.
 Winstanley Industrial Estate,
 Long Lane, Warrington,
 Cheshire WA2 8PR, England.
 Telephone 0925 54117
 Telex 629279 UMICRO G.

U-Microcomputers Inc.
 300 Broad Street,
 Stamford,
 Connecticut 06092,
 USA.
 Telephone 203 359 4236
 & Toll Free (800) 243 2475
 Telex 965999 O&S STD



Peachtree is blossoming...

An open invitation to suppliers of
microcomputer hardware and software




Peachtree
Software™

AN **MSA** COMPANY

Attention dealers and systems suppliers of Altos, Apple, Commodore, IBM, ICL, Intertec, Rair, Sirius, Victor and other leading microcomputers.....

A Peachtree Software Partnership will safeguard your software reputation and improve profitability!



Peachtree software really works! We have established the largest installed user-base in the USA and a unique worldwide distribution and support network. We are the world leader in business management software. Our programs are simple to use. They have professional documentation and are utterly proven!

Team up with Peachtree

It's goodbye to software problems and loss of profit if you become a 'Peachtree Partner.' You will be free to concentrate on the marketing of your complete business solutions, secure in the knowledge that you have the best systems in the world to enhance your reputation.

You will be supported by professionals and all the resources of a world class organisation determined to stay at the top of the tree in micro software.

Now is the time to say 'YES'

This is your opportunity to apply for your Peachtree Partnership. We are spreading our roots, right across the country and deep into your marketplace.

Peachtree is now an established and powerful force in UK software.

We intend to tie in with the leading suppliers in every town. They will be our type of people - professional, experienced and commercially sound. Above all dedicated to success!

Bumper Harvest in '83

In the new year, Peachtree suppliers will see the most spectacular growth in their business. We intend to continue taking the micro business software market by storm. There will be no stopping us or those who choose to join us NOW.

act IMMEDIATELY

Complete the initial application form now. It will be treated in the strictest confidence and places you under no obligation.

Successful initial applications will bring a personal invitation to meet the Peachtree team and to negotiate your Peachtree Software Partnership.

"There's more to Peachtree than just a computer program"

JOHN HALE, MANAGING DIRECTOR OF PEACHTREE SOFTWARE INTERNATIONAL LTD.

"We are part of MSA, the world's largest company specialising in computer software products for large computers.

Together we make an unbeatable combination, guaranteeing you the best in software and support, now and in the future."

Peachtree Proven Programs

Peachtree Basic Accounting Systems

Purchase Ledger, Sales Ledger with Invoicing, Nominal Ledger, Inventory Management, Payroll

Peachtree Business Management Systems

Purchase Ledger, Sales Ledger with Invoicing, Nominal Ledger, Costing Ledger, Inventory Management with Sales Order Processing, Payroll

Peachtree Office Productivity Systems

Word Processing, Automatic Spelling Dictionary, Name and Address Management, Financial Modelling, Communications, Colour Graphics

Peachtree programs run under Digital Research and Microsoft operating systems and they are written in Microsoft BASIC and Micro Focus CIS COBOL.

Peachtree Products are

- ★ Fully integrated. So your client can use all the information his system holds.
- ★ Totally modular. So your client can implement one system at a time.
- ★ Complete with professional documentation. Helping you to help your client.

Peachtree's commitment is to provide software products for the smallest business computers as well as the most powerful 16-bit multi-user micros with hard disk storage.

"Call me with your queries
on 0628 32711"

Ray Todd,
Peachtree Partnership Manager



Praise for Peachtree

"As an accountant and line manager with a wide experience of using systems, I consider Peachtree's product to be the best integrated business package I have found" VICTOR LINGARD
MANAGING DIRECTOR, DAEDALEAN CONSULTANTS

"We have the greatest confidence in Peachtree because Peachtree is continually investing in enhancing products, introducing new packages, providing the best support and backing our sales through its marketing campaigns" MALCOLM CHADWICK
MANAGING DIRECTOR, BUSINESS-LIKE SYSTEMS

"Not only have Peachtree products improved our sales by 25% but we have also developed a very good two-way relationship where we have input to Peachtree's plans for the future" STEVE JOHNSON
MANAGING DIRECTOR, JOHNSON MICROCOMPUTERS

Peachtree Software International Ltd
43/53 Moorbridge Road, Maidenhead, Berks. SL6 8LT
Tel: Maidenhead (0628) 32711

CONFIDENTIAL

Complete this initial application without obligation for a

Peachtree Partnership

My Name _____

My Position _____

My Company _____

Our Address _____

Telephone No. _____

Hardware Dealerships _____

Technical Facilities _____

Software Currently stocked _____

Date Established _____

Number of Employees _____

Marketing Area _____

Experience in mainframes _____

Experience in minis _____

Experience in micros _____

How many people would you
want to attend training sessions _____

Name and address of Bankers _____

Trade Reference 1 _____

Trade Reference 2 _____

Alternatively

Please contact me to discuss our potential before
I make an application

Signature _____

Date _____

PCW2

Mail this form today to
Ray Todd at Peachtree Software
International Limited, 43/53
Moorbridge Road, Maidenhead,
Berkshire SL6 8LT

Tel: Maidenhead (0628) 32711



AN MSA COMPANY

Peachtree Software is also distributed by:
Britannia Computers, Digital Equipment Company,
Logitek (Altos), Memory Computers, The OEM Group,
Rank Xerox, Wilkes Computing (YE Data).

Let Commodore expand your horizons.

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

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

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

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

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

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

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

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

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

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



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

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



MS-DOS™ gives you the only complete set of software tools for 16-bit systems. Now. From Microsoft.

Systems and Applications. Now. The success of any microcomputer system depends on the amount of software available for it. And, the ease of writing more. Microsoft™ MS-DOS is the only single-user operating system fully supported by Microsoft's 16-bit languages: BASIC Interpreter, BASIC Compiler, COBOL, FORTRAN and Pascal. Plus, the Multi-Tool™ family of applications software... starting with the Multiplan™ electronic worksheet.

More software. Soon. IBM chose MS-DOS as the primary OS for the IBM® Personal Computer. Lifeboat Associates chose MS-DOS as the 16-bit, single-user DOS it will support. And Microsoft will continually introduce new applications and systems software for MS-DOS. The implication is clear: MS-DOS is going to be even better supported. Fast.

Easier conversion. MS-DOS was written to make conversion of CP/M-80® programs simple. Simpler, according to programmers, than conversion to CP/M-86™. Again, the implication is clear.

Better system features. MS-DOS offers features unavailable under either CP/M-80 or CP/M-86: device independent I/O, advanced error recovery, variable length records, and full program relocatability in order to take

MS, Multiplan, Multi-Tool, and Microsoft are trademarks of Microsoft Corporation. CP/M and CP/M-80 are registered trademarks of Digital Research, Inc. CP/M-86 is a trademark of Digital Research, Inc. IBM is a registered trademark of International Business Machines, Corp.



advantage of the extended addressing capabilities of the 8086 and 8088 microprocessors. And MS-DOS' descriptive error messages make it a user-friendly OS.

Leadership in microsystems. Microsoft led the industry into the 8-bit world when we put BASIC on the first microcomputer. Now, we're leading the industry into the 16-bit world with the first complete set of software tools for the 8086 and 8088 microprocessors. The MS-DOS operating system. Languages. Utilities. And, applications software.

Planning an OEM system? Return the coupon below for complete OEM information on MS-DOS and Microsoft's complete set of tools for 8086 systems. Can't wait? Call our OEM Accounts Manager.

MICROSOFT

Microsoft Europe Ltd (04427) 75091
Bulbourne House, Gossoms End TLX: 825888 M(CROE G
Berkhamsted, Herts HP4 3LP

- Send me information on MS-DOS for OEM's.
 Send me information on applications for MS-DOS.

Name _____

Company _____

Address _____

Town _____ County _____ Postcode _____

In the USA: Microsoft Corporation, 10700 Northup Way, Bellevue WA 98004, U.S.A. Tel: 010.1.(206) 828.8080. Tlx: 328945



YOU'VE SEEN THE PICTURES, NOW SEND FOR THE WORDS

BBC Microcomputer or Acorn Atom

Acornsoft is the software division of Acorn Computers, designers and manufacturers, of the BBC Micro and Atom. We know better than anyone the capability of the machines, we know how to get the very best from the hardware. And we have produced a range of exciting games, exacting business and useful household software.

The Biggest Range Available

Acornsoft software ranges from authentic arcade games like Snapper to Algebraic Manipulation to Desk Diary to other languages like FORTH and LISP. Striking colour, amazing sound effects and powerful

graphics are all used to the full. And it does not stop there. There is a complete range of manuals, accessories and plug-in ROMs.

Free Brochures

Just clip the coupon or write to us and we will rush our catalogue absolutely free. Can't wait for the post ring 01-930 1614 now! Don't delay – do it today. Let Acornsoft help you get the best from our machine and open the doors to your imagination.

Acornsoft and Atom are registered trade marks of Acorn Computers Ltd.

ACORNSOFT

4A Market Hill,
CAMBRIDGE CB2 3NJ.



Please rush me my free literature from Acornsoft.

Atom
 BBC Please tick

Name _____

Address _____

Postcode _____

The Software House

★★★ SPECIALS ! ★★★ House ★★★ RECOMMENDED ★★★

TRS80 MODEL I, II

DAMBUSTERS – super graphic simulation £5.10
 DRAGONQUEST – medieval adventures £6.00
 DEVIL'S ISLAND – piratical adventure £5.10
 DARKSTAR – zany graphic space game £5.10
 MUSICMASTER – great keyboard organ – at only £5.10
 GALACTIC BLOCKADE RUNNER £5.10
 MICROCOSM – 20 programs – for only £12.00

APPLE II

SCOTT ADAMS ADVENTURES (tape – not graphic) each £5.00
 STAR CRUISER – "Galaxian"-style arcade action £9.00
 BOTH BARRELS – 2 game shootout £8.00
 COMPUTER CONFLICT £11.00
 HAYDEN DATA MANAGER (3.2) £20.00
 ASSEMBLY LANGUAGE DEVELOPMENT SYSTEM (3.2) £18.00
 APPILOT 3.2 (MUSE) £32.00

SORCERER

SCOTT ADAMS ADVENTURES (each tape) while they last! £4.00

PET (24K)

SCOTT ADAMS ADVENTURES 1 & 2 – both for only £5.00

APPLE II (all DISC)

ARCADE MACHINE – write your own superb Arcade games £41.40
 CHOPLIFTER – Arcade action – rescue the hostages £21.50
 ELIMINATOR – marvellous all action Arcade game £20.66
 HADRON – stunning 3D space shootout £22.50
 RENDEZVOUS – super graphic Space Shuttle simulation £27.57
 ZORK III – incredible new adventure – huge! £27.60

ATARI

CANYON CLIMBER – super Arcader – look out for arrows! £17.50
 DISK DETECTIVE – examines, modifies, moves etc. £17.50
 FROGGER – just like the arcades £23.00

BBC (Model B)

ARTIST – SUPERB graphic design system (32K) £12.50
 CHARACTER EDITOR – simply the best! Rave reviews! £5.95
 ARTIST DESIGN PACK (ARTIST & CHARACTER EDITOR) £16.10

VIC 20

FLIP-DISC – our 'Reversi' – superb at only £5.95
 VICSYNTH – turns your Vic into a music synthesiser £9.95
 VIC PANIC – our favourite arcade game! £7.00

Send S.A.E. for our FULL money saving special offers list – LOTS of really super deals.

ALL PRICES INCLUDE VAT. PLEASE ADD 60p post & packing

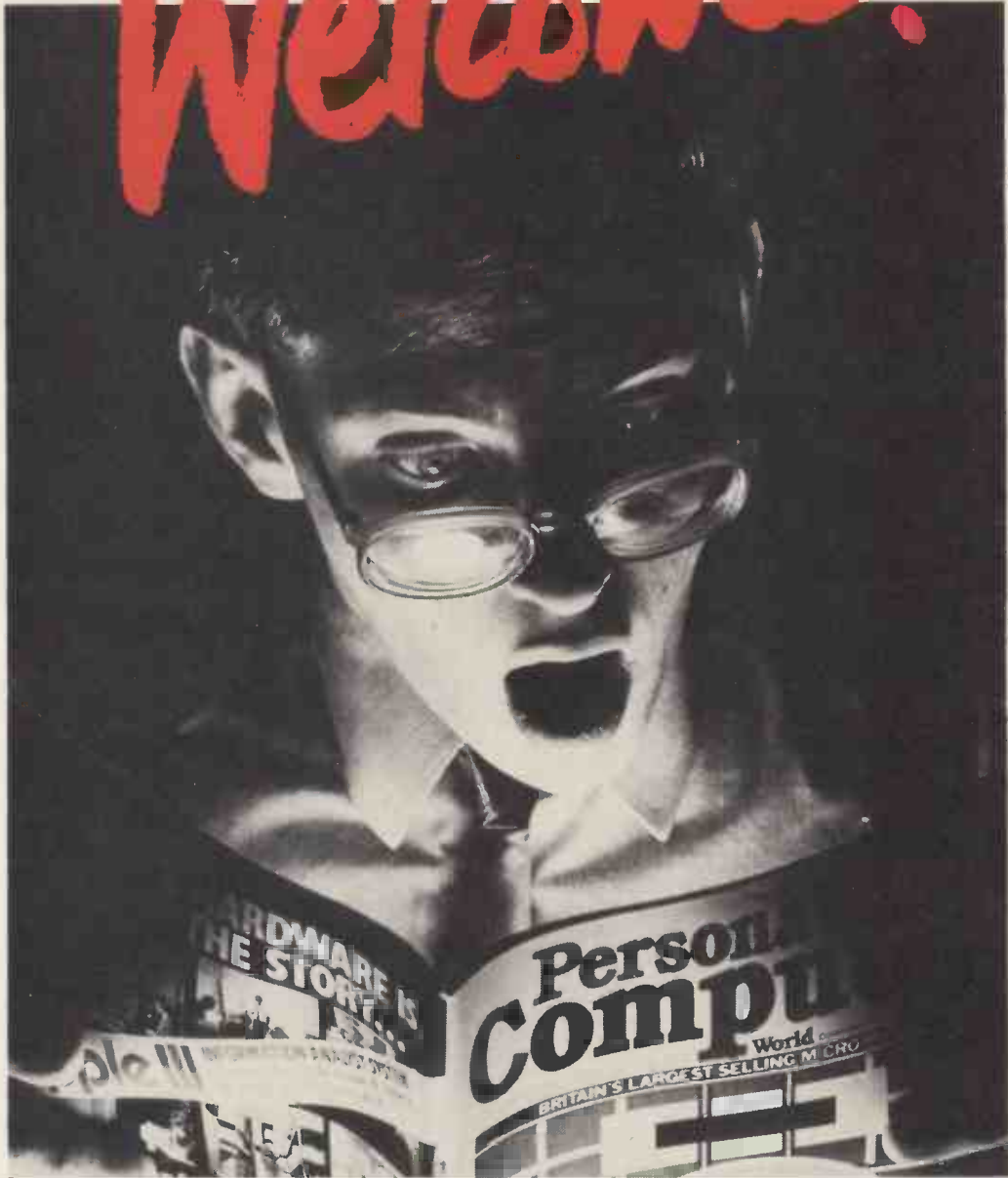
We accept ACCESS, VISA, DINERS CLUB

Sorry, but we're MAIL ORDER ONLY !

THE SOFTWARE HOUSE 146 OXFORD ST LONDON W1 Tel 01 637 2108

Personal Computer World BROWSERS

Welcome!



A complete selection of all available issues of Personal Computer World plus a large selection of personal computing books on sale in the West End of London.

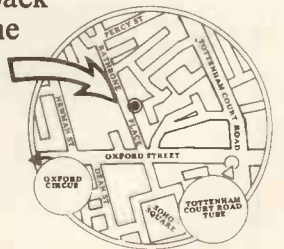
As far as we know there is only one place in the world where you can browse and buy from a complete selection of all available *PCW* issues going right back to Issue No 1.

That's the Bunch Books Back Issues Centre just off Oxford Street in the West End of London.

We also sell *PCW* binders and carry a good range of personal computing books from the UK and the USA.

And our receptionists do their best (time permitting) to xerox for you any article from an issue of *PCW* which is completely sold out.

To avoid any confusion we would like to remind you that if you want to buy back issues etc of *PCW* through the mail you should refer to the current advertisement elsewhere in the magazine. But if you prefer to browse before you buy, come up and see us sometime!



BUNCH BOOKS BACK ISSUES CENTRE
14 RATHBONE PLACE, LONDON W1P 1DE
MONDAY — FRIDAY 10am to 6pm
SATURDAY 11am to 5pm

**MICRO'S COMPUTING
BUSINESS ? RESEARCH
PLEASURE**



The answer's a
**Commodore
COMPUTER**

COMMODORE 64s
and
VIC 20s in stock

L&J COMPUTERS

192 HONEYPOT LANE, QUEENSBURY, STANMORE, MIDDX HA7 1EE. 01-204 7525
THE "PET" SPECIALISTS

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

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

HARDWARE

CBM MICRO-COMPUTERS	16K	4016
	32K	4032
	32K	8032
	96K	8096
	SUPER-PET	9000

DISK DRIVES (5.25")	2M/B	8250
	1M/B	8050
	340K	4040
	170K	2031

HARD DISKS CBM	5 M/B	9060
	7.5M/B	9090
	** MATOR	23 M/B SHARK
	** MATOR	30 M/B SHARK
	** MATOR	BACK-UP SHARKIVE

(** APPROX 8 WEEK DELIVERY)

PRINTERS (MATRIX)	CBM	4022
	CBM	8023
	CENTRONIC	150
	CENTRONIC	737
	(DAISY WHEEL)	CBM

NEC 7730
OUME SPRINT

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

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

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

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

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

WE
GUARANTEE
THE
BEST
SERVICE
AND
WHAT'S
MORE

WE
DON'T
QUIBBLE
WHEN
YOU
HAVE
A

WARRANTY
CLAIM!!

SOFTWARE

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

CASH BOOK
Enter daily-weekly amounts — printout and totals, weekly/monthly analysis, totals
and balances.

3032, 4032 & 8032 versions	from £90 to £150
STOCK TAKING for the licensing trade	£240
Superb new program for 8032	£420
OUTSIDE SERVICES (For Mini-Cabs, etc.)	£220
New 8032 Version at 3032 price	

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

DIRECT MAIL ORDER SYSTEM

Please send me/us the following items:

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

Name _____

Address _____

Postcode _____

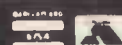
Phone No. _____

If you require more information, please tick

- Please send details of
- Please send Software details
- Please send Hardware details

PERSONAL SHOPPERS WELCOME
Phone & Mail Orders accepted.

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



INTEREST FREE

on Atari, VIC20, Commodore 64 and

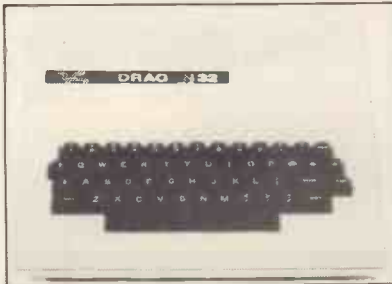
If your order contains over £120 worth of computer hardware apply now for interest free credit by telephoning: Mail-order: (0702) 552911. London Shop: 01-748 0926. Birmingham Shop: 021-356 7292. Southend Shop: 0702 554000 or write to P.O. Box 3, Rayleigh, Essex SS6 8LR.

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

THE NEW COMMODORE 64

The incredible new computer from Commodore comes with 64K RAM fitted! Plus 16 colours, hi-res graphics, 320 x 200 pixels, 40 columns by 25 lines, Z80 micro processor can be added — that means you can run CP/M software, 8 independently movable Sprites with collision detection, and a sound generator with 3 voices, 4 wave-forms, envelope and filter to rival some dedicated music synthesisers. And all this at the most incredible price ever. (AF56L) Only £339.00

DRAGON 32



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

THE AMAZING ATARI COMPUTERS

4 Consoles Available:

- Atari 400 with 16K RAM (AF36P) £249.95
- Atari 400 with 48K RAM (AF37S) £319.00
- Atari 800 with 16K RAM (AF02C) £399.00
- Atari 800 with 48K RAM (AF55K) £490.00

* All above with BASIC & handbooks

- Other hardware:
- Cassette Recorder (AF28F) £50.00
 - Disk Drive (AF06G) £299.95
 - Thermal Printer (AF04E) £265.00
 - Epson MX80T Mk III (AF38R) £399.95
 - Epson MX80F/T Mk III (AF40T) £447.35
 - Printer Interface for 400 (AF41U) £59.95
 - Printer Interface for 800 (AF42V) £59.95
 - Interface Module (AF29G) £135.00
 - Versawriter (AF43J) £199.95
 - 16K RAM Module (AF08J) £55.00
 - 48K RAM Module for 400 (AF44X) £125.35
 - 48K Upgrade for 400 (AF45Y) £75.00
 - Floppy Disk (YX87U) £2.50
 - Le Stick (AC45Y) £24.95
 - Joystick Controllers (Pair) (AC37S) £13.95
 - Paddle Controllers (Pair) (AC30H) £13.95

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

JOIN THE U.K. ATARI COMPUTER OWNERS' CLUB

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



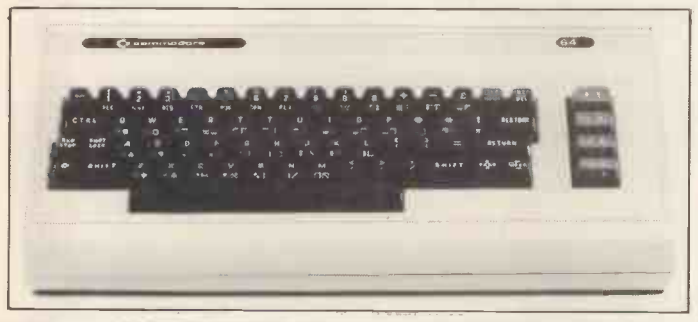
THE FINEST SELECTION OF ATARI SOFTWARE

- | | | | |
|---|--|--|---|
| Teach-Yourself Programs | Page Flipping | Rescue At Rigel | Curse Of Ra (Part 3) |
| Conversational French -5C-16K-YG44X £39.95 | -1C-16K-BQ65K £11.95 | -1D-32K-BQ808 £22.45 | -1D-32K-BQ90X £14.95 |
| Conversational German -5C-16K-YG45Y £39.95 | -1D-24K-BQ58L £11.95 | Dalestones Of Ryn -1C-32K-BQ22Y £14.95 | Analog Adventure -1D-32K-BQ33L £16.95 |
| Conversational Spanish -5C-16K-YG46A £39.95 | -1C-32K-BQ99H £69.95 | Dalestones Of Ryn -1D-32K-BQ92D £14.95 | Adventure Land -1C-24K-BQ00A £14.95 |
| Conversational Italian -5C-16K-YG47B £39.95 | Sounds & Music -1D-24K-BG05F £11.95 | Star Warrior -1C-32K-BQ24B £28.95 | Pirates Adventure -1C-24K-BQ01B £14.95 |
| Touch Typing -2C-16K-YG49D £15.95 | Tricky Tutorials -3C-32K-BG06G £59.95 | Star Warrior -1D-32K-BQ79L £28.95 | Mission Impossible -1C-24K-BQ02C £14.95 |
| States & Capitals -1C-16K-YG56L £9.95 | Tricky Tutorials -3D-32K-BG07H £59.95 | Invasion Orion -1C-24K-BQ23A £18.95 | Voodoo Castle -1C-24K-BQ03D £14.95 |
| Euro Countries & Capitals -1C-16K-YG57M £9.95 | Business Programs | Invasion Orion -1D-32K-BQ81C £18.95 | The Count -1C-24K-BQ04E £14.95 |
| Kids 1 (3 Programs) -1C-16K-BG00A £9.95 | Visicalc -1D-32K-VL39N £119.95 | Star Trek 3.5 -1C-32K-BQ15R £14.95 | Strange Odyssey -1C-24K-BQ05F £14.95 |
| Kids 1 (3 Programs) -1D-24K-BG01B £9.95 | Atari Word Processor -1C&30-48K-YG42V £99.95 | Star Trek 3.5 -1D-40K-BQ26D £18.95 | Mystery Fun House -1C-24K-BQ06G £14.95 |
| Kids 2 (3 Programs) -1C-16K-BG02C £9.95 | Text Wizard -1D-32K-BQ99H £69.95 | Crush, Crumble & Chomp -1C-32K-BQ83E £22.45 | Pyramid Of Doom -1C-24K-BQ07H £14.95 |
| Kids 2 (3 Programs) -1D-24K-BG03D £9.95 | Mini Word Processor -1C-32K-BG08J £11.95 | Crush, Crumble & Chomp -1D-32K-BQ84F £22.45 | Ghost Town -1C-24K-BQ08J £14.95 |
| Learn Programming | Mini Word Processor -1D-32K-BG09K £11.95 | Mission: Asteroid -1D-40K-BQ91Y £17.19 | Savage Island I -1C-24K-BQ09K £14.95 |
| Invitation To Programming 1 -1C-8K-YG43W £15.95 | Calculator -1D-24K-YG50E £16.95 | Wizard & The Princess -1D-40K-BQ25C £21.79 | Savage Island II -1C-24K-BQ10L £14.95 |
| Invitation To Programming 2 -2C-8K-BQ67X £22.95 | Graph-It -2C-16K-YG51F £13.95 | Ulysses & The Golden Fleece -2D-40K-BQ92A £20.64 | Golden Voyage -1C-24K-BQ11M £14.95 |
| Invitation To Programming 3 -2C-8K-BQ68Y £22.95 | Statistics -1C-16K-YG52G £13.95 | Zork I -1D-32K-BQ94C £29.95 | Softporn Adventure -1D-40K-BQ93B £20.64 |
| Basics Of Animation -1C-16K-BQ57M £11.95 | Personal Financial Management -3D-32K-BQ65V £49.00 | Zork II -1D-32K-BQ95D £29.95 | Deadline -2D-32K-BQ96E £34.95 |
| Basics Of Animation -1D-24K-BQ58N £11.95 | Mortgage & Loan Analysis -1C-16K-BQ66W £13.95 | Ali Baba & The 40 Thieves -1D-32K-BQ78K £27.95 | The Shattered Alliance -1D-48K-BQ98G £29.95 |
| Player Missile Graphics -1C-32K-BQ59P £18.95 | Bob's Business -1C-32K-BG11M £9.95 | Temple Of Apschai (Part 1) -1C-32K-BQ85G £28.95 | The Battle Of Shiloh -1C-40K-BQ63T £29.95 |
| Player Missile Graphics -1D-32K-BQ60Q £18.95 | Bob's Business -1D-32K-BG12N £9.95 | Temple Of Apschai (Part 1) -1D-32K-BQ86T £28.95 | The Battle Of Shiloh -1D-40K-BQ97F £29.95 |
| Display Lists -1C-16K-BQ51F £11.95 | Adventure Games | Upper Reaches Of Apschai (Part 2) -1C-32K-BQ87U £14.95 | Energy Czar -1C-16K-YG53H £9.95 |
| Display Lists -1D-24K-BQ52G £11.95 | Galentine Games | Upper Reaches Of Apschai (Part 2) -1D-32K-BQ88V £14.95 | Kingdom -1C-8K-YG55K £9.95 |
| Horiz. Vert. Scrolling -1C-16K-BQ53H £11.95 | Adventure Empire -1C-32K-BQ14Q £14.95 | Curse Of Ra (Part 3) -1C-32K-BQ89W £14.95 | Space Shuttle Module 1 -1D-32K-BG65V £19.95 |
| Horiz. Vert. Scrolling -1D-24K-BQ54J £11.95 | Rescue At Rigel -1C-32K-BQ21X £22.45 | | Arcade Games |
| | | | Star Raiders -1E-8K-YG66W £29.95 |

CREDIT

Dragon 32 computer hardware

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



ATARI SOFTWARE continued

- | | | | |
|--------------------------|-------------------------|--|----------------------|
| Asteroids | -1E-8K-YG600 £29.95 | Blackjack | -1C-8K-YG625 £9.95 |
| Space Invaders | -1E-8K-YG70M £29.95 | Hangman | -1C-8K-YG54J £9.95 |
| Missile Command | -1E-8K-YG64U £29.95 | Super Cubes & Tilt | -1C-16K-BQ48C £14.95 |
| Caverns of Mars | -1D-16K-BQ89A £24.50 | Humpty Dumpty & Jack & Jill | -1C-16K-BQ38R £19.95 |
| K-Razy Shoot Out | -1E-8K-BQ63T £29.95 | Hickory Dickory Dock & Baa Baa Black Sheep | -1C-16K-BQ39N £19.95 |
| K-Razy Krippers | -1E-8K-BG51F £29.95 | British Heritage Jigsaw Puzzles | -2C-16K-BQ40T £19.95 |
| K-Siar Patrol | -1E-8K-BG52G £29.95 | European Scene Jigsaw Puzzles | -2C-16K-BQ41U £19.95 |
| Pathfinder | -1D-32K-BG33L £27.95 | Video Easel | -1E-8K-BQ72P £24.50 |
| Crossfire | -1C-16K-BG22Y £20.64 | Micro Painter | -1D-48K-BG56L £29.95 |
| Crossfire | -1D-32K-BG23A £20.64 | Music Programs | |
| Protector | -1C-32K-BG24B £21.80 | Music Composer | -1E-8K-YG48C £35.95 |
| Protector | -1D-32K-BG25C £21.80 | Movie Themes | -1C-8K-BQ34M £9.95 |
| Threshold | -1D-40K-BG18U £27.54 | Computer Languages | |
| Deluxe Invaders | -1D-16K-BG34M £29.95 | Assembler | -1C-16K-YL32K £19.95 |
| Galactic Chase | -1C-16K-BQ62S £16.95 | Assembler Editor | -1E-8K-YG68Y £39.95 |
| Galactic Chase | -1D-16K-BQ61R £19.95 | Macro Assembler | -1D-32K-BQ73Q £59.95 |
| Race In Space | -1C-16K-BQ35R £14.95 | Basic A+ | -1D-48K-BQ31J £49.95 |
| Race In Space | -1D-16K-BG20W £16.95 | Basic A+ & Operating System A+ | -1D-48K-BQ32K £99.50 |
| Space Chase | -1C-16K-BG42V £10.95 | Microsoft Basic | -1D-32K-BQ74R £59.95 |
| Space Chase | -1D-24K-BG43W £12.95 | Pilot (Educator) | -1E-8K-YG75S £79.95 |
| Centipede | -1E-16K-BQ70M £29.95 | Pilot (Consumer) | -1E-8K-YG69A £54.00 |
| Angle Worms | -1C-8K-BG50E £10.95 | OS Forth | -1D-24K-YL29G £49.95 |
| Lunar Lander | -1C-24K-BQ16S £10.95 | Tiny-C | -1D-48K-BG62S £64.95 |
| Lunar Lander | -1D-24K-BG49D £14.95 | Inter-Lisp/65 | -1D-48K-BG61R £87.00 |
| Jumbo Jet Lander | Available November | Utilities | |
| Submarine Commander | Available November | Programming Aids Package 1 | |
| Rasterblaster | -1D-32K-BG35Q £22.95 | 6502 Disassembler | -1C-16K-BG60Q £9.95 |
| Shooting Gallery | -1C-16K-BQ36P £14.95 | 6502 Disassembler | -1C-8K-VL30H £9.95 |
| Shooting Gallery | -1D-16K-BG19V £16.95 | Atari World | -1D-8K-VL31J £12.95 |
| Shooting Arcade | -1C-16K-BG18R £24.95 | 3D Supergraphics | -1C-40K-BQ27E £43.95 |
| Shooting Arcade | -1D-16K-BG16S £24.95 | 3D Supergraphics | -1D-40K-BQ29F £29.95 |
| Super Breakout | -1E-8K-YG67X £24.50 | File-It 2 | -1D-48K-BG10L £34.95 |
| Dodge Racer | -1C-16K-BG29G £19.95 | Filemanager 800 | -1D-40K-BG69P £72.80 |
| Dodge Racer | -1D-16K-BQ30H £19.95 | K-DOS | -1D-32K-BQ76H £49.95 |
| Matchracer | -1C-16K-BG31J £23.95 | Disk Manager | -1D-32K-BG58M £21.80 |
| Matchracer | -1D-16K-BG32K £23.95 | Disk Detective | -1D-16K-BG57M £24.95 |
| Mouskattack | -1D-32K-BQ77J £22.95 | Operating System A+ | -1D-32K-BQ30H £49.95 |
| Jawbreaker | -1C-16K-BG17T £20.64 | Telelink | -1E-8K-YG59P £21.50 |
| Chest Hunter | -1D-32K-BQ28D £20.64 | The Next Step | -1D-32K-BG64U £27.54 |
| Pac-Man | -1C-16K-BQ64U £19.95 | Books | |
| Pacific Coast Highway | -1E-8K-BQ71N £29.95 | Master Memory Map | -XH57M £4.00 |
| Pacific Coast Highway | -1C-16K-BG13P £24.95 | De Re Atari | -WG56L £16.95 |
| Pacific Coast Highway | -1D-16K-BG14Q £24.95 | Operating System User's Manual | |
| Chicken | -1C-16K-BG27E £21.80 | & Hardware Manual | -WA46A £16.95 |
| Chicken | -1D-16K-BG28F £21.80 | Atari Basic-Learning By Using | -WG55K £5.24 |
| Tumble Bugs | -1D-24K-BG46A £24.95 | Games For The Atari | -WA47B £4.45 |
| Bug Attack | -1C-24K-BG36P £23.95 | Atari Basic | -WG50F £6.80 |
| Bug Attack | -1D-40K-BG37S £23.95 | Atari Sound & Graphics | -WA39N £8.25 |
| Canyon Climber | -1C-16K-BG44X £24.95 | Your Atari Computer | -WA40T £13.45 |
| Canyon Climber | -1D-16K-BG45Y £24.95 | 6502 Assembly Language Subroutines | -WA05F £12.45 |
| Mountain Shoot | -1C-16K-BQ12N £10.95 | Advanced 6502 Interfacing | -WA41U £11.45 |
| Haunted Hill | -1C-16K-BG38R £16.95 | Beyond Games (6502) | -WA45Y £13.00 |
| Haunted Hill | -1D-16K-BG39N £19.95 | Computers For People | -WA00A £8.25 |
| Time Bomb | -1C-16K-BG40T £10.95 | Analog: The Magazine For Atari | |
| Time Bomb | -1D-24K-BG41U £12.95 | (6 issues) Annual Subscription | -GG24B £9.00 |
| Tank Trap | -1C-16K-VL34M £9.95 | Send us now for our new software leaflet with details of all the above programs. | |
| Tank Trap | -1D-32K-VL35Q £12.95 | Order As XH52G - Issue 3. | |
| Thunder Island | -1C-16K-BQ37S £10.95 | Key: C = Cassette. D = Disk E = Cartridge. | |
| Home Game Programs | | 2C = 2 Cassettes etc. BK, 16K shows minimum memory requirement. | |
| Soram | -1C-16/24K-YG58N £17.50 | | |
| Basketball | -1E-8K-YG61R £24.50 | | |
| Cypher Bowl | -1C-16K-BQ20W £29.50 | | |
| Sunday Golf | -1C-16K-BQ13P £10.95 | | |
| Darts | -1C-16K-BQ42V £19.95 | | |
| Tournament & 8-Ball Pool | -1C-16K-BQ45Y £19.95 | | |
| Snooker & Billiards | -1C-16K-BQ44X £19.95 | | |
| Ricochet | -1C-16K-BG47B £14.95 | | |
| Ricochet | -1D-32K-BG48C £14.95 | | |
| Computer Chess | -1E-8K-YG63T £24.50 | | |
| Fast Gammon | -1C-8K-VL33L £16.95 | | |
| Gomoku | -1C-16K-BQ18U £14.95 | | |
| Gomoku | -1D-16K-BG55K £19.95 | | |
| Reversi | -1C-16K-BQ19V £14.95 | | |
| Reversi | -1D-16K-BG54J £19.95 | | |
| Cribbage & Dominoes | -1C-16K-BQ43W £14.95 | | |
| Poker Solitaire | -1C-16K-BQ17T £10.95 | | |
| Poker Solitaire | -1D-16K-BG53H £14.95 | | |

VIC20 COLOUR COMPUTER

- | | | | |
|---|-----------------|--|----------------|
| Hardware | | | |
| VIC20 Console | (AF47B) £169.99 | Simplicast Cassette (+16K) | (AC938) £19.95 |
| C2N Cassette Unit | (AF46C) £44.95 | VIC Stock Control Cassette (+8K) | (AC94C) £19.95 |
| VIC Printer | (AF49D) £230.00 | VIC File Disk (+16K) | (AC95D) £24.95 |
| VIC Disk Drive | (AF50E) £396.00 | VIC Writer Disk (+8K) | (AC95E) £24.95 |
| 3K RAM Cartridge | (AF51F) £29.95 | VIC Writer Cassette (+8K) | (AC97F) £19.95 |
| 8K RAM Cartridge | (AF52G) £44.95 | Education (CSE & GCE 'O' Level Revision) | |
| 16k RAM Cartridge | (AF53H) £74.95 | All cassette based and require at least 8K expansion memory. | |
| Joysticks and Paddles | | English Language | (AC98G) £9.99 |
| Single Joystick | (AC53H) £7.50 | Mathematics 1 | (AC99H) £9.99 |
| Pair of Joysticks | (AC37S) £13.95 | Mathematics 2 | (BC00A) £9.99 |
| Le Stick | (AC45Y) £24.95 | Biology | (BC01B) £9.99 |
| Pair of Paddles | (AC30H) £13.95 | Chemistry | (BC02C) £9.99 |
| | | Physics | (BC03D) £9.99 |
| Programming Aid Cartridges | | Computer Studies | (BC04E) £9.99 |
| Super Expander 3K RAM and Hi-res graphics | (AC54J) £34.95 | Geography | (BC05F) £9.99 |
| Programming Aid: Additional commands, function key programming etc. | (AC55K) £34.95 | History | (BC06G) £9.99 |
| Machine Code Monitor | (AC56L) £34.95 | Arithmetic for 9 to 11 year olds | (BC07H) £9.99 |
| | | Reading for 9 to 11 year olds | (BC08J) £9.99 |
| | | General Knowledge for 9 to 11 year olds | (BC09K) £9.99 |
| | | Spelling for 9 to 11 year olds | (BC10L) £9.99 |
| Software (all 3K unless stated) | | Home Programs | |
| Introduction to BASIC Cassettes | | All cassette based and require at least 8K expansion memory | |
| Part 1 | (AC57M) £14.95 | Quizmaster | (BC11M) £9.99 |
| Part 2 | (AC58N) £14.95 | Know Your Own IQ | (BC12N) £9.99 |
| | | Junior IQ | (BC13P) £9.99 |
| Game Programs | | Know Your Own Personality | (BC14Q) £9.99 |
| Avenger Cartridge | (AC59P) £19.95 | The Robert Carrer Family Menu Planner | (BC15R) £9.99 |
| Star Battle Cartridge | (AC60Q) £19.95 | VIC Money Manager | (BC16S) £9.99 |
| Super Slot Cartridge | (AC61R) £19.95 | VIC Road User & Highway Code | (BC17T) £9.99 |
| Jelly Monsters Cartridge | (AC62S) £19.95 | Garage Planner | (BC18U) £9.99 |
| Alien Cartridge | (AC63T) £19.95 | Interior Designer | (BC19V) £9.99 |
| Super Lander Cartridge | (AC64U) £19.95 | BBC "Ask The Family" | (BC20W) £9.99 |
| Road Race Cartridge | (AC65V) £19.95 | BBC "Mastermind" | (BC21X) £9.99 |
| Rat Race Cartridge | (AC66W) £19.95 | "Mastermind" additional General Knowledge | |
| Blitz Cassette | (AC67X) £4.99 | Data 1 | (BC22Y) £2.50 |
| Mole Attack Cartridge | (AC68Y) £24.95 | Data 2 | (BC23A) £2.50 |
| Adventureland Cartridge | (AC68T) £24.95 | Data 3 | (BC24B) £2.50 |
| Pirate Cove Cartridge | (AC68F) £24.95 | Data 4 | (BC25C) £2.50 |
| Mission Impossible Cartridge | (AC67U) £24.95 | "Mastermind" additional Specialist Knowledge | |
| Voodoo Castle Cartridge | (AC68V) £24.95 | Wine & Food | (BC26D) £2.50 |
| The Count Cartridge | (AC69X) £24.95 | Music | (BC27E) £2.50 |
| Sargon 2 Chess Cartridge | (AC77J) £24.95 | Sport & Games | (BC28F) £2.50 |
| Golf Cartridge | (AC90X) £24.95 | Films & TV | (BC29G) £2.50 |
| Omega Race Cartridge | (AC91Y) £24.95 | Books About VIC | |
| Another VIC in The Wall Cassette | (AC78K) £7.00 | Learn Programming on the VIC | (WA31J) £2.50 |
| VIC Panic Cassette | (AC79L) £7.00 | VIC Revealed | (WA32K) £10.00 |
| Cosmads Cassette | (AC80B) £7.00 | VIC Programmers Reference Guide | (WA33L) £9.95 |
| Backgammon Cassette (+3K) | (AC81C) £7.00 | VIC Graphics | (WA48C) £10.00 |
| VIC Men Cassettes | (AC82D) £7.00 | | |
| VIC Asteroids Cassette | (AC83E) £7.00 | | |
| Business Programs | | | |
| Simplicast Disk (+16K) | (AC92A) £24.95 | | |



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

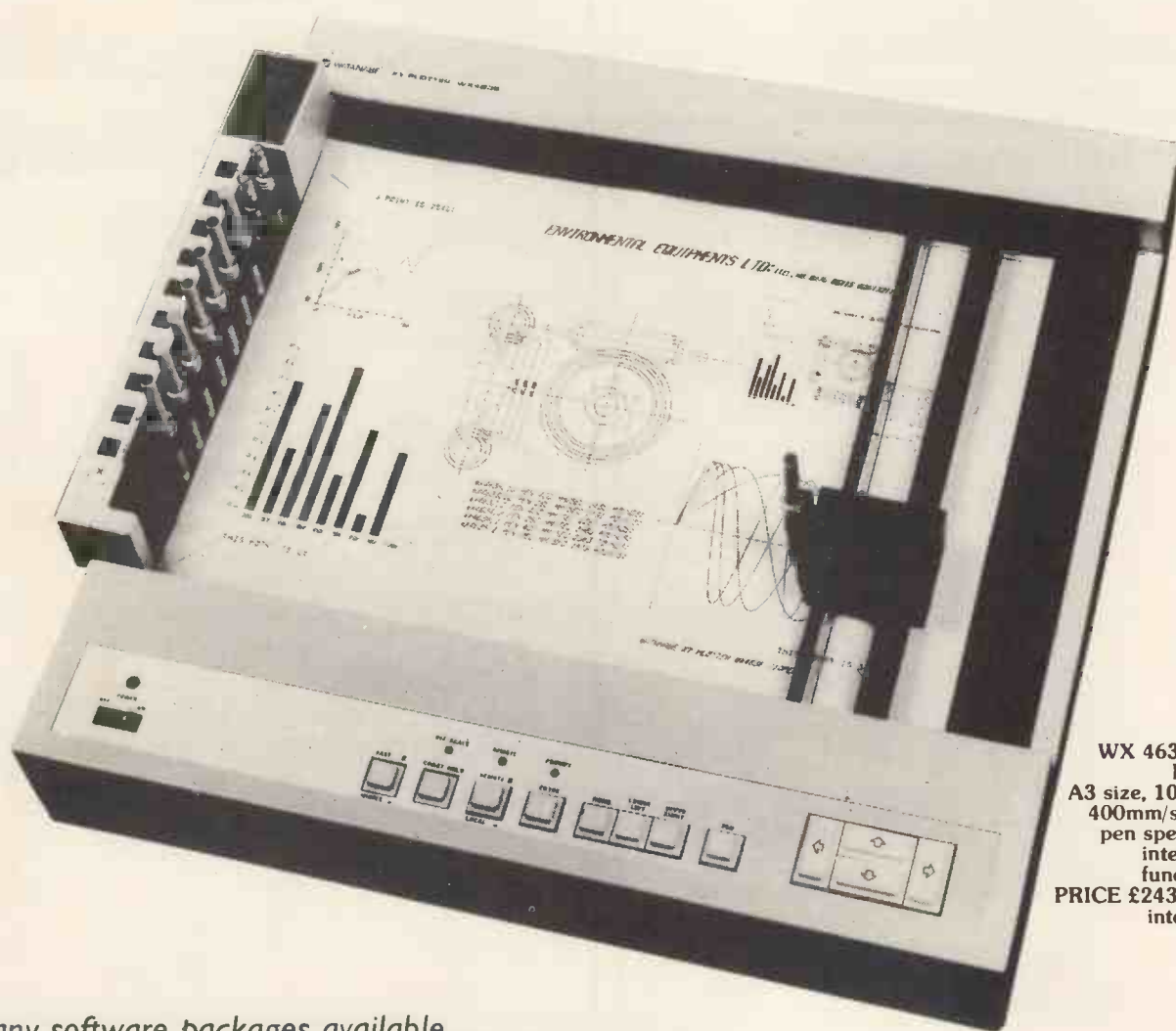
Demonstrations at our shops NOW. See the computers in action at 159-161 King St., Hammersmith W6. Tel: 01-748 0926
284 London Road, Westcliff-on-Sea, Essex. Tel: (0702) 554000
Lynton Square, Perry Barr, Birmingham. Tel: (021) 356 7292.

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

N°1 FOR DIGITAL X-Y PLOTTERS

If you are looking for a high quality X-Y Plotter, then look no further, we will almost certainly have one from our large range to suit your requirements (we have 17 different models in A3 size alone). Our Watanabe Plotters are available in sizes from A3 to A0, flatbed or drum type, with a choice of 1 up to 10 pens. With parallel, RS232 or IEEE interfaces.

Our prices must make these Plotters the best value for money available with A3 Plotters starting at £892.50 (1 pen, 12 intelligent functions, parallel interface) and at the top of the range in A3 size our 10 pen high speed Plotter with 42 intelligent functions (including digitizing) is only £2,430 plus interface.



**WX 4636 X-Y
Plotter**
A3 size, 10 pens,
400mm/second
pen speed, 42
intelligent
functions.
**PRICE £2430 plus
interface.**

*Many software packages available
Why not contact us on (0270) 625115, 626132, we will
be pleased to send you further information or
arrange a demonstration.*



Environmental Equipments (Northern) Limited

Tel: Nantwich (0270) 625115-626132

ENVIRON HOUSE, 64 WELSH ROW, NANTWICH, CHESHIRE CW5 5ES



OFFICE EFFICIENCY MACHINES LTD

1 Lochaline Street, London W6 9SJ

Tel. 01-741 7211/2/3/4

SPECIAL PROMOTION DEALS!

IBM
Personal Computer



£2599.00
PLUS! EPSON MX80 PRINTER
WORTH £400.00 FREE!

ACT
SIRIUS 1



£2395.00
PLUS! EPSON MX80 PRINTER
WORTH £400.00 FREE!

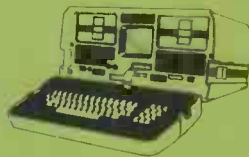
NEW!

DRG
VICTOR 9000



£2395.00
PLUS! EPSON MX80 PRINTER
WORTH £400.00 FREE!

OSBORNE 1



PLUS! EPSON MX80 PRINTER
and 12" MONITOR

£1499.00

(Total package worth £1800.00)

Includes
WORDSTAR, MAILMERGE,
SUPERCALC, MBASIC + CBASIC
worth £800 FREE!

OR **OSBORNE 1** PLUS 12" (GREEN OR AMBER) MONITOR – **£1250.00**

TO PLACE YOUR ORDER – CALL OUR
HOT LINE – 748 8404

OEM ALSO OFFER SOME OF THE BEST
TRADE PRICES IN THE UK ON IBM PC
AND MOST PRINTERS

To: Office Efficiency Machines

1 Lochaline Street, London W6 9SJ

Telex 263559 Micro G

Please send me information on the

Trade End User

Please ask your sales staff to contact me

re

Name

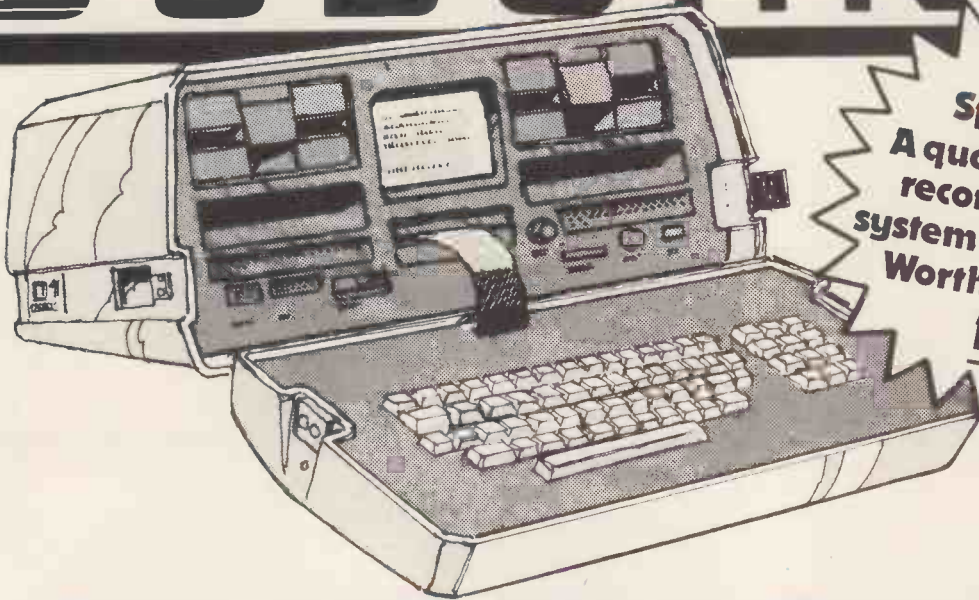
Company

Address

Telephone

A FREE 12" MONITOR WITH EVERY

OSBORNE 1



PLUS!
Special Bonus
A quality incomplete
records accounting
system to trial balance.
Worth at least £350
FREE!

Personal Business Computer!

Available NOW from DATALINK the amazing Osborne 1 is the totally portable 64K personal business computer. An incredible breakthrough for mobile executives, sales personnel, engineers etc., Osborne 1 weighs only 24lb and fits under the standard airline seat!

And just look at DATALINK's special introductory offer
WORTH NEARLY £200! —

— A FREE 12" QUALITY GREEN MONITOR

which Interfaces with the Osborne for home use PLUS A BOX OF HIGH QUALITY BASF DISCS complete with SUPERIOR LIBRARY CASE! FREE!

Datalink's price - £1250 + VAT!

The Osborne package also includes as standard: WORDSTAR®, SUPERCALC™, MAIL MERGE®, MBASIC®, CBASIC® and CPM®

Take advantage of this superb offer while it lasts.
Cash with order — Personal buyers welcome. Post FREE in UK!

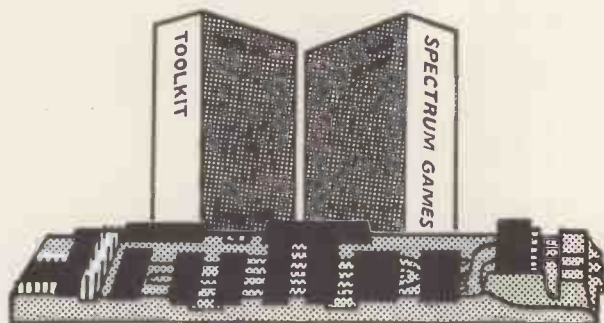
DATALINK

MICROCOMPUTER SYSTEMS (UK) LIMITED

10 Waring House, Redcliffe Hill, Bristol BS1 6TB Tel: Bristol (0272) 213427 Telex: DATAL G 44807

24 hr answering service

SPECTRUM BUDGET PAK



SPECTRUM 32K RAM **plus** SPECTRUM TOOLKIT and NEW SPECTRUM GAMES

SAVE £8.45!

For Issue One SPECTRUM – total package price only £44.95

For Issue Two SPECTRUM – total package price only £34.95

JRS SOFTWARE

19 WAYSIDE AVENUE, WORTHING, SUSSEX. BN13 3JU Telephone: (0903) 65691

SPECTRUM

HARDWARE

32K RAM (Issue One Spectrum) Only £42.50

32K RAM (Issue Two Spectrum) Only £32.50

SOFTWARE

Programmers Toolkit (16K & 48K) Only £5.95

Spectrum Games – Airport, Alien, Crabs (16K) Only £4.95

ZX81

A full range of software and hardware are available. Tick the coupon below for your free 1983 catalogue and enclose a large stamped addressed envelope.

I wish to order the following:

<input type="checkbox"/> Spectrum Budget Pak (For Issue One)	Only £44.95
<input type="checkbox"/> Spectrum Budget Pak (For Issue Two)	Only £34.95
<input type="checkbox"/> 32K RAM (For Issue One)	Only £42.50
<input type="checkbox"/> 32K RAM (For Issue Two)	Only £32.50
<input type="checkbox"/> Programmers Toolkit (Spectrum)	Only £5.95
<input type="checkbox"/> Spectrum Games	Only £4.95
<input type="checkbox"/> 1983 JRS Catalogue	FREE

Tick as applicable

Total (Inc VAT & P&P)

Name

Address

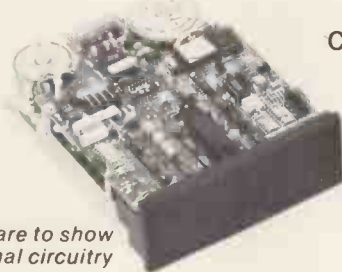
Age

Post to: JRS SOFTWARE, Department PCW/1
19 Wayside Avenue, Worthing, Sussex BN13 3JU

A M ELECTRONICS

“The Power behind the Drives”

Recognising a need for high quality drives at competitive prices, we are pleased to introduce our extensive range of Canon and Denset disc drive units.



*illustrated bare to show quality of internal circuitry

Canon 5 1/4" floppy disc drive

A 2/3 height drive, exceptionally quiet, very reliable performance and particularly well engineered, cased and ready to run with PSU

48 TPI single sided — 250K capacity *£175 — Dual £344

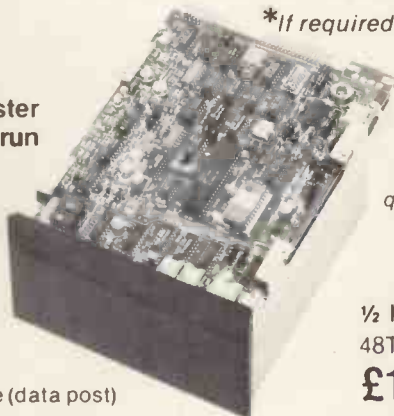
Double sided — 500K capacity *£216 — Dual £418

96TPI double sided 1 meg. capacity *£256 — Dual £506

*If required bare less case and PSU deduct £26.00

Denset 6.7 Mbyte 5 1/4" Winchester ready to run

- cased with PSU + controller for Apple II £1195 with host adaptor and software
- cased with PSU + controller for TRS80 £1195 with host adaptor and software
- bare £600



illustrated bare to show quality of internal circuitry

1/2 height drive Apple compatible
48TPI cased single sided drive
£180 — Dual £370

All prices exclusive VAT — add £8.00 postage (data post)

Delivery approximately 28 days

Office telephone 01-994 6477 9-5 pm

24 hr. Ansaphone Telephone 994 4470. Access telephone orders gladly accepted

A M Electronics 10 Barley Mow Passage Chiswick London W4 4PH

The box is not always black ...

At Rair we're continually enhancing and upgrading our Black Box microcomputer range to meet the ever-changing, ever-growing needs of our customers.

That's why you'll often find our systems turning up under different names, different colours—not always black.

Our current Black Box range includes 8- and 16-bit micro-processors, that can be configured from simple single-user floppy disk systems right up to powerful multi-user systems with Winchester hard disks and tape backup.

So next time you're choosing a micro-computer for a new application, remember to call us first. With Rair, you can have any colour you like, including black.



RAIR

United Kingdom
RAIR Limited
6-9 Upper St Martins Lane
London WC2H 9EQ
Telephone (01) 836 6921
Telex 298452

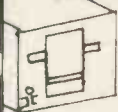


A fresh new 48K Apple II will only cost you:

£499

(While stocks last!)

Disk Drives



Apple disk drives at these amazing low prices!

With Controller **£270**
Without Controller **£220**

Apple III

At these prices, it must be the top of the crop!

128K 1995
256K 2495



Monitors

Haga
Denshi
12" Green
Screen
Monitor.



£90

Bits'n'Bytes

Numeric Keypad.....	£75
Joystick (TKC).....	£24
Paddles.....	£15
Cooling Fan.....	£50
Voltage Stabiliser.....	£170
Acoustic Coupler.....	£200
10 BASF 5.25" disks.....	£18
Listing Paper.....	£14
Locking Disk Box.....	£20
Printer Ribbons.....	POA
Daisywheels.....	POA



Mail Order



We accept both Access and Barclaycard, subject to a 5% surcharge. Telephone orders are welcome on

01-278 3838

Delivery

Please add 1.5% to your order for UK delivery charge. Securitor delivery by arrangement.

All goods are normally despatched same day.

All goods are normally carried in stock, however, please confirm before collecting.

We are open from 9.30 to 5.00 on Mondays to Saturdays

ATA SYSTEMS

4 ALBION HOUSE, 1 BACK HILL, LONDON EC1

01-278 3838/01-278 5285

WHILE STOCKS LAST!

LOWEST U.K. EPSON PRICES!

MX80T (Type 3).....£290
MX80F/T (Type 3).....£315
MX100F/T (Type 3).....£420

Other printer prices on application

UNBEATABLE VALUE

INTERFACES

Parallel Printer Card.....£70
Serial Printer Card.....£105
Pascal Card.....£105
Eurocolour Card.....£70

Apple Take Away

All prices plus 15% VAT

Software

Mathemagic.....	£46
Graphmagic.....	£46
Mathe/Graphmagic (Pack).....	£88
Microfinesse.....	£350
Micromodeller.....	£560
Apple Project Manager.....	£137
Order Tracking System.....	£28
Hand Holding Basic.....	£59
Personal Finance.....	£43
Applesoft Compiler.....	£110
Locksmith 4.1.....	£65
DOS Tool Kit.....	£41
Pascal Tutor.....	£60
Pascal Programmer.....	£60
Pilot.....	£84

Vlasac Orbit Accounting Modules are fully integrated, however, to use this facility, a third disk drive with controller and a pascal card are necessary.

General Ledger.....	£295
Sales Ledger.....	£295
Purchase Ledger.....	£295
Stock Control.....	£295
Payroll.....	£295
Auto Invoicer.....	£150

TABS
MODULES
ON REQUEST

VISICALC

ALL LATEST PACKAGING VERSIONS!

Visicalc.....	£98
Visitrend/plot.....	£131
Visidex.....	£126
Visifile.....	£120
Visischedule.....	£150

IEEE 488 Card.....	£241
780 System (Microsoft).....	£184
80 Col System (Videx).....	£199
16K RAM Card.....	£48
32K RAM Card.....	£150
128K RAM Card.....	£350

Daisywheel Printers

TEC 40cps.....	£995
TEC 55pcs.....	£1295
Ricoh 1600.....	£1195
Ricoh Flowriter.....	£1575
Diablo 630 RO.....	£1595

DATABASE

PFS.....	£40
PFS Report.....	£40
DB Master 3.....	£104
DB Utilities.....	£47
Data Factory 5.....	£195
Dalastar.....	£99
Supersort.....	£95
dBase II.....	£348
Access.....	£179

Word Processing

Applewriter.....	£39
Applewriter II.....	£85
Wordstar 3.0.....	£125
Mailmerge.....	£47

HEWLETT PACKARD

7470 PLOTTER

RS 232 OR HP 1B

INTERFACE

ONLY £969

The Gallid Trolley



Available for Apple II - III, Commodore Siruis, Victor 9000, NEC, Sord and a host of other Personal Computers. Price £69.50.

Selected by the Design Centre London. 5 year guarantee.

Can be seen at "Which Computer Show" NEC, January 18-23 1983

For further details contact:—

dimos
COMPUTER PRODUCTS

DI-MOS Limited, Kimal House,
Uxbridge Road,
Hillingdon,
Middlesex, UB10 0PP

☎ 01-561 6460 (3 lines)

— designing for tomorrow.



gallid Gallid Limited

Gallid House 1 Bilton Road Rugby
Warwickshire CV22 7AA
Tel: (0788) 74442-3

PRINTERS AND PERIPHERALS

Full range of printers and peripherals available for same day despatch at LOW LOW prices. Dot Matrix and Daisywheels from EPSON, OKI, NEC, MANNESMANN, TEC, QUME and others.

Compare these prices:

EPSON MX80T-3	£280
MX80FT-3	£320
MX82FT	£340
MX100FT-3	£420
OKI M80A	£220
M82A	£302
M83A	£425

LATE NEWS

Z80 4MHz 64K dual disk micro, CP/M, two serial ports and 12" intelligent terminal detachable keyboard. Supplied with soft-ware valued at £1000 (inc. Basic).

... £1825

Order from:

BB ELECTRONICS
ASHLEA HOUSE
OCKHAM ROAD NORTH
OCKHAM, WOKING
SURREY GU23 6NL

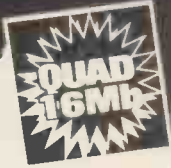
PHONE GUILDFORD (0483) 225480
for latest pricing and stock
(24 hr answer service)

ALL PRICES EXCLUDE VAT AND
DELIVERY CHARGED AT COST

BIRMINGHAM | MANCHESTER | BRISTOL | EDINBURGH
021-233 1000 | 061-792 2723 | 0272-2 14572 | 031-225 7446

01-800 8185

01-802 7186
01-834 9090



FREE! WITH ALL IBM PC'S
 & DOUBLE DENSITY OSBORNES!
ASHTON TATE d-BASE II
 (ALL-PURPOSE PACKAGE - VERY EASY TO USE) - WORTH **£400**

LEASE FROM £11.49 per week
 CASH & CARRY PRICE from £1,899

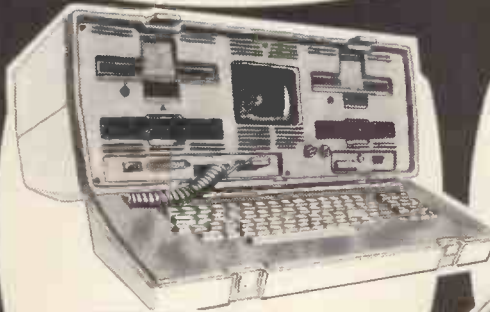
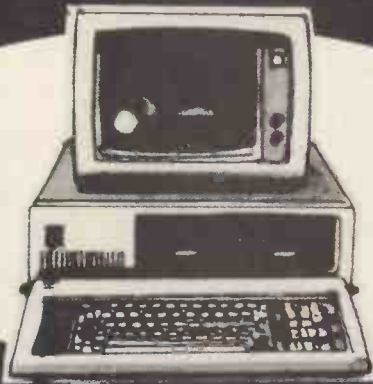
IBM
 Personal Computer

LEASE FROM £7.99 per week

OSBORNE 1
 & **PRAXIS 35**

LEASE FROM £13.40 per week

Logica VTS



QUAD DENSITY DRIVES:
 1.6 Mb fitted as standard

ACCESSORIES:

- High quality RAM expansion boards:
 Up to 1 Mb easily installed in your IBM PC
- 256K £475 512K £775

- Full list available on request
- Revolutionary LISTENING and SPEAKING system
- SPECIALITY AREAS:**
- Main Frame Communications
- Winchester Hard Disks 5 to 40 Mb
- Graphics
- Networking

FREEFONE 2718

PERSONAL CALLERS WELCOME.
 MANY OTHER MICROS AVAILABLE!

BETTER DEAL!
FOR EVERY NEED

CASH & CARRY
or ADVANCED FULL
SUPPORT

SPECIAL OFFER

COMPLETE SET OF ACCOUNTING SOFTWARE
 (Invoicing, Stock Control, Sales Ledger,
 Nominal Ledger, Purchase Ledger and Payroll).

AT GIVEAWAY PRICE OF **£299**
 (normal cost £1,500) available with every
 microcomputer purchased.

RAM EXPANSION BOARDS FOR **SINUS 1**
 and VICTOR 9000. In many sizes

- Call in for details and prices.

BRITAIN'S PRIDE

16-Bit Processor/15" Screen/Keyboard/Dual
 5 1/4" Disk Drives/64K RAM (up to 512K
 available). Serial and parallel
 communication ports,
 CP/M-86 Operating System.

VTS'S MENTOR
 ISICL

EASY CREDIT TERMS

We have a range of easy credit terms:

LEASING - HP
- SHORT TERM RENTALS
 can be easily arranged.

Call in or FREEPOST your coupon NOW!

THE COMPLETE SERVICE

- * ALL UPGRADING FACILITIES AVAILABLE
- * FULL SOFTWARE SUPPORT
- * MAINTENANCE AND FULL AFTER SALES SERVICE
- * PROFESSIONAL ADVICE IN CHOOSING THE BEST SYSTEM FOR YOUR NEEDS

For more information FREEPOST to
SILICON VALLEY - Group 18,
FREEPOST, LONDON N15 6BR.

My interests are:

Please send me further
 details about LEASING

NAME:

POSITION:

COMPANY:

ADDRESS:

TEL:



SILICON VALLEY COMPUTER CENTRE

Open Monday-Friday 10 am-6 pm

The Silicon Valley Computer Centre
 Group 18 Ltd
 115 Craven Park Road
 LONDON N15

Software for CP/MTM

MICROPRO

£

WORDSTAR	MICROPRO's comprehensive word processing system	250.00
MAILMERGE	Added power to WORDSTAR for mailing lists, standard letters, etc	60.00
SPELLSTAR	Dictionary on a disk for WORDSTAR spelling checking	120.00
DATASTAR	MICROPRO's data entry, validation and retrieval system	170.00
SUPERSORT I	Sorting, extracting and merging at high speed from MicroPro. Includes Relocatable version for inclusion in your own software.	120.00
CALCSTAR	MICROPRO's spread sheet and financial modelling system. Combine with WORDSTAR to get impressive end results.	150.00
WORDMASTER	Video text editor for programmers and simple Word Processing	60.00

MICROSOFT

£

BASIC-80	MICROSOFT's popular and powerful BASIC Interpreter (MBASIC)	150.00*
BASIC Compiler	Compile your BASIC-80 programs for speed and protection	190.00*
FORTRAN-80	Fortran compiler to ANSI X3.9 1966 except COMPLEX data	210.00*
COBOL-80	The COBOL compiler for microcomputers. (BASIC, FORTRAN and COBOL compilers include MACRO-80, LINK loader, LiBrary manager and CREF utilities.)	310.00*

MISC

£

CBASIC-2	COMPILER SYSTEMS widely used compiler/interpreter for BASIC	94.00
CB-80	CBASIC compatible compiler	310.00
PASCAL/M	SORCIM's PASCAL	120.00
SUPERCALC	SORCIM's spread sheet and modelling system	170.00
MILESTONE	Project Management and Scheduling from Organic Software	160.00
dBASE II	Relational Database Management from Ashton Tate	380.00
dUTIL	Programming aid for dBASE II	50.00
MICROSTAT	Statistical program library from ECOSOFT for (and needs) BASIC-80	150.00
PLI-80	Digital Research PLI Compiler	310.00
BT-80	Record Retrieval for PLI-80	125.00
MAC	Digital Research 8080 Macro Assembler	57.00
SID	8080 Symbolic Debugger	47.00
ZSID	Z80 Symbolic Debugger	63.00
DESPOOL	File Print Spooler for CP/M	31.00
TEX	Tex editor	63.00
SPELLBINDER	Lexisoft's Wordprocessing and Office Management System	275.00
PRO PASCAL	Z80 True Pascal Compiler	190.00

All products are available in 8" SD, SS, Superbrain 5" SS, North Star Horizon QD format except those marked * which are not available in North Star format.

IBM PC SOFTWARE NOW AVAILABLE - Please ring for full details

All products are supplied complete with full originators documentation.

Please send large s.a.e. for full details. **TRADE ENQUIRIES WELCOME**

Ordering Instructions: Cash with order. Specify disk format. Add £3.00 per item P&P. Add 15% VAT



the soft option (UK)LTD

PO BOX 11 CRANBROOK KENT TN17 2DF Tel. (058 080) 310

The Best Vic Software from Kobra

GAMES

All these selected games on cartridge (except Blitz)
AVENGER 'INVADERS' in colour £19.95
SUPER LANDER land the lunar module game £19.95
ALIEN bury marauding aliens in the maze £19.95
STAR BATTLE 'GALAXIANS' in full colour 1 - 2 players £19.85
JELLY MONSTERS is this 'PUCKMAN', or not? £19.95
ROAD RACE drive thro' the night and stay on the road £19.95
RAT RACE VIC's answer to 'RALLY X' £19.95

MOLE ATTACK stop the moles to survive £19.95
SARGON II CHESS the best available, seven playing levels £24.95
SUPER SLOT computerised one armed banditry £19.95
GORF five famous arcade games £24.95
OMEGA RACE sophisticated version of 'ASTEROIDS' £24.95
ADVENTURE GAMES telephone for titles - all £24.95
BLITZ flatten the city before you collide with the skyscraper £4.99
BRIDGE superb version of the card game £24.95



PROGRAMMING

Enhance your VIC with these programmer's aids - and add memory with the RAM Packs.
SUPER EXPANDER high-res graphics, sound, additional 3K RAM £34.95
PROGRAMMERS AID program development tool £34.95
MACHINE CODE MONITOR simplifies machine code programming £34.95
VIC FORTH fast, compact language cartridge with additional 3K £38.95
VIC REL simple electrical control for up to six pieces of apparatus £28.95

VIC STAT single word commands for statistical calculations with colour displays £28.95
VIC GRAF explores graphs and their equations £28.95
VIC SWITCH allows eight VIC's to use one printer and disk £79.95
16K RAM memory pack £74.95
8K RAM memory pack £44.95
3K RAM memory pack £29.95



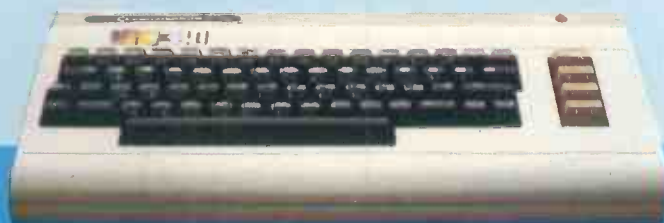
EDUCATION

For home or school. Unless shown all need 16K memory. Age range shown in brackets.
FACEMAKER for spelling and observation skills (5 - 12) £8.95
NUMBER CHASER exciting number estimating (5 - 12) £8.95
NUMBER GULPER gobble away at addition, subtraction, multiplication and division practice, (5 - 12) £8.95
WE WANT TO COUNT helps the very young to learn numbers (3 upwards) £8.95
TWISTER Rubik like geometric puzzle with 'SUPER TWISTER' section (8 upwards and the whole family) £8.95

SHAPE UP teaches shape and pattern recognition (3 upwards) £8.95
G.C.E. 'O' level revision programs (8K/16K) titles: English Language, Maths 1, Maths 2, Biology, Chemistry, Physics, Computer Studies, Geography, History £9.99 each
 For 9 - 11 year olds (8K/16K) titles: Arithmetic, Reading, General Knowledge, Spelling £9.99 each

Dealer enquiries to
 Adda Computers, Tel 01-579 5845

RAINBOW TOWERS problem solving to exercise memory and logic (8 upwards and the whole family) £8.95
CRANKY addition and subtraction practice (5 - 12) £8.95
HIDE & SEEK improves short term memory (5 - 12) £8.95
WORDS WORDS WORDS helps spelling and object identification (5 - 12) £8.95



HOW TO ORDER:

VISIT YOUR LOCAL VIC DEALER
 BY MAIL OR PERSONAL CALLERS

By mail add 50p post and packing per item and make cheques or PO's payable to Kobra Micro Marketing. Send to:

KOBRA

The Vic Centre
 154 Victoria Road, Acton
 London W3 6UL

Near North Acton tube, just off A40

BY TELEPHONE
 Telephone orders 24 hrs a day with
 Visa, Access, Amex

01-200 0200

There's a world of difference with...

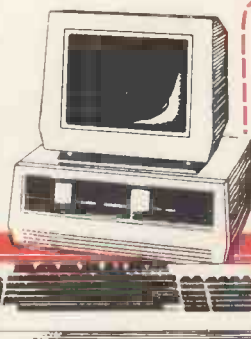


FAST

FINANCIAL ACCOUNTING SOFTWARE from TRIDATA...

... proven business software, specially developed for the worlds largest retailer of Microcomputers, is now available on a range of machines supporting the **CP/M*, MS-DOS* & TRS-DOS*** operating systems

FAST Business Software offers the discerning businessman powerful and proven packages that can be used individually or as a comprehensive company accounting system. Designed for the first time user, both the V.D.U. screen layouts and the comprehensive manual, ensure that the transition from hand written ledgers to a computerised system is painless. Over 3,000 individual Tridata Software packages are currently in use by businesses in the U.K. providing them with cost effective solutions to their accounting and payroll problems. The FAST suite of integrated business software comprises, sales ledger with invoicing, purchase ledger, nominal ledger, stock control and payroll. Each package has been developed with the needs of the user in mind and combined with the sophisticated features contained within the programs, FAST business software is the ultimate choice for your microcomputer.



PLEASE SEND ME DETAILS ABOUT **FAST** BUSINESS SOFTWARE

NAME _____

ADDRESS _____

PCW/01/83

TEL. NO. _____

TRIDATA MICROS LTD., FREEPOST, BIRMINGHAM B5 4BR. TEL: 021-622 6085

FAST

CP/M is a trademark of Digital Research Corp. MS-DOS is a trademark of Microsoft Corp. TRS-DOS is a trademark of Tandy Corp.

**"If you can buy a
business computer package
of the same quality
at a lower price,
I'll buy it for you!"**

**Noel C. May, Managing Director
Transtec Computers.**

**The Transtec Total Accounting
Package costs just £2400 (ex. VAT)
and includes . . .**

The BC2 Computer

- ★ 800K usable disk storage
- ★ 64K of memory
- ★ 80X25 hi-res. green screen
- ★ CPM 2.2 operating system as standard
- ★ Detachable keyboard with 17 function keys and numeric pad
- ★ In-built facility to expand capacity at any time.

The Printer

An Olivetti DM 5050C heavy duty 80 cols. 100 CPS dot matrix printer with capacity to handle single sheet or continuous sprocket fed paper.

The Software

Complete "Business Desk" set of programs by Paxton incorporating Invoicing, Stock, Sales, Purchase and Nominal Ledgers - a fully integrated accounting software package.

**Other financial modelling,
word processing
and data base packages
available**

at low all-in costs.

To get the full facts
Contact your local computer dealer or
Transtec direct.

**13 Small Street, Bristol BS1 1DE.
Tel. (0272) 277462**

European Plant
IDA Complex, Macken St., Dublin 2.
USA - Leading Edge Products Inc.,
Canton, Mass.

I'm interested, tell me more.

Name,

Address.

Company,

transtec

SIMPLY BETTER COMPUTING

Trade/User Enquiry (delete as appropriate).

LET YOUR MICRO TAKE OFF WITH GEMINI

USING GEMINI FUNCTIONAL CASSETTE SOFTWARE FOR JUST £19.95

Fully compatible with
 TI - 99/4A SHARP MZ - 80K/A/B
 VIC 16K BBC Micro
 Oric Sinclair Spectrum
 Dragon 32 ATARI 400/800

Here's the software to run your budgeting, your business, your stamp collection, your car costs . . . even to plan your next meal and help you choose a wife. Tested programs that come with all the documentation back-up you need from

SPECIAL LIMITED OFFER
 Any 3 programs at £19.95 for the price of two with all orders received before 31st March 1983.

Gemini who are experts in practical software. So mail us the coupon - and put your micro to work . . . fast.



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



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



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



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



COMMERCIAL ACCOUNTS A gem of a program, all for cassette, with the following features:-

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

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



HOME ACCOUNTS Runs a complete home finance package for you with every facility necessary for keeping a track of regular and other expenses, bank account, mortgage, H.P. etc. etc. etc! You'll wonder how you ever managed without it. **£19.95**

Gemini Marketing Limited.
Functional Software Specialists
9, Salterton Road Exmouth, Devon.
Telephone orders welcome. (03952) 5832
Please quote Access/Diners Card Number

For Functional Software
 Dealer Enquiries Welcome

ZX81 16K - Database available - Only £7.50 including FREE Decision Maker Programme.

Tick the box for Program you require. Prices include V.A.T and Package and Postage. Please supply the following cassette software.

Database	£19.95	<input type="checkbox"/>
Stock Control	£19.95	<input type="checkbox"/>
Mailing List	£19.95	<input type="checkbox"/>
Invoices and Statements	£19.95	<input type="checkbox"/>
Commercial Accounts	£19.95	<input type="checkbox"/>
Home Accounts	£19.95	<input type="checkbox"/>
ZX81 16K Database	£7.50	<input type="checkbox"/>

Name _____

Address _____

Machine Type _____ Memory Size _____

I enclose _____

Make cheques and postal orders payable to Gemini Marketing Ltd. All orders despatched within 7 days.

Diners Card Number _____ Access Number _____

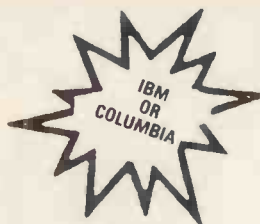


Signature: _____

Gemini. Functional Software Specialists 9, Salterton Road, Exmouth, Devon. (03952) 5832
 Telephone orders welcome. Please quote Access/Diners Card Number



GEMINI



MICROCOMPUTER SALES, LEASE OR RENTAL AND OTHER SERVICES

A comprehensive rental/hire service, featuring the ACT Sirius 1, the SUPERBRAIN, BBC, ICL, APPLE & IBM range of microcomputers. **PLUS** a full range of PRINTERS & SOFTWARE.

- Short term rental available • Rental fee refundable against purchase • Very competitive costs • Plus our own low cost 24 hour maintenance service • Phone 01-458 5845 or write to our central office for details.

ACT SIRIUS 1



- THE COMPLETE BUSINESS MACHINE
- CALL FOR PRICES

PRINTERS

New EPSON Type III Series



- Available for Apple, BBC, Tandy, PET NASCOM, Sorcerer & other Micros.
- MX80F/T₃ = £310
- MX 100 = £425

COLUMBIA



MAIN FEATURES	CDP-MPC	IBM-PC*	OTHERS
Microprocessor	16-Bit 8088 8-Bit Z-80 (Opt)	16-Bit 8088	?
USER Memory	128K-1 Mbytes	18K-256 Kbytes	?
IBM-PC Compatible Expansions Slots Beyond Professional Configuration 1	8 Slots	0	?
Resident Floppy Disk Storage	Dual 320K (std)	Dual 150K (Opt) Dual 320K (Opt)	?
Resident Cache Buffer Hard Disk Storage	5M/10M	-	?
OPTIONAL OPERATING SYSTEMS (Supported by Company)¹			
MS-DOS (PC-DOS)	Yes	Yes	?
CP/M 86	Yes	Yes	?
MPM 86	Yes	-	?
OASIS-16	Yes	-	?
XENIX	Soon	-	?
OPTIONAL HARDWARE EXPANSION BOARD (Supported by Company)			
RS-232 Communications	Yes	Yes	?
B/W and Color Display Controller	Yes	Yes	?
Expansion Memory	Yes	Yes	?
Z-80 CP/M-80 Board	Yes	-	?
Cache Buffer Hard Disk	Yes	-	?
Time/Calendar Board	Yes	-	?
IEEE Bus Controller	Yes	-	?
8" Floppy Disk System	Yes	-	?
8" Hard Disk System	Up to 40 Mbytes	-	?
Tape Cartridge System	Yes	-	?

OTHER MODELS AVAILABLE

£175 Silentye 80-Col Graphics Printer	£460 Paper Tiger 455
£1300 Flowriter 1600 RP	£560 Paper Tiger 460
£795 ET121 KFR Olivetti Daisy Wheel printer includes parallel RS232 & IEEE 488	£725 Paper Tiger 560
£1050 QUME 35 KSR	£760 Anadex DP9500
£110 QUME Form Tractor TEC	£795 Anadex DP9001
£1000 Starwriter 70/40	£900 Anadex DP9501
	£1200 Colour Prism 132 Printer

CP/M SOFTWARE - Available for both ACT Sirius 1 & Superbrain

LANGUAGES	STANDARD	ACCOUNTANCY
PASCAL	WORDSTAR	INCOMPLETE RECORDS
FORTRAN	MDBSIII	INTERF ACCOUNTS
CIS-COBOL	DBII	SALES LEDGER
COBOL	MAILMERGE	PURCHASE LEDGER
FORTRAN	DATASTAR	NOMINAL LEDGER
MBASIC	SUPERSOFT 1	INVOICING
CBASIC 86	SUPERCALC	PAYROLL
APL	MULTIPLAN	STOCK CONTROL
MPM	OASIS 16	DS
C		PULSAR SOFTWARE
MS-DOS		
CPM 86,80		



HARDWARE AVAILABLE • Call for Prices

APPLE 48K VIDEO OUTPUT ONLY U.H.F. £480
DISC DRIVE WITHOUT CONTROLLER £220
DISC DRIVE WITH CONTROLLER £260
MONITORS - FULL RANGE, BMC £80



Details of IBM & ICL range of P.C. and expansion hardware, software, ring for sales or lease or short term rentals.

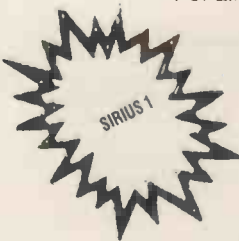
¹For comparison purposes, typical professional configurations consists of 16-Bit 8088 Processor, 128K RAM with Parity, Dual 320K 5-inch Floppies, DMA and Interrupt Controller, Dual RS-232 Serial Ports, Centronics Parallel Port and Dumb Computer Terminal or Equivalent.

²Columbia Data Products also supports CP/M 80 with an optionally available Z-80 CP/M Expansion Board.
*As advertised in BYTE Magazine, August 1982

For all Mail Orders, Rental Orders, Price Details or Further Information — Contact our Central Office:

MICROCOMPUTER SPACEDROME

3 WESTHOLM, HAMPSTEAD, LONDON NW11 Tel: 01:458 5845



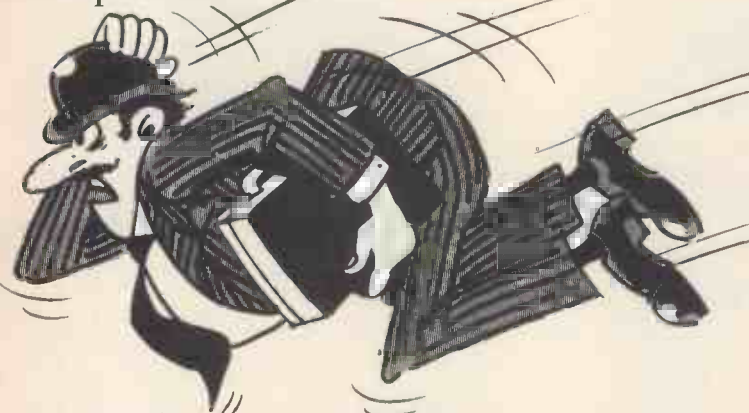
Our spreadsheet systems But let's start with

There was a time when you could run a business by the seat of your pants.

But the days of trusting to luck and following hunches are gone.

Today, computers, micros and more importantly business planning systems are no longer considered luxuries.

They allow you to keep one step ahead of your business, and one step ahead of the competition.



So it seems odd that most software companies still expect to solve all the problems with one system.

A "jack-of-all-trades" if you like.

Fortunately Comshare are not like most companies. We saw the need for different systems to suit different people.

NEW USERS START HERE

PlannerCalc at £39.00* is now accepted as the first choice for people new to financial planning.

Designed for 8-bit micros, it boasts the kind of features that you'd expect to pay three times as much for. (Buy PlannerCalc's nearest rival and you'll have to.)

Unlike all other 'calc' products it allows you to enter calculation in a language you understand. Plain English.

So it's much easier to use.

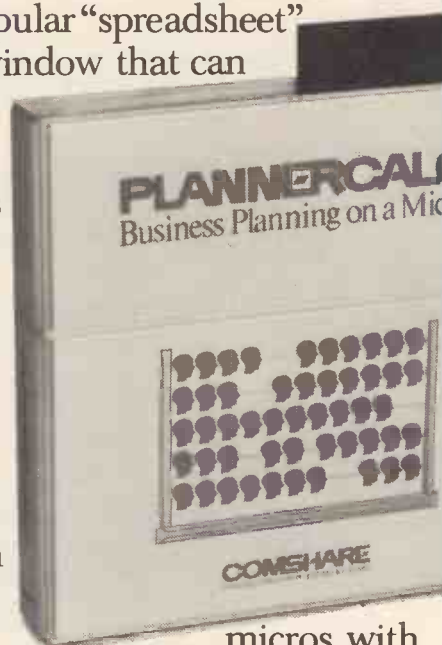
It uses the popular "spreadsheet" approach with a window that can be rolled in all directions.

Which means you can enter new figures and rules and immediately see their effect on everything else in the model.

It comes with the best manual on the market and it's suitable for most micros with a TMCP/M 2.2 operating system, 64K of memory, giving at least 900 cells, minimum screen width of 80 characters and floppy disc drives.

MUCH MORE POWER, NOT MUCH MORE MONEY

MasterPlanner is the most powerful spreadsheet system currently available with its increased matrix size, 2000-3000



micros with

a TMCP/M 2.2 operating system, 64K of memory, giving at least 900 cells, minimum screen width of 80 characters and floppy disc drives.



PLANNERCALC DEALERS

Aldershot: EMS (UK) Ltd 0252 313551	Clifton: Mercator Computer Systems Ltd 0272 731079	Clenlo Computer Systems Ltd 01-670 4202	Oxford: Choice Business Systems 049161 2697
Altrincham: Mercator Technical Services 061-941 4225	Croydon: Mayfair Business Systems Ltd 01-688 3836	Computer Aided Systems Ltd 01-487 3869	Redcar: Apple Stop Ltd 0642 474707
Aylesbury: Helistaar Systems Ltd 0296 630364	Dublin: Transtec Ltd 0001 718521	Dantedale Ltd 01-519 7004	Richmond: Tritec Computer Services 01-948 4213
Barnsley: Brook Office Supplies Ltd 0226 88916	Feltham: Ferrari Software Ltd 01-751 5791	Equinox Computers Ltd 01-739 2387	Rickmansworth: Al Microcomputers Ltd 09237 71428
Blackburn: TDS Business Systems 0254 676915	Hereford: Honeysett Computers 0432 279404	Jarogate Ltd 01-671 6321	Slough: KGB Micros Ltd 75 38581
Bristol: Belmondo Research Ltd 0272 427428	Ilford: Computer Aided Systems Ltd 01-518 1414	Ludhouse Computing Ltd 01-679 4321	Southampton: Xitan Systems Ltd 0703 38740
Transtec Ltd 0272 277462	P. W. Hare & Associates 01-551 1988	Spectrum Systems Ltd 01-405 1250	St Helier The Processor Centre 0534 77070
Canterbury: Kent Micro Systems 0227 50200	Ipswich: Anglia Microsystems 0449 740046	Sun Business Services Ltd 01-272 5205	West Byfleet: Fergusson Computers Ltd 91 41810
Cardiff Bowstrings Computer Services Ltd 0222 36825	Liverpool: Business Equipment Centre (Liverpool) Ltd 051-263 5738	Transam Computers Ltd 01-402 8137	Weston-Super-Mare Eastfern Ltd 0934 418346
Clevedon: Bard Computer Services Ltd 0272 878 157	London: Business Information Systems 01-373 3408	Whitpix Ltd 01-556 9151	Winchester: Modular Office Systems Ltd 0962 55759
		Milton Keynes: Pericom Data Systems Ltd 0908 614242	Yeovil: Dale Computer Systems Ltd 0935 72000

Items start at £39.00. Why you need one.

cells on most 64K micros. (But at £245* it certainly isn't the most expensive.)

Consolidation of models, allows you to create separate plans for each department and then combine them into an overall company plan. Data transfer to word processing and other systems lets you incorporate figures in reports and output to a data base. It also has extensive formatting facilities which means you can produce reports that wouldn't look out of place in the board room.

It can store up to 25 standard reports to run when you need them. It's got full WHAT IF? analysis and direct editing of both spread sheet and logic display.

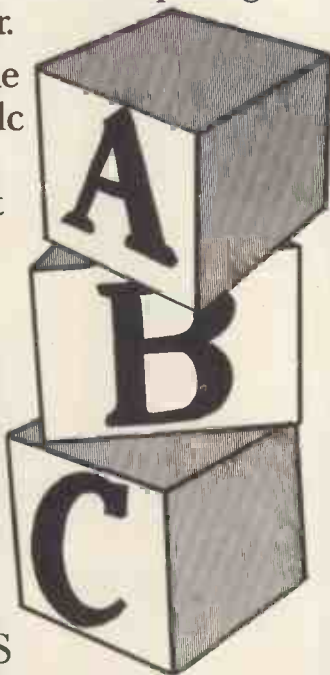
JUST AS EASY TO USE

All this increased power doesn't mean you'll need a degree in advanced computing to understand MasterPlanner.

It works on exactly the same system as PlannerCalc and models written on PlannerCalc run without modification on Master-Planner.

16 BIT VERSION

A new version of MasterPlanner has been specifically designed for the 16 bit micros like the Sirius I under TMCP/M-86 or the IBM personal using either CP/M-86 or TMMS DOS 1.1. With a vast matrix size of over 7000 cells on 128K and even more with larger memory, you'll at last be able to make the most of your micro.



OVER 10 YEARS EXPERIENCE

When you invest in MasterPlanner or PlannerCalc you're not just getting the best software money can buy.



You're also getting the kind of back up and after-sales service that only a company of Comshare's track-record can guarantee.

If you'd like to know more about either product call in at your local dealer or fill in the coupon and send it to us.

*Plus VAT and post & package.

COMSHARE

Making the computer make sense.

CP/M and TMCP/M-86 are the registered trade marks of Digital Research Inc. Comshare Ltd., 32-34 Great Peter Street, London SW1P 2DB. Telephone: 01-222 5665.



To: Department PCW1, Comshare Ltd., 32-34 Gt. Peter Street, London SW1P 2DB.

Please send me:

Qty	Product	Micro	Op System	Disc Size	K	Amount £	p.
	PlannerCalc @ £46.05 (8 bit only)		CPM 2.2	8"/5¼"			
	MasterPlanner @ £282.95		CPM 2.2	8"/5¼"			
	MasterPlanner	IBM PC	MS DOS 1.1	8"/5¼"			
	MasterPlanner		CPM/86	8"/5¼"			
All prices include VAT and postage & packing						TOTAL	

I enclose a cheque/postal order for £ _____ made payable to Comshare Ltd.

Please debit my Access Card No. _____ for £ _____

  Barclaycard No. _____ for £ _____

Signature _____

Name _____

Address _____

Tel. No. _____

Please allow 28 days for delivery. VAT No. 238418649. Registered No. 980406.

TOSHIBA DOUBLE SIDED/DOUBLE DENSITY 5 1/4" DISK DRIVES



Please note:

THESE DRIVES ARE BRAND NEW

These are high quality, very reliable, industry standard disk drives. These can be used as single sided/single density, double sided/single density or double sided/double density depending on the host computer disk interface. Compatible with most micro-computers e.g. VIDEO GENIE, ATOM, TRS80, BBC COMPUTER, SUPER BRAIN, NASCOM etc etc. If used as double sided/double density then the storage capacity is 3.5 MAGABITS/DRIVE (unformatted), track density is 48 TPI and can daisy chain up to 4 drives. 90 day warranty.

One Disk Drive Only £169 + VAT = £194.35
Two Disk Drives £329 + VAT = £378.35
Single Boxed with Power Supply £199 + VAT = £228.85
Dual Boxed with Power Supply £369 + VAT = £424.35
2 Drive Cable £15 + VAT = £17.25

QUANTITY PRICES ON APPLICATION

MITSUBISHI

DOUBLE SIDED/DOUBLE DENSITY DOUBLE TRACKS 5 1/4" DISK DRIVES

This is the latest addition to our range of disk drives. These drives use 1 MAGA BYTES (unformatted) per drive, the track density is 96TPI. Track to track access time is 3 msec. These are compatible with Shugart SAU60 (ANSI standard interface). Compatible with BBC COMPUTER, ATOM, NASCOM and lots of other computers

One disk drive only £219 + VAT = £251.85
Two disk drives £429 + VAT = £493.35
Single boxed with power supply £249 + VAT = £286.35
Dual boxed with power supply £459 + VAT = £527.85
DS/DD 96TPI diskettes £3.95 + VAT = £4.54 each
DS/DD 48TPI diskettes £2.50 + VAT = £2.88 each

EPSON TYPE 3 PRINTERS -



MX80 T-3

80 column, 80 CPS, super and subscripts, auto underlining, tractor feed, 32 print fonts, Bi-directional printing, logic seeking, 9 x 9 matrix, high res. graphics, centronic parallel interface.

Price Only £299 + VAT = £343.85

MX80 F/T-3

As above but with tractor or friction paper feed.

Price £325 + VAT = £373.75

MX100-3

136 columns, 100 CPS, all other features of MX80 plus true descenders, adjustable paper width up to 15 inches, friction or tractor feed, centronic parallel interface.

Price £429 + VAT = £493.35

OKI MICROLINE PRINTERS

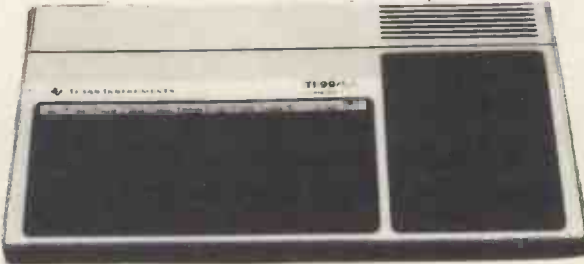
MICROLINE 80: Features 80 columns, 80 CPS, friction and pin feed, unidirectional block graphics, Centronics parallel interface.
Price £219 + VAT = £251.85

MICROLINE 82A: Features 80 columns, 80 CPS, friction and pin feed, bidirectional printing, parallel and serial (1200 bauds) interface.
Price £319 + VAT = £366.85

NEC 8023 PRINTER

100 CPS, 80 columns, bi-directional friction and tractor feed, high res. and block graphics, proportional spacing and Centronic parallel interface. NEC 8023. £299 + VAT = £332.35

TI99/4A 16 BIT MICROCOMPUTER



SPECIAL OFFER

PRICE £189.95 which includes a £50 refund guarantee. TI will send you a cheque for £50.

NETT COST
£139.95
including £50 Refund
Offer ends 31.1.83

This microcomputer is based on TMS9900 16 bit microprocessor. It includes 16K RAM, 16 colour high resolution graphic (192 x 256). The screen display is 32 characters, 24 lines TI-BASIC. Full size keyboard. For Software there are about 1000 Programs to choose from. There are a lot of peripherals available e.g. Disk Drives, Disk Interface, Speech Synthesizer, Extra RAM. Additional Languages (PASCAL, TI-COCO, ASSEMBLER).

Please send a large S.A.E. for full price list.

SPEAK & SPELL

NOW WITH BRITISH VOICE



- Ideal Educational Machine for children of 7 years upwards.
- 5 Operating Modes for building spelling and word recognition skills.
- Expandable with plug in modules
- Uses 4 C size batteries (not included).
- Optional AC adaptor available.

PRICE £31.26 + VAT = £35.95
AC adaptor price £4.95 + VAT = £5.69
The following play in modules are available: Vowel Power, Mighty Verbs, Homonym Heroes, Super Stumpers, Magnificent Modifiers.
Price £10.95 + VAT = £12.59 per module

FM-WIRELESS INTERCOM

Touch sensitive TALK, CALL and LOCK controls. Just plug into mains, no installation needed. 3 speech channels (150, 200 and 250 KHz) on each unit. Phase locked loop FM circuitry give noise free operation, built in automatic squelch. Use as many stations as you like. Price per station: £15 + VAT = £17.25
Price for set of two stations: £28 + VAT = £32.20

GUARANTEED LOWEST PRICES

We guarantee that our prices are the lowest on the market. If you can find any item advertised and in stock at less than our price we will match that price.

SEIKOSHA GP SERIES GRAPHIC PRINTERS



GP-100 30 CPS, 80 column, Hi-Res graphic line repeat function, adjustable up to 10" paper width, tractor feed, 5 x 7 dot matrix.

GP-100A centronic parallel interface £179 + VAT = £205.85

GP-100VC Vic 20 interface £199 + VAT = £228.85

GP-250X New 50 CPS, 80 column, tractor feed, true descenders, 64 user defined characters, double height and/or double width characters, 5 x 8 dot matrix, parallel and serial (RS232) interface.

GP-250X £219 + VAT = £251.85

SMITH-CORONA TP-1 DAISY WHEEL PRINTER

TP-1 Text Printer is a microprocessor controlled high quality daisy wheel printer which gives better quality print-out at 120 words per minute. Ease of drop-in ribbon cassettes and quick change snap-on daisy print wheels are two additional standard features. TP-1 is available with either Centronic parallel, RS232 serial or IEEE interface (please specify the one you require). This makes it compatible with BBC, TRS80, DRAGON, NASCOM, PET and lots of other computers. Additional daisy wheels of 10 different typeset styles are available. S.A.E. for further details.

TP-1 PRICE £429 + VAT
Additional Print Wheels £7.50 + VAT each
Replacement ribbons £2 + VAT each

COMPUTER PAPER
PLAIN SINGLE PART FANFOLD 11" x 9 1/2"
60 gms £9 - VAT = £10.35 per 1000 sheets
(MINIMUM ORDER 2000 SHEETS)

TI99/4A SOFTWARE

SOLID STATE SOFTWARE MODULES:

- TI-Investors £15 + VAT = £17.25
- Video Games £18 + VAT = £20.70
- Mini Challengers £10 + VAT = £11.50
- A-Maze-ing £18 + VAT = £20.70
- Connect Four £18 + VAT = £20.70
- Soccer £18 + VAT = £20.70
- Tombstone City £18 + VAT = £20.70
- Wumpus £18 + VAT = £20.70
- Zero Zap £18 + VAT = £20.70
- Allack £18 + VAT = £20.70
- Blasto £18 + VAT = £20.70
- Hustle £18 + VAT = £20.70
- Yahtzee £18 + VAT = £20.70
- Black Jack/Poker £18 + VAT = £20.70
- Car Wash £22 + VAT = £25.30
- Mr. Nunchun £22 + VAT = £25.30
- Oress £28 + VAT = £32.20
- Adventure & Pirate £28 + VAT = £32.20

ADDITIONAL ADVENTURE PROGRAMS
(Use with Adventure Module)

- Adventure Land £18 + VAT = £20.70
- Mission Impossible £18 + VAT = £20.70
- Voodoo Castle £18 + VAT = £20.70
- The Count £18 + VAT = £20.70
- Strange Odyssey £18 + VAT = £20.70
- Mystery Fun House £18 + VAT = £20.70
- Pyramid Fun House £18 + VAT = £20.70
- Ghost Town £18 + VAT = £20.70
- Savage Island I & II £22 + VAT = £25.30
- Golden Voyage £18 + VAT = £20.70

A lot more Software is available SAE for list

PROFESSIONAL MONITORS

- GREEN MONITOR** 12" green monitors with composite and sync input. Suitable for most computers
- Hitachi MM1216 £89 + VAT = £102.35
- SM12H 18VHZ monitor £89 + VAT = £102.35
- COLOUR MONITORS** 14" colour monitors, RGB or composite and sync input.
- SCM14N Normal-res 400 dots £199 + VAT
- SCM14M Medium-res 600 dots £339 + VAT
- SCM14H High-res 800 dots £499 + VAT

CORDLESS PHONES



LONG RANGE TELEPHONE
This is a long range (2-5 miles) cordless extension phone with intercom facility between portable hand set and the base station. You can receive all incoming call and dial out to anywhere in the world from the hand set from any location within 5 mile radius of your home or office. The maximum range is achieved by using roof top optional antenna (not included).

LONG RANGE EXTENSION PHONE
£249 + VAT = £286.35
OPTIONAL ROOFTOP ANTENNA
£45 + VAT = £51.75

MEDIUM RANGE TELEPHONE
Similar specifications to the above model but with operational range of 1/2 to 2 1/2 miles (with roof top antenna).
MEDIUM RANGE EXTENSION PHONE
£179 + VAT = £205.85
OPTIONAL ROOFTOP ANTENNA
£45 + VAT = £51.75

SHORT RANGE TELEPHONE
A short range cordless telephone for use within the house or from the garden. Receive and make calls from the hand set. Range approx. 600 feet.
Short Range Telephone... £69 + VAT = £79.35

40 MILE RANGE CAR TELEPHONE
This mobile telephone fits into your car and enables you to receive and make calls to anywhere in the world from within 40 mile radius of your home or office (use rooftop antenna).
Car Telephone £1195 + VAT = £1374.25

SILENT ALARM/POCKET PAGER



This is an individually coded 4 WATTS Radio transmitter and pocket pager receiver. The alarm system has connectors for door contacts and vibration sensors. 2 vibration sensors are included. It has a range of 2 miles. Ideal for protection of vehicle or property. Power requirements for transmitter is 12V dc. Not licensible in UK.

PRICE £78 + VAT = £89.70

BBC MICROCOMPUTER

BBC Microcomputer Model B £348 + VAT
Model B + Disk interface £409 + VAT
Parallel printer £179 + VAT
Parallel printer cable £12 + VAT

SOFTWARE

- DRAGON:**
 - Flipper (Reversi) 16K Cassette £6 + VAT = £6.90
 - Space Trader 16K cassette £6 + VAT = £6.90
 - Alcatraz 16K cassette £6 + VAT = £6.90
 - Escape 16K cassette £6 + VAT = £6.90
 - Mansion Adventure 16K cassette £6 + VAT = £6.90
- VIC 20:**
 - Ricochet (Nov) cassette £11 + VAT = £12.65
 - Kirk Arthur's Heir (Nov) cassette £17 + VAT = £19.55
- ATARI:**
 - Snake Byte 48K Disk £17 + VAT = £19.55
 - Cyclod 48K Disk £17 + VAT = £19.55
 - Space Eggs 48K Disk £17 + VAT = £19.55
 - Sneakers 48K Disk £17 + VAT = £19.55
 - Bandits 48K Disk £20 + VAT = £23.00
 - Wayout 48K Disk £22 + VAT = £25.30
 - Fast Eddy Carl £17 + VAT = £19.55
 - Deadly Duck Carl £17 + VAT = £19.55
 - Worm War I Carl £17 + VAT = £19.55
 - Beanie Bopper Carl £17 + VAT = £19.55
- APPLE:**
 - Tanktics 48K Disk £15 + VAT = £17.25
 - Tanktics 48K Cass. £13 + VAT = £14.95
 - B1 Nuclear Bomber 16K Cass £9.50 + VAT = £10.93
 - Midway Campaign 16K Cass £9.50 + VAT = £10.93
 - Nukewar 16K Cass. £9.50 + VAT = £10.93
 - Conflict 2500 16K Cass. £9.50 + VAT = £10.93
 - Planet Mners 16K Cass. £9.50 + VAT = £10.93
 - North Atlantic Convoy Raider 16K Cass £9.50 + VAT = £10.93
 - Computer Acquire 16K Cass £11 + VAT = £12.65
 - Galaxy 16K Cass. £11 + VAT = £12.65
 - Guns of Fort Defiance 48K Cass £11 + VAT = £12.65
 - Lord of Karma 32K Cass. £11 + VAT = £12.65
 - Voyager 32K Cass. £11 + VAT = £12.65
 - Dnieper River Line 48K Disk £15 + VAT = £17.25
 - Dnieper River Line 48K Cass £13 + VAT = £14.95

AKHTER INSTRUMENTS LTD.
DEPT CT, UNIT 19, ARLINGHYDE ESTATE, SOUTH ROAD, HARLOW, ESSEX, UK CM20 2BZ
TEL: HARLOW (0279) 412639 TELEX: 995801 - A18

ORDERING INFORMATION All orders which accompany a cheque or cash are CARRIAGE FREE (UK only). On all other orders a carriage charge of 3% of invoice total is applicable.

A £550* DAISY WHEEL BARGAIN!!!

At last a daisywheel printer with a professional performance and quality at an affordable price.

- ★ Wide 15 inch carriage.
- ★ Standard print wheels.
- ★ Standard ribbons.
- ★ Fast 25 characters per second.
- ★ Graphics commands.
- ★ Standard **Wordstar** printer.
- ★ Heavy duty mechanism.

★ Price exclude VAT and delivery



For further details contact
JAYMAN ELECTRO DEVICES LTD
15 ASH GROVE,
SPRINGHEAD,
OLDHAM.
GREATER MANCHESTER. OL4 4RP

... beat Sinclair at his own game!

'OLIGOPOLY'

"Oligopoly" is a development of the sort of business simulation game sometimes used in management training. It operates along the same lines but is in several ways more sophisticated and in every way more fun.

Each player runs a company which supplies the home computer market, developing new models, negotiating contracts for their manufacture and for the purchase of special components, buying advertising, engaging in price war and so on. It's all done on borrowed money which has to be paid for out of earnings. The winner is the player whose firm survives and accumulates the most profit.

Two to four players can take part and if you wish one of them can be the computer itself. It can assume the identity of whichever firm you would most like the chance of competing against on level terms - it's not easy to beat the computer but it can be done!

We have been looking out for a game of exceptional interest and originality with which to establish the reputation we mean to sustain as suppliers of a small range of selected quality software. "Oligopoly" had to be the one. It's easy to play and a lot of fun from the first attempt but for those who want to take it seriously there's plenty of scope to improve their performance through experience and by analysis (you can practise by playing alone against the computer).

It's just the thing for a wet Christmas/New Year holiday.

"Oligopoly" has too many features to describe here. For full details complete the entries below and send this advertisement (you'll need an envelope but no stamp) to:

Cambridge Software, FREEPOST, 7 Green Street, Cambridge CB2 1BR

For early delivery of "Oligopoly" on cassette indicate which computer you want it for and enclose £5 cheque or PO.

Name _____
Address _____

Please send details of "Oligopoly"
Please send "Oligopoly" cassette
for Spectrum
for ZX81 (16k)

PCW 1/83

(£5 enc.)

**A really
absorbing
new game**

**Spectrum
ZX81 (16k)**

**Cambridge
Software**



Torch The World Beater

Communication power for every business

Torch is a brand new all-British computer with the finest communication facilities available.

Local area networking, direct access to mainframes, speech synthesis, electronic mail, Viewdata/Prestel are all available.

And Torch is the only Microcomputer with official British Telecom approval for direct connection to all telephone lines throughout the UK and North America.

Computing power for every business

Torch is a dual-processor machine with a massive 800K of floppy disc storage (expandable up to 10 or 21 Mb with the hard disc option).

Torch runs a CP/M* operating system giving all the normal business software – accounting, budgeting spread-sheets, PAYE, stock control are all readily available and the high resolution colour graphics make the most of them.

For full specification, price and dealer list write or telephone:

Torch Computers, Abberley House, Great Shelford, Cambridge, England, (0223) 841000.

*CP/M is the registered trade mark of Digital Research Ltd.

TORCH . . . Puts the

ELTEC COMPUTERS

217 Munningham Lane
Bradford
W. YORKS

Contact:
Colin M. Wormald

0274 722512

P.R. Hartley Ltd
20-22 High St
Ruddington, NOTTINGHAM

0602 213492

Contact: Gordon Kirkman

R.H. Murcott Ltd
Great Central Road, Loughborough, LEICS
0509 214444
Contact: Jim Murcott

Permex
Lodge House, Lodge Road, LONDON NW4
203 4243
Contact: Tim Hopkins

Lendac Data Systems Ltd
8 Dawson St, DUBLIN 2
0001 01710226/01710796

Contact:
Don Lehane

J. Cox & Sons
14 Market Place, Grantham, LINCS
0476 3087/68558/76362
Contact: Noel Baumber

ARDEN DATA PROCESSING

166 Park Road
Peterborough

0733 47767

Contact: Steven Green

Micro Factor

1 Dunham Road
Altrincham
CHESHIRE

061 928 2070

Contact:

Roger Carrington
Denny Dewhirst

BITS & BYTES

44 Fore St
Ilfracombe
DEVON

0271 62801

Contact: Mr. Altass

S.I.R. Computers

Dam-y-Coedrd
Cyncoed
CARDIFF

0222 759015

Contact:

Colin Creasey

Van Raalte Associates
The Lodge
Thorpe Lubenham
Market Harborough

0858 32727
Contact: C.H. Van Raalte

C.C.E. Europe

10 Somerset Avenue
Yate, BRISTOL

Contact:

Jim Lawrence

0454 321 088

Torch the new

British business micro has:

- Twin processors ● 800K floppy disc storage
- Electronic Mail facilities ● Local area networking
- Direct access to mainframes
- Hard disc option (10 or 21Mb)
- Private Viewdata/Prestel
- High resolution colour graphics
- Over 20,000 Management Software packages
- Speech synthesis ● CP/M* compatibility

And this is the only Microcomputer with official British Telecom approval for direct connection to all telephone lines throughout the UK and North America etc.

For full specification, price, and dealer list write or telephone: Torch Computers, Abberley House, Great Shelford, Cambridge, England. (0223) 841000.

100 FREE PROGRAMS

FROM SILICA SHOP — WITH EVERY PURCHASE OF AN

ATARI 400

800




ATARI PRICES REDUCED!

We at Silica Shop are pleased to announce some fantastic reductions in the prices of the Atari 400/800 personal computers. We believe that the Atari at its new price will become the U.K.'s most popular personal computer and have therefore set up the Silica Atari Users Club. This club already has a library of over 500 programs and with your purchase of a 400 or 800 computer we will give you the first 100 free of charge. There are also over 350 professionally written games and utility programs, some are listed below. Complete the reply coupon and we'll send you full details. Alternatively give us a ring on 01-301 1111 or 01-309 1111.

ATARI 400 with 16K	£199
ATARI 400 with 32K	£248
ATARI 800 with 16K	£349

400/800 SOFTWARE & PERIPHERALS

Don't buy a T.V. game! Buy an Atari 400 personal computer and a game cartridge and that's all you'll need. Later on you can buy the Basic Programming cartridge (£35) and try your hand at programming using the easy to learn BASIC language. Or if you are interested in business applications, you can buy the Atari 800 + Disk Drive + Printer together with a selection of business packages.

Silica Shop have put together a full catalogue and price list giving details of all the peripherals as well as the extensive range of software that is now available for the Atari 400/800. The Atari is now one of the best supported personal computers. Send NOW for Silica Shop's catalogue and price list as well as details on our users club.

THE FOLLOWING IS JUST A SMALL SELECTION FROM THE RANGE OF ITEMS AVAILABLE:

ACCESSORIES Cables Cassettes Diskettes Joysticks Le Stick - Joystick Misc. Supplies Paddles	Mountain Shoot Rearguard Star Flite Sunday Golf AUTOMATED SIMULATIONS Crush Crumble Cmp Datestones of Ryn Dragons Eye Invasion Orion Rescue at Rigel Ricochet Star Warrior Temple of Apsah Upper Reaches Aps	BUSINESS Calculator Database Managemt Decision Maker Graph-It Invoicing Librarian Mort & Loan Anal Nominal Ledger Payroll Personal Finl Mgmt Purchase Ledger Sales Ledger Statistics 1 Stock Control Teletink 1 Visicalc Weekly Planner Word Processor	DYNACOMP Alpha Fighter Chompelo Crystals Forest Fire Intruder Alert Monarch Moonprobe Moving Maze Nominos Jigsaw Rings of The Emp Space Tilt Space Trap Stud Poker Triple Blockade	Maths-Tac Toe Metric & Prob Solvg Mugwump Music Terms/Notatn Musical Computer My First Alphabet Number Blast Polycalc Presidents Of U.S. Quiz Master Starware Stereo 3D Graphics Three R Math Sys Video Math Flash Wordmaker	EMI SOFTWARE British Heritage Cribbage/Dominos Darts European Scene Jig Hickory Dickory Humpty Dumpty Jumbo Jet Lander Snooker & Billiards Submarine Commdr Super Cubes & Tilt Tournament Pool	Castle Centurion Checker King Chinese Puzzle Codecracker Comedy Diskette Dice Poker Dog Daze Domination Downhill Eastern Front Galahad & Holy Grl Graphics/Sound Jax-O Jukebox Lookahead Memory Match Midus Touch Minotaur Outlaw/Howitzer Preschool Games Pro Bowling Pushover Rabbottz Reversi II Salmon Run 747 Landing Simul Seven Card Stud	Sleazy Adventure Soloitaire Space Chase Space Trek Sultan's Palace Tact Trek Terry Wizards Gold Wizards Revenge	Jawbreaker Mission Asteroid Mouskattack Threshold Ulysses/Golden Fl Wizard & Princess PERIPHERALS Centronics Printers Disk Drive Epson Printers Program Recorder RS232 Interface Thermal Printer 16K Memory RAM 32K Memory RAM PERSONAL INT from APX Adv Music System Banner Generator Blackjack Tutor Going To The Dogs Keyboard Organ Morse Code Tutor Personal Fitness Prg Player Piano Sketchpad	PROGRAMMING AIDS from Atari Assembler Editor Disassembler (APX) Microsoft Basic Pascal (APX) Pilot (Consumer) Pilot (Educator) Programming Kit	SANTA CRUZ Basics of Animation Bobs Business Display Lists Graphics Machine Kids 1 & 2 Horizontal Scrolling Master Memory Map Mini Word Processor Page Flipping Player Missile Gr Player Piano Sounds Vertical Scrolling	SILICA CLUB Over 500 programs write for details
---	--	---	---	--	--	---	---	--	--	--	--

FOR FREE BROCHURES - TEL: 01-301 1111

For free brochures and reviews on our range of electronic products please telephone 01 301 1111. To order by telephone just quote your name, address, credit card number and order requirements and leave the rest to us. Post and packing is FREE OF CHARGE in the UK. Express 24 hour delivery available at an additional charge.

● **SHOP DEMONSTRATION FACILITIES** — we provide full facilities at our shop in Sidcup. Monday to Saturday 9am to 5.30pm including Thursday 1pm - Friday 10am.

● **MAIL ORDER** — we are a specialist mail order company and are able to supply goods direct to your door.

● **MONEY BACK UNDERTAKING** — if you are totally unsatisfied with your purchase you may return it to us within 15 days. On receipt of the goods in satisfactory condition we will give you a full refund.

● **PART EXCHANGE SECOND HAND MACHINES** — we offer a part exchange scheme to trade in many makes of T.V. games for personal computers.

● **COMPETITIVE PRICES** — our prices, offers and service are very competitive. We are never known to underprice and will normally match any lower price quoted by our competitors.

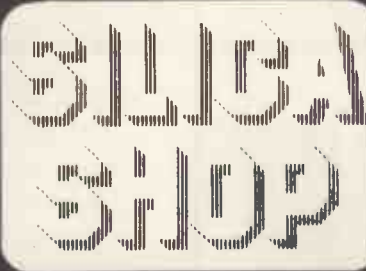
● **HELPFUL ADVICE** — available on the suitability of various computers.

● **AFTER SALES SERVICE** — available on all computers out of guarantee.

● **VAT** — all prices quoted above include VAT at 15%.

● **CREDIT FACILITIES** — we offer credit over 12, 24 or 36 months, please ask for details.

SILICA SHDP LIMITED
Dept PCW 0183, 1-4 The Mews, Hatherley Road, Sidcup, Kent DA14 4DX.
Telephone 01-301 1111 or 01-309 1111.



FREE LITERATURE

I am interested in purchasing an Atari 400/800 computer and would like to receive copies of your brochures and test reports as well as your price list covering all of the available Hardware and Software:

Name

Address

Postcode

PCW 0183

A LOW COST

Purpose-Built *ONLY* £485
Daisywheel
Printer

+ VAT

**SMITH CORONA
TP-1**



- Microprocessor Controller
- Dedicated Computer Printer
- Serial, Parallel or IEEE Interface
- Lowest cost purpose-built Daisywheel

Contact your local dealer — today!

Cambridge Computer Store
1 Emmanuel Street, Cambridge,
Tel: 0223 65334

CWP Computers
108 Rochester Row, London SW1
Tel: 01 630 7444

Chromasonic
48 Junction Road, London N19
Tel: 01 263 9495

A & C Business Computers
1 Beresford Street, St. Helier,
Jersey, Tel: (0534) 35433

Camden Computer Systems Limited
462 Coventry Road, Small Heath, Birmingham,
Tel: 021 771 3636

Peritronic Limited
Lomond House, Almondvale, Livingston, West Lothian,
Tel: 0506 410041

Computer Peripheral Supplies
2/10 Whitchurch Road, Pangbourne, Berkshire,
Tel: 07357 2721/4378

Maystar Micros
62 Peach Street, Wokingham, Berks, Tel: 0734 789381

Interface Components Ltd
Oakfield Corner, Sycamore Road, Amersham, Bucks,
Tel: 02403 22307

Dorling Microsystems
Tockington, Thornbury, Bristol BS12 4PR,
Tel: 0454 418596

Butel-Comco Limited
Garrick Industrial Centre, Garrick Road, London NW9 6AQ,
Tel: 01 202 2277

Computer Services (Scotland) Ltd
89/90 Westlaw Place, Whitehill Industrial Estate, Glenrothes, KY6 2RZ, Tel: (0592) 773710

Technicare Products Ltd
The Lodge, Brick Kiln Street, Evesham, Worcs.,
Tel: (0386) 41484/41587

discom

DISCOM TRADING COMPANY
Dresden House, 5.1 High Street,
Evesham, Worcestershire WR11 4DA
Telephone: (0386) 3591
SOLE U.K. DISTRIBUTORS

WATFORD ELECTRONICS

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

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

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

Computer IC's	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	
1702	350	FD1771	£15	7420	15	4161	99	4569	175
1802CP	850	FD1791	£22	7422	20	4162	99	4583	99
2112-2	250	FD1793	£23	7423	18	4163	99	4584	48
2114L-200n	90	FD1795	£28	7430	14	4174	99	4585	99
2147-3	425	FD1797	£28	7442	31	4175	105	4597	330
2532-450n	350	HD26501	75	7447	40	4411	690	4598	290
2564	12	HM6167 B	795	7448	40	4412	790	4599	290
2708	225	INS502	300	7450	30	4419	350	4601	130
2716-5V	235	INS8060N	1090	7474	20	4450	350	4605	115
2732-450n	350	INS8154N	£9	7475	25	4451	350	4610	75
2764	725	MC1488	55	7485	60	4490	350	46108	450
3242	590	MC1489	55	7486	20	4500	675	46110	300
4027	190	MC14411	675	7489	170	4504	75	46114	240
4118-150	80	MC14412	775	7490	20	4505	185	46163	50
4118-250	325	MC3447P	315	7491	35	4508	130	46284	195
4164-200	450	MC1488B-2M	£7	7492	25	4511	46	46245	195
4334-3	325	MM52800	695	7493	25	4519	30	46373	240
4864-364K	420	MM5303	835	74100	80	4528	50	46374	245
4864-100nS	250	MM5307	1275	74116	50	4549	375	45106	595
6116-150nS	450	MM5374	475	74121	25				
6116L-120nS	590	MM58174	770	74125	35				
6117-100n	490	RO-3-2513L	650	74126	35				
6167-100	795	RO-3-2513U	600	74143	210				
6502 CPU	350	SPF96384E	875	74148	60				
6503	600	SPO256AL2	18	74150	50				
6504-250	550	TMS2716-3	725	74151	40				
6522 VIA	100	TMS4164-15	475	74153	40				
6530 RRIOT	£11	TMS6011	365	74155	40				
6532 RRIOT	£50	TMS6018	£30	74156	50				
6545 CRT	895	TMS8995	£12	74186	470				
6551 ACIA	650	UPD7002	440	74383	99				
6592 PC	£20	Z80	1000						
6800	225	Z80ACPUM	1000						
6802	225	Z80ACTC	260						
6803	225	Z80ADMA	275						
6804	160	Z80ADMA	275						
6805	160	Z80ADMA	275						
6808	520	Z80ADMA	275						
6809	630	Z80ADMA	275						
6810	115	Z80ADMA	275						
6820	100	Z80ADMA	275						
6821	100	Z80ADMA	275						
6840	375	Z80ADMA	275						
6843	685	Z80ADMA	275						
6845	685	Z80ADMA	275						
6847	685	Z80ADMA	275						
6850	590	Z80ADMA	275						
6852	590	Z80ADMA	275						
6854	590	Z80ADMA	275						
6875	590	Z80ADMA	275						
68000	£78	74S00	30	LS125	24				
74C922	420	74S02	30	LS126	25				
8080A	250	74S03	32	LS128	25				
8085A	350	74S08	40	LS148	70				
8088	18	74S10	40	LS148	70				
81L595	80	74S20	40	LS151	40				
81L596	80	74S27	40	LS153	40				
81L597	80	74S32	40	LS156	35				
81L598	85	74S34	75	LS157	27				
8118-10	225	74S112	90	LS158	30				
8123	125	74S132	110	LS175	50				
8155	155	74S133	110	LS240	65				
8156	350	74S138	115	LS241	55				
8202	£25	74S139	115	LS242	55				
8205	225	74S155	39	LS243	55				
8212	110	74S158	195	LS244	55				
8214	425	74S175	160	LS245	70				
8215A-300	300	74S188	140	LS273	54				
8216	100	74S189	140	LS373	60				
8224	110	74S194	825	LS374	24				
8226	250	74S201	350	LS393	42				
8228	220	74S225	525	LS471	629				
8243	270	74S240	390	LS640	180				
8250	250	74S241	300	LS641	180				
8251	250	74S260	50	LS645	180				
8253	400	74S262	850	LS668	125				
8255	255	74S267	300	LS669	120				
8256A	400	74S268	210	LS670	100				
8257	400	74S269	290	LS673	550				
8259	395	74S301	000						
8271	£36	74S365	000						
8279	385	74S3745	365						
8284	350	74S470	325	4000	40				
8288	10	74S471	620	4001	10				
8T26A	99	74S472	1150	4002	12				
8T27	150	74S475	825	4003	24				
8T28A	120	74S571	620	4010	24				
8T31	350			4011	10				
8T35N	90			4012	16				
8T37N	90			4013	20				
9364AP	550	75107/8	95	4017	32				
9602	220	75110	90	4018	45				
AM26LS31C	125	75150/4	125	4023	13				
AM26LS32A	125	75151/4	125	4027	13				
AY-3-1015	300	75182/3	99	4027	20				
AY-3-1270	675	75188/9	55	4034	140				
AY-3-8910	735	7532	140	4040	40				
AY-5-1013	300	75450	90	4051	45				
AY-5-1350	388	75451/2	52	4052	60				
AY-5-2376	600	75454	70	4053	50				
AY-5-3600	750	75491/2	65	4056	24				
COM8017	700			4068	14				
COM8116	700			4069	13				
DM8131	275			4070	13				
DP8304BN	250	7400	11	4076	50				
DS3891N	320	7402	11	4077	13				
DS88L3120N	275	7404	13	4078	15				
DS88B20	110	7410	14	4081	13				
DS88B30	150	7411	15	4093	20				
DS88B31	125	7423	18	4099	75				
FD1761	£15	7414	20	4100	95				

Computer IC's	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.
4161	99	4569	175					
4162	99	4583	99					
4163	99	4584	48					
4174	99	4585	99					
4175	105	4597	330					
4411	690	4598	290					
4412	790	4599	290					
4419	350	4601	130					
4450	350	4605	115					
4451	350	4610	75					
4490	350	46108	450					
4500	675	46110	300					
4504	75	46114	240					
4505	185	46163	50					
4508	130	46284	195					
4511	46	46245	195					
4519	30	46373	240					
4528	50	46374	245					
4549	375	45106	595					

DRAGON The family Computer
6809E Microprocessor based computer 32K RAM as standard, expandable to 64K. Has nine colours, 5 resolution graphics from 16 x 32 to 256 x 192. Extended Microsoft colour Basic. Advanced graphic commands. 5 octave sound through TV speakers. Full editing-Inert, Delete, Amend. QWERTY keyboard. Simple plug-in type connections for Joysticks, cartridges & cassette. Centronic printer port. 160 page 'BASIC' manual. All one requires is a colour TV or Monitor & mains supply and your Dragon is Huffing and Puffing. Up & running.

Price: Only £173 (car. £4)

JUPITER ACE
Microcomputer. Uses the Ultrafast FORTH. Has 8K ROM 3K RAM, 32x24 display. User definable characters, timer, fast cassette interface, all controlled by a Z80A CPU.
Only: £78

ULTIMUM:
WATFORD's own most versatile MICRO EXPANSION SYSTEM. Ideal for interfacing with APPLE, ATOM, DRAGON, PET, RESEARCH MACHINE, SPECTRUM, SUPERBOARD, UK101 VIDEO GENIE, ZX81, etc.
Low cost, high spec. as published in Practical Electronics starting from November 1982 issue. Send SAE for details.

BBC MICRO UPGRADE KITS
Upgrade your BBC Micro with our Upgrade Kits and save yourself £ss...
● 16K Memory (8x4816AP-100nS) BBC1 £18.00
● Printer User I/O Port BBC2 £8.20
● Complete Printer Cable 36" £12.00
● Disc Interface Kit BBC3 £41.00
● Analogue I/O Kit BBC4 £6.75
● Serial I/O Kit BBC5 £7.50
● Expansion Bus Kit BBC6 £6.50
● Model A to Model B Upgrade Kit £45.00
● Joysticks for BBC (per pair) £12.00
● Complete range of Connectors & Cables available. Send SAE for list.
We specialise in BBC Peripherals, Software and Accessories.
Just phone us for your requirements.

FLOPPY DISC DRIVES
● TEAC FD-50A Single Uncased 40 track S/ided £125
● TEAC FD-50A Single Cased 40 track S/ided £180
● TEAC FD-50A TWIN Cased 40 track S/ided £335
● TEAC FD-50A Single Cased 80 track S/ided £238
● SIEMENS FDD 100-5 Cased, Head Motors, track zero, micro switch motor control PCB with read write and control electronics plus cable. Special Apple Compatible £215
● Apple Disc Interface Card £38
● Apple 80 Column Card £125
● 2 Drives Daisy Chain cable £12
● Single Drive Cable £8
● 10 Verbatim Diskettes 5 1/4" SSSD £20
● 10 Verbatim Diskettes 5 1/4" DSDD £30
● 10 Verbatim Diskettes 8" SSDD £30

Europe's most popular Printer
NEC PC8023-C
Bi-directional, 80 column, 100CPS, Logic seeking, Hi-Res, block graphic Forward and Reverse line feed, proportional spacing, true descenders, 2K buffer, as a giveaway price:
Only £320 (car. £7)

SEIKOSHA GP100A
Unihammer Printer, gives normal and double width characters as well as dot resolution graphics 10" Tractor feed. Parallel interface standard. £175 + p&p
SEIKOSHA GP250X now in stock.
Only: £235 (£7 car.)

SOFTY 2
Price includes FREE 2532
Softy is an intelligent EPROM Programme & Emulator. Has Memory Map TV Display, RS232 & Centronics I/P & O/P. Copies, Emulates and programs EPROMS. RS232 /Centronic routines standard includes PSU. £169

SPECIAL OFFER

2532	1+	25+
2732	350p	330p
2764	350p	330p
4116-200n	650p	590p
6116	85p	80p
6522	390p	360p
	300p	280p

We stock thousands more items. It pays to visit us. We are situated behind Watford Football Ground.
Just phone your order through, we do the rest

EPSON PRINTERS
Price includes FREE 500 sheets of paper

MX80FT/3 10" Tractor & Friction Feed
9x9 matrix, 80 column, Speed 80CPS, Bi-directional, Centronic Interface Baud Rate 110-9600 (RS232) Hi-res, Bit image, graphics, Subscript & Superscript, Italics & Underlining facilities. Fully guaranteed
Only: £324 (car. £7)

MX100FT/3 136 columns, 15" carriage, plus all the facilities of MX80FT/3
Only: £425 (car. £7)

ACCESSORIES

- TEX EPROM ERASER. Erases up to 32 ICs in 15-30 min. £33
- TEX EPROM ERASER with incorporated Safety Switch £38
- Electronic Timer Solid state. Connects directly to above Erasers. Protects your expensive Chips from overcooking. Our timer pays for itself in no time. £15
- Tex Eprom Eraser including the Electronic timer. £44
- Spare UV lamp bulbs £9
- POWER SUPPLY Regulated, overload protection. Variable: 5V to 15V @ 4A £38
- Multirail psu kit including Case. Output: +5V/5A; +12V, +25V, -5V, -12V @ 1A. Only £39 (p&p 95p)
- Attractive Beige/Brown ABS Case for Superboard/UK101 or Home Brew £26
- C12 Cassettes in Library Cases 40p
- 8" Fan fold paper (1000 sheets) £7

BBC Micro Computer

Please phone for availability



BBC Model A **£299**
 BBC Model B **£399**
 (inc. VAT) carr. £8 unit

Model A to Model B
 Upgrade Kit **£50**
 Fitting charge **£15**

MEMORY UPGRADE
 8x4816 AP-3 100nS £21.60
F.D. INTERFACE KIT
 IC77-78 £70

ANALOGUE PORT KIT
 IC73, SK6 £7.30
RS423 & VDU Port Kit £10.80

PRINTER & USER PORT KIT
 IC 69, 70, 71 PL9 10 £9.50
 Bus & Tube Port Kit £6.50

All mating Connectors with Cables in stock.
 Full range of ACORNSOFT, PROGRAM POWER
 & BUGBYTE SOFTWARE AVAILABLE.

Phone or send for our BBC leaflet.

BBC FLOPPY DISC DRIVES

Single Drive 5 1/4" 100K **£235 + £6 carr.**
 Dual Drive 5 1/4" 800K **£799 + £8 carr.**

BBC COMPATIBLE DRIVES

These are drives with TEAC FD50 mechanism
 and are complete with power supply.

SINGLE: 100K **£190**; 200K **£260**; 400K **£340**
 DUAL: 200K **£360**; 400K **£490**; 800K **£610**

OFFICIAL BBC DEALER

MICRODOCTOR

This is not a logic analyser or an oscilloscope. It tests a microsystem and gives a printed reprint on RAM, ROM and I/O - it will print memory map, search for code, check dataline shorts and operates peripherals.
Microdoctor complete with PSU, printer probe cable and two configuration board £295.

MONITORS

BMC BM 1401 14" Colour Monitor
 RGB input 18MHZ bandwidth
£240 plus £8 carr.
 Hi Res Green Monitor Antiglare
 screen **£99 plus £6 carr.**
 MICROVITEC 1431 M/S 14"
 Colour Monitor RGB input
£269 plus £8 carr.
 RGB lead for BMC **£8.**
 Composite Videolead **£3.50.**

ACORN ATOM

Basic Built **£135** Expanded **£175**
 (carr £3 per unit)
 Atom Disc Pack **£299 + £6 carr.**
 Send s.a.e. for our BBC Atom list

NEC PC 8023 BE-C

100CPS, 80 cols. Logic Seeking, Bidirectional, Forward and Reverse Line Feed, Proportional Spacing, Auto Underline, Hi-Res and Block Graphics, Greek Char. Set. Only **£320 + £8 Carr.**



PRINTERS

SEIKOSHA GP 100A

80 Cols 30 CPS
 Full ASCII e GRAPHICS
 10" WIDE paper
 Now only **£175 + £6 Carr.**
 Ask for details on GP 250A

Parallel Printer lead for BBC/Atom to most printers **£13.50**
 Variety of interfaces, ribbons in stock
 2,000 fan fold sheets 9 1/2" x 11" **£13.50 + £3 p&p**

EPSON MX80 and 100F/T3



MX 80 80CPS 80 cols
 MX100 100CPS 136 cols
 Logic Seeking, Bi-directional, Bit Image Printing, 9x9 Matrix, Auto Underline

MX 80 F/T3 **£325**
 MX 100 F/T3 **£430**
 (£8 Carr/Printer)

RUGBY ATOMIC CLOCK

This Z80 micro controlled clock/calendar receives coded time data from NPL Rugby. The clock never needs to be reset. The facilities include 8 independent alarms and for each alarm there is a choice of melody or alternatively these can be used for electrical switching. A separate timer allows recording of up to 240 lap times without interrupting the count. Expansion facilities provided. See July/August ETI for details.
 Complete Kit **£120 + £2.00 p&p.**

CONNECTOR SYSTEMS

I.D. CONNECTORS			
(Speed Block Type)			
St. Pin	Recep- tacles	Edge Conn.	
10 way	90p	85p	200p
20 way	145p	125p	240p
25 way	175p	150p	300p
34 way	200p	160p	380p
40 way	220p	190p	550p
50 way	235p	200p	600p

JUMPER LEADS

24" Cable with DIP Headers				
	14pin	16pin	24pin	40pin
Single End	145p	165p	240p	380p
Double End	210p	230p	345p	540p
Cable with Sockets				
	20way	26way	34way	40way
Single End 24"	185p	210p	270p	300p
Double End 18"	290p	385p	490p	540p

AMPHENOL CONNS

36 way Solder Type Plug (centronix type)		550p
36 way Solder Socket (centronix type)		550p
36 way IDC Plug (centronix type)		500p
24 way Solder Plug (IEEE type)		500p
24 way Solder Socket		500p
24 way IDC Plug		485p

RIBBON CABLE

(Grey)	
10 way	50p
14 way	60p
16 way	70p
20 way	80p
24 way	115p
25 wpy	140p
34 way	180p
40 way	210p
50 way	330p
64 way	370p

SOFTY II INTELLIGENT PROGRAMMER

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

D CONNECTORS

	9way	15way	25way	37way
Male Solder	95p	135p	160p	250p
Angled Pins	160p	230p	210p	425p
IDC	-	375p	450p	680p
Female Solder				
Bucket	110p	160p	210p	350p
Angled Pins	175p	240p	275p	500p
IDC	-	375p	475p	750p
Hoods	100p	100p	100p	130p

RS 232 CONNS

(25 way D)	
24" Single end Male	£5.50
24" Single end Female	£6.00
24" Female-Female	£11.00
24" Male-Male	£10.00
24" Male-Female	£11.50

DIP HEADERS

	Solder Type	IDC Type
14 pin	40p	120p
16 pin	50p	140p
24 pin	100p	200p
40 pin	200p	225p

EUROCONNECTORS

Plug Socket	
DIN 41617 21 way	180p
DIN 41617 31 way	200p
DIN 41612 2x32 way Straight pins	290p
2x32 way Ang. pin wrap	325p
2x32 way wire wrap	325p
2x32 way St. pins	375p
3x32 way Angled pins	400p
IDC Connector A+B	350p
IDC Connector A+C	475p
IDC Connector A+B+C	-
2x32 way U Connector	£15
(please specify a+b or a+c)	

EDGE CONNECTORS

	0.1"	0.156"
2x 6 way	-	140p
2x18 way	-	140p
2x22 way	200p	250p
2x23 way	200p	-
2x25 way	225p	300p
1x43 way	260p	-
2x43 way	395p	-
2x50 way	600p	-
way way	700p	-

UV ERASERS

UVIB up to 6 Eproms **£47.50**
 UVIT with Timer **£60.00**
 UV140 up to 14 Eproms **£61.50**
 UV141 with Timer **£78.00**
 (Carr £2/eraser)
 All erasers are fitted with mains switches and safety interlocks

TRAINER KITS

6502 Junior Computer **£85.00**
 6802 Nancomp I **£80.00**
 6809 Nancomp II **£80.00**
 1802 Micro Trainer **£64**
 Z80 Menta **£115**
 (Fully built and documented)
 Full details on request

SPECIAL OFFER

6116P-3 350p

BAUD RATE GENERATORS

4702B	750p
COM 8116	700p
MC 14411	675p

COMPONENTS

CPUS		TMS9995		8255		Z80AS10-0	
1802CE	650p	£12	6875	500p	500p	Z80AS10-0	£9
2650A	£12	£24	8205	225p	110p	Z80AS10-1	£9
6502	350p	290p	8212	100p	100p	Z80AS10-2	£20
6502A	500p	320p	8214	180p	180p		
6800	225p	£12	8216	850p	850p		
6802	225p	£18	8224	250p	250p		
68B02	700p		8250	250p	250p		
6809	650p		8255	£36	£36		
68B09	£12		6520	440p	440p		
6809E	£12		6522A	£11	£11		
8035	350p		6532	250p	250p		
8039	300p		6551	280p	280p		
8080A	250p		6821	100p	100p		
8085A	450p		68B21	220p	220p		
INS8060	£11		6854	770p	770p		
TMS9980	£20		68B54	800p	800p		
SUPPORT DEVICES		8255		CRT CONTROLLER			
6520	280p	8251	250p	CRT6545	900p		
6522	310p	8255	250p	CRT 5027	£18		
6522A	530p	8256	£36	CRT 5037	£18		
820P10	280p	8279	440p	EF9365	£48		
820AP10	280p	8288	£11	EF9366	£48		
820CTC	230p	8287	250p	6845	650p		
820ACTC	280p	8287	280p	6847	650p		
820ADART	700p	8287	230p	TMS 9927	£18		
820ADMA	£10	8287	280p	TMS 9928	£20		
		8287	700p	TMS 9929	£20		
		8287	£10	EF 9364	£9		

Send s.a.e. for our Comprehensive List including books

TECHNOMATIC LTD

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

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

Orders from Government Depts. & Colleges etc. welcome.

Detailed Price List on request.

Stock items are normally by return of post.



BUY
OR
RENT

18 MONTH
GUARANTEE

£995
TO BUY

PROFESSIONAL
SOFTWARE

QUALITY

HORIZON COMPLETE BUSINESS SYSTEMS

AVAILABLE ON

CREMENCO, NORTH STAR, HORIZON,
ADVANTAGE, SUPERBRAIN, TELEVIDEO,
SIRIUS I, AND OTHER C/PM MACHINES.

WRITTEN
IN
COBOL

FLEXIBILITY

- Customer file create and update
- Supplier file create and update
- Stock file create and update
- Printing of customer records
- Printing of supplier records
- Printing of stock records
- Printing of customer labels
- Printing of supplier labels
- End of year procedures
- Invoices, credit adjustments, payment received, order entry and despatch-notes
- Address labels for invoices and credit notes
- Address labels for despatch notes
- Data Base update
- Printing of invoices in batch mode
- Credit Notes
- Sales Ledger
- Sales Day Book
- Payment Received Report
- Sales Credit Day Book
- Age of Debt Report
- Sales Analysis by Customer Number
- Sales Analysis by Stock Number
- Sales Analysis by Area Code
- Sales Margins Report
- Printing of Statements
- On-line Enquiries for Customer Details
- Purchases
- Purchase Ledger
- Purchase Day Book
- Purchase Payment
- Purchase Price Analysis
- Creditors Report
- Purchase Analysis by Supplier
- Purchase Analysis by Stock Number
- Nominal Entries
- Nominal Ledger
- Nominal Day Book
- Nominal Payments
- Stock Re-ordering Reports
- Stock Movement Report
- On-line Enquiries for Stock Control
- Stock Supplier Index update
- Print Stock Supplier
- Purchase Orders
- Printing of Purchase Order
- Outstanding Order Summaries
- Clearing of Purchase Order Files
- Order Enquiries
- Printing of Stocks and Suppliers
- Profit and Loss Report
- V.A.T. Analysis

LIMITED
OFFER

PAYROLL
£500

RELIABILITY

COSTING
& ESTIMATION
£400

This Complete Business System

has been developed to cater for the needs of most businesses. Written in COBOL the system will meet the requirements of most organisations. Irrespective of the complexity of details required, the operator's task is minimal and only proportional to the total input.

The simplicity of the system is its unique feature

in that it is designed to be operational in a matter of minutes, yet you do not need to be a computer expert to run this system. Completely integrated, the system is self-checking with inbuilt security against inadvertent entries, with positive guidance for correction.

DEALER
ENQUIRIES
WELCOME

BILL OF
MATERIAL
£400

MAILING
LIST
£50

BEFORE PURCHASING OR RENTING THE SOFTWARE LICENCE MUST BE COMPLETED

Horizon Software Ltd

SPECIALISTS IN MICRO COMPUTERS

REGENT HOUSE, 16 WEST WALK, LEICESTER LE1 7NG. Tel: (0533) 556550

Business Blueprint



THE VECTOR 4

From the small business to the large multi-national, Almarc provide one of the largest selections of quality business, scientific and industrial applications software available today, including:

Wordprocessing/Mailing, Financial Modelling, Solicitors Package, Financial & Arable Management, Printers Estimating/Costing, Phototypesetting/Wordprocessing Interface, Data Base Management, Estate Agents Package, Manufacturing Software, Critical Path Analysis, Motor Trade Package, Planning Application Monitoring, Estimating, Data Logging,

Graphics Packages, Business Accounting, Accounts Receivable/Payable, Payroll, Stock Control, Invoicing, Ordering, Purchase Control, Clothing Industry Software, Network & Resource Analysis, Job Costing, Insurance Brokers.

All available on probably the most advanced, 'New Generation', micro-computer system produced today.

The Vector 4, is an advanced 8/16 bit desk top computer. It allows you to take advantage of the existing 8 bit CP/M programs, while also providing 16 bit processing power. The future is built into the Vector 4, with its Z-80 and 8088 processors, 128K of main memory (expandable to 256K), 3 S-100 expansion slots and standard software facilities with high resolution graphics that are second to none. Floppy disc and hard disc systems are available.

At Almarc, we pride ourselves in our systems and our high level of customer support. We can offer back-up and training which is second to none, with 24 hour on site maintenance available in all areas.

Almarc Data Systems Ltd,
18A Spittal Street,
Marlow,
Bucks. SL7 1DB.
Tel: (06284) 6419.

Almarc

DATA SYSTEMS

HEAD OFFICE
Almarc Data Systems Ltd,
Great Freeman Street,
Nottingham NG3 1FR.
Tel: (0602) 62667.
Telex: 37407 Almarc/G.

**INDEPENDENT
COMPUTER
ENGINEERING LTD.**

Welcome to the ICE Age



5 1/4 in. Winchester Sub Systems with a tape streamer back up
From 3 to 42 Megabyte configurations

Compatible with

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

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

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

Circle 1350

MPI MICROCOMPUTER PRODUCTS INTERNATIONAL LTD.

SOFTWARE FOR CP/M COMPUTERS

ANTHONY ASHPITEL TYPING MASTERS

BASIC VERSION	50	
BUSINESS VERSION	125	25

BYROM SOFTWARE

BSTAM—Utility to link one micro-computer to another also using BSTAM	112	7
BSTMS—Utility to link a micro to a mini or mainframe	112	13

CP/M USER LIBRARY

51 Volumes—Price per volume	5	
8" disc (one volume per disc)	10	
5" disc (one volume per 2 discs)		
Index		2

DIGITAL RESEARCH

BT-80	165	24
CBASIC v 2.08	76	16
CB-80 1.3	312	21
CP/M86	171	32
CP/M 2.2	103	24
CP/NET	126	16
DESPOOL	31	7
MAC	62	16
MP/M 1.1	138	21
MP/M 2.0	288	35
PASCAL MT+	206	24
PASCAL MT+ WITH SPP	297	35
PASCAL MT+ LIB SOURCES	129	14
PASCAL MT+ SPP ONLY	147	12
PL/1-80	315	32
SID 1.4	50	16
TEX3.0	65	16
XLT86	94	8
ZSID 1.4	65	16

ELECTRONIC ACCOUNTING SERVICES

LINEAR & GOAL PROGRAMMING	200	10
---------------------------	-----	----

FOX & GELLER

QUICKSCREEN FOR DBASE-II	103	14
QUICKSCREEN FOR CBASIC/CB-80	103	14
QUICKSCREEN FOR MBASIC	103	14
QUICKCODE FOR DBASE-II	182	21

GRAM BUSINESS SYSTEMS LTD.

DISKREV	65	13
DISKLENE	40	6
DISKORG	50	6
DISKED-2	65	8
DISKTOOLS-1 (DISKREV-DISKORG)	90	15
DISKTOOLS-2 (DISKTOOLS-1+ DISKED-2)	145	19

INFORMATION UNLIMITED

WHATSIT (Database Management System)	80	
--------------------------------------	----	--

KLH SYSTEMS

Spooler for CPM systems v3.0	82	7
------------------------------	----	---

MAGIC CIRCLE SOFTWARE

CPM SIM	141	
---------	-----	--

MICRO-AP

SELECTOR-V 1.6	324	29
----------------	-----	----

MPI LTD.

FORTH	85	23
PAYROLL	500	15
SALES LEDGER	200	15
PURCHASE LEDGER	200	15
NOMINAL LEDGER	200	15
INCOMPLETE RECORDS	1200	20
MATHSPACK	120	
STATSPACK	120	

MICROFOCUS

CIS COBOL v 4.5	425	25
FORMS 2	110	10
ANIMATOR	225	25
FILESHARE	250	20

MICROLOGY

FTNUMB (FORTRAN-80 RENUMBER & REFORMATTER)	50	
--	----	--

MICROPRO INC.

WORDSTAR 3.0	294	45
MAIL MERGE 3.0 (requires Wordstar)	88	12
SPELLSTAR 1.2 (requires Wordstar)	147	
WORDSTAR TRAINING MANUAL		21
WORDSTAR CUSTOMIZATION NOTES	59	
WORD-MASTER 1.7A	88	26
TEX-WRITER 2.6	44	20
SUPER-SORT 1.6	147	26
DATASAR 1.101	206	29
DATASAR CUSTOMIZATION NOTES	59	
CALCSTAR 1.2	176	29

APPLE VERSIONS

WORDSTAR 3.0	221	44
MAILMERGE 3.0 (requires Wordstar)	74	12
SPELLSTAR 1.2 (requires Wordstar)	115	
DATASAR 1.101	174	29
SUPERSORT 1.6	118	26
CALCSTAR 1.2	115	29

MICROTECH EXPORTS

REFORMATTER CPM→IBM	147	20
REFORMATTER CPM→DEC	147	20

MICROSOFT INC.

BASIC-80 5.21	218	
BASIC Compiler 5.3	241	
FORTAN-80 3.44	306	
COBOL-80 4.60	447	
M/SORT 1.012	88	
EDIT-80 2.02	76	
MACRO-80 3.43	124	
MULISP 2.12	124	
MUMATH 2.12	153	

OSBORNE & ASSOCIATES

ACCOUNTS PAYABLE & ACCOUNTS RECEIVABLE GENERAL LEDGER	50	15
	50	15

PHOENIX SOFTWARE ASSOCIATES

PLINK—Disc to disc link loader	85	18
PASM—Macro Assembler	85	18
PEDIT—Line editor with Macros	85	18
BUG—Very powerful debug	85	18
PDEVELOP Package with all the above	227	39
PLINK—2 Overlay Link Loader	218	18

SAPPHIRE SYSTEMS LTD.

MARS	295	25
------	-----	----

STRUCTURED SYSTEMS (All converted to UK Standard)

SALES LEDGER	350	20
PURCHASE LEDGER	350	20
NOMINAL LEDGER	350	20
STOCK CONTROL	350	20
LETTERIGHT	112	13
ANALYST (File management Reporting System)	147	13
NAD (Name and Address selection system)	65	13
QSORT	65	13

SUPERSOFT INC.

DIAGNOSTICS 1	53	11
TERM	85	8

SYNTAX SOFTWARE LTD.

CP/M TUTOR	55	
------------	----	--

TDL SOFTWARE

(Technical Design Labs)		
BUSINESS BASIC	80	
ZTEL (Text Editing Lang.)	35	
LINKER	35	

Retailer and OEM terms available

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

ORDER INFORMATION

When ordering CP/M software please specify the format you require. All software items are subject to VAT. Manuals, when purchased separately, are not subject to VAT. Please add £3.75 (plus VAT) for postage and packing for the first item purchased, and then £1.00 for each extra item. For overseas please add £6.50 per item and then £1.50 for each extra item required. Most software in this advertisement is available from stock and a 72 hour return service is thereby offered on most prepaid orders. These details and prices are all current as of November 1982. Our prices reflect an exchange rate of U.S. \$1.7 to £1.00. (Telephone at time of purchase to confirm latest prices.) All payments must be in Sterling and drawn against a U.K. bank.

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

NEW PRODUCTS



CP/M - 86

ANTHONY ASHPITEL TYPING MASTERS

BASIC VERSION	50	
BUSINESS VERSION	125	25

MICROFOCUS

CIS COBOL	425	25
FORMS-2	110	10
ANIMATOR	225	25
LEVEL-2 COBOL	965	40
LEVEL-2 FORMS-2	110	10
LEVEL-2 ANIMATOR	475	25

SAPPHIRE SYSTEMS

MARS	295	25
------	-----	----

IBM PC-DOS

MICROPRO INC.

WORDSTAR	294	
MAILMERGE (Requires WORDSTAR)	88	
SPELLSTAR (Requires WORDSTAR)	147	

CP/M - 80

ASHTON-TATE

d BASE-II v 2.3B	457	
------------------	-----	--

MICROFOCUS

CORAL-66	825	25
LEVEL-2 COBOL	965	40
LEVEL-2 FORMS-2	110	10
LEVEL-2 ANIMATOR	475	25

MICRO INTEGRATION

BISYNC 80/3780	525	
BISYNC 80/3780 (ASCII)	525	
BISYNC 80/3270 (BSC)	525	
BISYNC 80/HASP	975	

MICROPRO INC.

ALL-STAR WORD PACK	423	
ALL-STAR DATA PACK	423	

ORGANIC SOFTWARE

MILESTONE	283	
-----------	-----	--

PEARL INTERNATIONAL

PERSONAL PEARL	180	
PEARL-3	275	

MEDIA AND FORMATS

Altos	A1	Dec VT 180 SDDD	RG	Delta Systems
APPLE CP/M-80 13 Sector	RR	Dynabyte DB8/4	Q2	Exdy Sorcerer + CP/M-80
APPLE CP/M-80 16 Sector	RK	Exdy Sorcerer + Exdy CP/M-80	A1	EXO
Blackhawk Micropolis Mod II	Q2	Gemini Galaxy I	A1	Health H8 + H47
British Micros Mimi	P2	Hewlett-Packard 125.8in	P2	IBM PC-DOS SDDD
California Computer Sys 8 in	P2	IBM PC-DOS DSDD	P2	IBM PC-DOS DSDD
CDS Versatile 4	P2	IBM CP/M-86 SDDD	Q2	IBM CP/M-86 DSDD
Columbia Data Products 8 in	A1	ICL-PC	A1	ICL DRX Series
Comart Communicator CP50	A1	ICM 3712	R6	ICOM 3712
Comart Communicator CP100				
Comart Communicator CP200				
Comart Communicator CP500				
Compal-80				
CPT 8000				
Cromemco System 3				
Cromemco System 2 SD/SS				

Cromemco System 2 DD/SS	RX	IMSAI VDP-80	A1	Nascom/Lucas
CSSN Backup	T1	Industrial Microsystems 5000	RA	NCR 8140/9010
Cyber 8"	A1	Industrial Microsystems 8000	A1	NNC-80
Datapoint 1550/2150	A1	Intel MDS SD	A1	NNC-80W
Dec VT 180 SDDD	RV	Intertec Superbrain SDDD	RK	North Star Advantage
Delta Systems	A1	Intertec Superbrain QD	RS	North Star Horizon SSSD
Dynabyte DB8/4	A1	ISC Intercol 8063/8360/8963	A1	North Star Horizon SDDD
Exdy Sorcerer + CP/M-80	Q2	ITT 3030 DSDD	R1	North Star Horizon QD (MPI CP/M)
Exdy Sorcerer + Exdy CP/M-80	A1	Micromation	A1	North Star Horizon QD
EXO	A1	Micropolis Mod II	Q2	(Other CP/M)
Gemini Galaxy I	N1	Morrow Discus	A1	Nylac Micropolis Mod II
Health H8 + H47	A1	Mostek	A1	Osborne-I
Hewlett-Packard 125.8in	A1	Multi-Tech 1	Q2	Perc PCC 2000
IBM PC-DOS SDDD	C1	Multi-Tech 2	Q2	Rade 1000 SDDD
IBM PC-DOS DSDD	C2	Micromation	A1	Rade 1000 DSDD
IBM CP/M-86 SDDD	C3	Micropolis Mod II	Q2	Rair Black Box
IBM CP/M-86 DSDD	C4	Morrow Discus	A1	Research Machines 5.25in
ICL-PC	RE	Mostek	A1	Research Machines 8in
ICL DRX Series	A1	Nascom (Gemini Drives SDDD)	R3	Robotron 5"
ICOM 3712	A1	Nascom (Gemini Drives DSSD)	R7	Robotron 8"

IMSAI VDP-80	A1	Nascom/Lucas	N1	SD Systems 5.25in	R3
Industrial Microsystems 5000	RA	NCR 8140/9010	A1	SD Systems 8in	A1
Industrial Microsystems 8000	A1	NNC-80	A1	Sharp MZ-80B	R7
Intel MDS SD	A1	NNC-80W	A1	Sharp PC-3201	R8
Intertec Superbrain SDDD	RK	North Star Advantage	P2	Shelton Signet	RK
Intertec Superbrain QD	RS	North Star Horizon SSSD	P1	Spacebyte	A1
ISC Intercol 8063/8360/8963	A1	North Star Horizon SDDD	P2	Tarbell 8in	A1
ITT 3030 DSDD	R1	North Star Horizon QD (MPI CP/M)	P3	TEI 8in	A1
Micromation	A1	North Star Horizon QD		Televideo DSDD	S5
Micropolis Mod II	Q2	(Other CP/M)	P2	Torch	N2
Morrow Discus	A1	Nylac Micropolis Mod II	Q2	Toshiba T200 DSDD	SF
Mostek	A1	Osborne-I	Q2	TRS-80 Modell + Shuffle-board 8in	A1
Multi-Tech 1	Q2	Perc PCC 2000	RL	TRS-80 Modell II	A1
Multi-Tech 2	Q2	Rade 1000 SDDD	R1	Vector MZ	Q2
Micromation	A1	Rade 1000 DSDD	RE	Vector Systems 2800	A1
Micropolis Mod II	Q2	Rair Black Box	RN	Vector Systems B	Q2
Morrow Discus	A1	Research Machines 5.25in	A1	Vector VIP	Q2
Mostek	A1	Research Machines 8in	R3	Xerox 820 5.25in	S6
Nascom (Gemini Drives SDDD)	R3	Robotron 5"	R7	Xerox 820 8in	A1
Nascom (Gemini Drives DSSD)	R7	Robotron 8"			

2

MORE GOOD REASONS TO RING 01-591 6511

SAVE OVER
20%! WHEN YOU ORDER ONE OF THESE
SUPER ALL STAR PACKS



**WORDSTAR
MAILMERGE
SPELLSTAR**

**DATASTAR
CALCSTAR
SUPERSORT**

ALL-STAR WORD PROCESSING PACK.

Here's your chance to get the best word processing package at the best price ever. The All-Star Word Pack from MicroPro — WordStar[®] MailMerge[™] and SpellStar[™] — makes it easy.

With the All-Star Word Pack, you can:

- Write letters, articles and reports in a fraction of the time you do now
- Print mailing labels at the touch of a key
- Send out personalized form letters without typing them individually
- Make sure every word is spelled right every time, and much more.

WORDSTAR: The No. 1 selling word-processing software. The industry standard because it's simple to learn for basic word processing, yet packed with so many sophisticated features, you'll never outgrow it.

MAILMERGE: The easy way to send personalized form letters at a fraction of the time and expense of individually typed letters. MailMerge also creates invoices, prints mailing labels, and produces documents using commonly used paragraphs.

SPELLSTAR: The quick way to help make everything you write letter-perfect. SpellStar checks every word in your WordStar documents against its 20,000-word dictionary-on-a-disk. You can freely add words to SpellStar's dictionary or create your own special dictionaries for such things as technical terms or client names.

MAIL
ORDER
TELE-
PHONE
CREDIT
CARD
ORDER

• VISIT •

Trade
Enquiries
Welcome

ALL-STAR DATA PROCESSING PACK.

Three of the most powerful data handling products you can buy — at very special savings while supplies last. With MicroPro's DataStar[™], CalcStar[™] and SuperSort[™], you can easily automate many of your most important record-keeping tasks for remarkable gains in productivity, plus forecast what you'll need to make your business grow.

With the All-Star Data Pack you can:

- Create an inventory system that lets you check and update instantly
- Maintain customer lists accurate to a letter
- Prepare financial forecasts in a matter of minutes, and much more.

DATASTAR: Enter, update and retrieve virtually any kind of information you use in your business — such as customer records, shipping schedules and inventory records — in seconds. DataStar molds itself to your expanding needs.

CALCSTAR: The electronic spread sheet and financial planning tool that helps you make better business decisions. What if you add more product lines? Hire another employee? Lower prices? CalcStar helps you make projections that show you the financial effects of your decisions.

SUPERSORT: Sorting, selecting and merging data with remarkable speed and convenience. For example, SuperSort can take your customer list from DataStar and create a whole new file of customers identified by post code, last date of contact or other characteristics that you choose.

SPECTRUM

Shop NEWS

New Spectrum Centres now at
HORNCHURCH
ROCHFORD
GT. YARMOUTH
NEW MALDEN
LONDON W1
 and just opening or
 opening soon in
DUMFRIES
IPSWICH YORK
LONDON SE15
KILMARNOCK

**We won't be
 beaten on
 price!**

SPECTRUM is a rapidly expanding group of independent retailers who specialise in selling home computers. Our group policy is simple - **WE WON'T BE BEATEN ON PRICE!** - our **BULK BUYING** ensures this. We select and buy the best and pass the savings on to YOU, the customer. We **GUARANTEE** that if you find an item currently advertised and in stock at another dealer and at a better price than ours - **WE WILL MATCH THAT PRICE ON THE SPOT.**

After Sales care

SPECTRUM service centres will ensure that should your machine 'go-down' we will get it running again as quickly as possible. We also offer extended warranties at reasonable prices too! - ask your SPECTRUM HOME COMPUTER CENTRE for full details.

COMPUTER DEALERS!

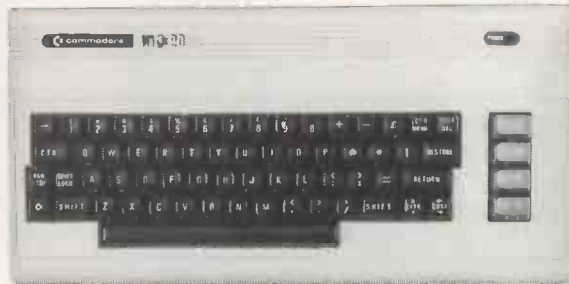
(or prospective Computer Dealers!)

If you would like to know more about becoming a SPECTRUM APPOINTED DEALER on an exclusive area basis, please contact MIKE STERN or ALAN WARREN on (07073) 34761.

Spectrum (U.K.) Ltd.,
 Burrowfield,
 Welwyn Garden City, Herts.

Commodore VIC-20

Now a top quality home/business micro for the price of a games machine.



The VIC-20 represents superb value-for-money from SPECTRUM. A truly expandable computer system which can be as simple or as complex as your needs require. Ideal as a home micro with a large number of educational and games cartridges available. Equally, with additional memory expansion, a disc drive and printer, it becomes suitable as a small business system, powerful enough for stock control, book-keeping and payroll generation.

■ Memory expandable to 32K ■ High resolution (full PET type) graphics ■ 16 Screen colours and 8 border colours ■ Plugs in to your T.V. or monitor ■ Add Disk Drive & Printer for impressive 170K Byte system ■ Can act as an intelligent terminal for a larger computer.

Sensational **NEW LOW** price

£139.90
 INCLUDING
 VAT

(£121.65 Excluding VAT)

	Exc. VAT	Inc. VAT		Exc. VAT	Inc. VAT
VIC C2N cassette unit...	£34.00	£39.10	Programmers Aid cart. ...	£27.50	£31.63
VIC Printer	£185.00	£212.75	Machine Code	£27.50	£31.63
VIC Single floppy disk drive (5 $\frac{1}{4}$ ")	£260.83	£299.95	Basic (1)	£13.00	£14.95
3K RAM	£24.00	£27.60			
8K RAM	£34.00	£39.10	BOOKS		
16K RAM exp. cartridge.	£59.00	£67.85	Learn Computer Programming with the Commodore VIC	£1.95	No VAT
Super exp. Hi Res cartridge	£27.50	£31.63	VIC Revealed	£10.00	No VAT
Joystick	£6.52	£7.50	VIC 20 Prog. Reference Guide	£14.95	No VAT
Games paddles	£11.74	£13.50	VIC Computing Magazine	£0.95	No VAT

..... STOP PRESS

SUPER X2
64K DYNAMIC
RAM PACK for VIC-20
EXCLUSIVE TO SPECTRUM!

Unbelievable-but-true, now you can upgrade your VIC-20 from 3.5K to a massive 67 $\frac{1}{2}$ RAM. Enables you to load up to 8 games or programs at a time & still select which one you wish to use. Can be used in conjunction with other expansions to increase total memory up to 152K-using the VIC memory expansion board. The SUPER X-2 will make your VIC-20 the biggest little micro in town!

Spectrum **LOW price**

£114.94
 Inc. VAT

(£99.95 excluding VAT)

New! COMMODORE 64

Just Arriving

Limited stocks are just arriving of this super new micro. Just look what it offers!

■ 64K Ram ■ Z80 processor option
 ■ Dedicated video chip ■ Sprite graphics
 ■ Music synthesizer ■ Prestel link
 ■ High resolution graphics (320 x 200) ■ 16 colours and lots more.

Spectrum **LOW price**

£344.99
 INC. VAT

(299.99 excluding VAT)

The ideal family computer! DRAGON 32



HURRY!
LIMITED
STOCKS
ONLY
LEFT!

Unbelievable value at only £173.00 from SPECTRUM! British built and designed it's one of the most impressive micros to appear for quite some time. Extensive facilities include highly advanced colour graphics. Just look at this top specification: Powerful standard 32K RAM (expandable to 64K Bytes) ■ 9 Colour, 5 resolution Display. ■ Extended Microsoft colour BASIC (as standard). ■ Advanced sound with 5 octaves - 255 tones. ■ Professional style editing, e.g. extract line, auto find reinsert. ■ Professional quality keyboard. ■ Centronics Parallel printer Interface. ■ Serious programmer/user - the BASIC on this machine is similar to that found on machines costing 3 times the price! ■ Uses almost any cassette recorder. ■ Standard file handling ON TAPE.

Spectrum **LOW Price** **£173.00**
 Price inc. VAT
 £198.95

Plus! A wide range of games, educational & personal finance carts. available

ATARI

800 16K RAM

Sensational
new **LOW** price



Sensational
£40
TRADE-IN ALLOWANCE
on your old computer
when you purchase an
ATARI 800
from Spectrum

HURRY!
This offer is for
a limited period
only.

(Offer Ends Dec. 24th 1982)

Here's a tremendous opportunity to trade in your old Micro Computer at SPECTRUM and take a full £40 off the price of the superb ATARI 800. Yes, for a strictly limited period, SPECTRUM will allow £40 for any micro, your ZX-81 (or even your IBM!) etc., whatever the age whatever the condition, when traded-in against a new ATARI 800. The ATARI 800 features a typewriter keyboard for fast and easy data entry. It has a 16K memory that can be easily expanded to 48K with convenient, slip-in ATARI Memory Modules. So you have more power available to run more sophisticated programmes. The ATARI 800 is expandable which means you can build the computer system you want today, knowing that it will grow to meet your needs tomorrow. You can add printers, programme recorders, disk drives and more. Call into your nearest SPECTRUM centre and ask to see the ATARI 800 today.

Sensational **NEW LOW** Price

£399.99
INC.
V.A.T.

(£347.82 excluding VAT)

Other ATARI equipment



ATARI 400
16K RAM

£198.95

INCLUDING V.A.T.
(£173 excluding V.A.T.)

Additional Equipment	INC. VAT	EX. VAT
Program Recorder	£49.45	£43.00
Disk Drive	£299.00	£260.00
Thermal Printer	£198.95	£173.00
Interface Module	£135.00	£117.39
Accessories		
16K Ram Pack	£65.00	£56.52



ATARI
THERMAL PRINTER

£198.95

INCLUDING V.A.T.
(£173 excluding V.A.T.)

Paddles (Pair)	£13.99	£12.17
Joysticks (Pair)	£13.99	£12.17
Printer Cable	£28.50	£24.78
RS232C Cable	£25.00	£21.74
Monitor Cable	£25.00	£21.74
Thermal Paper	£4.00	£3.48
Dos. 2 Master		
Diskettes	£21.99	£19.12



ATARI
DISK DRIVE

£299.00

INCLUDING V.A.T.
(£260 excluding V.A.T.)

Books and Manuals		
Wiley Manual	£5.99	£5.21
Basic Reference Manual	£5.99	£5.21
Dos. 2 Manual	£5.99	£5.21
Operating System Listing	£11.99	£10.43
Dos. Utilities Listing	£3.99	£3.47

FULL RANGE OF SOFTWARE AVAILABLE — SEE OUR 'SOFTWARE BEST SELLERS'

New! LYNX 48

Just look at this super new LYNX Micro — an incredible 48K of memory as standard and that's expandable to 96K, 128K, or even 196K! For just £225.00 INCLUDING VAT the LYNX is exceptional value and exceptionally versatile. All LYNX's 'add-on' connections are standard types. The massive memory and high definition colour graphics make it a top-value choice for the home or office (with 128K of RAM, the LYNX can become an 80 characters-per-line word processor!) Take a look at the LYNX — a memorable bargain from SPECTRUM, but please phone to check stock position before making a journey as this new machine is bound to be in great demand.



Spectrum **LOW** Price **£225** Including VAT
(£195.65 excluding VAT)

MORE SPECTRUM LOW PRICES!

SPECTRUM

SOFTWARE

The Best Sellers from Spectrum

For ATARI

Cartridges	Inc VAT
New! SUBMARINE COMMANDER	£34.34
New! JUMBO JET PILOT	£34.44
STAR RAIDERS	£29.99
MISSILE COMMAND	£29.99
CENTIPEDE	£29.99
PAC MAN	£29.99

Cassettes

EASTERN FRONT 1941	£22.50
INVITATION to PROGRAMMING (Part 1)	£19.99
INVITATION to PROGRAMMING (Part 2)	£22.99
INVITATION to PROGRAMMING (Part 3)	£22.99
SNOOKER & BILLIARDS	£19.49
DARTS	£19.49

For VIC-20

Cartridges	Inc VAT
STAR BATTLE	£19.95
JELLY MONSTERS	£19.95
ADVENTURE LAND	£24.95
PIRATE COVE	£24.95
SARGON II CHESS	£24.95
MOLE ATTACK	£19.95

Cassettes

INVITATION to BASIC (Part 1)	£14.95
INVITATION to BASIC (Part 2)	£14.95
SUPER WORM	£4.49
SPACE STORM	£6.49
FROGGER	£9.49
BBC 'MASTERMIND'	£9.99
QUIZ MASTER	£9.99
NIGHT FLIGHT	£4.49
MYRIAD	£9.49

For DRAGON

Cartridges	Inc VAT
COSMIC INVADERS	£19.95
GHOST ATTACK	£24.95
CAVE HUNTER	£19.95
STAR SHIP CHAMELION	£19.95

Cassettes

QUEST	£7.95
MADNESS and the MINOTAUR	£7.95
SELECTION of GAMES	£7.95
DRAGON MOUNTAIN	£7.95
FLAG	£7.95
SELECTION of UTILITIES	£7.95

For SHARP MZ-80-A

Cassettes	Inc VAT
PAK MAN	£9.20
FROGGER	£9.20
FENDER	£6.33
TOMBS of KARMAK	£9.20
GOLLUM	£9.20
ASTERIODS	£9.20
MZ D'HELLO	£12.08
BOMBER	£6.33
SPACE INVADERS	£6.33
CHESS	£16.68

For TEXAS

Cartridges	Inc VAT
TI INVADERS	£18.95
BLASTO	£22.95
MUNCHMAN	£26.95
CHESS	£35.95
ATTACK	£22.95
ZERO ZAP	£22.95
SOCCER	£22.95

Cassettes

OLDIES but GOODIES (1)	£9.50
OLDIES but GOODIES (2)	£9.50

For SINCLAIR

FLIGHT SIMULATION	£5.95
SPACE RAIDERS & BOMBER	£4.75
Plus a large selection of games from	£3.95

Plus many many more at your local SPECTRUM dealer NOW!

SINCLAIR ZX-81



Now available from SPECTRUM centres the top selling SINCLAIR ZX81 inc. VAT

SINCLAIR ZX	£49.95
16K RAM pack	£29.95
ZX Printer	£59.95

Cassettes available from £3.95 please ask your local SPECTRUM dealer for details.

Stop Press . . .

Coming soon in '83

ORIC 48K and JUPITER ACE

Check with your local SPECTRUM for further details

NASCOM

SPECIAL EDITION

For the computer enthusiast - if you're looking for a machine to take you way beyond the sphere of a normal micro then you need look no further than the NASCOM SPECIAL EDITION.

Spectrum LOW price	£494.44
(£429.95 ex VAT)	inc VAT
48K RAM Plug in board	£149.50
	inc VAT

SEIKOSHA GP-100A Graphic Printer



Now a top quality graphic printer at a price you can afford. The SEIKOSHA GP-100A - Terrific value at under £200 from SPECTRUM. Standard Centronics compatible interface for easy link-up with most micros. ■ Full graphics capability. ■ Printing speed 30 chars/sec. ■ Double width character output under software control. ■ Graphics, character and double width character can be intermixed on same line. ■ Paper width adjustable up to 10" - tractor feed. ■ Print position addressable by character or dot.

Spectrum LOW price **£189.00** Price inc VAT £217.3

Also Available	EX. VAT	INC. VAT	EX. VAT	INC. VAT
GP-100VC (for VIC-20)	£199.00	£228.85	APPLE SERIAL	£45.00
GP250X 50cps	£230.00	£264.50	APPLE GRAPHIC	£55.00
Optional Interfaces for GP-100A/GP-100VC			VIDEO GENIE	£36.00
RS232	£70.00	£80.50	Cables for BBC MICRO, ACORN, DRAGON	£19.00
MZ80-A	£60.00	£69.00		£21.95

EPSON PRINTERS

Chosen by SPECTRUM for their reliability, the superb new top quality graphic printers from EPSON. New features include super & subscript, underlining & deletion. If you're looking for an up-market printer at a down-to-earth-price, call in and see the EPSON range at SPECTRUM.

Model	EX. VAT	INC. VAT
MX80-T3	£329.00	£378.35
MX80 F/T Type III	£369.00	£424.35
MX100 Type III	£469.00	£539.35

Please see your SPECTRUM dealer for prices of INTERFACE/CABLE options.



BOOKS

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

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

NO VAT ON BOOKS

ACCESSORIES

	Exc.VAT	Inc.VAT.
NASCO Slim 3G Cassette Recorder (for use with Nascom and Dragon)	£26.04	£29.95
CTT 3106 14" Colour TV Set	£199.96	£229.95
ACCUTRAK C12 Cassettes	£0.43	£0.50
Single sided, double density disks (for Commodore, Atari, Apple, Tandy etc.)	£1.70	£1.95
Double sided, double density disks (for Sharp and Superbrain)	£2.87	£3.30
Single sided, double density double track disks (for Nascom and Commodore 8050)	£2.30	£2.65
Disk Bank Interlocking cases for diskettes	£3.91	£4.50
Disk head cleaner	£13.00	£14.95
Single part 11" x 9 1/2" printer paper, box of 2200 sheets	£10.39	£11.95

PRINCE 12" Green Monitor ONLY

Prince 12" Monitor	£86.00	£98.00
Sanyo 12" SM-12H	£84.00	£96.60
Sanyo 14" SCM-14H	£350.00	£402.50

Sensational SCOOP Offer!

LESS THAN WHOLESALE PRICE!

SHARP PC-1211

Pocket Computer
complete with
Cassette/Printer interface



Incredible Value from Spectrum!
ONLY £95.90
COMPLETE
Ex. VAT £110.28 inc. VAT

Here's a tremendous SCOOP OFFER from SPECTRUM - the SHARP PC-1211 Pocket Computer, a ready-to-use set up complete with printer & a cassette interface. And ALL for an amazing £95.90 ex. VAT. THAT'S LESS THAN WHOLESALE PRICE! Employing BASIC language. Complex interest rates, budget, statistics, engineering and architectural formulae can be handled quickly and easily. Connects to almost any cassette recorder. If you're looking for a pocket computer you must take a look at this sensational offer from SPECTRUM - FIRST!

SHARP PC-1211

Pocket computer complete with CE-121
Cassette Interface

■ Ideal for SCHOOL, OFFICE or HOME use ■ High performance functions with easy to understand BASIC language ■ Cassette Interface allows easy connection to almost any tape recorder for storage of programmes and data, etc. ■ 24 Digit alphanumeric dot matrix display ■ Plus many more top features.

Spectrum LOW price £59.95 ex. VAT

£68.42 inc. VAT



FREE!
£75 WORTH
of software
with every MZ80A purchased

SHARP MZ-80A

Desk top genius! - the all-in-one SHARP MZ-80A. A personal computer designed with the serious user in mind, ready to run the moment you get it home. Built-in keyboard, CRT 9" display and cassette data storage with 48K RAM. The BASIC with extra useful additions, offers quite a powerful micro for the home or business. ■ 4K Byte ROM + 48K Byte RAM + 2K Byte Video RAM ■ ASCII profiled keyboard + numeric pad ■ 2 page Video RAM allows screen to be scrolled up or down. ■ CP/M available.

Spectrum LOW price **£475.00**

Price inc. V.A.T. £546.25

SHARP PERIPHERALS FOR MZ80A	EXC. VAT	INC. VAT		EXC. VAT	INC. VAT
Twin floppy disk unit (inc. 1/0 card, diskette, Manual & Cable).....	£689.00	£792.35	MZ80 P5 Printer.....	£349.00	£401.30
Twin floppy disk unit (5 1/4") only.....	£590.00	£678.50	MZ80 P8 Printer.....	£409.00	£470.35
Single floppy disk unit only.....	£400.00	£460.00	MZ80 P4 Printer.....	£745.00	£856.75
Floppy disk interface card.....	£100.00	£115.00	Printer Interface.....	£30.00	£34.50
Floppy disk cable.....	£24.00	£27.50	P4 Cable.....	£33.00	£37.95
Master diskette and manual.....	£31.00	£35.66	Universal Interface Card.....	£45.00	£61.00
Expansion unit (disk drive or printer).....	£100.00	£115.00	Assembler Tapes & Manuals.....	£42.00	£48.30
			FDOS.....	£85.00	£97.95
			MX80K to MZ80A Converter Tape.....	£10.00	£11.50

There's a Spectrum Centre near you...

- ALFRETON**
Gordon Harwood, 69/71 High St. 0773 832078
- ASHFORD**
Ashford Computer Centre, 2 Station Parade, Clarendon Rd. 07842 44955
- BANBURY**
Computer Plus, 2 Church Lane. (0295) 55890
- BASILDON**
Godfrey's, 28-32 East Walk, Town Centre. 0268 289379
- BASINGSTOKE**
Fisher's, 2/3 Market Place. 0256 22079
- BATH**
Software Plus, 12 York St. 0225 61676
- BIRMINGHAM**
Sherwoods, Great Western Arcade. 021 236 7211
- BRADFORD**
Photosave, 18 Cheapside. 0274 308598
- BRIGHTON**
Capricorn, 1 Queens Rd. 0273 29634
- CAMBERLEY**
Camera Arts (Micro Computer Division), 36 High St. (0276) 65848
- CAMBRIDGE**
KP Ltd., 12a Kings Parade. 0223 68087
- CANTERBURY**
Kent Micro Systems, Conquest House, 17 Palace St. 0227 50200
- CARDIFF**
Randall Cox, 16-22 High St. Arcade. 0222 31960
- CHELMSFORD**
Maxton Hayman Ltd., 5 Brookfield Rd. (0245) 354595
- COVENTRY**
Coventry Micro Centre, 33 Far Gosford St. (0203) 58942
- DARLINGTON**
McKenna & Brown, 102 Bondgate. (0325) 59744 (Just Opening)
- DERBY**
CT Electronics, at Camera Thorpe, The SpoL 0332 44760
- DONCASTER**
Briarstar Computer Centre 13 Netherhall Rd. 0302 67135
- DUMFRIES**
Vennals, 71 English St. 0387 4547 (Just Opening)
- EDINBURGH**
The Silicon Centre, 6-7 Antigua St. 031 557 4546
- GLASGOW**
Victor Morris Ltd., 340 Argyle St. 041 221 8958
- GLOUCESTER**
The Modal Shop, 79-81 Northgate St. (0452) 504691
- GUILDFORD**
The Modal Shop, 23 Swan Lane. (07072) 0483 39115
- HARROW**
Camera Arts (Micro Computer Division), 24 St. Ann's Rd. 01-427 5469
- HATFIELD**
Microworld, 2 Crawford Rd. (07072) 64137
- HORNCHURCH**
Channel Dne, 174 High St. 040 24 75613
- HULL**
The Computer Centre (Humber-side) Ltd., 26 Anlaby St. (0482) 26297
- HYDE**
Pase, 213-215 Market St. 061-366 5935
- IPSWICH**
Brainwave, 24 Crown St. (Opening Soon)
- KILMARNOCK**
Vennals, 49 Foregate 0568 32175 (Just Opening)
- LEEDS**
Bass & Bligh, 4 Lower Briggate. 0532 454451
- LEICESTER**
Youngs, 40-42 Belvoir St. 0533 544774
- LONDON SE1**
Vic Odden's, 6 London Bdg, Walk 01-407 6833 (Just Opening)
- LONDON SE9**
Square Deal, 375 Footscray Rd., New Eltham. 01-859 1516
- LONDON SE15**
Castlehurst Ltd., 152 Rye Lane, Peckham. 01-639 2205 (Just Opening)
- LONDON N1**
ASP Micro Systems, 185 Upper St., Islington. 01-359 9095
- LONDON N.20**
Castlehurst Ltd., 1291 High Rd. 01-446 2280
- LONDON W1**
Devron, 4 Edgware Road. 01-724 2371
- LONDON W11**
Electroleisure, 120 Notting Hill Gate. 01-221 7029
- MACCLESFIELD**
Camera & Computer Centre, 118 Mill St. 0625 27468
- MANCHESTER**
Lomax Ltd., 8 Exchange St., St. Ann's Sq. 061 832 6167
Mr. Micro Ltd., 69 Partington Lane, Swinton. 061 7282282 open Thurs. - Fri. - Sat. till 8 p.m.
- MIDDLESBROUGH**
McKenna & Brown, 190 Linthorpe Rd. 0642 248345
- NEWCASTLE-ON-TYNE**
Newcastle Camera & Computer Mart, 16 Northumberland Ct. 0632 327461
- NEW MALDEN**
Surrey Micro Systems, 37 High St. 01-942 0478
- NORTHAMPTON**
Basic Computers & Systems Ltd., 72 Kingsthorpe Hollow. 0604 710740
- NORTHWICH**
Camera & Computer Centre, 3 Town Sq. (0606) 45628
- NOTTINGHAM**
Cameo Computers, 8/9/10 Trinity Walk. 0502 42912
- OLDHAM**
Home & Business Computers Ltd., in store at The Mall, 119 Union St. 061-633 1608
- PAIGNTON**
Devon Computers, 81 Upper Manor Rd. (0803) 526303
- PEMBROKE**
Randall Cox, 19 Main St., 064 668 2876
- PRESTON**
Wilding's, 49 Fishergate. 0772 556250
- READING**
David Saunders Computer Centre, 8 Yield Hall Place. 0734 580719
- ROCHFORD**
Channel One, 17 Golden Cross Parade, Ashington Rd. 0702 504055
- RUGBY**
The Rugby Micro Centre, 9-11 Regent St. 0788 70522
- ST. AUSTELL**
A B & C Computers, 11 Brookstone Rd. (0726) 64463
- STAFFORD**
Computerama, 59 Fergate St. (0785) 41899
- TEDDINGTON**
"Andrews", 49 Broad St. 01-977 4716
- WALLINGTON**
Surrey Micro Systems Ltd., 53 Woodcote Rd. 01-647 5636
- WATFORD**
SRS Microsystems Ltd., 94 The Parade, High St. 0923 26602
- WEST BROMWICH**
Bell & Jones, 39 Queens Sq. 021 553 0820
- WIDNES**
Computer City, 78 Victoria Rd. 051 420 3333
- WIGAN**
Wilding Ltd., 11 Mesnes St. 0942 44382
- WOKING**
Harpers, 71-73 Commercial Way. 04862 61061
- WORCESTER**
David Waring Ltd., 1 Marjion House, High St. 0905 27551
- GT. YARMOUTH**
Tony Hood Electronic, 26A Market Gate Shopping Centre 0493 3143
- YORK**
York Computer Centre, 7 Stonegate Arcade. 0904 641862 (Just Opening)

Up to £1000 INSTANT CREDIT with a SPECTRUM CHARGECARD
With a SPECTRUM CHARGECARD you choose the credit limit to suit YOU. e.g. a monthly payment of £10 gives you £200 credit. Ask your nearest SPECTRUM COMPUTER CENTRE for written details on how to apply for your SPECTRUM CHARGECARD - NOW!
(Typical APR 30.6%)

COMPUTER DEALERS!

(or prospective Computer Dealers!)

If you would like to know more about becoming a SPECTRUM APPOINTED DEALER on an exclusive area basis, please contact MIKE STERN or ALAN WARREN on (07073) 34761
Spectrum (U.K.) Ltd., Burrowfield, Welwyn Garden City, Herts.

V.A.T.

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

MAIL ORDER

When it comes to MAIL ORDER our service is FAST! with SECURICOR DELIVERY to anywhere in the British Isles. - Ask your nearest SPECTRUM dealer for further details at time of ordering.

comart communicator

PROGRESS REPORT



...now the pedigree really shows

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

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

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

New Communications Options Communicator now offers CP/Net™ and RBTE communications protocols. Individual Communicator



Systems can now operate as intelligent information terminals, integrated with either existing mainframe or mini computer installations, or be part of a shared resource or communications network.

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

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

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

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

Main Dealers

Birmingham The Byteshop 94/96 Hurst Street Tel 021-622 7149
 Dublin Lendac Data Systems 8 Dawson Street Tel 0001 372052
 Glasgow The Byteshop Magnet House 61 Waterloo Street
 Tel 041-221 7409 Leeds Hodene Bray House Leicester Place
 Tel 0532 459459 London The Byteshop 324 Euston Road NW1
 Tel 01-387 0505 Digitus Lading House 10/14 Bedford Street Covent
 Garden WC2 Tel 01-379 6968 Jarogate 197/213 Lyham Road Brighton
 SW2 Tel 01-671 6321 Manchester The Byteshop 11 Gateway House
 Piccadilly Station Approach Tel 061-236 4737 Nottingham
 The Byteshop 92a Upper Parliament Street Tel 0602 40576
 Southampton Xitan Systems 23 Cumberland Place Tel 0703 38740

A member of the Comart Group of Companies

comart
SPECIALISTS IN MICROCOMPUTERS

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

Dealers

Aberdeen MCM Offshore Tel 0224 22863 Bedford Ramdex Bradley Tel 93 68581
 Cambridge Cambridge Computer Store Tel 0223 65334 Edinburgh Holdene
 Microsystems Tel 031 557 4060 Glenrothes Computer Services (Scotland) Tel 0592
 773710 Blackpool Western Computers Tel 0253 404676 Manchester NSC Computers
 Tel 061 832 2559 Norwich Anglia Computer Centre Tel 0603 28652 Worthing Ace
 Computing Services Tel 0903 35411 Middlesbrough Aztech Tel 0642 22621 Barking
 Moldavia Tel 01-591 6511 Belfast Cardiac Services Co Tel 0232 625666 Wilmalaw
 Holkene Tel 0625 529486 Colchester Eurotec Consultants Tel 0206 72538
 Huntingdon Westcom Tel 0480 217217 Luton M.E. Marketing Tel 0582 31806
 Middlesex/Berks Newbury Data Recording Tel 0784 61141 Sheffield Hallam
 Computer Systems Tel 0742 663125 Watford Lux Computer Services Tel 0923 29513
 Aylesbury J.K. Wakeford Assoc Tel 0296 27473

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

'Now the world's most ingenious database program writes letters, you've found the ultimate business solution. And the Delta is a true transactional database – this is the biggest breakthrough for microcomputer users to date'

Nick Horgan, Managing Director, Compssoft Ltd.



If part of your microcomputer's job is to store information, you need Compssoft's Delta.

Compssoft DMS is already Britain's No. 1 record keeping program. And with 4000 users to our credit, we can honestly say we know more about information storage & retrieval than anyone else. We listen to your comments & requests and now we've produced a world first – the Delta – a true transactional database.

If you'd like to know more, we have general brochures, full technical specifications & free

guides to DMS handling a multitude of business situations from order processing, invoicing & stock recording, through to library, personnel & hospital record management.

Find out more about the database revolution. Either telephone the office or clip the coupon now.

Compssoft's Delta – taking microcomputers into the third dimension.

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



Please send me further details

Company

Contact

Address

Tel No.

512 x 512 GRAPHICS

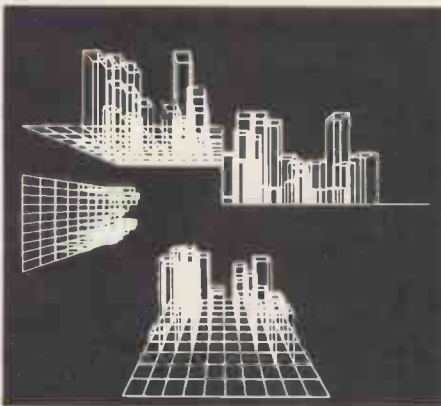
Digisolve offer you a way to increase your graphics speed and resolution. Using a high speed graphics processor our cards draw lines and characters FAST. The graphics processor works in parallel to the host machine, and gives you the power of using a co processor specifically designed for graphics. With drawing rates of up to 1,500,000 pixels per second lines appear instantly to speed up your plotting.

With the resolution, we offer new possibilities for software and systems. No longer is it necessary to consider one of the new 16 bit personal computers because of their better graphics. Digisolve offer a card designed for the Apple II to give 512 x 512 monochrome graphics. With the development of an 80 x 57 line Visicalc and Applewriter pre-boot serious business users are no longer finding 80 column cards good enough. We also offer a colour unit designed to connect to any computer and give the same resolution but with 64 colours.

Digisolve are committed to the development of graphic systems and character display equipment and have a rapidly growing soft-ware base to help you use better graphics.



APPLE II CARD



APPLE II

Digisolve's Apple II High Resolution Vector Graphic Processor Card quadruples the screen resolution and saves using up your Apple's memory space. With enhancements to Applesoft that use our card to provide powerful graphic functions software conversion is simple.

- * Draws vectors at up to 1,500,000 pixels per second
- * 512 x 512 pixels resolution
- * Graphics and characters mixed, allows proportional spacing and up to 85 characters by 57 lines of text
- * 64K bytes of on board memory will store two pictures for animation or have one text and one graphics page
- * 4 different line types for clarity
- * Blocks of variable sizes may be drawn to speed up area filling
- * Read modify write mode for drawing cursors
- * Screen read mode for dumping drawings to a printer
- * £399 + VAT + P&P

SOFTWARE: Visicalc and Applewriter pre-boot. Architectural Design & Modelling. Kitchen Design. Draughting. Report Presentation.

Turtle Graphics, TASC & Apple Soft software support.

VGP 64

Digisolve offer you high resolution colour graphics too. Designed to plug into any computer with a bus host adapter. The VGP 64 gives you 512 x 512 pixels in 64 colours. With its own vector processor and 384 K bytes of memory your computer can become a sophisticated graphics system.

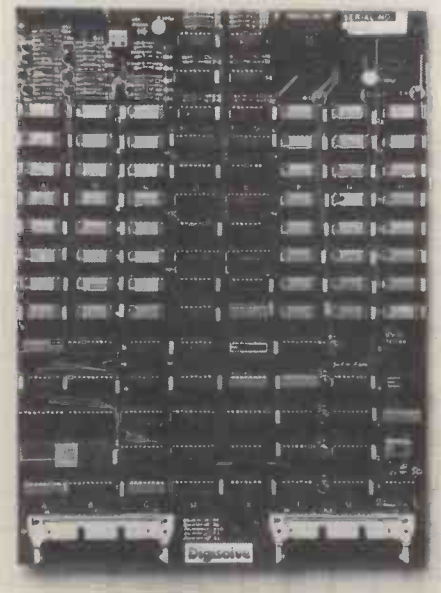
- * 64 colours that may be expanded with a palette or extension video ram card
- * 512 x 512 pixels resolution with fast vector processor
- * 384 K bytes of video ram on board
- * 2 pictures may be stored simultaneously in full colour for animation
- * In monochrome 12 pictures may be stored and selected for display under software control
- * Available as a boxed unit complete with power supply, or in board form to oem customers
- * Will plug into Apples, IBMs, S100 systems, PDPIIs or any computer with a bus
- * Available in several versions: 8 colour £799 64 colour £899

COMING SOON: Terminal emulations including TEK 4010 in monochrome and colour. Character displays 80 x 24 and A4 size.

VDU BOARD

Digisolve offer you the cheapest way to make a scrolling VDU with our intelligent 80 x 24 VDU card. With over 50 control functions the card works at up to 19.2 K band.

- * 80 Characters x 24 lines of text
- * Characters are properly formed with descenders
- * Block graphics option
- * Fully scrolling at 19.2 K band
- * Keyboard and RSZ 32 data input



VGP64

Digisolve

AIRE & CALDER WORKS
CINDER LANE, CASTLEFORD
WEST YORKSHIRE
TELEPHONE: (0977) 513141
TELEX: 557661 AGRAM
A MEMBER OF THE LAMBSON GROUP



APPLE II is the Trade Mark of Apple Computers Inc.

PERSONAL COMPUTER WORLD
presents the long awaited sequel

THE 1983 MICROCOMPUTER BENCHTEST SPECIAL

Starring in order of appearance

Sinclair ZX Spectrum	Positron 9000
Epson HX20	DEC Rainbow
Hewlett Packard HP125	Texas Instruments TI99/4A
Canon CX-1	Gemini Multiboard
Mimi	Newbrain
Apple III	ACT Sirius 1
IBM Personal Computer	Sharp PC1500
Dragon 32	Exleigh Expert
Sharp MZ80A	Olivetti M20
Hewlett Packard HP75C	Hewlett Packard HP86
Hewlett Packard HP15/16C	Texas Instruments TI88

AND MUCH MUCH MORE!

Please send me copy/copies of the 1983 Benchtest Special. @ £1.95.
Please make all cheques/postal orders payable to:
Computing Publications, and send this form to Computing Publications, 53/55 Frith St, London W1A 2HG
Price includes postage and packing. * Overseas orders requiring airmail postage add £1.00 per copy.
Please allow 28 days for delivery.

Name.....
(block letters)
Address.....
.....
.....

Dysan

The Highest Quality Diskettes For Your System.



Dysan diskettes, acknowledged to be the industry leader in quality and data integrity available for all these and other systems from HAL Computers, Dysan's key U.K. distributor.

 **DISC PACKS AND CARTRIDGES ALSO AVAILABLE**

 **TECHNICAL SUPPORT FROM HAL'S ENGINEERING TEAM**

 **QUANTITY DISCOUNTS**

 **FOUR HOUR ORDER TURNROUND**

 **EX STOCK AVAILABILITY**

Please tell me more about the range of Dysan Media for my system.

Name _____

Address _____

Computer System _____

Telephone No _____

Ring the Dysan hot line now on Farnborough 517171 or complete the coupon.

PCW/1/83

HAL Computers Limited
Invincible Road, Farnborough
Hants. GU14 7QU
Telephone (0252) 517171



Guy Kewney delivers his monthly package of micronews.

Why are we waiting?

The last three months should have taught prospective buyers one lesson: never put off buying a system simply because there may be a better one just round the corner.

First, there is *always* a better one just round the corner, and if you wait until you are round it there will be an even better one round the next corner. And all the people who bought before are going to be that much in front of you on their way to becoming experts.

Second, the corner takes a long time to get round. The Oric, a machine which appeared in these columns so long ago that we have had time to publish a retraction of our silly price (actually £169) is promised for the middle of December — in time for Christmas.

Whether this proves to be true or whether instead the magic custom-built ULA chips turn out to need one or two refinements (it has happened to other people) hardly matters. Either way, you will be lucky to get your sticky hands on one, because demand will follow custom and be too much for supply.

There are machines like the Commodore 64, which also should be here by now. It's mid-November as I write and I have yet to get hold of a European production version of that (very nice) machine. Commodore offered *PCW* a US standard machine for a Benchtest, but we felt we should wait for a proper version.

Last year I got very excited about the Z80 add-on to the BBC Micro, due around March 1982. Best estimate (unless you want to buy the Torch add-on, around £800) is for March 1983.

Acorn also promised to have an Electron ready for the big Compec computer show. The Electron, people first said, would be available before the end of the year, and would make fools of all those who bought Sinclair Spectrums (Spectra?).

In the business machine world, things are no better. Commodore is safe from having deceived the world into thinking that 500 and 700 series 'Porsche' machines would be available in September — but the only reason they failed to deceive the world is that nobody was stupid enough to believe them in May.

Corvus showed the Concept (through Keen Computers) in early summer (at the Apple show, of all places). So far, we haven't received one to review, but probably will have by the time you read this.

The star of last year's Las Vegas Comdex show — apart from Chuck Peddle and the Sirius 1 (or Victor 9000 — same beast) was the Fortune 16:32. You just might be able to get one now — and then again, you may find it difficult to make the journey to the nearest dealer — there aren't exactly hundreds of them. But that's quite appropriate, really, since there aren't exactly thousands of machines ready for them to sell.

The Digital Equipment people got quite shirty with us for failing to mention the launch of their Rainbow and Professional machines when they were announced in spring. We were a bit embarrassed ourselves. But even though our review (courtesy of David Ahl) appeared two issues ago, you still can't find any UK users.

And of course everybody knows that there are still no IBM Personal Computers for UK users, more than a year after they started being provided to US users. Some people have gone bust waiting. (Microcomputerland, for example.)

Apple is now very close to announcing the Mini-II, offering less silicon than the II and very little else with the network-based 68000 machine even further off. If you had decided you liked the sound of that particular dream machine when first you heard of it, you might have been waiting two years in vain by now — and there is more waiting to do.

If you feel like reading more about this, write it yourself — there's plenty of material. Just look through back issues, and write down the new machine announcements of the past 12 months.

Even the machines which are in full production, like the Dragon or BBC Micro, have been available only to the few for most of their lives.

And the VIC 20 was supposed to be dead now — it isn't, it's going to carry on being made 'for the foreseeable future' according

to Jack Tramiel. He's the boss of CBM and when he says 'the foreseeable future', he means it. (One should perhaps add that Commodore works in three-month cycles, and, while he may mean it, what he actually means is 'until February, anyway'.)

There are also the add-ons — the Sinclair 'disks' (or 'Interchangeable Storage Medium' as Clive would say), for example — which are always 'around the corner' too.

Actually, I've taken some care to list everything which I have some reason to believe will be in the shops come February. All of it is late now, and will be desperately late if it still isn't around in February.

The moral of the sermon is: if you want to buy, buy what is in the shops on the day you have the money, not what looks like it's going to be great next month.

At the moment, the 'toys' in the shops include the BBC Micro, the VIC-20, the Texas Instruments 99/4A, the Sinclair ZX81, the Spectrum, the Dragon, and the Atari. Precious little else is available, and some of that lot is hard to get hold of.

The 'business machines' in the shops are things like boring old Superbrains, boring old Osbornes, boring old Apples, boring old PETs and boring old Signets,

plus the occasional interesting machine like the Sirius.

By all means read this section of *PCW*, and make an intelligent study of what's on the horizon. Being well-informed about the future can help tremendously in making decisions about the present.

As long as you don't forget that the horizon is not here, and the future is not now.

Going Dutch

In Amsterdam, there was recently a show called Comdex Europe, where top US industry pundit Adam Osborne had hoped to address an attentive audience of the most powerful European corporate tradesmen.

Instead, he found himself telling a largely empty hall containing his chief computer designer, Lee Felsenstein (and a few colleagues) that 'designing the hardware is easy — to succeed in this business, you have to provide other things like software support'.

Lee took this tactlessness in good part, since it is his opinion that the 30-odd imitation Osbornes prove that the hardware isn't all that easy. He may be able to get timing signals out of the system to make sure that every chip operates in perfect synchronisa-



This printer can print both up and down: 'when mounted vertically, the printout can be made to emerge downwards, with the last printed line at the top (data mode) or upwards, with the last line lowest (text mode)' — according to Able Systems Limited.

It took me a couple of minutes to work out that what it actually does is to print either left to right, normally, or right to left, upside down. You think about it.

Details on Northwich (0606) 48689.



From the picture, you might deduce that this isn't a VIC with only 20 characters per line, but the Commodore 64, which has 40.

You would be wrong: it's a VIC with an add-on Stack product which gives 40 or even 80 columns. The only drawback I can see is that it costs £115, which just happens to be the lowest price I have heard of for the VIC itself. But if you already have a VIC, it sounds like worth having.

Details through Vicsoft, the VIC users' club, or from Stack at 290 Derby Road, Bootle, Liverpool L20 8LN.

tion but others don't have that skill. 'Three crystals,' Lee whispered while someone was talking about one particular rival system. 'Three crystals to generate all the timing signals. Two in the computer and one on the keyboard!'

Apart from that bright moment, the exhibition was the sort of show only a journalist would enjoy.

Comdex in America is a twice-yearly affair, for trade buyers and sellers only — none of you lot who just want to buy a packet of disks or play Pacman. Even with that restriction, the enormous aisles are crowded to bursting. Comdex Europe didn't have that problem.

One exhibitor had hit upon the brilliant idea of using female anatomy to publicise his wares. A belly-dancer with the astonishing trade-name of Yonina started up every couple of hours in what appeared to be competent style. At the end of her performance, she seized a microphone, cracked two or three (very breathless) bluish jokes ('we hope you'll come onto the stand and take a look, and look at the computers too') in a Pan-European accent. Nobody from the crowd did, of course. (They never do, because most of them are either interested only in the girl, or too shy to come near a female they obviously can't impress with their worldliness, or

otherwise daunt.) This time, however, they didn't come onto the stand, because they felt they ought to get back onto their own stands. They were all exhibitors.

Which Unix?

People wanting big power in a personal processing system usually end up listening to a salesman talking about Unix, because Unix is generally agreed (by the people who build bigger micros) to be suitable for big systems.

The trouble with Unix is that there is Unix and there is also Unix, and then there is a group of things like Xenix and Onyx and Uniflex.

British operating system expert Eddie Bleasdale has got himself into a bit of a stew about it all, since he sells a system with Unix and reckons that it is the only 'real' system with 'real' Unix — something which he can think if he likes but which his competitors get steamed up about if he says it.

Bleasdale sells one system based on the Z8000 and another based on the 68000 — the numbers refer to the central processing chips inside the systems. Lined up as his rivals nowadays is a longish list, starting with Fortune 32:16, Wicat, Victory (a new one) and Onyx.

The trouble is knowing what we are all talking about. Unix

Version 7 is the sort of Unix which most people have on offer — or else a version of Version 7 which they have written themselves.

Bell Labs, however, invented Unix, and is currently selling System III of the operating system. Oddly enough, that is a later version (Version 7 is Version Seven of System II).

Just to confuse everybody, Bell has produced System 4 as well and Berkeley University has produced 4.2, which is appearing on various systems. It's supposed to be a secret, but on a machine called the Sun, at Compec in London last month, 4.2 appeared on the screen with the suggestion that it would be on sale in March through Tim Keen. Even more secret, System Five is near to readiness.

Having established which version (or system) you may be talking about, the next thing is to establish whether that version (or system) is actually running. Here, you're on your own, because the number of people in this country who really can tell whether Unix is working properly is very limited.

No, this is not an attempt to answer the question in a couple of

paragraphs, just to warn you that you really do need an impartial expert when choosing a system with Unix. And to add that Bleasdale is contactable on 01-828 6661, since he has just announced a Sun-based system with Version 7.

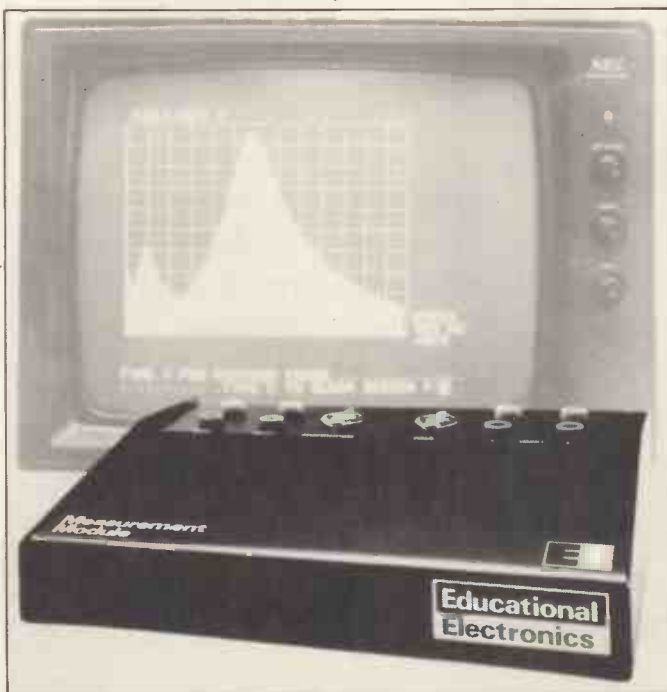
Print problems solved

The best-selling word processing package for personal machines is Wordstar, and the best-selling personal printer is the Epson.

It comes as quite a surprise, then, to find out that there are no commercial versions of Wordstar which can drive the Epson properly.

Even more of a surprise was the discovery that experts who can advise on how to link the two are equally few and far between and, until last month (November, if you are reading this January edition in December!), authorities on Wordstar itself didn't include its inventor, MicroPro.

MicroPro has now arrived in the UK. At press time (during the Compec exhibition) nobody was properly installed in their new



Dials, dials, dials, all the fascinating and inscrutable dials which used to make good old-fashioned sci-fi thriller movies so terrifically hi tech, used to do their thrilling by one simple little trick. They were mysterious and hard to understand. For building up tension in a movie, dials are fine. For showing a group of children what's actually happening in a science laboratory, a dial is often useless. You need a better display.

Anybody with a personal computer, of course, has a pretty good display. It can be programmed to display graphs, bar charts, numbers, and even (if you like) dials. All you need is something that does the actual measuring. For that, you go to Educational Instruments, which produces a range for physics and biology measurements (primarily) and says the equipment is particularly well suited for teaching because it is safe. It can connect a wide variety of measuring modules to most 'approved' educational computers.

Details at 30 Lake Street, Leighton Buzzard, Beds LU7 8RX, phone (0525) 373666.

THE GENIUS YOU CAN TAKE TO BREAKFAST.

Now, at last, real portable computer power. The new Sharp PC 1500 pocket computer. A pocket-sized genius that will travel with you to conferences, seminars and business breakfasts.

The PC 1500 has the capacity and BASIC language usage that is very nearly that of the desk-size Personal Computer. When fitted with the optional 4-colour graphic printer, it is one of the most powerful pocket computers on earth.

Chores can be handled swiftly and accurately any time of day, wherever you happen to be. Estimates, records and charts of sales, billings and other important data can be re-programmed, calculated and summoned at the touch of a button. It can even play blackjack, analyse your biorhythms or give you a beeped reminder of a scheduled meeting.

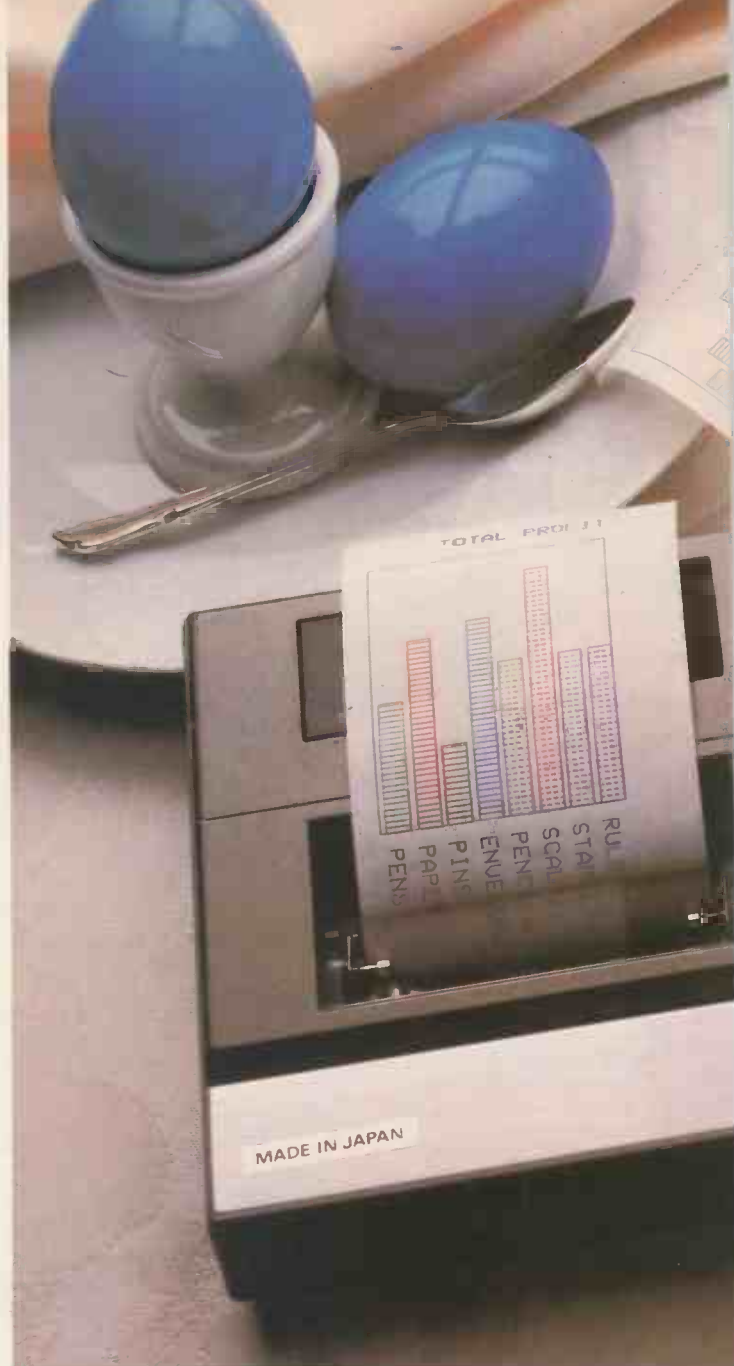
Large memory capacity, up to 11.5K bytes. 4-colour print-out. Six user-programmable keys.

The incredible new PC 1500. A revolution in pocket computers.

From Sharp. Where great ideas come to life.

SPECIFICATIONS PC 1500

Number of calculations	10 digits (mantissa) + 2 digits (exponent)
Program language	BASIC
CPU	C-MOS 8-bit CPU
Capacity	ROM: 16K bytes RAM: 3.5K bytes expandable to 11.5K bytes
Memory protection	C-MOS battery back-up
Display	7 x 156 dots mini-graphic display (English upper- and lower-case letters, numbers, special signs, etc.)



CE 150 Colour Graphic Printer/Cassette interface (Optional)

Colour Graphic Printer

Power source	Built-in rechargeable battery
Printing digits	Standard 18 digits (36, 18, 12, 9, 7, 6, 5, 4 digits selectable)
Printing system	X-Y axis plotter system
Printing mode	Graph/Text switchables
Character sizes	9 different sizes from 1.2 x 0.8 mm to 10.8 x 7.2 mm (from 1/16" x 1/32" to 7/16" x 9/32")
Printing colours	Red, blue, green, black
Printing directions	Right, left, up, down
Minimum step width	0.2 mm (1/64")
Cassette Interface	Up to two cassette tape recorders can be connected

CE 151 Memory Module (Optional)

Capacity	4k-byte C-MOS RAM
----------	-------------------

CE 155 Memory Module (Optional)

Capacity	8K-byte C-MOS RAM
----------	-------------------

CE 153 Software Board (Optional)

140 key soft-touch definable keyboard

CE 152 Cassette Recorder (Optional)

Audio cassette recorder to match PC1500

CE 159 Battery Back-Up Memory Module (Optional)

Capacity 8K-bytes, will retain memory contents when removed from PC1500.
--

CE 158 RS 232 Interface

RS 232C Interface also incorporating Centronics parallel interface.



**BASIC LANGUAGE SPECIFICATIONS
PC 1500**

Commands	RUN, NEW, LIST, CONT, TR ON, TR OFF, LOCK, UNLOCK, STATUS, MEM
Statements	INPUT, PRINT, GPRINT, CURSOR, GCURSOR, PAUSE, USING, WAIT, CLS, IF... THEN, STOP, GOTO, ON... GOTO, GOSUB, ON... GOSUB, RETURN, ON ERROR GOTO, FOR... TO... STEP, NEXT, END, DIM, LET, REM, DATA, READ, RESTORE, BEEP, AREAD, ARUN, CLEAR, RANDOM, DEGREE, RADIAN, GRAD, BEEP ON, BEEP OFF
Functions	SIN, COS, TAN, ASN, ACS, ATN, LN, LOG, EXP, DEG, DMS, RND, SQR ($\sqrt{\quad}$), SGN, ABS, INT, PI (π), LEFT\$, RIGHT\$, MIDS, ASC, VAL, LEN, CHR\$, STR\$, POINT
Variables	A ~ Z, AS ~ Z\$, two-letter variables possible, two-dimensional arrays applicable
Operations	+, -, *, /, (,), >, <, >=, <=, <>, =, ^, AND, OR, NOT, &
Others	INKEY\$, TIME, , ; :

CE 150 Printer

Commands	LLIST, TEST
Statements	LPRINT, TAB, LF, ROTATE, COLOR, GLCURSOR, SORGN, LINE, RLINE, CSIZE, TEXT, GRAPH, LCURSOR

Cassette Interface

Commands	CSAVE, CLOAD, CLOAD?, MERGE
Statements	INPUT#, PRINT#, CHAIN, RMT ON, RMT OFF

To: Sharp Electronics (UK) Ltd, Computer Division,
Sharp House, Thorp Road, Newton Heath,
Manchester M109BE Tel: 061-205 2333.

Please send me details of the Sharp PC 1500

Type of application: _____

Name: _____

Address: _____

Tel No: _____

PCW3

The world of
SHARP
where great ideas come to life.



Design and specifications subject to change without notice.

London offices at 31 Dover Street, but by now you should be able to contact Kristi LaBianca, director of MicroPro UK, at that address.

Incidentally, the new Epson printers (the Mark III) are much cleverer than the ones most of us have bought. They can do things like teeny tiny little super-script and sub-script letters, like emphasised print, like double-width letters, like 132 letters per column.

The old Epsons could do some of these things but not very well. If they did double width characters, it had to be a whole line at a time, so if they were required to do two lines of double width characters, you had to reset the thing each line.

Now here's an interesting thing: the difference between the old Epsons and the new ones is simply the memory chips inside them. Take your old Epson Mark 2 to a dealer, pay him £25, he will put the new chips in — and Shazam! a Mark III Epson.

For some reason, Epson isn't publicising this fact too heavily.

Bravery

It takes a brave man to announce Ethernet for a microsystem, since Ethernet is widely agreed to be neither fully operational, nor cheap. Two brave hardware companies, then: Altos, which had Ethernet on show in Amsterdam recently, and a company called 3COM.

The 3COM system is going to be built round the IBM Personal Computers (when we have them) to provide a line of products that will connect several users into a network. That way they can share big disks, expensive 'tape spoolers', and messages.

Anybody fancying trying the experiment can contact the company's agent, Ambar Components, on (0296) 34141 at Gatehouse Road, Aylesbury, Bucks, HP19 3ED.

Dithering

Osborne in the US is still dithering about how or when it will announce 80-column displays for current users.

Logic appears (but only appears) to be on its side. It has polled its customers to see how many of them will buy the 80-column display option if they make it available and the customers mostly say they don't need it.

This is hardly suprising, since it is about as clever a question as asking a convention of one-eyed cinema enthusiasts if the club films should be shot in 3-D. Naturally, everybody who wants an 80-column display (a lot of people) decided not to buy an Osborne in the first place.

Osborne should poll the people who nearly bought one, and didn't.

Free micros!

You presumably want to know how the world's first hard-disk portable computer ended up being sold through Rymans office shops? Read on.

Rymans used to sell an American-built overpriced system called Dynabyte, imported by Metrotech. Then Rymans and Metrotech and Dynabyte all split up.

Rymans has thought a bit about this and has returned to the market with a British product range — the extraordinary Andromeda family from ITCS in Staines.

This is the family of 'free' microcomputers which has attracted both controversy ('he can't do it!') and enthusiasm ('we've done £2.5 million worth of business in less than six weeks from startup') because the machines are not only free, but come complete with some cheap software.

The idea is simple enough: ITCS will lend a machine suitable for running the software it sells and maintain it for a reasonable fee, for three years.

All the machines (over 20 different combinations from six basic designs, including an Osborne-like portable) run CP/M on an identical central processor.

The difference between the systems is the size of the keyboard, the size of the screen, the density of the disks, and so on.

The systems have now been enhanced with the launch of what proprietor David Lewis-Pryce reckons is the 'first winchester-disk portable' in the world.

This is no light-weight: the basic Zita portable requires you to lift 36lb weight and the hard disk version is even heavier. However it does pack away into a single case, small enough to put in front of you on the tube, and compact enough to hold in one hand long enough to push open the door with the other.

Its advantages over the Osborne — apart from its UK origins — are the bigger screen (nine inches) with 80 columns display and much bigger disk capacity. It can be cheaper, too, but not for the same amount of software.

Franchising arrives

First British Computerland store — no, not the old Byte Shop group, but the new US-based ComputerLand group — has opened in Southampton.

It is an expensive store. First, the group had to pay Comart group close to £70,000 for the name, after several years' wait

and legal proceedings.

Second, the chain is a franchise, not a corporate-owned one. You can start up a ComputerLand store if you pay enough. In the case of the Southampton store, the Sperrings Group is spending £2 million and will use that money to open 11 different ComputerLand stores in 'selected southern and Midland locations'. Some of that money goes on stock but some goes straight to ComputerLand to finance central services — and central profits, too.

At press time, that store was the only one we knew for sure would get the DEC range of Rainbow and Professional models — one day. Details from the energetic publicity agents, Rayner, on (0703) 332829.

Directory

A directory of microcomputer software has been compiled by staff from Sunderland Polytechnic.

It has taken them a year to put it all together — not just lists of program names but details of what system the program runs on (and how big it must be) and who sells it and what the dealer's address is.

Copies are available from the Department of Mathematics and Computer Studies, Sunderland Polytechnic. Cost is £3.00 and cheques should be made out to the Borough of Sunderland. I can't vouch for it, however, since by press time I still hadn't seen a copy.

Good news

Two bits of good news from Welsh manufacturer Dragon Data, which produces the Dragon 32.

First, the company is not going 'down the tubes' with the failure of Mettoy (which at press time

seemed to me to be likely) because it has been bought out.

Second, the designers are planning to release reasonably priced disk drives early next year and also predict that the problems with display on many colour televisions will be overcome before February.

The machine is tremendously successful: from the launch in August to mid-November, it sold 12,000 units. Predictions were that, by Christmas, twice as many would have become the proud possessions of home users.

This makes it very hard not to recommend the machine as a serious choice. The power of its internal processor is comparable to (or greater than) some '16-bit' chips.

Financially, the company now has the backing of Prutech, the venture capital arm of the Pru. There is also some money from the Welsh Development Agency, rounding off a busy month for that body (it also sank a quarter of a million pounds into Torch, when that company bought Arfon).

Arfon, for those who don't have VIC 20s, is the company which sells a case for the VIC which expands memory and allows several other add-ons to be plugged in simultaneously.

False impressions

Hardly a day goes by, you may think, without some newspaper or journal showing a picture of some disabled human being helped by a computer. Surely, you say, it is ridiculous to suggest that this sort of thing needs more publicity — every time some picture editor wants to run a 'technology' story with a 'human touch' out comes the automatic Braille reader, or the talking wheel-chair. But the impression is false.

The British Medical Associa-



Look carefully at this Epson HX-20, because it isn't. It's a Sharp PC1251 in an integrated tape cassette and printer module. Sharp will be showing the machine at the Which Computer? Show in January (National Exhibition Centre, 18-21 Jan) together with a colour printer which will be launched in summer.

Still Need Convincing?

SOFTWARE FACTSHEET

Product: CARDBOX	Type: CardIndex
Retail Price: £155	Machine: CP/M & MP/M
File Size: CP/M 8MB MP/M 16MB	Records: 65,500 maximum
Record Size: 1484 ch maximum	Fields: 26 maximum
Field Size: 1484 ch maximum	Index Limits: None

Notes: Allows **complex searching** using up to **99** separate criteria.
Widely available from distributors in USA, UK and Australia.

Published by Caxton Software Ltd of London.

The Critics Don't....

"Cardbox is your familiar, tried and trusted card index... with most of the features you have always wanted on your manual card index but couldn't have, because of the limitations of pieces of card."

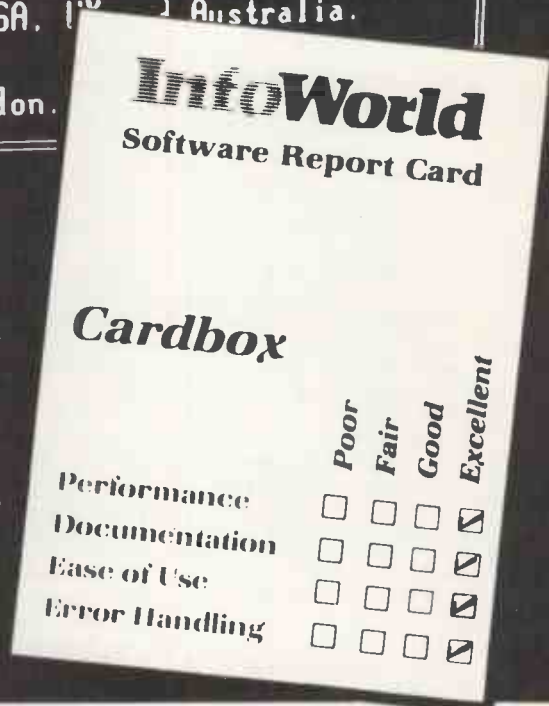
"Cardbox... succeeds extremely well. Its facilities for indexing and searching are good and very fast... the user image of the screen displays and the documentation are in the main excellent."

Personal Computer World, August 1982

"The interesting thing... is the display... Cardbox enables you to draw a form on the screen complete with headings."

"Cardbox is an excellent database manager... its versatility... and its ease of operation make it a useful program for home or business."

InfoWorld, September 13, 1982



Anyone can use Cardbox. It's a simple yet powerful electronic card indexing system. Easy to learn and easy to use, Cardbox is bringing real computer power to hundreds of new users.

Put yourself in a user's shoes:

- You wouldn't have to change your present working methods or think in computer terms. Cardbox talks to you in plain English.
- If you can do it with a card index you can do it better with Cardbox thanks to its sophisticated automatic cross-indexing.
- Up to 65,500 'cards' can be stored and they can be displayed, printed or passed to other programs in any number of alternative formats.
- Groups of 'cards' can be selected by any word in any field. Your choice can be refined by using up to 99 words in a single search.
- Information is easily added, changed, duplicated or deleted.

These are just a few of the reasons why the top British and American micro journals are convinced Cardbox is the ideal card index for CP/M users.

Cardbox - the ideal card index system for CP/M users

Caxton Software Ltd, 10-14 Bedford St, London WC2E 9HE. Tel: 01-379 6502. Telex: 27950. Ref: 398

Caxton products are available from leading microcomputer suppliers in the UK.

CP/M, MP/M are trademarks of Digital Research Inc.

I am an End User Dealer Distributor/OEM

Please send further information. Business Card attached

Please send _____ copies @ £157 + VAT (includes P+P)

A cheque for _____ is enclosed.



PRESS RELEASE OF THE YEAR AWARD

Every day we receive up to 50 press releases at PCW. Something like half of these go straight in the bin, either because they're nothing to do with micros or because they're plain boring. Occasionally, though, one appears which is either so ludicrously wild in its claims, or so riddled with errors, or so arcane in subject matter that it deserves to be considered for some sort of award. We're proud to announce, then, the PCW Press Release of the Year Award for 1982. There have been quite a few contenders during the year but we feel that Mitsubishi Electric Corporation wins hands down. The prize is the dream of every PR man: a verbatim reprint of the entire press release. So here goes:

Mitsubishi Electric develops pattern recognition software for sorting fish and cucumbers.

Mitsubishi Electric Corporation has developed Melsort pattern recognition software which promises to have wide application in the automated sorting and grading of commodities at the manufacturing and distributing stages. The microcomputer-operated Melsort system can recognise commodities by identifying their images with memorised key diagrammatic features.

One application is the fish sorting and grading system

developed jointly with Mitsubishi Kakoki Kaisha Ltd. It recognises sardines, herring, anchovies and a variety of mackerel by shape while grading them into three sizes — small, medium and large. The task of fish sorting which used to require skilled human labour is now done automatically, based on information regarding five to 10 selected diagrammatic elements such as length, width, snout shape, etc.

The system typically consists of a supplying unit, lighting unit, line sensor (TV camera), picture processing unit, conveyor and sorter which are controlled from the central control monitor linked to the data processing unit.

Fish first go through light to activate the line sensor which transmits diagrammatic information to the picture processing unit for identification and sorting. Fish up to 500mm in length and 150mm in width can be handled at a speed of about 14,400 per hour.

Melsort is also used in a cucumber sorting and grading system which Mitsubishi Electric is marketing to save time and labour in this hitherto tedious task. It sorts and grades cucumbers according to thickness, length and curvature and shape, which are appreciated by Japanese customers. The system has gained wide acceptance (in Japan), among agricultural co-operatives in particular.

tion is now trying to collect information on how information technology can help the disabled and this is being done not because the BMA hasn't heard of all the work going on but because it has heard of it, and is worried.

The trouble is that many people are all doing the same thing. Disabled people, especially teenagers, are publicity shy, and it really isn't easy to persuade them to pose before their cameras. People working to help them tend to work alone, without knowing what else has been done before in the same field.

'The primary aim of our conference, to be held in Spring 1983, is to plan how the effort in this field can be co-ordinated,' the BMA said recently. Its Under Secretary, Dr John Dawson, said: 'Realising the improvements in the life of a disabled person by use of information technology, requires aggressive and successful management at national level.'

When a crippled child gets an automatic wheelchair that can climb stairs, it shouldn't be news. It should be an everyday occurrence.

The BMA wants to hear from

organisations and individuals who are using micro-electronics to help disabled people. Research papers are being prepared to form a basis for discussion by participants.

The number to contact the BMA on (if you know of a project to help the disabled) is 01-387 4499.

NEC price cut

NEC has knocked 13 percent off the prices of its PC8000 range of micros and peripherals and has ended its distribution agreement with IBR, the company announced recently.

Despite being the biggest-selling micro in Japan, the PC8000 hasn't done too well in Britain — under 2000 systems have been sold here in the last two years, in fact, which, as NEC pointed out, is 'a morning's production run at the factory'.

One of the reasons for the machine's poor performance in the UK marketplace was its relatively high price, partly due to its being modified to include a £ sign on the keyboard. Now, although the 'official' price has been reduced,

it's likely that dealers will start to discount the machines even further, an attitude which NEC seems interested in encouraging — or at least in not discouraging.

However, there's still no sign of the company's 16-bit micro appearing here, even though it has been on sale in Japan for a time. NEC in the UK is still assessing it and does not expect it to be on sale for some months yet. Peter Rodwell

CP/M here — official!

At last, CP/M has officially come to Britain with the opening of a UK and Scandinavian head office in Newbury.

The company announced this at the same time as it revealed that there would be a new form of CP/M — not available on more than a couple of machines yet — which avoided several of the more gross limitations of all the predecessors.

The big assumption of all previous versions of CP/M was that some people would be sitting in front of a keyboard, but would have no screen in front of them.

Instead they would have a slow printer — a teletypewriter.

So if you typed a line, and got it wrong, you had to type it again. The fact that most users didn't have a printer, and had a computer quite capable of moving the printing 'cursor' up a line, and editing it, didn't matter, because the software had to work for the

users with a printing terminal.

The fact that the printer was slow meant that programs were limited to displaying as little information as possible when waiting for user commands.

If the machine says: 'We have now reached the point in the program where we require a decision from you.

- Would you like
- to repeat the last command?
 - to try something different?
 - to stop using the program?
- or
- to change some of the data used last time?

it is quite easy to understand what to do — but it drives the man in front of the printer mad with impatience. He knows full well he wants a) because he always does it. But he has to wait the best part of a minute, while the printer clacks away in front of him.

So the system says something enlightening like:

A> and you go and check what the manual says to do next (if you can find the right place in the manual).

The new version of CP/M, CP/M Plus, will avoid this, and all the other related insults to machine manners, because you will be able to edit lines on CP/M screens just as if they were PET screens.

There are lots of other enhancements and changes. For instance, it will be possible to change disks without getting a rude BDOS Error announcement. For instance, CP/M will suddenly be



Caxton Software has hit on a novel approach to packaging its products with this 'record sleeve' containing a disk for its latest product. Called Touch'n'Go, it's a program for teaching managers, office workers and others who aren't professional typists how to type on a computer keyboard. Calling it a 'typing tutor' scarcely does it justice: it took one Stan Harcourt over 20 years to develop and it can turn a two-fingered keytapper 'into a 10-fingered keyboard master in 24 hours' says Caxton.

Well, we've all been trying it out on and off here at PCW and it's certainly good. One of the nicest things about it is that you get to type real words as you learn instead of 'dfgklj' or 'swxjin' as you have to with other courses. All the instructions you need to start are printed on the sleeve (you type 'T' to run it rather than a whole name because you haven't yet learned to type!) and further instructions are contained within the program.

Oh, and it costs just £25 and runs on any CP/M machine. More from Caxton on 01-379 6502.

Peter Rodwell



The 16-bit Dot — portable but pricey.

able to control more disk space than eight megabytes, and more memory space than 64 kbytes.

For details, contact Digital Research on its new UK phone number of — ah, what a pity. No phone yet. Ring Belgium, then, and talk to Jim Porzak at Vector. The number is 32 (16) 202496.

Lynx in the chains

There is no reason I can think of to pretend that I thought the Computers Lynx would ever make it: it is starting to look as if I may have made a grave error of misjudgement.

The £215 machine has been adopted by Dixons, by Laskys, and (to me even more impressive) by the Spectrum voluntary retail chain.

All three organisations went on record as saying that they expected to start getting machines on December 10, and to sell a lot of them.

Still no sign of one here: but we think you can expect to see a review soon.

The machine is a colour CP/M micro — it doesn't do CP/M yet, of course, because it still has no disks. It has its own Basic, it has expandable memory, and one day, it will have software.

There are well over 100 dealers around the country.

16-bit portability

One of the more interesting machines launched at Comdex Europe in Amsterdam this November was a 16-bit portable computer, called the Dot. Claiming complete software compatibility with the IBM Personal Computer and the DEC Rainbow, the Dot is 8088-based to allow it to run MS-DOS software but comes with an optional Z80 add-on to allow users access to CP/M-80 packages too.

The Dot contains up to 704 kbytes of RAM and 24k of user-

programmable ROM and has up to two Sony 3½in disk drives, capacity 278k each. As if this wasn't enough to make it unique already, the Dot also contains a built-in 80-column thermal printer which can print out anything displayed on the screen, including high-resolution graphics. Options include a built-in modem and an 8087 arithmetic processor.

The snag, though, is the price: an estimated £2300 for the basic system, comprising CPU with 32k of RAM, bit-mapped graphics, keyboard, a single disk drive and two expansion slots. Manufacturer Computer Devices Inc maintains, however, that it's not competing at the Osborne end of the market; the machine is intended mainly for desk-top use, it says, where its main advantage is the small amount of space it occupies. More from Computer Devices' European office at 108, Place des Moires, 91000 Evry, France, tel: (6) 079 0077.

Peter Rodwell

Legal matters

Atari says it is suing Commodore for ripping off the Pac-Man game, and selling it as Jelly Monsters. Commodore says that Atari has lost a similar lawsuit in Hong Kong, and as a result has withdrawn from this one. Atari says no, it hasn't withdrawn, it has just 'stood over its application for a temporary injunction, but obtained an order for a speedy trial'. Commodore says it will be pressing for costs.

When we know more, we'll tell you. I can't help feeling a touch ironical about the wording of Atari's press release, however.

The release itself refers to the 'substantial commitment to the development and marketing of new and original software' — which is very true and valid — and says that it will 'continue to enforce its rights against those who would seek to misappropriate the fruits of Atari's labours,'

which is a matter for the courts to settle.

The irony of this case is the fact that Pac-Man is not a program which Atari wrote. It happens to be one they bought from a Japanese company.

Hand-held hand-outs

A possible £100 million is to go to London's shy or proud and needy under a new scheme based on hand-held micros.

The micros will be used by welfare visitors on their rounds to spot eligibility for welfare benefits.

A possible £100 million currently goes unclaimed in London.

The Greater London Council (GLC) is budgeting around £300,000 for a system based on devices like the Tandy, Sharp, Newbrain and Epson.

'The scheme, expected to be underway next spring, will reach people who would never dream of asking for any financial assistance,' says the GLC.

'Every day thousands of people are being means-tested for specific things, but the task of calculating their eligibility for any welfare benefits is very complicated.

'The new system will prompt welfare visitors to ask a series of questions leading to an automatic on-the-spot assessment of eligibility.'

Precisely which machine will be used has yet to be decided, but it

will have to include a small display and printer.

A parallel project involves communicating via existing terminals in Citizens Advice Bureaux to a central database at the GLC for textual information on legal advice about welfare benefits.

Jane Bird

Final act in Sirius drama

Sirius superstar Chuck Peddle flew into London in November for a lightning press conference to explain the mystery surrounding the rumoured takeover of his company, Sirius Technology, by the US Victor organisation.

The sequence of rumours went something like this: first, it was whispered that Sirius had taken over Victor. Then UK Victor 9000 distributors DRG issued a press release claiming that Victor had taken over Sirius and from now on we'd only see the Victor name on the company's products.

ACT, the British distributors for the Sirius 1, seemed as much in the dark as anyone — and nobody could get any information at all from Sirius in the States. Confusion was compounded at Comdex Europe in Amsterdam where the large Victor stand was populated with Sirius-style machines with a Victor label in which the 'o' in Victor was composed of the Sirius logo!

Here, then, is the (abbreviated)



No, he is not synthesising music: he is 'blowing' EPROMs — storing other people's code into semi-permanent memory chips.

He works for Dialogue in Camberley, who will blow EPROMs free, if you buy them from them. Details on 0276 682001.



The more observant of our readers may have noticed something different about this month's PCW. What we've done is to change over to phototypesetting, in the form of a brand-new, computerised Itek machine. Our dear old IBM golfball machines have been put out to pasture on a much less onerous task of setting Private Eye.

This doesn't mean, of course, that we'll now see fewer errors in PCW — it's just that they'll be high technology errors. Pic shows our typesetter, the glamorous Ms Jane Hammell, trying to get Space Invaders running on the Itek.

official story from Chuck Peddle. Back in October 1980 he and a colleague decided to go into microcomputer manufacture.

They did a deal with Victor Business Products (an offshoot of the Walter Kidde organisation in the US) under which Chuck's company, Sirius Technology Systems, would manufacture the machine we know as the Sirius 1, and Victor — a well-established office equipment company specialising in desk-top calculators but looking for a micro to add to its range — would market it throughout the US and abroad through its subsidiary companies. Victor would have the machine exclusively in America but Sirius remained free to market it under its own name elsewhere. In return, Victor injected a large amount of capital in Sirius.

For various reasons the Sirius machine got off the ground in Europe (through ACT, which still sells more of them than anyone else) before the Victor version was out in the States. With the Sirius selling well in Europe, Victor surprised us all by launching its machine over here too. Much to ACT's obvious annoyance, it appeared in this country through DRG. But as this was perfectly in order according to the Victor/Sirius agreement, there was little anyone could do except call each other rude names.

Earlier this year, though, two things happened which caused all the confusion. A company in the US called Sirius Software initiated legal action to prevent Sirius using the word 'Sirius' in its name. And Sirius (that's Chuck Peddle's Sirius) decided to buy out Victor's share. Sirius Systems lost the court case (despite desperately buying up a small, long-established but bankrupt company

called Sirius to try to establish prior use!) and had to find itself a new name. As it was taking over the Victor Business Systems empire anyway, 'Victor' seemed an obvious choice so Victor it became, with a new logo incorporating the old Sirius logo.

However, there's a final twist. Although the new Victor company can't use the Sirius name in the US, it can elsewhere and, as the machine is firmly established in Europe as the Sirius, that's how it will continue to be known over here. But established distributors and dealers of the Victor 9000 will also continue to sell that machine, although don't expect Sirius and Victor people to be any friendlier just because of the takeover. And don't expect them to indulge in a price war, either: that will be very firmly stamped on by the new Victor company. Peter Rodwell

Novel printer

Olivetti has found a new way to become newsworthy — by producing a new printer with a completely new way of printing. It involves shooting black sparks at white paper.

Most printers hit a piece of paper with an inky ribbon, pressed onto it either by a lump of metal in the shape of a letter, or else with sharp needles which repeatedly slam into it.

Some printers use the needle method but instead of hitting the paper in the right place, they burn the paper. To work properly, this method needs heat-sensitive paper. Don't leave it in the sun after printing ...

Olivetti has hit upon the idea of using a graphite electrode and instead of writing on the paper (as

with a pencil) it electrifies it. A spark flies between electrode and paper and a particle of carbon flies with it, onto the paper. The idea is exciting enough and, at £400 plus VAT (£14 more than the Epson), the price isn't badly wrong.

Olivetti claims that the printer has fewer moving parts, which is true enough, but omits the fact that it only has one electrode. So where your impact matrix (those needles) with seven or nine moving parts has to travel down a line of print once, the carbon head has to travel seven (or so) times. It has to shake about a bit. The drawback is that the carbon used in the printer is all too clearly carbon.

There is a printer which uses laser techniques, which is so fast that it does carbon copies by printing the same page twice and you don't notice the difference. 'Every copy a top copy,' somebody said once. The Olivetti has every copy a carbon copy.

One of the first companies to adopt the new printer is Acorn. Olivetti is on 01-785 6666.

that people can plug in their own peripherals to the new machine.

Like all people who understand the ZX back connector, Adams speaks a language almost totally impenetrable to me: I suggest you contact him direct for details of what he sells. It all seems pretty cheap.

Assorted op-systems

Anybody planning to sell you an imitation IBM Personal Computer with MS-DOS, the operating system which Microsoft produced for IBM, can plan on paying a mere \$19 per copy, providing they plan to sell more than 5000 machines.

Microsoft has announced new prices to go with its new version of the operating system, which is expected 'soon'.

MS-DOS 2.0 'offers a number of new and enhanced features,' the company says.

User friendliness is provided by a 'visual shell, and help facility' — that's to say, a menu of common commands and an explanation of them if you panic and type a question mark.

The new software should run a bit faster, too, because Microsoft has taken a little of the computer's main memory over and uses it to store data coming off disk. The assumption is that you are very likely, having read one sector, to want the next, so MS-DOS 2.0 reads in the whole track and your second access comes direct from memory.

Most interesting, however, is the sign of a response to Digital Research's Concurrent CP/M-86. So far, DR has offered this on the IBM PC and very few other systems. There are several reasons for the slowness of the response: first and foremost, people don't understand what it is.

Once you have understood that Concurrent CP/M-86 lets you switch happily between Supercalc and Wordstar and your electronic mail system without loading and unloading files, you tend to want it. At that point, you find that it

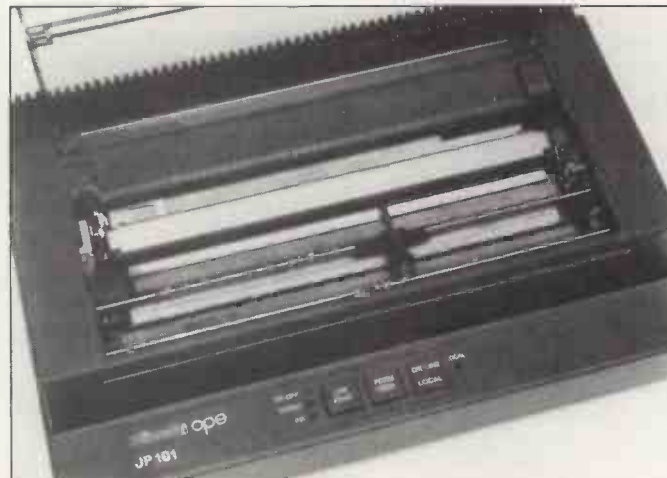
List service

You have just finished writing that immortal Spectrum program, which is not only going to make you rich but also famous. You plug in your ZX printer, LLIST it and then send it in to PCW.

You pop the silver paper into the letter-box and it pops straight out again, with a little note saying: 'This letterbox is not programmed to receive any more ZX printer listings for PCW because the line of unread listings (mostly unreadable) now stretches back from Evelyn House to here.'

Don't panic! Send the cassette to LE Listings, 1 Leswin Road, N16, with £2, and they will print it out on plain paper (missing out only the underscore, user-definable graphics and block graphics).

Stephen Adams, who runs the service, also sells various adaptors to make the ZX81 look like a Spectrum and vice versa, so



Shooting sparks: Olivetti's new printer.



The hard disk in front of the Apple is actually a disk and tape system. When you start to worry about the disk crashing and tearing your data into a finely separated stream of oxide, you read it all off onto the tape, and store the tape in a cupboard somewhere.

The difference between this one and other types of tape dump is that this one checks the data as it goes out — it has a tape read head behind the tape write head, and makes sure that what was written is what it wrote. If not, it marks it dud, and repeats the block.

You get it from Hal Computers, on Farnborough (0252) 517171.

takes up an extra 91 kbytes on the Sirius 1.

So there is no panic for Microsoft in producing its multi-tasking system, which (it adds mysteriously) is written in 'C'.

The only reason there is any mystery about this, is that 'C' is what Unix is written in and, of course, Microsoft does have a Unix-type operating system called Xenix. Microsoft now has a European office: details on 04427 75091.

Where's the action?

There is an 'adventure' type game for women, if they have a ZX81. It is called 'Love' and I haven't the nerve to try it out. All the action happens at a 'Zany Houseparty' and I just can't face another.

Normally, it is nice to see people advertise in *PCW*: on this occasion, however, it is necessary. John Noyce has written a superbly grovelling letter, with my address most efficiently printed on the top in the space where such things should be found.

But until he adds his own address, just above that, we won't know where to send our £5.95, will we?

Another 'portable'

Somebody at MicroAPL with a sense of humour has decided to put a handle on that company's enormous, specialised, expensive personal minicomputer and describe this as a 'challenge to Osborne'.

Osborne, I assume, is a manufacturer of computers which

are rather more expensive and specialised than Osborne CP/M micros. They are presumably quivering in their teak-lined boardroom.

Not that the Scorpion isn't an impressive-looking machine. And, at the price, it even seems quite reasonable value for what it is.

It is just that with a 16-bit 68000 super-chip inside, the highly specialised APL language for programming in, no packaged software and a price tag of £6000 (plus VAT) or more, it does seem to be in a difference world from Osborne. Even if it does come in a box with a handle. We can presumably expect a Porsche with pedals and a chain as a 'rival to the bicycle' any day now. Details on 01-834 2687.

Apple picks up

Apple has done pretty well in the last six months as it prepares to sell off the last of the Apple II machines and launch the smaller version with fewer chips, the Revision E version.

By bringing down the price of a disk system, the company has had its best quarter ever, winding up at the end of its financial year with a 74 percent net increase in sales. That's a very great deal more than was on the cards in June, Apple's worst month for ages, before the coupon offer.

In the UK, the boss, Peter Cobb, is convinced that somebody else has suffered. 'We want to know whose lunch we've eaten,' was the way he put it, talking to the trade paper *MicroScope*.

Some manufacturers at the upper price end of the micro market (competing with minicomputers) did have a lean time, but

they aren't really competing with Apple directly.

It seems likely that Apple did well because many new machines were announced, and were very effective in whetting buyers' appetites — but didn't appear.

Commodore certainly isn't the company to suffer — though: its PET range didn't boom — because its VIC has been enormously successful (see story elsewhere). In the third week of November, it reported a total of 20,000 machines shipped in the UK, at prices down to £130 through some chains, and even as little as £115 through some discount warehouses.

Disk delver

This is going to hurt so grit your teeth: if you want to see what's on a disk, you need a program called Watson.

I warned you.

It costs £35 and it does things like dump memory to screen, disassemble text, look through disks. It works with the Inspector, which Vergecourt has already launched. Details on (0268) 728484.

Multiplan here

Rivals to Visicalc still appear: Microsoft's Multiplan has now hit the UK at £169. Its unusual feature is the escape from grid references ('go to square AA 43') with ordinary words being used as labels. Formulae can be entered in slightly less mathematical form, therefore — reference to 'profit = sales - costs' would actually link the right fields together. Dealer in the UK is Pete and Pam Computers, on (0706) 227011.

Another Visicalc improvement is the one which you get from using the Apple III rather than the II — but not everybody with an Apple II is daft enough to want the III.

Vergecourt has produced a big-memory board and Visicalc expansion system for Apple II users, which (they say) provides 'a whole series of extra commands which speed up the production of presentation quality management reports. These include', they add, 'many of the long awaited format features found in Visicorp's Visicalc Advanced Version, which is currently only available on the Apple III.' Details here on (0268) 728484.

Forth spreading

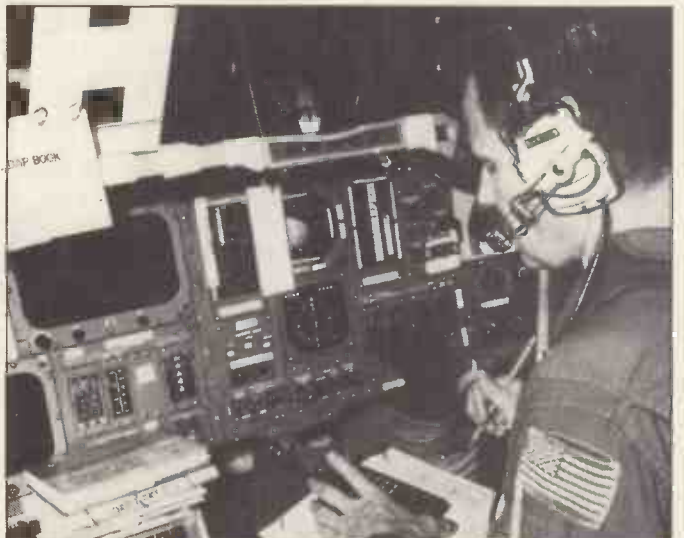
Oric, one of the many Christmas Bargain machines still not available at the time of writing (but expected in days rather than weeks, of course) has been given an extra programming language. So has the BBC microcomputer.

This one is obviously designed to take some of the wind out of the sales of the Jupiter Ace, which comes with Forth.

Forth is now available, on a free audio cassette, with every full-size Oric — the one costing £169. Or it will be, when the Oric is available.

The BBC Microcomputer gets its Forth from Level 9 Computing in High Wycombe. This isn't free, but, at £15 including a 70-page manual, it can't be exploitation.

Details from Oric on (0990) 27641, and from Level 9 on (0494) 26871.



All that is missing from this Space Shuttle simulator is the green face of the astronaut. He is practising using his Hewlett-Packard programmable HP-41C calculator which had been pre-programmed 'to help with several duties, including manual manoeuvring of the space-craft in an emergency, and calculation and adjustment of the shuttle's centre of gravity prior to re-entry.' A shame one of their guys got so seasick (space-sick, then) they had to come down early — not the sort of emergency the calculator was programmed to deal with, I suppose.

Maggie Burton brings you all the latest news.



The good news this month is the birth of a new 'Town. David (or myself — neither of us can remember which) sent some guidelines to Peter Stone of Wolverhampton recently. He's just written back to say that his (or their) 'Town started in October at the Polytechnic in Wolverhampton. They meet on Friday evenings during term time from 6pm until 9pm in the Computing and Maths department, so that's where you'll find them if you're in Wolverhampton and you feel like paying them a visit.

There's plenty of hardware there and technically knowledgeable people on hand to provide help and advice. The computers are: 16 TRS-80s running disk systems, a PET, a BBC model B and an RML 380Z.

On top of all that hardware CT Wolverhampton provides a self-teaching. Basic course and a large room for those who want to add their own micros to the already quite impressive list. Anyone who wants to know more should contact either Peter Stone or Mr P Strangman during 'normal working hours' at the Computing & Maths Dept., the Polytechnic, Wulfruna Street, Wolverhampton WV1 1LY. The phone number is Wolverhampton 27371 ext 145. We wish them all the best for the 'Town and other wise and hope to bring you more news on what they're up to in future.

CT Worcester has a new 'manager', as Tony Cartmell has stood down but will be helping out whenever he can. The new man-on-the-spot is Clive Watson — he's also manager of the local Tandy store, where the 'Town will now be based.

They've had a bit of a break recently, but should have started up again by the time you read this. The emphasis has tended to be on TRS-80s, mostly because that's

what's in the shop — but they hold an open house for people with other micros.

Clive Watson's put forward a really interesting idea which should be given a bit of fresh air. This is a regular session on making and testing modems, acoustic couplers and other communications devices and, when the products of such labours have been thoroughly tested, linking up with other CTs. This is very much a future proposal and not one that is just about to come to fruition. Who knows — perhaps there'll be a CTUK! bulletin board in operation one of these days. Any volunteers?

Anyone in Worcester wanting to contact Clive and hear more about his 'Town can reach him on Worcester (0905) 28985 or write to him at the Tandy Store, 8 St Nicholas Street, Worcester.

Pam Pollicott of ComputerTown Ruislip recently appeared in print. She's assistant librarian at Ruislip Library and she wrote about Ruislip's ComputerDay and about local 'Towns in general in *Service Point*, the journal of the branch and mobile libraries group of the Library Association (phew!). That's good publicity for CTUK! on the library front because the day was a great success and this is self-evident in what Pam says: 'With winter grasping us all by our collars at the moment there probably won't be any ComputerDays going for a while, but I had the idea of a computer carol singing session — five or six little loudspeakers all chiming "Once in Royal David's City", etc, could be made into quite a show if you think about it ...'

A letter arrived from ComputerTown Kalttenkirchen in Germany not long ago. They seem to be running a flourishing outfit and a short article was enclosed but that'll

have to be translated from German before a fuller report can be given on what they're up to. Nevertheless, at the last meeting before the letter from Peter Bendall (who runs the 'Town) arrived, they had 80 visitors and eight computers. They run meetings in their local school under the sponsorship of something called 'The People's High School' which runs evening classes. Apparently it's difficult for individuals to secure the use of a room. Hopefully, by the time next month comes round we'll have more to tell you about what they're up to.

That round up CTUK! News for this month. It only remains to say 'Merry Christmas and Happy New Year' to everyone reading this; we hope Computer Town UK! will keep spreading and flourishing in 1983. **END**

Computer Town 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. Computer Towns might be found anywhere — in a church hall, a library or perhaps a school after hours. The aim is to make computers 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 or 17 St George's Road, London NW11 0LU. Remember to enclose an A4 SAE for your reply. Please don't telephone PCW for information as CTUK! is entirely a spare-time activity.



The hunt is over and our man has been found. Congratulations to Stan Higgins from Malvern in Worcestershire who was the first person to ring in with the correct solution.

Despite our mammoth efforts to ensure that all copies of the December issue arrived at the same time, some subscription copies slipped the net and arrived early. So we have decided to run a compensatory competition for all those of you who rang in and left the correct answer on the Ansaphone before Friday 26 November. Details of this

THE PCW £5000 MANHUNT

will be sent to you by post shortly.

And for all of you who want to know, here are the correct answers:-

Puzzle 1 (September): 66266 and 8
 Puzzle 2 (October): 358926471 and 2
 Puzzle 3 (November): 44744 and 7
 N (Nineteen digit number):
 6626635892647144744
 N³: 290990844869903112884951885
 059487344774291087207667382784

The three single digit answers appear in N³ where underlined. Reading to the left

from that place, the next 35 digits form the key to the cipher. Decipher by writing the alphabet, space and the digits 0 to 9 in a circle. Each digit of the key is an anticlockwise displacement of the cipher digit. This gives the plain text:-

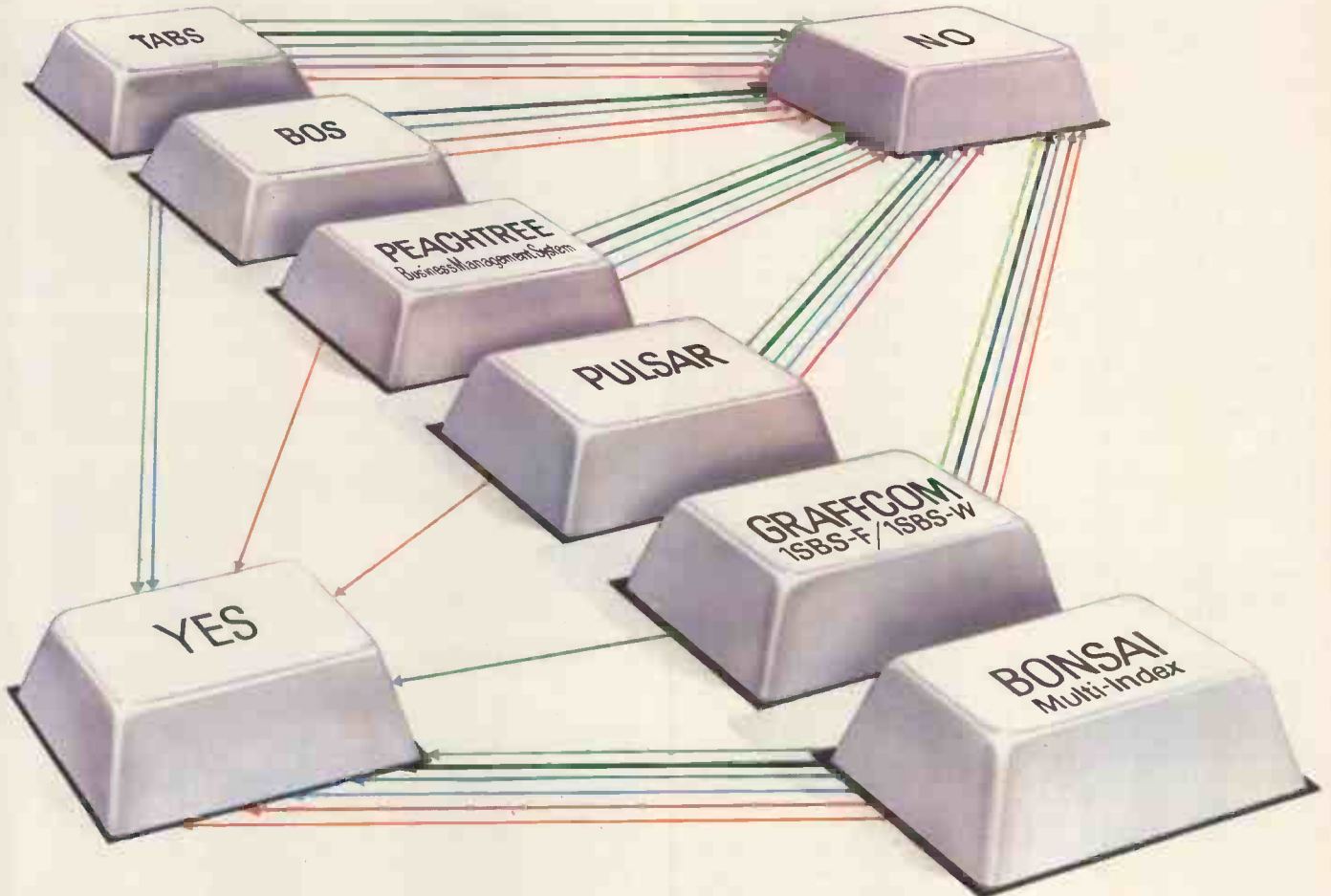
BRIGADIER BUMPER HARRIS
 01-636 6423

Easy, wasn't it?

END

Multi-Index from Bonsai.

The first Integrated Accounting Software for micros designed for real world business.



Multi-Index is a new generation of sophisticated Accounting Software. A completely integrated system written entirely in RM/COBOL, a professional business oriented language. It makes systems written in BASIC look pretty basic.

Multi-Index consists of seven fully integrated modules: Sales, Purchase, VAT and Nominal Ledgers, Stock Control, Order Entry/Invoicing and Sales Analysis, with several additional modules to be released soon. Multi-Index provides the ultimate combination of sophistication and ease-of-use. Entirely menu driven, easy to follow screen displays lead inexperienced operators step by step through all procedures so Multi-Index is quick and painless to learn.

Multi-Index presents features up to now only available on mainframes. Features like:

- Up to 13 open accounting periods with full detail accessible throughout the year.
- A financial statement report generator producing all statements including Sources & Applications of Funds, Balance Sheet, P & L and supporting schedules to your own format.

- Multiple-location stock control among unlimited branches with full stock transfer support.
- Access to customers, suppliers and stock items by name if the account or stock number is not known.
- Flexible price discount schedules, plus automatic calculation of salesmen's commissions, settlement discounts and finance charges.

→ No time-consuming sorts anywhere in the system.

Feature for feature Multi-Index beats all other micro accounting packages hands down. It is available now for many 8, 16 and 32-bit microcomputers running CP/M-80, CP/M-86, MS-DOS and Unix including the latest hardware like the IBM Personal Computer. Multi-Index also takes full advantage of developments such as colour displays and true multi-user file sharing.

To arrange a demonstration, or to receive our comprehensive information pack and details of our next seminar, give us a ring or return the coupon.

BonsaiTM

MICROCOMPUTER SYSTEMS
FOR PEOPLE IN BUSINESS.

112-116 New Oxford Street, London WC1A 1HJ.
(01) 580-0902.

Please (Tick as appropriate) Contact me to arrange a Multi-Index demonstration.
 Send me your Multi-Index information pack. Send details of your next Multi-Index seminar. Send information on the RM/COBOL programming language.

Name _____
 Company _____
 Position _____
 Address _____
 Phone _____
 OEM and Dealer Enquiries Invited

INVASION LAUNCHED IN TOKYO

Peter Rodwell reports on the new products at this year's Tokyo Data Show.

Expectations that the Japanese would do with computers what they've already done with motor-cycles, cameras, hi-fi's and watches have been rife for several years. The fact that, so far, we haven't seen our micro industry going the way our motor-cycle and hi-fi industries went has encouraged not a little complacency in some quarters: many people seem to think there's something different about computers which will prevent the Japanese from flooding us with shiploads of low-cost micros.

Meanwhile, oblivious to this difference, the Japanese are mass-producing computers on nearly the same scale as they do audio equipment, TVs, etc, and are preparing to flood us with shiploads (or, more probably, plane-loads) of them. October's Tokyo Data Show — roughly the Japanese equivalent of Compec in content but larger — gave a good preview of the latest Japanese machines, most of which are already selling well in Japan and many of which will be reaching our shores over the next few months (in fact one or two have already been seen in Europe).

The outstanding trend at the show was for 16-bit micros, most of them at least software-compatible with the IBM Personal Computer and some hardware-compatible as well. The 'mainstream' trend was for 8088 and 8086-based machines, typically with at least 128K of RAM, twin disks, good quality keyboard and medium-to-high resolution graphics displays.

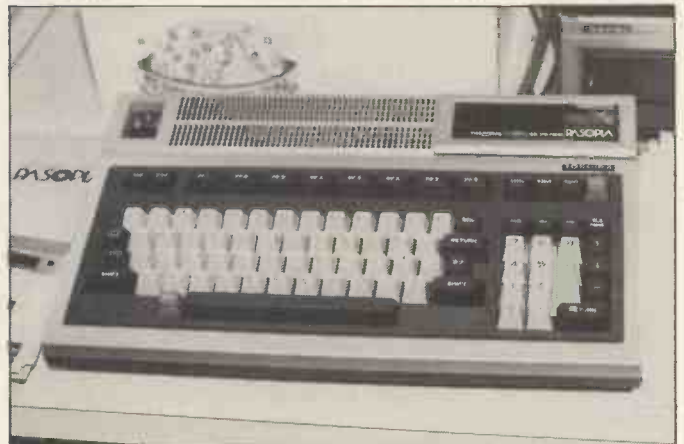
Although, in a certain sense,

the new wave of Japanese machines are much of a sameness and scarcely innovative, two features about them all struck me as particularly interesting: as we have long since grown to expect from Japanese products, they are all superbly made, with minute attention to detail and rigorous quality control; and they nearly all retail in Japan at prices which are typically between a half and two-thirds the price we expect to pay for such machines in Europe.

Before we look at the products, a word about the show itself: it lasts four days, had 127 exhibitors this year and was confidently expected to attract more than the 139,100 who attended last year. The 1983 Data Show will be from 18 to 21 October; for details, contact the Japan Electronic Industry Development Association, Kikai Shinko Building, 3-5-8 Shibakoen, Minato-ku, Tokyo 105.

New 16-bit micros

Nearly all the well-known names launched 16-bit machines, with the notable exceptions of Sharp and Casio. NEC seemed to offer best value for money with its PC-9800, which starts at 298,000 yen, say £650. For this you get a system based on NEC's equivalent of the 8086 with 128 kbytes of RAM (expandable to 640 kbytes) and a bumper 96k of ROM containing N88-Basic and the system monitor. The display gives 25 lines of 80 characters in text mode and three pages of 640 x 400



Toshiba's home computer.



Here's the National Mybrain 3000. Silly name but slick machine — note low-profile disk drives.



Sord's neat little home micro, the M5. Note plug-in ROM pack (16k).

dots or six pages or 640 x 200 dots monochrome graphics. Colour graphics are also available — 640 x 400 dots in eight colours. The PC-9800 runs both CP/M-86 and MS-DOS.

National (Matsushita) launched a micro — ludicrously named the Mybrain 3000 — which is very similar to the NEC in many respects: 640 x 400 dot resolution in eight colours, MS-DOS and CP/M-86, but 8088 instead of 8086. It comes with 96k of RAM as standard (expandable to 224k), 16k ROM and 32k of video RAM. The machine sells from 532,700 yen (£1100) for a monochrome display and

a single 5¼in, 160k disk to 865,700 (£1900) for the model with twin 8in 1.2 Mb disks. I particularly liked the machine's keyboard, which felt good and is a rather sexy twin-tone job: white for the main keys, olive green for the control and function keys.

Definitely outside the mainstream is Chuo Electronics, which rather bravely opted for the Zilog Z8001 CPU and Unix as the basis for a pretty smart business system housed in an all-in-one box and with a 20 Mbyte hard disk as an optional extra.

Sord launched two interesting

new systems. Well, actually, the M343 16-bitter wasn't totally new but was making its first big appearance in public. And very nice it is too, with full colour, high resolution graphics and 256k RAM (expandable to 768k) and twin floppy disks. However, it's certainly not cheap (by Japanese standards): 1,300,000 yen or about £2800.

Toshiba caused a big stir with the Pasopia 16 — a neat, 8088-based machine running MS-DOS — version 1 was on show but version 2 is promised for production machines. The machine comes as a 'main-frame' box with two built-in double-sided, double-density disk drives and separate keyboard. The basic version comes with 192 kbytes of RAM, expandable to 512k. Basic video display is 80 x 25 lines of text using just 4k of video RAM but this, too, can be expanded to four pages of 640 x 500 dot graphics in 16 colours, using a massive 512 kbytes (yes, half a megabyte) of video RAM! The Pasopia starts at 398,000 yen (£870) and Toshiba is planning a 100,000-units production run over the next three years.

8-bit micros

Although the 16-bit machines grabbed a lot of attention, the 8-bit world is by no means dead; the Tokyo show reassured me that my private conviction about



8-bit machines is true: there's a lot of useful software around for these machines and their performance is certainly adequate for many business applications. Thus there's still a place for them and what's happening is that — as I suspected — we're either getting more for our money, or paying less or, in some cases, both.

Take, for example, Sharp's new MZ-3500. It's a smart-looking beast which departs from Sharp's usual all-in-one configuration by coming in the 'standard' (for everyone else, nearly) three-box layout: keyboard, screen and 'mainframe' housing the disks and electronics. Inside are two Z80s

This is Sharp's MZ-700 with the optional four-colour plotter and cassette deck. It's software-compatible with the MZ-80K/A machines, has 64k RAM as standard and colour output to a TV set. Currently the machine is under consideration by Sharp UK.



Eat your heart out, Uncle Clive! This Japanese word processor managed to squeeze 12 functions from each key!

(one for processing, one for I/O) plus a separate dedicated processor for the keyboard. The entry level machine has 64k of RAM, internally expandable to 128k and there's provision for taking this to 256k with an external add-on. Its display system seems a typical piece of Sharp complexity (or ingenuity?): three kbytes of character video RAM, 2k for kanji (Chinese) characters and 96k of graphics RAM. And there's more: the machine has provision for up to 32 kbytes of program ROM (presumably a Basic interpreter and some sort of operating system) and an incredible megabyte of kanji generator ROM, which probably won't be in much demand if/when the machine goes on sale here! How those poor little Z80s cope with all this, heaven knows, but the graphics demo at the show looked acceptably quick and slick. Starting price in Japan is 320,000 yen, say £700.

Sharp also showed its MZ-2000, a very similar machine to the MZ-80B in specification and selling for 218,000 yen (£470). And the company also introduced its PC-1251, a tiny hand-held machine with Basic, very similar to the PC-1211 but considerably smaller — doubtless Dick 'Hand-held' Pountain will be telling you more about this in the next month or so.

The Sharp machine which I liked best was the MZ-700, a small home-hobby machine with 64k of RAM and a Z80, with colour TV output and sound, and software-compatible with

the MZ-80K/A machines. You can upgrade the machine to include a larger version of the incredibly neat four-colour plotter used in the PC-1500 and add a tape recorder as well. Both of these slot into the main unit and the result is a very useful, neat little system indeed. Japanese prices are £170 for the basic unit and £279 with plotter and recorder.

Epson launched its HX-20 portable (see Benchtest in last month's PCW) and a range of peripherals which included a rather nice acoustic coupler, a 5¼in disk drive and a TV interface. Epson was also doing interesting things with its range of printers — but see the 'Peripherals' section below. In addition, Epson showed a very neat 8-bit desk-top machine which can interface to an HX-20 for up- and down-loading and generally communicating. We should be seeing this machine in Britain sometime in '83.

Back on the Sord stand, a 12-deep crowd was jammed around a couple of tables showing the Sord M5, a tiny games machine in the Sinclair Spectrum mould (although Sord prefers to describe it as being suitable for 'studies, household accounts, playing intellectual games and for data processing and correspondence'). This all strikes me as a little ambitious but it's a very nice machine with excellent colour graphics (including sprites on 16 planes) and a good range of peripherals including 'joypads' (actually sort of flattened games paddles). Inside you get a rather



Here's Toshiba's Pasopia 16. Slimline keyboard plugs into the box under the printer which houses electronics and disk drives.



16 bits from NEC in the shape of the PC-9800 system. Expect it here next year some time.

TOKYO

measly 4k of user RAM, 8k of ROM and a handy 16k of video RAM. Software — mostly games, as far as I could see — comes in the form of plug-in 16k ROM cartridges and, apart from the joypads, you can interface the M5 to printers and to other Sord machines. The basic price of the M5 in Japan is £105, which places it a little awkwardly in the market in Europe: its graphics are far superior to the Spectrum but the latter — on paper at least — still looks better value for money, allowing for the fact that the Sord will probably sell for around £150 or so in this country.

NEC and Toshiba both came up with hand-held machines, of which the NEC looked the better buy, with a nicer keyboard and an LCD display of two lines of 40 characters, both upper and lower case. It has 20k of ROM, expandable to 32k externally, and 8k of RAM, externally expandable to 16k. Best news is that it's software-compatible with NEC's PC-8001 desk-top micro, but it's not cheap at £130. The Toshiba hand-held has a single-line display of only 24 characters and, it seemed, was less powerful and versatile than the NEC while selling at almost the same price — £120.

Finally in this section, there's Casio's 8-bit desk top machine, on which I have virtually no information other than it seems to run CP/M and I found it on sale in Tokyo computer shops for £600 or so for the basic unit.

Peripherals

Epson proved that printers can be as exciting as computers by showing an ink-jet printer with a very high-quality printout indeed. Not exhibited at the show, but

demonstrated privately at Epson's headquarters, was a four-colour ink-jet printer with a really impressive output; unfortunately, Epson still has a few problems to iron out (mainly with the jets getting clogged with ink, the universal problem with these printers) and nobody was able to say when the machine would be on sale or how much it would cost. Nothing to do with computers (yet) but at the same time I got to see Seiko's wristwatch TV, which uses an LCD display just over an inch diagonally. Actually, 'wristwatch TV' is a slight misnomer as the tuner and batteries are housed in a separate unit, about the size and shape of a Sony Walkman, and you run a wire down your sleeve to plug into the watch. Yes, it does function as a watch too, using a smaller display above the screen. The picture quality wasn't too good and the Seiko people reckoned that, although they will be marketing it in Japan this Christmas for about £250, a better version should be on its way next year.

Epson did, however, show its four-colour dot matrix printer, an MX100-sized device which, while being very good, wasn't quite the same as the ink-jet machine. Over on Canon stand, they were into lasers in a big way and had several 'desk-top' laser printers eating up paper at a frightening speed. 'Desk-top' here seemed to mean 'the same size as a desk top' rather than something you'd actually stick on your desk and still have room to eat your sandwiches. The smallest laser printer was about the size of a medium-sized photocopier, in fact.

Elsewhere, we had a plethora of disk drives — hard and floppy — including the Hitachi micro-floppies but excluding the Sony variety; oddly, Sony had only a medium-sized stand devoted exclusively to Tektronics graphics displays but not even a hint of a

micro to be seen.

There were several companies exhibiting video disks as high-density, low-cost-per-bit computer storage media. The fact that you can't erase and over-write them was regarded as unimportant by many of the technical people manning these stands: if a single disk can hold two gigabytes or so and costs a fraction of the price of a hard disk pack, so the theory goes, well you can just afford to keep on writing stuff to it instead of overwriting. If the disk ever does fill up (and it takes a lot of typing to fill two gigabytes) then you just transfer the latest copy of your data to a new disk and throw the old one away.!

Pricing

In general, computers in Japan seem to retail at between 50 and 60 per cent of British prices. (But so do cars and hi-fis and lots of other things except — annoyingly — cameras). I should stress that the prices I've quoted here are Japanese retail prices and if and when these machines appear here, they'll be somewhat more expensive — but not much. Most people at the show were talking about a 30 to 50 percent price markup on Japanese retail prices, and most seemed certain that by mid-1983 Europe would be receiving its first big assault from the Japanese micro makers, spearheaded by 16-bit desktop machines of slightly better than IBM PC spec selling at under £2000.

How much under depends on several factors, including the quantity being shipped here and how much the importers/distributors think they can slap on to allow for the unfortunate tradition of over-pricing which ails the British micro scene. It also depends on the reactions of people already selling this type of machine there, particularly ACT with the Sirius, DEC with its Rainbow and — by that time and by far the potentially most significant — IBM with its Personal Computer, currently rumoured to be launched in the UK in January. Certainly there's no way that IBM could sell at the prices currently being demanded by 'unofficial' importers of the IBM, and certainly all three could probably compete with £2000 machines, or add a few facilities and aim upmarket a bit.

But the Japanese manufacturers about to launch here are very big companies which could withstand a price war and probably win, bearing in mind that volume sales is what makes them tick, not low quantities with high mark-ups. It's more than probable that, without actually collaborating as such, they'll all pitch in at around the same price level, undercutting existing machines by a small

amount and prepared to drop a lot lower if the competition gets tough. But it'll only take one of them to step out of line and pitch a few hundred pounds lower for things to take off in a big way. . .

The implications for the British micro industry are vast and are either good or bad, depending on who you are. I think British hardware manufacturers are likely to be hardest hit. In general, with the shining exception of Clive Sinclair, we've been a pretty conventional lot, both technically and in business strategies. We churn out fairly uninteresting but over-priced machines which we insist on building on a cottage industry basis, frequently tailored at enormous hidden cost to the individual customer. We might be able to get away with this when it comes to shoes, shotguns and cars, but it's out of place in the micro world. The days of the hand-crafted British micro are definitely numbered (about 150-odd, I estimate) unless a remarkable amount of finger-extracting and getting-together of acts takes place.

I predict that we shall soon hear the awful sound of British micro makers bleating for trade barriers to stop the flood of Japanese micros which are putting them out of business. The Government, still only vaguely aware of the existence of micros, will of course do nothing. It's not entirely the fault of the British manufacturers, of course: to compete with the Japs they'd need a lot of capital and raising that in Britain is, to put it mildly, almost impossible. The sad fact is that, as with the motorcycle and hi-fi industries, by the time anyone notices it will be too late.

There is good news, though, for British software houses. It isn't true that the Japanese are incapable of producing software; I saw some very interesting packages in Tokyo, but they were all designed for the Japanese home market. Everyone was admitting that they were better at producing hardware and everyone was stating firmly that they would look for locally-produced software in each of their export markets. British software is very highly regarded and — as some people in the trade already know — various Japanese companies are already sniffing out good British products for their forthcoming machines. Sadly, not a single British company exhibited in Tokyo, although two or three American ones were there. The Japanese micro invasion has already started in a quiet way and we'll be seeing a lot more of it over the next six months. Let's hope our software houses are on the ball. . .



Sord's 16-bitter shows off its graphics.

WINCHESTER KILLER-£750

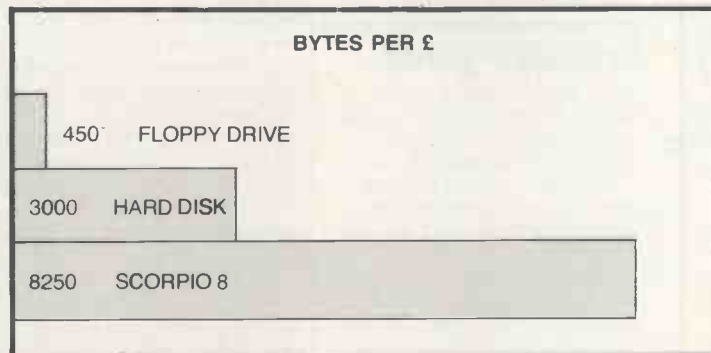
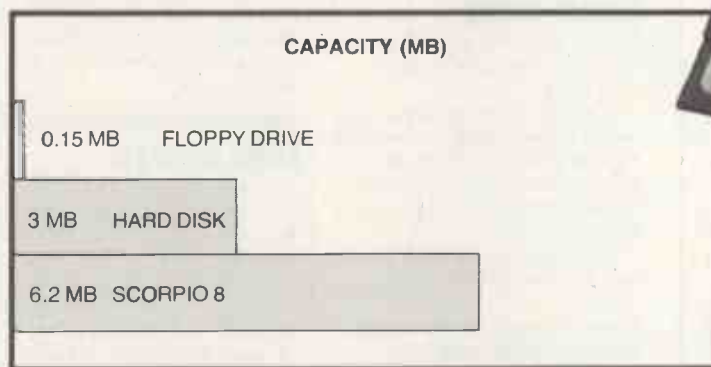
The incredible Scorpio 6.2 Mbyte hard disk alternative from HAL Computers annihilates small capacity Winchesters.

DISTINGUISHING CHARACTERISTICS

Hard disk capacity and speed with the capability of interchangeable media. Scorpio 8 eliminates the worries of head crashes, drive alignments, lost data or backup, with a new application of field proven floppy technology.

Fully Apple II compatible – DOS 3.3, Pascal 1.1 and CP/M. Uses all standard Apple DOS commands – appears to Apple as a massive 8 inch floppy.

HOW SCORPIO 8 IS KILLING THE SMALL WINCHESTER



REWARDS

- Winchester capacities on floppy disks.
- Removeable media – a cartridge pack of five 5.25 inch diskettes each of 1.2 Mb capacity.
- High speed DMA data transfer.
- Cost effective and software compatible disk memory expansion.
- Removeable media means separate packs can be kept for different applications.
- All this for £750 complete.

To claim your rewards contact us at the address shown below.

HAL Computers Limited
Invincible Road, Farnborough
Hants. GU14 7QU
Telephone (0252) 517175
Telesales (0252) 517171





PCW welcomes correspondence from its readers but we must warn that it tends to be one way! Please be as brief as possible and add 'not for publication' if your letter is to be kept private. Please note that we are unable to give advice about the purchase of computers or other hardware/software — these questions must be addressed to Sheridan Williams (see 'Computer Answers' page). Address letters to: 'Communications,' Personal Computer World, 62 Oxford Street, London W1A 2HG.

Handling charges

Recently I had to return a mains filter to the suppliers (Display Electronics) because it was not what was expected, although it may have matched the ad.

After 14 weeks' delay, four phone calls and various excuses, I received a credit note, the first acknowledgement of the safely-returned item, which showed that, as expected, I had paid postage both ways but also approximately 10 percent 'handling charge'. As the 14 weeks delay convinced me I would not buy there again, I succeeded in obtaining a cash refund.

On only one other occasion have I needed to return goods — to Lasky's and they returned my money in full, including postage on the goods one way!

In view of this and the 14 weeks' delay in refunding my money, I feel the 'handling charge' is a liberty. Is it common practice?

W George, Harlow, Essex

The Sale of Goods Act states that if an article is not suitable for the purpose for which it has been sold, the buyer is entitled to a full refund — not a credit note, not a partial refund with 'handling charges' deducted, but a full refund.

However, there are limitations to this. If the equipment you received matched what was advertised, then I'm afraid you are at fault for ordering something which wasn't what you required; caveat emptor still applies in these cases and Display Electronics would then have been under no obligation to give you a refund. In this case, the deduction of a 'handling charge' for dealing with your mistake is reasonable — after all, they have to pay somebody to do the paperwork. Taking 14 weeks to respond is not good enough but is, unfortunately, par for the course.

On a general note, the micro industry as a whole seems to consider itself magically exempt from the Sale of Goods Act. I experienced this a couple of years ago when a very large supplier sold me some faulty equipment. Getting my money back cost me £90 in solicitor's bills and the cheque only arrived on the day before we were due in court. If you do buy goods which don't perform as

advertised, you are covered by the Sale of Goods Act. It doesn't matter whether you're buying by mail order or over the counter and the 'as advertised' bit includes what the salesman tells you verbally (although he can always deny having said that, so get it in writing if a lot of money is involved). But always read adverts very carefully and check that you're certain that the advertised goods are exactly what you want before you send off your money. — Ed.

Quick Beeb

I have just received my BBC Computer Model B in three weeks and five days. Is this a record?
D.A.P. Mitchell, Northolt, Middx

No — it's a computer — Ed

Cheap C

I was interested to read in November's 'Braindump' references to the C programming language. Yes it is a nice language but compilers do not start at £400! True, a complete implementation of C under Unix 7 will cost around that figure but there are a number of versions (with some of the more esoteric features missing, admittedly) available for much less. I have a BD Software C compiler (available from Lifeboat) which cost £60. The main omission from this is that floating point is not directly implemented, although there is a package of routines which goes some way to alleviating the problem. Otherwise, it's a lovely piece of software.

Robin Jones, Folkestone, Kent

Beeb characters

I read with interest Mr Whitworth's letter (October PCW) on my character generator for the BBC Computer (July PCW) and I would like to thank him for his criticism.

When my friend received his Model A in February we both saw the usefulness of a character generator. The program was written in the first week of ownership and at the time there was only the Provisional Guide to refer to (as far as I know).

In answer to the question about the use of Mode 6, it was the only

mode in which we could display the characters defined and fit the program in on a Model A. I didn't use the cursor keys for the simple reason that the Provisional Guide didn't tell me how to and it was rather low on my priorities (getting it working was my main priority). The COLOUR query is simple to answer: I wasn't sure of the use of COLOUR at the time and, looking back, I don't know why I did that either!

After seeing the program printed out on paper I must say that I'm not too impressed with its general structure and can think of various improvements (using *SPOOL for saving the characters, for instance).

Finally, my thanks to Mr Whitworth and Mr Clayton ('TJ's Workshop' October PCW). Apologies to all those who typed it in and were screaming 'inefficient idiot' while doing so.

Mark Howlett, Braintree, Essex

Book boob

The recent article on Ada by Mike Parr contained a serious omission.

In the list of books recommended as further reading he omitted the bestseller on the subject — *Programming in Ada* by John Barnes, published by Addison-Wesley at £9.95.

Would you kindly bring this fact to the attention of your readers.

Peter Hoehnberg, University Director, Addison-Wesley Publishers Ltd

Pressure group

In his article, 'Expanda-Beeb' Paul Beverley referred to the use of the promised 'second processors' with the BBC Micro.

He said, '... Acorn suggests there will be capacity for 60k RAM on both the 6502 and the Z80 board.'

I regret to inform you that he was, at best, misinformed and at worst misled. I am informed by Acorn that the 6502 second processor will have less than 30k of user-RAM as it will have to cross-load both the MOS and the language ROMs. I understand that the position will be slightly better for the Z80 board as it will have an on-board interpreter.

I have not been able to get a straight answer to the question of

how user-RAM is affected by additional language ROMs in the host processor. You may be able to fare better.

Personally, I am sick of the reluctance of Acorn to face up to its responsibilities, particularly as regards the OS 0.1 MOS ROM that is fitted to my machine. Had I known that I would be expected to pay extra for a machine that performs in accordance with its published specification, I would have been extremely wary. Had I known that the machine would not be expandable in the manner published, I would definitely not have purchased. May I suggest that other users who feel similarly contact me with a view to some concerted effort to change Acorn's attitude.

Richard Bean, 81 Himley Green, Linslade, Leighton Buzzard, Beds LU7 7QA

I have a feeling that the ROM matter may be covered by the Sale of Goods Act. Certainly Acorn is creating massive ill-will among its very long-suffering customers by charging for the new ROM. — Ed

Info source

I would like to bring to the attention of your readers an organisation which could be of value to many of them.

I was recently involved in an attempt to attract financial support for some ideas which I felt to be of commercial value, and which proved to be a somewhat frustrating experience. Over the years I have often felt the need for a central information service which is able to match the needs of inventor, industry and finance, and during my investigations I found that such a system does actually exist. It is a fairly new company, but it is already showing signs of its potential, and I think it is deserving of our support.

Its computerised network matches ideas, skills, resources and financial support in such a way that it is able to cater for a variety of different needs, whether an amateur inventor, a large manufacturer or an investor looking for wider areas of commerce. I believe it to be an impressive use of computer data systems which I whole-heartedly endorse.

Membership fees are extremely reasonable, and I would suggest

that anyone who is interested in putting ideas into action get in touch with them as I did. They are extremely helpful about sending information about their service to anyone who contacts them.

The company is IREX, Snow House, 103 Southwark Street, London SE1 0JF. The telephone number is 01-633 0424.

Michael Harris, London E2

Tapebox tip

A quick tip for owners of Sinclair Spectrum machines.

Being small and relatively flat I find there is a tendency to stack things on top of it. I'm not certain that this is entirely a good thing so I started looking for a suitable case.

My eyes lit on a Sony U-Matic cassette case of the square, 'opens-like-a-book' variety. Provided that you install the Spectrum with the back of the machine towards the 'spine' of the 'book', the machine fits like a glove. You now have a neat rectangular container that will stack flat or will fit in a book case if needed.

I realise that not many people will have access to such cases but it is more than likely that some of the specialist audio-visual aids people or even your local video shop may be able to provide an empty library case at a reasonable cost.

For those who don't know, the U-Matic is a sort of higher quality cassette recorder, used semi-professionally or even for low-quality broadcast uses.

I should add that one or two internal obstructions need to be removed with a large sharp knife; these are two round bosses that fit the hubs of the cassette and also two angled flaps about 2in x 1in near the 'spine' of the box.

Who knows, someone may even paint coloured stripes on these boxes and sell them as Spectrum containers.

Finally, I don't think that the more modern AGFA case will do; it looks more stylish and has a better lock on it — but I haven't tried this type.

Peter Dunkley, Guildford, Surrey

Home computer software

I am writing to express my concern at a trend I have noticed in the attitude of software houses that specialise in programs for home computers.

It seems to me that as soon as a new home computer appears on the market the machines previously supported with software are ditched in a frantic re-writing of a lot of existing software to meet the demands from new owners.

My point is that although software houses continue to sell the software for existing machines they do not continue to develop programs to make use of all the add-on products such as memory, disk drives, toolkit ROMs, and sound boards, etc. Here they miss an opportunity to link up with the suppliers of these products so that each can benefit. The old cliché of 'software sells hardware' is more true now than ever due to the market moving away from the electronics hobbyist to the family entertainment setting.

A typical case is the Atom computer. This machine, now being up-staged by new machines, has an amazing list of add-on facilities which are not actively being supported. Where are the colour programs for the new colour board? Where are the disk programs? Where are the programs that take advantage of the huge add-on memory that is available? Why, for example, are the manufacturers not commissioning software to be sold with these products? A few duplicated sheets of suitable routines is not good enough.

I realise that the original surge in software sales is no longer there but I would have thought that steady sales would continue especially if stimulated with new software. Presumably the thousands of Atom machines are still out there. I have not seen breakers yards full of abandoned home computers. This may apply to other machines such as the Sharp MZ80K, Nascom, ZX80, ZX81 and others.

I hope that if you publish this letter it will encourage some response from the software houses if only in defence. If the software industry is solely dedicated to the support of new machines I see that this young industry will be badly damaged when computer owners in general realise that they will be continually under pressure to buy a new machine. Imagine the situation in the hi-fi market if all new records could only be played on new equipment straight from the factory.

John Ferguson, Chelmsford, Essex

P for Pathetic?

I was interested to read the Benchmark article 'The Ultimate Test' in the October PCW. It confirms my view that 'P is anything but Perfect' due to its being excruciatingly slow. I use a UK-produced Pascal compiler called PRO Pascal written by Prospero Software which just beats the best of the compilers (of any language on an 8-bit machine) listed in the original *Byte* article. The 10 iterations time on a 4MHz Z80 system for the standard Pascal version of the published benchmark was just less than the 14 seconds of the

Byte best. Using non-standard features the time is 121.7 seconds. This is more than 20 times as fast as the UCSD p-code version running on a similar machine according to *Byte* while the standard version is nearly 20 times faster than the version using only standard Pascal cited in the *PCW* article.

The faults with p-code are shared nearly equally between the compilation and the interpretation of it on the host machine as can be seen by considering the times given in the original article for the Pascal Microengine which has p-code as its machine code. It is 4.5 times as slow as the best (8-bit machine) listed even though it is nominally a 16-bit machine. This indicates that the compilation to p-code itself is a source of inefficiency as no interpretation is involved in this case.

I accept that the UCSD operating system is a pleasure to use but heaven preserve us from their compilers. It appears to me that the portability provided by p-code is dearly bought and the only beneficiaries are Softech.

One further point may be gained from the original article in that it provides a time for Z80 assembly language implementation of the benchmark which is only 1.7 times as fast as the PRO Pascal indicating that there is little room for further improvement with the Z80.

Timings for PRO Pascal were obtained on two Apple systems and they were confirmed by Prospero Software (with whom I have no other relationship that that of a well pleased customer) on a 4MHz system.

The first used a Microsoft Softcard. (The Z80 runs at 2.041 MHz with this card) and an Axlon Ramdisk. The Axlon was configured as a single 320k drive allowing an automatic compile and link for the PRO-Pascal system. Drive time is negligible with this arrangement.

The second used an Appli-Card with the Z80 running at 6MHz which of course gave me times half as fast again which I scaled down for comparisons. As I am not yet able to link the Appli-Card system to the Axlon due to all too typical manual problems, I used Apple drives. It appears to me that a moderately enhanced Apple II and a good compiler of standard Pascal (probably with the addition of an overlaying linker) provides a setup that is hard to beat.

John Crookes, Univ of Lancaster, Lancaster

Cheaper clock

I read with interest your article 'Clock it to me'; October/November 1982 but then I looked at the price of £36 just for the

parts minus battery. I take it, therefore, that Bruce Marriott is not aware of the clock-calendar card for the Apple II (soon to be released for the BBC it is rumoured) marketed by Namal Associates in Cambridge.

The card uses the now well established MC 146818 from Motorola (which was briefly mentioned by Mr Marriott) which is second sourced by Hitachi and has the following features:

- 1) Day light savings, eg, it automatically corrects for British Summer Time.
- 2) Alarm function which will cause an interruption to the CPU when an alarm time occurs.
- 3) Has a full year counter to 99 years.
- 4) Can work in BCD or Binary.
- 5) Has a square wave output which can be used as a very accurate programmable function generator.
- 6) Has 12 or 24 hour format.

This board sells for around the £70 mark which is much less than the £149 quoted by Mr Marriott for the standard Apple board. The Namal board also contains a battery as standard and a 4k (2732) operating system on the card! A kit of parts (although not sold yet) has been quoted at being around the £40 mark, which makes Mr Marriott's £36 look a bit expensive.

Mr Marriott also said that the MSM5832 is rather difficult to get hold of. For the interests of the experimenter, the 146818 is readily available from: Namal Components, Radio Resistor (part of the electrocomponents group, ever heard of RS?) and the Hitachi version is available from Impulse Electronics and probably ITT Meridian.

May I also take this opportunity to draw to your attention the clock calendar board using the 58174 which is sold by Computech Systems for £80. I agree with Mr Marriott about this chip and this makes the Computech board very suspect.

Never mind, maybe Mr Marriott's article was a long time getting to print and the prices have dropped since it was written.

For further information, contact the following:
 Namal Associates, Gatehouse, 25 Gwydir Street, Cambridge.
 Radio Resistor Co, St. Martins Way Industrial Estate, Cambridge Road, Bedford.
 Impulse Electronics Ltd, Croudace House, Caterham, Surrey.
 ITT Meridian, West Road, Harlow, Essex.
 DN Anderson, Cambridge.

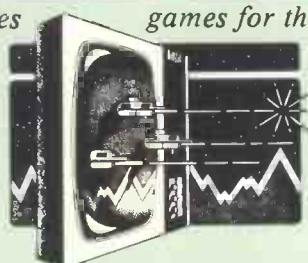


SCREENPLAY

Dick Olney investigates games for the ZX Spectrum

When David Tebbutt Benchtested the ZX Spectrum in June 1982 he proclaimed it the best value for money around and, despite the flurry of price drops in home computers over the past few months, there's no doubt that this low-cost colour computer still deserves that title. Like the ZX81 the Spectrum is not particularly impressive to look at, being only slightly bigger than its predecessor but offering a more substantial button keyboard. Since no joysticks are currently available, this keyboard is used for all the games, and works quite well despite the rubbery texture.

I used a 48k machine which (as I'm sure nearly everybody in the western world is aware!) costs £175 including VAT. Many of the games will run on a 16k machine (£125 if

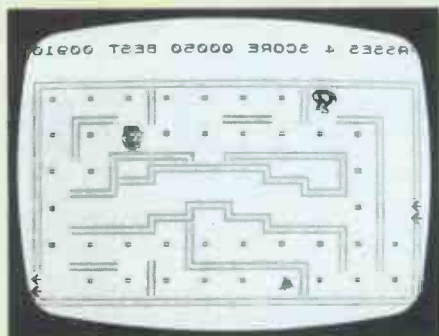


you didn't know) so I've marked those that need the full 48k. I've covered a wide selection of software including some of Sinclair's own label Psion and ICL games.

As yet there is not much of a selection of games around for the machine, with a sizeable portion of it being old favourites. The Spectrum itself impressed me, although few of the games I saw seemed to make very

good use of the facilities it offers. To be fair I may have jumped the gun, and I will be interested to see if enough good games software becomes available to make it worth giving this machine a second look. I do know that Psion is planning a flight simulator and a sequel to Hungry Horace (see review), both of which should be available by the time you read this, but unfortunately neither were available for review at the time of writing.

Sinclair label games are available on mail order through the usual channels and Quicksilver and Bug-Byte games are on general sale. Simon Hessel Software can be found at 15 Lytham Court, Cardwell Crescent, Sunninghill, Berks, and Impact Software at 70 Redford Avenue, Edinburgh.



Game: Hungry Horace
Supplier: Sinclair - Psion
Price: £5.95

Question — when is a Pacman derivative not a Pacman rip-off? Answer — when it's Hungry Horace. Yes folks, with a stroke of genius Psion has managed to produce a game which should satisfy the most painful Pacman craving, yet march proudly through Atari's legal net. The scenario is a

town park where an endearing little character is intent upon eating up all the flowers (this is not a game with a social conscience!). You control his movement using the 'Q' and 'Z' keys for up/down, and 'I' and 'P' for left/right. This arrangement works very well, making the game a joy to play.

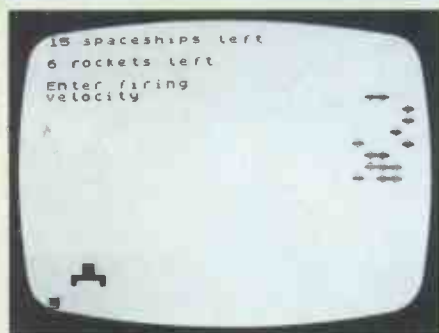
The park is divided into four sections, each of which consists of a 'maze' of paths, bridges and tunnels. In each section there is a one-way gate to the next frame through which you can move at any time. Horace is chased by between one and three park keepers, who will throw him out of the park if they catch him (quite right too!). Occasionally one of them will drop his lunch of a cherry or a strawberry, which Horace may then eat to supplement his flower gobbling. If he is caught three times the game ends.

To help Hungry Horace on his campaign of destruction there is one alarm bell situated in each section of the park. When this is rung the park keepers panic

(their hair stands on end) and Horace can throw them out of the park, though only for a few seconds. The game, of course, gets progressively harder (though not faster) mainly due to an increased awareness of Horace's position among the keepers. Indeed, because of the layout, in some places it can get almost impossible to continue since the keepers make an immediate beeline for you, which is very frustrating.

This game is destined to be a big success among Spectrum users of all ages. The graphics are excellent, and there are some interesting, if rather limited, sound effects. The noise when Horace gets caught could, with a lot of imagination, sound like a gruff 'get out of here' shouted by an angry and highly inarticulate official. Strongly recommended and well worth the money.

Presentation: ██████████
Use of graphics: ██████████
Addictive quality: ██████████
Value for money: ██████████



Game: Games 1; Pastimes 2; Games 3; Games 4
Supplier: Sinclair - ICL
Price: £4.95

What on earth do these people think they are doing? It was understandable when games were in their infancy for Sinclair to produce their trivial games packages for the ZX81, whose potential in this respect was limited, anyway, but now that they have a full colour graphics 16k machine such behaviour is inexcusable. Each tape contains a selection of four diversions, any of which should put the new user off video games for life. Let me explain.

Games 1 starts with 'Martian Knock Out'. You are presented with a huddle of green lines and circles in the top right hand corner representing the Martian fleet, and a simple 'missile launcher' which moves around the bottom left. The idea is to key in the velocity of your missile (a number between 10 and 60) so that it will hit the maximum number of enemy spacecraft. After each launch the program re-positions your base whilst the attacking fleet remain static. A game consists of 15 missiles.

Second on the agenda is 'Racetrack'. The track is marked by a multi-coloured boundary which uses standard Sinclair graphics symbols. It races up the screen (there are nine speeds to choose from) while, using the '5' and '8' keys, you attempt to steer a little car through it — the car incidentally remains on the same horizontal level. This is a fairly standard idea, and would be quite fun to play except the moving track soon starts to hurt the eyes and make them water.

The third game on Games 1 is called 'Labyrinth' and is a simple maze game. Using the cursor keys you move an 'o' into a maze inhabited by three asterisks (which march across the entrances) with a view to reaching the dollar sign in the centre without being caught. You have a limited

number of moves determined by your 'water supply'. The asterisk guards only move when you do and will only patrol a predefined corridor. This is probably the best game on the tape, but it is hardly mind-boggling.

The fourth and final game on this tape is 'Skittles'. The bowling lane appears at the top of the screen with a square (!?) block of thirty skittles on the left and your ball (the square) on the right. You position the ball vertically using the '5' and '8' cursor keys and bowl it with '0'. Not the most stimulating of tasks I think you'll agree.

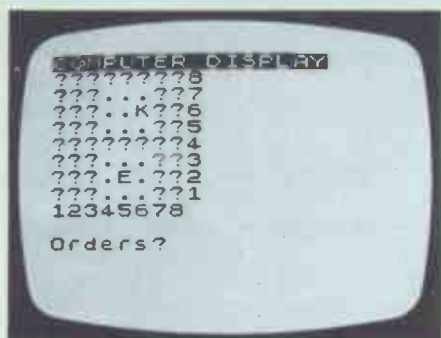
The tapes continue in this vein. Pastimes 2 has a reasonable 'Mastermind' program called 'Secret Code', in which the player can allow the computer between four and eight valid numbers; a strange game called 'Mindboggling', which presents you with 16 random letters with the idea that players compete to see who can make the most words; a version of the well known cub scout game 'Kim' in which 20 random characters are displayed, one is removed when 'Enter' is pressed, and you must guess which one it was; and, finally, a magic square program which acts just like the fairground novelties except that you decide the final pattern.

Games 3 and 4 contain much the same sort of stuff as Games 1, so don't be misled by names like 'Journey into Danger' and 'Escape from Jupiter'. None of these tapes even gives a taste of the Spectrum's capabilities, though you can list them, which might be a useful exercise to help you understand some fundamental

programming techniques (why not just list them in the Basic manual or use them as part of a teaching course?). This sort of thing only encourages those Philistines who see home computers as a passing fad with no real usefulness or lasting qualities. Using a machine like the Spectrum for such programs is like warming your feet

with a nuclear reactor - both Sinclair and ICL should be ashamed of themselves.

Presentation: ██████████
Use of graphics: ██████████
Addictive quality: ██████████
Value for money: ██████████



Game: Startrek
Supplier: Impact Software
Price: £5.00

Since playing Startrek was the first contact I really had with computers, I'm always interested when new versions of the game

are produced. The most successful version to date is, of course, Atari's ever popular Star Raiders, which manages to incorporate some nice real-time graphics. Impact Software has been much less adventurous with this very traditional interpretation for the ZX Spectrum.

The galaxy consists of a disappointingly diminutive eight by eight grid, and can be displayed to show the whereabouts (if known) of the Enterprise, Klingons and empty quadrants (but not Starbases). This map is updated when you perform a long range scan, which uses the standard format of three numbers for each neighbouring quadrant to represent Klingons, Starbases and stars. I'm not sure why they've bothered to include the number of stars, since in this version of Startrek, unlike most others, they do not restrict movement and are immune to

torpedo fire.

As versions of Startrek go, this one can best be described as barely adequate. The presentation is entirely standard with no extra sophistications and none of the interjected comments from Mr. Spock or Scotty that experienced Trekkers have come to expect. No use is made of the Spectrum's graphics or colour facilities and the only significant sound effect is a brief rendition of the Startrek theme tune during warp drive relocation. Despite its limitations, however, this program does retain some of the attraction of the original Startrek, and for Spectrum owners unfamiliar with the game it could well prove to be a good buy.

Presentation: ██████████
Complexity: ██████████
Addictive quality: ██████████
Value for money: ██████████



Game: The Quest (48k only)
Supplier: Impact Software
Price: £5

The colourful picture which introduces this game looked extremely promising. Unfortunately that is the only colour or graphics used, and the 'full sound effects' mentioned on the product list I was sent are in fact fairly trivial. The claim that The Quest is 'one of the most exciting adventure games currently available' is similarly exaggerated - but then I suppose if all games publishers were completely honest I'd be out of a job!

The idea in this game is to move around a 60 x 25 grid (giving 1500 rooms) searching for the Holy Grail. These rooms

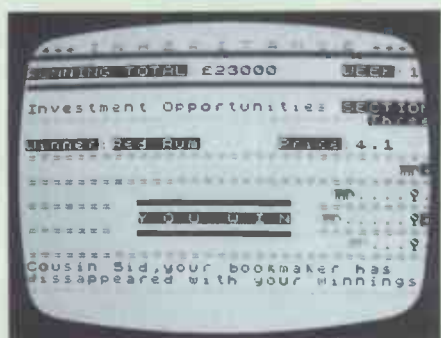
may contain jewels, monsters, elixirs or any one of a number of useful artefacts. Upon entering a room you are given the option to display your current status, take an elixir, move, or quit the game. The status report gives your current levels of food, drink, strength, stamina, dexterity and intelligence, and if any one of these drops to zero you will die. An elixir will restore the chosen factor to one hundred per cent. The report also includes other information such as the number of arrows, elixirs and gold pieces in your possession, as well as the number of moves you've had and the time taken to do it.

The movement option always allows you to go north, south, east or west unless you are at the top or bottom of the grid (the sides link with each other). You also get the opportunity to shine your lamp in any of these directions to receive advance warning of the contents of any adjacent room. The lamp does however, run out eventually, so you should use it fairly sparingly. If you move into a room occupied by a monster, you will be given the chance to use any of the weapons or spells in your possession to attack it, or to retreat. The choice of weapon does, of course, depend on the type of monster (curiously the only one I was able to bribe was the rat!).

In one of the rooms you'll come across a trader, from whom you can purchase any number of weapons, elixirs or spells - depending on your current wealth. It is essential to find this room, since many of the monsters can only be killed by weapons available exclusively from the trader. There are some other interesting rooms, but on the whole the game involves searching as much of the maze as possible, collecting useful artefacts and avoiding monsters (unless well-armed) with no clues as to the whereabouts of the elusive Grail.

Unlike many adventures this one reconfigures the room on each run, which means its attraction may prove more lasting. On the other hand, the massive size of the maze cannot disguise the lack of complexity. Certainly you'll need to learn which weapons are effective on the various monsters, but on the whole there is little in the way of real brainteasers. You could almost certainly get your fiver's worth out of this game, but I'm sure that most experienced adventurers would find it a little dull.

Presentation: ██████████
Complexity: ██████████
Value for money: ██████████



Game: Inheritance (48k only)
Supplier: Simon Hessel Software
Price: £5.95

This must be one of the most extensive and complex management games I've seen, with two discrete sections, both of which would take a lot of time and effort to master. In the first section you must prove your financial acumen by turning £10,000 into £100,000 in 26 turns (weeks) and thus become the beneficiary of Great Uncle Arbuthnott's inheritance. Each turn comprises three sections. First you can invest in the stock market by buying shares in any of six major industries, for which current prices are displayed. Next you may make a similar investment in the metal market, and again there are six choices. When these two sections have been completed all stock and metal prices are

updated with an analysis of your gains and losses.

Your turn culminates in an opportunity to gamble on the horses or at blackjack. The horse race includes five horses, and you are allowed to back any number of them. Sometimes the odds will make it worthwhile backing four of the horses and thus be almost certain to come out winning, but if you win too much it will be stolen by your dishonest cousins. The race itself is run before your eyes and in one of several simple graphics frames in the game. The blackjack (pontoon) is less interesting than the races, and the program rarely churns out a winner, making it easy to lose a lot of money, although you do

SCREENPLAY

only get the chance to play one hand. I'm assured that experienced players find this first part easy, but I failed to get the hang of it even when provided with a few handy hints. The whole thing seems interminably slow, and with your capital - though easy to lose - making only small increases each turn. If, however, you do manage to make the hundred grand (or find the right statement to GOTO) you'll receive the inheritance, which turns out to be a soft drinks factory.

Having found the secret formula (a simple task involving only patience) you set off to the Bango Island to buy Bango fruits - more graphics - and you must negotiate the cheapest price for this vital ingredient. This concluded, you set about

managing the factory in an attempt to make your million.

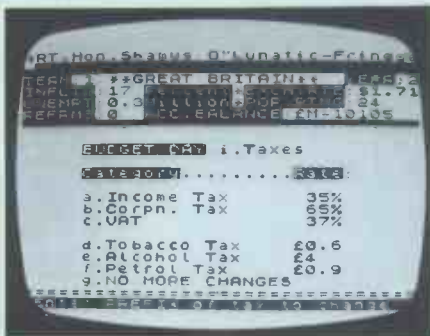
Running the soft drinks factory involves three main decisions - the weekly production, number of advertising entries placed and the selling price of your product. To help you with this you are given a market forecast at the beginning of each turn. The idea is to build up stock for an excellent market forecast, then advertise extensively and hence sell all your stock at maximum price. As your capital builds up you may be hit by strikes, frauds and advertising rate increases, and you will eventually be given the chance to extend the factory for greater production capability.

The second part of the game is faster moving than the first, but will still often

involve long waits for 'excellent' weeks to come along before you seem to make much headway. The game is well presented throughout with a colourful menu format.

There is no doubt that this is a must for management game enthusiasts with plenty of patience, but less determined players may find their interest waning after a short time. If you do like this sort of thing and need something to while away the cold winter nights this is one of the best games in terms of value for money that you'll find.

Presentation: ██████████
Complexity: ██████████
Addictive quality: ██████████
Value for money: ██████████



Game: Great Britain Limited (48k only)
Supplier: Simon Hessel Software
Price: £5.95

I'm assured that the 16k ZX81 version of this is number 10 in the ZX software library Top 20 (out of 200 titles). It's a colourful and sophisticated management game that gives you the chance to play at being Prime Minister of our sceptred isle. The idea, of course, is to stay in power for as long as possible, which means ending each five-year term in as popular a state as possible among your decidedly fickle electorate.

To start the game you key in your name (or any other suitably silly title) and then choose which party you represent - Labour, Conservative, Liberal or Social

Democrat. This is not a decision to be taken lightly - I found for instance that a Labour government always started on a much worse footing than the rest, particularly Tory. When the preliminaries have been completed you are presented with a rundown of the current state of affairs.

Although Simon Hessel does stress that this is a game and not a simulation, plenty of variables are taken into consideration - inflation and unemployment being the key elements. Each year begins with these two factors being updated, along with the exchange rate, your popularity rating and the balance of the national account; their movement depending on your performance in the previous year. There are three ways in which you can control these figures.

Firstly you must set the levels of income tax, corporation tax and VAT, and also of excise duties on tobacco, alcohol and petrol. These will not only determine your total income at the end of the year, but will also have significant effects on unemployment, inflation, and your popularity rating.

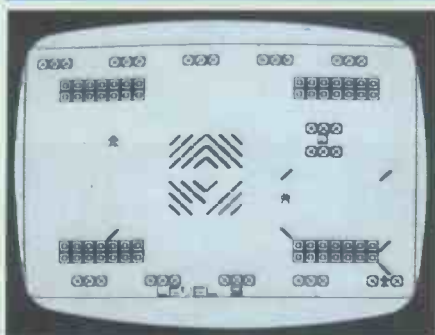
Next you must set the levels of social benefits, including child allowance, pensions and unemployment benefits. The populace are particularly sensitive to any of these, especially pensions falling behind inflation, so great care must be taken,

particularly in the final years of each term. Finally you are given the opportunity to plough money into some worthy cause in the hope that a social reform will be recognised. Occasionally at the end of the year, news flashes will appear on the screen concerning riots or party revolts which may force you to revise your policies.

After five years an election takes place, at which point you may be given the chance to outline your manifesto for the following term. This involves apportioning 1000 points between four areas of social concern: inflation, unemployment, overseas aid and law and order. Then you sit and watch as the results clock up.

As I've said, Simon Hessel impressed upon me that this is a game and *not* a simulation. Any student of economics or political science would no doubt be appalled by the simple model GB Ltd uses. Nevertheless, as a game, it's got great potential, and should be sophisticated enough to hold most people's interest. Incidentally, it's also available for the BBC micro as well as the ZX81 and Spectrum.

Presentation: ██████████
Complexity: ██████████
Addictive quality: ██████████
Value for money: ██████████



Game: Superdeflex (48k only)
Supplier: Llamasoft
Price: £4.95

The first of Jeff Minter's offerings for the Spectrum (I'm assured that there are others on the way), Superdeflex starts its loading procedure with the warning that anybody making an illicit copy will be 'hung, drawn and quartered'. His worries stem from the fact that, unlike most of the other games I looked at, the 'Break' key is not disenabled during this program, making listing or copying the program a simple operation.

The game is not entirely unlike a type of computer pinball, except that instead of a ball bouncing around the screen there is 'Sid the silly space invader'. You use the 'n' and 'm' keys to place a '/' or '\ ' in front of Sid and hence change his direction by 90 degrees. These deflectors flip over when Sid hits them so that a \ turns into a / and vice versa. The idea, therefore, is to control Sid's movement so as to bounce him onto a prescribed target, while avoiding the various obstructions placed in his path.

There are nine levels of play, with an increasing number of hazards. Black boxes are merely barriers which Sid bounces off harmlessly, whilst red boxes represent deadly land mines. At the higher levels bunches of coloured deflectors appear, behaving just like those which you place yourself, and these serve to add to the general confusion. The most lethal hazard pitted against you is the laser beam. This fires between two tiny markers at the top and bottom of the screen (the markers are set up afresh just before each blast) and will disintegrate Sid if it hits him. Finally the most difficult frames includes 'Grud the Droid' who races Sid to the target. If

he reaches it first, or if Sid bounces into him, a life is lost.

Each game consists of four lives, and you are given the choice of which level to start on. To complete a level you must hit ten targets (they only appear one at a time) and the layout remains the same except for the position of these targets. If you place too many deflectors it can become almost impossible to control Sid, and for this reason placing 10 deflectors without hitting a target invokes one of the most endearing features of the game; a giant llama strolls across the screen, clearing it completely, and the game is then reset as if you had just begun that level.

Although this is probably one of the most original arcade type games I've seen on the Spectrum, the limited controls and tediously slow action (it is after all in ZX Basic!) make it rather dull. Nevertheless, good value for money and a refreshing change from the endless Invaders-Asteroids-Pacman derivatives.

Presentation: ██████████
Use of graphics: ██████████
Addictive quality: ██████████
Value for money: ██████████

INTERNAL MEMO



*I want a
Word Processor
that's simple
to understand,
fast, and easy
to use...*

*...it'll need up to 20,000 characters of
text, a wide, clear screen, and be able to spell!*

She needs 'Superscript'!

Superscript Features

- Provides full screen edit, delete, erase, insert, transfer and document merge facilities.
- Simple facilities to send mailshots to standard address lists.
- Powerful aids to produce tables with wide screen, horizontal, decimal and vertical tabs.
- Search with optional replace
- Comprehensive printer controls with control of margins, lines per page, underlining, bold print, super and sub scripts, variable line and character pitch.

Superspell Features

- Dictionary in excess of 30,000 words.
- User definable dictionary with facilities to add, delete, print or merge with standard dictionary.
- Spelling checker verifies largest 'Superscript' document in less than two minutes.
- Displays totals of words, different words and unrecognised words.
- Editing of unrecognised words in document includes options to accept, ignore, change or add to user dictionary.

'Superscript' transforms your Commodore computer into a true Word Processor, enabling your secretary to turn out high quality letters, mailshots, quotations, etc., faster and easier than ever before.

But spell? – Adding 'Superspell' gives you access to an extensive dictionary with automatic checking of any document entered, enabling recognition of spelling errors and mistypes.

If she wants a better machine, and you want the very best of Word Processing, then you both need a Commodore with 'Superscript' and 'Superspell' available from your local Commodore dealer.



Precision
Software

Superscript
A Professional's Word Processor

Precision Software Limited,
4, Park Terrace, Worcester Park,
Surrey KT4 7JZ, England.
Telephone 01-330 7166

Superscript and *Superspell* run on the 2001, 3016/32, 4016/32, 8032 and 8096 Commodore computers, 2040, 3040, 4040 and 8050 disk drives, all Commodore printers and a wide range of letter quality printers.

This month sees the start of a regular new chess column. Tony Harrington kicks off with a look at the latest dedicated chess computer from SciSys.

THE NEW CHAMPIONS

This is the start of a regular monthly column on computer chess. I will be concentrating, at least for the first few months, on dedicated chess computers — the kind you can go into a games shop and buy for anything from £35 to £400 — and the companies that make them.

Computer chess is still new enough for a question like 'Who is Fidelity?' (or SciSys, or Hegener and Glazer) — to name but three of the leading suppliers of dedicated chess computers — to need an answer. More importantly, computer chess, by its very nature, involves a fairly unique meeting point between the separate areas of business, computers and chess. So this question gives one an ideal way of tackling all three areas simultaneously.

This doesn't mean that the technical issues — like how you go about programming your own personal computer to play chess — will be entirely neglected. But for the first few months we'll be looking at what is around and how the machines available perform. Computer chess tournaments are becoming increasingly frequent and we'll be keeping an eye on the results of such competitions. There will also be a games section, where in future issues annotations be done by international master David Levy.

Levy is well known in chess playing circles for his bet a decade ago that no computer would be produced for ten years that would be able to beat him. He was right, but he himself admits that the time is approaching when the gap between experienced players like himself and computers will close. As a founder and director of Intelligent Software which specialises in writing chess programs he himself is working to make that prediction come true.

This first column is about SciSys, the London-based supplier, and looks at its Chess Champion Mark V and the new, soon-to-be-released Mark VI. The decision to start with this particular supplier is arbitrary — both the founder, Eric Winkler, and the UK director, Andrew Page, happened to be on hand — and it doesn't mean that I think it is the best supplier around.

Eric Winkler came into the chess computer business four years ago, almost in spite of himself. His background is in physics and one thing he is not is a chess player. Winkler was working in a trading company and had done some electronics research when he was approached by Peter Auger (who now runs a rival chess computer company, called Novac). 'Auger came to my office and said, "Eric, build me a chess computer." And he sent round a microchip as an example of what could provide the means for constructing one,' Winkler remembered. This was in early 1978.

The technological challenge interested him, and when Auger assured him that he (Auger) would find someone to program the computer once it was built, the whole project began to take shape. During the short period when Winkler and Auger were partners three ver-

sions of their particular machine were produced. Then Winkler left, in late 1979, to set up his own company SciSys.

His chess computers are unique (we think, though things happen too quickly in this market so someone else may be doing this too by the time we go to press!) in that they use a liquid crystal display (LCD). The machines are assembled in Hong Kong and, in the early days, SciSys ran into production difficulties training assembly workers to meet the demanding tolerance levels demanded by the technology. Users complained about faulty machines and the LCD display seemed to be an unnecessary complication. (It has definite advantages, though, as we will see.)

SciSys set up a London office in November 1980 and Andrew Page was appointed to control European operations outside of Germany (which has its own office). Chess computers are now big business, and Page estimates that the UK office turnover this year will be around two million dollars.

Now that the production problems have been solved the advantages of an LCD chessboard display can be appreciated. The obvious comparison is with the various 'sensor-board' machines (such as Fidelity's Chess Challenger 9), which actually give you a chess board and pieces. There the moves are indicated by LEDs which light up on the square of the piece the machine intends to move, and on the square it wants to move the piece to. The LCD display gives you an animated two-dimensional, pictorial chessboard. So from the start you don't have the satisfaction of actually holding a chess piece in your hand. (SciSys, incidentally, has a sensor board machine in its range, but this machine has a different development history and a different programmer.)

For many chess players the absence of a 'real' chess board is a disadvantage, not an advantage. They like the familiarity of board and pieces and the illusion that one is playing a 'normal' game. I like the display, not least because I combine chess with TV watching and the LCD display means I don't have to worry about chess pieces falling off the board if it tilts out of kilter while my attention's on the screen rather than the game.

More seriously, the LCD display comes into its own if one considers the replay feature. Here again, the comparison is with sensor board machines. Many sensor board machines have a replay function, but it is fairly tedious and involves the player following an endless series of LEDs lighting up square after square, replaying the move sequences.

The LCD board on the other hand simply provides a movie-like rerun of the game. The player doesn't have anything to do except concentrate on the game as it unfolds on the board. As a teaching device, it is hard to beat. I've played dozens of games on it and it's a marvellous way of finding out where you or the computer lost the initiative, or went astray in the opening, middle-game or end-game.

Another advantage of the LCD display is that it enables a range of comments and a two-ply analysis to be displayed. (A ply, for the uninitiated, is a single move by one player.) What the analysis entails can be seen by looking at the demonstration game, where we play the Mark V against the Mark VI, and give the analyses provided by both after each move.

For those who feel that all these advantages don't outweigh the disadvantage of not having a physical, solid chessboard to play on, SciSys is about to introduce a sensor-board which can be added to the Mark VI. It is not

1	e4 d5	
2	Nc3 Nf6	
3	Bb5 c6	
4	Bd3 Bg4	
5	Nf3 ...	(Mk.5: b8d7, o-o +001)
	... e5	(Mk.6: e4d5, c6d6 +001)
6	O-O ...	(Mk.5: b8d7, e4d5 +001)
	... Nxd4	(Mk.6: c3e4, d5e4 +003)
7	Nxe4 ...	(Mk.5: d5e4, d3e4 -000)
	... d5e4	(Mk.6: d3e4, f7f5 +000)
8	Bxe4 ...	(Mk.5: f7f5, e4d3 -012)
	... f5	(Mk.6: e4d3, e5e4 +015)
9	Bxf5...	(Mk.5: gf4, f3e5 -011)
	... BxB	(Mk.6: f3e5, b8d7 +007)
10	Nxe5...	(Mk.5: b8d7, d2d4 -011)
	... Be7	(Mk.6: d1f3, g7g6 +010)
11	d4 ...	(Mk.5: b8d7, e5c4 -011)
	... O-O	(Mk.6: f1e1, b8d7 +013)
12	Be3 ...	(Mk.5: b8d7, e5c4 -012)
	... Nd7	(Mk.6: e5d7, d8d7 +010)

13	Nc4 ...	(Mk.5; d8c7, d1e2 -011)
	... Qc7	(Mk.6; f1e1, a8e8 +011)
14	Qd2 ...	(Mk.5; a8e8, a1e1 -012)
	... Be6	(Mk.6; d2c3, a8e8 +013)
15	Qa5 ...	(Mk.5; c7a5, c4a5 -011)
	... b6	(Mk.6; a5c3, a8e8 +010)
16	Qc3 ...	(Mk.5; a8e8, c4d2 -012)
	... Rf5	(Mk.6; f1e1, a8e8 +010)
17	h3 ...	(Mk.5; a8f8, c4d2 -012)
	... Raf8	(Mk.6; f1e1, d7f6 +013)
18	g4 ...	(Mk.5; f5f3, c4c5 -011)
	... Rf3!	(Mk.6; g1g2, e6d5 +018)
19	Ne5 ...	(Mk.5; d7e5, d4e5 -012)
	... Nxe5	(Mk.6; d4e5, f3h3 +016)
20	dxe5 ...	(Mk.5; f3h3, f1e1 -021)
	... Rxh3	(Mk.6; f1e1, e6d5 +018)
21	b4 ...	(Mk.5; g8h8, c3d4 -016)
	... Rf4	(Mk.6; g1g2, f4g4 +040)
22	Rb1 ...	(Mk.5; offered to resign)
	... Rxg4+	(Mk.6; g1f1, e6a2 +050)
23	Kf1 ...	(Mk.5; Comment; Only one move)
	... Bc4+	(Mk.6; f1e1, h3h1 +059)
24	Ke1 ...	(Mk.5; h3h1, e1d2 -063)
	... Rh1+	(Mk.6; e1d2, c7d7 +098)
25	Kd2 ...	(Mk.5; Comment; Only one move)
	... Qd7+	(Mk.6; e3d4, e7g5 +114)
26	Qd3 ...	(Mk.5; c4d3, b1h1 -103)
	... BxQ	(Mk.6; b1h1, d3e4 +087)
27	RxR ...	(Mk.5; e7b4, d2c1 -104)
	... Be4+	(Mk.6; d2e2, e4h1 +102)
28	Ke2 ...	(Mk.5; e4h1, a1h1 -103)
	... BxR	(Mk.6; a1h1, d7f5 +100)
29	RxB ...	(Mk.5; e7b4, h1d1 -103)
	... Bb4	(Mk.6; a2a3, b4a4 +110)
30	Rd1 ...	(Mk.5; d7e6, d1d8 -112)
	... Qf5	(Mk.6; d1d8, g8f7 +108)
31	c3 ...	(Mk.5; f5c2, d1d2 -112)
	... Bxc3	(Mk.6; d1d8, g8f7 +113)
32	Rd8+ ...	(Mk.5; g8f7, d8d6 -112)
	... Kf7	(Mk.6; f2f4, f5c2 +117)
33	Rd3 ...	(Mk.5; c3e5, f2f3 -126)
	... Bxe5	(Mk.6; a2a3, c6c5 +126)
34	Rd8 ...	(Mk.5; c6c5, d8d5 -129)
	... Ra4	(Mk.6; d8d2, e5c3 +132)
35	Rd2 ...	(Mk.5; c6c5, f2f3 -129)
	... Bc3	(Mk.6; d2d8, a4a2 +142)
36	Rd6 ...	(Mk.5; a4a2, e2f1 -140)
	... Rxa2	(Mk.6; e3d2, a2d2 +149)
37	Bd2 ...	(Mk.5; c3d2, d6d2 -195)
	... BxB	(Mk.6; d6d2, f5e4 +206)
38	Kf1 ...	(Mk.5; f5h3, f1e2 -225)
	... Bb4	(Mk.6; d6d7, f5d7 +223)
39	Rd7 ...	(Mk.5; f7e6, d7d2 -236)
	... QXR	(Mk.6; F!G!, D&G\$ +999)
40	Kg2 ...	(Mk.5; Comment; Forced Move)
	... Qg4+	(Mk.6; Comment; Mate in 5)
41	Kh1 ...	(Mk.5; Comment; Forced Move)
	... Qh3+	(Mk.6; Comment; Mate in 1)
42	Kg1 ...	(Mk.5; Comment; Forced Move)
	... Ra1	Checkmate.

my intention here to offer a duplication of the SciSys product catalogue. Those who want to know more about the sensor board or other chess computers in the SciSys range will get all the information they need from SciSys.

I had some fun with the computer's rather attractive habit of rating the current position on a scale of +999 to -999. It takes a pawn as being valued at 9, and bases its assessment of where it stands on the likelihood of it winning material. My finding was that so long as no one was material down, the computer tended to fancy its own game, even if one had some fishish combination in mind.

The playing strength is in the region of 1750, though it will play a lot worse and a fair bit better than that on occasion. My own playing level is around 1900, but I found that if I didn't pay attention, or let the position slide, the program was perfectly capable of crushing me. (With the one proviso that it doesn't really know too much about endgames. Programmers find the algorithms at this point of the game incredibly tricky. Rook and pawn endings baffle masters, and the computer can be excused the odd positional blunder here.)

The 'levels' of play are set by defining the number of seconds (on average) the machine has for its move. This is extremely flexible. You can instruct it to play at whatever average number of seconds a move you fancy, and there is an elaborate facility to set up a series of eight different tournament time controls. There is also a problem solving facility which Page claims once found a solution to a complex problem quicker than the UK's grandmaster, John Nunn.

The actual lay-out of the machine was designed by Ian Sinclair, brother to Clive, and from an engineering point of view there is only one flaw. The elegant keys tend to stick from time to time, which produces an error message on the screen. I soon learned not to put my finger on the key centre but instead to press the left or right hand edge down, which got rid of the problem. According to Andrew Page, this is something that SciSys is working on.

The Mark V has been selling at £275, but the price of the new Mark VI (which is simply a new module inserted into the Mark V chassis) has been cut to £199 — as have all the Mark V machines.

Game Corner

It is perhaps appropriate that the first game should be one between the Mark V module and the new Mark VI, designed by Intelligent Software. When I spoke to him Page wasn't sure if 'improvements' made to the Mark V version actually meant that the Mark VI would beat it in practice. (One of the maddening things about writing chess programs is that everything is so interrelated that an 'improvement' in one area can actually cause weaknesses in other algorithms that go to make up the program.)

In fact the Mark VI won handsomely in the only game I set up between them, as you will see. The analysis is more or less self explanatory. After each move, I give the analysis produced by the machine that has just played. So 5)Nf3... (Mk 5; b8d7, 0-0 +001) means that the Mark V expects its opponent to develop its queen's knight to d7. It doesn't, of course, because it already has a neat combination in mind (so to speak). One of the interesting features is how the Mk.5 gradually increases its negative assessment of its position as the game proceeds. Note, too, that the two programs differ quite often in their predictions about their opponent's likely next move (ie, the move they each consider the 'best').

END

EXPERT SYSTEMS

Robin Webster investigates the 'expert system', which offers advice plus an intelligible explanation of its decisions.

Normally, if you ask the question 'why' too many times you'll get a slap around the face — expert systems, though, are much more polite.

Whatever the field of expertise in which an expert system is supposed to operate, it can, on demand, provide the user with a justification of any conclusion it comes to.

It all has to do with the following premise: human experts use sets of knowledge-based rules to solve problems — discover these rules, code them up in a form that can be understood by a computer, and you have a machine that can act as a consultant — or at least as an intelligent reference tool.

But whereas the human consultant cannot always explain why he/she made a particular decision, the expert system can be asked to explain itself in a form intelligible to humans. Generally, this will be achieved by having the system display or print out the selection of rules it used in making a particular decision. Sometimes it is also valuable to ask it for the rules it considered, but rejected, during a session.

The trend is to predict that one day there will be hand-held expert systems which can be used in the office or home to work out tax or accounting problems or to care for your car or houseplants.

Right now, that's not feasible — although there are some micro-expert systems running on machines such as the Sirius, IBM Personal Computer and the Sage II (the second part of this article will look at a couple of packages in detail).

Application areas can be large or small, trivial or dramatic.

On the large and dramatic side there is one US-developed system called Prospector, which is designed to be of use in geological exploration. Last year, Prospector came into the limelight because it made a prediction that stopped more than a few geologists in their tracks.

Prospector was given the same field study data about an area in Washington State in the US as that used by experts employed by a mining company and came up with the conclusion that there were deposits of a metal ore called molybdenum over an extended region. The geologists disagreed and said the molybdenum was present in a much more restricted area.

Shortly after exploratory drilling had commenced, Prospector was found to be correct.

To explain why it's so difficult to put really useful expert systems onto micros, it should be made clear that Prospector is written in a dialect of Lisp called Interlisp

and program listings run to more than 300 pages of source code. The whole thing needs a Digital Equipment mainframe to turn it over.

Faced with this, most micros would curl up and die.

There are some hopeful signs, however. What about a Sinclair ZX81 being turned into a medical expert system? Some UK practitioners of homeopathy (the technique of taking minute doses of poisons as a cure or prevention of ills) have already taken the mail-order machine and PROMmed it full of homeopathic wisdom in the form of knowledge-based rules. No longer able to play ZX Invaders, the reworked machine is committed to being a homeopathic advisor.

The bigger Sinclair Spectrum looks like it will suffer a similar fate since somebody else is developing a version of the Prolog language (the UK equivalent of Lisp) for the machine.

On the grand scale, companies such as IBM, DEC, Texas Instruments, and Fairchild have all set up special groups to carry out research in the US. In the UK, Unilever, ICL, ICI and even the Department of Health are taking an active interest.

The DHSS intends to use expert systems in its social security offices: members of the public will be able to find out what they are entitled to in the way of payments and how they can make sure they get them.

A far different project is a joint venture between Stanford University and IBM in the US called Dart — for 'Diagnosis, Assistance, Reference Tool'. The Dart project team is attempting to tackle the thorny problem of how to give a computer some knowledge about its own functions — its physiology, so to speak. The next step is to then give it the ability to reason about that physiology.

'If I ask a computer how it is expected to work I want to get an answer somewhat like the answer I would get from the designer of that system,' said Mike Genesereth, who is participating in the Dart project for Stanford. 'What is the expected behaviour of the system and why is it expected?'

'To achieve this goal, we have a knowledge base in which we write down assertions about the structure of the machine — very high level assertions such as what the CPU does. Once we have that design model built in, we make a set of rules that access it and take a fault as input . . . We get it to do some reasoning about that fault and then conclude which part is suspect.'

Another implication of this work is that it becomes feasible to develop intelligent operating system interfaces, as Genesereth explains.

'We are finding that as computers become more and more complicated they become more difficult to use, so, apart from the Dart project, we are working on ways in which it will be easier for users to get access to systems. The idea is to have what we are calling an "intelligent agent" in each machine, one that knows about its machine and how to achieve a user's goals.'

Heurisko is a fairly recent expert system developed by Doug Lenat, another Stanford man who regularly consults on expert systems for Rand and Xerox.

Lenat has applied Heurisko to two very different problems — the design of 3D semiconductors and playing a sophisticated war-game.

Earlier this year, Heurisko was set the task of seeing whether or not it could come up with a successful method of designing chips in three dimensions instead of just the usual two dimensions. According to Lenat, the results surprised even him.

'The system is based on an earlier expert system that I developed called AM,' he said. 'AM was designed to take fundamental mathematical ideas and go off by itself to see if it could discover new rules. It really worked quite well for a time, but it began to get interested in really trivial things and wouldn't let go — it essentially ran out of steam. With Heurisko I've made some changes so that this kind of thing can't happen.'

'About six months ago Heurisko came up with a discovery that looked promising in terms of 3D chip design. Just as the fundamental device in 2D chips is the gate, which handles one function at a time, Heurisko found another device structure that could simultaneously handle the two functions AND/OR.'

Lenat wouldn't give full details of the device, but said that the 3D design work was proceeding under the name XMOS (Cross MOS) because of the shape of the new computing device.

'The rules responsible for Heurisko's discovery are only at an elementary maths level,' said Menat. 'In fact, the one that provided the new design essentially said "If you have a device that works well, make it more symmetrical and see what happens."'

What is even more interesting, claims Lenat, is that the integrated expert working on the 3D project took the new design away and actually fabricated a working example



Illustration by Peter Benton

in six months. It is said to be no larger than a conventional 2D gate, but since it is somehow able to compute both the AND/OR functions simultaneously (one presumes not on the same piece of data) less devices are needed per chip, and 3D chips should prove to be very compact if they are ever produced commercially.

Apart from such practical pursuits, Lenat has also used Heurisko to help make him something of a war-game champion. For the last two years, he has entered and won the Trillion Credit Squadron competition organised in the US by the Game Designers Workshop.

Essentially, competitors must design a fleet of sea and spacegoing ships that are invincible. The rules for the game run to several books published by the organisers. Each fleet designer has a theoretical limit of a Trillion Credits to fund his work.

Lenat has applied Heurisko's technique — ie taking a given design and 'mutating' it in all manner of ways — to the war-game.

'The resolution of any confrontation between fleets can be worked out fairly easily,' said Lenat, 'but the rules of design are very, very detailed. For example, there are maybe 100 to 200 ships of all types in the fleet and any design must take account of 100 or so different parameters. For example, if you want to increase the power of a particular engine, you have to be aware that it will be more expensive and that you may have to strengthen many other related parts of the ship. Or maybe you want to have thicker armour plating than usual — this will obviously increase the weight and result in a slower, less manoeuvrable ship.'

After hundreds of hours of computer resource time, Lenat managed to give Heurisko the rules of the game in a form it could use. For many nights he simply set the system loose on design work and came in the next morning to look at the results.

'The key thing is that Heurisko is able to mutate a design by making a large collection of small changes to a ship and then assessing the quality of that new design,' he said. 'I've won the competition for the last two years and hope to do so again in 1983, but it is probably going to get harder. It is becoming clearer that more and more computer science people are getting involved, and expert system techniques are ideal for this environment.'

END



**Your hands will sweat. Your heart
Your oxygen might run out. And you're still**



At seventy fathoms the only light comes from your Sonar, steadily tracking the advancing enemy fleet.

Suddenly they're above, dropping depth charges. You could dive. But how close is the sea bed? You could attack. But how many torpedos are left? And your oxygen. Isn't it dangerously low?



Submarine Commander, 12 K ROM Cartridge. 3 screen modes: map, sonar and periscope. 9 skill levels. Controls: Fuel, Damage Indicators, Speed, Compass Bearing, Depth Gauge, Battery Charge, Oxygen, Hydrophone/Engine Noise, Attitude, Clock, Depth below keel, Torpedos, Tonnage Sunk.

'Submarine Commander' is one of 21 challenging new home computer games from THORN EMI, for use with Atari 400/800 or Commodore VIC 20. Like our 'Jumbo Jet Pilot' it's more a real-life simulator than a game.

But our programs aren't all work and no play. 'River Rescue', 'Kickback' and 'Soccer' are all-action games. 'Pool' and 'Darts' will suit armchair sportsmen.

And whilst budding Beethovens play the 'VIC Music Composer', would-be Chancellors can work on their budgets with 'Home Financial Management'. We also have educational puzzles for children that will puzzle adults at higher skill levels.

But there's one simple idea behind all our titles. They're designed for players who expect more of a challenge from a video



game than creatures from outer-space can provide. Now, are you sitting comfortably?

The world's greatest TV games.



PROGRAMS FOR ATARI 400/800 (Trademark of Atari Inc. except where indicated). *PROGRAMS FOR COMMODORE VIC 20 (Trademark of Commodore International)

**will beat faster.
only sitting in an armchair**

Available from all branches of Laskys (Nationwide), Micro C at Currys, and all other leading Computer software outlets.

FORTH BENCHMARKS

PCW already has a set of Benchmark programs for the Basic and Pascal languages. As Forth is becoming more widespread on personal computers Dick Pountain has produced an equivalent Benchmark set, the first results of which are printed here.

It seems likely that during 1983 Forth will finally emerge from the shadows and take its place as a major microcomputer language. The evidence for this assertion is not hard to find: during 1982 Forth systems at reasonable prices have become available for most of the popular low priced micros, while the Jupiter Ace, reviewed in this issue, makes the language available to beginners for less than the price of many software systems. The number of professional level Forth systems under CP/M is now quite bewildering. At the West Coast Faire last year there were more Forth than Pascal products on display. IBM has commissioned and sold Forth developed software for its PC while Atari's arcade games are now developed in a graphics Forth.

This is not the place to go into how Forth works (see PCW Dec 1981 or Brodie's magnificent book *Starting Forth*). Nor am I going to oversell Forth as the universal panacea for programming problems as has, unfortunately, been done so often before.

After a year of working in Forth I have formed a somewhat more realistic opinion of its capabilities and shortcomings; suffice it to say that I remain impressed enough to use it whenever appropriate for serious programming tasks and to offer these Benchmarks for evaluating Forth systems.

Forth is definitely not a suitable replacement for Basic as a beginner's language, any more than an AC Cobra is a suitable car for learner drivers. Logo is a much better bet to take on this role. What Forth does offer, as a second language, is a complete programming environment which offers more control over the computer than any other interactive system which is currently available. Notice the word interactive; the main rival to Forth for flexibility and power in systems programming is C (and its progenitor BCPL). C offers advantages over Forth in that it produces stand-alone machine code modules which can be linked to programs produced by other compilers, whereas Forth generally requires run time support from a Forth interpreter. C-produced code will usually run slightly faster, too. But C is not interactive; it is a compiler in the old Fortran tradition (and even slower to compile) and thus goes against the grain of the microcomputer philosophy. For large projects by professional programmers this doesn't matter, but for we mortals the interactive 'suck-it-and-see' approach is what makes programming bearable.

Forth is not only interactive; it is more interactive than any other language in existence. How else can you sit at a terminal and work in any number base you desire at a keystroke, dump blocks of memory, mix Assembler in with your high level code, manipulate any object from a bit up to an array or file without ever leaving the system? And it's structured, too. One myth which circulates about Forth is that the code is always unreadable; the truth is that it can be as readable as you want to make it. The commenting facilities in Forth are unlimited and since you decide word names (up to 31 characters on my system) it is your responsibility to make them intelligible. One day soon I intend to publish in PCW a fairly heavyweight piece of Forth code I have produced which is certainly as readable as Pascal.

Anyway, on to the Benchmarks. Since Forth is an extensible language it presents some problems in choosing the level at which to write Benchmark programs. In order to produce programs which stand a chance of running on all systems it is necessary to restrict the functions tested to the 'core' words which are mainly control constructs or stack manipulation words. I have not tested any lower, byte level, words as these tend to be almost 'naked' machine instructions and one ends up Benchmarking the processor not the implementation. Similarly high level structures like strings and arrays are excluded because they are not implemented on many systems. Floating point extensions are becoming more widespread and could be a candidate for future addition.

Even having decided to stick to core words there were problems over standards. There are two major variants of the Forth core, the Forth Inc version and the Forth 79 Standard plus lots of 'eccentric' versions such as Transforth and Stackworks Forth. The differences are usually only a matter of names; there are equivalent words in most systems but they may be called by different names. I have chosen (with one exception) to go for Forth 79 Standard words in these programs as this gives compatibility with most Forth systems. The fact that my own system is 79 Standard of course didn't influence me at all.

The exception I mentioned is the word SP! which removes all the contents of the data stack. This isn't required in the standard though it is in fact implemented in a lot of 79 systems. The reason it's required is as follows. PCW's other Benchmarks, the Basic and Pascal, are analytical in the sense that by subtracting the timings of successive tests one can isolate the time due to a given instruction (not completely true for the arithmetic functions). We feel that this is a desirable feature which is why we haven't adopted catch-all tests such as Eratosthenes Sieve. (For a full account of Benchmarks see PCW Nov.)

Forth is so fast that most of the programs test 100,000 iterations (and that is barely sufficient for 'magnifier'). No Forth system in the world can hold 100,000 items on its stack and so the stack has to be cleared if we are to get a direct timing for any word which leaves a result on the stack. Hence SP! is required. I have deliberately placed it in 'magnifier' which is meant to be subtracted from the other timings as a constant overhead (thanks to Chris Sadler's Pascal BMs for the idea). If you want to run the BMs on your system and don't have SP! or an equivalent, you must write one; it hardly matters whether it's in machine code or high-level as it's part of the overhead. I had to write SP! for two of the systems timed here, PicoFORTH and GraFORTH. PicoFORTH keeps the stack pointer in a processor register; the definition in 8080 code is:-

```
CODE (SP!) H POP SPHL NEXT JMP
```

```
: SP! S0 @ 2 - (SP!);
```

The word S0, which is present in most systems is a variable holding the address of the stack base; many systems also have SP@ which fetches the address of the stack top.

GraFORTH uses RAM locations and has the unForthlike PEEK and POKE so

```
: SP! 7680 156 POKEW ;
```

Block 8001

```
0 ( PCW Forth Benchmarks - Dick Pountain 10th Nov 1982)
```

```
1
```

```
2 FORTH DEFINITIONS DECIMAL
```

```
3
```

```
4 : magnifier ." S" 10001 1 DO
```

```
5 SP! LOOP ." E" ;
```

```
6
```

```
7 : do-loop ." S" 10001 1 DO
```

```
8 11 1 DO LOOP
```

```
9 SP! LOOP ." E" ;
```

```
10
```

```
11 : literal ." S" 10001 1 DO
```

```
12 11 1 DO 9 LOOP
```

```
13 SP! LOOP ." E" ;
```

```
14
```

```
15 -->
```

Block 8002

```
0 ( Benchmarks 2)
```

```
1
```

```
2 VARIABLE V
```

```
3
```

```
4 : variable ." S" 10001 1 DO
```

```
5 11 1 DO V LOOP
```

```
6 SP! LOOP ." E" ;
```

```
7
```

```
8 : literal-store ." S" 10001 1 DO
```

```
9 11 1 DO 9 V! LOOP
```

```
10 SP! LOOP ." E" ;
```

```
11
```

```
12 : variable-fetch ." S" 10001 1 DO
```

```
13 11 1 DO V @ LOOP
```

```
14 SP! LOOP ." E" ;
```

```
15 -->
```

DOUBLE DENSITY OSBORNE AND PRAXIS

£1599
+ VAT

1

The heart of this office of the future is the powerful new "double density" Osborne 1 portable computer with 64k memory, two 200k disc drives and built-in monitor. The Osborne is linked to an Olivetti Praxis 30 11cps daisy-wheel printer/typewriter for printing your work superbly. In addition you get software (sold elsewhere for up to £800) to make your office of the future into a word-processor or a financial planner.

And as a special bonus we add the exciting new UCSD Pascal.

3

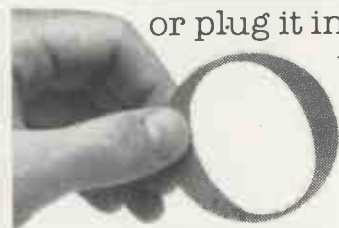
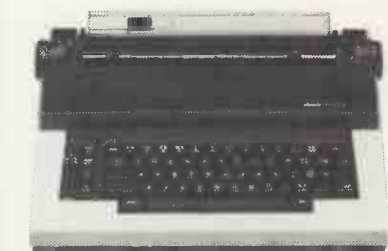
The Olivetti Praxis 30 is a new style electronic typewriter with its own memory, automatic erase, and a double keyboard which gives you 14 extra characters. Use your Praxis on its own as a prestige easy-to-use typewriter,

or plug it into your Osborne and use it as a high quality computer printer.

THE OFFICE OF THE FUTURE TODAY

2

Your Osborne and Praxis are a remarkable combination. The machines are so portable you can carry them both home instead of working late. Plug them together slip the Wordstar/Mailmerge disc into the drive and you have a word-processor with twice the capacity of earlier Osbornes. Change discs for Supercalc and you have the power of a dozen clerks for your budgets. Then Osborne types your work perfectly on Praxis.



O-COMPUTERS

A member of the C/WP Group
104-106 Rochester Row, London SW1
Telephone: 01-828 9000



FORTH BENCHMARKS

does the trick here.

Some readers may wonder why TEST> and TEST< are both included. When I was checking out different candidates I discovered that on my system (xForth 1.2) a > test is 50% slower than a < test, because it is defined at high level using <. I thought this was useful knowledge as by choosing appropriate logic it is possible to save time, and so included both in the BMs.

I deliberately haven't included any timings for compilation as this is so I/O dependent; there would be no basis for comparison between disk and cassette based systems for example.

What of the systems timed here? Z-80 FORTH is a product of Laboratory Microsystems in Los Angeles and has established itself as one of the best CP/M systems available. It is based on fig-FORTH 1.1 recoded for the Z80. It features a first class screen editor, floating point extensions, and a true Z80 assembler and it has the ability to generate a new system for any RAM size of host with any required extensions included. All the high level source code is included and it uses a CP/M-compatible file format to store screens.

xForth is a British product from AIM Research of Cambridge, and also runs under CP/M. It has a 79 Standard kernel with lots of very advanced extensions. In particular, it has facilities for modular programming with local variables, run-time conditionals and conditional assembly (8080 assembler), and full CP/M file handling capabilities which can access, for instance, Wordstar files. Floating point and sequential files (with pipes and spooling) are available as extras. It has an even better screen editor than Z-80 FORTH which includes a global search-and-replace and user configurable control codes.

PicoFORTH is a 'kosher' product from Forth Inc, itself, distributed in the UK by Computer Solutions of Chertsey. Meant as an introduction to Forth programming rather than as a professional system, it is a smallish single-user subset of their multitasking polyFORTH. An 8080 assembler is provided but only the original Forth line editor which is rather spartan compared to the editors on the other systems tested. Although it boots from CP/M it does not use CP/M compatible files but 'pure' Forth blocks. This means you cannot, for instance, copy files with PIP nor interface with CP/M via system calls.

GraFORTH is a special graphics language, based on Forth, for the Apple II; it is written by Paul Lutus of Appewriter fame (notoriety?). It provides some very nice features for animated 3D graphics and music synthesizing. The demo programs impressed everyone who saw them, even given the limited resolution of Apple graphics. It is possible to draw a wire-frame picture using turtle graphics and then animate it by scaling, rotation and translation without any more drawing at all. As a Forth system it is rather eccentric with numerous wilful deviations from Forth practice which make it hard to come to or go from this to a 'standard' system. For instance, variables are handled in a Basic-like assignment statement eg, L 1 + -> L and put their value rather than address on the stack when called (which is why I have no timing for 'variable'). The editor is based on the Apple Basic editor using the same ESC codes and line numbers; it is quite nice to use. No floating point or assembler is included. Unusually GraFORTH is directly threaded - ie, it compiles 6502 code rather than pointers into its headers; the effect on the time for 'dictionary-search' is very noticeable.

Working Forth is a teaching system from Mountain View Press of California based on standard fig-FORTH. Like picoFORTH, this is a 'pure' system which doesn't use CP/M files. It has a large number of screens of teaching-machine type instruction which have the nice feature that the student can come out into Forth and do exercises and then easily start at the point he/she left off (or indeed repeat a lesson). The quality of the teaching is high, if perhaps rather forbidding the total novice; it would be better to know Basic and best to know some Assembler before approaching it. It represents terrific value for money, though, because you get a full Forth system with assembler and editor (an enhanced line editor) which will keep you happy long after you finish the teaching course. They even give you the assembler source for the kernel on disk. The documentation is very rudimentary, however, as most of it is meant to be on the screen.

At the last minute before hitting the press I received a copy of Kuma Computers' Forth for the Sirius 1. This is a fig-1.1 based system written in genuine 8088 code, and as you will see from the timings it is indeed quicker than a 4MHz Z80 version except in the odd case of 'increment' (maybe in high-level?). It seems, at cursory acquaintance, to be a nice implementation, with a simple but effective screen editor. It goes well beyond the 79 Standard with a large part of the Reference Word-set included. It comes with

```
Block B003
0 ( Benchmarks 3)
1
2 9 CONSTANT K
3
4 : constant ." S" 10001 1 DO
5           11 1 DO K LOOP
6           SP! LOOP ." E" ;
7
8 : dup      ." S" 10001 1 DO
9           11 1 DO 9 DUP LOOP
10          SP! LOOP ." E" ;
11
12 : increment ." S" 10001 1 DO
13           11 1 DO 9 1+ LOOP
14          SP! LOOP ." E" ;
15
```

```
Block B004
0 ( Benchmarks 4)
1
2 : test>    ." S" 10001 1 DO
3           11 1 DO 9 9 > LOOP
4           SP! LOOP ." E" ;
5
6
7 : test<    ." S" 10001 1 DO
8           11 1 DO 9 9 < LOOP
9           SP! LOOP ." E" ;
10
11
12 : arithmetic ." S" 10001 1 DO
13           9 2 / 3 * 4 + 5 -
14          SP! LOOP ." E" ;
15
```

```
Block B005
0 ( Benchmarks 5)
1
2
3 : while-loop ." S" 10001 1 DO
4           1 BEGIN 1+ DUP 11 < WHILE REPEAT
5           SP! LOOP ." E" ;
6
7
8
9 : until-loop ." S" 10001 1 DO
10          20 BEGIN 1- DUP 11 < UNTIL
11          SP! LOOP ." E" ;
12
13
14
15
```

```
Block B006
0 ( Benchmarks 6)
1
2 : ten ;
3 : nine ten ;
4 : eight nine ;
5 : seven eight ;
6 : six seven ;
7 : five six ;
8 : four five ;
9 : three four ;
10 : two three ;
11 : one two ;
12
13 : dictionary-search ." S" 10001 1 DO
14           one
15          SP! LOOP ." E" ;
```

GOODBYE TO FLOPPIES C/WP BRINGS YOU A LOCAL NETWORK FOR £495 (+ £150 PER STATION)



C/WP announces a new solution to the network problem, the C/WP STARNET, based on an intelligent multiplexor serving up to 64 microcomputers.

STARNET allows each station to access up to 42 megabytes of CONTOUR Winchester disc storage (soon to be increased to 84 megabytes).

STARNET can include a wide variety of microcomputers in a single network, including APPLE II, APPLE III, SUPERBRAIN, OSBORNE, SIRIUS, IBM PERSONAL.

STARNET handles many operating systems in the same network - DOS 3.3, CP/M, CP/M 86, PASCAL, BOS, MSDOS, PCDOS.

STARNET will support printer spooling, electronic mail, and a communications gateway to mainframes and other networks.

C/WP STARNET offers extraordinary value for money. A six station network

with 12 megabyte shared disc storage, tape streamer back-up (2.5 minutes for whole disc), Qume Sprint 5 shared printer with CP/M and WordStar, and multiple print spooling costs less than £10500 ie. £1750 per station.

Write or telephone for full details of this great price breakthrough. Now you can afford the luxury of a network.

(All prices exclude VAT)

**C/WP PRICES STILL TURN
OTHERS GREEN**

C/WP

C/WP Computers
108 Rochester Row, London SW1P 1JF
TELEPHONE: 01-828 9000

System	Z-80 FORTH v 1.14	xForth v 1.2	Working Forth v 2.5	picoFORTH	GraFORTH	Kuma Forth
Host machine	Transac Tuscan 4Mhz Z80	Sharp MZ80B 4Mhz Z80	Transac Tuscan 4Mhz Z80	Superbrain 4Mhz Z80	Apple II Euro+ 1Mhz 6502	Sirius 1 5Mhz 8088
Operating System	CP/M 2.2	CP/M 2.2	CP/M 2.2	CP/M 2.2	DOS 3.3	CP/M 86
magnifier	1.3	1.2	1.4	3.6	4.3	1.0
do-loop	9.5	8.6	10.1	11.4	18.0	6.5
literal	13.2	11.4	13.7	14.7	26.5	8.9
literal-store	19.4	16.4	20.1	21.0	27.9	13.7
variable	12.2	10.6	12.9	14.1	Not applicable	8.7
variable-fetch	15.8	13.6	16.5	17.7	26.8	11.5
constant	13.0	11.2	13.7	14.9	Not applicable	9.1
dup	16.4	14.0	17.0	18.4	30.7	11.5
increment	16.2	13.8	16.9	17.8	41.4	19.5
test>	21.4	28.0	36.2	22.9	52.1	23.3
test<	21.4	18.3	23.8	22.7	51.7	15.3
while-loop	22.5	18.9	25.4	24.2	56.2	25.9
until-loop	20.4	16.8	22.9	21.7	54.7	18.9
dictionary-search	10.0	8.0	10.3	12.1	5.3	6.3
arithmetic	29.1	21.0	41.3	26.0	25.7	23.5

FORTH BENCHMARKS

floating point but no assembler, and does not have full CP/M86 file compatibility though you can read a CP/M86 file into RAM at a chosen address using a routine called READFILE. It has a reasonable manual and user guide which is short on low-level information, however.

What is my overall impression of the products? As far as speed is concerned the Z80 systems were not far apart as you can see from the table. The 6502 system was slower overall than I would have expected. My money is already on the table as I am an xForth licence holder (and extremely happy with it). Z-80 FORTH runs it pretty close and is now on sale in this country, I believe. The ability to work on CP/M files from either of these is of inestimable value to me; I can write utilities such as word count programs to work on Wordstar or Cardbox files without having to buy a CP/M Basic or resort to assembler. These two also have excellent documentation which allows you to probe as deep as you will into the system.

I hope that any Forth using readers will run the Benchmarks and send in their timings so that I can print updates on an annual basis as Chris does with the Pascal. Please specify what processor and clock-rate if you do this. Any suggestions for improvements or modifications will also be welcome.

Addresses of suppliers

AIM Research, 20 Montague Road, Cambridge - xForth.
Laboratory Microsystems, 4147 Beethoven St., Los Angeles, CA. 90066 - Z-80 FORTH.

Mountain View Press Inc., PO Box 4656, Mountain View, CA 94040 - Working Forth.

Computer Solutions Ltd, Treway House, Hanworth Lane, Chertsey, Surrey - picoFORTH.

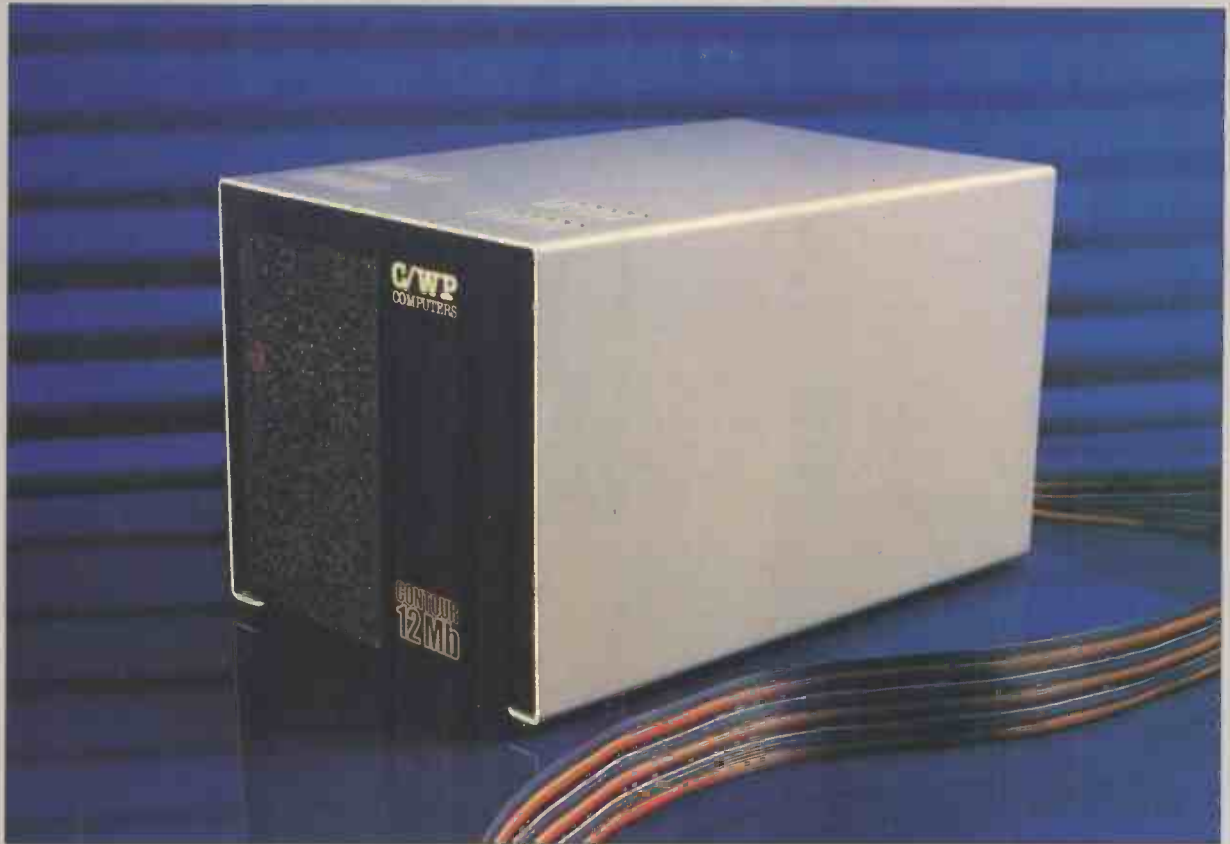
Insoft, 10175 Barbur Blvd, Suite 202B, Portland, Oregon, OR 97219 - GraFORTH.

Kuma Computer Ltd., 11 York Road, Maidenhead, Berks - Kuma FORTH.

END



GOODBYE TO FLOPPIES C/WP INTRODUCES A HARD DISC FOR £995.



C/WP have done it again. We proudly announce the C/WP CONTOUR, a range of British-made high technology 5-inch Winchester discs at prices starting below £1000.

Suddenly your micro-computer has come of age. One little box, not much larger than a floppy disc drive, stores up to 21 million characters. That size costs £1995 and stores the equivalent of more than 160 floppy discs, or 35 full-length books. And in a maximum of around a fifth of a second the C/WP CONTOUR finds any piece of information your computer asks for.

C/WP CONTOUR is available now for your APPLE II, Pet, IBM Personal, Sirius, Superbrain and many other CP/M and S100 machines. On APPLE the C/WP CONTOUR supports DOS 3.3, Pascal and CP/M operating systems.

Write or telephone for full details of this great price breakthrough. Now you can afford the luxury of a Winchester.

C/WP CONTOUR PRICE LIST

3Mb (formatted)	£995
6Mb (formatted)	£1195
12Mb (formatted)	£1595
21Mb (formatted)	£1995
Tape streamer back-up (21Mb 4min)	£1495

All prices exclude VAT

C/WP FOR BIG VALUE IN HARD DISCS

C/WP

C/WP Computers
108 Rochester Row, London SW1P 1JP
Telephone: 01-630 7444

JUPITER ACE

The fastest micro computer in the universe? Mike Curtis investigates a new British micro that spurns Basic in favour of Forth

At last there has appeared on the market a small computer which does not use Basic as its principal language — and about time, too, as many people will no doubt think. There is no doubt that Basic is a good language for absolute beginners to play about with, but it has severe limitations and most people would soon outgrow it if it were not for the rash of 'super-Basics' with limitless features which only really hide the problem rather than solve it.

Forth has long been touted as a possible alternative to Basic for very small systems because of its compactness and high speed of execution; but although Forth is now available for many machines no one up until now has taken the plunge and produced a machine for the mass market which has Forth as its main — and indeed its only — language.

This ground-breaking machine is the Jupiter Ace and it comes as a surprise to those of us who have been waiting for a Forth machine: for a start it is a much smaller machine than I would have anticipated, priced to put it in direct competition with the Sinclairs, Acorns and other giants of the mass market; and secondly it uses the Z80 which, excellent chip though it may be in other ways, is less suitable for a Forth machine than say a 6809. However, the Ace is certainly an interesting machine with many features to recommend it both to absolute beginners and Forth enthusiasts.

Hardware

The Ace has the look of a ZX80 about it: a small white plastic case measuring 210cm by 190cm and a rubber keyboard, each key having a number of symbols on it. The Sinclair background of the designers shows through in a number of other ways too. There are two edge connectors at the back of the case, one of which looks just like a Sinclair interface but isn't quite; in fact the same signals appear on this connector as do on a ZX81 or Spectrum but they are not quite in the same order so you cannot plug in extra memory and the printer straight away: however, an adaptor between the two would be easy enough to make and doubtless one will be appearing soon. There are four sockets around the side of

the case: one jack socket for the power which comes from a separate power supply with an integral mains plug, one phono socket for the UHF output to a normal television and two for connection to a cassette recorder.

All leads are supplied — the power lead and the television lead are of quite reasonable length, but the cassette leads are a bit short and use only jack plugs instead of the more common DIN plugs. The sockets are labelled on the underside which means that anybody (like me) who gets worried about plugging the power supply into the wrong socket has to keep turning the machine upside down. The underneath also holds the interesting observation 'No user serviceable parts inside'. The user is clearly not intended to venture inside this machine, for the case is held together by a sort of plastic rivet which needs the application of pincers to remove.

The insides of the Ace are very much as you might expect: there is a single board, the front half of which is taken up by the keyboard. The rubber sheet which forms the keyboard lies loose on the board, and when a key is pressed the part of the rubber under the key moves down to make a contact on the board. It may be simple but it is hardly elegant. I have been told that the design has been improved to overcome the tipping problem, but it still does not impress me very much. I think I would prefer to pay the extra and get a machine with a proper keyboard. The Z80 processor sits at the back left hand side of the board with 8K of ROM in two chips next to it, and the loudspeaker. The rest of the board is taken up with discrete logic TTL; no ULAs and so hopefully no delays! The design again is reminiscent of the ZX80. The board itself is not of the highest quality but it looks well put together; it will need to be strong because the case itself is quite flimsy.

There is no on/off switch — the power plug being simply removed and inserted to perform this function. When the plug is inserted and the television tuned in then you are rewarded by a black screen with a small rectangular cursor at the bottom left hand corner, a refreshing change from the usual blowing of horns (and own trumpets) so beloved of many manufacturers.

A good approach to any new Forth system is to get it to 'VLIST' all the words in the dictionary, which breaks the ice by filling the screen with characters; it worked normally on the Ace.

The first noticeable thing about actually using the Ace is that the keyboard could take a lot of getting used to; each key needs a firm push in the centre otherwise it is liable to tip sideways and not make contact. There are both lower and upper case letters available, and most keys also have a symbol on them; there is a normal shift key on the lower left hand side which gives upper case letters but also gives some control functions when used on the top row of numeric keys. For example, shift-0 is to delete the previous character, shift-9 switches to graphics mode, shift-5 to 8 are the four cursor controls, shift-4 inverts the video, shift-2 is CAPS LOCK and shift-1 deletes an entire line.

The second shift key on the right hand side is labelled 'symbol shift' and is used to obtain the mathematical and punctuation symbols on most keys. All keys are the same size except for the space which is double sized and in the extreme bottom right hand corner: shift space acts as a BREAK in most circumstances. The display is black and white giving 24 lines each of 32 characters. It is not a particularly good display (but reasonable for this price of machine), having no proper descenders on lower case letters, for example. All commands are entered on the bottom line of the display, and on pressing return they are moved to the next available line at the top of the screen and then executed. Ace Forth does not distinguish between upper and lower case for commands, all words being converted to upper case before incorporation into the dictionary, though they are distinguished in anything that is not a dictionary name — ie, string input.

Software

The list of words produced by the VLIST command shows a fairly normal Forth basic dictionary with one or two omissions and one or two additions to the 79-Standard. The one major departure from any other Forth system I have ever used is

BEEP BEEP

DUP



EXECUTE

DROP

DOES

EMIT

ROT

DABS

FORGET

HEX

JUPITER ACE

the way of entering and editing source code. Normal Forth systems are "screens" which are 1K blocks of memory normally held on disk and transferred into a buffer when needed; a vocabulary of editor commands is used to manipulate text on these screens while they are in memory — for example to write Forth code which can be saved on the disk or loaded into the dictionary. A sort of virtual memory is used, where the system will decide whether a given screen is in memory, and fetch it from disk if it is not. This has always been a difficulty with cassette-based Forth systems; how to duplicate this system? It has normally been resolved by the use of a number of buffers in RAM as a pseudo-disk whose contents could be written to or read from tape.

The Ace uses a different technique entirely: incorporated into the basic dictionary are three words LIST, EDIT and REDEFINE which use a powerful decompiler to edit source code. Forth definitions are entered at the keyboard and entered into the dictionary immediately; this can be done on most Forth systems but that new definition is not normally accessible anymore except to execute it or forget it. The

Ace, however, can access any word that has been defined in this direct way; LIST will list the definition of the word on the screen. EDIT will make it available for editing using the cursor keys. As soon as enter is pressed the new definition is added to the top of the dictionary. This of course leaves you with an extra copy of your word but the use of the command REDEFINE causes the new copy to be put back to the previous position in the dictionary with the rest of the dictionary being adjusted accordingly.

The same edit mode is entered if there is an error in a word definition. An interesting side effect of this form of editing is that it is possible to make forward definitions, using words that have not yet been defined; the trick is to use an arbitrary predefined word in place of the yet-to-be-defined word. Later, when you have defined this word properly, you can return to the higher level word which is meant to use it and insert it in the appropriate place. REDEFINE will now move this high level word back, pointing forward for one of its components.

The problem of saving to tape is overcome in two ways: the entire RAM dictionary (that is, excluding the predefined words in ROM) can be saved to tape using the SAVE command, and these tapes can then be loaded using the LOAD command to be added onto the dictionary. There is also a VERIFY command to check the con-

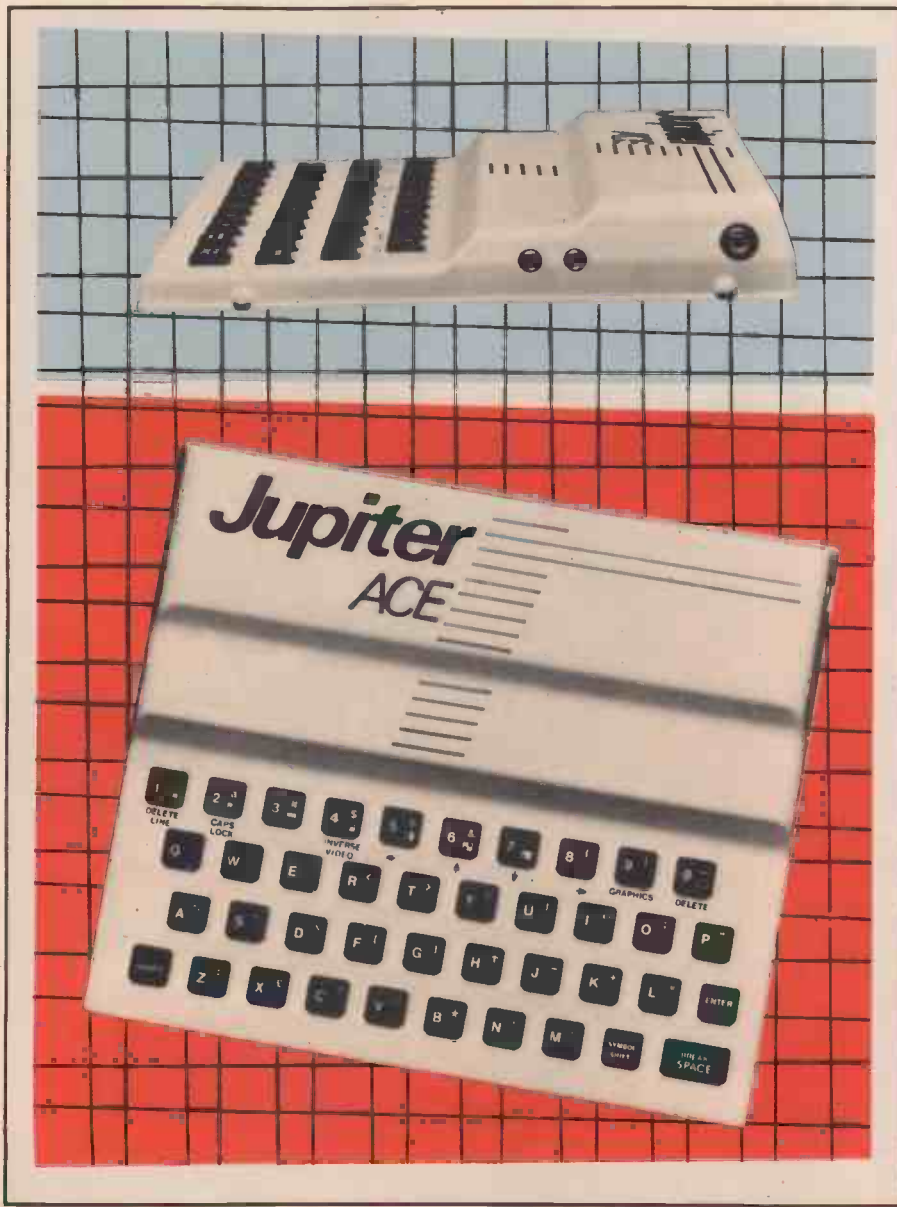
tents of a tape against the contents of memory. The second way of saving data is by the BSAVE, BLOAD and BVERIFY commands which save, load and check a block of memory between two addresses on the stack. This could be particularly useful for saving screen pictures from the memory mapped screen. I tried recording and playing back on two standard cassette recorders; one gave no trouble at all, the other gave a few problems but it's one I've had trouble with before. The standard of recording seems quite adequate and fast at 1200 baud.

The rest of the supplied dictionary is fairly standard (see the accompanying table of words for a more comprehensive comparison with 79-Standard Forth), but there are some more interesting features. There is a floating point facility supplied, which should placate many Forth critics. Words F+, F-, F*, F/, F., FNEGATE, INT and FNEGATE allow a full range of floating point calculations to be done to 6-digit precision and the normal Forth double numbers are available as well. There are words VIS and INVIS which can cause the screen to blank out and reappear and (another relic of the ZX80?) the words FAST and SLOW to control the speed of execution. FAST does not use any error-checking procedures (such as stack size) so programs run appreciably quicker, but of course this should not be used until the program is known to be working properly in the SLOW mode.

There is a limited sound generation facility using an internal speaker, and the word BEEP is provided to control this. It takes two parameters off the stack to specify pitch (period in units of 8 microseconds) and duration in milliseconds. There is a table in the manual giving appropriate pitch values for various notes. The sound produced is rather weak but it could produce reasonable sound effects for games. The other major provision is a graphics facility provided by the word PLOT. The resolution is 64 pixels across by 46 down, which is hardly high by today's standards but the graphics are generally easy to use; it is quite painless and a good exercise to define your own words to draw lines or shapes, and the speed of execution, even in slow mode, is very good as you would expect from Forth. Animation is straightforward and it is possible to get a higher resolution if desired by programming the character generator which is RAM-based. Some examples of how to do this are given in the manual.

One other noteworthy difference between Ace Forth and 79-Standard is the provision of two constructions DEFINERDOES> and COMPILER.....RUNS> to replace the normal CREATE.....DOES> construction to define new defining and compiling words. They work in the same way, though, and so anyone who is familiar with Forth or who is using a book such as *Starting Forth* should find no difficulty.

CODE definitions are provided to produce faster execution for hex instructions (or decimal or any other base) as no assembler is included, which is fairly unusual for a Forth system. Given the extensible nature of Forth, however, once the user has become a reasonably competent programmer they should soon be able to produce an ASSEMBLER vocabulary if desired. The way that this Forth system works is another interesting departure from the norm. Most Z80 Forth systems use the machine stack for the data stack and arrange the return stack by other means, but Ace Forth does



the opposite. Indeed the data stack is not in a fixed position at all but remains at 12 bytes up from the current top of the dictionary, the ROM part of the dictionary occupying the bottom 8k on the memory map. The return stack is placed via a system variable at the top of available memory and grows downwards, the dictionary and data stack growing up to meet it. The 3k or so of space that is available for this is available for this is much more usable than you would expect because of the compact nature of Forth, but it is not exactly huge and you are going to run out of space fairly soon; there is not sufficient space to store all the Benchmarks at the same time. For example. This organisation does, however, mean that the system can immediately take advantage of extra memory simply by initialising the return stack at the highest available memory.

The version of Forth implemented on the Ace, in summary, is a good version which incorporates all the desirable features of a standard Forth dictionary with additions to make full use of the features of the machines; some useful words which are omitted can easily be added if the need arises.

Documentation

The manual is impressive; written by Steven Vickers, one of the two designers, it sets out to be both a user's manual and a self-instruction course in Forth. It does not quite succeed but it does as good a job as most other manuals for machines in this class. It has 181 pages with illustrative examples of the use of all the words in the dictionary, and reference sections including details of the memory map and locations for all the system variables, so all features of the machine are available to the user. A section of the manual explains how to write code definitions (words defined in machine code for extra speed). The manual is written in a fairly light-hearted manner, so that anyone intelligent enough to want a computer in the first place should be able to make sense of it. An illustration of the style is this quote from the section on loading programs from tape: 'Let us suppose that your tape has an interesting program called DVLC — it runs a game in which you are menaced by hundreds of vehicle licence application forms falling out of the sky, and you have to destroy the enclosed vehicle registration documents.' Clearly the author has had a recent unfortunate experience.

Benchmarks

The Benchmark timings given below were taken using the Benchmark programs discussed elsewhere in this issue. They were taken in SLOW and FAST modes. The word SP! which is an essential element of these benchmarks is not available in Ace Forth, so I have defined it as: SP! HERE 12 + 15419 !;

Where HERE 12 + calculates the bottom of the stack at 12 bytes up from the next dictionary space and 15419 is the address of the system variable SPARE (not available as a Forth word) which holds the next free space on the stack. The timing of 'magnifier' is subtracted from the other figures to compensate for the time taken by SP! which would, of course, have been much quicker if defined as CODE.

Conclusions

The Jupiter Ace is a cheap computer at £89.95, and externally it looks cheap. It

does not have colour and with the price of colour machines dropping fast this could turn out to be a big disadvantage. It has as yet no peripherals, though Sinclair ones can be adapted and Jupiter themselves will shortly be bringing out a parallel Centronics interface. There is no software around either as yet but hopefully this will change soon especially if a large number of machines are sold; it could even bring about a boom in Forth software which could be run on a variety of machines. It is a bit difficult to imagine what the market for this machine will be; a lot of people may be put off by the Forth language itself with its use of Reverse Polish notation (calculators which use this system have never been particularly popular except in the scientific community). However, there are real benefits to be had from this machine as opposed to many of its competitors; programs will run appreciably faster than their equivalents on a Basic machine; anyone who is prepared to persevere with Forth will find it a rewarding experience which will lead to a quicker program development time, and more reliable programs as well as a better understanding of the operation of the machine; and simple Basic interpreters written in Forth as well as a lot of other

interesting software are available through the Forth Interest Group. The Jupiter Ace is a very interesting machine; I would not like to predict whether or not it will be a sales success but it deserves to be. It uses a very good version of the Forth language and has a reasonably clear and detailed manual.

The Jupiter Ace is available only through mail order at present from Jupiter Cantab Ltd, 22 Foxhollow, Bar Hill, Cambridge CB3 8EP. The price including power supply and leads is £89.95.

Benchmark timings

BM	Name	Time SLOW	Time FAST
1	magnifier	10.6	6.3
2	do-loop	27.8	20.9
3	literal	44.5	28.6
4	variable	42.6	27.4
5	literal-store	77.1	43.6
6	variable-fetch	60.7	36.1
7	constant	43.3	27.4
8	dup	64.7	39.9
9	increment	62.9	38.0
10	test>	3.1	51.5
11	test<	113.9	71.6
12	while-loop	131.3	81.9
13	until-loop	127.9	78.6
14	dict-search	16.7	12.4
15	arithmetic	98.5	62.6

See also 'Forth Benchmarks' elsewhere in this issue.

Fig 1 Table of Forth words used by the Jupiter Ace

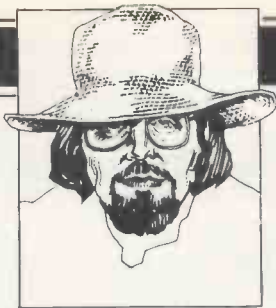
!	★	★/	★/MOD
(/	%MOD
+	+LOOP	.	/MOD
-	..	/	/MOD
0<	0=	0>	I+
1-	2+	2-	:
:	<	<£	=
>	>R	?DUP	@
ABORT	ABS	ALLOT	AND
ASCII	AT	BASE	BEEP
BEGIN	BLOAD	BSAVE	BVERIFY
C!	C.	C@	CALL
CLS	COMPILER	CONSTANT	CONTEXT
CONVERT	CR	CREATE	CURRENT
D+	D<	DECIMAL	DEFINER
DEFINITIONS	DNEGATE	DO	DOES>
DROP	DUP	EDIT	ELSE
EMIT	EXECUTE	EXIT	F*
F+	F-	F.	F/
FAST	FIND	FNEGATE	FORGET
FORTH	HERE	HOLD	I
I	IF	IMMEDIATE	IN
INKEY	INT	INVIS	J
LEAVE	LINE	LIST	LITERAL
LOAD	LOOP	MAX	MIN
MOD	NEGATE	NUMBER	OR
OUT	OVER	PAD	PICK
PLOT	QUERY	QUIT	R>
REDEFINE	REPEAT	RETYPE	ROLL
ROT	RUNS>	SAVE	SIGN
SLOW	SPACE	SPACES	SWAP
THEN	TYPE	U*	U.
U/MOD	U<	UFLOAT	UNTIL
VARIABLE	VERIFY	VIS	VLIST
VOCABULARY	WHILE	WORD	XOR

The following 79-Standard words do not appear in Ace Forth: ', +!, -TRAILING, 79-STANDARD, >IN, ?. CMOVE, COMPILER, COUNT, DEPTH, EXPECT, FILL, KEY, MOVE, NOT, STATE, [COMPILE], SP!.

The following words are extra to 79-Standard Forth: ASCII, AT, BEEP, CALL, CLS, FAST, IN, INKEY, INVIS, LINE, OUT, PLOT, RETYPE, SLOW, VIS.

Technical specifications

Processor	Z80 3.25MHz
ROM	8k
RAM	3k
Keyboard	Rubber keys, 40 keys with auto-repeat and caps lock
Mass storage	Domestic cassette recorder, 1500 baud.
Screen	TV (black and white), 32x24 characters, 64x46 dots in graphics
Sound	Internal speaker
Ports	Expansion port contains power rails, address, data and control lines. Accessible through IN and OUT.
Language	Ace Forth



BANKS' STATEMENT

STAND IN LINE, GET YOUR PICTURE TOOK...

Photography. Now, there's a subject to contemplate. Like playing a guitar, it is something that is easy to do in a simple fashion, but it is almost impossible to become a master.

The world and his uncle has spent many joyous hours taking full-colour photographs of Aunt Ethel's knees (neatly exorcising thereby the part of Aunt Ethel that has always affronted a delicate set of eardrums). Pocket Instamatics can be seen distorting the careful tailoring of every other suit seen walking down Oxford Street. The other every-other-suit is only not being distorted because the Instamatic is in someone's hand, taking a glorious, full colour shot of the top half of the right-hand corner of Selfridges.

Yet, if it is done properly, photography can capture a mood or emotion — a nuance of the pain or happiness felt by a subject, an insight into the horror of war and the joy of laughter. A master with a camera can see and capture what most of us miss until the photograph gave us the time and space to observe.

So many things can be photographed it is hard to know where to start sometimes. Should the camera be pointed at people — old people that smile, young ladies that work the Page 3 circuit — or should it be pointed at the inanimate things of our world: cars, mountains, computers, telephones, data, plates of chips or...?

Data?

Yes, indeed, why not photograph data? In fact it is becoming eminently sensible to photograph data instead of carrying out all this silly nonsense about encoding it in magnetic flux.

In a few years time, and almost certainly before the end of this decade, it is reckoned that the majority of data storage in small systems will be photographic rather than magnetic. Who says so? Well, actually it's a Mr Bill Martin, who works for Control Data, planning that company's product and marketing strategy in storage peripherals. As an important sideline, of course, this means observing what IBM gets up to.

He has to watch this particular company because of its pre-eminent position in the computer business. Where IBM leads the others have to follow, and be damned quick about it. In fact they usually try to out-guess the Blue Giant, at least in terms of the general outline or configuration of an upcoming product.

This means that Bill Martin is well aware of not only the IBM marketplace, but also the technologies involved in all aspects of data storage. He is a wizz at magnetic storage techniques such as disks and tapes, and fully understands their advantages and disadvantages. He is also a reasonable wizz at photography and its implications.

To be fair, the photography in question is not the same as yer actual David Bailey (or Editor Rodwell, for that matter). No, what this particular photography refers to is the optical disc.

This has enormous potential in the small computer systems market because of its

truly staggering storage potential. Its use will require a rethink on how users store their data, and on the economics of storage, vis-a-vis existing techniques. It will also bring about an important development for the large numbers of first time users that will continue to make up the majority of the personal computer market for years to come. The development is that, for the first time, they will not be able to lose their data... ever.

First, however, some facts. Bill Martin is predicting that by the mid to late 'eighties, there will be optical disc storage systems available for small computers. He sees this marketplace being developed, quite possibly by IBM, before the mainframe market, if only because with applications like word processing and small business accounting the market itself is well defined.

The storage system will not be cheap to start with, probably around \$10,000. It will

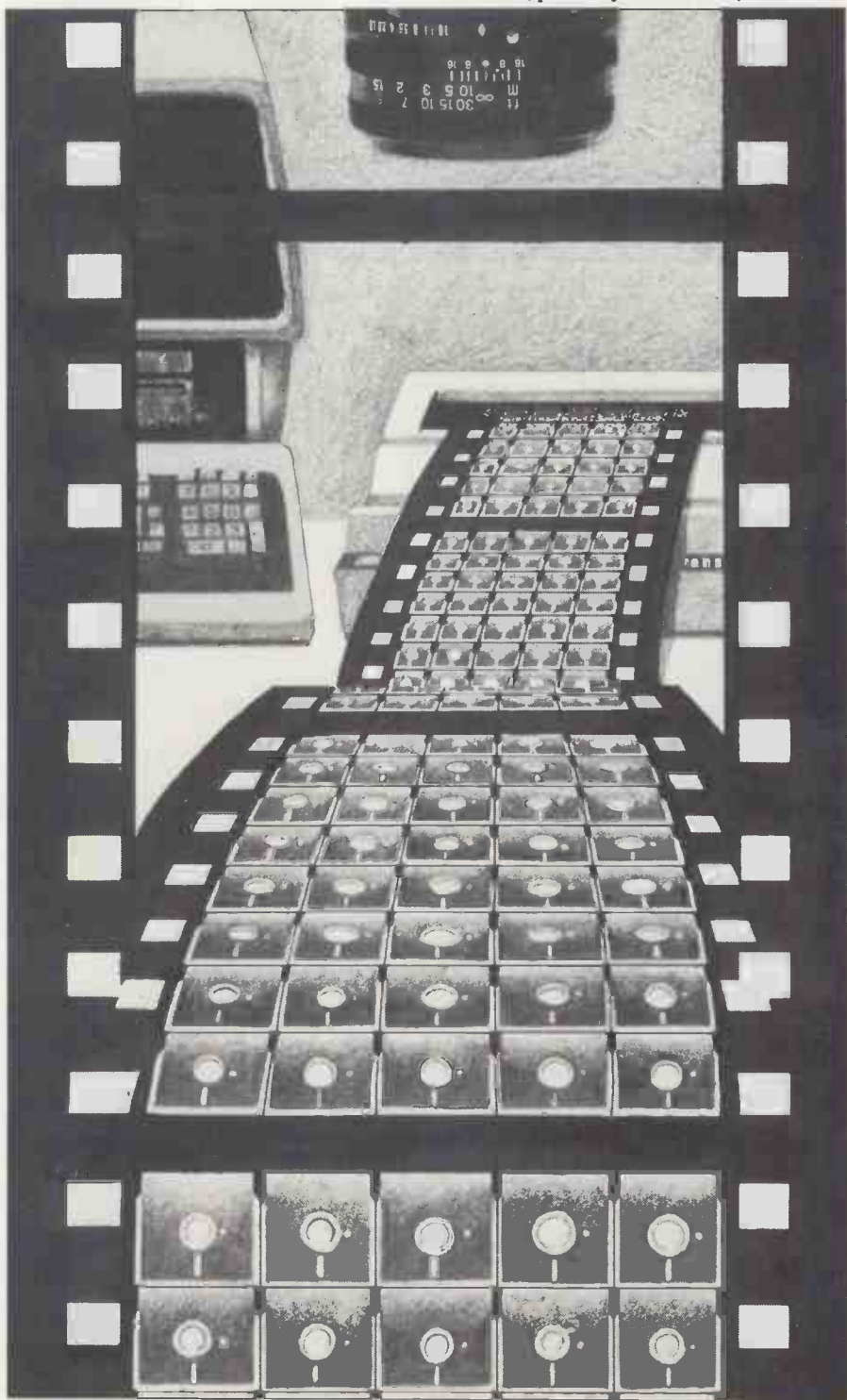


Illustration by Martin Ingley

appear firstly therefore on the bigger 'professional' systems. It would use a standard optical disc that is written to and read from by laser. Each of these would cost around \$10.

This is where the fun starts. The capacity of each disc will be around 2,000 megabytes per side. Sounds a lot, doesn't it? Sit and think about it for a while. Modern minifloppies pack around a megabyte per disc. A mini-winnie crams maybe 50 megabytes. Each side of an optical disc will be the equivalent of a string of 80 mini-winnies. But the disc can be turned over and the other side can be used. This means that for around \$10,010, 4,000 megabytes of storage will be available.

That starts to make nonsense of current data storage economics. For example, a mini-floppy storing 1 megabyte, and costing some \$500, provide 2,500 bytes of on-line store for each dollar spent. The optical disc, though more expensive, will provide a staggering 20,000 bytes of on-line storage per dollar spent.

The change in the economics of data storage will bring with it changes in the way that storage is used. The relative cost, and more importantly the inconvenience, of magnetic disk storage means that it is against the user's interests to be profligate with storage resources. Floppy disks are inconvenient at times, hard disks need backing up and, because of its very nature, magnetic media can easily lose data.

Well, that's not entirely fair. It is not normally, the magnetic media itself that loses the data, it is usually the electronic systems and software that drives them that actually perpetrates the loss. And it is the inherent complexity of these elements — either

externally so that the poor user barely understands how to operate them, or internally so that he can get at least some idea — that creates the well known situation of the user who pressed the *wrong* button and sent all his files to the great data-dump in the sky.

With optical disc this need not, indeed will not, happen. I will now expound on the reason why.

Like many people, the first time I considered the subject of optical discs as a storage medium I fell into a classic trap. 'Ah,' said I, 'they'll be okay for archival use — excellent in fact — but as there is no erase or over-writing function, they won't get used for on line storage.'

Wrong.

They will, and the reason is quite straightforward — brute capacity. At 2,000 megabytes per side a user can be as profligate with storage as it's possible to be. Should a disc ever become full (and that would take some doing) then all the user has to do is turn it over and start again. Should that side become full, well then, just spend \$10 on another one.

If you let this attitude to data storage sink in, its implications become clearer. Optical disc systems no longer are seen as being just for archival use. It matters not that you can't erase data. In fact you shouldn't want to (in most cases anyway). Even in really profligate applications like word processing, which uses up storage like it's going out of fashion, there is really no need to erase or over-write files. It is an advantage not to have to.

As Bill Martin points out, the optical disc automatically produces father/son file structures, and gives an automatic 'audit trail' of

those files. Because a file cannot be erased it can never be lost or erased accidentally. Any amendment or addition to a file will just produce another, latest, version of it. The original will still exist.

This has important implications for a variety of applications, of both textual and numeric types. The daily grind of backing up files will no longer always be necessary for the back-ups will already exist. The inherent father/son structure for creating files would seem to match the requirements of the accounting/data processing areas to a tee. It would also fit many of the requirements of the word or text processing environment.

Unfortunately, the one drawback of the early use of optical discs is going to be the cost. The hardware will cost considerably more than a domestic disc player because it will have to incorporate a 'write' as well as 'read' capability. In time, of course, the price will drop, and so will the price of the discs. Then the systems could prove to be unbeatable in terms of price and performance, instead of performance alone. At that time, maybe the magnetic era could come to a close.

And remember, all this refers to using optical discs in a predominantly conventional data processing manner, storing data as '1's and '0's. Even here it would seem to stand up well against magnetic media in all but initial purchase price. But this does not include the many other tricks that optical discs are capable of — the interleaving of data and audio/visual material, for example. There just have to be thousands of applications for that trick that no one has yet thought about. Try thinking — that's what Clive Sinclair did.

Qume +
AUTHORISED
DISTRIBUTOR



= the perfect
partnership

- If you want the best in letter quality printing then a Qume is the daisywheel for you.
- If you want the best in pre and after sales service then make sure you buy your Qume from Access Data Communications, the authorised Qume distributor.
- At Access Data all Qume printers, both past and present, are backed in the field and at our extensive workshops by a team of engineers who know Qume from the inside out.
- Service to us also means that our engineers are available to you. That's why we operate from two centres; Uxbridge in the South and Hull in the North, making 24 hour call-out a reality.
- When you think daisywheel, think Qume, when you think Qume think Access Data Communications.



SPRINT 9

access data communications ltd.

Eskdale Road, Uxbridge Industrial Estate, Uxbridge, Middlesex. UB8 2RT Tel: (0895) 59781 (10 lines) Telex: 267336
Northumberland Avenue, Hull, North Humberside, HU2 0LN Tel: (0482) 223379 Telex: 52269

Sigma Technical Press

The UK Software Publisher

THE SINCLAIR SPECTRUM IN FOCUS

by M.R. Harrison, *Software Sciences Ltd.*

Supplements the Sinclair operating manual, and provides answers to some of the questions posed but left unanswered in the manual. The book is designed for readers of all ages, and those with either no previous computer experience or others who require more assistance in operating the ZX Spectrum computer system.

0905104 28 5 approx. 160pp Dec'82 £6.25

Z80 INSTANT PROGRAMS Machine Code Routines for Nascom and Other Z80 Systems (2nd Fully Revised Edition)

by J. Hopton

The first edition of this book, which was approved by Nascom Microcomputers Limited, was a sell-out. It has now been completely revised with the following features: all of the programs now work under the NAS-SYS monitor, which is the monitor for both NASCOM-1 and NASCOM-2 machines; all of the programs are now listed with mnemonic, as well as pure machine codes; all the programs start after address OC80, to fit the Nascom systems and terminated well before OFFF, allowing ample space for the stack.

0905104 19 6 198pp Nov'82 £7.50

GETTING MORE FROM YOUR PET/CBM:

Advanced Microcomputer Applications

by E.A. Flinn; A.E. Hill and R.D. Tomlinson, *all of University of Salford*

For a number of years the authors have been running a series of highly successful and proven courses at Salford on the PET/CBM computers for a wide spectrum of audiences. This book is a distillation of the experiences gained on these courses.

0905104 23 4 198pp Nov'82 (paper only) £7.50

UNIX — THE BOOK

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

0905104 21 8 approx. 160pp Nov'82 £6.50

HART'S DICTIONARY OF BASIC

by W.A. Hart

0905104 27 7 166pp Sept'82 £5.95

WILEY COMPUTER BOOK MONTH — FEBRUARY 1983

A wide range of Computer Books and Software on display at leading Bookshops and selected Computer Stores throughout the UK

(Checklist of titles available from Wiley)



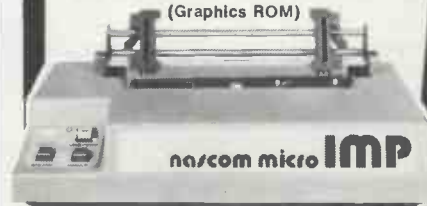
Marketed by
John Wiley & Sons Ltd.
Baffins Lane, Chichester
Sussex PO19 1UD, England

NASCOM

Special Offer from SRS!

We have the last of the makers stocks of the

NASCOM IMP
Serial Printer with imprint
(Graphics ROM)



GREAT VALUE!
ONLY
£199.95
EX. VAT

(Previous price before being discontinued £325 + VAT)

apple C.O.R.P.

Come & see the complete APPLE II system with C.O.R.P. program generator. It's incredible — now anyone can write what they require and C.O.R.P. will work out the program for you — call into our new store at Watford and see it for yourself.

We are pleased to advise our customers that we are members of the SPECTRUM COMPUTER GROUP and can supply all the items featured in SPECTRUM'S ad's in THIS issue.

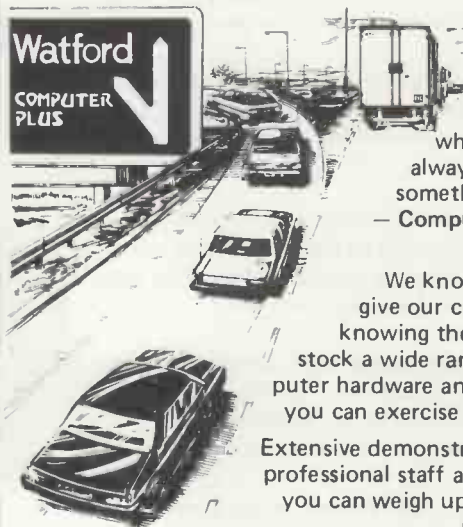
SRS MICROSYSTEMS

94 The Parade, High Street, Watford, Herts.
Telephone (0923) 26602

You'll value our experience, you'll value our prices, free Securicor delivery or post on orders over £50. Access & Barclaycard welcome. Hire purchase and part exchange available E. & O.E.



Turn to Computer Plus



If you're used to the kind of dealer who rarely has exactly what you need, but is always ready to sell you something nearly as good — Computer Plus will make a pleasant change.

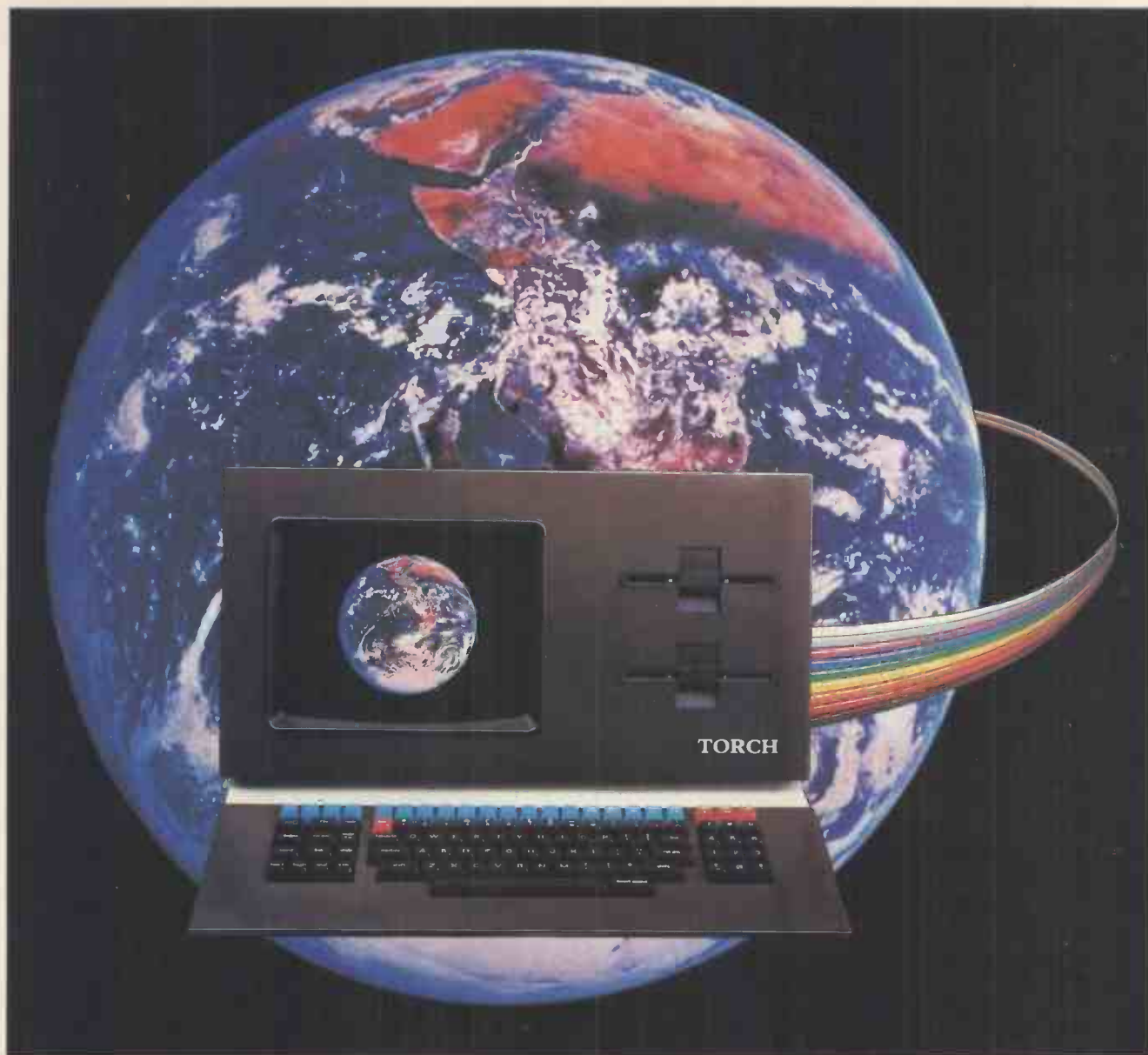
We know our business and give our customers credit for knowing theirs. That's why we stock a wide range of leading computer hardware and software, so that you can exercise YOUR judgement.

Extensive demonstration facilities and professional staff are on hand, so that you can weigh up specifications and make comparisons.

We have excellent sales back up service and credit facilities for our customers.

When you turn to Computer Plus you can be sure you have taken a turn in the right direction.

COMPUTER PLUS, 47 QUEENS ROAD, WATFORD
TELEPHONE: WATFORD 33927



Torch The World Beater

Communication power for every business

Torch is a brand new all-British computer with the finest communication facilities available.

Local area networking, direct access to mainframes, speech synthesis, electronic mail, Viewdata/Prestel are all available.

And Torch is the only Microcomputer with official British Telecom approval for direct connection to all telephone lines throughout the UK and North America.

Computing power for every business

Torch is a dual-processor machine with a massive 800K of floppy disc storage (expandable up to 10 or 21 Mb with the hard disc option).

Torch runs a CP/N operating system giving all the normal business software – accounting, budgeting spread-sheets, PAYE, stock control are all readily available and the high resolution colour graphics make the most of them.

TORCH... Puts the world at your fingertips.

LEASLINKVIEWDATA
LIMITED

— The UK Distributor

Dealers please write or telephone for full details to:-
Scientific House, Bridge Street, Sandiacare, Nottingham
Tel. (0602) 396976



BENCHTEST

THE TORCH

David Tebbutt investigates an interesting and very versatile British micro with built-in comms and colour.

Cambridge-based Torch Computers has produced a very interesting machine which combines the ability to run standard software products with high resolution colour graphics and in-built communications capabilities. My first impression was one of surprise, since I hadn't really expected to evaluate a machine with such features for some little time yet.

Owned by the Climar Group, Torch is a young and very aggressive company, determined to secure a niche for itself in the world markets. With American and Canadian offices and exhibits at the NCC in Houston and Comdex in Amsterdam, Torch evidently means business — and I wish it every success.

At the time of this review, Torch had got most of the hardware sorted out but there

were still some serious gaps in the promised software offerings. Fortunately, its operating system (CPN) is compatible with CP/M and, providing that you can get it on Torch format disks, a wealth of software is available.

Hardware

My first impression of the machine was that it was very plain, if not downright ugly. The welded sheet metal construction has led to a very rectangular design which makes the machine appear a lot larger than it really is. In fact, it is just about the same size as a Superbrain but without the curves. I understand from Torch that an injection moulded casing is being designed which should make it look a lot better as well as reducing the

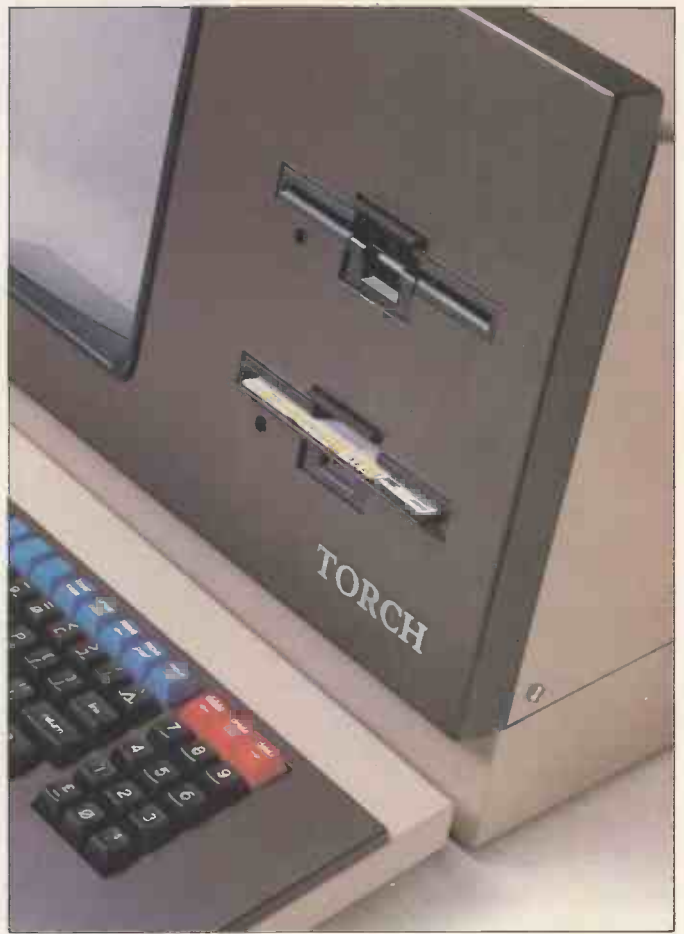
weight somewhat. On my bathroom scales, the Torch came near to 14 kilos!

The main unit comprises the screen, disk drives and processors while the keyboard is separate and attached to the main unit by a coiled black lead. The screen is a good quality monitor made by NEC and the disk drives vary. The first review machine had Tandon drives, one of which gave me trouble. The second machine had Mitsubishi drives which behaved perfectly. The review machine contained a 6502 processor and a Z80 processor. Future 'super-Torches' will run a Motorola 68000 processor *as well as* the two current processors. The 6502 processor board is, in fact, the one which drives the BBC machine.

The screen is a high resolution, colour monitor which can handle eight different



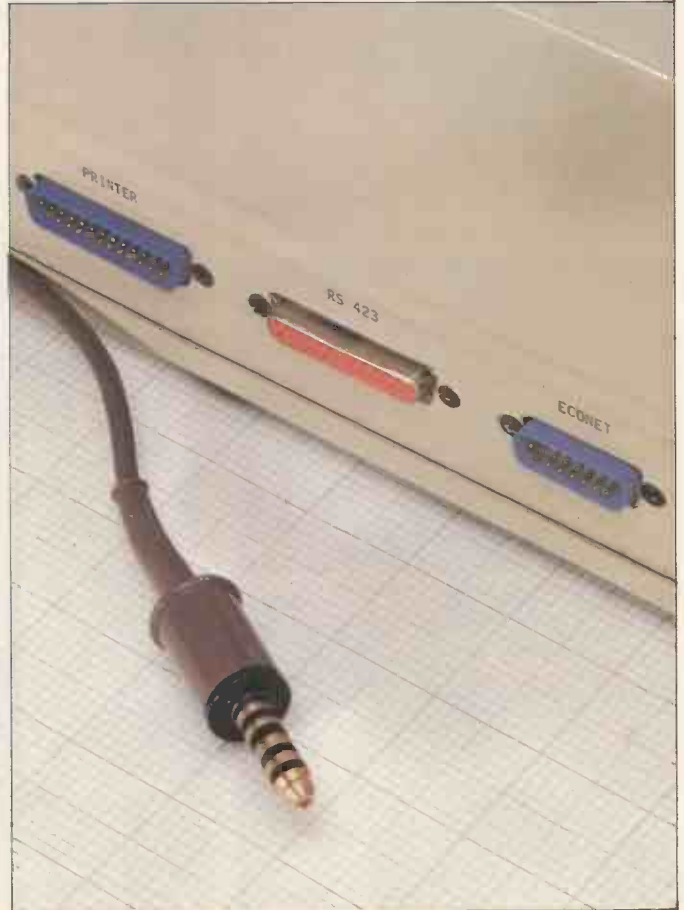
Detachable keyboard.



Twin disks are standard



Built-in editing pad.



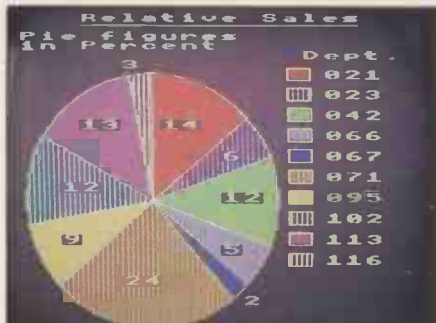
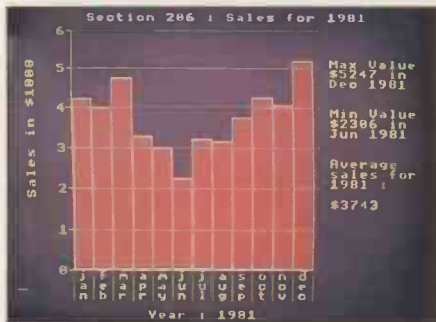
I/O includes direct-connect modem.

THE TORCH

resolution/colour combinations — see Figure 1 for the details. You'll notice that up to 16 colour modes are available. Eight of these relate to plain colours, while the others refer to flashing colours. Although yellow/blue flashing would appear to be the same as blue/yellow flashing, the separate modes are useful since if each is being used at the same time one would be displaying blue while the other displays yellow. Whichever way you look at it, I think the sales literature is naughty when it refers to '16 colours'. See Figure 2 for the details. All this activity is handled at present by the BBC board inside the Torch.

Individual pixels may be given a different colour to their adjacent neighbours to give the illusion of further colours such as orange. I think that the screen characteristics are very good. They will certainly cope with the vast majority of applications over the next few years. I did notice, when I was programming, that it would accept logical screen addresses up to a resolution of 1280 x 1024 which probably bodes well for future screen developments.

The Torch has a very comprehensive keyboard comprising the normal keys, a row of 14 user-definable keys, a numeric keypad and a word processing function keypad. The dished and textured keytops give the keyboard a very pleasant feel. Upper and lower case letters may be used and the keys automatically repeat after a short while. I didn't bother to time it since it can be varied by the user anyway. The only things that bothered me were that some of the symbol keys were in unexpected posi-



Impressive colour graphics



Inside view.



Z80 comms card

tions and the numeric keypad didn't contain the Prestel '#' and '*' keys. Fashion-conscious ladies who like using detachable keyboards on their laps may find the cold steel casing a little unpleasant. I did, and I wasn't wearing a miniskirt! (*Liar — Ed.*)

The keyboard contains a number of editing keys — one set operates on the current line while another set allows you to move a 'shadow' cursor to a different line so that relevant parts of the other line could be embodied in the current line. Does that make sense? It overcomes CP/M's inability to allow cursor movement to previous screen lines. I found it very useful anyway, and a pleasant change from having to retype CP/M commands whenever I made a trivial mistake.

Setting up the user-definable keys is a doddle. You simply type the word **KEY** followed by its number and contents. <cr> can be included using the stretched-out colon (:) followed by M. Use <cr> to finish the entry and the new function is attached to the key. I found this particularly useful when initialising and copying disks since it is so easy to mess up these commands. This is the sort of command I encoded:

FORMAT B: M: COPY A: TO B:

Each Torch is supplied with two 400k disk drives or a single 400k drive coupled with a hard disk of either 10 or 21 Mb capacity. As I

Mode	Colour Modes Available	Text	Resolution
0	2	80x32	640x256
1	4	40x32	320x256
2	16	20x32	160x256
3	2	80x25	
4	2	40x32	320x256
5	4	20x32	160x256
6	2	40x25	
7	Teletext	40x25	

Fig 1 Screen modes

	2 Colour	4 Colour	16 Colour
0	Black	Black	Black
1	White	Red	Red
2		Yellow	Green
3		White	Yellow
4			Blue
5			Magenta
6			Cyan
7			White
8			Black/White
9			Red/Cyan
10			Green/Magenta (ugh!)
11			Yellow/Blue
12			Blue/Yellow
13			Magenta/Green
14			Cyan/Red
15			White/Black

Fig 2 Colour modes

B, BACKGROUND	Colour
BASIC	BBC Basic
C, COMMAND	Submit a file
COPY	File
DEL, DELETE	File
DIR, DIRECTORY	List of files
DUP, DUPLICATE	A disk
H, HELP	List these options
INPUT	Type into a file
KEY	Define a key function
MODE	Screen attributes
PRINT	A file to the printer
REN, RENAME	A file
TYPE	A file to the screen
USER	User number (0-31)
VDU	Screen control codes
VIEW	A graphics file on the screen

Fig 3 Resident commands

said earlier, one of the Tandon drives gave me trouble whereas the Mitsubishi drives were fine. Whether this is a reflection on the drives or not, I have no idea. I understand that Tandon drives are used in plenty of other micro-computers so perhaps something came loose in transit. If you're not familiar with disk drive capacities then you should know that 400k is quite respectable. It is roughly equivalent to 100 A4 typewritten pages. The disks are double sided single density with 80 tracks per side.

A number of connections to the outside world are provided at the back of the Torch. A DIN socket is used for plugging in a cassette player. Incidentally, this is the only way of saving programs written in the built-in BBC Basic. It gave completely trouble-free operation when I used it with a Sanyo Slim 3G recorder. An RS432 port allowed me to connect up to another computer (a Superbrain) and, by connecting the 'Ready to Send' and the 'Clear to Send' pins to each other, I was able to fool the Torch into exchanging files with the Superbrain. In fact I took a CP/M program (Cardbox) and its associated data files from the Superbrain and got it running successfully on the Torch. I'm sure that I could have attached my printer too, but I couldn't fathom out the appropriate connections. A Centronics interface is provided for those who need parallel connections.

An external UHF monitor socket allows you to connect a display screen which echoes

the information on the computer screen. This would be useful for exhibitions and talks, for example. I tried it on a portable black and white TV and the picture disappeared off the edge of the screen but I presume this sort of thing can be adjusted. An RGB output socket is also provided but it wasn't connected to anything inside the review machine.

An Econet connector suffered the same fate. It disappeared into the bowels of the Torch where it wasn't connected to anything either. More usefully, a flying lead attached to an internal modem allows you to plug into the telephone system and communicate over the line with other computers. I used this to great effect as you will see later in the Benchtest.

An internal analogue to digital converter allows you to accept signals from up to four analogue devices through the connector supplied. Each analogue signal is converted to 12 bits. The only other external sockets and controls are the power socket, the keyboard socket, a contrast control, a reset key and a rather old-fashioned looking on/off switch.

A 3½in, 8 ohm speaker receives signals from the four-channel (three music, one noise) sound synthesiser and, thanks to the ability to vary amplitude and envelope shapes, it is possible to get the machine to make some fairly pleasant sounds. The BBC board contains a speech synthesis unit which one of the demonstration programs used to produce rather slow American speech. Apparently this part of the BBC machine is being improved in revision 4 to give the speech more natural speed but no doubt the American accent will remain.

Overall, the hardware seemed very good quality and it was certainly robust. As we go through this review it will be hard to tell whether we're reviewing the BBC machine or the Torch, so dependent is it on the BBC base board for all its peripheral handling activities. No doubt Torch is planning to replace the board in the long term with one of its own. First, though, we can expect to see the 68000/Z80 board mentioned earlier. People who buy the current model should be able to upgrade to the SuperTorch without any problem.

Firmware

The Torch has two main firmware elements — BBC Basic which is on the BBC board and CPN, the operating system. Try saying CPN over the 'phone to a friend and see if they think you're talking about some other, well-known operating system. It makes me feel uneasy that Torch deliberately chose this selection of three letters when there are over 16,000 other three-letter combinations to choose from. CPN, by the way stands for Control Program Nucleus. Since it is in ROM, it doesn't intrude too much on the memory associated with the Z80. In fact 63k is available for application programs. The screen memory (20k) is on the base board so graphics do not interfere with memory availability either.

As if to confuse the public further, Torch has called the console command processor (CCP in CP/M) CCCP, which stands for Cambridge Console Command Processor. I suppose all this is pure accident or it is to stop people like me saying 'Oh no, not another new operating system'? In fact I wouldn't say that. Providing people give a perfect emulation of an existing standard operating system then I think the user wins both ways. He can run popular software while taking advantage of the additional facilities offered by the new system. The people who are mad are those who decide that CP/M is rubbish and then introduce their own operating system which bears no resemblance to any other operating system, living or dead. Oddly enough, they

are often companies who don't expect to sell more than a few hundred machines a year and therefore end up charging the earth for software which has to be specially commissioned. At least Torch didn't fall into that trap.

What Torch has done is to produce a machine which is very easy to use because so much is sitting there in ROM from the moment you switch on. For example, you can format disks and copy files using programs resident in memory; see Figure 3 for a list of resident commands.

One direct command not on the list is FX which is used to set internal attributes of the Torch — things like printer port details, flashing speed, baud rates and so on. This command actually brought home one of the frustrations of having the Torch for review. Since the base processor board is the BBC board, many of the things I wanted to do were implemented on this. Torch is not allowed to sell the BBC manual so I had great difficulty finding out how to write programs and access the internal workings of the equipment. I could not get a BBC manual for love nor money. In the end I 'phoned one of Acorn's directors early one Saturday for a telephone course in using the BBC machine. It was a bit silly and a bit irritating for both of us that this was even necessary, so I used PCW's BBC articles from earlier this year to do most of the work.

Software

Like so many computer manufacturers, Torch managed to get its hardware act together more quickly than its software. One product, called Executive Aid, is claimed to comprise three elements — a card indexing system, a word processor and a diary system. Only one of these was available at the time of review. A Torchlink program was supplied which allowed me to access and exchange files with other computers. After succeeding only occasionally, I called Torch and mentioned my inconsistent results and they informed me that there was no CRC (a checking system) in the Torchlink program and it was about to be replaced by Torchmail which would be much better. I understand that Torchmail is in the post to me and I am sure that it will be much better because Torchlink came close to being very useful. Torchtel, the program supplied to allow access to Prestel, worked very well indeed and I'm rather dreading my next 'phone bill since I was hooked up to Prestel for several hours.

At first I thought that Prestel was boring and amateurish but once I got away from the 'what's on in Brighton' type of screen, I found plenty to interest me. Mind you, it was all frustratingly slow. For me the most relevant items were the Viewtel microcomputer news pages. Since they invited users to write to them, I even got round to using the mailbox facilities. I know my letters were sent; I wonder whether they arrived — there's no way of telling. Electronic Insight too had quite a bit of microcomputer information but I think it has to take second place to Viewtel at the moment. I must confess that, although I found Prestel interesting, I would be hard pushed to justify using it myself. It ties up the telephone and costs a fair bit of money purely in connect time, never mind the other charges associated with it. I can see the day not very far off though when instant access to relevant information will become even more important than it is now and that, coupled with things like telesoftware and access to interesting private databases, will increase Prestel's popularity providing the Source, or something like it, doesn't get in first.

THE TORCH

I couldn't use the Telex or Datel facilities which are offered by Torch so I can't pass comment on them. I asked Torch whether UHF broadcasts could be received so that Ceefax and Oracle facilities could be used. The answer is that, since the BBC board is in there, all you have to do is add the Acorn Teletext board and you could do this. Other communications programs which I didn't get to see were Torchtalk for communicating with other micros, Torchterm to allow the Torch to act as a terminal to IBM computers and Torchnet for local networking. I read in one of the manuals that the Torch could handle communications in 'background' mode while the user got on with some other job. This is apparently an intention rather than an actuality at the moment.

I was sent some interesting stuff on a music package but, since the package wasn't supplied, I can't comment. It's a shame, since that was one area I'd have enjoyed playing with. In fact, I'm beginning to wish I'd bought myself a BBC machine. All I managed with music was some envelope shaping and simple tunes through the BBC Basic thanks to an article in good old *PCW*. At least it worked and it showed great promise. I even programmed some of the user-definable keys to play set tunes! Hardly the thing to do on a business machine, perhaps.

Wordstar, Mailmerge and Supercalc were supplied and they all worked just fine. A financial accounting package came with the machine but I didn't try it out. I read the documentation and it looked OK. You really need to spend several days at least to get a true feeling for such a package. Cardbox worked just fine on the machine so I don't think anyone will have much trouble implementing CP/M programs on the Torch providing they can configure the screen controls and get the appropriate format disks. MBasic was supplied too and that worked well, both interpreted and compiled. Compiled, of course, was faster than interpreted and, on the whole, Microsoft's Basic ran faster than the BBC version. You will notice that I only checked a couple of the compiled Basic figures simply to give a comparison; see the Benchmarks timings table.

Other languages which are said to be available are Fortran, Pascal, Cobol, BCPL, Algol 80, C, Lisp and Forth.

Documentation

Two manuals were supplied with the machine — a user guide and a programmer's reference manual. The user guide is a delight. It is well written and entirely appropriate to get you over those first few hours while you explore your new machine and its capabilities. The programmer's manual was very good in its way, very well written and comprehensive but, I found, nigh on impossible to use because there was no bridging documentation to put everything into context. I see from the various documents supplied that there is another manual called a systems manual. Perhaps that's the missing link. If I had been prepared to write a few programs in assembler, I think the programmer's guide would have served me very well. It is really written for people programming at that level, or people who have learnt from elsewhere exactly what bits are relevant to a programmer in a high-level language. All round I had a pretty frustrating time, eventually finding things out by trial and error.

For example, I learnt most of the high resolution graphics commands by writing a simple Basic program which sent various combinations of control codes to the screen until I hit on those which had some effect. Later, Maggie Burton extracted me from the mire by digging the codes out of a BBC book. I'm back to that silly business of Torch not being able to supply BBC manuals. Such a manual at the right time would have shortened this Benchtest by about 10 hours.

My conclusions on documentation are that Torch is doing a conscientious job on its manuals. The lack of a BBC manual or equivalent is likely to prove very frustrating for programmers working in high-level languages. Looking at the outline contents of the Systems Guide I'm not at all confident that it will be the answer.

Potential

There's no doubt about it: this is a business machine which can handle most, if not all, current CP/M applications. It goes beyond that, though. The high resolution colour graphics give a potential for presenting statistical information in a far more easily digested way than the common rows of figures. It also allows users to store and view graphic information as well as text and numbers. All that's needed is for the software industry to catch up with this type of machine. I'm certain that they will be very common in a year or two, but right now it poses a headache for people looking for packaged solutions for their graphic software problems.

The communications facilities are very good and, once again, provided the software is made available this probably gives the Torch its greatest advantage over its competitors at the moment. Torch has seen this and its main emphasis on software has rightly been on the communication package mentioned earlier.

So, if you need a machine which can run a wide range of proven software, which has communication facilities and which offers high resolution colour graphics then you should take Torch very seriously indeed.

It's not a pretty machine but functionally it's very good.

Expansion

A 68000 based machine is on its way. It will keep the Z80 processor too, so no systems investment will be lost. The new machine will run 'DAVROS, an all British operating system developed by Torch'. I found that statement pretty depressing until I went on to read that it will support Unix programs. Once again Torch has recognised what's happening and taken steps to improve things but without putting itself out on a limb. There's talk of Torch taking on APL and the UCSD p-System too. Reading between the lines, Torch seems to believe that the 8086/8088 based systems are a temporary phenomenon devised to take advantage of existing software

availability. All I can say about that is that they're not alone. I do believe that Apple has bought quite a large number of 68000 chips too. We shall see.

Prices

At first glance the price of the Torch looks high. I think it's important to bear in mind that it has an in-built modem which would cost in the region of £300 if it was bought separately. It has high resolution colour graphics and reasonably high capacity disk drives. Against this, it is currently a 6502/Z80 based machine and prices of these are dropping like stones. You must decide for yourself what you consider is important to you. If you'd never use graphics or communications in a month of Sundays then perhaps this isn't really your machine.

Hardware	Price
Basic Torch	£2795
with 10Mb plus 1 floppy	£4995
with 21Mb plus 1 floppy	£5495
Light pen	£ 60
Dot matrix printer	£ 650
Daisywheel printer	£1350

Software	Price
Basic 80 interpreter	£215
Basic compiler	£237
Torchlink/Torchtel	£400
Wordstar	£275
Mailmerge	£ 90
Calstar	£175
Financial accounts	£600
MCS fully int accounts	£1250
Maintenance contract 14 percent of purchase price pa.	

A basic Torch includes colour, high resolution graphics, inbuilt modem and twin 400k floppy disks. (Incidentally, Torch also supplies a Z80 processor board and twin disk drive for the BBC machine at £780).

Conclusions

For anyone who needs a high resolution colour graphics, communications oriented, CP/M compatible machine, the Torch should be considered among their options. I get the feeling of 'almost ready' on the software and documentation front which is a pity — it spoils an otherwise fairly professional approach. The machine is heavy and not very good looking but it offers an impressive range of capabilities.

END

Benchmark timings

Benchmark	BBC Basic	Interpreted MBasic	Compiled MBasic
1	1.4	1.5	
2	5.4	4.2	
3	14.4	10.6	
4	15.3	10.4	
5	16.1	11.6	
6	24.9	21.1	
7	38.4	33.0	9.2
8	8.9	5.5	4.9

For a full explanation of Benchmark timings, see *PCW*, Nov 82.

Technical specifications

Processors:	Z80A (6 MHz), 6502 (2 MHz)
RAM:	Main system: 64k; peripheral processor: 32k
ROM:	4k bootstraps for main system; 32k inc Basic, operating system and comms software for peripheral processor.
Display:	12in colour monitor (optional monochrome); 8 text modes, 3 graphics modes, up to 16 colours.
Keyboard	Expanded qwerty with cursor control, editing & numeric pads, 16 user-definable keys.
Disk drives:	Twin double-density, double sided 5¼in, 400k each.
Interfaces:	Centronics parallel, RS232 serial, 4 12-bit A/D inputs, modem for comms in Prestel.
Systems software:	CPN (CP/M — compatible) operating system.
Languages:	BBC Basic in ROM

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.



The long way round

How do I get a Basic program to run on my Osborne? The only way I've found is to create the program using Wordstar using the 'non-document' option; call this program "PROG.BAS" and save it with KX. Now put the disk with the Basic compiler and interpreter and type what is underlined: B>A:MBASIC
B:PROG.

This method works but I'm sure there must be a better way, because I'm sure that I've lost the advantages of compilation. R. Emerson, Eindhoven, The Netherlands.

There certainly is a simpler way because you are going all around the houses. A lot of people do use Wordstar to edit Basic programs; however there is no need to learn Wordstar just for that purpose. Just type MBASIC and you will enter the Basic interpreter; now you can simply type in your Basic program, line by line. Consult your MBasic manual for instructions on editing. When you have completed it you can test the program with RUN. To save a copy of the program just type SAVE "PROG". A. Once you are totally satisfied that it works correctly then you can use the Basic compiler and compile your program. The speed advantages of a compiler will only be noticeable if you have optimised the writing of the interpreted version; for example, used integer variables wherever possible, avoided unnecessary calculations, etc. In a program that is I/O bound you will not notice much of a speed improvement I'm afraid.
SW

Speeding up

Is it possible to convert a Z80-based microcomputer into a Z80A micro by changing a few components? If so, how?
E. Kwok, Ballards Lane, London N3 2NT.

As the difference between the Zilog Z80 and Z80A processors is essentially one of speed, the components that may need changing are those which are speed-dependent or speed-limiting. The Z80 can be replaced by a Z80A simply by removing the former, and plugging in (if your processor chip is socketed) a Z80A. In a few machines this may be enough, but you will almost certainly have to alter the computer's internal

'clock' to match. This may be a matter of altering some jumper settings, or it may mean changing a quartz crystal for another one. The most expensive area is likely to be memory. RAM chips have maximum operating speeds, and the faster ones are usually appreciably more expensive. Thus it is likely that the RAM used in your micro will be just fast enough to cope with the existing processor. You could make the existing memory compatible by using software 'wait states', but then you've lost the speed you changed the processor for! Disk controllers may also be speed-limiting, but as long as your programs do not make a lot of disk accesses, you could live with 'wait states' as a solution.

So, yes, you can change from a Z80 to a Z80A, but if you already have a lot of RAM it could be expensive.
P L McIlmoyle

Horses for courses

From magazines such as your own, and from books, I have learned a lot about hardware, packaged software, and how a computer operates. However, a gaping hole in my knowledge is languages.

I have used a ZX81, and discovered the extreme disadvantages of Basic. Consequently I would like to upgrade both my language and my hardware.

Which high-level language should I choose from the vast range which includes Pascal, Comal, Forth, Cobol, Logo, Algol, Lisp, Pilot, APL, PLI, Fortran, etc?

Are we working towards a 'universal' language, or a series of languages tailor-made for each application? Will the language we learn tomorrow be out-dated in six months' time?

Your magazine is by far the best of those I see at the newsagents, and I thus look forward to some constructive comments — perhaps to a comparison table of the main microcomputer languages?
A L Taylor, Grimsby.

I fear there would not be room in 'Computer Answers' for the table you envisage, but I will give thought to putting it together, in case the Editor would consider an article on this subject appropriate.

Personally, I do not expect to see a 'universal' high-level computer language adopted, if only because it would have to be very complex and hence cumbersome to use if it could cope well with all applications. Having said this, I must also add that the USA military have been hard at work on just such a language for some years, under the name of Ada.

The nearest to a 'universal' language is Cobol, which is very,

very widely used for commercial data-processing applications on mainframes (there are also micro versions).

On microcomputers the closest approach to a 'universal' language is in fact Basic! Despite your comments, and Basic's many detractors, a good implementation of this language copes very well with most programming applications, and is much used by professional programmers. The more generally available versions on microcomputers tend to suffer from poor string and file handling, but this problem is not irretrievably built into the language. The other problem with micro Basics is slow execution, due to the infrequent use of compiled versions. A good implementation of Basic, with matrix operators, long variable names, good string and file handling, and a compiler is an excellent programming tool. Ideally, you should aim for the ability to develop programs using an interpreted version, and then be able to compile the finished, debugged program for fast operation. Basic is one of the few languages in which this can be done.

Pascal (and Comal) are of great interest to the academic world, for their use fosters good programming habits. They are not much used commercially because this very feature makes them inflexible. Pascal does seem to be making some head-way of late as a commercial programming language for microcomputer applications.

Nonetheless, it is very much a question of 'horses for courses'. In the mainframe world Cobol still reigns supreme for commercial applications, and Fortran for technical and scientific applications. For 'real-time' 'interactive' (eg, via VDUs) applications Basic and APL are the leaders, with Ada intended to take over at some time. PLI was a deliberate hybrid of Cobol and Fortran, which has not found a lot of supporters, while Lisp was specifically developed for 'artificial intelligence' applications, and Forth for the control of equipment. Comal, Logo and Pilot all started out for various teaching applications.

So, how to resolve your dilemma? My recommendation would be to ensure that your new hardware does not have any high-level language 'built-in', but is able to load any you like, either from disk (which gives you an effectively unlimited range) or from ROM cartridges which at the present time will probably limit you to three or four languages on any one machine).

If you are lucky enough not to be too worried over the cost I would go for a disk-based machine using CP/M (such as the Osborne 1). Otherwise choose a machine which offers the possibility of expansion to disks running under CP/M.

Why CP/M? Quite simply because this will give you the widest range of high-level language interpreters and compilers commercially available. Don't be put off by all the sniping at CP/M... it's not nearly as bad as it's painted, and is very powerful. Anyway, it is now possible to get a program which will add most of the advantages of Unix to CP/M, without adding Unix's major disadvantages.
P L McIlmoyle

Computergook

With reference to the answer from P L McIlmoyle in the November issue of PCW regarding CP/M, I would have thought that the latter was a sufficiently simple concept for it to be explained in one column of your estimable publication, with references to further reading elsewhere, and without the use of the quite unnecessarily artificial computergook, which makes the answer incomprehensible to all but the ardent enthusiast.
J. Carey, Canterbury, Kent

It may surprise you to know that I agree with much of what you say. If only the 'computergook' (it sounds even more appropriate if you don't pronounce the 'k') were mine — then it would be easy to ignore or dismiss it. Unfortunately, it comes from the writers of CP/M, and more particularly, from the writers of the CP/M manuals. I fear it is largely the lack of clarity of the latter which has earned CP/M the bad name it has in some quarters. As an operating system, while it certainly has some faults, it is good, and certainly easier to use than others of comparable power. And now quite a few of the better aspects of Unix can be added to CP/M with 'Microshell' (sold in the UK by Asro Information Systems).

In my earlier reply I was attempting to explain to someone familiar with CP/M, but not expert in it, who might not be able easily to get hold of the various books and articles in question, just how to use the SUBMIT facility for program auto-start. Thus it was necessary to go into some depth of technicalities.

However, in an attempt to sum up the whole auto-start discussion, and to show that good, plain English is possible when writing about CP/M, I would comment that:

Programs can be made to run automatically on start-up under CP/M by two main methods. In the first, the CP/M BIOS is altered by inserting the name of the program to be run (eg, BASIC MYPROG) in the appropriate place on the disk. As soon as CP/M is loaded these programs will be run. (See: *The CP/M Handbook* by Rodney Zaks, pp

203, 2060).

The alternative is to make a special file, (with an extension of .SUB) containing the name(s) of the program(s) to be run, and also, if needed, other commands or data. Typing SUBMIT Filename would then cause these programs to be run. (See Zaks' *CP/M Handbook* pp79,81 and *Osborne CP/M User Guide* by Thom Hogan, p107, 110).
P L McIlmoyle

Memory refreshment

Can you explain how 'bank switching' of memory works? Does the normal Z80 refresh system function over the whole of the bank switched memory?
G V Barbier, Tiverton, Devon

In 'bank switching' the RAM memory of the computer is arranged in blocks (or 'banks') of (typically) 64k, and at any one moment only one bank is connected to the processor's data bus, as 8-bit processors can only address a maximum of 64k at any one time. The other banks are likely to contain data, and if they are dynamic rather than static RAM will need refreshing. This can be done by the main Z80 without difficulty.

Switching from one bank to another is done under software control, and it is essential that the memory cards used are equipped

with an appropriate control line for this purpose. Thus, if you have an S100 machine you cannot necessarily just slot in some more memory cards. You must make sure that the cards are equipped with a bank-switching control line, that your S100 bus also supports this, and that your operating system software also does so. The newer S100 systems meeting the IEEE S100 spec do support bank-switching.
P L McIlmoyle

Random tip

For the past two months I have been trying to write a machine code random number generator for the ZX81 but with little success. Please could you give me some ideas?
Andrew Quilley, Gosforth, Newcastle-upon-Tyne.

Try playing around with the machine register R; it does not hold a random number but the computer uses it constantly, hence the value changes continuously.
James Walsh

Spectral quirks

At present I am considering purchasing a ZX Spectrum as I already own a 16k ZX81. However I would like the answers to a few questions before I do:

(1) Is it true that the Spectrum

crashes when a certain number of keys are pressed at once?

(2) Are you limited to only two colours within the 8x8 pixel character square?

(3) I wish to learn machine-code; what facilities do the Spectrum and manual have to help? Also, are there any good books on the subject?

(4) Since the Spectrum has only one user port, how can a printer plus joysticks, etc, all be connected at once?

Steven Garrett, Southwick, Sunderland

(1) I have heard of cases where the pressing of two or more keys causes some strange effects, but I am yet to hear of one actually crashing. The Spectrum does have some weird bugs, many of which I am yet to discover. If you do have any good ones I would be very interested to hear from you.

(2) Yes, this is the same as for most of the new, cheap colour computers - it is done to save memory.

(3) The Spectrum has few actual facilities for machine code and the manual is rather sketchy on the subject, though there are various assemblers and disassemblers on the market. One of the best is available from ACS Software. At the time of writing there were no really good machine code books on the market for the Spectrum, though 'Interface' may have one ready for the early part of next year.

(4) The Spectrum has one edge connector rather than one port. The Z80 is capable of communicating with 256 simple on/off applications before it starts actually using memory space.
James Walsh

M/C error

When I was typing in the machine-code program in the October edition to display the number of free bytes on the ZX81, I noticed that there were a number of errors in the listing. For this reason could you please publish a corrected edition?
T J Stanfield, Birmingham

Thank you very much for your letter. I apologise for any inconvenience that these errors may have caused you. So here goes for the corrected version:

```
10 REM 12345678901234
29 FOR X=16514 TO 16527
30 INPUT A
40 POKE X,A
45 PRINT X,PEEK X
50 NEXT X
60 PRINT USER 16514
1000 REM THE CODES ARE:
    33,0,0,57,237,91,28,64,167,
    237,82,68,77,201
```

Lines 25 and 70 in the M/C loader program in the same edition should read:
 25 LET X=X+1
 70 GOTO 25
James Walsh

THE WORKING SPECTRUM

A LIBRARY OF PRACTICAL SUBROUTINES AND PROGRAMS

By David Lawrence

The Working Spectrum is based on a collection of solid, sophisticated programs in areas such as data storage, finance, calculation, graphics, household management and education.

There is also a chapter of utility routines including a Basic renumbering program which can handle GOTOs and GOSUBs.

Each of the programs is explained in detail, line by line. And each of the programs is built up out of general purpose subroutines and modules which, once understood, can form the basis of any other programs you need to write.

Advanced programming techniques spring out of the discussions explaining each subroutine. The result is not only to advance your programming skills but also to leave you with a wide range of practical applications programs which might otherwise only be available to those prepared to buy cassettes or those capable of writing substantial programs for themselves.

Expert or novice — whatever your experience, you will find this the most useful and valuable book for the Spectrum.

THE WORKING SPECTRUM

A LIBRARY OF PRACTICAL SUBROUTINES AND PROGRAMS



DAVID LAWRENCE

Please send me a copy of The Working Spectrum.

I enclose a cheque/postal order for £5.95.

Name.....

Address.....

.....

Signed.....

Please make your cheques payable to Sunshine Books.

Please send your order to The Working Spectrum, Sunshine Books, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

We can normally deliver within four to five days.

How Epson beats the competition.

What competition?



The amazing HX-20.
The most complete portable computer available today.

The HX-20 is a portable computer with a full size typewriter keyboard, LCD Virtual Screen, printer and microcassette facility actually built in. A computer with a rechargeable power source that's large enough for writing programs and manipulating data virtually anywhere, yet small enough to carry in a briefcase.

But don't let the size fool you. The HX-20 is not a gimmicky toy or an excuse for a calculator. It's a precision machine using a full extended version of Microsoft BASIC with 16k RAM, optionally expandable to 32k and 32k ROM expandable to 64k, RS-232C and Serial interfaces. The ASCII typewriter keyboard and five programmable keys brings ten separate program functions to your fingertips.

Power to your elbow.

The HX-20 runs on its own power supply for over 50 hours and can be easily recharged overnight, or whilst in use, with the ability to retain its memory in RAM even when switched off.

Keeping you in the picture.

The LCD screen is unique - showing any 20 characters by 4 lines at a time - enabling you to carry out word processing or data entry as if you are using a large screen.

HX-20

PORTABLE COMPUTER



Print Out. Built In.

The 24 column dot matrix impact microprinter offers 42 LPM in a crisp, precise 5 x 7 matrix for perfect hard copies. Every time. And you can choose from a wide range of peripherals from bar code readers to acoustic couplers for total capability.

Epson. Reliability through Research.

You'll find our name on a highly successful range of computer printers. So you can be assured of the same quality and reliability through an extensive research programme prior to the launch of any Epson product.

Write or call us for further details and the name of your local stockist (because seeing really is believing).

Just take a glance at the competition and you'll soon realise that the HX-20 is the most portable computer available today.

Epson (UK) Limited
Dorland House 388 High Road Wembley Middx HA9 6UH
Telephone 01-900 0466/9 Telex 8814169

EPSON

Extraordinary product.
Exceptional quality.

TRIUMPH ADLER makes it all refreshingly simple



with the arrival of the 8/16 bit Alpatronic micro

The Alpatronic P3 micro: the latest, most powerful addition to the outstandingly successful Alpatronic family. An addition that makes Alpatronic the largest range of 'ready to use' micros on the market, priced from £1,895 to £2,345.

The dual purpose 8/16 bit processor means you can make use of the wealth of proven 8 bit software now. As 16 bit software becomes more widely available, we can upgrade your P3 to 16 bit operation.

The P3 is a micro version of a larger system - rather than a 'blown-up' hobby computer. It's a high quality, engineered computer, designed to cope easily in the business environment.

Triumph Adler is a world leader in business products and committed to simplifying business procedures and reducing business costs. We provide a helping hand to our customers and our dealers. With over 80 years' experience in the business market our single source philosophy is second

Triumph Adler (U.K.) Limited, 27 Goswell Road, London, EC1M 7AJ. Tel. 01-250 1717 A member of the Volkswagen Group.

to none. We actually do what everyone else claims. We test software, educate your staff, supply high quality stationery and supplies and ensure your system runs smoothly.

In short, we at Triumph Adler are dedicated to making your life refreshingly simple and to providing successful computing for your future.

To get the full story, simply clip your letterhead or business card to the coupon, or ring the Triumph Adler hotline on 01-250 1717 and ask for department MMD.



TA

TRIUMPH ADLER

Computing for your future

Please tell me in simple terms the benefits I can expect from the most extensive range of business micros.

Name _____ Company _____

Address _____ Telephone _____

HOW TO MAKE EPSON, WORDSTAR AND OSBORNE SING AND DANCE

Bob Huckle of Digitus Ltd shows how to get the best from your Osborne/Epson combination.

When I first discovered the Epson MX-80 I believed I had grasped all the reasons for its success. In my view it scored heavily on all fronts — practicality, ease of use, reliability, and cost-effectiveness. On top of all this it battled along bidirectionally and logic-seekingly at 80cps, it looked good, and it was portable (it came in a sturdy box with a handle on it).

One morning I received a telephone call from a distressed customer. In desperation he had taken a stop watch to his MX-80. It was only printing at 50 cps! Oh dear, had those 'awfully nice' Epson people let me down? Further investigation showed that it was also printing with a jolly nice but non-standard typeface (this however was of no interest to my customer).

I took the printer along to the surgery where I received some sound advice from the chief fitter. . . 'When in doubt, read the manual!' It seemed like a good idea and an hour or so later I was almost overcome with the delights displayed before me (I get excited easily). . . Print options galore, true superscripts and subscripts, the ability to change line heights, a host of international character sets, and full graphics capability! All this for what price?

Being reasonably versed in the art of Wordstar, it was not long before I was experimenting with the different ways of making the MX-80 sing and dance from within a document file. I have also spent some time heavily involved with the Osborne 1 and decided that the combination of these three world leaders required further investigation.

Let's start with the MX-80. Figure 1 shows some of the different print options available. If you find one of the options so pleasing that you would like to use it all the time, the best approach is to modify the printer internally. Refer to the section in your Operation Manual entitled 'Setting the DIP Switches'. Take it slowly and you should find this a simple matter.

It would be nice, however, if you could get the MX-80 to obey your will by selecting the different print options whenever you desire. The way you do this is by sending a sequence of control characters to the printer while it is turned on. The different characters determine the different print options. When you turn the printer off and back on again it resets itself back to normal. You can send these characters directly from the keyboard of your computer (in this case an Osborne). Or you can send them from within a program (in this case Wordstar).

Direct from keyboard

I suggest this method for experimental purposes initially. Load your Wordstar disk and then return immediately to the operating system by typing X. The CP/M prompt A>_ is displayed on the screen. Now type ^P and <CR>. The printer should have jumped into action. From now on, everything you type at the keyboard will be sent to the printer. Let's tell it to print

everything in emphasised mode. Type <ESC> E <CR>. Some gibberish will appear on the screen and on the printer — don't worry about this. Now type ^P and <CR> again. This stops your typing being sent to the printer. Return to Wordstar by typing WS <CR> and away you go!

Anything you now print will appear in emphasised mode. Remember, by turning the printer off you set it back to normal. To select other print options, merely enter the correct sequence of characters instead of <ESC> E above. Table 1 gives the correct sequences to be sent for each different option. To choose one print option while using another, you first have to deselect the one in use. The simplest method is to turn the printer off or send <ESC> @ to initialise the printer.

Try experimenting with some combinations. In particular send the combination <ESC> S ^A <ESC> A ^F. This combination is ideal for those terms and conditions you don't want anyone to read!

The table also includes the sequence of characters which turns off the paper end detector. With this off you can feed single sheets through without that blasted buzzer sounding and the printer stopping half way down the page.

Direct from Wordstar

Of course, the ideal solution for a user of Wordstar and the MX80 would be the ability to select the printer's options while creating a document. Hence enlarged titles,

emphasised subtitles, condensed tables, etc, could all be chosen at will, to enhance the presentation of the text. We have seen how print options are selected and deselected by sending a unique sequence of characters to the MX-80. These sequences can be sent from within Wordstar and the ^P menu

Print Option	Keyboard Entry Sequence
Condensed	^D
Double Strike	<ESC> G
Emphasised	<ESC> E
Enlarged	<ESC> W ^A
Subscript*	<ESC> S ^A
Underline	<ESC> -
Line Heights	
6 lines per inch (default)	<ESC> 2
8 lines per inch	<ESC> 0
3 lines per inch (double spaced)	<ESC> 3 H
1.5 lines per inch (triple spaced)	<ESC> A 0
12 lines per inch	<ESC> A ^F
Other Options	
Initialise Printer	<ESC> @
Turn off paper end detector	<ESC> B

* Sadly you can't access the Superscript option directly from the keyboard, because you need to send <ESC> S ^A. Does anybody know a way of typing ^A on the Osborne?

Table 1: Direct keyboard entry sequences from the Osborne 1.

This is the normal default printing mode. Here the MX-80 prints at 80 cps and produces 6 lines per inch. This mode is usually used for fast draft printing.

This is condensed mode which will print up to 132 characters on A4 paper. It's jolly useful for financial reports.

These are double printed characters. They are different to WordStar ^PB characters because the printer offsets slightly on the second pass of the head.

This is emphasised printing. It gives an even stronger impression on the paper. The print speed is reduced to 50 cps.

This¹ line² demonstrates* true superscript printing.

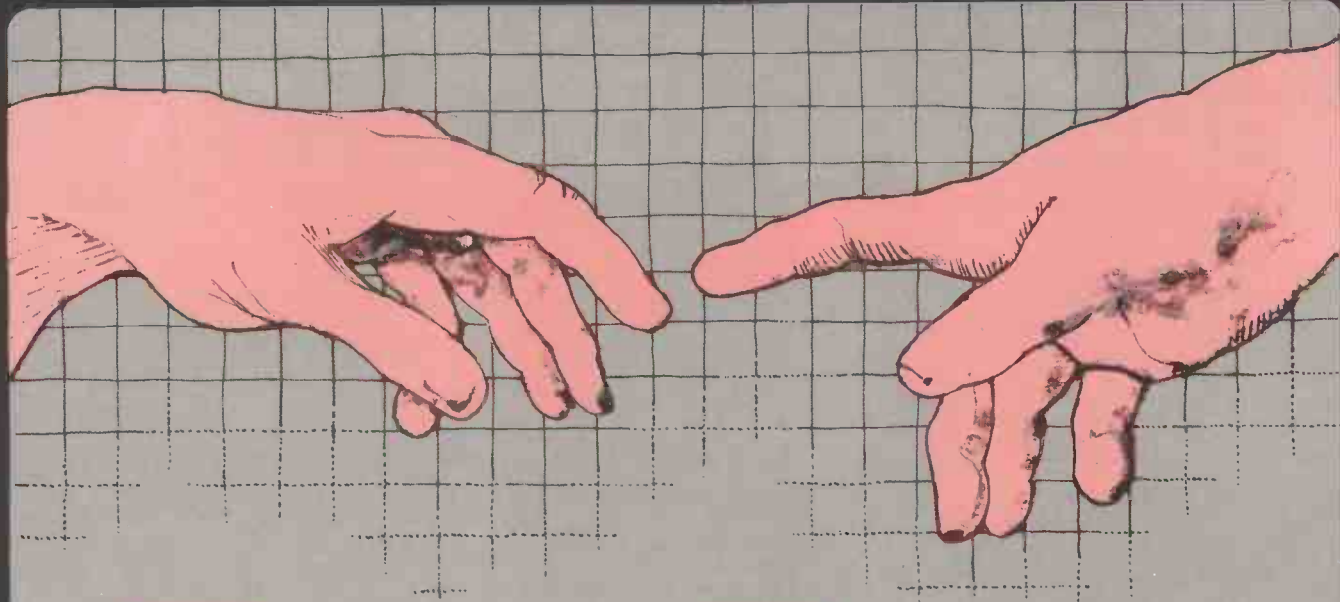
Some enlarged printing

The MX-80 has its own underlining facility. It provides a true underline instead of dashes and you don't have to fill in the spaces manually!

Most combinations are possible. One of the most interesting is Enlarged/Condensed. It produces 66 columns on A4 paper.

This is a combination of Double Printing and Emphasised. Find the dots in this one!

Fig 1 Some examples of MX-80 print options.



DATAFLEX™

SOFTWARE FOR CREATORS

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

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

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

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

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

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

transport completed applications to the 8086/8088.

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

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

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

Trademarks:

CP/M; Digital Research DataFlex; Data Access.

TURBOdos; Software 2000

OEM, SYSTEM HOUSE AND DEALER ENQUIRIES INVITED.

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

SING AND DANCE

holds the clue. Choosing one of the options from V through to R sends a unique sequence of characters to the printer! At the moment, they're not sending the sequences we want to send, but some of them we can easily change. MicroPro has made it easy for us to change Q, W, E and R. But you can also change V, T (these are not true sub/superscripts at the moment), Y (there is no alternative ribbon colour on the MX-80), A and N (there isn't really an alternative pitch either). I won't go into the reasons why, but the others are best left for the time being.

Ignore for the moment what the above

^P Option	Memory Address	^P Option	Memory Address
Q	06C9	Toggles	
W	06CE	Y (select)	06DD
E	06D3	Y (deselect)	06E2
R	06DB	T (select)	06BF
A	06B5	T (deselect)	06C4
N	06BA		

Table 2: Memory addresses for available ^P options.

Print Options	Select	Deselect
Condensed	0F	12
Double Strike	1B 47	1B 48
Emphasised	1B 45	1B 46
Enlarged	1B 57 01	1B 57 00
Subscript	1B 53 01	1B 54 1B 48
Superscript	1B 53 00	1B 54 1B 48
Underline	1B 2D 01	1B 2D 00
Line Height		
6 line per inch	1B 32	
8 lines per inch	1B 30	
1.5 lines per inch	1B 41 30	
3 lines per inch	1B 41 18	
12 lines per inch	1B 41 06	
Other Options		
Initialise printer	1B 40	
Paper end detector	off 1B 38	
Paper end detector	on 1B 39	

Table 3: MX-80 print options with the associated select/deselect HEX sequences.

0:	^PX0^PX
1:	<ESC>3H<CR>
2:	<ESC>A0<CR>
3:	<ESC>0<CR>
4:	<ESC>B<CR>
5:	^PQ^PE
6:	^PR^PW
7:	^PT^PA
8:	^PN^PT
9:	^OD

Table 4: Osborne 1 function key configuration.

KEYBOARD ENTRY				WORDSTAR SELECTION			
LINE HEIGHTS	SINGLE SHEET	STYLE	66	STYLE	66	SUPER BOLD	SUPER BOLD
DOUBLE SPACED	TRIPLE SPACED	8 LINES PER INCH	FEED	CONTROL DISPLAY	COMPUTER ZERO	ON - OFF	(8)
			-ON-	-OFF-	-ON-	-OFF-	

Fig 2 The Osborne function key template.

options are supposed to do. Just look upon them as sequences of characters being sent to the printer. By changing these sequences, we can decide what the relevant ^P menu options will be. I have decided that the easiest way to do this is by using DDT. For Osborne users, DDT is located on your CP/M utilities diskette. We are about to mess about with the Wordstar program itself. Don't do this on your master diskette. Make a copy.

Before we begin, there are some things we need to be aware of. Wordstar is stored on disk in hex code. One hex character is in fact represented by two normal characters. Hence 1B 00 2D 6C represents four hex characters. Each cell of your 64k memory has a unique address. These addresses are also represented in hex. Typical addresses might be 06DD 0799 and 06CF. DDT gives you the ability to:

1. Load a program into memory, putting each hex character into its own individual cell
2. Locate and change particular hex characters by telling DDT which cells they are stored in (the unique hex address) and
3. Write the modified program back to disk.

We are now going to change the sequences sent when options Q, W, E, R, A, N, V, T and Y are chosen from the ^P menu. It is important to note that the first six options send only one sequence to the printer whenever they are chosen. Option Y is a toggle. The first time it is used it sends one sequence to select the option. The second time, it sends another sequence which deselects the option. Options V and T are also toggles, but just a trifle more complex. They were originally designed to raise or lower the carriage of the printer half a turn. This gives somewhat compromised superscripts and subscripts. They work in conjunction with each other by sending the same sequences from the same memory addresses — only the opposite way round. V raises the carriage the first time it is chosen, and lowers it the second. Vice versa for T. We now have true superscripts and subscripts on the MX-80. There is no need to merely raise or lower the carriage, and I can't think of any two operations we could usefully combine in this way. We are stuck with only being able to use one of either V or T. The other is redundant.

Table 2 gives the start addresses of the sequences sent by the associated ^P options. Table 3 gives the sequences we need to send to select or deselect the associated MX-80 options. As an example, let's make ^PQ turn on emphasised printing and ^PW turn it off.

Load your CP/M utilities disk (drive A) and your copy of Wordstar in drive B. Type DDT B:WS.COM <CR>. The following message appears on the screen:

```
DDT VERS 2.2
NEXT PC
3F00 0100
```

(I don't know what it means either!) Now type S6C9 <CR> (the address is actually 06C9 but leading zeros can be ignored). The screen will now display what currently resides in this memory address. To change the sequence for Q we first enter the number of hex characters in the new sequence

^PQ	Condensed ON
^PW	Condensed OFF
^PE	Enlarged ON
^PR	Enlarged OFF
^PA	Emphasised ON
^PN	Emphasised OFF
^PT (select)	Double Strike ON
^PT (deselect)	Double strike OFF
^PY (select)	Underline ON
^PY (deselect)	Underline OFF

Table 5 Allocation of options.

and then the sequence itself. Type 02 <CR> (the number of characters) 1B <CR> 45 <CR> (the sequence). Type X <CR> to finish. The same goes for W. Type S6CE <CR> 02 <CR> 1B <CR> 46 <CR> and X <CR> to finish. ^C brings us back out of DDT to the CP/M prompt. To overwrite the changes on disk type SAVE 62 B:WS.COM. Now load Wordstar in drive A. Prepare and print a document using ^PQ and ^PW somewhere within. Exciting isn't it!

As we've discovered, the MX-80 is extremely versatile. To use all the options in Table 3 we would have to include 22 different sequences within Wordstar. We can include only 10, so some compromise is called for. Combining the information in Tables 2 and 3 with the above procedure will enable you to allocate the available ^P characters to the options of your choice. I found the decision of what to include and what not to include an extremely difficult one to make. I decided to opt for maximum flexibility, which meant choosing lowest common denominators. These basic choices could be combined to provide even further options with a few more key-strokes. I waved goodbye to superscripts and subscripts, as I would use these least of all. True MX-80 underlining was a must — this is so superior to broken dashes. Line heights I chose to control directly from the keyboard and outside Wordstar. Before printing, either single, double or triple-spacing can be selected. The same applies to configuring the printer for single sheets. Table 5 shows my final solution.

Wordstar also enables you to include an end of print sequence. This is located at memory address 06F8 and is normally used to set the printer back to its normal default values. I left this and used the scientific method (when in doubt, turn the printer off and back on again). Most of my work I prepare ragged right. I don't usually include page numbers. I never use hyphens at the end of a line and I find it useful to be able to produce computer zeros (0). You may also find it useful to use Wordstar with INSERT off. The following are the memory addresses and patches to produce a Wordstar with the necessary defaults.

Justification off	0386	00
Omit page numbers	03D3	FF
Hyphen-help off	0389	00
Insert off	0362	00
Strike-out character '/'	070B	2F

With reference to the Osborne, there is no need for words to wrap round at column 80. The computer has a unique, scrollable 128-column screen and the Osborne version of Wordstar allows you to edit documents up to 120 columns wide. Editing



SOFTWARE

FLEXIBLE SUPERFILE

Kathy Lang takes a look at a new CP/M-based data management system.

Superfile is another CP/M based data management system, constructed rather differently from most of those I've reviewed in this series. Instead of a fixed record structure, in which every record must have the same number of items of the same size even if in a particular record there are empty fields, Superfile uses a storage method which allows records to differ widely in structure within the same file. This is achieved by storing item names — called 'tags' in Superfile — with the associated value(s) within records. Such flexibility makes it more likely that you will be able to manage with just one file to hold all your data on one application — though for reasons of efficiency you may need to be more specific than is usual in Superfile about which tags you will most often use to retrieve data.

The adding of data items and tags can be achieved easily with this approach, so there is no need to copy a complete file if you simply want to add a data item. Since the records essentially have no structure, the need for copying files to change their structure does not arise either. The storage of tags within files also permits Superfile to use a compressed storage format, in which items with null values need not be stored, and this may save a lot of space (more than enough to make up for the space the tags take in the records) if you have ill-structured records. However, even if this trade-off does work in your favour, you will still need to consider some side-effects of this method of storage — for instance in the display of information from long items.

Superfile is itself simply a package for storing and retrieving data in a straightforward line-by-line format, with no formatting. It is complemented by Superforms, a form-design package, and Supertab, which allows the generation of formatted printed reports. All three functions are accessed by loading Superfile's overall control program, and then requesting the particular facility you need. Under this control program you can access all the CP/M commands except SAVE, so you can get directories of files, delete files and so on within Superfile. You can also create files of commands (which may be either Superfile or CP/M commands or a mixture of both) to be executed with a single SUBMIT command, just as in CP/M. This is important, as Superfile is a command-driven package and does not use menus, though Superforms and Supertab work partly through menus.

As well as the command-based access to Superfile, interfaces are provided to Microsoft Basic, to Whitesmith's C and to assembler; the supplier, Southdata, which is based in London, will write interfaces to other languages on request, I understand free of charge. However, I think a user would need to be an experienced programmer to understand the interfacing process. You would need a program to read in data

from outside Superfile, or to make connections between different Superfile data files.

Data access

All access to data, whether for reading or writing, is achieved either through the LOOK command or through Superforms. The LOOK command simply displays records by listing them on the screen, one item per line; for more sophisticated formatting one uses Superforms. Normally, all tag values are indexed; to index an item, Superfile takes the first word in the item of more than two characters, and reduces it to three characters, consisting of the initial letter and a phonetic representation of the remainder. Thus, in an item consisting of more than one word, you cannot choose to have other words indexed — you must split the item up so that any item to be indexed is the first or only word in an item. If the item contains only words of two or fewer characters, it has an index value of zero.

If you are using a large file of information, it is unlikely that the whole of such an index would fit into a micro's memory, and this would slow access down considerably. The user can increase the size of memory available to the index to the maximum available; if this still won't accommodate the index in memory, access times can be improved by reducing the size of the index so that it will fit. In Superfile this is achieved by the creation of minor indexes, each using only those tags needed for a particular use of the file. If necessary, this minor index file can be given the name of the standard index file, and will thus automatically be used by Superfile when accessing data, without explicit instructions. In this mode, Superfile's method of indexing works very similarly to packages like dBASEII which allows you to have several indexes in use at one time, although the ability to control the size of the memory available for indexing is unusual.

A tag may occur more than once in a record — for instance, if you store personnel records which may include two or three Christian names for each individual, you may use the same tag for each. So a request for people called John would find all those whose name was John whether this was their first, second or third name. This achieves with one request matches which in most packages require the combination of requests with OR (is XNAME1 equal to John or XNAME2 equal to John, or XNAME3 equal to John?) — which is just as well, as Superfile has no method of ORing requests for matching, and can only combine them with AND. All matching is 'case-blind', for instance, a request to match John would also match JOHN.

When data is added to data files, the index is not automatically updated. Updating occurs when the TIDY command is issued; TIDY reorganises the main index

and integrates all amended or added information in one operation. This can take some time. If required, TIDY can be used with a minor index instead of or as well as the main index. After information has been added, but before a TIDY is done, Superfile accesses new data by reading the file of new data sequentially.

Constraints

Superfile can handle files up to the CP/M maximum (currently 8 megabytes). The maximum record size is variable within Superfile; initially it is set at 1024 characters, but this can be changed by the user. A record may contain just one field if you wish, or it may contain up to 150 fields in the version of Superfile normally distributed to users; this limit can be changed by Southdata on request. The number of tags in one file is limited to 250, and this limit cannot be changed.

Data may be alphabetic or numeric in form; there is no special data format, so dates must be stored either as three separate items or in year/month/day order if comparisons are to work properly. Numbers are always stored in character format, but may be defined as integers, money numbers or fixed point numbers of a particular precision, and these definitions used to check data when inputting via the forms package.

File creation

The most common way of using Superfile is to have just one file containing all the data, since records do not have to be all of the same format. So, unless this pattern is inappropriate, the user does not need to worry about explicit file creation. To put data in a file, you must first use the LOOK command to set up tags for all those items which you will want to index. You can then simply type in a record using the LOOK command to set up tags for all those items which you will want to index. You can then simply type in a record using the LOOK command, or devise a screen form and fill that in with data. Records may be added, amended or deleted; deleted records may be restored provided you have not yet carried out a TIDY. Since the process, whether using LOOK or a form, is exactly the same for addition and amendment and for simple display, I shall describe it under 'Display'.

Displaying data

The LOOK command expects each new record to be typed in the form 'tagname=value tagname=value. . .'. Since this involves typing the tag name for each item in each record, you are unlikely to want to use this method for large volumes of data. The alternative is to design a form using the Superforms package. This involves supplying a caption and a data space for

each item; these can be anywhere on the screen. Then you are asked what tag, if any, to associate with each item in turn.

You can also indicate a wide variety of options, to be used when the form is displayed either to add records or to access them for updating or reading. These include the ability to restrict the value of a particular item to the elements of a list (for instance, to ensure that days of the week are filled in correctly), to validate an item to ensure that it lies within a particular range, and to calculate an item either from constants or from the values of other fields. You can copy from one field to another within a record, and you can specify a 'stay-put' value for a field to be constant across all records.

Items may appear on just one screen line; if an item has more than 80 characters less its caption, then another line can be used for the rest of the item and both lines given the same tag. However, in some circumstances such information may not be retrieved in the order in which it is stored, so you could have line 1 of an item appearing on the form after line 2 when the record is retrieved. This may happen when the user takes the option to store information in the compressed format, which takes advantage of the fact that items with null values do not have to be stored.

You may have as many different forms as you like associated with a single data file. Since a form may display a subset of the items in the records in the file, you can use one form for editing data and another for display. You can also use different forms for particular purposes — for instance using a form without confidential salary information for display to someone who is updating names and addresses.

The forms package is flexible and powerful, and has some very valuable features. However, there are some awkward features, such as the need to go back over each item in the form to specify the tag for each field. A more important limitation is the lack of any facility within Superforms for creating new tags — so you have to know which tags you want to use, and these must be first set up with LOOK before any forms are designed. When setting up my terminal to use Superforms, I was asked to provide information about the cursor movement keys, yet these were not available to me when setting up the form; I had to use CTRL/L to move the cursor left. CTRL/R for right and so on. In fact I never did find out why the set-up program wanted to know about my cursor keys. . .

Printed reports

Printed reports are set up by using another part of Superfile called Supertab. The report formats are designed on the screen in just the same way as forms are designed for screen display with Superforms, with the addition of a facility for showing how to design reports wider than 80 columns (up to 132) and with enhanced calculation facilities to give totals and sub-totals. The documentation I had on Supertab was a pre-release version, and I couldn't tell whether it is possible to divert a report for the printer onto the screen; without this, one cannot total information across records interactively, as there is no provision for memory variables without writing a program.

Selection

Records can be selected for display either by the LOOK command or by using a pre-designed form. Superfile uses indexed

searches where you specify an exact match (is Surname equal to Smith?) for items whose tags are in the index, otherwise a sequential search is used. A search with LOOK will, if prefaced by a pound sign, give the number of records matching the selection criteria. You can use wild codes to match partly-known item values; for instance, a request to find John* would match all surnames such as Johns, Johnson, etc (and also JOHNSON, since matching is case-blind).

A single-character wild code can be used where you are uncertain only about one letter; John? would only match Johns (or Johni). If you don't remember how to spell an item, you can use a 'sounds-like' facility, which will, for instance, retrieve Jons as well as Johns if you ask for names which sound like Johns. (Don't expect too much of this, though — three characters-worth is not very much to produce a reliable Soundex-type matching.) For numbers, you may ask for items which are greater than or less than a constant. If you don't remember which tag to use, you can leave the tag name out. But all these inexact searches must, of course, read every record and will therefore be slow for large files.

All selection terms are ANDed together, and only those records which match them all are selected. You cannot use OR or NOT to combine terms in selections.

No sorting facilities were provided in the release of Superfile I tested, although there are plans to include sorting in the Supertab package.

Calculations

Calculations can be performed within records as part of input or look-up, or across records as part of Supertab. You can use brackets to alter the order of evaluation, and the usual arithmetic operators with the standard precedence, although there are no numeric functions such as ABS or square root. If you use Superform's facilities for calculation within records you must be careful about the order in which you display items on a form if you want to use a calculated value for a field which is based on the value of a field which is itself calculated.

Security

Superfile files are 'lightly encrypted' so that you cannot display them with the CP/M TYPE command. Beyond this, there are no true security features, although a five-level password-operated control system is planned for future releases. You can of course provide some security by giving people access through Superforms to forms which display only part of each record — but you can't stop them using LOOK, and it's quite easy to find out how.

Tailoring

There is a setup utility to allow you to tailor Superfile to your terminal which actually uses the novel idea of testing out each terminal feature (clear screen, move cursor left, etc) as the user puts it in — other suppliers please copy! Within the package, you can tailor to some extent by creating files of commands to be executed using SUBMIT; thus allowing inexperienced users to be given exactly those forms or reporting methods desired. For more sophisticated tailoring, Superfile provides a series of procedure calls for use via Microsoft Basic and other languages, although I found the descriptions very difficult to follow without the

example program which was advertised in the Table of Contents. . .

Stability and reliability

I did manage to abort once with CTRL/C (though only back to Superfile's control level). I have also talked to a user who had some problems with reliability some months ago but who is now happy with his package. There are, though, some features which should help with data file integrity — for instance the file is automatically closed and re-opened after each write operation.

User image

The user image of the software itself I found reasonably straightforward, though there were some less pleasant features — for instance the use of arbitrary item names within Superforms to compensate for the fact that a tagname may appear more than once within a record. However, this straightforwardness was recognised only after a long and dour struggle with the manual, and with the help of the demonstration program, which as usual tells as much by example in five minutes as most manuals tell you in five hours. The manual is as unstructured as the records in the Superfile data file. Its level of treatment varies from the simplistic to the highly technical even within a single page, it has no index, and the standard of proofreading is appalling.

A particularly unhelpful instance of the last mentioned problem occurs when describing Superforms; this program uses a module called CFORMS to create forms and a module called FORMS to display information using forms. The first line of the CFORMS chapter reads 'To load FORMS, enter SUPERFILE [sic] (s1.1) and type "FORMS". . .' Needless to say, it doesn't work like that (perhaps it would be even worse if it did). However, the lack of proofreading also provided a little relief — where else would you find that 'The detail of interfacing Microsoft Basic 80 to Superfile [sic] is handled automatically. . .'

Costs

Superfile costs £175 alone, and Superforms and Supertab cost £75 each; these are all single-user versions. A multi-user version is also available for £800. I should have liked the opportunity to try that out, as there are very few true multi-user data management systems around.

Conclusions

At £325 for the total package, Superfile is pretty competitive with those file management systems, such as DMS and dBASEII, which use a more structured approach but have a wider range of facilities; while Cardbox, which also uses an unstructured approach but which can't do calculations, costs only £155. There are a lot of good ideas in Superfile, and if you have data which doesn't have much structure and if you can cope with the limitations I've described (especially the manual), then it would be well worth investigating. I should add that as yet I've only been able to test the demonstration version, with a maximum of 20 records, so potential buyers should, as always, make sure they see the package tested on a sizable file. Finally, the originator and supplier, Southdata, is a London based British company, which may make for better support than some.

END

1982 FEATURES INDEX

The complete list of PCW's features for the year.

BENCHTESTS

ACT Sirius	5-2
Apple III	5-3
BBC Micro	5-1
Canon CX-1	5-11
Casio fx 9000p	5-2
Dragon 32	5-8
Epson HX-20	5-12
Exleigh Expert	5-8
Gemini Multiboard	5-2
Hewlett Packard HP-125	5-3
Hewlett Packard HP-86	5-10
Hewlett Packard HP-75C	5-11
Hitachi Peach	5-5
Mimi 801	5-7
Monroe OC 8820	5-4
Newbrain	5-7
Olivetti M20	5-9
Positron 9000	5-10
Sharp MZ-80A	5-6
Texas Instruments 99/4A	5-3
Xerox 820	5-1
ZX Spectrum	5-6

CHECKOUTS

DCP Speech Pack	5-8
Frequent	5-2
Microwriter Revisited	5-9
Motorola MC68000	
Educational Board	5-12
Pluto Board	5-12
Robocom Bit Stik	5-11
Sid 1	5-4
Walters 100 Printer	5-12
Watanabe Plotter	5-2
ZX Printer	5-1

PROGRAMS

Apple Letters	5-1
Apple Lifespan	5-8
Apple Pianocomputer	5-11
Apple Maze	5-5
Apple Trees	5-8
Atari Colour Selector	5-12
Atari Earth	5-7
Atari Sums for Kids	5-5
Atari Walls	5-10
BBC Breakout	5-6
BBC Music Player	5-9
BBC Radar	5-9
Cromemco Personality Test	5-2
Microtan 3D Rotation	5-5
Moon Module	5-11
MZ 80K Area Filling Curve	5-11
MZ 80K Catch	5-5
MZ 80K Fortune	5-1
MZ 80K Tarot	5-6
The MZ 80K Next to Last	5-6
One	
Nascom Business Docs	5-3
Nascom Snail Racing	5-8
PC 1211 Exam Questions	5-2
Pet Boot the Cat	5-4
Pet Boxes	5-7
Pet Cheese	5-2
Pet Doc	5-7
Pet File Comparison	5-9
Pet Firebird	5-12
Pet German Game	5-9
Pet Haemophilia Simulation	5-2
Pet Knockout	5-10

Pet Letter Writer	5-11
Pet Mini Animate	5-5
Pet Mopup	5-10
Pet Search and Rescue	5-12
Pet Stockmarket	5-5
Pet Trains	5-10
Pet Virus	5-9
RML Restore	5-11
Teepee Textpro	5-12
TRS-80 Cardshuffle	5-9
TRS-80 Screen Dump	5-7
TRS-80 Quadrangle	5-8
UK101 Conversion of Units	5-8
UK101 Crossword Notepad	5-5
UK101 Logic	5-11
UK101 Long Multiplication and Addition	5-8
UK101 Screen Converter	5-7
Vic 20 Large Characters	5-6
Vic 20 Trailblazer	5-6
Video Genie Extended Basic	5-9
ZX 81 Alphabetising	5-9
ZX 80 Book Index	5-5
ZX 81 Graphplot	5-3
ZX 81 Hypocycloids	5-7
ZX 80 Labyrinth	5-1
ZX 81 Resistor and Res Code	5-4
ZX 81 Star Trek	5-10

SERIES

Frames of Reference	5-1, 5-2, 5-3, 5-4, 5-5, 5-6
P for Perfect?	5-7, 5-8, 5-9
Patterns	5-1, 5-2, 5-3, 5-4, 5-5, 5-6
One Bit at a Time	5-8, 5-9

CALCULATOR CORNER

Breaking Password Protection on the fx602p	5-8
Calculator Benchmarks	
Defended	5-1
Casio fp10 Printer and Procos Reviewed	5-4
Casio fx602P Quirks	5-5
HP15C and HP16C Reviewed	5-9
I'm Programmable, Fly Me!	5-2
News on Hewlett Packard	5-3
PC1211 Complex Arithmetic	5-12
Programming Hints for the PC1211	5-10
Programs for HP-41C and fx702p	5-11
Sharp PC 1500 Reviewed	5-6
TI's Programmable Calculators	5-7

PROGRAMMING IDEAS

Algy — algebra checking	5-11
Anatomy of the BBC Micro	5-7
An Intelligence Test for Computers?	5-12
Beeb Colour Hi-Res	5-9

DIY Logo	5-9
Getting to the Roots	5-5
Inside the Interpreter	5-1
Making a Hash of it	5-10
Number Crunching	5-1
Pouring Quarts into Pint Pots	5-6
Screen Forms	5-4
Stereo Graphics	5-10
There's a hole in my Apple	5-9
3D Made Easy	5-5
Writing the Small Print	5-11

DATABASE BENCHTESTS

Aquila	5-9
Cardbox	5-8
Comsoft DMS	5-3
Condor	5-11
Database Comparison	5-12
DBASE II	5-5
DBMS2	5-6
FMS-80	5-4
Personal Pearl	5-10
Silicon Office	5-7

OPINION & REPORTS

Chess (3rd European Micro Championship Report)	5-12
Choosing a Database	5-3
Commons Report	5-3
Computer Bores	5-5
CP/M-86 v MSDOS	5-12
Data Dabbling	5-10
DEC Rainbow — Preview	5-11
5 Out of 10 — Micros in the Classroom	5-7
Interrupt (David Tebbutt on Computer Literacy)	5-7
Is BBC Basic Structured?	5-4
Microcomputer Databases	5-1
NCC Show Report	5-8
PCW Show Report	5-11

Protective Measures	5-11
Read All About It — Spectrum Books	5-12
7th West Coast Faire Report	5-6
Sony SMC 70 Preview	5-8
The Man Behind the West Coast Faire	5-2

SCREENPLAY

Acorn Atom	5-11
Apple II	5-7
Atari	5-5
TRS-80 Colour	5-12
TRS-80 Mod III	5-5
ZX81	5-8, 5-9

LANGUAGES (& BENCHMARKS)

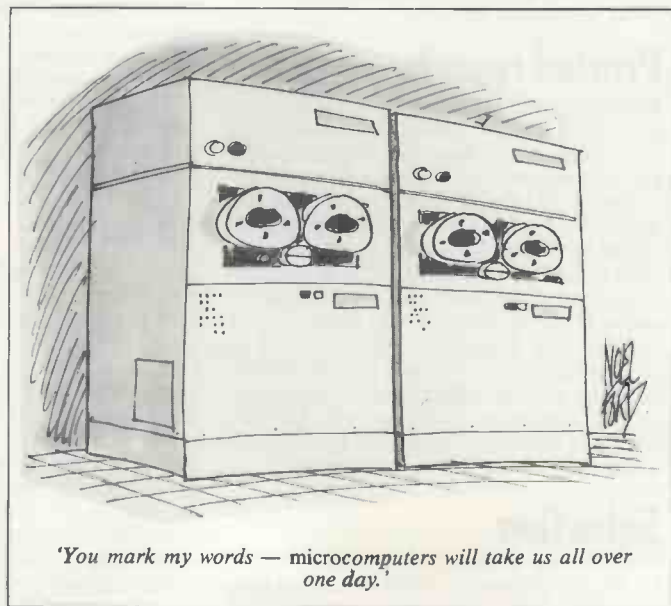
Ada	5-12
ANSI Basic	5-2
Benchmark Summary	5-11
Comal	5-4
Lisp	5-6
Logo	5-4
Pascal Roundup	5-5
The Ultimate Test	5-10

SOFTWARE REVIEWS

Computer Scrabble	5-12
E40 Data Compression	5-9
Scriptit 2.0	5-2
Select Word Processor	5-9

HARDWARE PROJECTS

Clock it to me	5-10, 5-11
High Density VDU Card	5-2, 5-3, 5-4
March to a Different Drummer	5-1



If you are about to make an important decision in computers

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

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

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

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

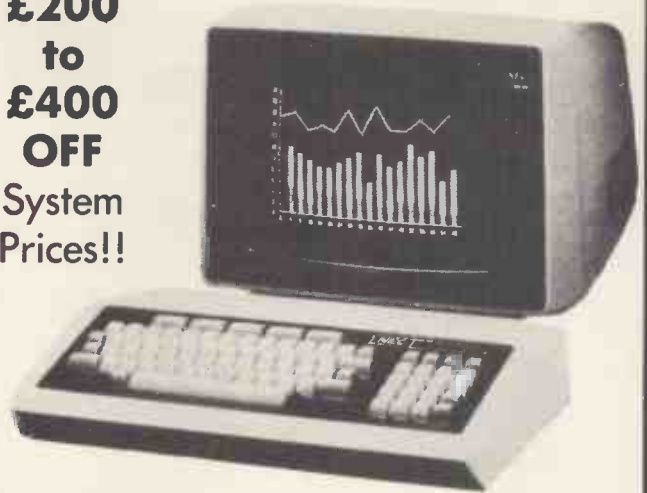
MICROFRAME FROM THE TYCOM CORPORATION



"THE FIRST OF THE 4TH GENERATION"

NEC PC-8000!

**£200
to
£400
OFF
System
Prices!!**



PRICES DOWN! Removing the middle man has saved hundreds of pounds on system prices – phone now!

- KEYBOARD UNIT:** * Z80A processor (4 Mhz).
- * 32k RAM + 24k ROM MICROSOFT EXTENDED DISK BASIC. Screen editor, resident monitor, 8k ROM slot.
- * 83 key qwerty keyboard with N-KEY ROLLOVER for fast typists. Auto repeat on all keys. Numeric keypad.
- * 36 to 80 screen width, 20/25 lines, 8 colours/shades. SCROLLING AREA control, function key display.
- * SINGLE or DOUBLE PRECISION (16 significant digits), INTEGER, HEX. Maths/Greek character set.
- * TERMINAL OPTION with built-in RS232 INTERFACE.
- * 15 character FUNCTION KEYS, VECTOR/PLOT/ARRAY graphics.
- * Parallel & RS232 I/O to 4800 baud, 600 baud cassette I/O.

**JAPANESE QUALITY
AND RELIABILITY**

£397 (DOWN £202)

- EXTRAS:** * 12" Green Monitor: £127. (DOWN £32)
- * 12" top defn RGB Colour Monitor: £469. (DOWN £110) – true 80 chars, not to be confused with inferior types.
- * Expansion boxes – extra 32k RAM, interrupts:–
(A) + 2 syn/asyn RS232 + IEEE 488 + 4/8 bit I/O: £351;
(B) + 6 slots for RAM up to 192k or A/D etc: £362.
- * Dual 5 Inch floppy disks – 2 x 160k: £603, 2 x 320k: £907.
- * DUAL 8 INCH – 2MB: £1375. HARD DISK 5MB: £1995.
- * 100 cps bi-directional logic-seeking dot matrix printer, 14 styles including proportional & graphics: £393.

32k BASIC system, 2 x 160k disks, green/colour	p.o.a.
64k CP/M 2.2 system, 2 x 160k disks, green/colour	p.o.a.
64k CP/M 2.2 system, 2 x 320k disks, green/colour	p.o.a.
64k CP/M 2.2 system, 2 x 1MB disks, green/colour	p.o.a.
64k CP/M 2.2 system, 2 x 1MB floppies 5MB hard disk	p.o.a.

NEC NETWORK SYSTEM NOW AVAILABLE

Brighton Computer Centre

130 Lewes Road, Brighton BN2 3LG
(0273) 688946 Mon-Sat 10am-6pm

Please send me further details of the NEC PC-8000 series.

Name

Address

.....

..... Tel

Application.....PCW1.83



WE WISH YOU A MERRY CHRISTMAS. AND

The microcomputer is a Santa Claus machine that will speed up the world's productivity.

And end the recession forever.

Unfortunately, not all the machines on the market are up to this historic task. Fortunately,

there's the iotec 'iona,' with 64K of available memory built-in.

It's expandable to an unbeatable 960K. And it has the unique, quick-start 'io' key that makes it easier to use than any other microcomputer.



OFFER YOU A PROSPEROUS NEW YEAR.

The 'iona' is also the only machine in its class to offer colour as standard.

All this intelligence comes gift-wrapped in a professionally-designed metal cabinet. Inside and out, it's the best microcomputer you can buy.

Contact us for the address of your nearest iotec dealer.

And have a very prosperous new year.

IO TECHNOLOGY PLC, 4 PLAYHOUSE YARD, BLACKFRIARS LANE,
LONDON EC4V 5EX. TELEPHONE 01-248 4876.

TJ's WORKSHOP

Our monthly pot-pourri of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to 'TJ's Workshop', PCW, 62 Oxford Street, London W1A 2HG. Please keep your contributions as concise as possible. We will pay £5-£30 for any tips we publish.

PCW can accept no responsibility for any damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.

BBC RESTARTER

Although the BBC micro has no equivalent of the Microsoft command CONT, restarting a program which has been halted (eg, by accidentally hitting the 'escape' key) can be achieved by using GOTO.

I do not know what restrictions apply to this, but certainly if only the variables A% through Z% are used there is no reason why it should not work. Indeed I have experienced no problems in restarting programs using other variables; however I do not know how lucky I have been in this.

Nicholas Phizackerley

ATOM VARIABLE LISTER

This simple program will print out the values of the integer variables A-Z, and will wait for a key to be pressed before returning to the main program.

Before entering it, type ?18=#28, and type this if you press BREAK while entering it. To save it onto tape, use *SAVE "VAR LIST" 2800 28F0. To use the program, *LOAD it from tape, and insert the following into the program you are debugging: ?18=#28;GOS.10, when you want a list of variables.

The program works by placing the four bytes which form each variable in locations 541 to 544, and printing them out as a vector.

Note that extra spaces must not be inserted into the program, as it must stay shorter than 256 bytes to avoid clashing with the normal text area.

Mike Harrison

```
10?545=0
200=12
40?540=0
50?540=?540+1
60?541=(?540)?801
70?542=(?540)?828
80?543=(?540)?855
90?544=(?540)?882
100P,*(64+?540)"="
110P.!541" "
120IF?540<265.50
1300=?545
125P." " PRESS ANY
KEY TO RETURN"
137LINK#FFE3
140?18=#29:P.
```

SPECTRUM LOOK-UP TABLE

The Spectrum Basic includes the READ, DATA and RESTORE verbs. The manual only shows RESTORE followed by a line number — however it will in fact accept an expression. This provides the basis for a fast and economical table look-up technique. The following example illustrates the method.

50 REM month table look-up
101 DATA 31, "January"
102 DATA 28, "February"
103 DATA 31, "March"
104 DATA 30, "April"
105 DATA 31, "May"

106 DATA 30, "June"
107 DATA 31, "July"
108 DATA 31, "August"
109 DATA 30, "September"
110 DATA 31, "October"
111 DATA 30, "November"
112 DATA 31, "December"
200 INPUT "Month number?";mm
300 RESTORE mm+100
400 READ dd,a\$
500 PRINT "There are "; dd; "days in "; a\$
600 GOTO 200

The line numbers of the DATA statements are arranged so that a simple expression can relate the

required DATA statement to the month number. Statement 300 uses this expression to set the READ pointer so that statement 400 retrieves the corresponding days in the month and month name.

The technique is especially useful with tables containing mixed data types, and variable length strings, as shown. Considerable space and effort are saved over the traditional method of setting up dimensioned arrays.

Mike Kerry

VIC IN HIGH-RES

Here is a tip for anybody with a VIC computer who wishes it had high resolution graphics. The solution to this problem is to redefine the character set to include the patterns required. Normally, the character definition table is held in ROM, and consists of 256 8-byte entries (one for each character), each bit corresponding to one pixel in an 8 by 8 grid. The best way to explain this is by using an example: let's take a Space Invaders character. This fits on to the grid as shown. Thus the code for this character is: 60,126,219,255.102,60,66,129

Of course, this wouldn't

help much, except that by poking location 36869 (one of the registers in the VIC chip), the computer can be made to expect the character table to be in RAM. The precise details are:

CONTENTS OF LOCATION 36869
252
253
254
255
ADDRESS OF CHARACTER TABLE IN RAM
4096
5120
6144
7168 *special setting*

The address shown is the starting address of the table, which in the first three cases would be 2k long. The value

255 is a special setting which allows the first 128 characters to be defined by the user, but which keeps characters 128 to 255 as the usual first 128 characters (ie character 128 is '@', character 129 is 'A', etc).

So, to set up your own character set, POKE the table into memory at one of the above addresses, then POKE the location 36869 with the correct value, and afterwards the new characters can be printed just as if they were the originals.

This is the trick by which all the fancy VIC games provide such good graphics, and I hope that PCW readers will find it just as effective.

Nicolas Weeds

BYTE	BIT								
	7	6	5	4	3	2	1	0	
1			*	*	*	*			00111100 binary = 60 decimal
2		*	*	*	*	*	*		01111110 binary = 126 decimal
3	*	*		*	*		*	*	11011011 binary = 219 decimal
4	*	*	*	*	*	*	*	*	11111111 binary = 255 decimal
5		*	*	*	*	*	*		01100110 binary = 102 decimal
6			*	*	*	*			00111100 binary = 60 decimal
7		*					*		01000010 binary = 66 decimal
8	*							*	10000001 binary = 129 decimal

ATOM HI-RES POINT TESTER

This short subroutine will test the state of any point on the mode 4 hi-res graphics screen. The variables X and Y are used to pass the co-ordinates of this point to the subroutine, and the variable P is set to 1 if the point was set, and 0 if it was clear (black).

Mike Harrison

```
1 DIM A$(8);A$(0)=1;FOR W=1 TO 8:A$(W)=A$(W-1)*2;NEXT W
2
3 REM MAIN PROGRAM TO BE INSERTED HERE
4
98 REM SUBROUTINE STARTS HERE
99
100 H=((191-Y)*32)+#8000+(X/8)
110 Z=7-(X/8)
120 P=(?H)&(A$(Z))
130 P=(P<>0)
140 RETURN
```

SPECTRUM FLASHY LISTINGS

It is not widely known that ZX Spectrum listings can incorporate colour commands (and indeed OVER and BRIGHT) as well as INVERSE VIDEO. I suspect that this feature is a happy accident of the machine's logical structure for these attributes — but it allows you to produce pretty listings!

The entrance to those effects is to go into extended mode (E) after the line number. You can do this at any stage — on first entering the line, or when using EDIT. We then employ the number keys, shifted or unshifted to get the effects:

These data are set out on Pages 114/5 of the User Guide. The best way to explore them is to set up a little program of a dozen or so REM statements. Once you get the hang of the above, investigate these ideas:

- Inserting more than one such code after a given line number.
- Inserting one or more at the end of a line.
- Adding a REM message in inverse in one line, and using ENTER without returning first to TRUE VIDEO.
- Inserting these codes within the REM message.
- Doing the same with a

PRINT statement.

f) Seeing the effect of resetting PAPER and INK by direct commands before listing. And even INVERSE 1 and/or FLASH 1.

Try RUN occasionally of course — strange that such flashy listings have little effect on the display when the program is executed!

After a while playing around with these ideas, you should see lots of uses. These include:

- producing an invisible listing (even when EDIT is attempted);
- highlighting REM or other statements, perhaps to remind you to check something later;
- highlighting whole sections of program.

One little note — although (unlike the case of the BBC computer), these control characters do not take up screen space they *do* take up memory. In fact each E-mode numeral code takes two bytes, the same as if got direct from the keyboard.

How to restore normality and what happens if you POKE out a REM, I'll leave to you. But the Spectrum's flashy listings must be unique.

Keith Jammer

Key	Unshifted makes listing	White shift gives
0	black paper	black ink
1	blue paper	blue ink
2	red paper	red ink
3	magenta paper	magenta ink
4	green paper	green ink
5	cyan paper	cyan ink
6	yellow paper	yellow ink
7	white paper	white ink
8	normal brightness	flashing off
9	bright	flashing on

SPECTRUM SCREENS

When writing interactive graphic games for the ZX Spectrum one often has difficulty when using user defined graphics (UDG) because the SCREEN\$ function returns the empty string.

I have written a small machine code subroutine which compares a character on screen with the characters stored in ROM (as SCREEN\$ does) and RAM (ie, UDG).

To use the subroutine type and RUN the program given (48k Spectrum owners may wish to change lines 1 and 10

to load the sub-routine higher in RAM). The variable P must be declared before any variable or string in the program as the sub-routine assumes it to be there.

To PEEK a given position load the variable P (which must always be a whole number) with the screen position to be tested, then call the sub-routine — ie, LET p=row*32+column: LET x=USR Peek. The value returned to x is the code of the character at the given position. Character codes 32 to 127 and 144 to 164 are recognised. Sinclair graphics codes 128-143 are not recognised — but if required UDG can be programmed to Sinclair graphics.

PET DO-UNTIL

Most programmers are concerned about making well-structured programs. In Basic, structuring is very difficult as the language lacks the required control commands.

This program for the PET with Basic 3.0 gives a DO/UNTIL structure. It resides in the second cassette buffer and has full error checking. DO/UNTIL may be nested to any degree so long as there is sufficient space on the stack.

To enter the program, type SYS 1024 to get into the monitor, then type, after the full stop prompt, code in Table 1. After the colon there is a double space, but all the other spaces are single.

The code may be saved on tape using a save command in the form S"DO/UNTIL",01,033A,03FA. To initialise the routine, type: 0079 4C 3A 03 — not forgetting the double

space after the colon. To disable the routine use: 0079 C9 3A B0.

Using the structure is simple. Its basic form is DO: (instructions): UNTIL (number). The instructions are carried out at least once, but are repeated if the number after UNTIL is zero. The number may be a constant, variable, function or condition.

Remember that a condition that is true returns -1, and one that is false returns zero. An example of a condition in a DO/UNTIL loop is DO: GET A\$: UNTIL A\$="X". The action is obvious from reading the code.

So much for DO/UNTIL — but has anyone got a routine for a proper IF/THEN/ELSE?

J D Slodznik

:	033A	C9	44	F0	16	C9	55	F0	12
:	0342	C9	3A	B0	0A	C9	20	F0	4C
:	034A	38	E9	30	38	E9	D0	60	4C
:	0352	70	00	BA	BC	01	01	00	F9
:	035A	D0	E6	C9	55	F0	2D	A0	01
:	0362	B1	77	C9	4F	F0	04	A9	44
:	036A	D0	D6	A9	03	20	1B	C3	68
:	0372	A9	F9	48	A5	79	48	A5	77
:	037A	48	A5	37	48	A5	36	48	A9
:	0382	85	48	20	70	00	20	70	00
:	038A	4C	FA	C6	BA	BD	03	01	C9
:	0392	85	D0	45	A0	04	B1	77	D9
:	039A	CA	03	D0	A4	88	D0	F6	A0
:	03A2	05	20	70	00	88	D0	FA	20
:	03AA	9F	CC	68	68	68	A5	5E	F0
:	03B2	07	68	68	68	68	4C	0E	C8
:	03BA	77	68	85	78	4C	53	03	3F
:	03C2	77	68	85	78	4C	54	03	3F
:	03CA	55	4E	54	49	4C	20	57	49
:	03D2	54	48	4F	55	54	20	44	4F
:	03DA	46	0D	A5	0E	F0	07	20	CC
:	03E2	FF	A9	00	85	0E	20	E2	C9
:	03EA	A2	00	BD	C9	03	20	45	CA
:	03F2	E8	E0	11	D0	F5	45	77	C3

Any unrecognised character returns a '0'. A '1' is returned if there is an error in p (ie,

too large or not a whole number).

Gerard A Allan

1311	209113	JSR	1391
1391	AD0302	LDA	1399
1394	F003	BEQ	1399
1396	4CEBFF	JMP	FCEFE8
1399	20EAF8	JSR	FCEA
139C	C91C	CMP	=1C
139E	D013	BNE	1383
13A0	A908	LDA	=08
13A2	20EEFF	JSR	FFEE
13A5	A920	LDA	=20
13A7	20EEFF	JSR	FFEE
13AA	A908	LDA	=08
13AC	20EEFF	JSR	FFEE
13AF	68	PLA	
13B0	68	PLA	
13B1	A95F	LDA	=SF
13B3	60	RTS	

GENIE LOWER CASE

Users of the Video Genie will know how it signs up with 'READY?' instead of the more usual 'MEMORY SIZE' question. Also the screen scrolls 26 times instead of giving the message 'RADIO SHACK LEVEL II BASIC' which is usual with the TRS-80. A special message or owner's name could replace the second message — possibly for security.

Genie owners will know that even if their machine has the hardware mod for lower case they still have to load a lower case driver, or call the driver in the extra ROM at 3000H. Embedded in the print routines in the Genie ROM there is a test for lower case characters; lower case characters sent to the ROM print routines are automatically converted to upper case before being displayed. If this test could be removed then upper and lower case could both be displayed without another VDU driver.

There is no control key on either the TRS-80 or Genie, however the SHIFT↓ keys may be used as an alternative,

but there is a problem. Every time SHIFT↓ is pressed CHR\$(26) is generated before the required control code; this is because SHIFT↓ generates control-Z on its own. In the ROM there is a table of ASCII values for the non-alphanumeric keys such as BREAK, CLEAR, ↓, etc. In the table the value for SHIFT↓ is 1AH or 26 (ie, control-Z) — if this were changed to 00H (ASCII null) then the erroneous control-Z would not occur.

All of the above modifications require changes to the first ROM (0000H — 0FFFH); this may be done by replacing it with an appropriately programmed 4k EPROM (eg 2732 or 2532). Some EPROMs are not pin for pin compatible with the ROMs fitted, and in this case one or two address lines may have to be moved.

Below is a table of the locations that require alteration.

M J Tubby

Table of alterations to Video Genie ROM 1

0059 1A		;Old location's contents
		;ASCII value used for SHIFT
0105 52		;'R'
0106 45		;'E'
0107 41		;'A'
0108 44		;'D'
0109 59		;'Y'
010A 00		;Null characters
010B 00		;
010C 00		;
010D 00		;
010E 00		;
010F 00		;
0110 00		;Message terminator
0111 0D		;Sign up message 26 times carriage return
0112 0D		;on Genie, or 'RADIO SHACK LEVEL II BASIC'
		;on TRS-80
012A 0D		;Last of message characters
012B 0D		;Carriage return
012C 00		;Message terminator
0471 FE 40	CP 'A'	;Test with letter A
0473 38 08	JR C,047DH	;jump to print if not alphabetic
0475 D6 40	SUB 40H	;subtract 64, make alpha in range 0-26
0477 FE 20	CP 20H	;test if lower case
0479 38 02	JR C,047DH	;jump to print if upper case
047B D6 20	SUB 20H	;convert lower case to upper case
047D CD 41 05	CALL 0541H	;print next character on VDU
0059 00		;New contents
		;ASCII Value for null
0105 - 010F	inclusive	;message 'Memory size'
0110 00		;message terminator
0111 - 012A	inclusive	;message ' EG3008-II Basic L2
		;or any message upto 26 characters long
		;e.g. Name & Telephone no.
012B 0D		;Carriage return
012C 00		;message terminator
0471 00	NOP	;No operation, i.e. ignore lower case conversion
0472 00	NOP	;
0473 00	NOP	;
047C 00	NOP	;
047D CD 41 05	CALL 0541H	;print next character on VDU

BBC 'BAD PROGRAM' FIX

If you have trouble loading tapes, perhaps because of dropout or some other gremlin, or write programs which go crashing through the Basic buffer and bring up the message 'Bad Program', you are then in a situation where most of the program may be intact but you can not LIST because the Bad Program flag will not go away. If you wish to recover at least something, then try typing the following as a command line — ie, one without a line number. (Any lines starting with a number would be fatal at this stage).

```
A=&E00:REP.B=A?3:
IFA? B=13 A=A:B:
U.0 ELSEU. TRUE: A?B=13;
A?(B+1)=255<RETURN>
```

When the prompt returns

```
type: END <RETURN>
```

You should then be free to LIST the remaining if slightly corrupted, part of the pro-

gram. If the prompt fails to return after a few seconds, no harm will have been done — do not despair, just press ESCAPE and the dreaded 'Bad Program' will reappear.

Now type:

```
A=?E04:REP.A=A+1.?A=
13:P. A-&E00<RETURN>
```

If, for example, this returns the value 61 then type: !?E00=!6101000D <RETURN> and try the kludge again. All will now be well, but make sure you fix any subtle errors which may have occurred in the listing before RUNNING it.

David Julien-Waring

ZX SPECTRUM BUG

I recently had the rather dubious honour of finding what I believe to be the first ZX Spectrum software bug (you'd be lucky — Ed). I stumbled across it when writing a short routine for a friend to extract the hundreds, tens and units from a three digit number. The routine was as follows:

```
10 REM X=3 DIGIT
NUMBER
20 LET u=x-INT(x/10)*10
30 LET h=x/100
40 LET t=INT((h-INT
h)*10)
```

```
50 LET h=INT h
60 PRINT "Hundreds=";h;
"Tens=";t; "Units=";u.
```

The routine works fine until $h-INT h=0.1$, eg, when $x=410$. The Spectrum is therefore evaluating $INT(0.1 * 10)$ as zero instead of one. The way to get round this is

to amend line 40 to:

```
40 LET t=INT
(.01+(h-INT h)*10)
which will ensure that the
value is rounded up. Such a
'fudge' is irritating and should
have been unnecessary.

```

Another Spectrum quirk but in this case useful is demonstrated by:

```
PLOT 128,87:DRAW
20,20,780
```

which will 'fill' a circle. Other high values for the third DRAW parameter give equally unusual results. Setting OVER also makes for an interesting effect.

Larry Carasco

SPECTRUM RAM OCCUPATION

I have found a way to find how much memory your program and variables are taking up in RAM. Also I have found a way to create an untouchable line (useful for copyrights). Both these routines are for the ZX Spectrum. To find out the memory used, type in PRINT (PEEK 23641+256*PEEK 23642)-(PEEK 23635+256*PEEK 23636). To get an untouchable line, first type in the line you want

at line 1 (like 1 REM (C) M. SANDERSON 1982) then as a direct commend type POKE (PEEK 23635+256*PEEK 23636)+1,0. This will give you a line 0 which can not be taken out or edited in the usual way.

Mark Sanderson

ATOM 'BEEPTAPE'

A considerable frustration for many Atom owners is the lack of a useful 'end of operation' indicator for cassette loading and saving. The only present indication of successful completion is the all-too-silent, and easily overlooked, re-emergence of the screen cursor.

This routine cures the problem by providing an audible 'beep' signal on completion of load and save operations, which repeats until a key is pressed. For good measure, a clearer, visual indication is also provided in the shape of the inverse-video message, 'END OF TAPE TRANSFER'.

To assemble the program, simply type "RUN". I recommend assembling the code starting at #2800, out of the way of normal Basic text space. However, line 90

allows an alternative starting address to be entered, if desired. The program automatically advises you how best to save the machine code (see line 370). Line 380 tells you how to re-initialise the new operating system vectors, which needs to be done should you press BREAK. These vectors are automatically initialised for you if the assembled machine code is loaded using the '*RUN' command.

To appreciate the benefit of this small routine, try it the next time you perform a long LOAD or SAVE. Instead of developing square eyes waiting for the re-emergence of the screen cursor, you can safely get on with something more useful, like writing your next masterpiece!

V. Fojut

```

10 REM*****
20 REM "BEEPTAPE"
30 REM ATOM O.S. PATCH FOR AUDIBLE
40 REM 'END OF LOAD/SAVE' INDICATION.
50 REM (C) V.FOJUT, 1982.
60 REM*****
70 DIM LL3, L1
80 FOR N=0 TO 3: LLN=-1: NEXT N
90 INPUT "ASSEMBLE FROM (HEX) " S
100 INPUT "LIST ASSEMBLY (Y/N) " $L
110 FOR N=1 TO 2
120 IF $L="N" PRINT #21: REM SUPPRESS LISTING
130 P=S: REM SET UP CODE POINTER
140C
150 :LL0 JSR #F96E \LOAD FILE
160 :LL1 JSR #F7D1 \EXECUTE CONTROL CODES
162:REM \& PRINT FOLLOWING STRING
164 !P=#D07:P=P+2 :REM CARR.RET. & "BEEP"
166 @P="end of tape transfer"
168 P=P+LEN(P):REM \REALIGN "PROGRAM COUNTER"
170C NOP \END OF STRING MARKER
180 JSR #FE71 \KEY DOWN?
190 BCS LL1 \NO, BEEP AGAIN
195 JSR #FFED \CR/LF
200 RTS \YES, EXIT.
210\
220 :LL2 JSR #FAE5 \SAVE FILE
225 CLV \FORCE FOLLOWING BRANCH
230 BVC LL1 \(<=JMP IN RELOCATABLE CODE)
240\
250 :LL3 LDA @LL0%256 \SET
260 STA #20C \UP
270 LDA @LL0/256 \NEW
280 STA #20D \ADDRESSES
290 LDA @LL2%256 \IN
300 STA #20E \VECTOR
310 LDA @LL2/256 \TABLE.
320 STA #20F
330 RTS
340J
350 NEXT N: PRINT #6: REM TURN SCREEN ON
360 @=5
370 PRINT " *SAVE" "BEEPTAPE" "" &S, &P, &LL3'
375 @=4
380 PRINT "TO SET UP VECTORS, LINK #" &LL3'
390 END

```

PET TO REAL-ASCII

For Old ROM PET 2001, this machine-code converts PET ASCII to real-ASCII if characters have to be sent to a printer (device nr 4).

When printing to the screen nothing is changed. Strings in PET are never changed. The program was developed to be able to print lower case characters on an ASCII printer (Epson MX 80 with

a standard IEEE-interface). When loaded any PRINT statement can be replaced by
 SYS (826)A\$
 SYS (826)A\$(X,Y)
 SYS (826)A
 SYS (826)A(X,Y)
 SYS (826)any expression.

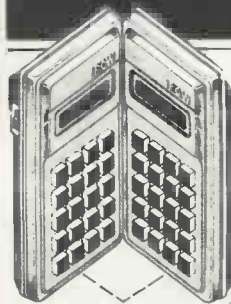
Robert de Rooij

```

100 REM CONVERTS PET-ASCII TO REAL ASCII
110 REM FOR PET 2001 OLD ROM TO EPSON MX80
120 POKE 59468,14
130 REM AUTHOR R DE ROOIJ
140 REM MELIS STOKESTR 35, 5013 BK TILBURG/HOLLAND
160 REM IDEA DERIVED FROM A PROGRAM
170 REM ON PAGE 143 BEST OF UK COMMODORE PET NEWSLETTER
180 REM IN STEAD OF 'PRINT A$' TYPE 'SYS(826)A$'
190 REM AFTER EACH SYS-COMMAND YOU HAVE TO TYPE :PRINT, AS NO
210 REM CARRIAGE-RETURN IS GENERATED.
220 REM PROGRAM WORKS FOR ALL EXPRESSIONS (NUMEROUS AS WELL
AS STRINGS).
230 REM IT WORKS FOR SIMPLE VARIABLES AND ARRAYS.
240 REM SET PRINTER ON-LINE WITH OPEN4,4:CMD4
250 REM ALL ASCII-VALUES, HIGHER THEN
260 REM 191 ARE DECREASED BY 96.
270 REM ATTENTION: DEVICENUMBER MUST BE '4'.
280 REM STRINGS IN PET ITSELF ARE NOT BEING CHANGED.
300 REM ON THE SCREEN YOU ALSO CAN PRINT BY TYPING THE COMMAND
310 REM .SYS(826)A$ INSTEAD OF PRINT A$.
320 REM WHEN LOADED THIS SMALL MACHINE-CODE IN THE CARR.BUFFER
330 REM YOU CAN, AT ANY TIME, CALL FOR SYS(826)
340 REM DURING PROGR.MODE AS WELL AS IN DIRECT MODE.
350 REM THE CODE IS FULLY RELOCATABLE WITH ONE EXCEPTION.
360 REM YOU MUST CHANGE THE UNCONDITIONAL JUMP IN LINE 858.
380 REM SEE DISSASSEMBLER LISTING.
390 REM THESE ARE THE BYTES 859/860.
450 FORR=826TO875
460 READ A:POKE R,A: NEXT
470 DATA 32,184,204, 36, 94, 48, 6, 32,175,220
480 DATA 32,107,211, 32,126,213,160, 0,170,240
490 DATA 28,177,113, 72,173,100, 2,201, 4,240
500 DATA 4,104, 76,100, 3,104,201,192,144, 2
510 DATA 233, 96, 32,210,255,200,202,208,228, 96
600 STOP
700 REM AN EXAMPLE
710 PRINT "This was printed by the command 'PRINT'"
720 SYS(826)"This was printed by command 'SYS(826)'" :PRINT:PRINT
725 PRINT "Printed by the command 'PRINT'":
730 PRINT "How much is 144^2*12/6? This is"144^2*12/6:PRINT
740 PRINT "Printed by command: SYS(826)!"
750 SYS(826)"How much is 144^2*12/6? This is"
760 SYS(826)144^2*12/6:PRINT
770 Y=826:SYSY "In stead of 826 You may of course use a
variable":PRINT
780 SYSY "And now open your ASCII-printer. Type 'RUN 700'"
READY.

```

DEC	HEX		Hex	DEC
826	33A	20 B8 CC JSR	\$CCB8	52408
829	33D	24 5E BIT	\$5E	94
831	33F	30 06 BMI	\$347	839
833	341	20 AF DC JSR	\$DCAF	56495
836	344	20 6B D3 JSR	\$D36B	54123
839	347	20 7E D5 JSR	\$D57E	54654
842	34A	0A 00 LDY	#\$00	0
844	34C	AA TAX		0
845	34D	F0 1C BEQ	\$36B	875
847	34F	B1 71 LDA	(\$71),Y	113
849	351	48 PHA		0
850	352	AD 64 02 LDA	\$0264	612
853	355	C9 04 CMP	#\$04	4
855	367	-F0 04 BEQ	\$35D	861
857	359	68 PLA		0
858	35A	4C 64 03 JMP	\$0364	868
861	35D	68 PLA		0
862	35E	C9 00 CMP	#\$C0	192
864	360	90 02 BCC	\$364	968
866	362	E9 60 SBC	#\$60	96
868	364	20 D2 FF JSR	\$FFD2	65490
871	367	C8 INY		0
872	368	CA DEX		0
873	369	D0 E4 BNE	\$34F	847
875	36B	60 RTS		0



Time marches on and Calculator Corner must march with it. From now on this column will be called **PORTABLE COMPUTER WORLD**, so that not only calculators but new machines like the Sharp PC1500 and the HP-75C and Epson HX20 can be covered without hurting anyone's feelings. Just to prove that I don't intend to forget calculators, this month's column, by Ed Rosenstiel, is for the TI-59

CONTINUED FRACTIONS

In my time continued fractions were not done at school, so I'll explain briefly this remarkably easy to understand concept which may well have been known in antiquity, and which has ramifications in many branches of higher mathematics.

Any (real) number X has a unique counterpart of the form

$$N_1 + \frac{1}{N_2 + \frac{1}{N_3 + \frac{1}{\text{etc}}}}$$

with integral N_n s, either finitely many — when trivially $X = N_1$ or when X is just a common fraction, ie, rational — or else the 'continued fraction' (technically called 'simple' since all its 'numerators' are 1) goes on for ever, like an infinite series.

Take, for example, $X = 2.285714...$ which any schoolboy will tell you is equal to $16/7$. To work out its CF:

$$16/7 = 2 + 2/7 = 2 + \frac{1}{7/2} = 2 + \frac{1}{3 + 1/2} = 2 + \frac{1}{3 + \frac{1}{1 + 1/1}}$$

which shows that periodic decimals (being rational) have *finite* CFs. If, however, you start with a square root like $\sqrt{2}$ we have:

$$\begin{aligned} \sqrt{2} &\approx 1.414236... = 1 + \frac{1}{\frac{1000000}{4142136}} = 1 + \frac{1}{2 + \frac{1715728}{4142136}} \\ &= 1 + \frac{1}{2 + \frac{1}{\frac{4142136}{1715728}}} = 1 + \frac{1}{2 + \frac{1}{2 + \frac{710678}{1715728}}} \\ &= 1 + \frac{1}{2 + \frac{1}{2 + \frac{1}{2 + \frac{1}{2 + \dots}}}} \end{aligned}$$

Considering that we started with an (8-digit) *approximation* it is a fair guess (and true) that the twos go on *ad infinitum*. — ie, we have a *periodic* CF with a 1-digit period, usually abbreviated as

$$\sqrt{2} = [1; \overline{2}]$$

In fact, all square roots of *integers* are periodic CFs, eg:

$$\sqrt{3} = [1; \overline{1, 2}]$$

$$\sqrt{13} = [3; \overline{1, 1, 1, 6}]$$

An important use of CFs follows from the property that, whenever one truncates an infinite CF after any number of terms, a common fraction results which is a 'best' approximation to the infinite CF. Eg,

$$\begin{aligned} \sqrt{2} &\approx 1 + 1/2 = 1.5 \\ &\approx 1 + \frac{1}{2 + 1/2} = 1.4 \\ &\approx 1 + \frac{1}{2 + \frac{1}{2 + 1/2}} = 1 + \frac{1}{2 + 7/5} \\ &= 1 + \frac{10}{24} \approx 1.417, \text{ etc.} \end{aligned}$$

The first of two TI-59 programs is based on a formula of Patz (1941). It displays the list representing the CF of \sqrt{N} (called the list of 'partial quotients') whenever the N is entered and followed by keystroke A. All these lists will be periodic after a certain point, and some periodic CFs will also show other striking regularities first proved by the French mathematician Lagrange (1766).

The simplest periodic CF is $[1; \overline{1}] = X$, say. Then

$$X = 1 + \frac{1}{1 + \frac{1}{1 + \text{etc}}} = 1 + \frac{1}{1 + \frac{1}{x}} = 1 + \frac{x}{x + 1}$$

Continued Fraction of \sqrt{X}				Inverse CF Program to recover X from the Continued Fraction of \sqrt{X}																
000	76	LBL	032	43	RCL	060	76	LBL	032	42	STD	061	13	C	090	12	B	119	91	R/S
001	11	A	033	04	04	001	15	E	033	13	13	062	42	STD	091	67	EQ	120	61	GTD
002	99	FRT	034	95	=	002	99	PRT	034	65	x	063	16	16	092	14	D	121	11	A
003	98	ADV	035	59	INT	003	98	ADV	035	43	RCL	064	65	x	093	42	STD	122	76	LBL
004	42	STD	036	99	PRT	004	42	STD	036	12	12	065	43	RCL	094	17	17	123	13	C
005	01	01	037	66	PAU	005	10	10	037	85	+	066	14	14	095	65	x	124	43	RCL
006	34	FX	038	42	STD	006	91	R/S	038	43	RCL	067	85	+	096	43	RCL	125	12	12
007	42	STD	039	05	05	007	76	LBL	039	10	10	068	43	RCL	097	12	12	126	55	+
008	02	02	040	65	x	008	16	A'	040	95	=	069	12	12	098	85	+	127	43	RCL
009	59	INT	041	43	RCL	009	67	EQ	041	66	PAU	070	95	=	099	43	RCL	128	11	11
010	42	STD	042	04	04	010	13	C	042	99	PRT	071	66	PAU	100	14	14	129	95	=
011	03	03	043	75	-	011	42	STD	043	42	STD	072	99	PRT	101	95	=	130	47	CMS
012	99	PRT	044	43	RCL	012	11	11	044	14	14	073	42	STD	102	66	PAU	131	99	PRT
013	66	PAU	045	03	03	013	65	x	045	43	RCL	074	12	12	103	99	PRT	132	98	ADV
014	43	RCL	046	95	=	014	43	RCL	046	13	13	075	43	RCL	104	42	STD	133	91	R/S
015	01	01	047	42	STD	015	10	10	047	65	x	076	16	16	105	14	14	134	76	LBL
016	75	-	048	03	03	016	85	+	048	43	RCL	077	65	x	106	43	RCL	135	14	D
017	43	RCL	049	33	X ²	017	01	1	049	11	11	078	43	RCL	107	17	17	136	43	RCL
018	03	03	050	94	+/-	018	95	=	050	85	+	079	15	15	108	65	x	137	14	14
019	33	X ²	051	85	+	019	42	STD	051	01	1	080	85	+	109	43	RCL	138	55	+
020	95	=	052	43	RCL	020	12	12	052	95	=	081	43	RCL	110	11	11	139	43	RCL
021	42	STD	053	01	01	021	66	PAU	053	42	STD	082	11	11	111	85	+	140	15	15
022	04	04	054	95	=	022	99	PRT	054	15	15	083	95	=	112	43	RCL	141	95	=
023	76	LBL	055	55	+	023	43	RCL	055	99	PRT	084	42	STD	113	15	15	142	47	CMS
024	12	B	056	43	RCL	024	11	11	056	98	ADV	085	11	11	114	95	=	143	99	PRT
025	43	RCL	057	04	04	025	99	PRT	057	91	R/S	086	99	PRT	115	42	STD	144	98	ADV
026	02	02	058	95	=	026	98	ADV	058	76	LBL	087	98	ADV	116	15	15	145	91	R/S
027	85	+	059	42	STD	027	91	R/S	059	11	A	088	91	R/S	117	99	PRT	146	00	0
028	43	RCL	060	04	04	028	76	LBL	060	67	EQ	089	76	LBL	118	98	ADV	147	00	0
029	03	03	061	61	GTD	029	17	B'												
030	95	=	062	12	B	030	67	EQ												
031	55	+	063	00	0	031	14	D												

Enter X and press A

Enter in sequence the numbers (= "partial quotients") of the CF of \sqrt{X} , pressing after each of the first five entries one of E, A', B', A or B (in that order). Next alternate A & B. For approximations of X enter 0 and repeat the last keystroke.

hence $(X - 1)(X + 1) = X$, ie, $x^2 - x - 1 = 0$

Of this equation

$$X = \sqrt{5/2 + 1/2} \approx 1.62$$

is the relevant root, since $X > 1$. Many will recognise this equation as the one for the famous 'Golden Section', which defines a rectangle with sides 1 and ≈ 1.62 respectively, and that the so-called 'convergents' of $[1; 1]$, ie, $1/1, 2/1, 3/2, 5/3, 8/5$, contain the well-known Fibonacci numbers. (This example also shows that there are periodic CFs which are not just the square root of an integer.)

Having loaded the CF-program into the TI-59, any real number can also be entered — eg, π^2 (with $\pi \approx 3.141592654$), which gives the CF of $\sqrt{\pi^2} = \text{CF of } \pi = [3; 7, 15, 1, 292, 1, 1, 1, 2, 1, \dots]$ accurately to 10 places. Although unending, no periods or regularities have been discovered among the first several thousand partial quotients of this CF, nor in any other irrational reals excepting square roots and the Euler number $e = \text{INV } 1n \ 1$ and some simple arithmetical formulas based on these two exceptions. (Enter e^2 and discover a 'regular' non-periodic infinite CF!)

The CF of another Euler number called γ (gamma) = the limit (as $n \rightarrow \infty$) of $(1 + 1/2 + 1/3 + \dots + 1/n - 1/n) \approx 0.577 \dots$ has also been calculated to several thousand digits without finding any regularities. This makes it likely by unproven that this number is not rational, but here is one of the famous unsolved problems of mathematics, namely whether γ (gamma) is the root of some algebraic equation or is transcendental like e and π , or is rational after all.

Now to use the inverse CF-program: Enter in sequence the partial quotients of some CF by pressing after each of the first five the keys E, A', B', A, B, respectively, then follow further entries by alternating between keys A and B. After any entry and appropriate key stroke the corresponding convergent is displayed, first its numerator, then the denominator. After the first two entries (E and A'), whenever zero is entered and followed by the keystroke which was used last, the decimal

value of the convergent reached so far is displayed and the program is reset.

Examples

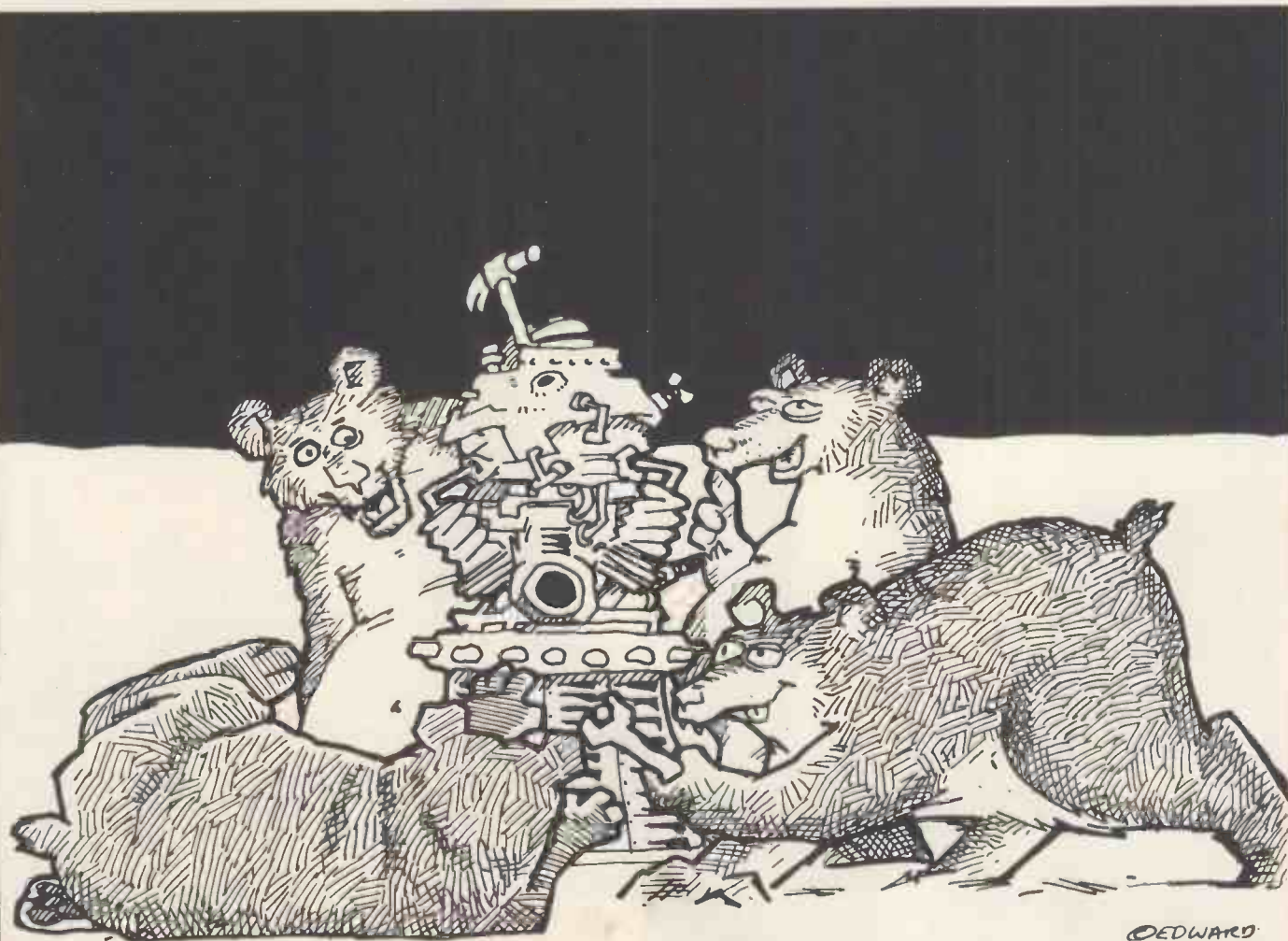
- a) $\pi \approx [3; 7, \dots]$
 Enter 3,E; display 3.
 enter 7,A';display 22(PAU/PRT)7
 enter 0,A';display 3.142857143
- b) $\pi \approx [3; 7, 15, 1, 292, \dots]$
 Enter 3,E; display 3.
 enter 7,A';display 22(PAU/PRT) 7
 enter 15,B'; display 333(PAU/PRT)106
 enter 1,A; display 355(PAU/PRT)113
 enter 0,A; display 3.14159292

It is noteworthy that the approximation $\pi \approx 355/113$, known already in China in antiquity, which is accurate to 2.7×10^{-7} is followed by the unusually large partial quotient 292. Such large PQs in CFs often give a clue to hidden and obscure interrelationships (Churchhouse, 1973).

Regarding the (so far unending) CF of γ (gamma) it is — as for the CF of π — not even known whether the partial quotients have an upper bound, but that they are unbounded for e was already known to Euler (1701-1783). Finally, the convergents of \sqrt{N} readily supply integer solutions of the famous PELL equation $X^2 - N.Y^2 = 1$ (Beiler, 1964) — but that is another story.

References

- Beiler, A H: *Recreations in the Theory of Numbers* Dover Publications, Inc., New York, 1964.
 Churchhouse RF: *JIMA*, 1973, 9, 17.
 Patz W *Tafel der regelmässigen Kettenbrüche*, Becker & Erler, Leipzig, 1941.



OEDWARD

KNOWING NO BETTER THE FOOLISH BEARS ATTEMPT TO REPAIR THE DEVICE WHILST INTOXICATED.

THE NEARLY MAN

Charles Babbage is remembered as the man who nearly invented the digital computer. Working in a pre-electronic age he nevertheless discovered principles which were not put into practice until Von Neumann in the 1940's. His mechanical computer was defeated by the lack of precise enough manufacturing techniques. Nigel Holder tells the story.



Above: The Difference Engine.
Below: The Analytical Engine's Rack.

This is an account of the work of the pioneer of automatic calculating machines, Charles Babbage. His Difference Engine and Analytical Engine will be discussed. The emphasis is mainly historical, and as such there will be no detailed descriptions of how the machines work. A general overview of the calculating machines is given,

as well as a description of the problems that Babbage faced.

With the advances in technology towards the end of the eighteenth century, mathematical tables assumed an increasing importance as an aid to calculation. These tables were more often than not riddled with errors, introduced either during the original computation or at the typesetting stage.

The Difference Engine

The method used to calculate the tables was the 'method of differences'. This had the advantage of using addition only in calculating the next value of a function, even if the function was very complex. This simplified the task of the computers (the name given at the time to the human evaluators), and reduced the risk of error since addition is easier to perform than multiplication. Another great asset of this method is that each result obtained relies on the previous result. Therefore, if the hundredth result is correct then it is almost certain that all of the previous results are also correct.

The method of differences work as follows (see PCW Dec pg 134):

If a function such as $F(x) = 3x + 7$ is evaluated for successive values of x , the difference between adjacent values of $F(x)$ is found to be constant.

For $F(x) = 3x + 7$			For $F(x) = x^2$			
x	$F(x)$	D^2	x	$F(x)$	D^2	D^2
			0	0		
0	7		1	1	1	2
1	10	3	2	4	3	2
2	13	3	3	9	5	2
3	16	3	4	16	7	2
4	19	3	5	25	9	2

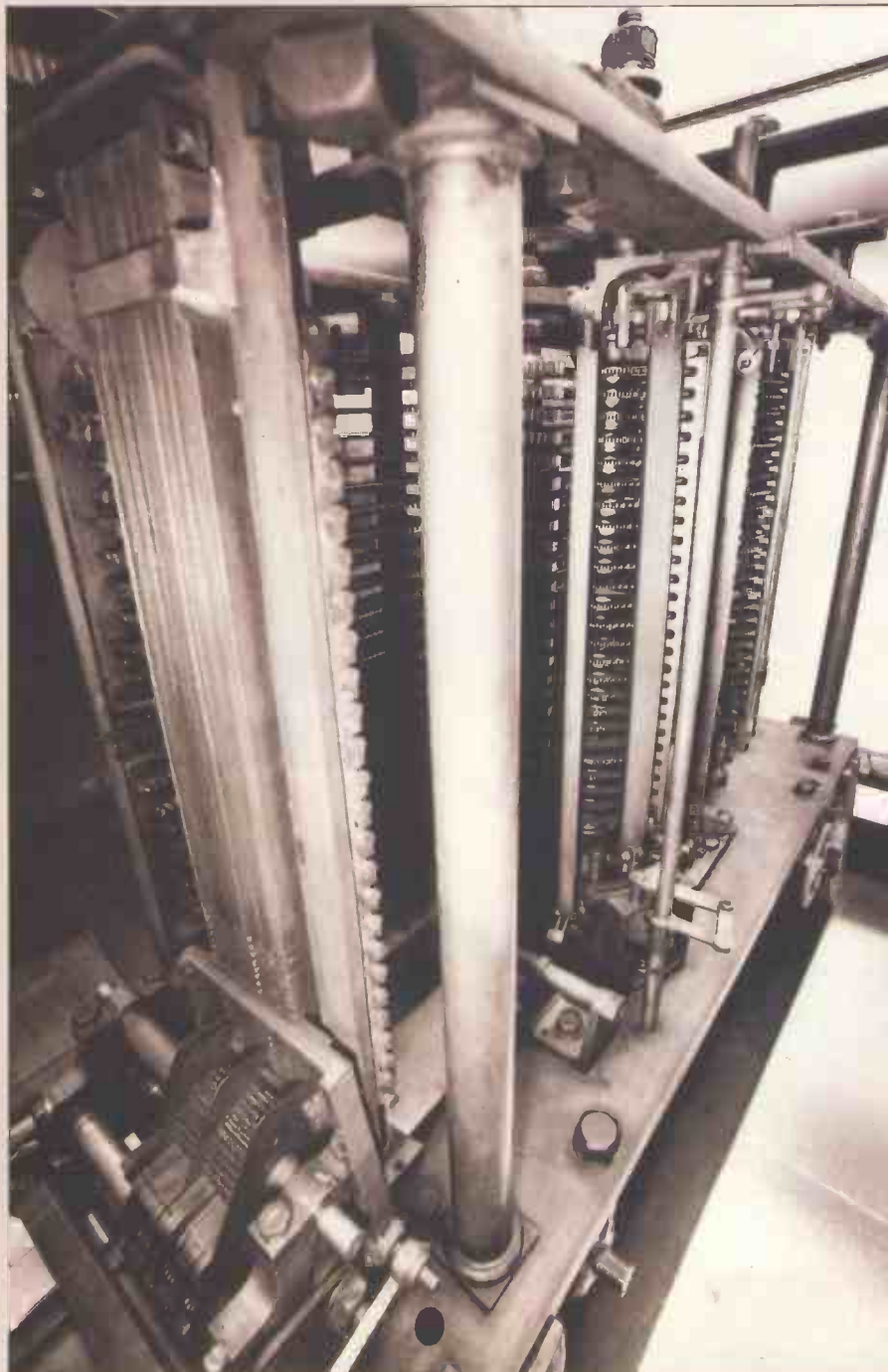
D^2 , the second difference, is constant in case of $F(x) = x^2$.

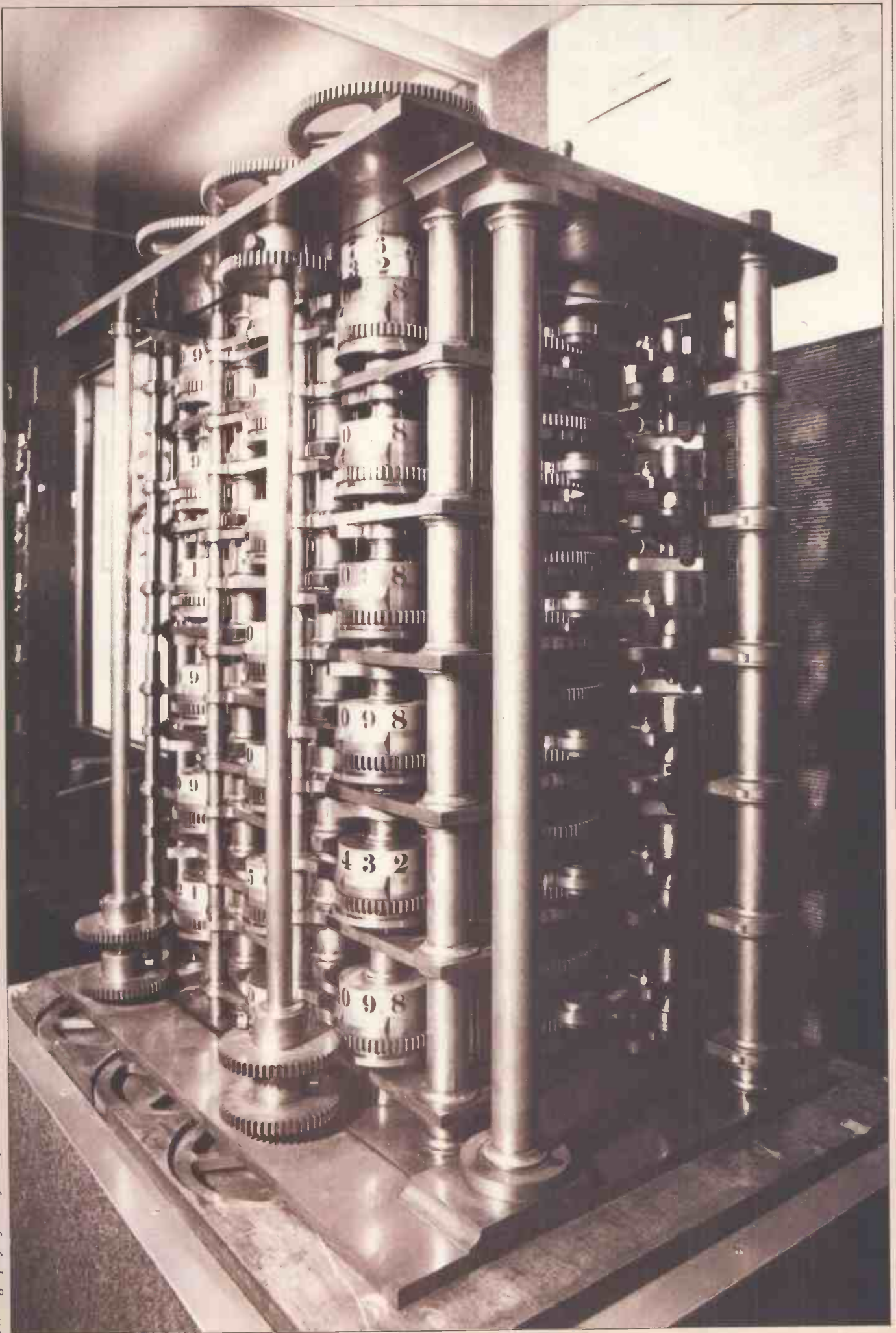
In general, for a polynomial of degree n (x^n), the n th difference will be constant.

Although all polynomials have a constant difference, functions of much greater interest, such as logarithms and trigonometric functions, do not in general have a constant difference.

In order to produce tables for these functions by using the method of differences, it is necessary to divide the function into sections which may be approximated by suitable polynomials.

In 1820 Charles Babbage, aware of the problems inherent in producing tables (he had already produced a few of his own), decided to design and construct a machine which would compute and typeset mathematical tables — a Difference Engine. By





Photography by Tony Sleep

THE NEARLY MAN

1822, after devoting a great deal of his time towards the project, he had a working model which was capable of working with 6-digit numbers to a constant second difference. This machine was a prototype, built to show what could be achieved. In order to finance a project to construct a full scale Difference Engine, Babbage petitioned the government of the day for aid. The government asked the Royal Society to prepare a report on the project's viability; they replied that, in their opinion, Babbage's work should be aided where possible.

The government agreed to advance £1500 towards the project; Babbage agreed to provide between £3000 and £5000. This would, in Babbage's opinion, provide sufficient resources to construct the Difference Engine (presumably based on his experience with the prototype), in two to three years, at which time he hoped that the government would reimburse his financial outlay.

But Babbage discovered that a full scale Difference Engine was a great deal more complicated to construct than a prototype. The machine was larger and more complex, and thus required finer tolerances of components. He also found that the state of engineering at the time was not sufficiently developed to construct his Difference Engine. Babbage therefore decided to devote the first few years of the project to advancing the art of mechanical construction. This involved designing a part and then designing a tool for making the part. During this process, an alternative and often simpler method would sometimes appear — the whole process of design and construction would then be repeated. Although this was a costly and time-consuming process, Babbage's work advanced the state of engineering in Britain by many years.

Due to the project taking longer and costing a great deal more than originally anticipated, Babbage frequently found himself asking the government for more money; he had the Royal Society audit his accounts

to prove that the money was being spent on the project. Unfortunately, the audit and the government's deliberations on the future of the project meant a delay each time (up to four years in some cases) before Babbage received any money. During this time, work on the project all but stopped; most of the engineers working for Babbage were disbanded (however, this helped to spread Babbage's engineering advances throughout Britain) — each time the money was received Babbage had to hire and train new engineers before work could commence on the project.

It was during one of these enforced breaks in production, in 1833, that Babbage had a disagreement with his chief mechanic (Joseph Clement, who had always stayed with Babbage — even during the breaks in construction). This was never settled and, under British law, mechanics possess the right of property of all tools that they have constructed, even if construction was paid for by their employers. This right was exercised, and the plans to the Difference Engine were also taken, although they were later returned. This would have considerably delayed the project if it had continued, since all of the tools would have had to have been constructed again; this, however, was not the case.

During this time Babbage, while attempting another modification to the design, conceived the idea of the Analytical Engine. This would need a much more sophisticated arithmetic mechanism than that currently employed in the Difference Engine — he therefore set about designing one. After over 20 different designs, he produced one which he considered could not be improved. He decided that this new improved design should be incorporated in his Difference Engine, and informed the government that, in his opinion, it would be quicker and cheaper to incorporate his new design into the Difference Engine than to complete the old one. The government was dismayed at the thought of yet another redesign after nine years of delay (and a

change of government) and in 1842 informed Babbage that they would not continue financing the project. The government offered to let Babbage keep everything, but Babbage, remembering the original terms of the agreement, said that the machine's future was in the government's hands — the Difference Engine now resides at the Science Museum in London.

In all, Babbage had spent £17,000 of government money, and it is estimated that he spent a further £20,000 of his own personal fortune. The Difference Engine that Babbage had constructed at the collapse of the project was a working model which had a constant third difference, and handled 6-digit numbers.

Had it been fully completed, the Difference Engine would have been approximately 10 feet high, 10 feet wide and five feet deep. It was to have worked to a constant sixth difference, handling integer numbers to a precision of eighteen digits. Babbage had realised that truncation could lead to errors when accumulating results; he therefore devised a rounding mechanism to round off the eighteenth digit correctly.

Once the initial values had been loaded (set up) into the machine, the machine would have operated as follows:

A cycle would consist of two steps —
Step 1 : Add ODD differences to EVEN differences

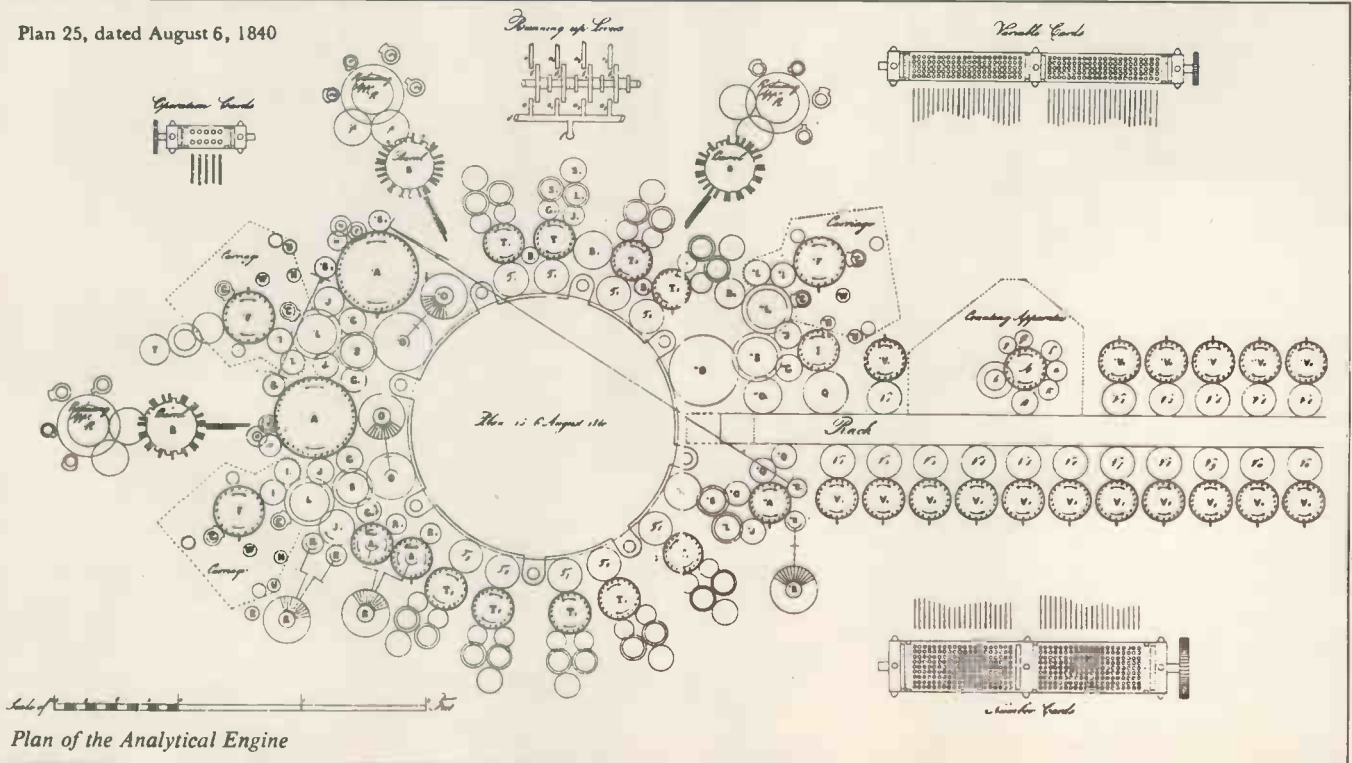
Step 2 : Add EVEN differences to ODD differences

The result of the next value is now obtained. For successive results, repeat steps 1 and 2. Each step consists of two parts since after addition any carries generated had to be added, allowing them to 'ripple through'. Each step consisted of turning the operating lever half a turn backward (producing the addition), followed by half a turn forward (addition of any carries generated). The words 'Calculation Complete' would be displayed at the end of each cycle.

The Analytical Engine

In 1833, Charles Babbage began work on what turned out to be the most ambitious project of his life's work: the Analytical

Plan 25, dated August 6, 1840



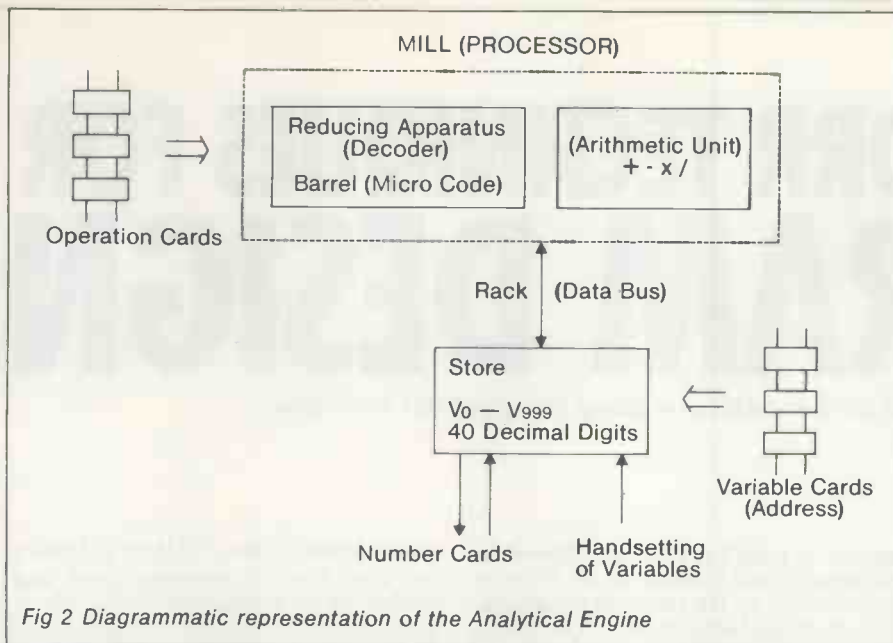
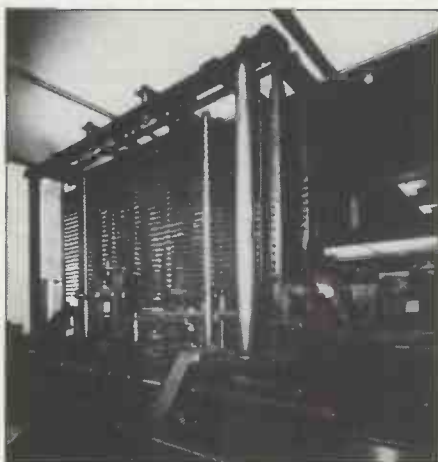


Fig 2 Diagrammatic representation of the Analytical Engine



The Rack is equivalent to a data -Bus

Engine. This machine was strikingly similar in concept to computers of today, although it was never completed. During the many years devoted to the project, many excellent engineering drawings were made of parts of the Analytical Engine; work had in fact started on constructing the machine before Babbage's death in 1871 — at his own expense since there were no means of raising financial aid after the collapse of his Difference Engine project.

The Analytical Engine would have been the first general purpose automatic calculating machine. It was to be capable of doing virtually any mathematical operation. It would follow the instructions programmed into it by its operators, and even go on to make decisions about which instructions to follow next, based on the results of its own computations. Both the instructions and data were to be entered separately on punched cards designed by Babbage. The cards themselves were strung together with narrow ribbons — this enabled the cards to read sequentially in either direction. Following the instructions, a processing unit called the 'mill' by Babbage performed operations on the data and returned the results to the 'store'. The final results were to be printed out or automatically set in type.

The Analytical Engine was conceived to be on a massive scale. It was to be powered by steam and was capable of storing up to a thousand 40-digit numbers; it would have been about the same size and weight as a small railway locomotive. Whenever it required additional values for a calculation

it was working on it could signal to its operators that it needed additional values by ringing a bell.

The Analytical Engine was a decimal machine which used sign and magnitude representation for the numbers. A decimal number base was used since, unlike electrical circuits, in a mechanical device it is just as easy to represent ten states as it is two states; the decimal system is man's 'natural' number system. A sign and magnitude representation was chosen since it simplifies input/output and the examination of internal states of the machine. It also simplifies multiplication and division. Throughout the machine numbers are represented by the positions of wheels (each holding a digit), rotating about a vertical axis.

As previously mentioned, the basic theory of design of the Analytical Engine is remarkably similar to that of modern computers. To show this, Figure 2 shows, in a diagrammatic form, the main architectural features of the Analytical Engine with modern names in brackets. Figure 1 shows Babbage's General Plan 25, which is the general configuration of the Analytical Engine. In contrast to his Difference Engine, Babbage has distinctly separated the Store from the Arithmetic Unit.

The basic four arithmetic operations are provided — addition, subtraction, multiplication and division. Two variations on the above are also provided — multiplication and division with limited precision. These operations are provided for when the full 40 digits of accuracy are not required or when the speed of computation is important. Since the operations are mechanical, a multiplication/division would take about four minutes.

A major innovation was the use of a barrel for control of complex operations such as multiplication and division. The barrel would have studs around the outside, against which levers would rest (with as many as 70 'rings' to a barrel, each ring containing up to 80 studs). As the barrel revolved, whenever a stud touched a lever the lever would move. By use of many levers, the operation would take place synchronously for one revolution of the barrel. Today, exactly the same concept is used in computers, known as micro code (or micro programming). Another great innovation was the advent of a 'look ahead carry' mechanism. Since there were 40 digits to a number, the process of allowing the carry to 'ripple through' would take a great deal lon-

ger than the addition itself required. Babbage realised this and developed the technique of 'look ahead carry' (which he called 'anticipatory carry'), allowing an addition to take place in one operation as the carry would be pre-determined. This technique proved the most difficult for Babbage, and he spent a great deal of time perfecting this technique.

Babbage spent most of his time on the project in designing and redesigning parts of the Analytical Engine. He appeared to find great satisfaction with the intellectual stimulus of theoretical design (perhaps it was because he realised that the machine would probably never be built — at least in his lifetime, anyway).

The reading of numbers from the store had a destructive effect in that, once read, the value was no longer held in the store (compare with the destructive read of 'core store' memory on early electronic computers) — if the number was required for further calculation, it had to be written back into the store.

As far as programming the Analytical Engine was concerned, Babbage did not have a very clear idea of how this would be achieved; it was as if this was a secondary consideration — he was concerned mainly with the mechanical working of the machine. The store could be accessed only by specifying the location in the instruction itself; there was no true variable address concept that would allow the store to be accessed as an array or vector. This is not really a criticism of Babbage himself, since the early electronic computers also lacked this ability until John von Neumann proposed it in 1945. The Analytical Engine possessed what is known today as the 'three address system', in which two addresses specify the operands to be used, and the third specifies where the result is to be placed.

It is perhaps a shame that Charles Babbage had so many great ideas, but was never able to realise them fully. If he had successfully completed the Difference Engine, he would have probably been granted financial aid for the Analytical Engine — it is just possible that, given enough time, the engineering technology of the day would have permitted the Analytical Engine to have been constructed. It is ironic that Babbage himself was the prime cause of his failures; he was always updating and modifying his designs — if he had kept to a single design throughout he would have probably completed the Difference Engine. His work was not in vain, though, for it stimulated others into designing and constructing their own Difference Engines, as well as advancing the state of engineering in Britain by many years.

It is not known exactly to what extent Babbage's work affected the design of early electronic computers, although it is thought to be only superficial — in which case it is remarkable that Babbage's concepts are so similar to those of modern computers. It is almost certain that computers would have evolved earlier if the Analytical Engine had been built. It is a shame that Babbage is mostly remembered for his failures; he was a brilliant mathematician and design engineer, years ahead of his time.

For anyone interested in early mechanical and electronic computing, an excellent book to start with is *The Origins of Digital Computers*, edited by Brian Randell and published by Springer-Verlag. The price is £18.45, and the ISBN is 0-387-11319-3. This book contains selected papers, and for the really keen person, the bibliography contains over 850 items.

END

WARNIER-ORR TECHNIQUES FOR PROGRAM DESIGN

Paul Overaa gives further advice on using this powerful technique.

Assembly language programming is prone to difficulties that are not generally in higher level languages. One major factor is that assembler programs are notoriously difficult to read, and thus difficult to understand. Such difficulties make progress in writing low level language routines slow compared with equivalent progress in high level languages. As the size of programs increases the difficulties become more apparent, with the result that developing even moderate size assembler programs becomes a major undertaking.

The pioneering work of Professor Warnier in France and the subsequent work of Kenneth T Orr in the USA has resulted in an approach to designing and writing programs that is now beginning to be considered as one of the most important advances in program design made to date. The techniques emphasise the role of finding the logical solution to a problem in terms of the program before such considerations as language and coding are dealt with. Because of this the techniques are essentially language independent and are therefore applicable to all types of programming problems.

Resultant programs are logically correct before they are coded and inevitably work 'first time' bar any typing errors from those of us that suffer from keyboard dyslexia. As an example of the technique in use, I have selected a relatively short utility subroutine called DUMP whose purpose is to dump the contents of a selected page of memory in hex form and in printable characters form.

To print the contents of 256 bytes (ie, one page) using 16 lines of 16 bytes, the format to be used is as follows: the starting

address of each line is given, followed by the hexadecimal contents of the 16 bytes and secondly by the character representation of those same bytes. Non-printing characters (ie, control characters) must be printed as a period. Figure 1 shows an example of the required format.

Steps in program design

Having described in words what we want our program to do we now attempt to express this in terms of a Warnier-Orr diagram. Figure 2 is such a diagram and contains the bare essentials of our problem. If you are not familiar with the basic concepts then previous articles in *PCW* (October 1981 and April 1982) will be of use. I will restate the essential conventions. The diagrams are sets of hierarchical square brackets that are read downwards within each bracket. The brackets contain statements of what actions are to occur and statements of what decisions are required at certain stages of the program. A statement with a bar written over it signifies the logical opposite — ie, in Figure 2 there is a statement '16 lines printed' which is interpreted as the logical opposite — '16 lines have *not* been printed'. Statements that are mutually exclusive are written with a \oplus sign separating them. Such statements infer that only one of the actions will be performed. When the word 'SKIP' is written in a bracket it means that no actions are associated with the bracket. If a bracket to the right of a statement does itself contain further statements then these are actions to be performed if the higher level statement has been performed.

Figure 2 tells us that we are dealing with

a routine that is called 'DUMP' and that it has some form of beginning block and another as yet unspecified 'END' block. Two mutually exclusive options exist depending on whether or not 16 lines have been printed. While 16 lines have not been printed we perform an action called 'PRINT LINE'. If 16 lines have been printed, then, since there are no corresponding actions within the bracket on the right, we skip the bracket and perform the 'END' block.

Notice that we have not specified how to print a line or how we start or finish our routine. We are only interested initially in attempting to create on paper some form of basic structure consistent with the essential details of our problem.

The next stage in the design process is one of 'iterative refinement' — ie, we look at our problem and attempt to find areas that we can specify in greater detail. In this case our original problem specification indicates that we can add more detail to the 'PRINT LINE' bracket since we have specified that we wish to print the contents of 16 bytes on each line. Figure 3 is the diagram showing this.

Notice that we add to our initial diagram by progressive expansion rather than by altering the basic structure.

Our problem tells us how we are to print each line and we can expand Figure 3 to show that we are to print the contents of each line of 16 bytes in hexadecimal form and then in ASCII character form. Figure 4 reflects this and also introduces statements that indicate we will be using some means of counting how many lines we have printed and how many bytes of current line have been printed.

This process of 'iterative refinement' can

AA00H	29 0E 00 00 00 53 C3 41 AA 60 AA F5 BB 43 B9 21)...S.A.'...C.!
AA10H	1A AA 06 00 09 4E C3 21 B7 00 03 06 09 0C 0F 02N.!.....
AA20H	05 08 0B 0E 01 04 07 0A 0D 10 14 1A 06 0C 12 18
AA30H	04 0A 10 16 00 00 00 00 00 10 1F 03 07 47 80G.
AA40H	04 EB 22 0A AC 21 09 AC 71 21 00 00 39 22 0E AC	..".!..9!..9"
AA50H	31 40 AC CD D3 B3 2A 0E AC F9 2A 0C AC 7D 44 C9	1@...*...*..}D.
AA60H	21 A4 AA CD 7B AA FE 03 CA 00 00 C9 21 AF AA C3	!...{.....!...
AA70H	75 AA 21 B6 AA CD 7B AA C3 00 00 E5 CD 53 AB 3A	u.!...{.....S.:.
AA80H	08 AC C6 41 32 A0 AA 01 94 AA CD 5D AB C1 CD 5D	...A2.....]...]
AA90H	AB C3 BA AA 42 44 4F 53 20 45 52 52 20 4F 4E 20	...BDOS ERR ON
AAA0H	20 3A 20 24 42 41 44 20 53 45 43 54 4F 52 24 53	: \$BAD SECTOR\$S
AAB0H	45 4C 45 43 54 24 52 2F 4F 24 21 07 AC 7E 36 00	ELECTR/D\$!...G.
AAC0H	B7 C0 C3 09 B7 CD 8A AA CD D3 AA DB F5 4F CD 3AD.:.
AAD0H	AB F1 C9 FE 0D C8 FE 0A C8 FE 09 C8 FE 20 C9 3A:.
AAE0H	07 AC B7 C2 01 AB CD 06 B7 E6 01 C8 CD 09 B7 FE
AAF0H	13 C2 FE AA CD 09 B7 FE 03 CA 00 00 AF C9 32 072.

Fig 1

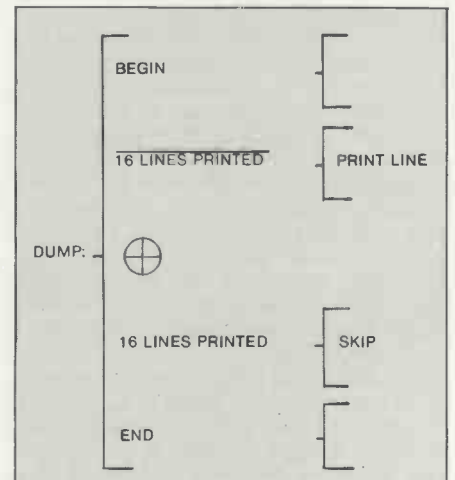


Fig 2

be continued because we also know from our original specification of the problem that having printed the hexadecimal form of our 16 byte line we print the ASCII form of the same bytes. *But...* if the character is non-printing then we must print a 'period' instead. These additional restraints are shown in Figure 5 as an expansion of the Figure 4 statement 'PRINT SAME 16 BYTES AS ASCII FORM'.

Notice that as we expand the statement bracket we do not alter any of the other parts of the diagram. The diagram as it 'evolved' is separating the problem into distinct separate logical entities and it is this effect of the design technique that is particularly significant.

At this stage I would mention that these diagrams evolve very quickly once you are used to the technique and as they do they formalise the 'logic' of the problem in a way that is obviously language-independent.

Since the problem we are dealing with is simple it is instructive to combine Figures 4 and 5 to show the complete representation that, as you will see, is the solution in terms of the program design.

Figure 6 is then the combined diagrams of Figures 4 and 5. It represents the logical statement of our problem and it is the logical solution to the associated problem of designing the program. It is possible to continue the process of iterative refinement to any level that is desired, but for the purposes of this example I now wish to consider the transition from our Warnier-Orr diagram to the coding of an 8085 assembly language program. The coding was written for a CP/M environment utility subroutine

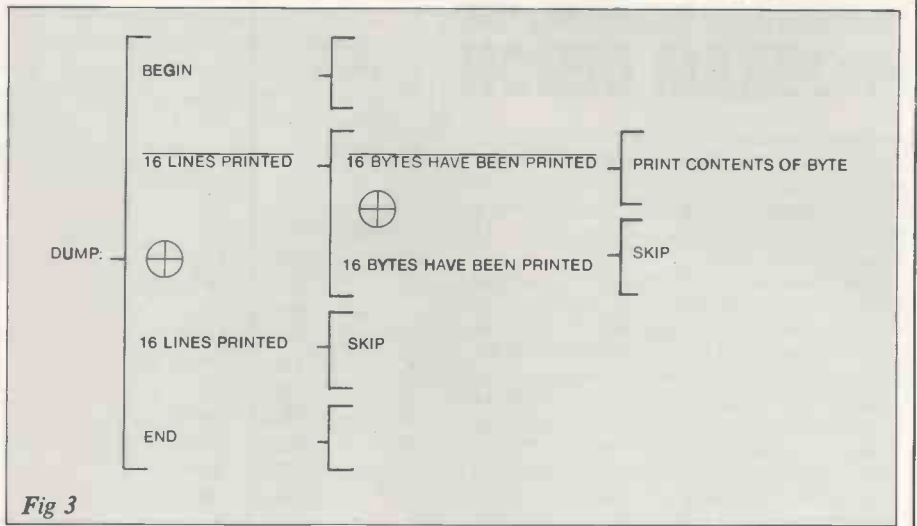


Fig 3

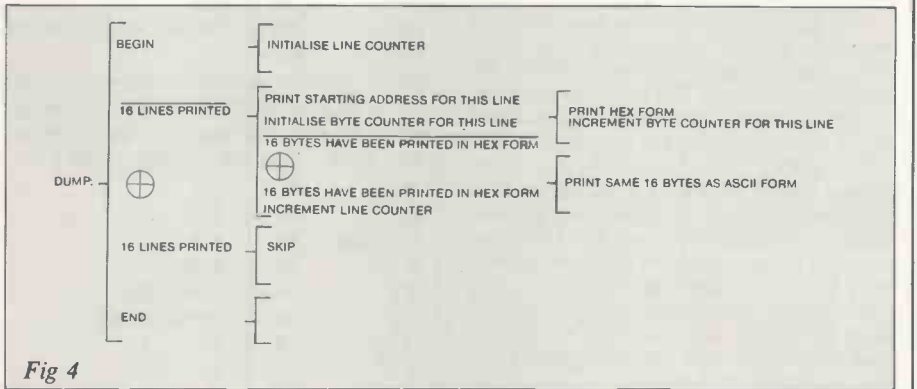


Fig 4

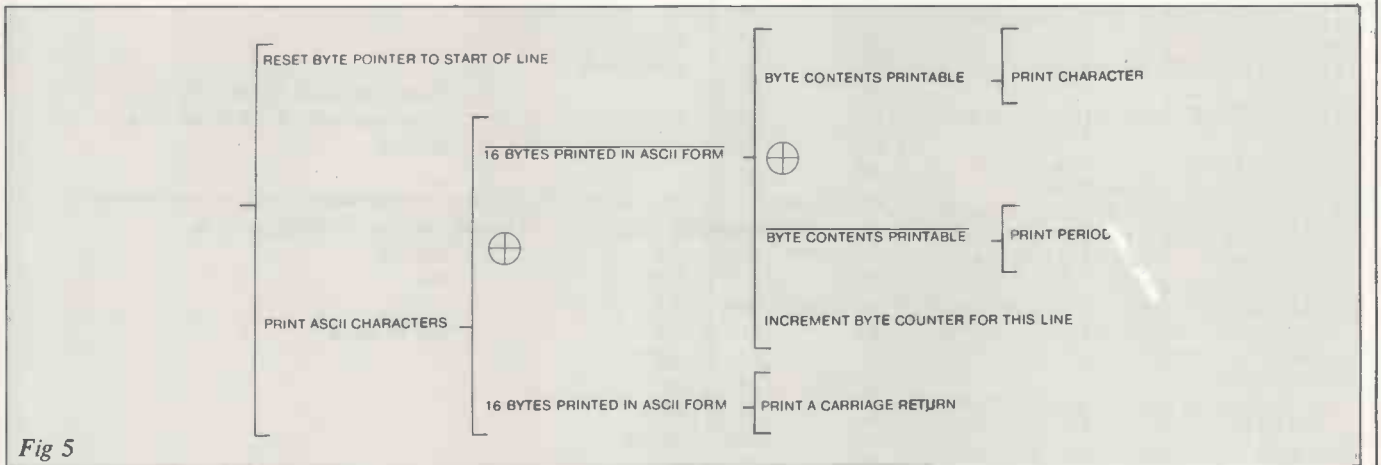


Fig 5

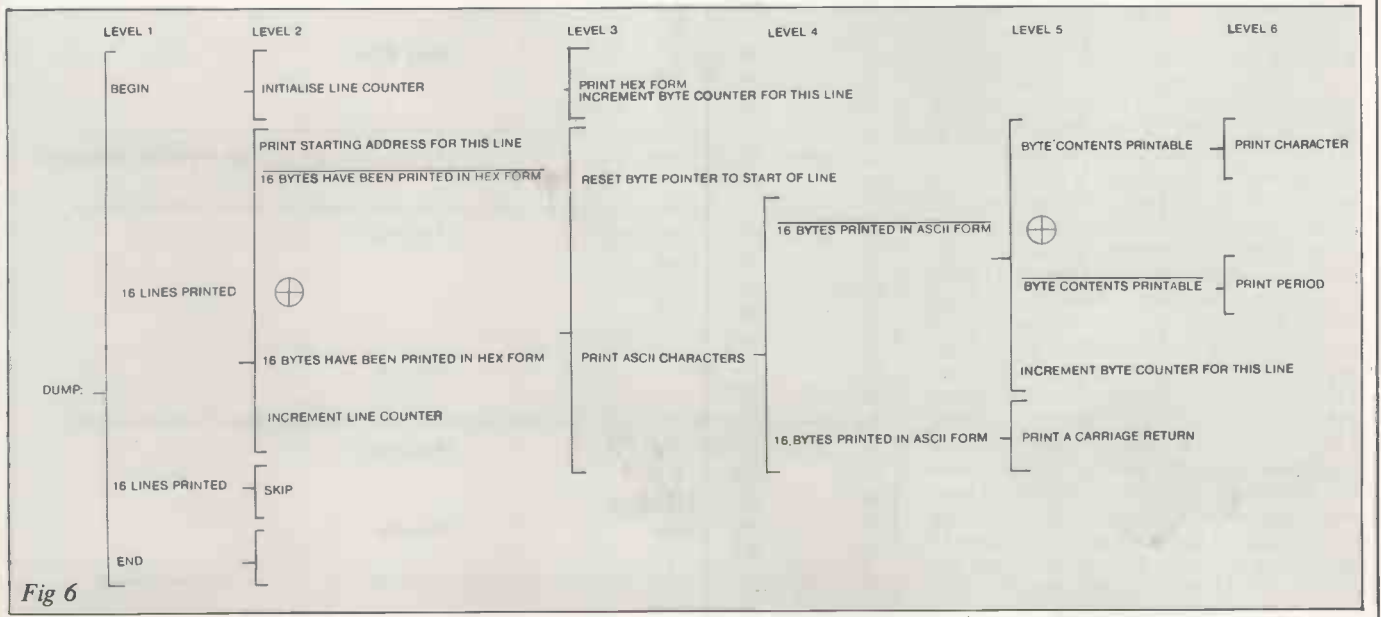


Fig 6

WARNIER-ORR TECHNIQUES FOR PROGRAM DESIGN

used to dump, at the line printer, selected pages of applications programs under development. To facilitate discussion of such diagrams I frequently identify along the top of a diagram various 'levels of brackets'.

The transition is accomplished in general by treating the brackets in the Warnier-Orr diagrams as called subroutines. Occasionally the first or last statement of a bracket may be included in the coding of the next highest level bracket, but this is often a matter of personal preference. The ideas are best explained by referring to the example of coding provided. I have numbered the lines of the assembler program for ease of reference and have placed plenty of remarks within each of the routines.

The basic core of the program will reference several subroutines that come without modification from a library of my assembler routines. The example itself, ie, the DUMP utility, has proved quite useful and is also now a library program.

The names that are used to call these various library subroutines together with a brief description of their functions are now listed for convenience. Since DUMP is not expected to be resident in any finished program I have not made any attempt to save bytes. It is my personal opinion that in most cases it is more important for routines to map directly to their design layouts since this facilitates maintenance in large programs.

L\$PRINT\$BC Prints BC register pair at line printer

L\$PRINT\$SPACE Prints a space at line printer

L\$PRINT\$TAB Prints a tab at line printer

L\$CRLF Prints a carriage return — linefeed sequence at line printer

The above routines use another subroutine L\$OUCH to actually print the characters. L\$OUCH uses a CP/M 'BDOS' call to handle character output.

BIN\$HEX This converts a single byte number held in the accumulator into the hexadecimal form which is returned in the BC register pair.

Let us examine first the initial section of the DUMP subroutine. This is shown as lines 6-23 and corresponds to the first or highest level bracket (this is the one containing the BEGIN and END blocks).

The BEGIN block is in fact lines 6, 7 and 8 of the source listing. We push existing register values onto the stack, load HL with the starting address of the page to be dumped and initialise a line counter (the D register) by placing the value 16 in it.

Lines 9-21 constitute a loop that is executed 16 times. First the starting address of each line of information is to be printed, followed by the contents of the 16 bytes starting from this address. Lines 9-11 print the H register contents. Lines 12-14 repeat for the L register. Lines 15-17 simply print an 'H' character followed by a tab for format spacing. Line 18 calls a subroutine DUMP2, and this label was inserted before the coding for DUMP2 had been written. Line 19 prints a carriage return-linefeed sequence ready for dealing with the next line of printing. Once these operations have been performed we decrease the line counter (ie, the D register) and providing 16 lines have not been printed we repeat the loop. Lines 22 and 23 constitute the END

```

1: * =====
2: * LIBRARY SOURCE PROGRAM ..... DUMP.LIB
3: * Purpose: To dump selected page of memory in hex. and character form at printer
4: *       The address is passed via an EGU pseudo-op named DUMP$ADDRESS
5: * -----
6: DUMP:  PUSH PSW ! PUSH B ! PUSH D ! PUSH H       ;Preserve
7:       LXI   H,DUMP$ADDRESS           ;Address of page to be dumped
8:       MVI   D,16                      ;Counter 16 lines of 16 bytes per line
9: DUMP1: MOV   A,H                       ;Print address in hex form
10:      CALL  BIN$HEX                    ;Library routine
11:      CALL  L$PRINT$BC
12:      MOV   A,L
13:      CALL  BIN$HEX
14:      CALL  L$PRINT$BC
15:      MVI   A,72                       ;ASCII "H" character
16:      CALL  L$OUCH
17:      CALL  L$PRINT$TAB                ;TAB on printer
18:      CALL  DUMP2                      ;Prints 16 Hex contents after location
19:      CALL  L$CRLF
20:      DCR   D                          ;Decrement counter
21:      JNZ  DUMP1
22:      POP  H ! POP D ! POP B ! POP PSW   ;Restore
23:      RET
24: * =====
25: * PRINT$LINE ROUTINE... Prints starting location and contents of 16 bytes
26: * This routine does NOT preserve HL but leaves pointing to next location !!!
27: DUMP2: PUSH PSW ! PUSH D ! PUSH H       ;Preserve
28:      MVI   D,0                         ;Counter
29:      MVI   E,16                        ;Max to exit
30: DUMP3: MOV   A,M                       ;Contents of memory byte for printing
31:      CALL  BIN$HEX
32:      CALL  L$PRINT$BC
33:      CALL  L$PRINT$SPACE
34:      INR   D                            ;Increment counter
35:      MOV   A,D
36:      CMP   E
37:      INX   H
38:      JNZ  DUMP3
39:      CALL  L$PRINT$TAB
40:      POP  H                             ;Restore original value to HL
41:      CALL  DUMP4                       ;Print same data in character form
42:      POP  D ! POP PSW                  ;Restore
43:      RET
44: * =====
45: * PRINT$CHARACTER ROUTINE ..... Prints the data in character form
46: DUMP4: MVI   D,0                         ;Counter
47:      MVI   E,16                        ;Max
48: DUMP5: MOV   A,M                       ;126 or above ?
49:      CPI   126
50:      CP   DUMP5
51:      CPI   32
52:      CM   DUMP5
53:      CALL  L$OUCH
54:      INR   D
55:      MOV   A,D
56:      CMP   E
57:      INX   H                            ;Next byte
58:      JNZ  DUMP5
59:      RET
60: * -----
61: DUMP6: MVI   A,46                       ;Period replaces all non printing characters
62:      RET
63: * =====
64: L$PRINT$BC:  PUSH PSW                    ;Preserve
65:      MOV   A,B
66:      CALL  L$OUCH
67:      MOV   A,C
68:      CALL  L$OUCH
69:      POP  PSW                            ;Restore
70:      RET
71: * =====
72: L$PRINT$SPACE:  PUSH PSW                ;Preserve
73:      MVI   A,32
74:      CALL  L$OUCH
75:      POP  PSW                            ;Restore
76:      RET
77: * =====

```

```

78: L$PRINT$TAB:  PUSH  PSM          ;Preserve
79:             MVI   A,9
80:             CALL  L$OUCH
81:             POP   PSM          ;Restore
82:             RET
83: * -----
84: * ASSEMBLER SOURCE LIBRARY ..... L$OUCH.LIB
85: * PURPOSE: TO OUTPUT A CHARACTER TO PRINTER VIA BDOS CALL.CHARACTER MUST BE PRESENT
86: * IN ACCUMULATOR BEFORE CALLING
87: * -----
88: L$OUCH: PUSH PSM ! PUSH B ! PUSH D ! PUSH H ;SAVE REGISTERS
89:             MVI   C,5          ;WRITE LINEPRINTER CODE
90:             MOV   E,A          ;TRANSFER TO BDOS IS VIA E REGISTER
91:             CALL  BDOS         ;MUST BE PREVIOUSLY DEFINED
92:             POP  H ! POP D ! POP B ! POP PSM ;RESTORE REGISTERS
93:             RET
94: * -----
95: * ASSEMBLER SOURCE LIBRARY ..... L$CRLF.LIB
96: * PURPOSE: TO OUTPUT TO PRINTER A CARRIAGE RETURN-LINE FEED COMBINATION
97: * USING THE ACCUMULATOR.
98: * -----
99: L$CRLF:  PUSH PSM          ;SAVE REGISTERS
100:         MVI   A,CR          ;CR MUST BE DEFINED
101:         CALL  L$OUCH        ;LIBRARY UTILITY PROGRAM
102:         MVI   A,LF          ;LF MUST BE DEFINED
103:         CALL  L$OUCH
104:         POP  PSM          ;RESTORE REGISTERS
105:         RET
106: * -----
107: * ASSEMBLER SOURCE LIBRARY ..... BIN$HEX.LIB
108: * PURPOSE: TO CONVERT A BINARY NUMBER PASSED VIA THE ACCUMULATOR INTO THE HEX
109: * FORM WHICH IS OUTPUT TO THE PRINTER USING L$OUCH (LIBRARY PROG.)
110: * THE HEX VALUE AS TWO PRINTABLE CHARACTERS IS RETURNED IN BC PAIR
111: * -----
112: BIN$HEX:  PUSH  PSM          ;PRESERVE
113:             MOV   C,A          ;SAVE VALUE
114:             ANI   00F0H        ;MASK OUT LSB'S
115:             RRC
116:             RRC
117:             RRC
118:             RRC          ;SHIFT TO LSB'S POSITION
119:             CALL  BIN$HEX1
120:             MOV   B,A          ;READY FOR OUTPUT !!
121:             MOV   A,C          ;READY FOR OUTPUT !!
122:             ANI   000FH        ;MASK OUT MSB'S
123:             CALL  BIN$HEX1
124:             MOV   C,A          ;READY FOR OUTPUT !!
125:             POP   PSM          ;RESTORE
126:             RET
127: * -----
128: BIN$HEX1:  ADI   48          ;THIS ENSURES THAT THE EQUIVALENT
129:             CPI   58          ;ASCII NUMBER IS PRINTED IF 0-9
130:             CP    BIN$HEX2
131:             RET
132: * -----
133: BIN$HEX2:  ADI   7           ;ENSURES THAT ASCII LETTER IS
134:             RET              ;OBTAINED
135: * -----

```

block. We simply return the original values to the internal registers and execute a return from the subroutine.

The coding for the initial section was completed first, but as well as referencing some of the library subroutines we placed a reference to CALL DUMP2. This was in effect a 'dummy' label placed into the initial section so we could complete the coding for this section without having to worry about more detailed problems — such as are involved with the printing of each line of information.

The next stage in the development of the coded solution was to write the subroutine corresponding to the label DUMP2 whose purpose is to print the contents of the 16 bytes that constitute a line. The starting address for the line is held in the HL register pair. The following notes apply to lines 27-43 of the source code.

First we save all registers by pushing onto the stack, then as before we set up a loop using a simple counter. This loop will as before be executed 16 times. Using a MOV A,M instruction we place each of the sixteen memory location contents into the accumulator and then print them by using calls to subroutines BIN\$HEX, L\$PRINT\$BC and L\$PRINT\$SPACE. As we step through the loop we use a INX H instruction to point HL to the next location to be examined.

In this way we are able to deal with printing the hex form of a Line. Our Warnier-Orr diagram tells us that having done this we must print the same bytes in ASCII character form. The solution is simple. . . we reset the HL memory pointer by POP H (which restores the original values) and then we write another subroutine call using a further 'dummy label'.

In this case the dummy label is DUMP4 and it corresponds to the statement in Figure 6 of 'PRINT ASCII CHARACTERS'. Since the diagram indicates that no further actions are required to complete this 'bracket' we simply restore the registers that have still to be returned to their original state and return from the subroutine.

The general pattern for the translation of the Warnier-Orr representation to the final coding should be becoming clear. Once you have a completed diagram to the level of detail required to formalise the logic of the problem you start coding 'level by level'. If you reach a point where some required action involves more coding than can comfortably be written in a few lines than you place a call to another level of subroutines using a 'dummy label'. By doing this you will be able to complete the routine you are currently working on without getting involved with details on a lower level. Having then coded one particular level you can in a similar fashion concentrate your attention on writing the subroutines for the next level down — ie, the ones you used the 'dummy labels' for. This technique is used at all levels until all the 'brackets' in the Warnier-Orr diagram have been translated.

The subroutine DUMP4 — ie, lines 46-59 — uses a simple loop counter as in previous routines to print the contents of the 16 bytes. Since DUMP4 is now dealing with the ASCII forms it is necessary to check that the character is printable, ie, has an ASCII code between 32 and 126. You will see from the coding that cases where this is not true result in a period being printed rather than the character itself.

I have tried to provide sufficient detail of all the stages in the development of the example to enable the technique to be tried on your own programming problems using whatever hardware/software combinations you have.

The essential points to bear in mind are:

1. Express your problem in terms of ordinary language.
2. Draw an elementary Warnier-Orr diagram that is consistent with the most fundamental aspects of the problem as stated.
3. Iteratively refine the diagram by examining areas that you can define more exactly. As the diagram grows it will be formalising the logic of your problem and in fact solving the design problem as well.
4. Choose whatever programming language you feel is appropriate and then code the solution 'level by level' using 'dummy calls' for statements that involve complex brackets — ie, brackets which you feel may involve more than just straightforward coding.
5. Continue level by level until you have completed the lowest levels of subroutines.

To conclude, we can do little better than restate what we have indicated by example to be the main advantages of the technique. We define a problem and by using Warnier-Orr techniques we logically describe the problem and at the same time solve the associated program design problem. We also end up with a logically structured program together with a diagram formally documenting the structure of the problem and the final coding. Because of this, such programs suffer far less from debugging problems and are very easy to maintain since the 'logical independence' of the various sections is accomplished readily with the 'nested subroutine' type of development.

END

HARD WARE

You don't need a Cray 1 to do interesting things with images; even a micro can handle digitised video (although not quite as quickly!). C Grant Dixon explains how.

DIGITAL VIDEO

One of the areas where microcomputers will be making their mark in the future is in the processing of visual images. Of course this is already being undertaken in certain specialist laboratories where the analysis of space photographs and the use of enhancement techniques are the day-to-day workload. Other research workers are looking into the problem of pattern recognition with a view to tying up the computer controlled robots with a television image of the scene where the robot is operating.

Amateur computer enthusiasts have, so far, done very little in this field, but after my article in *PCW* (April 1981) I received a number of requests for information on digitising video signals — so here's some further information on the subject.

The normal 625-line TV picture is generated by interlacing two fields of 312.5 lines each, the field rate being 50 Hz (mains frequency). The aspect ratio of the picture is 4:3 and if we work in round figures this means that we have 400 picture elements (pixels) along a line and 300 pixels in the vertical direction, assuming a sequential scan with no interlacing. Thus in 1/50th sec we have 120,000 pixels, a data transmission rate of 6,000,000 pixels/sec. Can your computer cope with this rate of data flow? Probably not! But there are several ways in which we can reduce this high-speed requirement; first of all we can say that each pixel can be described by a 4-bit word, giving 16 possible grey levels, and packing two such words into one byte. This would give a data transfer rate of 3 Megabytes/sec which is still rather fast.

Secondly, we can slow up the scanning process by converting the fast-scan signal to a slow-scan signal, or even by generating the video signal by a slow scanning process in the first place. We gain by being able to manipulate the video signal at a rate which the computer can handle but we lose the ability to display movement. Slow-scan TV is for still pictures, or, at best, a series of 'snapshots' of a movement. This is no detriment as far as computing is concerned, as the computer will normally be used to store a single image.

When converting from a fast-scan signal to slow-scan it is only necessary to have a temporary buffer store to hold one line of data as the whole picture is being repeated at the fast rate. If, however, the original picture contains movement, it's better to load the whole picture at the fast rate into a temporary picture store using TTL hardware for the purpose. This will give us a kind of

'snapshot' as mentioned above, but it involves a fairly large extra memory which has to be interfaced to the computer — unless, of course, we use the computer memory itself and access it by DMA techniques.

The actual conversion of the analogue signal to a digital one is not possible by the usual A/D techniques which employ counters operating over a given period. The alternative technique, suitable for video frequencies, uses a chain of comparators (Figure 1) which gives an almost instantaneous digital value for the analogue input. Potentiometers W and B are used to set the voltages for white level and black level to match the incoming video signal; the outputs A,B,C,D are then a digital representation of the signal in Gray code. This code has the advantage that only one bit changes at any level transition and it is less liable to cause trouble with 'glitches' on the power

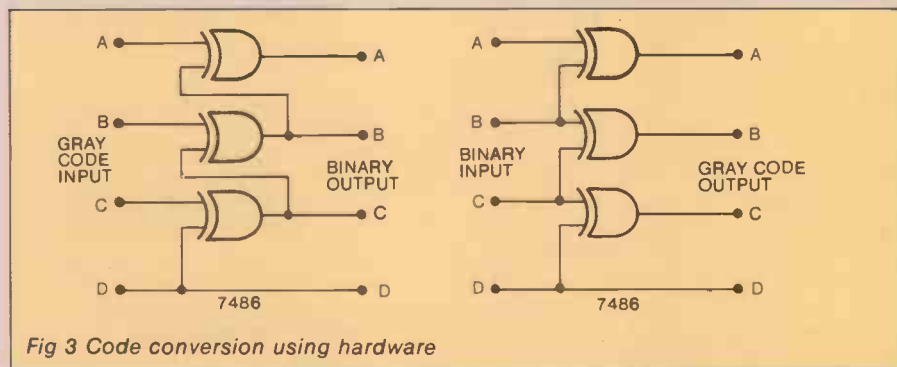


Fig 3 Code conversion using hardware

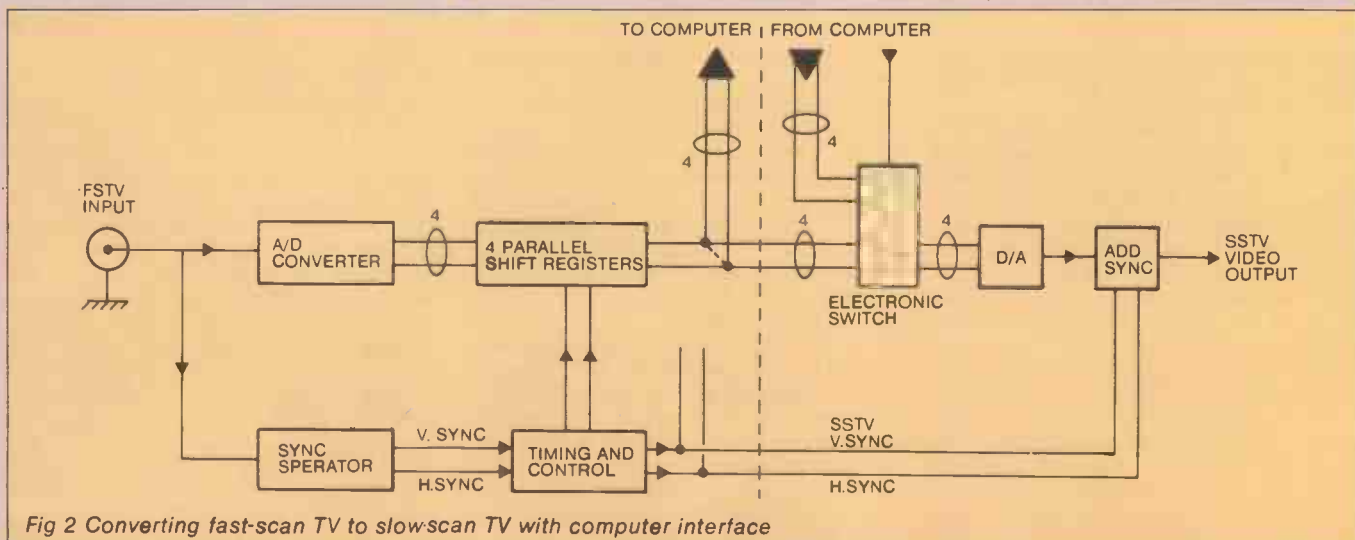


Fig 2 Converting fast-scan TV to slow-scan TV with computer interface

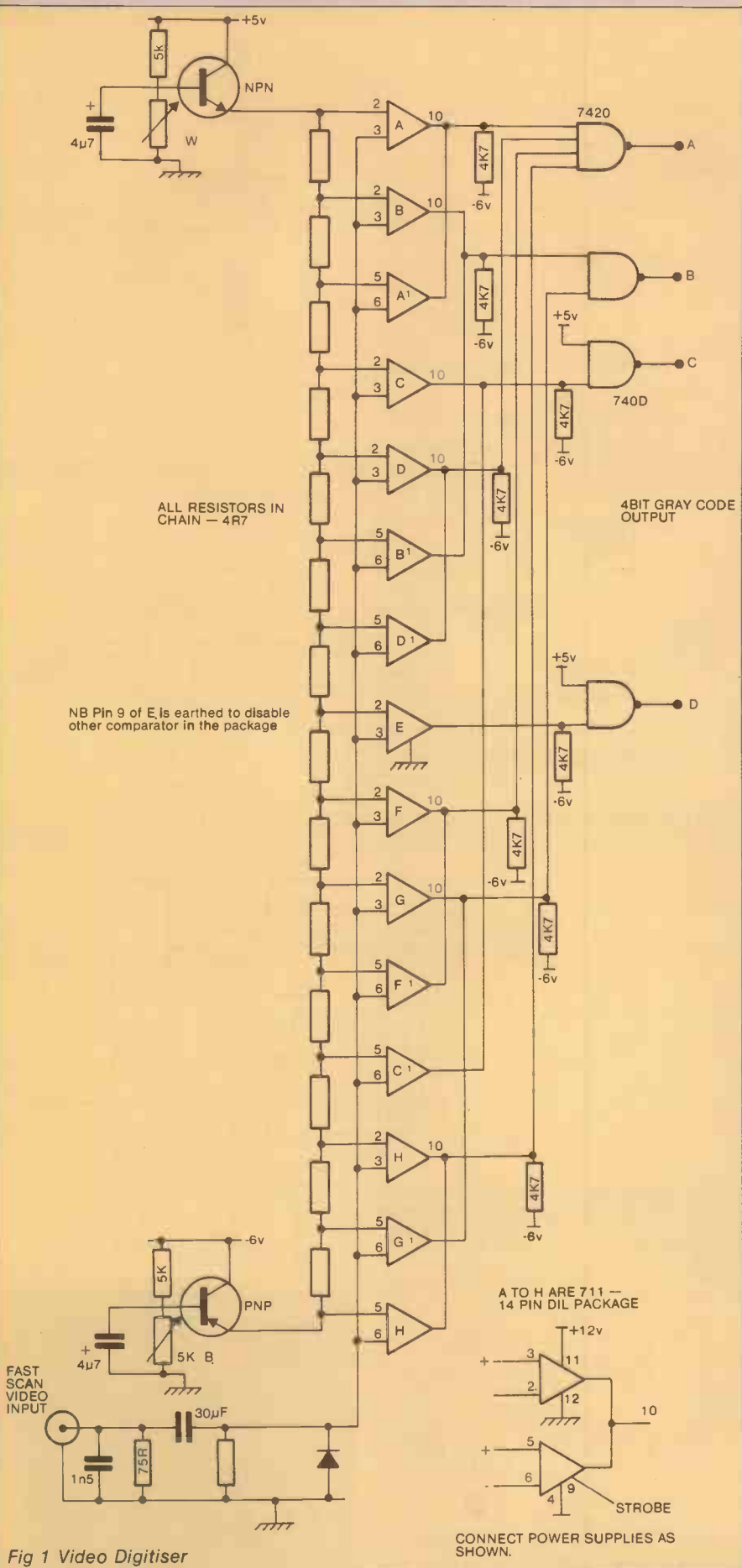


Fig 1 Video Digitiser

lines and elsewhere. Table 1 compares Gray code with hex and binary. A typical slow-scan converter adapted for linkage to a computer is shown as a block diagram in Figure 2. For those people who are not interested in SSTV as such, and whose only concern is to be able to load

video information into a computer, the area to the right of the dotted line can be ignored. In the scan-converter, a 4-bit wide shift register memory is used and a fast clock shifts the video data along the register until one line has been stored. This is then replaced by a slow clock which delivers the

HEXA DECIMAL	BINARY	GRAY CODE
0	0000	0000
1	0001	0001
2	0010	0011
3	0011	0010
4	0100	0110
5	0101	0111
6	0110	0101
7	0111	0100
8	1000	1100
9	1001	1101
A	1010	1111
B	1011	1110
C	1100	1010
D	1101	1011
E	1110	1001
F	1111	1000

Table 1 Comparison of Hex, Binary and Gray codes

data at the output end of the shift register during the next three frames of fast-scan TV. This process is then repeated for a line further down the picture until all lines have been stored. The SSTV used by radio amateurs has a square picture of 128 lines with 128 pixels per line. Thus, every alternate line of the fast-screen picture is sampled and a few lines at the top and the bottom of the picture are ignored. The total storage area for a picture to these standards is 8 kbytes, with each byte holding two pixels. When SSTV is transmitted each line of 128 pixels is sent in 60 ms ... approx 1 ms per byte or 500 μ s per pixel. Now a lot of useful computing can be done in 500 μ s and the digital video signal which emerges from the shift register memory can be read at a computer input port and hence stored in computer memory. Special effects, such as contrast enhancement, can be achieved by using a look-up table before storing the pixel.

If the digitised fast-scan signal (Gray code) is converted to binary and then reconstituted by a D/A converter, the signal can be viewed on a TV monitor and it will be found that, despite the A/D and D/A conversion, the picture is still good quality even though we have used only 16 grey levels. Conversion between Gray code and binary can be performed by the circuits of Figure 3; if you prefer doing it by software then refer to PCW Sub.Set, October 1981. The type of D/A converter usually used for fast-scan video work is a simple weighted resistor network as in Figure 4; the resistors are in the ratio 8:4:2:1 to match the binary digits — the largest resistor gives the smallest current and corresponds to the LSB of the video signal.

Another possible way of digitising a video signal is shown in Figure 5; this is only put in as a suggestion by the author as it has not been tested in practice. We have an 8-bit up-down counter which is continuously driven by a fast clock; the output of the least significant five bits is converted to an analogue signal and compared with the incoming fast-scan signal from the camera. If it is of greater amplitude than the camera signal, then the comparator switches the counter to count down; conversely if it is lower, the comparator switches to count up. The least significant bit is likely to be oscillating rapidly when the video signal is at a steady level so we take the next four bits from the counter as the digitised video signal (binary, not Gray code) and this can be latched when require. For fast-scan TV, a clock frequency of 12 MHz would give 6 Megapixels/sec which is about right.

It is worth noting that an A/D chip has recently appeared on the market as a 'flash digitiser' capable of handling frequencies

DIGITAL VIDEO



up to 15 MHz; this is the RCA CA3300D. The main snag is the price — in the region of £66 per chip (summer 1982)!

Now we have the picture in the computer's memory we want to display it on the VDU, which is, of course, a fast scan device. Once again we run into problems with speed, and the most promising answer seems to be the elimination of the micro-processor chip and the use of direct memory access (DMA) with some form of hardware interface, possibly using one of the CRT controller chips. Clayton Abrams has successfully used the 6843 CRT controller for displaying stored pictures on a monitor screen (see *Ham Radio*, July 1979). In my equipment, the picture in computer memory is converted to a slow-scan signal which is then sent to a separate slow-to-fast scan-converter with its own 8k memory which can be read out at high speed.

Notice that with access time of 150 ns or 200 ns for a modern dynamic RAM chip, the speed of the memory is no longer the problem — it's the speed of the processor and the amount of processing needed which is the limiting factor. Hardware circuits can be used to eliminate the processing needed when, for example, the two 4-bit pixels have to be packed into or unpacked from one byte. Figure 6 shows suitable circuits for doing this. The 74LS 157 is equivalent to a 4-pole 2-way electronic switch and the 74175 is a 4-bit latch used as a temporary store. The switching must take place at a speed which is twice the speed of the memory address clock.

Perusal of *PCW's* advertising pages, not to mention the helpful equipment reviews, reveals that most computer manufacturers are keen to stress their machines' capability for high-resolution graphics or colour; very few make any mention of any form of greyscale which is almost essential for picture display, yet the CRT in the VDU is ideally suited for displaying a full greyscale picture. When one comes to the adverts for printers, however, it's a different story. Quite a few manufacturers illustrate their machines with what looks like a photograph emerging from the roller — despite the fact that a printer is essentially a black and white device; even thermal printers are unable to reproduce a satisfactory greyscale.

The secret is, of course, in the dot-matrix print-heads which are so popular. Examination of some newspaper photographs reveals that they are composed of lots of dots of ink which are closely or sparsely spaced to give the overall impression of the required shade of grey. This is a task for which the dot-matrix printer is ideally suited as long as it is possible to program each individual dot in the print-head. Figure 7 shows the result obtained by Martin Emmerson (G30QD) using a dot-matrix printer to obtain a hard copy of a slow-scan TV picture. In this case the picture resolution was 128x128 pixels and the rather elongated appearance results from the fact that the printer was not geared to produce an equal number of dots/inch in the horizontal and vertical directions.

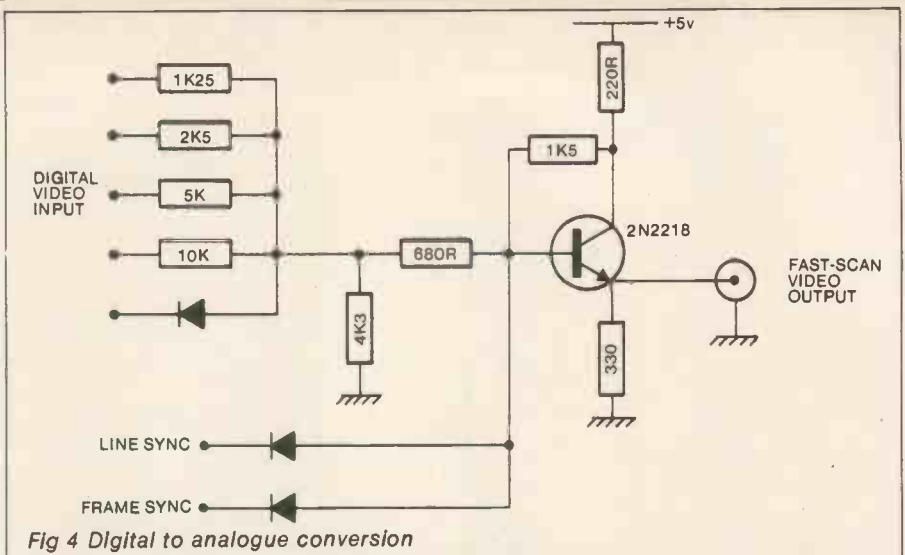


Fig 4 Digital to analogue conversion

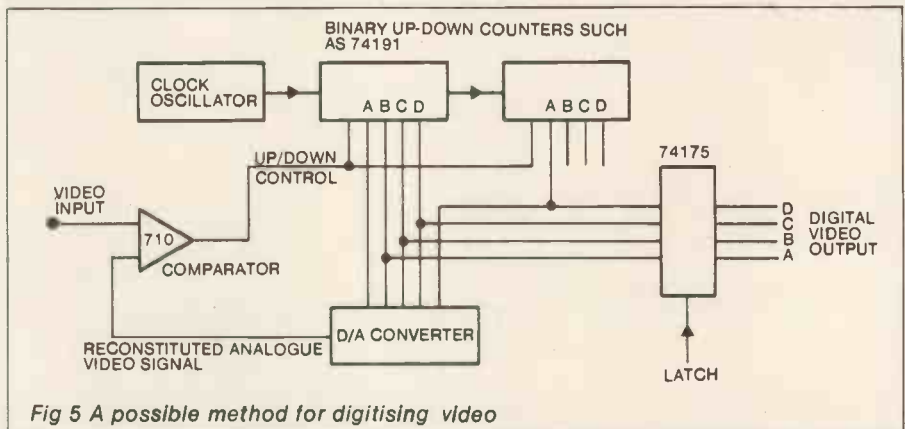


Fig 5 A possible method for digitising video

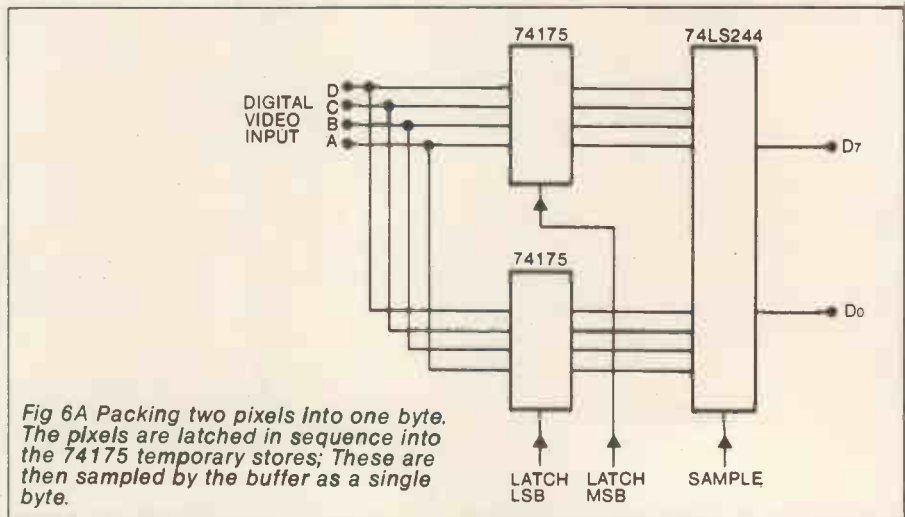


Fig 6A Packing two pixels into one byte. The pixels are latched in sequence into the 74175 temporary stores; these are then sampled by the buffer as a single byte.

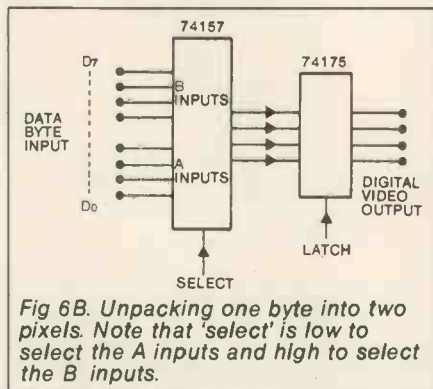


Fig 6B. Unpacking one byte into two pixels. Note that 'select' is low to select the A inputs and high to select the B inputs.

To show how it is done, let us take an example. . . the Thomson 96364 display chip uses a rectangle for each character measuring eight elements wide by twelve elements vertically; within this area is the



Fig 7

usual 5x7 matrix for the character proper, the extra being inter-character and inter-line spacing. If we divide the 8x12 area into blocks of 4x4 elements and let each 4x4 block represent one pixel, then for a 64-character line we have 128 pixels, and for the 16 character lines of the display we have 498 pixels (three blocks per character in the vertical direction). Clearly on this basis the VDU screen will not display a full 128x128 pixels picture but if we have a printer whose print head has similar characteristics it's a simple matter to use a bit of extra paper and print the whole picture.

Each block of dots represents one pixel, and by choosing to print any number of dots from zero to 16 we can, in fact, have 17 levels of grey. Care is needed in choosing which dots to print for a given value of grey as it's possible for the dots in adjacent squares to join up and form an undesirable patterning rather than the overall grey effect which is desired. Figure 8 gives a set of recommended pixels. The resolution of a 128x128 picture is not, of course, anything like as good as a standard TV picture, but does give an adequate picture for radio amateur purposes and possibly for other purposes also. Figure 9 shows a picture which was stored in the memory of my Triton computer, block shifted for tape recording and sent to Alan Strong (G3WXI) of Sheffield. Alan has a Nascom with a different recording format, but a simple program was written to read the Triton

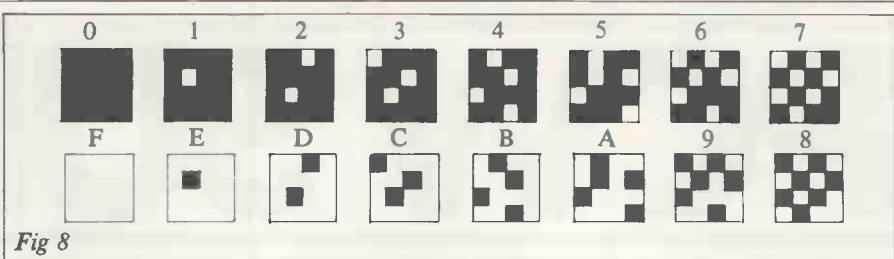


Fig 8

tape into the Nascom memory as a hex-dump whence it was fed to a specially built fast-scan display. The original photograph shows clearly how each pixel is represented by two TV lines.

Figure 10 shows a picture printed by the technique outlined above using an Epsom MX100 printer; acknowledgements to Alan Strong whose picture it is. Figures 11 & 12 show two pictures printed from my Triton using an Anadex 9501 printer. This printer uses approximately the same number of dots/inch in both directions and thus gives the correct aspect ratio of 1:1. Not all printers are able to do this, and if this technique of picture printing becomes popular some manufacturers may have to modify their machines to give equal resolution in both directions.

Another point to note is that the printed dots may possibly be larger than the space they are supposed to occupy due to the lateral spreading of the ink in the paper; future experiments will attempt to improve the picture by using a look-up table to

modify the pixels before they are stored in memory.

The field of video computing is rapidly expanding and offers a challenge to computer enthusiasts who are looking for something different on which to exercise their skills. **END**



Fig 9



Fig 10



Fig 12

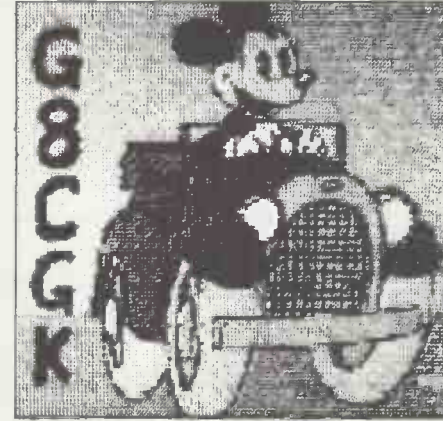
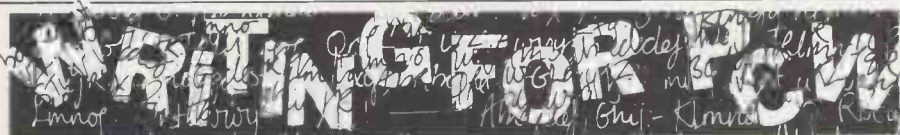


Fig 11



PCW welcomes approaches from would-be writers, even those who have never appeared in print before. In this game it's often those with practical experience who have important things to say so we don't mind if your prose is less than perfect — providing submissions have a sensible structure and follow a logical sequence, we can take care of the polishing.

If your article is already written, send it in — taking care to ensure that your name and address, together with a daytime phone number if possible, appears on both the covering letter and the manuscript. Manuscripts should, preferably, be typed or printed out (dot matrix output is quite acceptable) but *must* be double line-spaced with ample margins top and bottom and on each side.

We can now accept articles on a limited number of disk formats: standard IBM 3740 single-sided, single-density 8in, and the following 5¼ in formats: Superbrain SSSD 35-track; RML 380Z SSSD; Sharp

MZ-80K/A DSSD, Cromemco SSSD, Nascom DSSD, Rair/ICL DSDD, SD Sales SSSD, Triton 35 track SSDD and ACT Sirius 1 (CP/M-86 or MS-DOS) single-sided. By prior arrangement we can accept stuff over the phone by modem using BSTAM at 300 baud but as we can only do this during office hours (10am to 6pm) it's not exactly a cheap way of getting your article to us! In the near future we hope to be able to accept material by The Source and Rewtel. Please note that if you want to send your article in this way, it should be as an ASCII file rather than as a 'work file' for any one type of word processor — ie, use your word processor to print the text to disk instead of to paper.

Please note that we cannot undertake to return manuscripts, diagrams and photographs, although we always try to return the latter. We can only return disks if they are accompanied by adequate postage and packaging.

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 is what we're looking for. But before you send anything to us, take a good look through PCW to see what sort of articles get published and to see what style of writing we prefer (basically, avoiding pomposity at one extreme and flippancy at the other). Also take a look through the Back Issues advert to see what sort of things we have already published — no point in re-inventing the wheel.

Once you've sent off your article or proposal, please don't hassle us for a decision. We receive far more submissions than we can ever use and it takes us a while to sort through them, acknowledge receipt and give an opinion one way or the other. Please be sure to tell us if you've sent the article to another magazine — it would be very awkward indeed if the same article appeared simultaneously in two publications! Frankly, we're more likely to accept something which has been offered exclusively to us.

Finally, we do pay for published work but please be patient! Payment *normally* follows about 4-6 weeks after publication.

PCW SUBSET

Alan Tootill and David Barrow present more useful assembler-language subroutines. This is your chance to help build a library of general-purpose routines, documented to the standards we have developed together this series. You can contribute a Datasheet, improve or develop one already printed or translate the implementation of a good idea from one processor to another. PCW will pay for those contributions that achieve Datasheet status. Contributions (for any of the popular processors) should be sent to SUB SET, PCW, 62 Oxford Street, London W1A 2HG.

Z80 anybase conversion

Last month we had the 6502 routine, XBIN, to convert an unsigned ASCII encoded number, in any base from 2 to 36, to a 32-bit binary number. This prompted me to fish out a set of routines in Z80 code, which I have had for some time, to do a similar conversion into the 16-bit HL regis-

ter. These Z80 routines, ANYNO/CTON/DEXBC are from Jim Chance of Birmingham University. In the input string, digits greater than 9 are represented by the characters A to Z. Note the meticulous validation of the ASCII encoded input.

Datasheet

```

;=ANYNO - gets base 2-36 number to HL
;CLASS: 2
;TIME CRITICAL? No
;DESCRIPTION: Gets +ve number to binary in HL from digit
; strings at (DE) with base (eg, 2 for binary,
; 16 for hex) in BC.
;ACTION: Start at left digit, get to binary (F=15, G=16 etc),
; add to partial result. If more digits, multiply by
; base and loop for more digits.
;SUBR DEPENDENCE: CTON, DEXBC (local)
;INTERFACES: A byte in RAM, pointed to by IX, is used to hold
; the number of digits in the ASCII string and is
; reduced during the routine to zero.
;INPUT: (IX)=number of digits, BC=number base, (DE)=left digit.
;OUTPUT: HL=binary number, NC=o.k. carry=error. (IX) AF,BC,DE
; destroyed.
;REGS USED: AF,BC,DE,HL,IX
;STACK USE: 6
;PROCESSOR: Z80

ANYNO: LD HL,+0 ;zeroise result register. 21 00 00
AY1: LD A,(DE) ;get ASCII digit. 1A
INC DE ;increment digit pointer. 13
CALL CTON ;convert chr to binary. CD YY YY
RET C ;return cy set if invalid. D8
CP C ;compare chr with base. B9
CCF ;and return with carry set 3F
RET C ;if not less than base. D8
ADD A,L ;add 85
LD L,A ;digit 6F
LD A,H ;to 7C
ADC A,+0 ;partial CE 00
LD H,A ;result. 67
DEC (IX+0) ;adjust digits left to go. DD 35 00
RET Z ;return if zero. C8
PUSH DE ;else save digit pointer D5
PUSH BC ;and base. C5
EX DE,HL ;get partial result in DE & EB
CALL DEXBC ;multiply it by base into HL. CD YY YY
POP BC ;restore base and C1
POP DE ;digit pointer. D1
JR AY1 ;go back for next digit. 18 E3

;CTON character to binary number. Carry=invalid.
CTON: SUB 30H ;return with carry set D6 30
RET C ;if digit less than 0. D8
CP +10 ;return with FE 0A
CCF ;carry clear if 3F
RET NC ;digit 0-9. D0
SUB +7 ;return with carry set D6 07
RET C ;if digit >9 and <A. D8
CP "Z+1 ;return with carry clear if FE 5B
CCF ;digit A-Z, else 3F
RET ;return with carry set. C9

;DEXBC 16-bit multiply HL=DE*BC. carry=overflow.
DEXBC: LD A,+16 ;bit counter. 3E 10
LD HL,+0 ;zero answer. 21 00 00
;MXBL: SRL B ; CB 38
RR C ;gets 1s bit of multiplier. CB 19
JR NC,MXB2 ; 30 02
ADD HL,DE ; 19
RET C ;overflow return. D8
MXB2: EX DE,HL ;get multiplicand to HL. EB
ADD HL,HL ;double it. 29
EX DE,HL ; EB
RET C ;overflow return. D8
DEC A ; 3D
JR NZ,MXB1 ;loop for all bits. 20 F1
RET ;return. C9

```

Z80 square roots

Steven Weller's very fast square roots (August'82) have not gone unchallenged. Both K P Leary of Chislehurst and John Kerr of Glasgow have sent amended versions and pointed out that, in Steven's versions, the correct remainder is not always returned. As KP puts it, since $(n+1)^2 - n^2 = 2n+1$, extracting a square root of k bits can leave a remainder of k+1 bits, since the largest remainder when extracting n is 2n. In other words, a 15 or 16 bit square can have a 9 bit remainder

and a 31 or 32 bit square can have a 17 bit remainder.

In the original DSROOT the 17th bit of the remainder is in the carry flag, though this was not stated, but in SROOT the 9th bit of the remainder is actually set to zero.

There is very little to choose between the two corrected versions of the 16 bit routine so, to counter John's move to take over the whole of this issue's SUB SET, we give K P Leary's version in Datasheet SQR15/16.

Datasheet

```

;=SQR15 - 15 bit square root. SQR16 - 16 bit square root.
;CLASS: 2
;TIME CRITICAL?: No
;DESCRIPTION: SQR15 calculates square root of 15 bit 2s
; complement positive number.
; SQR16 calculates square root of 16 bit unsigned
; (assumed positive) number.
;ACTION: Shifts pairs of bits in A, L left through A, L, H.
; Trial subtraction from 4 times (last remainder in H)
; + next pair (in L). Subtrahend is 4 times (last part
; root in D) + 1. New part root = twice (old root)
; + 1 if subtraction, 0 if not.
;SUBR DEPENDENCE: None
;INTERFACE: None
;INPUT: Number in HL
;OUTPUT: SQR15: If number -ve, NZ state, registers unchanged. Else
; SQR15 and SQR16: z state, 8 bit positive signed root
; in HL, 9 bit positive signed remainder in DE.
;REGS USED: AF, B, DE, HL
;STACK USE: Nil
;LENGTH: 35
;TIME STATES: 843 max.
;PROCESSOR: Z80

SQR15: BIT 7,H ;test for negative number. CB 7C
RET NZ ;if so exit with Z flag unset. C0
SQR16: LD DE,40H ;set subtrahend to zero. 11 40 00
LD A,L ;set up 24 bit accumulator 7D
LD L,H ;in HL, A 6C
LD H,D ;high bits = 0. 62
LD B,+8 ;set bit count. 06 08
OR A ;clear carry. B7
W: SBC HL,DE ;trial subtraction. ED 52
JR NC,X ;jump if successful 30 01
ADD HL,DE ;else add back. 19
X: CCF ;switch carry to roll into 3F
RL D ;subtrahend high bits in D. CB 12
ADD A,A ;shift up next bit pair 87
ADC HL,HL ;in accumulator. ED 6A
ADD A,A ; 87
ADC HL,HL ; ED 6A
DUNZ W ;jump if not done. 10 F0
RLA ;overflow of remainder to A. 17
LD L,D ;root to HL. 6A
LD E,H ;remainder to E. 5C
LD D,A ;set remainder high bits. 57
LD H,B ;set root high bits (=0) 60
XOR A ;set Z state. AF
RET ;return. C9

```

KP also sent a corrected version of the 32 bit routine, appreciably faster than the original. But John Kerr's ver-

sion is faster by just about the same amount again, so here it is in Datasheet DSRTZ. The essence of the improvement

hinges on the fact that the low order subtrahend, previously held in BC, never changes from its initial value of 4000 hexadecimal, so can enter the

program as immediate data. This frees register pair BC and saves using the 'stacktop' and all those time consuming EX (SP),HLs.

Datasheet

```

;=DSRTZ - four byte integer square root.
;CLASS: 2 (does not preserve flags)
;TIME CRITICAL?: No
;DESCRIPTION: Calculates square root of non-negative 32-bit
;              2s complement binary number, giving remainder.
;ACTION: Terminate if input is negative.
;         Store input in four low order bytes of working accum.
;         HL,A,C,IX: clear HL (high order accumulator word)
;         Clear DE (high order subtrahend; accumulates answer).
;         Take subtrahend from high order accum. HL,A,C
;         If carry set (borrow required) add back in
;         Invert carry status and rotate into DE
;         Multiply working accumulator HL,A,C,IX by four
;         Repeat to 16 times. Put remainder MSB into A.
;SUBR DEPENDENCE: None
;INTERFACES: None
;INPUT: BC,DE contains input number (B is MSByte)
;OUTPUT: Z flag cleared if input was negative; else
;         BC,DE contains square root; remainder in A,HL
;REGS USED: AF,BC,DE,HL
;STACK USE: 2
;LENGTH: 50
;TIME STATES: 2792 max
;PROCESSOR: Z80

```

```

DSRTZ: BIT 7,B ;find sign of input. CB 78
RET NZ ;and exit if negative. CD
LD A,B ;high order input in A,C 78
PUSH DE ;low order input in A,C D5
EX (SP),IX ;contents of IX saved. DD E3
LD D,+0 ;clear high order 16 00
LD E,D ;subtrahend 5A
LD H,D ;and top word of 62
LD L,D ;working accumulator 6A
LD B,+16 ;B is loop counter. 06 10
DSR10: SUB 40H ;take subtrahend from 06 40
SBC HL,DE ;HL,A,C. ED 52
JR NC,DSR20 ;if no borrow required jump 30 04
ADD A,40H ;else add back in. C6 40
ADC HL,DE ; ED 5A
DSR20: CCF ;invert carry status 3F
RL E ;and rotate into answer, CB 13
RL D ;modifying subtrahend. CB 12
ADD IX,IX ;shift DD 29
RL C ;working CB 11
RLA ;accumulator 17
ADC HL,HL ;two ED 6A
ADD IX,IX ;bits DD 29
RL C ;to CB 11
RLA ;the 17
ADC HL,HL ;left. ED 6A
DJNZ DSR10 ;do sixteen times. 10 E1
RLA ;remainder MSB into A. 17
CP A ;set Z for valid result. BF
POP IX ;restore IX DD E1
RET ;return C9

```

Error flags

The error correction routine EFIX8 by John Kerr of Glasgow printed last month was the subject of a late amendment which unfortunately resulted in the documentation giving false information. The original version used the N flag to signal whether a correction had been made but the output state of the N flag is uncertain in the amended version. In all fairness to John, who did alter his documentation accordingly, I take full responsibility for not correcting this part of the Datasheet.

However, I do not feel particularly repentant as the inci-

dent does highlight the necessity of careful attention to flag conditions. The point I made last month about using any handy flag result to carry information out of, or indeed into, a routine was that it should be easy to test, perhaps of greater importance is that the exit flag conditions when used to pass information ought to be specifically set, and commented on. Relying on the happy accident that instructions immediately prior to exit produce useful flag results is risky when the slightest change to a routine could destroy the whole set-up.

6502 data protecting

The two Datasheets ECAL6 and EFIX6 are the 6502 versions of ECAL88 and EFIX8 printed last month and also sent by John Kerr.

To recap briefly on the method used by the routines, ECAL produces an error correction byte (ECB) for a data block up to 31 bytes in length. This can be appended to the data before its storage or

transmission. On retrieving or receiving the data and ECB, EFIX calls ECAL to get a new ECB for the data block and compares it with the appended ECB. The difference between the two ECBs gives a correction code which is in effect an index to any single bit which may have suffered inversion during storage or transmission.

In order to calculate the ECB, a parity mask is formed. The highest 5 bits of this mask index the bytes not from the start of the data block but from the end. The lowest three bits index the bits within each byte. Eg, the parity mask for each bit in the byte that is 23rd from the end would be 10111XXX where the Xs would take values 111 down to 000 for bits 7 down to 0 in that byte.

The ECB is initially reset to 00000000 and each bit of the data block is checked in turn. If the bit is reset (0), no action is taken, but if it is set (1) then its unique parity mask is exclusive-OR'd with the ECB. This inverts the bits of the ECB which are in the same position as the set bits of the parity mask.

The completed ECB is a collection of eight parity bits such that bit 0 of the ECB shows the parity of alternate data bits, bit 1 shows the parity of alternate pairs of data bits, bit 2 shows the parity of alternate groups of four data bits, and so on in a binary pattern. Any difference found between the stored and new ECB in EFIX will be a binary pattern representing the parity mask of one bit which, because of inversion of that bit, affected one ECB but not the other. As this correction code is exactly the same as the parity mask, EFIX can use the highest five bits to index the byte in which the error has occurred and the lowest three bits to create an inversion mask to re-invert the corrupt bit in that byte.

Datasheet

```

;=ECAL6 - Calculate error correction byte
;CLASS: 1
;TIME CRITICAL?: No
;DESCRIPTION: Calculates a one-bit error correction byte (ECB)
;              to be appended to a data block of 1 to 31 bytes and
;              subsequently used by EFIX6.
;ACTION: Abort if no of bytes = 0 or GTMHAN 31
;         Initialise mask to 8 * (no of bytes) + 7
;         Clear ECB
;         For each byte in data block
;         For each bit in current byte
;         If bit is 1 then ECB ECB W mask
;         Decrement mask
;SUBR DEPENDENCE: None
;INTERFACES: None
;INPUT: Y = no of bytes MO,1 points to 1st byte
;OUTPUT: Cy set: abort
;         Cy reset: X=ECB Y,M0,M1 unchanged
;REGS USED: X Y P M0 M1
;STACK USE: 3
;LENGTH: 60
;TIME STATES: 63+175 per byte average
;PROCESSOR: 6502

```

```

ECAL6: CPY £$20 ;terminate if no of bytes CO 20
BCS EXIT2 ;is greater than 31 80 37
PMA ;save A and M2 48
LDA M2 ; 48
PMA ; 48
TYA ;move block length to A and 98
SEC ;terminate with Cy set if 38
BEQ EXIT1 ;no of bytes = 0 FO 28
ASL A ;move no of bytes DA
ASL A ;into highest five bits of A and 0A
ORA £7 ;set lowest three bits to get 0A
STA M2 ;initial parity mask 09 07
LDA M3 ;in M2 85 ZZ
PMA ;save M3 45 ZZ
LDX £0 ;clear initial ECB 48
LDY £0 ;and byte pointer index A2 00
ECLP1: LDA (M0),Y ;move byte from data block A0 00
STA M3 ;move M3 81 ZZ
TXA ;into M3 85 ZZ
TXA ;ECB into A 8A
LDX £8 ;set up bit count A2 08
ECLP2: ASL M3 ;move bit into Cy and 06 ZZ
BCC SKIP2 ;if it is '1' 90 02
EOR M2 ;then ECB ECB W mask 45 ZZ
SKIP2: DEC M2 ;next mask C6 ZZ
DEX ;decrement bit count and CA
BNE ECLP2 ;repeat for all bits in byte 00 F5
JNY ;point to next byte CB
LDX M2 ;check for end of block when A6 ZZ
CPX £8 ;parity mask is 7 E0 08
TAX ;ECB into X AA

```



PCW SUBSET

```

BCS  ECLP1  ;repeat for all bytes in block  80 E6
PLA  ;restore M3  68
STA  M3    ;  85 ZZ
EXIT1: PLA  ;restore M2  68
      STA  M2    ;  85 ZZ
      PLA  ;restore A  68
EXIT2: RTS  ;  60
    
```

Datasheet

```

;=EFIX6 - Detect and correct a one-bit error in data block
;/CLASS: 1
;/TIME CRITICAL?: No
;/DESCRIPTION: Examines a 1 to 31 byte data block with appended
;/ ECB and corrects a singler bit error.
;/ACTION: Abort if no of bytes = 0 or GTHAN 31
;/ Calculate ECB of data block
;/ EOR with stored ECB
;/ If no error then terminate
;/ Else use highest 5 bits to point at corrupt byte,
;/ terminating if error in ECB indicates corrupt
;/ byte outside block, lowest 3 bits to produce
;/ a bit inversion mask and invert corrupt bit.
;/SUBr DEPENDENCE: ECAL6 - calculate ECB
;/INTERFACES: None
;/INPUT: Y = no of bytes excluding appended ECB
;/ MO,1 points to first byte
;/OUTPUT: Cy set: abort
;/ Cy reset: no error found: Y = no of bytes
;/ error found: Y = no of corrected byte -1
;/REGs USED: Y P MD M1
;/STACK USE: 7 (including JSR ECAL6)
;/LENGTH: 53
;/TIME STATES: Average 192 + 175 per byte
;/PROCESSOR: 6502
    
```

```

EFIX6: PHA  ;save A and X  48
      TXA  ;  8A
      PHA  ;  48
      JSR  ECAL6 ;get new ECB of data block  20 XX XX
      BCS  EXIT4 ;terminating if ECAL6 aborted  80 29
      LDA  M2 ;save M2  A5 ZZ
      PHA  ;  48
      TXA  ;compare new and stored ECB  8A
      EOR  (MO),Y ;terminating if correction  51 ZZ
      CMP  £8 ;code is too small to indicate  C9 08
      BCC  EXIT3 ;error in data block  90 1C
      TAX  ;save correction code  AA
      LSR  A ;move highest 5 bits down to  4A
      LSR  A ;give an index to corrupt byte  4A
      LSR  A ;and test  4A
    
```

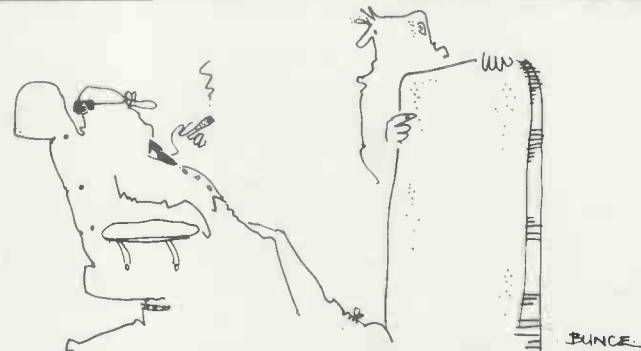
```

STA  M2 ;if position is greater than  85 ZZ
CPY  M2 ;no of bytes in block, terminating  C4 ZZ
BMI  EXIT3 ;with Cy reset if it is  30 12
TYA  ;subtract index-from-end from  98
SBC  M2 ;no of bytes to give  E5 ZZ
TAX  ;index-from-first-byte in Y  A80
TXA  ;make X a count to corrupt bit  8A
AND  £7 ;using lowest 3 bits of  29 07
TAX  ;correction code  AA
LDA  £0 ;move a '1' into A  A9 00
EFLP1: ROL  A ;in the same position  2A
      DEX  ;as the  CA
      BPL  EFLP1 ;inverted bit  10 FC
      EOR  (MO),Y ;reinvert it and  51 ZZ
      STA  (MO),Y ;restore it to data  91 ZZ
EXIT3: PLA  ;restore M2  68
      STA  M2 ;  85 ZZ
EXIT4: PLA  ;restore X and A  68
      TAX  ;  AA
      PLA  ;  68
      RTS  ;  60
    
```

Military two-step

I have been advised that perhaps not all of SUB SET readers are aware of the old story about the message, 'Send reinforcements, we are going to advance', being

passed by word of mouth along the trenches. Battalion HQ were surprised to receive the request, 'Send three and fourpence, we are going to a dance.' Try decimalising that!



'The biggest chip the world has ever seen, eh, Brian? I'm impressed but aren't we rather swimming against the tide a bit here?'

BBC ELTEC SERVICES LTD



COMPUTERS

BBC Model "A" (in stock now) £299.00
 BBC Model "B" (in stock now) £399.00
 BBC Model "A" plus extra 16K memory £330.00
 16K Hitachi memory (as fitted by ACORN) £31.00
 FULL UPGRADE KIT (Genuine ACORN issue) £90.00
 UPGRADE KIT fitting charge £10.00

CASSETTE RECORDERS

Cassette Recorder (Pye) £23.00
 Cassette Recorder (Ferguson) £28.00
 Cassette Recorder (Sony) £37.95
 Cassette lead (7 pin DIN/3 jacks) £5.00
 Blank Cassettes (Scotch 3M) £0.70

PRINTERS

Seikosha GP100A £225.00
 EPSON MX80 F/T III £390.00
 EPSON MX100 F/T III £530.00
 SMITH CORONA Daisy Wheel Printer £557.00
 Printer Cable £18.40

MONITORS

14" Full colour MONITOR (used in BBC computer programmes) £309.35
 12" Green Screen MONITOR £126.00
 RGB Monitor Lead £5.00
 Monitor lead £5.00

BBC SOFTWARE

ACORN SOFTWARE Peeko Computer £9.95
 ACORN SOFTWARE Defender £9.95
 ACORN SOFTWARE Monsters £9.95
 ACORN SOFTWARE Philosophers Quest £9.95
 ACORN SOFTWARE Snapper £9.95
 ACORN SOFTWARE Arcade Action £11.90
 ACORN SOFTWARE Desk Diary £9.95
 Sinclair Mutant Invaders £3.95
 Sinclair Super Hangman (Hilarious! with sound) £3.95
 Sinclair "B" Invaders (Just like the Pub version) £6.95
 Sinclair Beebunch (Like Snapper) £5.95
 Sinclair 3-D Maze (FAST & INTRICATE!) £3.95
 Sinclair WORD PROCESSOR £9.95
 PRO-DIS Disassemble/Dump/Edit £9.14

PS for ATOM OWNERS!

DISATOM SUPER ROM 27 new words plus FULL DISASSEMBLE £29.95
 SOFTSWITCH 4X4K ROMS Software selectable, plug-in PRO LOG ADC Board. Eight inputs for joysticks, paddles machine inputs £24.95
 ACORN SOFTWARE BBC BASIC board £49.50

SEE OUR CHRISTMAS PRICE LIST

PRICES ARE VAT INCLUSIVE
 P&P £1.00 for orders under £100.00
 Orders over £100.00 add £10.00
 for a Securicor Delivery

ELTEC SERVICES

217 Manningham Lane, Bradford
 Telephone: (0274) 722512
 Opening hours Mon - Fri 8.30 am - 5 pm
 Sat 9 - 12 (noon)

Moore on Kuma

Word processing for Sharp

User-friendly and user-oriented are much over used words in computing, but it is difficult to find more suitable phrases to describe the WDPRO word processing package for the Sharp range.

It's a really professional system, that is probably better than you'll ever need. Its only drawback is the price. At £39.50 and £79.95 for cassette and disk respectively, you might believe it is too cheap to be true.

Well, it is true and Kuma can provide an impressive postbag of endorsements. They also supply a "Layman's (sorry, Layperson's) Guide" with a practical, step-by-step, approach. If you can't follow this — give up computing and try knitting.

Low cost phototyping

If you're in a business or organisation that buys typesetting, take a careful note of the following.

A system is now available that can slash typesetting costs by 60%. Using a Sharp micro, the text is typed and posted in cassette form for specialist phototyping. The data is fed directly into a phototyping machine thus eliminating that major cost item — the compositor's time in retyping the text. How about that Mr Zgorelec? For more details phone John Feltham on 01-778 2458.

VAT Panacea

Do you suffer from VATphobia? Many small businesses do, which is why Dean Software has brought out a new version of its SOLID STATE VAT accounting system called EASIVAT.

It caters for over 200 entries per month, produces monthly and quarterly VAT payments at the touch of a button, has full search facilities, can generate end of year profit and loss accounts, and many more.

It's available for Sharp micros on cassette at £39.50 but a disc version will be here soon.

Other small business programs from Dean Software include a really useful "electronic card index" called SOLID STATE Database and offering a full sort and summary print facility that can be changed at any time; and a SOLID STATE Stock Control package that can handle up to 200 items.

New Sharp software catalogue

The new Kuma catalogue supplement for MZ80A & K costs 50p or is free with your next order and contains details of more than 30 additional programs.

We also have a new MZ80B software catalogue and a Newbrain software and accessories catalogue which are available free of charge.

Kuma has

Exclusive distribution rights to G.P. Ridley's "Peeking and Poking the Sharp MZ80K and MZ80A", priced £4.30.

★ Newbrain software now (as a stop press).

★ Signed distribution rights for Professor Frank Georges' Sporting Forecast software for the Sharp range and Newbrain.

★ Added Seikosha printers to its range of peripherals for the Sharp range.

Your country needs you!

That's right. If you have written any software for the Sirius, Sharp, Newbrain, Osborne-1 or Dragon, don't keep it to yourself.

Kuma believes the future lies in software and has become the leading publishing house for Sharp and other micros. So contact us if you would like your work published.

Go forth and multiply

If you've outgrown BASIC on your Sirius, Sharp MZ80B, A, K, you will be glad to know that Kuma has a Fig Forth for these systems.

This fully structured language offers considerably faster program development and execution, and is particularly useful for scientific and education applications. And it includes an incremental compiler, text editor, virtual memory system and, Sirius, a floating point option.

Kuma Forth conforms to the Fig Forth International Standard and can be yours by phoning Kuma.

But if that's outside your interest a very good value for money modification to the Sharp BASIC SA-5510 is available for MZ80A/K. Called BAS MOD it costs only £17.50 and provides over 100 new facilities to make programming easier and faster. For example when an error occurs, BAS MOD will give 50 messages to help find the error. In other areas, single commands replace lines of program in the basic BASIC.

BAS MOD allows a large degree of 'structure' and care has been taken not to retard original BASIC instructions. In fact some have even been speeded up!

Model figures

What you can do with a calculator, pencil and paper, you can now do on the Sharp MZ80K/A with the aid of Calc 3.1.

A simple, yet powerful version of Calc II, but faster and with almost double the free memory, Calc 3.1 supports all that program's usual functions. Calc 3.1 is available in both cassette and disc at £34.50 and £54.50 respectively. Both give a matrix size of 26 by 50.

Next to robbing the bank, Calc 3.1 is the second best thing for improving your financial figurework. A very useful spread sheet calculator.

Character change

The Sirius has become Kuma's largest computer and we aim to dispell the myth that there is little software for this sophisticated machine. Already we have a number of packages, including Forth, that old favourite Othello, and of course Chedit.

Not heard of Chedit? It's a new character set editor that allows you to edit any character by displaying it on the screen and moving the cursor to the position to be changed.

The character set being edited is held in a separate buffer from the set in video ram. So the editing process will not affect this until the edited set is downloaded.

Chedit runs under both MS-DOS and CPM86 on the 128K Sirius.

Kuma Computers Limited

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



PROFESSIONALS IN SOFTWARE APPLICATIONS: INTERFACING

Sirius - 1.

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



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



Newbrain:

The only professional micro of this size: Phone us for immediate FREE delivery + SOFTWARE CATALOGUE Newbrain AD with onboard display £229. + VAT.



SHARP A + B;

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



SHARP ≡ KUMA ≡ SOFTWARE

Printers:

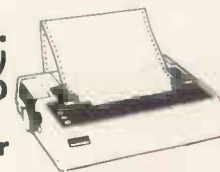
Matrix - from £380.00 + VAT.

Epson Mx 80F/T3 NEC (C. itoh)

Daisywheel - from £476.50

+ VAT.

Brother 8300 Tec Star Writer



Applications:

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

Software: the established leader for Sharp Computers.

MAIDENHEAD (0628) 71778

Kuma Computers Ltd., 11 York Road, Maidenhead, Berks. SL6 1SQ.

Tel: (0628) 71778/9 Telex: 849462 TELFAC KUM



PLEASE SEND ME MORE DETAILS ON: Software Hardware

Sharp Osborne Name

Newbrain Sirius-1 Address

Subscribe to PCW and get a free copy of the new 1983 Benchtest Special

CONFUSION NOW HATH MADE HIS MASTERPIECE!

(Macbeth II.iii.)

Hardly a month goes by without news of another launch issue of a new computing title. We stopped counting earlier this year when the total reached more than 25 regular microcomputing magazines in the UK.

To read them all would, by our calculations, take approximately a fortnight each month. And that would be a superficial reading only! Confusion indeed.

As the first microcomputing magazine in Europe (launched way back in 1978) we welcome competition. But, frankly, there are only so many good editors in the business. Only so many experienced editorial staff. Only so many first class contributors. Somewhere, quality must suffer.

One place where you can be certain editorial quality will never be allowed to fall off is Personal Computer World. PCW is one of the finest microcomputing journals in the world. We constantly strive to stretch our own and our reader's abilities and comprehension of the subject. We will *not* lower editorial standards in the mad scramble to gain new readers.

The truth is, astonishingly, that we do not have to. Despite the plethora of magazines that cater only to gamesplaying and yet another 'learn Basic course' and

despite the fact that we know that many of our readers find PCW a challenge to read, sales of our magazine continue to outstrip every other competitor in the business. We thank you for that.

And as a concrete way of showing our thanks (and, let's be honest, of keeping our subscriptions growth rate) we are offering a free copy of the new 1983 PCW Microcomputer Benchtest Special. Whether you are taking out a new subscription or wish to renew your subscription use the coupon opposite and we'll send you your free 1983 Benchtest Special immediately. And to show that we care for those of you who have already subscribed and who still have several months of your subscription to run, if you renew now we will add the copies still outstanding onto the new subscription so that you can benefit from the offer.

But don't delay. The offer is only open for as long as we have copies of the 1983 PCW Benchtest Special. The last such Special sold out in a very short time. Send off the coupon, today. And thank you for reading Personal Computer World.

For a limited period only, here are the special offer rates for a subscription to Britain's largest selling microcomputer publication.

Year Subscription (U.K. only)	£11.50	In addition to 12 issues of PCW we will send you a copy of the 1983 Microcomputer Benchtest Special completely free of charge.
Year Subscription (U.K. only)	£19.50	(You receive 24 issues, saving yourself £3.50 off the full current subscription price. Plus you protect yourself against future increases in cover prices and postal rates which will probably amount to a saving of £5.00 over the period, plus, of course, the 1983 Microcomputer Benchtest Special.)
Year Subscription (U.K. only)	£29.50	(You receive 36 issues, saving yourself £5.00 off the full current subscription price. Plus you protect yourself against future increases in cover prices and postal rates which will probably amount to a saving of £7.00 over the period, plus, of course, the 1983 Microcomputer Benchtest Special.)

PLUS

We have now arranged for special 'first-off-the-press' copies to be mailed direct to subscribers which will ensure that they arrive either on the same day or one or two days in advance of national distribution in the U.K.

PLUS

Existing subscribers can take advantage of any of the offers above. Just tick the 'this is an extension subscription' box on the coupon and enclose your payment. The additional copies will be added to your existing subscription automatically. You do not have to wait until it is time to renew (by which time this offer will probably have been withdrawn). Save money by extending your subscription today!

PLUS

We have completely reorganised our Subscriptions Department and any problems, change of address, special requests etc. etc. will be promptly dealt with by an extremely 'user-friendly' human being should you need to write to us.

PLUS

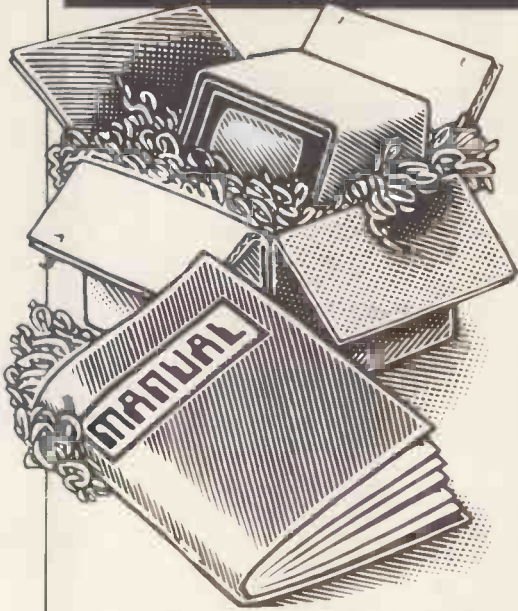
We send subscription copies of PCW in a tough polythene wrapper. It will reach you promptly every month, unfolded and in good condition.

PLUS

You can pay for your subscription to PCW by cheque, postal order or by using Barclaycard (Visa)/American Express or Access. And you don't even need a stamp for your envelope. Use the coupon on the right.

Why do more people read PCW than any other microcomputing magazine in Europe? Subscribe today!

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** (Erasable PROMs) which can be programmed using a special device; EPROMs can be erased using ultraviolet 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.

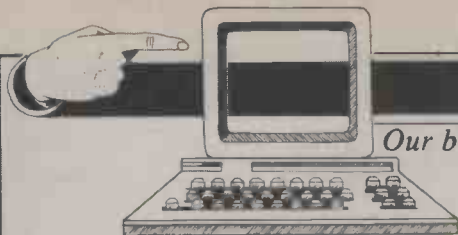
Half-way between cassettes and disks is the **stringy floppy** — a miniature continuous loop tape cartridge, faster than a cassette but cheaper than a disk system. **Hard disk** systems are also available for micro-computers; they store more information than floppy disks, are more reliable and information 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 system 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.



IN STORE

Our bi-monthly guide to microcomputing systems. Updates should be sent to:
Dick Olney, PCW, 62 Oxford Street, London W1A 2HG.

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
ABC 26 (£4500)	AI 09237-70578(19)	64k RAM: Z80A: dual 8" F/D (2.3Mb): 12", 24 x 80 VDU: 2 x RS232 ports: 3 x P/P	CP/M: <i>MP/M Basic:</i> <i>Cobol: Fortran: Pascal.</i>	Options: 10Mb H/D £4000. BT 4/81 (S).
ABC 80 (£738)	Datormark Ltd: 97 44896	16-40k RAM: Z80A: C: 12", 16 x 40 b&w VDU: 4680 bus: IEE 488: RS232 port.	DOS Basic (16k ROM): <i>Fortran: Pascal: A:</i> <i>Multi user Basic.</i>	Colour video graphics with UHF output. Viewdata compatible. Loudspeaker. Numeric keypad. Options: dual 5 1/4" F/D (320k) £895: dual 8" F/D (2 Mb). BT 1/80. (1)
ACT Sirius 1 (£2395)	ACT 021 501 2284 (50)	128-512k RAM: 8088: dual 5 1/4" F/D (1.2M): 12", 25 x 80 VDU: 2 x RS232 ports: 2 x P/P	CP/M 86: U: <i>Basic 8:</i> <i>Cobol: Fortran: Pascal</i>	High res graphics. Options: 10 Mb H/D: dual 5 1/4" F/D (2.4 M) BT 2/82.(S)
Adler Alphatronic (£1895)	Adler 01-250 1717	48-64k RAM: 8085A: dual 5 1/4" F/D (1Mb): 12", 24 x 80 VDU: S/P: P/P	CP/M: <i>Basic: CBasic:</i> <i>Fortran: Cobol</i>	With 80 cps printer and dual F/D £2345 (inc CP/M). (S)
Altos ACS 800-2 (£2995)	logitek: 0257 426644 (33)	64k RAM: Z80A: dual 8" F/D (1 Mb): 2 x RS232 ports: 2 P/P.	CP/M: <i>Basic: CBasic:</i> <i>Cobol.</i>	Single user. Options: DMA. Floating point processor. Phototyping board.
Altos ACS 8000- 10 (£6675)	As above.	280k RAM: Z80A: single 8" F/D (500k): 10 Mb H/D: 6 x RS232 ports: P/P: network RS422 port: DMA	CP/M: <i>MP/M: Basic:</i> <i>Cobol: Fortran: APL:</i> <i>Pascal.</i>	Multi-user/multi tasking. Up to 4 users. Options: 10 Mb: mag tape backup (S + H).
APL Signet (£1750 or £130pm)	Micro APL: 01-834 2687	64k RAM: Z80A: dual 5 1/4" F/D (380k): 2 x RS232 ports.	CP/M: <i>APL: Basic: U:</i> <i>Fortran: Cobol: Algol:</i> <i>Forth</i>	Desktop APL computer with self teaching course. (S)
Apple II (£695)	Apple (UK) 0442 48151 (200 +)	16-48k, RAM: 6502: 8 I/O slots.	OS: <i>Basic: Pascal:</i> <i>Fortran: Cobol: Pilot</i>	280 x 192 high resolution graphics: Option: single 5 1/4" F/D (116k) £349.
Apple III (£2496)	As above	128-256k RAM: 6502B: dual 5 1/4" F/D (286k): 12", 24x80 VDU: RS232 port: P/P.	SOS: <i>Basic: Pascal:</i>	Options: single 5 1/4" F/D (143k) £384: 5Mb H/D £2256. (E) BT 5/82
Atari 400 (£200 inc VAT)	Atari UK: Slough 33344	16k RAM: 6502: C int: cartridge slot: 24 x 40 TV int: touchpad k/b: Opt: C £50	OS (10k ROM): <i>Basic (8k ROM):</i> <i>Pilot: A:</i>	High resolution colour graphics. 4-channel sound. Four games controller/light pen sockets. BT 10/80. (I/B).
Atari 800 (£500 inc VAT)	As above.	16-48k RAM: 6502: C int: 2 x cartridge slots: 24 x 40 TV int: Opt: single 5 1/4" F/D (90k) £300: 16k RAM £65.	OS(10k ROM) Basic (8k ROM): <i>Pilot</i> <i>A: Forth: MBasic</i> (I/B).	As above. Software & RAM on cartridge modules. Up to 4 disk drives RS232C int £135. BT 10/80.
Atom (£120)	Acorn: 0223 245200 (160)	2-12k RAM: 8-16k ROM 6502: Full K/B: C int: TV int: 20 I/O lines: 1 P/P. Options: 80 col printer £199, Prestel adaptor £120.	Basic in 8k ROM: A Cass O/S: <i>Lisp:</i> <i>Forth</i>	High resolution graphics on bigger model: Single 5 1/4" F/D £297 B/ 7/80 (B)
BASF 7120 (£4400)	BASF: 01-388 4200 (12)	88k RAM: 2xZ80A: 3 x 5 1/4" F/D (480k): 12", 24 x 80 VDU: RS232 port: P/P	DOS: (OASIS) <i>Ex Basic:</i> <i>Cobol U. A: CP/M</i>	H/D available. Also 7125 with 960k F/D £4900 and 7130 with single F/D (430k) & 5Mb H/D £6300. Disk controller has own Z80A. BT 9/80
BBC Micro (£299 inc VAT)	BBC Micro Systems 0933 79300	16-32k RAM: 32k ROM 6502: C int: TV int: RS423 port: P/P: Option: single 5 1/4" F/D (100k) £230	MOS: <i>Basic A: Pascal</i> <i>Logo: Forth: Lisp</i>	Video text & second processor int. 32k model with Econet and disk interface £399. BT 1/82 (I)
Bonsai SM3000 (£1995)	Bonsai 01-580 0902	64k RAM: Z80: dual 5 1/4" F/D (700k): 12", 24x80 VDU: RS232 port: P/P	CP/M: <i>Basic: Cobol:</i> <i>Pascal: Fortran</i>	Many floppy and hard disk options. Applications software avail. from Bonsai.
Computers Lynx (£225 inc VAT)	Computers Ltd 0223 315063 (TBA)	48-192k RAM: Z80A; 24x40 TV int: C int: RS232 port	Basic	248 x 256 colour graphics (8 colour). CP/M compatible 5 1/4" F/D & printer avail soon. (B)
Canon BX-3 (£3000)	Canon 01-680-7700.	32k RAM: 6809: dual 5 1/4" F/D (640k): 28 char display: 80 cps printer: 3 x RS232 port: P/P.	OS: <i>Basic: A:</i> <i>Cobol: Pascal</i>	Fully integral unit. Extensive applications support offered on all Cannon Machines. Options: dual dual 5 1/4" F/D (640k) £1500.
Canon CX-1 (£2850)	As above.	32k RAM: 6809: dual 5 1/4" F/D (640k): 12", 24 x 80 VDU: 3 x V24 ports: P/P: light pen.	OS: <i>Basic: A:</i>	Price includes installation & training. Extensive application support offered. Options: dual 8" F/D (1Mb) £3300.(S)
Canon TX-25 (£1450)	As above.	16-32k RAM: 6809: C: 20 char display: 26 col, 2.4 lps printer. Option: 2 x RS232 port.	Basic: A	Fully integral unit. Cassette is Cannon's own design (8k). Can be used with communications. (S).
Clenlo Pronto (£2825)	Clenlo Computing Systems Ltd: 01-670 4202 (TBA)	64k RAM: Z80: dual 8" F/D (1 Mb): 3 S/P: 2 P/P.	CP/M: <i>CBasic-2:</i> <i>Pearl 1: U Fortran:</i> <i>Cobol: Pascal</i>	With 2.4Mb F/D £3105. Also H/D systems with 5-20 Mb H/D & tape drive £5430.
Cleno Table Top 525 (£1750)	As above	64k RAM: Z80 dual 5 1/4" F/D: 2xS/P	CP/M: <i>MBasic: W/P</i>	Wordstar & Logicalc included in price. Many options

List of Abbreviations

A Assembler
BT Bench Tested
C Cassette
E Extensive
F/D Floppy disk

G/C Graphics card
H Hardware
H/D Hard disk
I Introductory
Int Interface

M/A Macro assembler
N/A Not available
N/P Numeric pad
O/S Operating system
P/P Parallel port

S Software
S/P Serial port
T/E Text editor
TBA To be announced
U Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive of VAT*.

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Colour Genie (£200 inc VAT)	Low Electronics 0629 4057 (100+)	16-32k RAM: Z80: 16k ROM: C int: 24x40 TV int: Audio port: RS232 port: P/P	ExBasic	160x96 colour graphics. 16k RAM £30. Many options inc joysticks and light pen. F/D avail soon. (B)
Columbia PC (£2800)	Icarus 01 485 5574 (50)	128k RAM: 8088: dual 5 1/4" F/D (640k): 24x80 VDU: 2xRS232 ports: P/P: 8 expansion slots	MS-DOS: CP/M 86: Basic: Cobol: Fortran: Pascal	IBM PC compatible. With integral H/D (5 Mb) £4200 or (10 Mb) £4550 (S)
Comart Communicator (£1895)	Comart 0480 215005 (25)	64k RAM: Z80A: dual 5 1/4" F/D (780k): 2 S/P: P/P.	CP/M: MP/M Basic: Cobol: Fortran: Pascal	With 1.5 Mb F/D £2195. With 4.8 Mb H/D & 790k F/D £2995. Option: 18 Mb H/D. £3895 Also CP100 range with 8086 & 128k-1Mb RAM from £2295. Expandable to multiuser/multitasking. (S).
Commodore PET 16k, & 32k (£550, £695)	Commodore: 0753 79292 (150)	16-32k RAM: 6502: C: 12" 25x40 VDU: IEEE-488 port: Options: dual 5 1/4" F/D (343k) £695: same but (1018k) £895	O/S: Basic (in 8k ROM): Forth: Pilot: Pascal: Comal: Lisp: A	CBM 8032 with 80-col screen (32-96k) BT 12/80. £895 Field service avail. (1).
Commodore Vic 20 (£200 inc VAT)	Commodore: 0753 79292 (150)	5-32k RAM: 6502: C int: 22 x 23 TV int: S/P: P/P: Games int.	Basic	Graphics 3 tone sound generator. Will interface to PET. Option: single 5 1/4" F/D (170k). BT 9/81(S).
Commodore 500 Series (From £659)	As above	128-896k RAM: 6500: 25x40 TV int: P/P	O/S: Basic: CP/M: Pascal: Forth: Cobol: Fortran	High res. 16-colour graphics. Second processor option: Prestel facility avail.
Commodore 700 Series (From £995)	As above	128-896k RAM: 6509: 24x80 VDU: Option: dual 5 1/4" F/D (1Mb): IEEE- 488 port: RS232C port.	As above	8088 or 80 second processor option Tilt and swivel screen.
Commodore 64 (£299)	As above	64k RAM: 6509: 25x40 TV int: C int: RS232 port: P/P	Basic	Second processor option. 320x200 colour graphics. Option: Joystick: Light pen
Compucorp-625 (£6000)	Compucorp: 01-907 0198 (17)	48-60k RAM: Z80: dual 5 1/4" F/D (630k): 9". 16x80 VDU: 40 col printer: RS232 port, P/P.	Basic: A: Fortran: Pascal: U	IEEE-488 Controller and S100 int. Many applications packages avail. (E).
Compucorp 655/ 665/675/685 (from £5050)	As above	60k RAM: Z80: Up to 4x5 1/4" F/D(160k-2.4 Mb): 9", 20x80 or 12" 20x80 or 20" 60x80 VDU: 40-col printer: RS232 port.	As above	Prices incl installation and training. Opt: 10-20 Mb H/D
Cromemco System Zero/DDF, System 2, System 3, System Z2H. (£1975/£3095/ £4495/£6585).	Datron: 0742 585490. Comart: 0480 215005 (25) MicroCentre: 031- 556 7354 (18)	64k RAM: Z80: dual 5 1/4" F/D (390k) on System Zero, System 2 & Z2H: dual 8" F/D (1.2 Mb) on Sys 3: 10 Mb H/D on Z2H: S/P: P/P.	CDOS: Basic: Cobol: Fortran: RPG II: Lisp: A: W/P: Multi- user Basic. Cromix. CP/M	System 2 & 3 expandable to Multi-user (max 7) Also 'D' series with 6800/ Z80A dual processor from £3620. Options: dual 8" F/D (996k): 11.2Mb H/D. BT 10/79 (E).
Commodore 500 Series (From £659)	As above	128-896k RAM: 6509: 25x40 TV int: P/P	O/S: Basic: CP/M: Pascal: Forth: Cobol: Fortran	High res. 16-colour graphics. Second processor option: Prestel facility avail.
Commodore 700 Series (From £995)	As above	128-896k RAM: 6509: 24x80 VDU: Option: dual 5 1/4" F/D (1Mb): IEEE- 488 port: RS232C port.	As above	8088 or 280 second processor option Tilt and swivel screen.
DAI (£595)	Data Applications (UK): 0285 2588 (7)	48k RAM: 8080: C int: 24x60 VDU int: RS232 port: over 20 industrial ints. option: dual 5 1/4" F/D £595	Basic (ROM): U	Colour graphics up to 255 x 335: 3 notes & noise generator: PAL O/P to TV: Paddle int: H maths option. (1). BT 10/80.
Diablo 3000 (£6250)	Business Computers Ltd: 01-207 3344	32k RAM: 8085: dual 8" F/D (1.3 Mb): 12", 24x80 b&w VDU: 45 cps printer.	DOS: Basic: DACL: A: U.	Selection of business packages included (S).
Digital Micro- systems DMS-3 (£3530)	Digital Microsystems 0734 343885 (14)	64k RAM: Z80A: dual 8" F/D (1.14Mb): 3xRS232 ports: 1xRS422 port: P/P.	CP/M: CBasic: Cobol: Fortran: Pascal: PL/I	Expandable to multi-user system with 10-28 Mb H/D. Extensive software avail. (S).
Digital Micro- systems DMS-4 (£4395)	As above	128-512k RAM: Z80A: single 8" F/D (500k): 11 Mb H/D: 4x RS232 ports: P/P.	CP/M: Basic-E: CBasic: Cobol: Aortran: Pascal.	Port expander to enable up to 10 workstations under M/PM. Options: 128k RAM £1295: up to 96Mb H/D. (H).
Dragon 32 (£200 inc VAT)	Dragon Data 0792 580651 (50+)	32-64k RAM: 6809E: 16x32 TV int: C int: P/P	Basic	9 colour 256x192 high resolution graphics. Option: Joysticks BT 8/82
Durango F-85 (£4995)	Comp Ancillaries: 0784 36455 (12)	64k RAM: 8085: dual 5 1/4" F/D (1 Mb): 9", 16x64 green VDU: 132 col 165 cps printer: N/P.	O/S: D Basic: CP/M: CBasic: Micro Cobol.	Up to 5 work stations: fully integrated system. Options: additional dual 5 1/4" F/D (1 Mb): 12-24 Mb H/D.(S).
Eagle II, III and IV (from £2350)	Mediatech Bus Syst 01 903 4372	64k RAM: Z80A: dual 5 1/4" F/D (768k and 1.5Mb) or single 5 1/4" F/D (784k) with 10Mb H/D: 2xRS232 ports: 2 x P/P	CP/M: CBasic: Cobol Pascal: Fortran	Many different configurations available. Full range of applications software
Equinox 200 (£7500)	Equinox: 01-739 2387 (N/A)	64-512k RAM: Z80: 10 Mb- 1200 Mb H/D: 6xS/P: 1 P/P.	CP/M: CBasic: Cobol: Fortran.	Multi-user MVT/FAMOS available in place of CP/M. 16-bit version (Equinox 300) £10,000. (S&H).
Fortune 32:16 (£4375)	Fortune Systems 01 938 1721	256-512k RAM: MC 68000: dual 5 1/4" F/D (800k): 12", 25x80 VDU: S/P: P/P	FOS: CP/M: Basic: Pascal: Cobol: Fortran: C	Expandable to full multi-user system. High res colour graphics
Gecas 64/2 (£3305)	Grecas Micros 01 629 3758	64k RAM: Z80A: dual 8" F/D (2.4 Mb): S100 bus.	CP/M: Cobol: Basic Pascal Fortran	Up to 4.8 Mb F/D. Expandable to multi-user/multitasking system.

List of Abbreviations

A Assembler
BT Bench Tested
C Cassette
E Extensive
F/D Floppy disk

G/C Graphics card
H Hardware
H/D Hard disk
I Introductory
Int interface

M/A Macro assembler
N/A Not available
N/P Numeric pad
O/S Operating system
P/P Parallel port

S Software
S/P Serial port
T/E Text editor
TBA To be announced
U Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Gemini Multiboard (£500)	Micro Value 02403 28321(7)	64k RAM: Z80: 25 x 80 VDU int (with Z80): Option: dual 5 1/4" F/D £690.	CP/M: <i>Basic: Cobol: Pascal: Fortran</i> AP/L:	Modular system. Other options inc ROM board & EPROM programmer. BT 2/82 (H&S).
Gemini Galaxy 1 (£1450)	As above	64k RAM: Z80A: dual 5 1/4" F/D (800k): 12", 25x80 VDU: RS232 port: P/P: C int	CPM: <i>Basic: Cobol: Fortran: Pascal:</i> AP/L: A	Options: dual 5 1/4" FD (800k): dual 8" F/D (2.4Mb)
Gimix System 68 (£2000)	SEED: 05433 78151: Windrush 0692 505189	16-64k RAM: 6800/6809: dual 5 1/4" F/D (500k): 2xRS232 ports.	OS-9: <i>Flex Basic: Pascal:</i> A: Dls A: T/E:U	With dual 8" F/D (2 Mb) £2900. Designed as development system for industrial control. (H).
Genie I (£299)	Lowe Electronics: 0629 2430 (N/A)	16k RAM: Z80: 500bps C: 16 x 64 TV int: extra C int: 1 P/P	Basic (12k ROM): <i>Pascal: A M/A: Fortran</i>	Options: single 5 1/4" F/D (184k) £220; dual 5 1/4" F/D (368k) £375 (I) Also Genie II with numeric keypad and function keys but no cassette (same price as I).
Genie III (£1900)	As above (26)	64k RAM: Z80A: dual 5 1/4" F/D (1.25 Mb): 24x80 VDU: RS232 port: P/P	NewDOS 80: <i>CP/MZ: Basic: Cobol: Fortran</i> <i>Pascal</i>	System complete with business applications software, maintenance contract and choice of printer £3250 (S).
Haywood 9000 Composite (£1795)	Haywood: 01-428 0111. (TBA)	64-192k RAM: Z80A: dual 5 1/4" F/D (640k): RS232 port: P/P: 15" 28x80 VDU.	CP/M: <i>Basic: Cobol: Fortran: Pascal: W/P.</i>	Graphics avail. Expandable to 18 Mb H/D. Networking version planned (H&S)
Haywood Hinet (£7500)	As above	64k RAM: Z80A: dual 8" F/D (2Mb): 11Mb H/D: RS232 port: RS422 port: P/P: 24x80 VDU	CP/M: HiNet: <i>Basic: Cobol: Fortran: Pascal</i>	Local area network, up to 32 users. Range of H/D avail. Local disks & printers, if required. Work station £2050 (H&S)
HP 75C (£728)	As above	16-24k RAM: 48k ROM: CPU: 32 char display: mag card reader	Basic	8k RAM £142. Video interface £221. Thermal printer £371. (E) BT 11/82
HP 85 (£2013)	Hewlett Packard Ltd: 0734 784774 (16)	16-32k RAM: C.P.U.: 5", 16x32 VDU: C(200k): 64 cps printer: 4 P/P. Options: dual 5 1/4" F/D (540k) £1610: fusi 8" F/D (2.4 Mb) £4108	Basic (ROM)	Full dot matrix graphics. Complete range of interfaces, peripherals and application packages avail. 16k RAM £142. (S).
HP86 (£1314)	As above	80k RAM: C.P.U.: 48k ROM. Options: 12", 24x80 VDU £238: 9", 16x80 VDU £216: 5 1/4" F/D (207k) £622	ExBasic	Many expansion possibilities including CP/M module (£362), RS232 port (£289) and up to 576k user RAM. 400x240 graphics. BT 10/82 (E)
HP 125 (£2479)	As above	64k RAM: 2xZ80A: 12", 24x80 VDU 2xRS232 ports: HP-1B port. Options: dual 5 1/4" F/D (500k) £1693	CP/M: <i>Basic: Cobol: Fortran: Pascal</i>	Integral thermal printer £629. Also available with dual 8" F/D (2 Mb). (S). BT 3/82
IMS 5000 (£1500)	Equinox: 01-739 2387 (20)	16-56k RAM: Z80: dual 5 1/4" F/D (320k): 2xS/P: 1 P/P:	CP/M: C/Basic: <i>Cobol, Fortran.</i>	3 drives option: (S&H).
IMS 8000 (£2500)	As above	64-256k RAM: Z80: dual 8" F/D (1 Mb): 2xS/P: 1 P/P	CP/M: CBasic: <i>Cobol: Fortran: MicroCobol.</i>	Multi-user MVT/FAMOS available in place of CP/M. (S&H).
Jupiter Ace (£90 inc VAT)	Jupiter Contab,	3k RAM: 8k ROM: Z80A; 24x32 TV int: C int: loudspeaker.	Forth	Has 140 Forth words defined in ROM.
Kemitron K2000 E (£2300)	Kemitron 0244 21817 (3)	64k RAM: Z80A: single 5 1/4" F/D (150k): 12", 24x80 VDU: 2xS/P: P/P	CP/M: <i>Basic: Cobol: Fortran Pascal: A</i>	Extensive range of support cards and industrial interfaces.
Kemitron K3000 E (£3300)	As above	64k RAM: Z80A: dual 8" F/D (2Mb): 2xS/P: P/P	CP/M: MP/M: <i>Basic: Cobol: Fortran: Pascal: A</i>	Up to four screens and four printers can be attached. Options: 10Mb H/D.
LSI M-Two (£6000)	LSI Computers 04862 23411 (20)	64-128k RAM: 8085A: dual 8" F/D (1.2 Mb): 12", 24x80 VDU: 60 cps printer	Elsie: <i>CP/M: Basic: Cobol: Fortran: Pascal: A: U</i>	Max 8 VDUs and 4 printers. Many applications packages available. Option: 10 Mb H/D £2600. (S).
LSI M-Three (£1700)	As above	64k RAM: Z80A: dual 5 1/4" F/D (350k): 12", 24x80 VDU: RS232 port: P/P	CP/M: <i>Basic: Cobol: Fortran: Pascal: A</i>	Option: Dual 8" F/D, 10 Mb H/D (E)
LSI M-four (£2175)	As above	128-256k RAM: Z80B: 8088: dual 5 1/4" or 8" F/D 3xRS232 ports: RS422 port: P/P 12", 24x80 VDU	MS-DOS: <i>CP/M-86 Basic Cobol: Fortran: Pascal: MP/M-86</i>	Operates on either 8-bit or 16-bit applications software. Option: 10 Mb H/D
Macro 1 (£3950 or £294 pm).	Micro APL Ltd. 01-834 2687 (TBA)	64k RAM: Z80A: dual 8" F/D (1 Mb): 4xRS232 ports.	CP/M: APL: <i>U: Basic: Fortain: Cobol: Word-2star Algo: Pascal: Forth.</i>	Designed as timesharing replacement. Macro 2 with 2 Mb F/D £4750 or £334 pm.
Marinchip M9900 (£4990)	Microprocessor Eng. 0703 775482	128k RAM: 9900: dual 8" F/D (2Mb): 4xRS232 ports.	NOS: <i>Basic: Pascal: W/P: SPL: Forth: Meta</i>	Multi-user/multi-tasking OS. Options: H/D up to 120 Mb.
Micro Trainer 1 (£650)	Hewart: 0625 22030 (N/A)	16-32k RAM: 6800/6809: 10" 16x24 VDU: 2xC int: Opt: dual 5 1/4" F/D (160k) £595: 8k RAM £17.	Basic: <i>A: Pascal: PL/M: W/P</i>	SS50-based system. Graphics avail. Int card with real time clock £17. (I).
Millbank Sys 10 (£2395)	Millbank: 01-891 4691(6).	65k RAM: Z80: dual 5 1/4" F/D (700k): 12", 24x80 VDU: 2x RS232 ports: RS449 port: P/P.	CP/M: <i>Basic: Cobol: Fortran: Pascal: PLI: W/P.</i>	12-month warranty. Main-frame comm. package. Maintenance contracts. Options: 1.6 Mb F/D. 5-50 Mb H/D. (S&H)
Munroe EC8800 (£2150)	Fi-Cord Int. 061 445 7716	128k RAM: Z80A: single 5 1/4" F/D (320k): 3xRS232 ports: P/P	Munroe Multitasking System: <i>CP/M: Basic: Cobol: Fortran: Pascal</i>	High res colour graphics. Option: single 5 1/4" F/D. (320k). £495
Munroe OC8820 (£2990)	As above	128k RAM: Z80A: dual 5 1/4" F/D (640k): 9", 24x80 VDU: 3xRS232 ports: P/P	As above	5MB H/D avail soon. BT 4/82.

List of Abbreviations

A Assembler
BT Bench Tested
C Cassette
E Extensive
F/D Floppy disk

G/C Graphics card
H Hardware
H/D Hard disk
I Introductory
Int Interface

M/A Macro assembler
N/A Not available
N/P Numeric pad
O/S Operating system
P/P Parallel port

S Software
S/P Serial port
T/E Text editor
TBA To be announced
U Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.



Discover our range of CP/M software.

Although we must admit we have not yet found the cure to the common cold, we have found the solution to a problem that's almost as daunting. The task of choosing and buying your CP/M software.

We hold one of the largest ranges of CP/M software, covering most applications and uses. These are supplied over various formats including: I.C.L. Personal Computer, I.B.M., Rair, Sirius, Superbrain, Apple, etc.

So if you are fed up with suffering, when all you really need is sound advice and off-the-shelf service, then give us a call.

Telephone: 01-387 8832 or 01-388 9927.



Software Limited, Duchess House, 18/19 Warren Street,
London W1P 5DB.

It's rather like finding the remedy to the common cold!

CP/M is the trademark of Digital Research.

Attractive quantity & dealer discounts available

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Nascom 3 (£549)	Lucas Logic 0926 59411	48-60k RAM: Z80: dual 5 1/4" F/D (700k): RS232 port: P/P.	Basic: <i>Pascal: A: CP/M: Cobol Fortran</i>	Options dual 5 1/4" F/D (700k) £685: 48k RAM £130.
NEC PC 8001 (£599)	IBR 0734 664111	32k RAM: Z80A: P/P Option: dual 5 1/4" F/D (326k) £699	Basic N: (24k ROM) <i>CP/M: Fortran: Cobol: Pascal.</i>	Colour monitor £359 (low res) or £579 (high res) both 12", 25x80 many expansion units avail. (E) BT 6/81
Newbrain Model A (£199)	Grundy: 0223 350355 (TBA)	32k-2 Mb RAM: Z80A: Nat 420: 2xC int: TV int: 2xV24 ports.	CBasic (29k ROM): A.	Graphics. Battery or mains. Options: 1/2 Mb RAM £450. Also Model AD £299.(E).
North Star Horizon (£1975)	Comart: 0480 215005. (25)	32-64k RAM: Z80A: dual 5 1/4" F/D (360k): 15", 24x80 VDU: 150 cps printer: 2 S/P: 1 P/P.	DOS: Basic: <i>CP/M: Cobol: Fortran: Pascal.</i>	Options: 5-18 Mb H/D, Multi-user.
North Star Advantage (£2195)	As above	64k RAM: Z80A: dual 5 1/4" F/D (720k): 12", 24 x 80 VDU: S/P.	GDOS: <i>CP/M: CBasic: MBasic: Fortran: Cobol: Pascal</i>	Price includes business graphics & demo software.
Oki if 800 (£3000)	Encotel. 01 686 9687	64k RAM: Z80A: 2k ROM: dual 5 1/4" F/D (768k): 12", 24x80 VDU: 80 col printer: loudspeaker: RS232 port: 20k ROM cartridge.	Basic: A: <i>CP/M: Cobol: Fortran:</i>	Fully integral unit. Graphics. Options: dual 5 1/4" F/D (560k): RS232 port: PP. (1). BT 10/81
Olivetti M20 (£2395)	Olivetti 01 785 6666	128k-512k RAM: Z8001: 2-8k ROM: dual 5 1/4" F/D (640k): RS232 port: P/P	Basic: <i>PCOS: A</i>	Alternative 8086 processor board to run CP/M86 & MS-DOS. Options: 11 Mb H/D (integral): printer £738. (S) B/T 9/82
Onyx C8000 (£6875)	Onyx Dist Ltd: 09066-5432 (TBA)	64k RAM: Z80: 12 Mb Cartridge: 10 Mb H/D: 4 S/P: P/P	<i>CP/M: MP/M Oasis: Unix: Fortran: Pascal: W/P</i>	C8001 with 128k RAM £8220. Multi-user version - avail. using Oasis.(E) BT 3/81.
Oric 1 (£100 inc VAT)	Oric Products Int 0990 27641	16-48k RAM: 6502A: 28x40 TV int: C int: S/P: P/P: Loudspeaker	Basic (16k ROM): <i>Forth</i>	With 48k RAM and Forth on cassette £170 inc VAT. 240x200 colour graphics. Micro disk and modem avail soon. Viewdata compatible.
Osborne 1 (£1250)	Osborne 0908 615274(40)	64k RAM: Z80A: dual 5 1/4" F/D (200k): 5", 24x52 VDU: RS232 port: P/P	<i>CP/M: W/P: Cobol Fortran: Pascal CBasic: MBasic: Wordstar: Mailmeege: Supercalc Forth</i>	Integral system in weatherproof carrying case. Will run on battery pack. Option: dual 5 1/4" F/D (400k). BT11/81.
Oscar (£2560)	IDS Ltd: 0908 313997(30)	64k RAM: Z80: dual 5 1/4" F/D (800k): 12", 25x80 VDU: RS232 port: 1 P/P	<i>CP/M: Basic: Pascal Fortran: Cobol: W/P:A</i>	Also avail. with dual 5" F/D (1.6Mb) £2905 and 8" F/D (2 Mb) £3380. Advanced video board. S&H).
Panasonic JD 800M, JD850M (£3300, £4350)	Panasonic Business Equipment: 0753 75841 (10 regional dist)	64k RAM: 8085A: 4k PROM: dual 8" F/D JD800M (500k): JD850M (2 Mb): 12", 24x80 VDU: 3xRS232 ports. P/P	<i>CP/M: Basic: A Micro: Cobol.</i>	Option: 8.4 Mb H/D £2725 (up two). BT3/80(S).
Pascal Microengine (£2295)	Pronto Electronic Systems Ltd: 01-554 6222	64k RAM: MCP 1600: 2x RS232 ports: 2 P/P.	Pascal.	CPU instruction set is P-code: no interpreter needed. Available with dual 8" F/D (2 Mb) £3900.
Pasca 640 (£1900)	Westrex Ltd: 01-578 0957 (TBA)	64k RAM: Z80A: dual 8" F/D (512k): 12", 24x80 VDU: RS232 port: P/P	<i>CP/M: Basic: Cobol: Fortran: Pascal: A: W/P: U</i>	Maintenance contracts avail. Option: 5-20 Mb H/D. (S) BT 5/18
Philips P2000 (£2444)	Philips Data	16-48k RAM: Z80: dual 5 1/4" F/D (140k): 12", 24x80 VDU: RS232 port.	<i>PDOS: UCSD p-system: Pascal: Basic Fortran:A.</i>	With 48k RAM, Pascal and Basic £3300: BT 12/81.(S)
Position 900 (£1950)	Position Comp. 09252 29741 (10)	64-512k RAM: 6809: 4xRS232 ports: IEEE-488 port: 1200 band C: dual 5 1/4" F/D (720k)	OS-9: Basic 09: <i>Pascal: C: A: Cobol: U FLEX O/S</i>	Supports 4 users, expandable to 8. Networking allows 28 users on 7 Options dual: 5 1/4" F/D (1.4 Mb): 5-40 Mb H/D (E)
Position 9000 (£1536)	As above	64-512k RAM: 6809: 4xRS232 ports: IEEE-488 port: 1200 band C.	OS-9: Basic 09: <i>Pascal C: A: Cobol: U</i>	240x240 high res colour graphics. Viewdata compatible/Disk options as above. Supports 5 users. Networking allows 35 users on 7 systems (E) BT 10/82.
Prince (£3045)	Digico: 04626 78172 (50)	64k RAM: 3xZ80A: dual 5 1/4" F/D (800k): 2xRS232 port: P/P 12", 25x80 VDU	<i>CP/M: Basic: Pascal: Fortran: Cobol: W/P:A: T/E:U</i>	High res graphics. Options: single 5 1/4" F/D (400k) £600: dual 8" F/D (2 Mb) £2000 5-10Mb H/D. Rentals avail. (S).
Quantum 2000 (£2250)	Quantum Comp Sys 0532 458877	64k RAM: Z80A: dual 8" F/D (2.4Mb): 12", 24x80 VDU: C int: P/P	<i>CP/M: Basic: Cobol Fortran: Pascal: A</i>	Many expansion boards avail inc high res colour graphics. Option: 5-10Mb H/D.
Rair Black Box 3/30 (£3750)	Rair: 01-836 6921 (N/A)	64-512k RAM: 8085: dual 5 1/4" F/D (500k): 6 Mb H/D: 2xRS232 ports.	<i>CP/M: Basic: Cobol: Fortran: M/A</i>	64k RAM expansion £500. 256k RAM £1250. Up to 16 RS232 ports.
Research Machines 380Z (£1867)	Research Machines: 0865 49866 (N/A)	16-56k RAM: Z80A: dual 5 1/4" F/D (300k) RS232 port. P/P.	<i>ExBasic: A: T/E: U: CP/M: Fortran: Cobol: Algol: Pascal.</i>	High res colour graphics. Many possible systems. With 56k RAM & dual 8" F/D (1 Mb) £3347.
Research Machines Link 480Z (£550)	As above	32-64k RAM: Z80A: C: 2xS/P: P/P	Basic: A: T/E	High res colour graphics. Network station.
Philips P2000 (£2444)	Philips Data	16-48k RAM: Z80: dual 5 1/4" F/D (140k): 12", 24x80 VDU: RS232 port.	<i>PDOS: UCSD p-system: Pascal: Basic Fortran:A.</i>	With 48k RAM, Pascal and Basic £3300: BT 12/81.(S)
SEED System 1 (£1900)	Strumech: 05433 78151 (5)	32-56k RAM: 6800: various disk options: 12", 24 x 80 VDU: RS232 port: P/P	DOS: Basic: <i>M/A: CBasic: A: T/E</i>	Graphics. PROM programmer Also system 19 multi-user (£3000). (E)

List of Abbreviations

A Assembler
BT Bench Tested
C Cassette
E Extensive
F/D Floppy disk

G/C Graphics card
H Hardware
H/D Hard disk
I Introductory
Int Interface

M/A Macro assembler
N/A Not available
N/P Numeric pad
O/S Operating system
P/P Parallel port

S Software
S/P Serial port
T/E Text editor
TBA To be announced
U Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
Sharp MZ-80K (£460-34k)	Sharp Electronics (UK) Ltd: 061-205 2333 (22)	6-48k RAM: Z80: C: 10" 24 x 40 VDU: Option: dual 5 1/4" F/D (289k) £695	Basic, A. <i>CP/M: Pascal: Fortran: Forth</i>	Graphics: loudspeaker. BT 10/79 (B)
Sharp MZ80A (£549)	Sharp Electronics (UK) Ltd 061 205 2333 (22)	48k RAM: Z80: 25x40 VDU: C: P/P. Options: single 5 1/4" F/D £400: dual 5 1/4" F/D £590: RS232 port	Basic: <i>CP/M: A: Pascal: Fortran: Cobol</i>	Expansion unit needed for disks (£100) Low res (80x50) graphics. Loudspeaker Numeric pad (B)
Sharp MZ-80B (£1095)	As above	64k RAM: Z80A: C: 9", 25 x 80 VDU: RS232 port: P/P.	Basic: <i>A: Pascal: FDOS</i>	High res graphics. Options: dual 5 1/4" F/D (560k) £800: 80 cps printer £415. (S)
Sharp PC1500 (£150)	As above	3-11k RAM: CPU: 16k ROM: 26 char LCD:	Basic	Full system with dual cassette int. and miniature four colour plotter £375. RS232 port avail. soon. (B). BT 6/82
Sharp PC3201 (£2995)	As above <i>CP/M: Cobol</i>	64k RAM: Z80A: dual 5 1/4" F/D (500k): C int: 12", 25 x 80 VDU: 70 lpm printer.	DOS: U: Basic: <i>CP/M: Cobol.</i>	Various expansion cards avail. BT 7/81 (I&B)
Sig/Net 100ZS (£1299)	Shelton 01 278 6273 (5)	64k RAM: Z80A: dual 5 1/4" F/D (400k): 2xRS232 ports	<i>CP/M: Basic: Cobol: Fortran: Pascal</i>	Various disk options, up to 16 Mb H/D
Sinclair ZX81 (£50 inc VAT)	Sinclair: 0276 66104 (300 +)	1-16k RAM: Z80A: C int: TV inb: full K/B: 44-pin expansion port.	Basic (8k ROM).	Advanced 4-chip design. Printer now avail. BT 6/81
Sinclair ZX Spectrum (£125 inc VAT)	Sinclair 0276 685311	16-48k RAM: Z80A: 16k ROM: T.V. int: C int	Basic	Options: 32k RAM £60. RS232 port and microdrive disks avail soon. BT 6/82
Smoke Signal Chiefan (£1800)	Windrush 0692 405189: (TBA)	32-64k RAM: 6800/6809: dual 5 1/4" F/D (500k): 2 x RS232 port.	DOS: <i>68/FLEX: Basic: Fortran: Cobol: A: Disc A: Pascal: U.</i>	With dual 8" F/D (2 Mb) £2600. Designed as development system for industrial control. (H).
Sorcerer (£790)	EMG 0293 519211 0736 798157 (27)	48k RAM: Z80: RS232 port: 1 P/P: S100 connector: 30x64 VDU int. N/P.	<i>O/S: Basic (ROM): A: Algol: Fortran: MBasic: ExBasic: 80. Pascal: W/P.</i>	High-resolution graphics capability: user programmable character set, Option: single 5 1/4" F/D (316k) £600 Video disk unit (1.5Mb) £1890
Sord M100 ACE (£2339)	Midas Computer Services Ltd: 07917 64686 (10)	48k RAM: Z80: 8k ROM dual 5 1/4" F/D (245k): 24 x 64 green VDU: RS232 port: N/P	<i>O/S: Basic: A: Fortran: Pascal.</i>	Up to 3 drives possible. Colour graphics avail. Option S100 bus. (I)
Sord M223 Mk II-VI (£4078)	As above	64k RAM: Z80: 8k ROM: dual 5" F/D (700k): 12", 24 x 80 green VDU: RS232 ports: S100 bus: N/P	<i>O/S: Ex Basic: CBasic: Multi-User Basic: Fortran: Cobol</i>	Expandable to 4 Mb F/D. 32 Mb, H/D, 5 screens, 2 printers. M243 with 192k RAM & 1.4 Mb F/D £5087.
SPC/1 (£3140)	Digital Data: 01-573 8854	96-1056k RAM: 8085 A-2: dual 5 1/4" F/D (280k): 12", 24 x 80 VDU: 2 x RS232 ports: Option: Up to 106 Mb H/D	Mikados, Comal: Pascal: A.	Expandable to multi-user system (8 users). BT 7/80 (S).
Superbrain (£1750)	Icarus: 01-485 5574 (45)	64k RAM: 2 x Z80: dual 5 1/4" F/D (320k): 12" 25 x 80 VDU: 2 x RS232 port.	<i>CP/M: A: Basic: Cobol: Fortran: APL: Pascal</i>	Limited graphis, Mainframe int avail. With 676k F/D £2090, 1.5Mb £2345. With 5Mb H/D & single 338k F/D £3950. BT 8/80. (S&H)
System 10 (£2995)	Millbank 01-788 1083 (TBA)	64k RAM: Z80: dual 5 1/4" F/D (700k): 12", 24 x 80 VDU: 2 x RS232 port: P/P	<i>CP/M: Basic: Fortran: Pascal: Cobol: PL/1: W/P</i>	12 month warranty. Maint. contracts. Applications packages avail. Choice of high level language in price. (E)
Tandberg EC10 (£3250)	Tandberg: 0532 774844 (N/A)	64k RAM: 8080 A: single 8" F/D (250k): 12" 25 x 80 VDU: 7 x RS232 ports: printer int	<i>CP/M: Ex Basic (24k) Multi-user Basic: Pascal: Cobol: A: U:</i>	Up to 7 terminals. Includes V28 comms port. (S&H)
Tandy PC-2 (£179 inc VAT)	As above	3-11k RAM: CPU: 16k ROM: 26 char LCD	Basic:	System with dual cassette int. and miniature four colour plotter £338 inc VAT. RS232 port avail. soon. (B)
Tandy TRS-80 Model I (£174)	Tandy: 0922 648181 (200)	16-48k RAM: Z80: C: 12", 16 x 64 VDU: RS232: P/P	Basic (12k ROM): A.	Fully expandable. Option: single 5 1/4" F/D (175k) £320 (up to 4). Many extras available. 32k RAM £260. (I)
Tandy TRS-80 Model II (£2347)	As above	64k RAM: Z80: single 8" F/D (500k) 12" 24 x 80 VDU: 2 x RS232 port: P/P	Basic <i>M/A Fortran: Cobol 3-32 Mb H/D</i>	Option: single 8" F/D (500k) £782 (subsequent £391, up to 4). 8-32Mb H/D
Tandy TRS 80 Model 3 (£434-£1477)	As above	See Model I Levels I and II		Fully integral unit. Up to 2 integral and 2 external 5 1/4" F/D. BT 8/81
Tandy TRS-80 Colour (£209)	As above	16-32k RAM: 6809: 8-16k ROM: C: 16 x 32 TV int: RS232 port.	Colour Basic.	With 16k RAM, 16k ROM & Extended Colour Basic £261 (I). BT 9/81.
Tandy TRS-80 Model 16 (£3651)	As above	128-512k RAM: Z80A 68000: dual 8" F/D (1-2Mb): P/P: 2xRS232 port.	TRSDOS: A: <i>Cobol Basic</i>	Will run all Model II software. System with single 5 1/4" F/D (600k) and 8Mb H/D £5911. Options: 8Mb H/D £2173 (up to four): 640x240 high res graphics: Multi-user system avail. soon. (S)
Tele Video TS800 (£3100)	Colt 01-577 2686	64k RAM: Z80A: dual 5 1/4" F/D (700k): P/P: S/P: 24x80 VDU: 80 cps printer.	<i>CP/M: Basic: Cobol: Fortran: Pascal</i>	Fully expandable to local area network with 16 users. 8 and 16 bit versions avail. and full set of application software. (S)
Terodec PBM-1000 (£4020)	Terodec: 0734 664343 (40)	80k RAM: Z80A: single 5 1/4" F/D (819k): 6Mb H/D: 2xS/P: P/P	<i>CP/M CP/Net CBasic: Fortran: Pascal: Cobol</i>	System with Okidata 80 printer: TV1 910 VDU: W/P and various application packages £5995 (S&H)

List of Abbreviations

A Assembler
BT Bench Tested
C Cassette
E Extensive
F/D Floppy disk

G/C Graphics card
H Hardware
H/D Hard disk
I Introductory
Int Interface

M/A Macro assembler
N/A Not available
N/P Numeric pad
O/S Operating system
P/P Parallel port

S Software
S/P Serial port
T/E Text editor
TBA To be announced
U Utility

Please note: Software items listed in *italic* are not included in the basic price of the equipment. All prices are *exclusive* of VAT.

LOOK! . . . A NEW NAME IN



apple ACCESSORIES



🍏 All items fully guaranteed for one year
🍏 Free postage and packing on all orders within UK

🍏 Immediate delivery
🍏 Many more items available

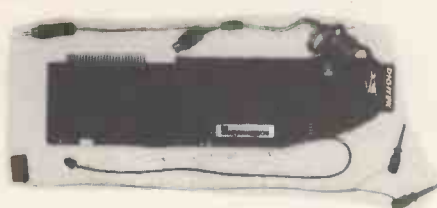


BUSINESS SOFTWARE	NET	INC. VAT
Access	170.00	195.50
Calcstar (CP/M) (80 column spread sheet)	59.00	67.85
dBase II (CP/M)	299.00	343.85
Data Star (CP/M) (powerful data entry)	122.00	128.80
D.B. Master (version 3.02)	104.00	119.60
D.B. Master statistics	58.00	66.70
D.B. Master utilities (links with visi's)	58.00	66.70
Desk Top Plan II (while stocks last)	89.00	102.35
Graphmagic (bar graphs, pie charts, etc)	52.00	59.80
Mathemagic	52.00	59.80
Multiplan (microsofts superior spreadsheet)	155.00	178.25
PFS Filing system (new improved)	68.00	78.20
PFS Graph	68.00	78.20
PFS Report	53.00	60.95
Supersort (CP/M)	75.00	86.25
The General Manager	68.00	78.20
Versaform (form generator in Pascal)	199.00	228.85
Visi + (Visicalc Consolidation)	19.45	22.37
Visicalc	105.00	120.75
Visicalc expander (use with 32K/128K cards)	53.00	60.95
Visicalc utilities	34.00	39.10
Visidex	122.00	140.30
Visifile	115.95	133.34
Visiplot	93.00	106.95
Visischedule	144.00	165.60
Visitrend/plot	142.00	163.30
WORD PROCESSING		
Apple Write II	72.00	82.80
Executive Secretary	145.00	166.75
Executive Speller	45.00	51.75
Format 80	200.00	230.00
Pie Writer (40/80 columns)	85.00	97.75
Sensible Speller (new fast proof reader)	69.00	79.35
Screenwriter II (70 col w/out 80 col card)	62.50	71.88
Super Text (40/80 columns)	109.00	125.35
Wordstar 3.01 (CP/M) (enhanced features)	135.00	155.25
Zardax	125.00	143.75
GAMES		
Beer Run (Sirius)	16.95	19.49
Cannonball Blitz (Online Systems)	16.95	19.49
Chopflifer (Broderbund)	16.95	19.49
Epoch (Sirius)	16.95	19.49
Flight Simulator (Sublogic)	16.95	19.49
Knights of Diamond (use with Wizardry)	18.95	21.79
Laff Pak (Online Systems)	16.95	19.49
Minotaur (Sirius)	16.95	19.49
Pinball (Sublogic)	16.95	19.49

Pool 1.5 (Innovative design)	16.95	19.49
Swashbucker (Datamost)	16.95	19.49
Tawala's Last Redoubt (broderbund)	16.95	19.49
The Prisoner (Edu-Ware)	14.95	17.19
Threshold (Online Systems)	16.95	19.49
Time Zone (Online Systems)	43.75	50.31
Wizardry (Sir Tech Software)	24.95	28.69
Zork II (Infocom)	21.95	25.24
PRINTERS		
Epson MX80T-3 (up to 132 col & hi-res)	299.00	343.85
Epson MX80FT-3 (as above & friction drive)	324.00	372.60
Epson MX82FT (very hi-res graphics)	359.00	412.85
Epson MX100FT-3 (100 cps & wide carriage)	429.00	493.35
Mannesmann Tally MT 120 (160 cps)	365.00	419.75
Nec 8023 (100 cps & prop. spacing)	299.00	343.85
Silentype & interface	159.00	182.85
Smith Corona TP-1 (daisy wheel printer)	449.00	516.35
PRINTER INTERFACE CARDS		
Aristocard Parallel	75.00	86.25
Aristocard Serial	69.00	79.35
CPS Multifunction Card (inc real time clock)	119.00	136.85
Digitek Printmaster (BASIC/CPM/PASCAL)	69.00	79.35
Digitek Printmaster III with memory mang	159.00	182.85
Grappler + (Epson/Anadex/Cent/P.tig)	98.00	112.70
IPB-16K (Buffer & Serial + par card)	125.00	143.75
MBP-16K (Epson 16K buffer)	96.00	110.40
Wizard 16K Buffer & graphics interface	149.00	171.35
80 COLUMN CARDS		
Digitek Screenmaster 80	185.00	212.75
U-Term (inc shift mod. & font editor)	115.00	132.25
Videx Enhancer II	83.00	95.45
Videx Function Strip (freq Enhancer II)	48.00	55.20
Videx Inverse Eprom	18.45	21.22
Videx Utility Disk (inc font editor etc)	24.45	28.12
Videx Videoterm	169.00	194.35
Visicalc preboot disk (80 col with videx)	32.00	36.80
Vision-80	185.00	212.75
MONITORS/COLOUR CARDS		
Digitek Colour Card (excellent colour on TV)	95.00	109.25
Microvitec colour monitor	275.00	316.25
Microvitec colour card (use with above)	35.00	40.25
Sanyo 12" Green Screen	95.00	109.25
Zenith 12" Green Screen (very good value)	89.00	102.35
GRAPHIC UTILITIES & MUSIC		
Arcade Machine (game designer)	21.45	24.67

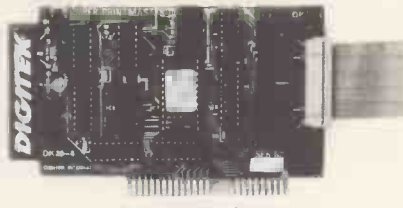
Artist Designer	33.00	37.95
Bit Stick	245.00	281.75
Digitizer II	189.00	217.35
E-Z Draw 3.3 (excellent graphic quality)	25.95	29.84
Graforth (fast 3D utility plus music)	43.00	49.45
Graphic package Sublogic (detailed 3D pack)	64.45	74.12
Graphic Processing System	35.00	40.25
Higher Text II (many diff fonts, sizes, cols)	21.95	25.24
Pascal Animation	34.00	39.10
Pilot Animation Tools	34.00	39.10
Versawriter (graphic digitizer)	165.00	189.75
Versawriter expansion Pac 1	24.00	27.60
Zoom Grafix (zoom in on hi-res screen)	23.95	27.50
Alf Music System (9 voice)	85.00	97.75
Audex	14.95	17.19
Electric Duet (creates 2 part music)	18.95	21.79
Forté (4 voices & 9 octaves)	15.95	18.34
Music Machine 9 Voice (Vista)	79.00	90.85
Music System (Mountain Computer 16 Voice)	211.00	242.65
Mutek VoxBox	61.00	70.15
S.A.M. (speech synthesis)	75.00	86.25
Zapple Sound Effects & Music Board	56.00	64.40
UTILITIES		
Aplus (Applesoft structured Basic)	18.95	21.79
Appleguard (software protection)	175.00	201.25
Assembly lang. Dev. (6502, Z80 or 8080)	68.00	78.20
Bag of Tricks	20.45	23.52
B.E.S.T. (Enhanced Software Tool)	23.95	27.54
Build Using (Provides 'printing' comand)	23.95	27.54
Disk Library (incl CPM & Pascal)	33.95	39.04
Disk Organizer II	19.45	22.37
Disk Recovery	24.45	28.12
Dos 3.3 Tool Kit	39.00	44.85
Edit Soft (powerful macro line editor)	18.95	21.79
Fast DOS	19.45	22.37
Global Program Line Editor (supports 80col.)	34.50	39.68
Image Printer-Epson (flexible hi-res dump)	24.95	28.69
Lisa (Assembly lang. dev. system)	46.00	52.90
Lisa (Educational system)	68.00	78.20
List Master (inc. smart renumbering)	23.95	27.54
Locksmith 4.1 (bit copier for most disks)	61.00	70.15
Merlin Macro Assembler (editor & utilities)	42.00	48.30
Printographer (supports almost any printer)	27.95	32.14
Speed Star (compiles 1200 lines per min.)	75.00	86.25
Super Disk Copy III	20.00	23.00
Super Kram	87.00	100.05
Tasc Compiler (handles V. large programs)	95.00	109.25
The Bug (assembly language debugger)	38.00	43.70

THREE NEW REVOLUTIONARY CARDS FROM DIGITEK



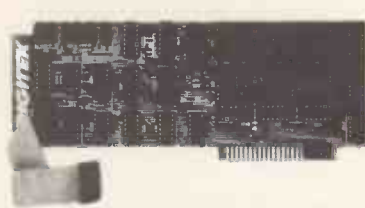
SCREENMASTER 80

This new 80 column card is the most advanced available with features like: 9x10 matrix, 3 scrolling speeds, shift lock, user definable graphics, supports all Applesoft commands and Applewriter II. Well worth the £185 + VAT.



SUPER PRINTMASTER III & BUFFER MANAGEMENT

A totally new concept in printer cards, supporting both colour & B/W printers. It incorporates a unique buffering facility using Ram cards. Up to 16 x normal size graphics dump and pic rotation etc. Prices: £159 (B/W) or £179 (Colour) + VAT.



64K & 128K RAM-MASTER

These cards use the latest low power D RAM chips and can be used for high speed disk emulation in Basic, CP/M or Pascal. Visicalc Expand software available, can also be used as printer buffer with Super Printmaster III. PRICES: 64K £213 Or 128K £319+VAT.



ROBOCOM BIT STIK GRAPHICS SYSTEM

The Robocom BIT STIK graphics system is the first in a new generation of low cost computer graphics controllers that eliminate the time consuming inputting of instructions via a keyboard.

It opens up exciting new possibilities for inexpensive computer graphics by enabling micro-computer users to create multi-colour graphics, sketches, technical drawings, circuit diagrams, typography, etc., plus a host of visual effects, quickly and simply with the minimum of computer knowledge. Price £245 + VAT.



MICROVITEC 14" COLOUR MONITOR

Besides offering a crystal clear display in either text, hi-res or low-res modes. It also includes the following features, 16 text colours, b/grd colours, 80 column card compatibility. A superb colour monitor for £264.00+VAT.



12" PRINCE MONITOR

Features 24 M/Hz bandwidth, giving a very clear display, and contained in a neat Apple compatible case, available with either Green or Amber screen. Well priced at £105+VAT.

CE

0274 575973

The Inspector (disk snooper, needs 16K cd)	35.00	40.25
The Routine Machine (mach. lang. routines)	34.50	39.68

SYSTEM EXPANSION

16K Ramcard Digitek	75.00	86.25
16K Ramcard Ramex	65.00	74.75
16K Ramcard Samram	55.00	63.25
32K Ramcard Saturn	129.00	148.35
128K Ramcard Saturn	299.00	343.85
128K Ramex card	275.00	316.25
Clip on fan (inc separate power switch)	44.00	50.50
Cool stack (holds 2 drives & monitor + fan)	65.00	74.75
DDS upgrade kit (3.2 to 3.3)	36.00	41.40
E-Z Port (game socket extender)	11.45	13.17
Keyplus Numeric Keypad	83.00	95.45
Lower Case adaptor W/shift (rev 7+)	34.00	39.10
Romplus Card	85.00	97.75
The Mill 6809 with Pascal speed up	189.00	217.35
VC-Expand/80 (up to 145K Visicalc & 80 col)	65.00	74.75
VC-Expand Ramex (loads 136K visi in 20 sec)	40.00	46.00
Z 80 card U-micro (card only)	70.00	80.50
Z 80 card Microsoft (CP/M & Mbasic)	179.00	205.85
Z-Card (inc CP/M & Supercalc)	179.00	205.85
Z-Card with CP/M software	110.00	126.50

LANGUAGES

Apple Logo	115.00	132.25
Apple Pascal	145.00	166.75
Apple Pilot	79.00	90.85
Cobol 80 (CP/M)	345.00	396.75
Forth II (Integer only)	39.00	44.85
Fortran 80 (CP/M)	103.00	118.45
Terrapin Logo	95.00	109.25
Transforth (full floating point Forth)	68.00	78.20

MISCELLANEOUS ITEMS

Disk Drive (Fully Apple Compatible)	199.00	228.85
Disk Drive Controller Card	65.00	74.75
Disk Head Cleaning Kit (2 disks & fluid)	15.95	18.34
Disk Tray (40 disks, lockable)	19.95	22.94
Joyport	38.45	44.22
Joystick (Le stick)	22.00	25.30
Joystick (self centering)	36.00	41.40
Lang Card utility (permits software backup)	59.00	67.85
Master Diagnostic Disk	48.00	55.20
Plastic Disk Box (10 disks)	2.50	2.88
Typing Tutor	14.95	17.19
Wabash 5.25 Disks (pack of 10)	17.25	19.84
Wild Card (permits software backup)	93.00	106.95

Please make your order by completing the coupon and returning to us - or you can phone **DAVE** or **SHERIDAN** on **0274 575973** and your enquiry will receive a friendly and speedy response.

PACE-SOFTWARE-SUPPLIES

Rose Bank, 130 Clayton Road,
Bradford BD7 2LY, West Yorks.

Please rush me the following items.

£ p

1			
2			
3			
4			
5			
TOTAL			

I enclose my cheque made payable to **PACE SOFTWARE**
(Export licence arranged)

Name _____

Address _____

Town _____

County _____

Postcode _____ Tel. No. _____

PCW/13



PORTABLE ACOUSTIC COUPLERS

TYPICAL APPLICATIONS

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

KEY FEATURES

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

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

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

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

TECHNICAL APPROVAL

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

Software available for:

Pet Series, Apple, BBC Micro and many others

O.E Limited,
Industrial Estate,
Appleby in Westmorland
Cumbria CA16 6HX
Tel: 0930 51909 Tele 64157



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

Name _____

Company _____

Address _____

Tel: _____ (Ref.PCW, I.83)

IN STORE

Machine (Price from)	Main Distributor/s (No. of Dealers)	Hardware	Software	Miscellaneous (Documentation)
TI 99/4A (£199 inc VAT)	TI: 0234 67466 (TBA)	16-48k RAM; 26k ROM; 9900: 2 x C int: 24 x 32, 16 colour TV int: 3 tones & noise: P/P.	OS: Basic.	12 month guarantee. Options 32k RAM: 2 x RS232: 3 x 5 1/4" F/D (92k each): Speech Synthesiser.
Tuscan CP/M Starter (£999)	Transam: 01-405 5240 (N/A)	24k RAM; Z80: single 5 1/4" F/D (190k); Cint: TV int: RS232 port: P/P: N/P.	CP/M: Basic: Fortran: Pascal: Cobol:	Options: single 5 1/4" F/D (190k) £155: single 5 1/4" F/D (370k) £285: 16k RAM £162: 3 Mb H/D £1450: 20 Mb H/D £2970 (S&H)
Tuscan Starter Kit (£299)	As above	8k RAM; Z80: Cint: 56-key K/B Options: Case £110: 5 x S100-sockets £20: TV int £3.50	8k Basic	Fully assembled version £499 BT 1/81 (H&S)
Vector MZ (£2650)	Almarc: 0602 52657 (3)	56k RAM; Z80A: dual 5 1/4" F/D (630k): 3 S/P: 2 P/P.	CP/M: Basic: Algol: Cobol: Pascal: Fortran: Coral: CBasic: A.	High resolution graphics. Also system B with video board & terminal £3450. (E)
Vector System 2800 (£4600)	As above	56k RAM; Z80A: dual 8" F/D (2.4 Mb): 3 S/P: 2 P/P	As above	High-res graphics. Many Options. Fully expandable to 5005 multi-user system (max 5) £5400.
VIP (£2650)	Almarc 0602 52657 (3)	64k RAM; 3k ROM; Z80B: single 5 1/4" F/D (630k): 12", 24 x 80 VDU: RS232 port, 3 x P/P	CP/M: Basic: Fortran: Cobol: Pascal: A.	Up to 3 additional F/D drives. Options: dual 8" F/D (2 Mb) £1063, 32 Mb H/D (TBA). (H&S). BT2/81
Windrush 6809 (£2418)	Windrush 0692 405189	56k non-volatile CMOS RAM: 6809: 2xRS232 ports: 2xP/P: dual 5 1/4" F/D (700k)	OS-9: Flex: Uniflex Basic: A: PL9: SPLM: Cobol: Fortran: Pascal	Designed as development system for industrial control/computer station for commercial OEM's. With dual 8" F/D (2 Mb) £2953. (E)
Xerox 820 (£1845)	Business Comp Sys 01 207 3344	64k RAM; Z80: single 5 1/4" F/D (162k): 12", 24 x 80 VDU: 2 x RS232 ports: P/P	Monitor: CP/M: Basic: Cobol: Fortran: Pascal.	With 8" F/D (500k) £2250. CP/M £95. BT 1/82 (S+H)
Zenith WH-11A (£2673)	Zenith Data Systems 0452 29451 (TBA)	LSI 11: 16-32k RAM: 25 x 80 VDU: S/P: P/P.	O/S: Basic, Fortran: A: U.	PDP 11-compat. Option: 2 x 8" F/D (1 Mb). £1717 (S&H).
Zenith Z89 £1570-£1710	As above	16-48k RAM; Z80: single 5 1/4" F/D (102k): 12" 24 x 80 b&g vdu: RS232.	Basic: A: HDOS: CP/M: MBasic: CBasic: Fortran.	3 x 5 1/4" F/D possible. Options: dual 8" F/D (1 Mb) £1717, 20 Mb H/D.
Zilog MCZ 1/05 (portable): MCZ 1/20A (£3250)	Thames Systems: 084421 5471 (N/A)	64k RAM; Z80: dual 8" F/D (600k): RS232 port: MCZ1/20A only 1 P/P: Option: 10 Mb H/D £7100	RIO: O/S: Cobol: Basic: Fortran: Pascal: M/A: U.	Available desk top or rack mounted. Debug in 3k PROM. 1/20A runs multi-user Cobol, up to 5 terminals with 40 Mb H/D: (S&H).

ACC NEWS

Rupert Steele presents his monthly round-up of news from the Amateur Computer Club.

This month is going to be a month of clubs. I have been so keen to waffle about national things in the last few issues that I have neglected mentions for the various clubs around the country. But first, as they say, here is the news...

The ACC held its AGM at the tail end of 1982, at the North London Polytechnic. Not many of the members turned up to constitution-monger and raise points of order; I hope that this means that the members are happy with the way the ACC is going. One important decision was made, namely to change the name from 'Amateur-Computer Club' to 'ACC'. This was done in order to emphasise the ACC's national liaison role, while at the same time retaining the initials. Various suggestions such as 'Association of Computer Clubs' had been previously discussed by the committee, but the name ACC was felt to be best, since it can be associated with both the 'club' and 'national body' functions.

Also at the ACC AGM, it was agreed to appoint, informally, a 'Vice Chairman' to be the heir apparent to the job of Chairman. The idea of this is to help provide continuity between the years of the ACC Committee. As the idea is experimental this year, it does not preclude somebody other than the committee nominee standing. The only party state is not with us... yet!

Have you seen the ACC area on Prestel? Page 8008 has all the info... The ACC is keen to

encourage clubs to involve themselves in Prestel, and will be able to make pages available to clubs, via Telemap. There is an ACC National Prestel Committee organising all this, and we would be very keen to talk to anybody interested in putting material up on Prestel. Contact me for more information (address below).

I think it's about time I got the idea of regional groups off the shelf, and waded it around for general discussion. As many of you will know, there is a very successful cooperation of computer clubs in the London area, known as the Association of London Computer Clubs. These clubs benefit each other by being able to share lecturers and to mount exhibitions. They are also able to solve the 'Your club is a little too far away' problem by swapping members. The ACC has been thinking about setting some more of these wonderful groups up in other parts of the country, but so far nothing spectacular has happened as a result of our hints. There seems to be a group starting up in Manchester, and there might soon be one in the Thames Valley area. Anybody interested in regional club groupings, please drop me a line.

Finally on ACC matters, it's about time that I reminded you about the ACC's Club Affiliation Scheme. Many Clubs feel the need for a full newsletter; a substantial proportion of the members attend only a few of the meetings, and it is necessary to give

them something if they are going to renew their subscriptions. However, preparing such a newsletter is both expensive and hard work, a number of clubs are therefore not in a position to do this. Since the ACC prints ACCumulator in large numbers, it makes sense for us to make it available to clubs.

The idea of the scheme is therefore that, in return for a capitation fee of £3 per member (with discounts beyond 50 members), the ACC enroll all the members of the club as ACC affiliate members, with full rights, except for the right to be on the committee or vote at the AGM. The ACC then sends ACCumulator to the Club, who insert further information, such as a programme or a chairman's letter and then distribute it. Anybody interested in this for their club, please write to me for details.

Uncle Bazyle tells me that there is a Pascal User Group (PUG) lurking in the rain forests of Pinner. They are interested in promoting 'standard' Pascal, rather than having the same proliferation of dialects as Basic has suffered. Quarterly newsletter: enquire Nick Hughes, 01-866 3816, or write PUG, PO Box 52, Pinner, HA5 3FE.

Lonely Mr Sadler, of 18 Wanescot Road, Brentwood, Essex, CM15 9HD is canvassing for support for a computer club in the Brentwood Area. Now, I've had to send them to Ilford or

Chelmsford. So here is your answer; Mr Sadler awaits your letter.

Further down my postbag, I find a similar enquiry from Mr D Norden of 138c Church Road, Harrow Wood, Romford, Essex. Perhaps you and Mr Sadler could get in touch... (this is beginning to sound rather like Julie Dawn's pen pals spot on Radio 2 in the middle of the night).

The Royal and Ancient Borough of Slough is apparently still devoid of computer clubs; last time I mentioned these worthy people's plight, I received a letter from a Mr P A Seal of 1 Ormonde Flats, Church Road, Iver Heath, Bucks, in which he said that all he knew of was evening courses at Evreham Adult Education Centre (Contact Mr D de Silva). However, he is intending to try to form a club, so why not get in touch?

Back in the teeming Metropolis, I hear tell of '68 Microgroup'. This is half-way between a London based club and a national group with a bi-monthly newsletter. They are interested in micros whose names start 68, which means 6800, 6809, 68000 (ie the Motorola Appreciation Society). The club is described as 'resolutely non-profit-making' and the subscription is £5 pa plus £1 per meeting. The Chairman is Jim Anderson, of 41 Pebworth Road, Harrow, Tel: 01-422 4724.

On a rather different note, I have been asked to plug the Central Program Exchange. This is a

TRANSACTION FILE

● Acorn Atom — 12k RAM 12k ROM £200. Includes Joysticks, ROM, extension board, 2 utility ROMs 6522 via plus £200 of software inc. Forth and Lisp. Fully working. Tel: Manchester 061-881 4473 after 6pm.

● Epsom MX80FT — printer PET Interface £300 PET programs, Papermate word processor PET plan PET aid animator £10 each, Microchess games utilities education music etc. PET books cheap. SAE list. All 50p-£5. Tel: 0926 81 2168.

● Compu/Think — dual disk drive with controller board, cables for PET/CBM 2001. Perf cond, £175 ono. Tel: 0444 455177.

● TRS80 — Pocket Computer and Printer/Cass Interface inc paper, manual and leads, housed in durable locking carry case. Worth £170 selling for £150. Tel: Jonathan 0274 43973 after 6pm. C28 Mannheim Road, Bradford.

● Better ZX81 — 16k plus 4k graphic Rom, pro keyboard with numeric pad, all steel cased and many tapes, books, leads, offers over £100. Tel: Harpenden 827-61564.

● UK101 — 16k cased with buffered motherboard, new Basic Rom, Cegmon, Exmon, Assembler. Also 6821PIA board if required, £130 Tel: 061-437 5621.

● TRS-80 L2/16k — with CTR 41 recorder, new Rom, numeric keypad, leads, manuals, books, approx £80. Software light hobby use only £230 complete, boxed. Tel: Burnley 0222-76237.

● Genie EG3003 — 16k, plus Epsom MX-80 printer, plus printer Interface plus all manuals and cables. Never used, still boxed, worth £800 selling for £490. Tel: 01-435 1300.

● For sale — 1k ZX81 plus ver £30 of books, 2 M/C plus others. First offer over £60. Upgrading. P Gower, 4 Cliffrad Crescent, Newport, Gwent, NP1 4GE.

● Sharp — MZ80k 48k Basic, Sharp Assembler, Machine Language, Hisoft Pascal 3 Compiler, Manuals £365 ono. Tel: Mark 01-578 8719 eve or weekends.

● Video Genie — joysticks, lower case and sound plus £200 extra software including Scripsit, Adventure, Space Games plus books and manuals £270 ono. Tel: Bedford 53322 eve.

● VIC-20 with cassette player. Purchased April '82, manual, leads etc plus over £100 of games and VIC revealed. All £180 ono. Tel: 01-892 6439

● PET 8k — cassette deck, Basic 4, dustcover, manuals, PET revealed and PET graphics, books, games on cassette, boxed, £400. Tel: 01-363 8901 after 6pm ask for Nick.

● TRS-80 — Model I L2 16k VDU cass, unique ROM separate soundbox, PSU, manual, all leads, plenty of software, £500 or offers. Must sell — moving to 16-Bit. Tel: Stubbington Hants 61677.

● Data Dynamics — RO390 printer complete with interface and software driver for Tandy TRS-80 Model I Level II, no need for expansion interface just connect to tape output. Only £99. Tel: Hertford 50243.

● PET 4040 — disk drive plus Basic 4 Roms £475. PET 3016 plus cassette plus toolkit £425. PET 2020 printer £225. All 3 for £1050. Offers to Mike. Tel: 021-477 0191.

● MZ-80k — 48k RAM plus manuals, software, Asteroids, Disassembler, extended Basic, etc. 1 year guarantee over 30 programs £320 ono. Tel: 051 342 5789 Wirral. A. J. Warre, Meadow House, Barnston Road, Heswall, Wirral L10 1UE.

● ZX81 plus 16k — RAM PAC as new Sinclair built, all leads £25, software all worth £110 will accept £90 ono. Tel: 870 2081 (eve). Write: L. Baines, 8 Santos Rd, SW18.

● Apple II Europlus — 48k, 16k expansion card, dual drives, B&W Hitachi, Monitor, Paddles, Serial Interface, Visicalc, Visicalc utilities, Supercopy, 50 disks as new. Tel: 01-546 2376.

● Smart 16k — memory expansion with header and 8k installed for UK101 £37 solve The Great Pyramid Puzzle Using your computer £9.95. Speech input with Bigears £19. Tel: 094-68 6627 after 5.

● Atari 800 — 16k Ram cassette deck, various software including Star Raiders, many Atari books. Still under warranty by shop. Faultless,

original packing £560 for everything. Call Cobham 4569 ask for Ryan.

● Printer SWTPC — type PR-40 line-printer £65 ono. Wanted: GP80 or GP100 suitable for Acorn Atom. Tel: Halesworth 09867 3862 after 5pm, Richard.

● Video Genie — 16k Arrow keys VU Meter and sound unit, fitted manual leads and some software. Good condition, hardly used only £185. Tel: 0382 452614.

● Atari 400 — 16k Basic, Star Raiders plus other games 410 recorder, joysticks, manuals. Exc cond cost price over £450 sell for £320 ono or swap for Commodore 64. Tel: 994 2511.

● Sharp MZ80k 48k boxed machine code and manuals many programs, Invaders, Apollo, Plotter, Cosmaid, Ilectron waves, Asteroids, Chess, many others, £350 to £375. London area. Tel: 01-554 9488 eve only.

● MK14 RAM — 110 extra RAM revised manual manual and specialised book cassette interface PSU special interface board and many extras £40. Tel: 01-422 1990 eve (Hatch End).

● ZX Printer — C/W 1.2 amp PSU, 9 rolls of paper £45 ono. Tel: 01-642 3102.

● Acorn Atom — factory made, 12k Rom 12k RAM, Magic Book, getting acquainted, £50 worth of software, leads, manual, PSU, £180. Tel: Andrew Cardiff 796663.

● MZ80k — 36k toolkit, machine language tapes, reset button, manual, 20 months old, details to connect to Creed JE Printer, £345 ono. Manchester 061-761 5374.

● Centronics printer — 165cps, 132 column parallel interface, auto motor control, tractor feed, lots of free paper, vgc, leads for BBC Micro, fully working, £189 ono. Tel: Uxbridge (0895) 35129.

● Colour Atom, — fully expanded 12k plus 16k with via chip, new typecolour board, 4 amp PSU. Much software (Invaders, Asteroids, Star Trek, soft VDU etc), books, newsletter, £235, deliver south. Tel: 0705 321743.

● ZX81 — fitted inside professional keyboard plus 16k RAM plus several 16k programs plus printer, complete with books, leads power supply etc. Bob Hammond, Tel: Maidenhead 28411 ext 282 daytime — price £200.

● Sharp PC-1500 — CE150 printer 4k mem. exp mini cassette, value £60, 20 rolls paper, spare pens, leads, manuals, software £275 ono. Tel: Workson 4763906.

● HP41C — Scientific calculator with card reader, printer, Wand users, manuals as new, worth £48, will accept £250. Tel: Reigate 40520 (Surrey).

● Apple — Serial Interface by Aristocrat, many features, Dot Matrix printer up to 132 columns, tractor feed, serial, upper and lower case, working well £70 buyer collects. Tel: 0203 72438

● Atari — software on cassette: Temple of Apsah (32k) £17.50 Scott Adams Adventures 7, 10, 11 (24k) £7.50 each. PAC Man ROM cartridge £20. Tel: 01-642 6553.

● QS — character generator and Motherboard. Design your own alphabets and Invaders etc. Boxed as new. exc cond only £30. Tel: 0634 41159 eve only. Ask for Ian Poynter.

● Atari 800 — (48k) plus Disk plus Recorder plus Star Raiders plus Mission CXCommand plus Space Invaders plus many programs on disk and cassette including Microsoft Basic p/exch ZX81 £800 ono. Bill Tel: 01-572 2917 (might split).

● Acorn Atom — 12k plus 17k via printer I/O plus Atom Bus extension ports, Invaders, Snapper, Asteroids, Breakout, Dogfight, 747, Hwrite, manual plus leads. Worth £350 plus, will accept £120 ono. Tel: 01-993 2572.

● Epsom MX80FT3 — printer latest Epsom model with graphics features, friction and tractor feed: less than 2 months old £310 inc. Tel: Dorothy North, Watford (0923) 31289 after 4pm.

● PET 4000 — Series computer upgraded professional to 32k complete with toolkit, cassette recorder and some software. Commodore 4022 Matrix Printer with paper. All in immaculate cond. £795. Tel: 0792 781370.

● Sharp MZ80k — 48k RAM with extended Basic, books, listings, notes and games inc Missile Command, Invaders, Defender, Adven-

ture £350. Local delivery. Tel: Farnborough (Kent) 0689 52191.

● Tandy TRS-80 — 16k MIL2, 1 boxed exc cond, leads, green screen, monitor, manuals, games, Star Trek, Pyramid, Chess etc £350 ono London. Tel: 01-379 3581 day 01-690 4019 eve. Paul Colbert.

● TRS80 — 16k LII with PSU, cassette, manuals and games. Used very little and want quick sale so only £230 01-902 4627.

● North Star Horizon — OS/OD drives 56k RAM, DOS Basic, CP/M £1425, ovno. Micro divisions 40x86 video board (S100) plus software £100, 16k RAM boards £82 each. Phone Paul Crawley 515201.

● Wanted: Apple II — Europlus 48k with disk drive. Tel: Stephen Whale. Tel: Romford 614966 after 6pm.

● ZX81 — 16k RAM plus printer. Complete with leads, manuals plus PSU, £85. Tel: 01-504 3149 after 7pm.

● PET — 8k integral cassette Immaculate. External Honeywell large keyboard on extension cable, users manual. PETS "Revealed" "Graphics" and "Subroutines" Games tapes £290. Nascom 1 uncased working £49. Tel: 0633 895451 anytime.

● Sharp MZ-80k — 48k. As new, complete with cover, manual, Basics and other programmes (worth over £100 in themselves), including Space Invaders, Asteroids etc £350 ono. Tel: Kenilworth 0926 56737.

● RML-380Z — 48k RAM Hi-res, colour Graphics, 6-channel sound synthesiser, RS232 interface, several Basics to powerful 16K-5.1D version. Assembler and Forth. Various games and utility programs, £900 ono. Tel: Brentwood 225613.

● ZX81 — plus 16k RAM plus portable black and white Television plus over 75 programs on cassette and one game cassette all for just £120. Tel: Temple Cloud 52576 for further details.

● Tangerine Micron — 24k, system Rack, Motherboard, Bulldog sound board, Hi-res Graphics, Epsom storage board, Epsom programmer, toolkit, keyboard, keypad. Plenty of interesting software. Will demonstrate £200 ono. Tel: Ken 01-801 7894 eve.

● PCW — vols 1-4 in binders £25 ono the lot or will split. HP19C printing calc all standard accessories GQC £160 ono. Steve Yewen 6 Pilham Court, Gainsborough Lincs ON21 1PD.

● Centronics Microprinter — P1 good cond 2 rolls paper, manual etc £80 or will swap for 12in green screen monitor. Tel: Lincoln 0522 40621.

● Apple II Europlus — twin disks, 64k memory, 12in green monitor Basic and Pascal languages. As new, guaranteed until August 1983, £1,500 ono. Tel: Chester 0244 41961 (job now involves computers).

● Osborne I — portable computer only 3 months old, complete with Supercalc Wordstar, CPM CBasic and MBasic software new cost £1437, accept £950 ono. Tel: 01-228 8860.

● Acorn Atom — 5k plus 12k colour new style keyboard 1.8A PSU plus books and Acorn software, unwanted gift £100. Tel: Julien Limpfaffert Chart 2143.

● Hazeltine 2000 — Data Terminal, acoustic coupler, speed from 300-9600 Baud, detachable keyboard, green screen, great for networks and linking to mainframes vgc. £160 ono. Tel: Darren 01-445 4429 after 6pm.

● Exchange Fairline — 2 plus 2 Berth fibreglass cruiser, toilet, cooker, 60 gallon water tank, 20HP Johnson outboard, moored at Stourport, West Midlands for 4032 PET twin discs, Printer or similar. Tel: 021 358 1872.

● Nascom-2 — fully cased with 32k RAM NAY-SYS 3, Zeap, NAS-DIS, NAS-DEBUG, NAS-PEN, graphics, 8k Basic with toolkit, also extended 12k Basic. Complete documentation £485 ono. Tel: Terry 094 37566 weekdays or 0793 42305 eve and weekends.

● Superboard — 50HZ 8k RAM 'Cegmon' correct case built in power and TV MOD with leads manual demo tape £70 plus postage. Tel: Maidstone, Kent 678782 eve.

● PET Model 4 — 32k, pristine cond with green screen, large keyboard, cassette deck, manuals (inc PET Revealed, IEEE-Bus interfacing etc.) Program tapes, Chess,

Spaceace, Micromon, RTTY etc £520. Tel: St Albans 51037.

● Acorn Atom — 12k RAM, 20k ROM (FP Willowsoft and Program Power ROMs), homemade PSU, leads, software, Astrobirds, Asteroids, Invaders etc, books and extras, £165. Robert Heards, Flat 69, Lower Court, Beeston, Nottingham.

● Atari VCS — with 20 cartridges inc 3 Activision cartridges and keyboard will accept £200 ono. Tel: 01-552 9403.

● Video Genie — 487k Sound, manuals, books, 42 programs inc Assembler, Dissembler, ZChess, Startrek. original packing £225. Tel: Rotherham 79647 eve.

● TRS-80 Level 2 — 16k new ROM with numeric keypad, new style VDU, manuals, cassette and £50 plus of software. Exc cond £250 or highest offer. Tel: Amersham 6527 (Bucks).

● Sharp MX80k — 48k 8 months old, original boxes, green screen, dustcover, 25 software games inc Startrek, Adventure, The Valley £325 ono. Tel: Bridlington 601615 anytime. Mr IS McKie.

● PET — 32k New ROM cassette player, toolkit, chip, software includes games ASSEMBLER PET Graphics Routines, Book perf cond £475 ono. Tel: James Tagg 01-979 1648.

● ZX81 — Sinclair built, 16k. Printer 5 cassettes, learning lab £100 Tel: 01-381 28457 eves.

● Commodore PET — 3032 upgraded to 4032, diskdrive printer Visicalc Wordpro and many other programs. Contact Tom Chambers, 12 Sagsbury Road, Sawbridgeworth, Herts or tel after 9pm on 0279 723231.

● VIC40 — CZN cassette unit, joystick, programmer's aid, super expander, C3k, Hi-res and Invaders cartridges, VIC revealed book, magazines and software, complete with manuals £250. Tel: 01-449 9424 after 6pm.

● TRS-80 — 16k L2 boxed complete with numeric keypad, recorder, amplifier, leads, manuals, books and over £200 of software inc Micro-rocchess, Invasion Force, Pinball, Editor/Assembler, £320 ono. Tel: Leeds 643116.

● Bargain! — ZX81 plus 16k Sinclair built, complete plus 3 prog, books, all £70 only! Tel: 01-995 0936 after 6.30pm. Quick sale needed, hurry!

● HP41C — with Quadram, card reader, printer, plus access £450 ono. Like new. I'm selling to move up to new HP-75. Tel: 01-351 4746 eves or write Cox, 9 Cheyne Row, Flat 4, London SW3.

● Hobbit — cassette system plus 7 tapes for Nascom £100, Teletype £45, Nascom £45 with graphics and Cottis/B £45, buffer board, 32k RAMA, keyboard, software, games all cheap. Tel: 01-303 7852 Sidcup, Kent.

● PET 2001 — 8k, new ROMS fitted with reset switch, with manuals, "PET Revealed", games cassettes. Buyer please collect! Only £250, David Booth 11 Greenfield Street, Dunkirk, Nottingham NG7 2JN.

● OHIO Challenger — 1P 8k RAM and RS232 Interface, "Pre-Cegmon" operating system (upgraded) Basic in ROM. Several utility and games cassettes £150 ono. Tel: Chris Armstrong 0970-3181 office hours only.

● S100 IMS Gdbout — 8k RAM boards £38. Cromeco 16k (2708) Epsom board £233, Tandon TM100 96TPI 800k 5 1/4" drive £220. Morrors disc 8in Controller CP/M £95. Tel: 0293 515201.

● BBC Computer — Model B, cassette recorder, Acorn Defender, 5 issues Beebug £375 or will swap for Atari 800 045-36 6143.

● Atari — software Asteroids ROM, Temple of Apsah Star Warrior, £17 each, Hazard Run, Draw Pk, Crypts of Terror £14 each, Adventures One and Eight Galactic Empire £9 each, tel: 045-36 6143.

● ZX81 — 16k RAM Deans keyboard and case with auto-repeat. All leads and manual, ASASTD Software, £110 ono. All exc cond. Tel: 01-727 6956.

● UK101 — with UK02 monitor and 8k RAM. Hardly used only £100 ono. Tel: Malcolm 01-997 9002, 24 Mount Park Road, Ealing, London W5 2RT.

● Sharp PC1211 — good cond with printer/cassette interface. Good value at £100. Tel: 050 634 3278.

● UK101 cased with Cegmon 10k Basic. New Basics 3,4,5 300/600

Baud, 1-2 MHz games inc Invaders with Ikegami 9" B/W monitor only £250. May separate. Tel: Mark on Erith 33906.

● PET — 32k 3032 plus 3040 dual drive, floppy disk unit plus cassette drive plus manuals, exc cond, £875, buyer collects. Tel: Jackie Flynn, Brighton 812270.

● Superbrain — 64k twin disks SSDD (320k) in immac cond with CP/M 2.2, Microsoft Basic interpreter and compiler, £1450; also MICROLINE M80 Printer, RS232 interface, little used. £220. Tel: Dunfermline (0383) 28075.

● Two DRE 7200 — DS/DD cased 8in disk drives new but untested, £200 each ono Also two Kode Power supplies for above £30 each ono plus 1 Model B BBCC Machine £380. Tel: 435 3959.

● TRS-80 — 16k Level 2, monitor, cassette recorder, 32k expansion interface, cables and manuals, over £140 worth of software, Editor Assembler, many games, £800 ono Will separate. Tel: 051 339 7427 after 6pm.

● PET — 32k 4016 professionally updated with cassette and many tapes. As new with green screen and dust cover, £550. TX80 IEEE printer card £10. Tel: Hemel Hempstead (0442) 41826 after 6.30pm.

● Atom 10k ROM choice 29 or 29k RAM HO-P/5 5V12A plus 12VV cassettes plus recorder, software games, books, newsletters, fitted I/O chips. All leads plus experimenters pack £180 or £220. Tel: Southend (0702) 65063.

● PET 2001 — new ROM 8k upgraded to 32k, large keyboard, separate cassette, sound box, anti glare screen, PET revealed, Vigil, over 50 games, books, first class cond. £500 ono. Tel: Crawley (0293) 83351.

● Sharp 48k — MZ80k with 320 x 200 Hi-res graphics, 2 basics Assembler, Redefinable character set, dust cover, programs, full documentation, books. Any offers over £300? Tel: Marlow (06284) 6136 for details.

● DA1 — software, DA1, joysticks, DA1, All kinds of programs including exc games and individual software and joysticks from Germany, each program in English! Free information wanted? Wolf, Oberfeldweg-11, D-840, Regensburg, Germany.

● TRS-80 — Lev 2 16k and numeric keypad, including manuals, books, magazines, catalogues, up to £350 of software, CTR-80A, recorder £40. All worth up to £750, asking £350. Tel: Wallington 669 3491.

● TRS-80 — pocket computer plus manual and book of fifty programs, games 1 package and cassette interface. £80. Tel: 0243 864021.

● Atari 800 — complete with recorder, joysticks, games and manuals including Dara Atari, £440. Tel: Croydun 01-630 3681 eve, weekends.

● Apple II — integer card, £30. Colour card, slight fault, £30. Tel: Lymington 72518.

● ZX81 — 16k Sinclair made, 6 months old, hardly used in original packing includes 4 cassettes and 15 mags complete only £75 ono. Quick sale. Tel: Northwood 28204 anytime.

● Acorn Atom — 12k plus 12k, exc cond inc PSU, all leads, manuals, Epsom printer, drive, VIA, games packs 1 and 5, 747 flight simulator other information and software details £190 ono. Tel: Mark 051-638 8504.

● Apple II — 48k Europlus single disk drive programs including Database manuals £88.5. Tel: 261323 weekdays, Stratford-upon-Avon 2928187 weclend. P Howard.

● Video Genie I — 16k, 8 months old exc cond, latest model £260. Tel: Crawley 33099 after 5pm.

● TRS-80 — quick Printer II 2 1/2" thermal printer, connects directly to TRS-80 or to Expansion Interface. Hardly used boxed with manual and cable, £85. Tel: 027 564578 (day) 0761 418499 (eve) Bristol.

● Atari 800 — 32k program records, joysticks, Star Raiders, manual plus DE RE Atari, need cash for car so £530. Tel: Farnborough, Hants (0252) 512722 after 5, only 8 months old.

● UK101 — 8k RAM, new monitor, disassembler tape, some home-written progs, manual and cased £220 ono. Tel: Billericay 57592.

● ZX-81 — inc 16K manual, leads etc. ZX-81 pocket Book Games

TRANSACTION FILE

magazines, A Working Knowledge available. All in vg cond. Sinclair built only months old £70 ovno. Tel: Aylesbury (0296) 624661.

- Brand new — Dragon 32 computer 32K, still boxed, manuals etc inc., £160. Tel: Andrew on 01-521 3031. Hurry. Quick sale!
- HP41C — with 2 memory modules, complete with manual and box £80. East Sheen, London SW14. Tel: 01-876 5719.
- Video Genie — 16K complete with manual and leads plus extra cassette recorder. All in exc. cond. £260 ono. Tel: 01-561 4918.
- Video Genie — new June '81, hardly used, books, tapes, £220. Ray Wilkes, Dept of Chem Eng, Bradford University or Tel Bradford 594413. Good machine but owner short of cash.
- Adler Alphantronic — P2 48K computer with 12" green display unit, dual 5 1/4" disc drives and serial interface. New cond. £1145 Tel: 0203 75633
- Commodore 4022 — printer, cables, superb cond, little used £300. Tel: Homdean 597066 (eves), Cosham 321212 ext. 5233 (days).
- Acorn Atom — for sale, colour, 12K RAM, 12K ROM, 4K toolkit ROM 3A PSAU, leads, various games and magic book £200. Tel: R Martin 01-997 9731 after 7pm.
- Sharp MZ-80K — Quantum hi-res graphics, Knights Commander, Pascal, Fortran, Forth, various games £370 ono. Sharp P3 Printer, expansion box, 6 months old £330 ono all vgc with original packing. Tel: Kendal (0539) 27058.
- Sharp MZ80K — 48K perf cond over year's guarantee left. Games inc Space Invaders plus-Adventure Games £300. Tel: (0792) 701186.
- VIC-20 with cassette player Purchased April '82, manual leads etc plus over £100 of games and VIC revealed. All £180 ono. Tel: 01-892 6439
- PET 8k — cassette deck, Basil 4, dustcover, manuals, PET revealed and PET graphics, books, games on cassette, boxed, £400. Tel: 01-363 8901 after 6pm ask for Nick.
- TRS-80 — Model 1 L2 16k VDU, cass, unique ROM separate soundbox, PSU, manual, all leads, plenty of software, £500 or offers. Must sell — moving to 16-Bit. Tel: Stubbington Hants 61677.
- Data Dynamics — RO390 printer complete with interface and software driver for Tandy TRS-80 Model II Level II, no need for expansion interface just connect to tape output. Only £99. Tel: Hertford 50243.

- Acorn Atom — 12k RAM 12k ROM £200. Includes Joysticks, ROM, extension board, 2 utility ROMs 6522 via plus £200 of software inc. Forth and Lisp. Fully working. Tel: Manchester 061-881 4473 after 6pm.
- Epsom MX80FT — printer PET Interface £300 PET programs. Papermate word processor PET plan PET aid animator £10 each, Microchess games utilities education music etc. PET books cheap. SAE list. All 50p-£5. Tel: 0926 81 2168.
- Compu/Think — dual disk drive with controller board, cables for PET/CBM 2001. Perf cond, £175 ono. Tel: 0444 455177.
- TRS80 — Pocket Computer and Printer/Cass Interface inc paper, manual and leads, housed in durable locking carry case. Worth £170 selling for £150. Tel: Jonathan 0274 43973 after 6pm. C28 Mannheim Road, Bradford.
- Better ZX81 — 16k plus 4k graphic Rom, pro keyboard with numeric pad, all steel cased and many tapes, books, leads, offers over £100. Tel: Harpenden 827-61564.
- UK101 — 16k cased with buffered motherboard, new Basic Rom, Cegmon, Exmon, Assembler. Also 6821PIA board if required, £130 Tel: 061-437 5621.
- TRS-80 L2/16k — with CTR 41 recorder, new Rom, numeric keypad, leads, manuals, books, approx. £80. Software light hobby use only £230 complete, boxed. Tel: Burnley 0282 76237.
- Genie EG3003 — 16k, plus Epsom MX-80 printer, plus printer Interface plus all manuals and cables. Never used, still boxed, worth £800 selling for £490 Tel: 01-435 1300.
- For sale — 1k ZX81 plus ver £30 of boks, 2 M/C plus others. First offer over £60. Upgrading. P Gower, 4 Clyfford Crescent, Newport, Gwent, NPT 4GE.
- Sharp — MZ80k 48k Basic, Sharp Assembler, Machine Language, Hisoft Pascal 3 Compiler, Manuals £365 ono. Tel: Mark 01-578 8719 eve or weekends.
- Video Genie — joysticks, lower case and sound plus £200 extra software including Scripsit, Adventure, Space Games plus books and manuals £270 ono. Tel: Bedford 53322 eve.
- Creed teleprinter with interface for VIDEO GENIE. Good working order; £75. Buyer collects. Tel 0632 745600.
- Acorn ATOM 12k RAM and 8k ROM complete with PSU. All leads. Manuals and some software including Invaders, Fruit Machine. £155. Tel Ringswinford 038 44

4405 West Midlands.

- Why wait 3 months? Brand new 16k SINCLAIR SPECTRUM complete, with 2 games tapes. Cost £130 (including delivery) + long wait. Reasonable offers. Tel Burntwood (05436) 71561, 9am to 9pm.
- Sharp PC1211 pocket computer with cassette interface, printer, manuals etc. £95. Tel Barry 01-434 1365.
- Philips G7000 TV game and computer keyboard. G. cond and in original packaging with 9 cassettes worth £240 will sell for £135. o.n.o. Tel: 01-508 8008 eve. will also sell tapes separately.
- ACORN ATOM — Acorn built. 7k RAM 8k ROM, all leads, software on cassette, £120. Tel (0902) 68302 (West Mids).
- Texas instruments PC100C print cradle for TI58/58C/59 calculator. Boxed, rarely used with spare paper. Tel Iver (Bucks) 655625 (STD 0753). Price £90 ono. Ask for Keith.
- Sharp MZ-80B 64k. CPM dual floppy disks virtually unused complete with original packing £1400 ono. Tel Newbury 35734.
- Spectrum/ZX81 printer + power supply, instructions and original packing. 4 months old. Excellent condition £45 ono. Harpenden 63729.
- Nascom 2 36k RAM professionally built and boxed, Jasy 3, Naspen, Zeap assembler, graphics ROM, revas disassembler, games software £375. Tel Kidlington 77893 (after 6pm or weekends).
- Xerox 820 system — complete with dual 5 1/4" disks, CP/M, WordStar, SuperCalc, CBASIC in perfect condition. Unique opportunity saving £1100 on list at only £1199. Tel: Rossendale (0706) 226313 even (Lancs).
- UK101 + premiers, Basic 5, Basic 4, toolkit, 7xII socket expansion board complete, with 2x Eprom boards, assembler disassembler in Eprom, 32k RAM, uncased, quick sale at £300 ono. Phone 021-360 1718 aft. 6.
- MZ80K 48k. Hi-res graphics including Epsom printer with Direct Interface. Word processor, Data-Base, Sharp machine code, Screen dump and many other programs £650 ono. Tel Brentwood (0277) 212114.
- TRS 80 level 2 32k new ROM numeric keypad 16k expansion interface, one disk drive green screen monitor some software books £600 ono. London Surrey area. free delivery. Tel Tadworth 2164.
- TRS 80 pocket computer with printer interface, and cassette interface complete (including software).

QWuick sales £125. Write: Martin Stubbs, 35, Gagewell Drive, Horbury, Wakefield, W. Yorks or Tel. 0924 277171. After 6.00pm.

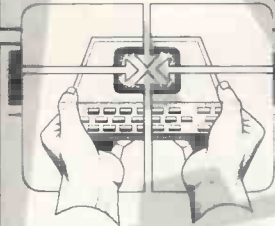
- PET 4032, cassette unit, manuals, books. V.G.C. bargain at £425. Tel Kim Swain 01-407 9898 (office) 01-366 8395 (home).
- Sharp MZ.80K 48k VGC still guaranteed with basic fortran pascal M/C fortran commander over 100 progs including arcade games manuals still boxed. £420 or nearest offer. Tel. Reading (0734) 64234.
- TI 994/A complete, 3 months old. Inc Invaders + MucAhman, new style joysticks + many listings + cassette recorder + many mags, books, tapes all V.G.C. cost over £350. Quick sale only £250. Tel Rick on 444-9132.
- £1500 Reward for information leading to recovery of stolen North Star Horizon (SS/DD Floppy) No 10-05252; 20MB rodime hard disk no 24000191; diablo 1610 printer no 43977. Usual conditions. 01-370 4907.
- Wanted Sharp MZ-80K. Must be 48k RAM version. Don't want software. Will pay up to £250 if in good nick. 01-578 1413 eves. 01-998 0819 days. Chris Morris.
- VIC 20, cassette recorder, basic course, tapes, books, used twice £185. Video Genie 16k £200. Exchange small PET, Atari 400 or + cash for bigger computer Ipswich 70473) 210028.
- Wanted home computer and accessories for swap with very large 00 gauge model railway — worth £300. Sensible offers tel 01-749 2784 evenings.
- ITT 2020 32k with disk drive and paddles all manuals + Chess Adventure etc. £650. Southend on Sea (0702) 204901.
- Mattel Intellivision VGC still boxed hardly used. Including 6 cartridges — Autoracing Astromash Armourbatttle Soccer Space Battle and Starstrike worth £290 will sell for £190. Hounslow 572 2308 even only.
- Nascom-1 8k-ROM basic, 48k Gemini G802 RAM, G806 5-slot supermum with 5A-PSU, cottis blandford cassette interface, cased, perfect working order, programs and manuals. £360 ono. Jackson Tel Stevenage (0438) 66355.
- Acorn Atom 12k RAM +4k toolbox ROM & F.P.ROM PSU leads, manuals, 14 taped progs worth over £60 also 2 books. The lot for £170. Tel Glasgow (041) 637 1272.
- Sharp MZ80K games Bomber (Destroy Village) Pop (Zap The Aliens) HMS Torpedo (shoot down fighter planes) Decision maker. Any 2 for £6.00. Langworth 15 Hitchin

Road, Stevenage, Herts SG1 3BJ.

- Acorn Atom — 12k + 12k (floating point), Acorn built; power supply, leads, manual + 2 books. Invaders, Asteroids, Astrobirds, etc. (worth £70), also home-made programs £190.
- Tandy TRS-80 MOD1 lev2 — CTR-80 cassette, £20+ books £50+ games progs including Sargon II, Asylum, many adventures + utilities. Perfect for games player or beginner. Only £240! tel 01-942 2385 any time.
- HP41C + memory modules £75 — HPIL module + HP82162A printer £250 — HP digital cassette drive £300 — each with charger. Newcastle Ponteland (0661) 23135 eve.
- Nascom II — Kenilworth case, 64k RAM 'B', nassys 3 graphics, toolkit, zeap, nassys, nas debug, nas pen. £325 ono. Ejector VDU + KBD £45 ono. PET computinh disk controller £50 ono 'BAS8 8" double side driver — new £200. Tel Tamworth (0827) 250429
- Wanted Sharp MZ-80K. Must be 48k RAM version. Don't want software. Will pay up to £250 if in good nick. 01-578 1413 eves. 01-998 0819 days. Chris Morris.
- VIC 20, cassette recorder, basic course, tapes, books, used twice £185. Video Genie 16k £200. Exchange small PET, Atari 400 or + cash for bigger computer Ipswich 70473) 210028.
- Wanted home computer and accessories for swap with very large 00 gauge model railway — worth £300. Sensible offers tel 01-749 2784 evenings.
- ITT 2020 32k with disk drive and paddles all manuals + Chess Adventure etc. £650. Southend on Sea (0702) 204901.
- Mattel Intellivision VGC still boxed hardly used. Including 6 cartridges — Autoracing Astromash Armourbatttle Soccer Space Battle and Starstrike worth £290 will sell for £190. Hounslow 572 2308 even only.
- Nascom-1 8k-ROM basic, 48k Gemini G802 RAM, G806 5-slot supermum with 5A-PSU, cottis blandford cassette interface, cased, perfect working order, programs and manuals. £360 ono. Jackson Tel Stevenage (0438) 66355.
- Acorn Atom 12k RAM +4k toolbox ROM & F.P.ROM PSU leads, manuals, 14 taped progs worth over £60 also 2 books. The lot for £170. Tel Glasgow (041) 637 1272.
- Sharp MZ80K games Bomber (Destroy Village) Pop (Zap The Aliens) HMS Torpedo (shoot down fighter planes) Decision maker. Any 2 for £6.00. Langworth 15 Hitchin

CTUK! CONTACTS

For further information on ComputerTown UK! see 'CTUK News' or Prestel page *800803 #



Patrick Colley
52 Queensway
Caversham Park Village
Reading
Berks RG4 0SJ

Alan Hooley
21 Brammay Drive
Tottington
Bury BL8 3HS

Vernon Quaintance
50 Beatrice Avenue
Norbury
London SW16 4UN

BJ Candy
9 Oakwood Drive
Gloucester GL3 3JF

Roger Shears
18 Woodmill Lane
Bitterne Park
Southampton SO2 4PY

Christopher Bates
Ashford Main Library
Church Road
Ashford Kent

Derek Knight or Bob Carter
Rayners Lane Library
Imperial Drive
Rayners Lane
Middx

Ray Skinner
62 Central Avenue
Billingham
Cleveland TS23 1LN

Brian Taylor
Tonbridge Area Library
Avebury Avenue
Tonbridge
Kent

Lyn Antill
1 Defoe House
Barbican
London EC2

Peter Jarvis
c/o Health Dept
Corporation of London
Guildhall
London EC2

Vernon Gifford
111 Selhurst Road
Croydon
London SE25 6LH

Bill Gibbings
2 Longholme Road
Retford
Notts DN22 6TU

Chris Cooper
110 Church Road
Hanwell
London W7

Paul Maddison
Gardenways
Chilworth Towers
Chilworth
Southampton SO1 7JH

Chris Woodford
31 Hopley Road
Anslow Burton-On-Trent
Staffordshire

Mike Perry, Steve Collas
or Dave Lee
The Library
Ealing Road
Wembley
Middlesex HA0 4BR

Peter J Kiff
52 Stone Road
Broadstairs
Kent CT10 1DZ

Robin Bradbeer
Polytechnic of North London
Holloway Road
London N7

Derrick Daines
18 Cuttings Avenue
Sutton in Ashfield
Notts

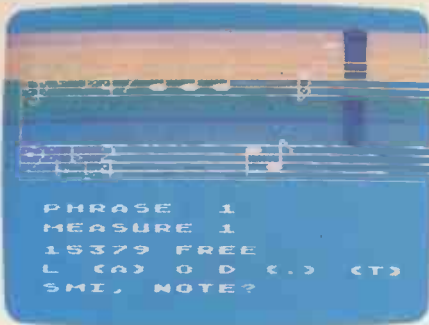
Keith Taylor
Carter Hydraulic Works
Thornbury
Bradford BD3 8HG

Philip Joy
130 Rush Green Road
Romford
Essex

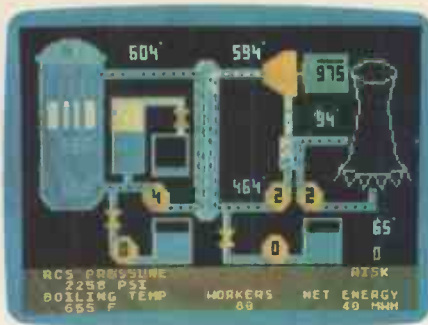
Pete Shaw
15 St Vincent Road
Clacton-on-Sea
Essex CO15 1NA

Ted Ellerton
25 Beachdale
Winchmore Hill
London N21

J M A Kilburn (Headmaster)
Shawfield Norden Community
Middle School
Shawfield Lane
Norden
Rochdale OL12 7QR



Music Composer



Scram



Graph-it



Intro to BASIC 1



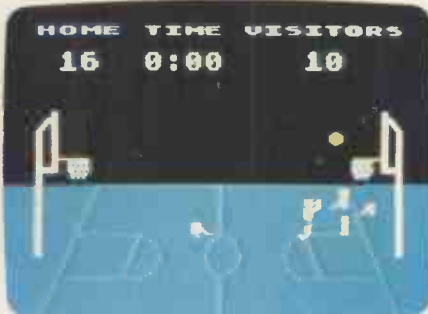
Star Raiders



European Countries



Missile Command



Basketball

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

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

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

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

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

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

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

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

*Atari 800™ computer only.



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

Name _____

Address _____

PCW7
Atari International (UK) Inc.
Windsor Hse., 185-195 Ealing
Road, Alperton, Wembley,
Middlesex.



A Warner Communications Company

CTUK! CONTACTS

Andrew Stoneman
135 Birchdale Avenue
Newcastle-Upon-Tyne
Tyne & Wear

David Sharp
5 Bridgenhall Road
Enfield
Middx

Rex Shipton
17 Woodlands Avenue
Eastcote
Middx

Tony Cartmell
54 Foregate Street
Worcester WR1 1DX

Pam Pollicott
South Ruislip Library
Victoria Road
South Ruislip
Middx

John Stephen Bone
2 Clarendon Place
Gateshead
Tyne & Wear

Derek Moody
2 Victoria Terrace
Dorchester
Dorset DT1 1LS

Alan Sutcliffe
4 Binfield Road
Wokingham
Berks RG11 1SL

Peter Earthy
46 High Street
Church Stretton
Shropshire SY6 6BX

R L Saunders
14 St Nicholas Mount
Hemel Hempstead
Herts

Brigitte Gordon
18 Purbright Crescent
New Addington
Croydon CR0 0RT

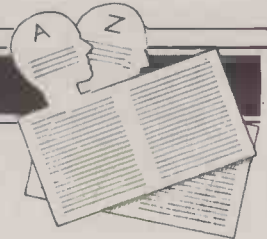
Richard Powell
22 Downham Court
South Shields
Tyne & Wear

Susan Kelly
Head of Reference Services
PO Box 4
Civic Centre
Harrow
Middx

Andrew Holyer
10 Masons Road
Mannings Heath
Horsham
Sussex RH13 6JP

USER GROUP INDEX

These are alterations and additions to the complete listing published in the August issue. The next full listing will appear in the February 1983 edition.



National

Forth Interest Group - membership fee £7 pa. Includes Newsletter 'Forthwrite', issued bimonthly. Meetings held in London on first Thursdays monthly at the Polytechnic of the South Bank, Borough Road, London SE1. Contact: Keith Goldie-Morrison, 15 St Albans Mansion, Kensington Court Place, London W8 5QH.
Proton Acceleration - research and development organisation dealing with 6502-6809 based machines, including BBC, PET, Apple, Microtan. Membership includes 'Accelerator' newsletter, published monthly. OEM and professional bodies welcomed as members. Registered offices: Epworth House, 25/35 City Road, London EC1Y 2DE.

County

South Middlesex Atari Club (SMAC) - meetings fortnightly at Ashford Computer Centre, Clarendon Road, Ashford 7.30.

Membership 50p per meeting.

Harpenden Microcomputer Group hold informal meetings in Harpenden on alternate Monday evenings. Contact: Richard Buchanan, 114 Lancaster Road, St Albans, Herts. Tel: St Albans 61236.

Portsmouth Co-Operative Computer Club - new informal club aiming to give advice on home computers and to see and use different machines. Meetings every Sunday, 5pm at 53a Heidelberg Road, Devonshire Square, Southsea. Contact: Mr A H May, 30 Delamere Road, Southsea (Tel: 0705 830603).

Ribble Valley Microcomputer Club - all sorts of micros welcome. Meetings 7pm 2nd and 4th Mondays monthly. Contact: Ian Thornton-Bryar. Tel: Clitheroe 25933.

SOBAT Computer Club - new address, B25 Berridge House, Hillfield Road, London NW6.

Telephone enquiries can no longer be accepted. Anyone interested in Contact: Brian Milligan, 50 Linkcroft Ave, Ashford, Middlesex.

Towns

BUG - Birmingham User Group for Atari Owners. Meets 2nd and 4th Thursdays monthly at the Matador public house, Bull Ring, Birmingham City Centre. Magazine soon to be launched. Contact Les Ellingham on 0785 41153 or 021 233 1488 if you want to know more.

Caterham Computer Club. Meets every Thursday at 8pm in Caterham Leisure Centre, Godstone Road, Caterham. A BBC micro is available for demonstrations. Contact: Mr M Goldsbrough, Caterham 48304 or Mr J Hodges, Caterham 43316.

Chiltern Computer Club meets on 2nd and 4th Mondays monthly at 7.30 in the function room of the

Five Bells pub in Eaton Bray. Users of all micros welcome. Contact: Steve Betts, Eaton Bray 220922.

forming a computer club for Hampstead should contact Mr T Kayani at the above address.

Tilbury, Chadwell and Grays area of Essex. Is anyone interested in forming a computer club in this locality! If you're over 16 and would like to run the club or just help out with ideas for discussions, contact John Mayhew on Tilbury 2424. It's hoped that would-be members will help out with their own equipment for demonstrations to non-owners.

Worcester Computer Club meets 2nd Monday in the month 8pm in the Old Pheasant Inn, New St, Worcester. Secretary: John Stafford, 29 Somerville Road, Worcester WR4 9QG. Tel: Worcester 20297.

NETWORK NEWS

These are all the European networks of which we're aware. Most are free - but phone them for details.

Forum-80 Hull ... (Forum-80 HQ) Tel: 0482 859169, System operator: Frederick Brown. International electronic mail, library for up/down loading software.
Forum-80 Users Group, Pet Users section shopping list system hours, 7 days a week midnight to 8.00am, Tues/Thurs 7.00pm to 10.00pm Sat/Sun 1.00pm to 10.00pm.

Forum-80 London ... Tel: 01-747 3191. System operator: Leon Jay. Electric Mail, library for

downloading. System hours: Tues/Fri/Sun 7.00pm to 11.00pm.

Forum-80 Milton ... (TRS-80 Users Group 80-Nett) Tel: 0908 566660. System operators: Leon Heller and Brian Pain. Electronic mail, library, newsletter, TRS-80 information system hours: 7 days a week 7.00pm to 10.00pm.

Forum-80 Holland ... Operator: Nico Karssemeyer, Tel: 01 313 512 533. Facilities: electronic mail, program up/downloading,

shopping list. Hours; Tues-Sat 1800-0700 nightly, continuous from 1800 Sat-0700 Tues.

CBBS London ... Operator: Peter Goldman, Tel: 01-399 2136. Facilities: electronic mail, program downloading. Hours: Wed 0700-0930 & 1900-2200, Fri 1900-2200, Sun 1600-2200.

Mailbox-80 Liverpool ... 051-220 9733. System operator: Peter Toothill, Electronic mail, downloading TRS-80 information.

ACC ... members bulletin board, Peter Whittle (0908 44262).

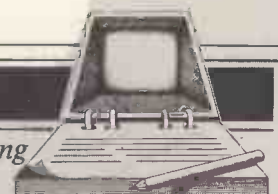
ABC-80 ... Stockholm (Sweden). Tel: 010-468 190522.

University Research Computer ... Sweden. Tel: 010-468 23660, guests use password "66,66" for access. Elfa ... Sweden 010-468 7300 706.

Tree Tradet ... Sweden 010-468 190522.

DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.



Swansea	(Leisure Centre) Microshow. Contact: Centre for Trade and Industry, 0792 50821	13-15 Jan
USA	(Atlanta, Georgia) Southcon Electronics Show. Contact: ECL (Exhibition Agencies) Ltd, 01-486 1951	18-20 Jan
Birmingham	(NEC) Which Computer Show. Contact: Clapp & Poliak Europe Ltd, 01-747 3131	18-21 Jan
London	Bleasdale Computer Systems, Unix and C courses. Contact: 01-828 6661	24-29 Jan
London	(Cunard Int. Hotel), Peripherals Suppliers Exbn. Contact: IPC Exhibitions Ltd, 01-643 8040	2-4 Feb
London	(Heathrow Penta Hotel) Video Software Show. Contact: Link House Magazines (Croydon) Ltd, 01-686 2599	20-22 Feb
London	(Barbican Exbn Centre) Information Technology Office Automation Exhibition and Conference. Contact: BED Exhibitions Ltd, 01-647 1001	22-25 Feb

MICROMART

If you are interested in advertising in Micromart please call Gaye Collins on 01-636 6890.

LCL EDUCATIONAL SOFTWARE

PARENTS, give your children a head start in life. Make sure they understand and enjoy Maths now, so when the dreaded but necessary O-Level Maths comes along they pass well.

TEACHERS, at last a complete CAL software package is available that last years, not just one lesson. It includes class-demonstration programs. For example:-

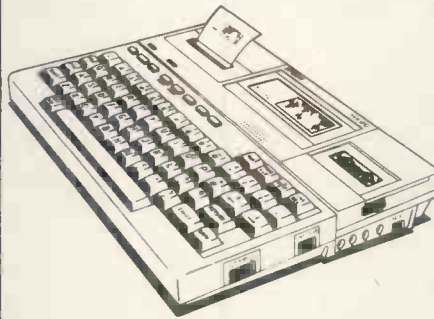
Suite 110. For ages 8 to 'O' Level £5. ANIMATED ARITHMETIC for Ages 3 to 8 (moving colour pictures) for £9.50. MICRO MATHS 24 programs for £24.50. MASTER MATHS 50 programs on 76 discs for £90 inc. VAT.

All software uses Colour Graphics and Sound where appropriate. They are well-tested and reliable and sell worldwide. They run on BBC Micro, Apple, PET, ZX81, ZX Spectrum and RML 380Z. Phone or send for a free catalogue to:

G. Ludinski B.Sc (Hons) ARIBCS LCL,
26 Avoidale Ave., Staines, Middx. Tel (0784) 58771



THE EPSON HX-20 Portable Computer Now available from GMT COMPUTERS (LTD)



The HX-20 is light and totally portable. You can write programs and manipulate data virtually anywhere.

Its powerful 20K Basic, integral printer and display make it the most complete portable computer available today.

Send for more details or visit us at

GMT Computers Ltd
22 Hartfield Road
Wimbledon SW19 3TD

(We are 2 minutes from Wimbledon Station)
or phone (01) 947 7234

ZX 80/81 CASSETTE INTERFACE

Cassettes that were previously un-loadable can now be loaded! Simplify your ZX80/81 program loading with our Interface Unit. Our ZX1 Interface Unit plugs neatly between the recorder and the ZX80/81. It filters and shapes the signal from the recorder and outputs a clean, constant level signal to the ZX80/81. It has an input level indicator, ZX Power on led and a protected ZX Reset Button.

It is easy to use, and small at 3"x2"x1".

Prices:
Kit £13.00p
Built £16.00p
including VAT and postage
If our ZX1 Interface Unit does not simplify your program loading, please return it to us for a refund, within 14 days of purchase.

JELVALE LTD
104 Marshalswick Lane,
St Albans, Herts
Tel St Albans (0727) 69437

Now available for Micro users Advanced OPTIMAL PLANNER in BASIC.

Applications range from users in the home — betting, dieting, to small business, — cost, minimising, production management, military tactics, games strategies, social planning, etc.

Complete with detailed manual £35 (Does not require disks).

Also available range of high quality application programmes.

Address and diary files, account, maintenance and solutions, statistical analysis, advanced mathematics, astrology etc..... from £9

Apply for free catalogue.

Enquiries/Orders to:-
POSTBUS 12,2000
ANTWERPEN 22
BELGIUM

Cheques addressed to
Mr T. Machin — for
sterling amount or
current equivalent.

COMPUTER CASSETTES

Screw cassettes with Agfa tape

C5 - 37p C20 - 43p
C10 - 39p C25 - 45p
C12 - 40p C30 - 46p
C15 - 41p C40 - 49p
plus P & P £1.50 (or 10% if larger).

COMPUTER LEADS

BBC1 7 pin to 2 x 3.5mm, 1 x 2.5mm £2
BBC2 7 pin to 5 pin, 1 x 2.5mm £2.50
DRAGON 5 pin to 2 x 3.5mm, 1 x 2.5mm £2 inc. P & P.

COMPUTER SOFTWARE

ZX81, Spectrum, Vic, Atom, Dragon (soon) BBC.....
We now stock software from all the famous names.
COME AND BUY IN CENTRAL LONDON

MICROVITEC HIGH QUALITY MONITORS

FOR COMPUTER USE.
COMPETITIVE PRICES RANGE FROM £199.
BAND WIDTHS TO 15MHz.

SPLICE VIDEO LTD
01-845 6705

VDU DESK

TEAK LAMINATE FINISH

Assembly in seconds without tools

Other sizes

TRADE ENQUIRIES WELCOME



£37.97 +VAT WITHOUT TOP SHELF
FOR 24"x24" size

OPCO LTD

65 TREDEGAR SQ.
LONDON E3 54E
Tel:01-981 7301

OSBORNE 1

- * Praxis daisywheel £425
- * NEC EPSON/OK1 £CALL
- * Monitors (inc cable) £ 99
- * OSBORNE £CALL
- * GAMES FOR OSBORNE from £ 19

We specialise in Osborne & hold large stocks of the above

CALL FOR SUPERB PRICES
FRASER ASSOCIATES
BUCKINGHAM 02802 - 6087

***** CAN YOU WRITE? *****

We are a major international publishing company, and we are looking for microcomputer enthusiasts. If you think you could contribute to our programme of books and software for hobbyists in the UK and USA, please contact us. We will pay good royalty rates for the right material. Box 373 - 62 Oxford Street, London W1.

calcsheet78

financial planning and modelling for the CBM 8032 and CBM 8096.

NOT JUST ANOTHER SPREADSHEET PROGRAM BUT A COMPREHENSIVE SUITE OF PROGRAMS.

IT WILL sense automatically if you have a 32K or 96K machine.

IT WILL create dt (TM) data transfer files which can be accessed directly, via the calcsheet78 (TM) or word processing programs (eg WordPro).

IT INCLUDES a specimen VAT spreadsheet which will calculate tax paid and received and how much tax due to or from the Customs for each quarter.

IT INCLUDES examples of invoicing and book-keeping using the spreadsheet.

Concise, comprehensive manual supplied.

All this for just £75 inc VAT (plus £1 p&p). Manual only £5 plus 50p p&p (deductible if calcsheet78 (TM) is ordered subsequently).

Also available: USING VISICALC, a simple guide to the world's most famous spreadsheet program (£5 plus 50p p&p).

Available soon: VICTORY over B*A*S*I*C, a programming manual for the VIC20 user (£2.50 plus 50p p&p if ordered now, £4 plus p&p if ordered after publication).

ESSENTIAL SOFTWARE
4 Fanshawe Avenue, Barking, Essex

data-asette®
Dept. PCW 1

44 Shroton Street,
London NW1,
01-258 0409



TELEPHONE OR MAIL
OR COME AND SEE
US.

MICROMART

DISCS STATIONARY PRINTERS

Floppy diskettes in boxes of 10
 5 1/4" s/s/density s/sectored only £15.00
 8" s/s/density s/sectored only £15.00
 (Add £1.00/box P & P + Vat.)

Continuous stationery- 1000 sheets
 9 1/2" x 11" Plain single part only £4.95
 9 1/2" x 11" Plain (with 1/2" margins) only £5.96
 14 1/2" single part only £7.00
 (Includes delivery, excludes Vat.)

Printers from Newbury Labs

Special Introductory Offer
 A free box of 9 1/2" x 11" Stationery with every Newbury Printer purchased

The 8510 (11" carriage) only £480.00
 The 1550 (15" carriage) only £650.00

Printer ribbons
 8510/1550 only £7.50
 Epsom MX80 only £4.56
 Centronic 700 (zip pack) only £3.08

Price - single item but sold in boxes of 5
 (Add £1.00 P & P + Vat.)



CDP Consultants Limited
 Clavering 079985-617

ESSEX & SUFFOLK

YOUR LOCAL ONE STOP COMPUTER SHOP. CALL IN AND BROWSE AT YOUR LOCAL STORE and SEE:

Acorn from	140.00	Printers from	129.95
Apple	669.00	Disk drives	199.00
Atari	89.00	Cas Recorders	17.40
Dragon	173.00	Monitors	69.50
NEC	599.00	Cassettes	49p
Tandy	78.00	Disks	1.99
TI 99/A	179.00	Software	49p
VIC20	147.99	Avaton Hill war	
Video Genie	173.50	games on cass	9.52
Accessories & Books			

We are an authorised service centre for all the above computers. Emprise provides full support so that you get 100% enjoyment from your computer

All our products can be hired on a try-before-you-buy basis and membership of our computer club is free if you buy your computer from EMPRISE

FREE

All prices are subject to VAT and refer to current stock

EMPRISE
 (0206) 865926

58 EAST STREET
 COLCHESTER ESSEX
 CO1 2TG
 TEL (0206) 865926



CALL US NOW 865926

BRANCHES AT:
 CHELMSFORD TEL (0295) 336834
 SUDBURY TEL (0781) 330142
 CLACTON TEL (0255) 431796

PET PET PET PET PET

**** HI-RESOLUTION GRAPHICS ****

A high resolution graphics board that gives a 64,000 dot (320 x 200) resolution. Versions available for any dynamic ram Pet, BASIC 2,3,4, FAT40 & 80 columns. No soldering or track cutting required, supplied complete with fast GRAPHIX software in ROM and full fitting & operating instructions. £149.00

**** SUPER ROM-SELECTOR ****

A high quality printed circuit board giving 64K of utility ROM space, software selectable!!! Allows 16 x 4K ROMs/EPROMs to reside in the expansion area of your PET. One 'POKE' enables any two ROMs at a time. Suitable for bank-switched software. £75.00

**** PET UPGRADES ****

WHILE-U-WAIT service! (Dynamic ram pets only.)
 Memory expansion:- 8K - 32K. £59.90
 16K - 32K. from £48.70
 8K - 16K. £38.26

40 column (12" VDU only) to 80 column conversion.
 40 to 80 column £89.00
 40 to 80 column switchable (two machines in one!) £105.00
 Full keyboard functions:- i.e. TAB, ESC, REPEAT, SCROLL up/down, define WINDOW, lower case/graphics mode & DELETE from/locursor. All available in direct or program mode.

**** REPAIRS AND SERVICING ****

Fast and efficient repairs to all Commodore computers at reasonable prices. WHILE-U-WAIT service whenever possible.

Please add VAT to the prices shown at the current rate.

Telephone Mick Bignell for more details at:-

MICROSERVE
 7 Clydesdale Close,
 Borehamwood, Herts. WD6 2SD.
 Tel: 01-953-8385

PROGRAMS

PCW is interested in programs written in Basic, Pascal, Forth, Logo and Comal - all of which being languages we've covered in previous issues. please supply your programs on disk or cassette with all necessary documentation (so we've got a good idea what it's about and how much memory it uses) and, if you can, a clear listing on plain white paper.

As all programs in PCW are checked either by a referee or by one of the editorial staff, it can take some time for a program to actually appear. If you don't hear from us within two months or so, it usually means your contribution is in the referee pipeline. It's essential to ensure that your program is fully debugged before you send it in - get a friend to try it out first - and all programs we publish are paid for at a regular rate. Send contributions to: Maggie Burton PCW Programs, 62 Oxford Street, London W1A 2HG - and please enclose an SAE if you want material returned.

More on Star Trek

Some clarification seems necessary on the subject of the program 'Star Trek' published in October PCW. Inundated as I was with phone calls from readers with caloused fingers who'd found it won't work, I contacted the author in a state of manic desperation. Only two actual errors have been discovered in the listing. line 2610 should read IF D THEN LET D=D-10 and the end of line 21000 should read GOTO 2300. I hope that will clear up many readers' problems with this program, but the following points are worth bearing in mind.

It is essential to include the REM statement in line 10 (the program is so long it's possible that a lot of people will have left this out in the interests of saving

time), which should contain at least 28 full stops. This is because the machine code routine is loaded into this by lines 20-29. You can check this routine by entering lines 10 to 29 (inclusive), running them, and entering RAND USR 16514, upon which the top ten lines of the screen go black.

The character in lines 520, 540 and 560 which is referred to as 'graphic "H"' is not the inverse video 'h' but the chequered character on the 'H' key.

This kind of thing has been said before in these pages, but Star Trek contains a lot of POKEs to the display file and a great deal of numbers which must be entered with great care if the program is not to crash. Lines 4180-4264, 5090-

0

10 USS ENTERPRISE

11 STARDATE 10000 ENERGY 5000
 CONDITION GREEN SHIELD DOWN
 WARP 1 VECTOR 1 SENSORS OFF
 PHASERS READY TORPEDOS 10
 15 DAMAGE 0 SCORE 0

20 These two lines are used to print temporary messages to the player
 21 during the game.

Fig 1

This edging is the chess board type graphic symbol on Key 'H'

SHARP MZ80K 'N' MZ80A SOFTWARE

On Tape	On Disk
Scrambler.	Tele Data
IQ Test	Data Base
General Knowledge	Payroll
Quiz	Stock Control

Poster Printer
 And many many more on both disk and tape for the k and a. Send SAE for our latest Price List. To:

D. TEC Digital Technology
 254 Bridle Road, Eastham,
 Merseyside L62 8BX
 Tel 051 327 5070

We are always looking for High Quality Programs for Sharp. And will pay up to 30% royalties. Please contact us with your proposal. Trade Enquiries Most Welcome.

Epson MX80T	£290
Dragon 32	£165
Eprom programmer for UK01	£26

Prices exclude VAT
 Data cables made
 Micro designs undertaken

Please add £6 carriage but free delivery in Herts.

**Melmark
 Microsystems**

Mail Order Dept
 6 Kingsfield Rd, Dane End
 Ware, Herts SG12 0LY
 (092 084) 300

PROGRAMS

5270, 6030-6302 and 9030-9150 all involve POKEing the display and should be checked carefully. Incidentally, in line 1100 the variable S contains the address in the display file of the top left hand corner black square in the display. It is used as a base address for calculating all the other display POKEs, so a mistake in this line will definitely cause problems.

The two diagrams should help with any problems encountered with the display. Figure 1 is the display as printed by lines 5020-5050. The other squares in the grid shown are black on the actual display. Figure 2 is the display handled by lines 510-610 and through looking at this it should become apparent why using decimal numbers for the warp factor will ruin the display. Care must be taken to

ensure that the right amount of spaces are used in any strings — some of them contain two together and this is not always apparent from just reading the listing. It's best to try them with two at first and then if it looks wrong to go back and alter them.

I hope this clears up any problems readers have had with this program. If anyone is still having trouble with it after reading this and they're sure the trouble is in the program rather than in the arduous task of keying in a long listing on that unfriendly ZX81 keyboard, then they are welcome to write in and I'll send a list of variables which should make it easier to understand the program.

Starbase Graphics (lines 5020 - 5050)

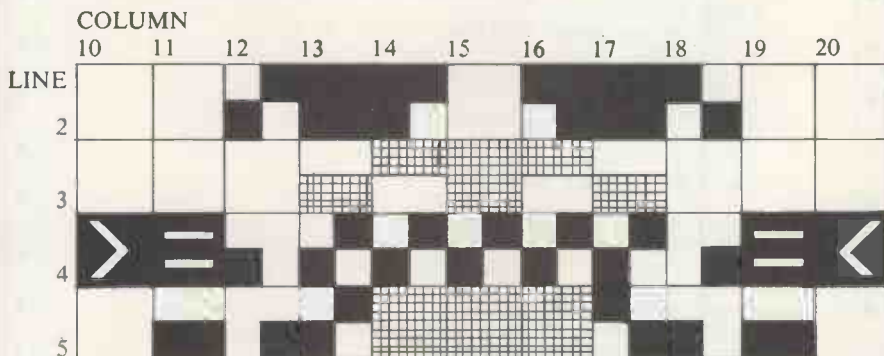


Fig 2

VIC Connect-4

by Adrian Millet

This game, for a 3.5k VIC, is a game of the Othello type in which player and computer take it in turns to drop black or white pieces onto a 7x6 grid. The winner is the first player to obtain a line of four either horizontally, vertically or diagonally on the grid. To input the position on which you want to play a turn,

simply type in the appropriate column numbers when the prompt is given.

The reverse video '/' in line 8020 is not directly available from the keyboard and can be left out if desired. I'd like to thank Softex Computer Accessories for this program, which was listed on a ZX Printer using the Softex Printerface.

```

130 DIMB(8,7),E(2,9),Y(3),X(3)
200 GOSUB8000
220 IFNP=1ANDRND(8)>.5THENPRINT"
I'LL GO 1ST THIS TIME":GOTO300
250 C=2:GOSUB7000
300 C=1
310 IFNP=2THENGOSUB7000:GOTO250
350 GOSUB1000:GOTO250
499 REM # EVAL X,Y
500 E=EC(X)
    
```

NEC

PC-8000

OSBORNE 1

IN THE NORTH

NMR Tel: (0484) 892905
COMPUTERS (Holmfirth)

BBC SOFTWARE & HOLIDAYS

Programs that are guaranteed to run! Save hours of work and worry with these utilities and practical programs.

- | | |
|---|------------|
| 1. CASHBOOK Double entry accounts DATA or TAPE B | £4.95 |
| 2. MAILING 6 options, sort addressing etc B | £4.95 |
| 3. PAYROLL A 2 part full weekly PAYE programme B | £11.90 |
| 4. STATPACK over 18 different analyses B | £7.95 |
| 5. CARDS Best Bruce Forsyth at his own game A/B | £2.95 |
| 6. BATTLEFIELD has you on your nerves edge B | £2.95 |
| 7. BANNER Print out large characters and graphics A/B | £2.95 |
| 8. DISTANCES between any 2 places | £2.95 |
| 9. SEARCHBAS to search and alter a program | £1.95 |
| 10. PROCVAR to list all the variables in a program | £1.95 |
| 11. PROCFLUSH clean memory right round | £1.00 |
| 12. DEFCHR Define graphic characters | £2.95 |
| 13. SORTM/C / SORTBAS Fast sort routines (listings) | each £1.00 |
| 14. UTILITY A items 9,10,11,12,13 | £4.95 |
| 15. FIAGS OF THE WORLD | £2.95 |

Micro-Aid (p)

All programs guaranteed on tape. Fully documented.
EASTER HOLIDAY for computer freaks. Come and enjoy yourselves.
Send for lists in more detail or cheque or PO made out to
MICRO-AID, 25 Fore St., Praze, Camborne, Cornwall. Tel: 0209-831274

MICROMART

RADEC

ASCII Keyboards



- Upper & Lower Case plus Control
- Low Power Consumption
- Shift & Alpha Lock
- Autorepeat (Model 777)
- Parallel Data Output
- Metal Mounting Frame
- Suitable for Tuscan, Tangerine etc.

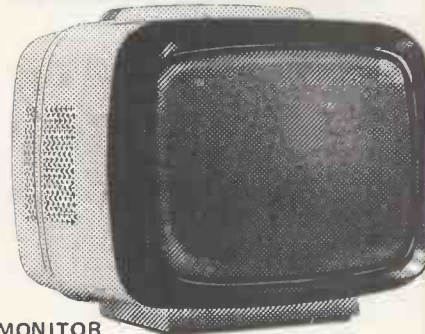
Model KB756A	56 key	£39.50
KB710	Numeric Pad	£ 7.50
KB771	72 key	£55.00
KB777	77 key	£62.50

Accessories available include:-

Metal Case	£ 14.95
Edge Connector	£ 1.95
DC to DC Converter	£ 5.00

(for operation off single 5V supply)

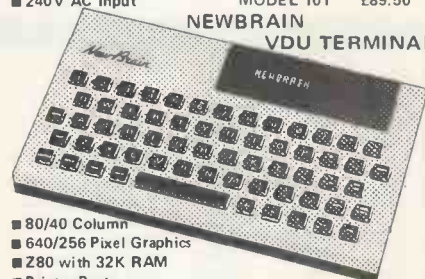
High Performance Monitors & VDU's



MONITOR

- 12" Green P31 Phosphor
- MULLARD C.R.T.
- 80 Character Line Capability
- 24MHz Video Bandwidth
- 240V AC Input
- Toroidal Transformer
- Composite Video Input
- Ideal for Apple, B.B.C., Micro, Gemini, Nascom, Tuscan, Newbrain etc.

NEWBRAIN VDU TERMINAL



- 80/40 Column
- 640/256 Pixel Graphics
- 280 with 32K RAM
- Printer Port
- Ideal with above Monitor
- Ansi Basic, Graphics and Maths Software onboard for local processing
- Expansion Port for CPM, Floppies, Winchester and up to 2M Bytes RAM.

U.K. Orders add 15% VAT on order total
Orders under £50 add £2.00 p&p plus VAT
Orders over £50 add £3.50 p&p plus VAT
Overseas orders add £5.00 to cover part cost postage and documentation.

FULL DATA SHEETS ON REQUEST

Citadel Products Ltd
Dept. PCW, 50 High Street, Edgware,
Middlesex, HA8 7EP. Tel: 01-951 1848

MICROMART

MIDLANDS

COMMODORE PET SERVICE CENTRE

Phone Anne on 021-772 8181 about our:

1. Workshop & Field Repairs
2. Business Software
3. Stationery & Supplies



75 Watery Lane, Birmingham B9 4HW.
Telephone: 021-772 8181 (7 Lines)

SHARP

C.P.E. are proud to announce ***CPE DATABASE*** One of the most sophisticated tape based programs currently available and designed specifically for MZ80K/A! Ideal for small business, clubs, personal use. Basic and machine-code give big system performance. FEATURES Alphabetic, Numeric & DATE types, Modify, block Copy/Delete/etc., Sort, Search (1-6 levels), Calculate, Cross-Field Total, flexible user-defined Printer Formats for reports (with headings) mailing lists etc. Loads data files at 10x normal speed! On cassette with 35 page manual £39.99. Manual only, £4 (refunded against program).

BASIC PLUS a popular program for 80K only. Offers Key-Repeat (incl cursor), Numeric-Pad, Syntax errors pinpointed & displayed, Single-Key, List Pause, Auto number, Link. On cassette, with comprehensive manual and printed key labels. Still only £13.80

Large SAE for further details. All prices are fully inclusive, please state machine when ordering and send cheques/P.O. to:

C P Electronics,
51 Fairholme Road,
Withington, Manchester
M20 9SA.

SEARCHING FOR 'BEST PRICE'

FOUND 'BEST PRICE'...GOTO

PET	TAPE	RRP
C2N	16K	£55
4016	16K	£550
4032	32K	£695
8032	32K	£895
8096	96K	£1195

DISK DRIVES

2031	170K	£395
4040	343K	£695
8050	1M	£895
8250	2M	£1295
9060	5M	£1995
9090	7.5M	£2495

PRINTERS

4022P	80COL	£395
8023	136COL	£895
8300	DAISY	£1395

VAT TO BE ADDED @ 15%

CARRIAGE - £5 PER ITEM

IF YOU KNOW WHAT YOU WANT WHY WAIT?

THESE ARE THE PRICES YOU NEED

ORCHARD COMPUTER SERVICES

Orchard House, 21 St Martins St
Wallingford, Oxon
Tel: Wallingford (0491) 35529
Open 6 days per week



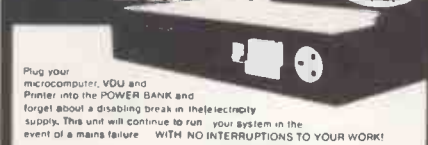
PROGRAMS

```

510 FOR D=0 TO 3
520 Q=X(D):R=Y(D)
530 FOR C1=1 TO 2
540 N=0:I=X+Q:J=Y+R
550 IF B(I,J)<>C1 THEN S580
560 I=I+Q:J=J+R:N=N+1
570 IF B(I,J)=C1 THEN S560
580 O=(B(I,J)=0)
590 I=X-Q:J=Y-R
600 IF B(I,J)<>C1 THEN S630
610 I=I-Q:J=J-R:N=N+1
620 IF B(I,J)=C1 THEN S610
630 O=-(B(I,J)=0)-O
640 A=N*3+O:IFA>9 THEN A=9
645 C2=C1:IF C=2 THEN C2=3-C2
650 E=E+E(C2,A)
660 NEXT
670 NEXT
890 RETURN
1000 REM COMP MOVE B
1020 B=-1:BE=-1E9
1050 FOR X=1 TO 7
1060 GOSUB 1900:IF Y>6 THEN 1200
1100 GOSUB 500
1110 PRINT"#####"TAB(X*3-2)MID$(CST
R$(E),2)
1120 IF E>BE THEN BE=E:B=X
1200 NEXT X
1400 X=B:IF X<0 THEN RETURN
1410 GOSUB 7500
1420 IF E<500 THEN RETURN
1430 PRINT"#####I WIN. HIT SPACE
"
1440 GET A$:IFA$<>" " THEN 1440
1450 RUN
1900 FOR Y=1 TO 6:IF B(X,Y) THEN NEXT
1910 RETURN
7000 GOSUB 7400
7020 PRINT"#####MID$( "WHITEBLACK",C
#5-4,5)" MOVE? (OR #####STOP)"
7030 GET A$:IFA$<>" " THEN 7030
7050 GET A$:IFA$="S" THEN RUN
7100 X=VAL(A$)
7110 IF X=0 OR X>7 THEN 7050
7120 GOSUB 7500
7150 IF Y>6 THEN 7050
7200 IF E<500 THEN 7400
7210 PRINT"#####YOU WIN. HIT SPACE
"
7250 GET A$:IFA$<>" " THEN 7250
7270 RUN
7400 FOR A=7680 TO 7745:POKE A,32
7410 NEXT
7490 RETURN
7500 FOR Y=1 TO 6
7510 IF B(X,Y) THEN NEXT:RETURN
7550 FOR A=X*3+7744 TO X*3+8140-Y*6
65 STEP 22
7555 POKE A-22,32:POKE A-21,32
7560 IFC=1 THEN POKE A,233:POKE A+1,
223:POKE A+22,95:POKE A+23,105
7570 IFC=2 THEN POKE A,78:POKE A+1,7
7:POKE A+22,77:POKE A+23,78
7600 NEXT A
7610 GOSUB 500
7650 B(X,Y)=C
7990 RETURN
8000 REM *NEW GAME
8020 PRINT"#####1 OR 2 PLAYERS ?"
8025 POKE 36879,8
8030 GET A$:NP=VAL(A$)
8040 IF NP<1 OR NP>2 THEN S030
8050 PRINT"#####"

```

The POWER BANK



Plug your microcomputer, VDU and Printer into the POWER BANK and forget about a disabling break in the electricity supply. This unit will continue to run your system in the event of a mains failure WITH NO INTERRUPTIONS TO YOUR WORK!

Vital when running business. This unit will of course suppress MAINS SPIKES and SURGES. Batteries included (sealed for life) 120 V.A. and 250 V.A. (output) units available.

Power Testing (Sales) Ltd
65a Shenfield Rd, Shenfield, Brentwood, Essex CM15 8HA
Tel Brentwood (0277) 233188 Telex 24224586

What can you get for your **SPECTRUM?** Find out from our new **GUIDE TO SPECTRUM RESOURCES**

- ★ Suppliers
- ★ Hardware plus software in various categories
- ★ Books
- ★ Magazines
- ★ User Groups, and so on
- ★ Illustrated

We attempt to assess objectively and in some detail all that our Panels have seen. And we list, without comment, all other resources that come to our attention.

For this sizable and, we hope, complete collection of information, send £2.50 (overseas £3 sterling) to
Microscene
6 Battenhall Road, Birmingham B17 9UD

PROGRAMS

```

8100 FORX=1T018:PRINT" | | | |
| | | |";NEXT
8120 PRINT" 1 2 3 4 5 6
7 8"
8200 FORX=1T07:FORV=1T06
8205 B(X,V)=0:NEXT:NEXT
8210 FORX=0T08:B(X,0)=-1
8215 B(X,7)=-1:NEXT
8220 FORV=0T07:B(0,V)=-1
8225 B(8,V)=-1:NEXT
8400 RESTORE
8410 FORC=1T02:FORX=0T09
8415 READE(C,X):NEXT:NEXT
8420 FORX=0T03:READX(X):NEXT
8430 FORX=0T03:READY(X):NEXT
8450 FORX=1T07:READE(C,X):NEXT
8490 RETURN
9600 DATA0,2,3,0,4,6,1,12,16,100
0
9620 DATA0,0,0,0,2,3,0,8,11,120
9700 DATA0,1,1,1
9710 DATA1,1,0,-1
9750 DATA0,0,1,3,1,0,0
READY.
    
```

VICMon

by D M Evers

Here's a program which is really much more interesting than directly useful (I hope the author isn't offended by that statement. . .). I say this because it's a machine code monitor written in Basic. All routines are, therefore, handled through a monitor emulator rather than a monitor proper. The use of Basic for this type of application also detracts somewhat from the speed of execution.

For the novice to machine code it will make a fair introduction to the subject, although a beginner's book on machine code and some instruction material on programming the 6502 processor would be necessary. Machine code aficionados will find its actual uses are rather limited, but it's unusual to see a program like this in the Programs mailbag.

Here is a list of the commands available:

The 'M' command (format M xxxx yyyy) displays memory in hex from xxxx to yyyy, both of which are addresses in hex.

The ';' command (format ;xxxx AA BB CC DD EE) places the byte values shown (AA, BB, etc) into memory starting at xxxx. In fact you should use the 'M' command to display the memory, use the screen editor to alter the bytes and press 'return' to enter them.

The 'G' command (format G xxxx) tells the computer to execute the machine code program starting at xxxx.

The 'L' command (format L "filename") loads byte values into memory from the specified tape file. This subroutine uses data files and these cannot be loaded into memory using the normal Basic LOAD command.

The 'S' command (format S "filename") saves byte values from memory to the tape file specified. This subroutine prompts for start and end addresses which should both be given as four-digit hex numbers.

The 'H' command (format H n) gives the hex value of decimal number n.

The 'D' command (format D xxxx) gives the decimal value of xxxx which must be a four-digit hexadecimal number.

Lastly, but not leastly, the 'X' command (format X) drops you out of the monitor and back into Basic command mode.

Readers who use this program should beware of incorrect syntax on input as this is likely to crash the program. This would, in fact, be quite easy to remedy with some nifty error trapping routines in the appropriate places. Apart from that little complication it is easy to use and well put together.

```

10 POKE 36879,0
20 PRINT"[cls][green] VICMON.BAS 1.0"
30 PRINT"(c)-1982 BY D.M.EVERS"
40 GOSUB 5000:GET CMD
50 CH$=MID$(LINE,2,1)
60 IF CH$="M" THEN 400
70 IF CH$=";" THEN 550
80 IF CH$="G" THEN 650
    
```

DRAGON - ATOM - BBC

GAMES-UTILITIES-PROGRAMME GENERATORS

For the DRAGON: **MAZE RUNNER**

The Maze is tortuous, the exit is closed, time is short, you MUST find a control panel.....
A High-Res. 3D Game £3

For theATOM: **MEANIES**

A High-Res. Arcade Action Game! Stop the Meanies landing or they'll turn into a Super-Meanie, and then you really have got trouble!!! £3

for catalogue, send S.A.E. to

QUODLIBET
2, Victoria terrace,
Dorchester,
DORSET DT1 1LS

QUODLIBET

OSBORNE 1

- * Praxis daisywheel £25
- * NEC EPSON/OK1 £CALL
- * Monitors (inc cable) £ 99
- * OSBORNE £CALL
- * GAMES FOR OSBORNE from £ 19

We specialise in Osborne & hold large stocks of the above

CALL FOR SUPERB PRICES
FRASER ASSOCIATES
BUCKINGHAM 02802 - 6087

MICROMART

COMPUTER CORRESPONDENCE COURSE

Learn to program a computer in the comfort of your own home using the latest Dragon micro with 32k of RAM and COLOUR GRAPHICS capability. The computer is yours to keep.

The course extends over a period of 10 weeks taking you from BEGINNERS BASIC to BUSINESS applications and DATABASE handling.

IMMEDIATE ENROLMENT

Fee: £259« £3.40 p&p All inclusive
FOR FURTHER DETAILS write enclosing SAE to:

COMPUTER CORRESPONDENCE COURSES

Churchway, West Ilsley,
Nr Newbury RG16 0AH
Berks

EX-DEMO COMPUTERS with warrantee

CBM 8096 96K Computer	895.00
CBM 8032 32k Computer	695.00
CBM 8050 1 Meg Disk Drive	695.00
CBM 8023 Fast Matrix Printer	695.00
CBM 8027 Daisy Printer	599.00
ESW100KSR Daisy plus keyboard	699.00
FLOWRITER Fast Daisy Printer	1195.00
Apple II 48K Computer	450.00
Disk with controller	250.00
2nd Disk Drive	210.00

All the above equipment are in perfect working order and are in almost new condition.

THESE OFFERS ARE ONLY WHILE STOCKS LAST

We also buy and sell used equipment. Please call for latest.

Please add VAT to above prices.

Call:- **DaVinci Computers Ltd.**
65 High Street
Edgware
Middx. HA8 7DD.
01-952 0526



SHARP

CURSED CHAMBERS - MZ-80K, A or B-Search and explore up to 4000 rooms using Magic wares, Precious stones, Elixirs and your weapons and armour to protect you from the evil that lurks in many of the rooms. Find and kill the Guardians of the Almighty Sphere, take it and escape, but beware of the most deadly monster at the exit..... £5

QUEST-MX-80K, A or B - Travel through over 120 well described locations using the artefacts found to reveal the 4 Eyes of Morpheus. These will then lead you to the treasure..... £4

ARCADE PACK-MZ-80K only - Alien Attack (in M/C for fast action with full sound and graphic effects). Escape Force, Blockstop and Madness..... £4

All programs supplied on cassette for 48K RAM machines upwards. All prices are fully inclusive. Please state computer when ordering and send to J. Wolstencroft, Sagar Fold, Bleasdale, Preston, Lancs. For more details send an SAE or 'phone Chipping (09956) 327 after 5.30 pm.

MZ80 SERIES

ELCOMP

Dealers welcome!

BOOKS
and SOFTWARE

For ATARI-PET-OSI-APPLE II-6502-VIC-20-Sinclair-Times

ATARI ATARI ATARI ATARI

ATARI BASIC - Learning by Using

This new book is an "Action" Book. You do more than read it. Learn the intricacy of ATARI-BASIC through the short programs which are provided. The suggestions challenge you to change and write program routines. Yes, it's exciting - Many of the programs are appropriate for beginners as well as experienced computer users. (Screen Drawings, Special Sounds, Keys, Paddles + Joysticks, Specialized Screen Routines, Graphics and Sound, Peeks and Pokes and special stuff).

Order-No. 164 \$9.95

ATARI Learning by Using - Book + cassette or disk

This package includes the book No. 164 plus a cassette or disk (please specify) containing a variety of the programs which are listed in the book.

Order-No. 7220 \$39.95

Games for the ATARI-Computer

How to program your own games on the ATARI. Complete listings in BASIC and Machine Language of exciting games. Tricks and hints.

Order-No. 162 \$7.95

GAME PACKAGE for the ATARI

Book + cassette or disk. Includes the book No. 162 plus cassette or disk (please specify) containing a variety of the programs listed in the book.

Order-No. 7221 \$39.95

ATMONA-1

Machine Language Monitor for the ATARI 400/800.

This powerful monitor provides you with the firmware support that you need to get the most out of your powerful system.

ATMONA-1 comes on a bootable cassette. No cartridges required. Disassemble, Memory Dump HEX + ASCII, (Change Memory Locations, Blocktransfer, fill memory block, save and load machine language programs, start mach. Lang. Progr. (Printer optional).

Comes with introductory article on how to program the ATARI computer in machine language. (Available also in ROM)

Order-No. 7022 \$19.95

ATMONA-2 Superstepper

A very powerful Tracer to explore the ATARI ROM/RAM area. Stop at previously selected address. Opcode or operand (cassette).

Order-No. 7049 \$49.95

EDITOR/ASSEMBLER for ATARI 800, 32K or 48K RAM

Extremely fast and powerful Editor/Assembler. (8K Sourcecode in about 5 seconds) Includes ATMONA-1.

Order-No. 7098 \$49.95

MACRO-Assembler for ATARI 800, 48K RAM

Please specify your system: RAM, disc or cassette.

Order-No. 7099 \$89.00

Add \$39.00 for carriage version

Quarfight - For ATARI 400/800

16K RAM, needs two joysticks, animation and sound. (8K machine language).

Order-No. 7207 \$19.95

Birth control with the ATARI

(Klaus Glogin) Cass. or disk

Order-No. 7222 \$29.95

Astrology and Biorhythm for ATARI (cass. or disk)

Order-No. 7223 \$29.95

EPROM Cartridge KIT for ATARI

Cartridge (bare board) with instructions (holds two 16K or two 32K EPROMs (2716,2532,2732)

Order-No. 7224 \$19.95

Order-No. 7043 complete \$29.95

Invoice Writing for small business with ATARI 400/800

16K RAM.

Order-No. 7022, cass. \$29.95

Order-No. 7200, disc. \$39.99

Mailing-List No. 7213 \$24.95

Inventory Contr. No. 7215 \$24.95

NEW IATEX-1

This new wordprocessor in machine language (8K) for all ATARI 400/800 computers offers the best price performance ever. 23 editor control commands, 17 formatting commands, dynamic formatting. Vertical and horizontal scrolling up to 255 char. per line! Include command on disk!

Order-No. 7210 cassette \$29.95

Order-No. 7211 disk \$39.95

Order-No. 7212 cartridge \$29.80

Learn FORTH for the ATARI

400/800, cassette or disk

Order-No. 7053 \$19.95

ELCOMP FORTH - Enhanced FIG-FORTH on disk only.

Order-No. 7055 \$39.95

How to connect your EPSON-Printer to the ATARI 400/800. Construction article with printed circuit board and software. (Screenprint and variable characters per line).

Order-No. 7210 \$19.95

OSI OSI OSI OSI OSI

The First Book of Ohio Scientific Introduction to OSI computers. Diagrams, hardware and software information not previously available in one compact source, 192 pages.

Order-No. 157 \$7.95

The Second Book of OHIO

Order-No. 158 \$7.95

The Third Book of OHIO

Order-No. 159 \$7.95

The Fourth Book of OHIO

Order-No. 160 \$9.95

VIP Package - Above book plus a cassette with the programs.

Order-No. 160A \$19.95

The Fifth Book of OHIO

Order-No. 161 \$7.95

Invoice Writing Program for OSI: CIPMF, C4P, Disk and Cassette, 8K RAM.

Order-No. 8234 \$29.80

Mailing List for CIPMF or C4PMF 24K RAM

250 addresses incl. phone number and parameters on one 5 1/4 disk

Order-No. 8240 \$29.80

BK Microsoft BASIC Ref. Man.

Order-No. 151 \$9.95

Expansion Handbook for 6502 and 6802

Order-No. 152 \$9.95

Microcomputer Appl. Notes

Order-No. 153 \$9.95

Complex Sound Generation

New revised applications manual for the Texas Instruments SN 76477 Complex Sound Generator.

Order-No. 154 \$6.95

Small Business Programs

Complete listings for the business user. Inventory, Invoice Writing, Mailing List and much more.

Introduction to Business Applications.

Order-No. 156 \$14.90

Microcomputer Hardware Handbook (845 pages)

Descriptions, pinouts and specifications of the most popular microprocessor and support chips. A MUST for the hardware buff.

Order-No. 20 \$14.95

Care and Feeding of the Commodore PET

Eight chapters exploring PET hardware. Includes repair and interfacing information. Programming tricks and schematics.

Order-No. 150 \$9.95

Prototype-Expansion Board for VIC-20 (\$44-Bus).

Order-No. 4844 \$18.95

Wordprocessor f. VIC-20, 8K RAM

Order-No. 4870 \$19.95

Mailing List for VIC-20, 16K RAM

Order-No. 4883 \$14.95

Tricks for VICs - The VICtory

Programs, hints and expansion information for VIC-20

Order-No. 141 \$9.95

TIC TAC VIC

Order-No. 4880 \$9.95

GAMEPACK I (3 Games)

Order-No. 4881 \$14.95

Dual Joystick Instruction

Order-No. 4885 \$9.95

INPUT/OUTPUT Programming with your VIC

Order-No. 4886 \$9.95

16K RAM/ROM board for \$44-bus.

Any combination of RAM and ROM on one board.

(S2128 or 2716)

Order-No. 613 \$39.95

Low cost expansion boards for your APPLE II.

Bare board comes with extensive description and software.

8522 VISA-I/O Exp. Order-No. 805 \$39.00

2716 EPROM Burner Order-No. 607 \$49.00

8K EPROM/RAM Card Order-No. 609 \$29.00

Software for SINCLAIR ZX-81 and TIMEX 1000

Machine Language Monitor Order-No. 2399 \$9.95

Mailing List Order-No. 2398 \$19.95

Programming in BASIC and machine language with the ZX-81(82) or TIMEX 1000.

Order-No. 140 (book) \$9.95

PROGRAMS

```

90 IF CM$="L" THEN 700
100 IF CM$="S" THEN 1000
110 IF CM$="X" THEN PRINT'CLsJ':END
120 IF CM$="H" THEN 1400
130 IF CM$="D" THEN 1200
    ** MUST BE ERROR **
310 PRINT'CrvsJrredJ ERROR'rvsvofJlgreenJ'
320 POKE 36878,10:POKE 36876,215:FOR XX=1 TO 150:NEXT:POKE 36876,0
330 GOTO 40
    ** 'M' COMMAND **
410 ST$=MID$(IN$,4,4)
420 FI$=MID$(IN$,9,4)
430 HX$=ST$:GOSUB 2000:S1=DC:IF ER THEN 300
440 HX$=FI$:GOSUB 2000:FI=DC:IF ER THEN 300
450 AD=S1
455 BET A$:IF A$="[space]" THEN 40
460 PRINT CHR$(13)'>';
470 DC=AD:GOSUB 2200:PRINT HX$'[space]';
480 SL=AD:FL=AD+5
490 FOR AL=SL TO FL-1
500 DC=PEEK(AL):GOSUB 2100:PRINT HX$:IF AL<FL-1 THEN PRINT'[space]';
510 NEXT AL
520 AD=FL:IF AD<FI+1 THEN 455
530 GOTO 40
    ** ';' COMMAND **
560 A$=MID$(IN$,4,4)
570 HX$=A$:GOSUB 2000:IF ER THEN 300
575 AD=DC
580 FOR AL=1 TO 5
590 HX$=MID$(IN$,5+3*AL,2):GOSUB 2000
600 IF ER THEN 300
610 POKE AD+AL-1,DC
620 NEXT AL
630 GOTO 40
    ** 'B' COMMAND **
660 HX$=MID$(IN$,4,4)
665 GOSUB 2000:IF ER THEN 300
670 GOSUB 2000:IF ER THEN 300
680 SYS(DC)
690 GOTO 40
    ** 'L' COMMAND **
710 NM$="":PT=5
720 IF MID$(IN$,PT,1)<>CHR$(34) THEN NM$=MID$(IN$,5,PT-4):PT=PT+1:GOTO 720
740 OPEN 2,1,0,NM$
745 PRINT'FOUND';NM$:CHR$(13)'LOADING'
750 INPUT#2,AD,FI
760 FOR CA=AD TO FI
770 INPUT#2,BT
780 POKE CA,BT
790 NEXT CA
800 CLOSE 2
810 GOTO 40
    ** 'S' COMMAND **
1010 NM$="":PT=5
1020 IF MID$(IN$,PT,1)<>CHR$(34) THEN NM$=MID$(IN$,5,PT-4):PT=PT+1:GOTO 1020
1030 PRINT CHR$(13)'START >':GOSUB 5010
1040 HX$=MID$(IN$,2):GOSUB 2000:IF ER THEN 300
1050 S1=DC
1060 PRINT CHR$(13)'END >':GOSUB 5010
1070 HX$=MID$(IN$,2):GOSUB 2000:IF ER THEN 300
1080 FI=DC
1090 PRINT CHR$(13):OPEN 2,1,1,NM$:PRINT'WRITING';NM$
1100 PRINT#2,S1
1110 PRINT#2,FI
1120 FOR AD=S1 TO FI
1130 PRINT#2,PEEK(AD)
1140 NEXT AD
1150 CLOSE 2:GOTO 40
    ** 'D' COMMAND **
1210 HX$="":PT=4
1215 IN$=IN$+'[space]';
1220 IF MID$(IN$,PT,1)<>'[space]' THEN HX$=MID$(IN$,4,PT-3):PT=PT+1:GOTO 1220
1230 GOSUB 2000
1240 PRINT CHR$(13);DC
1250 GOTO 40
    ** 'H' COMMAND **
1410 DC$="":PT=4
1415 IN$=IN$+'[space]';
1420 IF MID$(IN$,PT,1)<>'[space]' THEN DC$=MID$(IN$,4,PT-3):PT=PT+1:GOTO 1420
1430 DC=VAL(DC$):GOSUB 2200
1440 PRINT CHR$(13);HX$
1450 GOTO 40
    ** HEX TO DEC **
2010 ER=0:DC=0:FOR I=0 TO LEN(HX$)-1
2020 D1=ASC(MID$(HX$,LEN(HX$)-I,1))-48
2030 IF D1>22 THEN ER=1:RETURN
2040 IF D1>9 THEN D1=D1-7
2050 DC=DC+D1*16+I:NEXT I
2060 RETURN
    ** DEC TO HEX (2) **
2110 HX$="":FOR I=1 TO 2
2120 Q=INT(DC/16):R=DC-16*Q+48
    
```

ZX Spectrum

HEX AUTOLOADER
 - Input Z80 machine code
 - Load to any address
 - Full use of labels
 - Run and break at any point with register display, continue
 - Cassette and manual only £4.00 from S. Turner, 85 Chelmer Rd, Witham, Essex.

ZX 81 16K LOWER CASE TOO, ON ZX PRINTER



Easy to use m/c program. Use in any BASIC program. Quality cassette and instructions. Send £8 - by VISA, cheque or Norwegian Giro Account 2040566.

KENT MICRO BUSINESS
 Boks 53, Nordstrandhøgda, Oslo 11 NORWAY

PROGRAMS

```

2130 IF R>57 THEN R=R+7
2140 HX£=CHR£(R)+HX£:DC=Q:NEXT
2150 RETURN

** DEC TO HEX (4) **
2210 HX£=""FOR I=1 TO 4
2220 Q=INT(DC/16):R=DC-16*Q+48
2230 IF R>57 THEN R=R+7
2240 HX£=CHR£(R)+HX£:DC=Q:NEXT
2250 RETURN

** INPUT FROM KEYBD. **
5005 PRINT CHR£(13)">";
5010 OPEN 1,0
5020 INPUT#1,IN£
5030 CLOSE 1
5040 IF LEFT£(IN£,1)<>">" THEN IN£="">IN£
5050 RETURN
    
```

CONVENTIONS USED IN THE LISTING

[cls]=clearscreen: [rvs] & [rvsoff]= reverse video on & off
[spc]=space : [green] etc. = colour controls

Program
of the Month

Atari Character Set Mover

by A Ferguson

Here's an ingenious little routine for the Atari 400/800. As far as I'm aware nothing like it has been published before for this machine — certainly not in the popular micro press, anyway, but I'd stand corrected if this were not so. The whole program serves to demonstrate the Atari's internal register graphics modes which are not documented in the user manuals. In fact, most Atari owners are blissfully unaware of their existence and they cannot be accessed through the normal Basic GRAPHICS statement. If you're an expert you should be able to build on this program and make fuller use of your Atari's hidden potential, and if you're a beginner then looking hard at this program should teach you quite a bit about your micro's internal workings.

Basically, these internal modes centre around the Atari's 'Antic' LSI chip and are numbered 3, 4, 5, 12 and 14. Internal modes 4 and 5, which are dealt with here, are character modes. To use these, the 'display list', a small machine code routine for the Antic processor, has to be altered, which is very slow from Basic. This program does the job much more quickly and efficiently.

The first part of the program loads a small machine code routine into RAM at 'page 6' (hex 600, decimal 1536), which is reserved space. This routine is accessed using the USR function and it loads a redefined character set as five bit-maps into a position just below mem-top. The , \$, %, & and ' keys are then found to be altered if you type them.

The second part of the program is a proper demonstration of operating system graphics modes 4 & 5. What actually happens is that the normal graphics square is changed so that you can only

work with a 4x8 pixel block. Using the diagram below, this is how the colour controls work: colour location 708 (line 370) controls the colour if B is shaded; colour location 709 (line 350) controls the colour if A is shaded; colour location 710 (line 360) controls the colour if A and B are shaded and colour location 712 (line 380) controls the background colour.

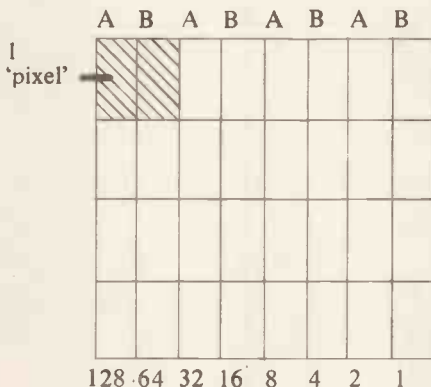


Fig 3 A representation of a character square and how it is changed by using the internal register graphics modes.

When you run the program, first type , \$, %, & and '. Then go into inverse video and type the % key again. An explanation of the alteration of the % key can be found by treating a row of pixels in the graphics square as a binary number, each shaded square being a 1. The %'s top row as it now appears in inverse video is 10101010 which, translated into decimal, is 170 (128+32+8+2). This comes from line 170 in which all the data items are 170.

INSURE YOUR COMPUTER

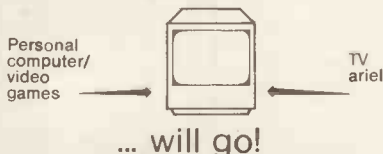
Impact damage, Fire & Theft Insurance for your Computer Equipment:

£1 to £1,500 cover £8.00 pa
£10 (excess)
£1,500 to £2,500..... £16.00 pa
£15 (excess)

Ask for details

KGJ Insurance Brokers
6 Hagley Road, Stourbridge,
West Midlands
DY8 1QG
Tel (03843) 5333/2545

2 into 1 ...



With this passive signal combiner. This simple unit plugs into the back of your TV, and provides 2 ariel sockets. All you have to do is to change channels from your TV. programme to your computer/video game.

SEND £5.50
(incl. p&p)

KNIGHTS MICROSYSTEMS
191 FRENCH STREET
LOWER SUNBURY
SUNBURY-ON-THAMES
MIDDLESEX

MICROMART

EPSON TYPE 3 PRINTERS

Save £60-£80 (+VAT) on your superb new Epson Type 3 printer.

Full range of interfaces, cables and sundries available.

For FREE BROCHURE and special DISCOUNT OFFER write, stating your computer, to:

Datatech Ltd (PCW)

3 BRAMHALL CLOSE, TIMPERLEY, ALTRINCHAM, CHESHIRE, WA15 7EB

GAMER

VIC	£129 plus VAT
DRAGON 32	£173 plus VAT
SHARP MZ80A	£433 plus VAT
ATARI 400 (16K)	£164 plus VAT
ATARI 800 (16K)	£390 plus VAT
EPSON HX20	£402 plus VAT
VIDEO GENIE (16K)	£299 plus VAT

Coming soon ORIC 1.

+ software, books, chess computers
+ Intellivision + Ace TV games
+ SF, Fantasy & Wargames

BRIGHTON 24, GLOUCESTER
TEL 0273 698424

IS YOUR FLOPPY DISK
A CLOSED BOOK?

FILEMASTER

HOLDS THE KEY TO
RELEASE YOUR DATA

If you need to transfer data between programs, create listing files from any disc file, create a command file, re-format a file, or indeed manipulate file data in any way, FILEMASTER can probably do it, for you automatically. A brand new product from Camel Micros price £11.90 inc. VAT & postage. We mean to provide the tools you need.

33a Commercial Road,
Weymouth, Dorset

MICROMART

MICROCOMPUTER INSURANCE

Comprehensive cover at a reasonable premium:-

- All Risks Cover (incl Transit) — up to £8,500 for £20
- Increased Cost of Working — to reinstate lost data
- Breakdown and Derangement md alternative to maintenance agreement

Write with details to:

Geoffrey Hoodless & Associates
Freepost (no stamp required)
Woking, Surrey GU21 3BR
Tel: Woking (04862) 61082
Answering service

BBC (32k) plus VIC20 (6.5K)

Guaranteed Programs

- 'INKOSI' — Adventure game. be an African King! £5.95
 - 'INVISIBLE MAN' — interactive, teaches coordinates, fun to play £5.95
 - 'METRICS' — five long programs on one cassette (length, mass, volume, etc) £9.95
 - 'ANGLES' — uses BBC graphics to demonstrate this important mathematical concept. Four programs for £6.95 on one tape.
 - 'SEQUENCES' — five demos on one tape (square numbers, Fibonacct, triangle numbers) £5.95
- for Home and School**

SAE for details and complete list
CHALKSOFT, Lowmoor Cottage,
Tonedale, Wellington, Somerset,
TA21 0AL.

USED SUPERBRAINS

Bought and Sold
 Also part exchanged against
 most new 16 bit micros

INTERLEX LTD
01-943 0968
 Imperial House
 Lower Teddington Road
 Kingston
 KT1 4EP

CHECK OUR PRICES

- IBM PERSONAL •
- TANDOM FLOPPY DRIVES •
- WINCHESTER DRIVES
- SUITABLE FOR APPLE
- AND IBM PERSONAL

CALL ALASTAIR DODS
01-467 1985
01-467 8489
THOMAS BUSINESS
SYSTEMS LTD

PROGRAMS

As all the squares which would be marked 'A' if the % character square were labelled as in the program are shaded the colour is controlled by location 709 — green.

To try out operating system mode 5 change the following lines:
 310 POKE DL+3,69
 320 FOR A= 0 TO 12
 330 POKE DL+6+A,5

```

1 REM MACHINE CODE CHARACTER SET MOVER
2 REM A FERGUSON,NEWTON AYCLIFFE
3 REM CO.DURHAM
4 REM
10 TOP=PEEK(106)-5
20 POKE 106,TOP:GRAPHICS 0
30 TOP=TOP+1
40 Z=TOP*256:REM PAGES INTO BYTES
50 FOR A=0 TO 81:READ LOAD:POKE 1536+A,L
   OAD:NEXT A
60 DATA 104,104,133,205,104,133,204,160,
   0,185
70 DATA 0,224,145,204,200,192,255,208,24
   6,160,0,230
80 DATA 205,185,0,225,145,204,200,192,25
   5,208,246
90 DATA 160,0,230,205,185,0,226,145,204,
   200,192,255,208,246
100 DATA 160,0,230,205,185,0,227,145,204
   ,200,192,255,208,246,96
110 X=USR(1536,Z)
120 REM THIS SECTION ABOVE WILL LOAD YO
   UR NEW CHARACTER SET IN USING
   MACHINE LANGUAGE
130 REM START LOADING CUSTOM SET INTO
   R.A.M SET THAT WE HAVE JUST CREATED
140 FOR LOOP=0 TO 39:READ NSET:POKE TOP*
   256+(LOOP+24),NSET:NEXT LOOP
150 REM TO ALTER YOUR CHARACTERS
   CHANGE THE DATA NUMBERS BELOW
155 REM EACH CHARACTER IS FORMED FROM
156 REM AN 8X8 GRID. THE DECIMAL
157 REM VALUE OF EACH 8 BIT ROW IS
158 REM LISTED IN A DATA STATEMENT.
160 DATA 85,85,85,85,85,85,85,85
170 DATA 170,170,170,170,170,170,170,170
180 DATA 255,255,255,255,255,255,255,255
190 DATA 250,186,190,255,190,186,250,0
200 DATA 170,170,170,255,255,170,170,170
205 REM AFTER EVERY GRAPHICS STATEMENT
   LOCATION 756 MUST BE POKED TO TOP OR TOP
   +2 (lower case)
206 REM OK AFTER YOU TYPE RUN TRY
   TYPING IN '# % & '
300 DL=PEEK(560)+256*PEEK(561):GRAPHICS
   0
310 POKE DL+3,68
320 FOR A=0 TO 18:REM CHANGE 18 TO 22 FO
   R FULL SCREEN MODE 4
325 REM NOTE THAT INTERNAL REGISTER
   MODE 4 IS NOT THE SAME AS
   BASIC GRAPHICS 4.
330 POKE DL+8+A,4
340 NEXT A
350 POKE 709,187:REM GREENY
360 POKE 710,54:REM RED
370 POKE 708,117:REM BLUE
380 POKE 712,11:REM BACKGROUND COLOUR
   REGISTER
    
```

SPECTRUM SOFTWARE

- FIGARO II powerful numeric database gives you seasonal forecasting, statistics, 6 graph options, data files, full manual & much more. Very friendly, no statistics knowledge needed. (48k only) 14.95
- PHANTASMAGRAPHS 2D & 3D plotting under your control. (16 or 48k) 6.95

ZX81 SOFTWARE

- SZX-TSA forecasting, graphs 6.95
- SZX-DBMS database system 4.95
- SORCERY medieval adventure 3.95

Saxon Computing



3, St. Catherine's Drive,
 Leconfield, Beverley,
 Humberside.
 phone. 0401-50697



BBC

INVADERS £5.00

A FAST MACHINE CODE
 GAME USING HI-RES
 COLOUR GRAPHICS
 FOR MODELS A & B



Features include 1 or 2 player games, name registration on high score, four sheet layouts, aimed bombs, splitting invaders, fountains, invaders dropped from UFOs and amazing sound effects.

DAVID MCKERAN
 23 WARWICK DRIVE, EAST HERRINGTON
 SUNDERLAND, TYNE & WEAR, SR3 3PU

PROGRAMS

- 1000 POKE 756, TOP: REM POKE 756 WITH TOP AFTER EVERY GRAPHICS COMMAND
- 2000 REM *****
- 2001 REM MEANING OF MEMORY LOCATIONS
- 2002 REM *****
- 2003 REM
- 2004 REM 106= ACTUAL TOP OF RAM MEMORY IN PAGES (MULTIPLES OF 256 BYTES).
- 2005 REM 560,561= LO BYTE & HI BYTE VALUE WHICH POINTS TO THE ADDRESS OF DISPLAY LIST.
- 2006 REM 756= CHARACTER BASE REGISTER
- 2007 REM 708-712= COLOR SHADOW REGISTERS

VIC UFO

by David Taylor

Unfortunately there are no instructions contained within this program as the VIC-20 doesn't have enough memory to incorporate them alongside the game. Readers with expanded VICs should have no trouble in coding these if they want to.


Custom-made graphics characters and effects are used to give some really interesting effects at the beginning. The object is to shoot down a squadron of UFOs and then to land safely. Keys S, F, E and C are used to line up your sights (left, right, up and down respectively) and function 5 controls your gun.

What actually happens when you 'line up your sights' is that the UFO moves in relation to them — although the end result is exactly the same. As the UFOs move randomly it's no easy job to get them lined up long enough to be shot, and the more you destroy the more unreliable your gun becomes although your chances of landing safely increase.

When you're ready to land you have to 'drop down' using the sights until your instruments pick up the ground, which is indicated by a flashing green 'land' in the top left hand corner of the screen. The frequency with which it flashes indicates how near you are to the ground. When you are directly above a dot between two men, you hand control over to the automatic pilot by pressing 'return' until your amount of fuel is printed on the screen in red. If there are still UFOs on the screen you shouldn't land as you can't shoot them once the automatic pilot has taken over and they will bomb your ship. If you crash when landing you lose 5 points. A landing cannot be aborted once it has begun.

Finally, 3.5k VIC owners should avoid using too many spaces as this will cause 'out of memory' errors. If David Taylor is reading this, could he please contact me as I have mislaid his address.

- 1 PRINT"(CLS)":POKE36869,255:POKE36879,140
- 2 FORI=7168TO7679:POKEI,255:NEXT
- 3 FORI=1TO16:PRINTTAB(I)"U.F.O.":POKE646,I:NEXT
- 4 POKE52,28:POKE56,28:POKE657,128
- 5 FORI=7679TO7169STEP-1:POKEI,PEBK(I+25600)
- 6 FORL=1TO50:NEXT:NEXT:CLR
- 7 PORP=0TO63:READJ
- 8 POKE7344+F,J:NEXT
- 9 M(1)=-1:M(2)=1:M(3)=22:M(4)=-22:M(5)=-23
- 10 M(6)=23:M(7)=-21:M(8)=21
- 11 S(1)=-1:S(2)=1:S(3)=-1:S(4)=1:S(5)=1:S(6)=-1:S(7)=1:S(8)=-1
- 12 PU=0000:AM=15:SO=205:SP=129:RA=66
- 13 SD=8:F=7954:F1=38674:Q=INT(RND(1)*22)+F:C=9220+Q:PRINT"(CLS)"
- 14 MH=INT(RND(1)*22)+1:A=7943+MH
- 15 POKE36879,8:GOTO24
- 16 IPC=8186ANDQ<>1ANDQ<3THENPOKEC,32:POKEC-1,32:POKEC+1,32
- 17 RETURN
- 18 IPC=8186ANDQ<>0ANDQ<21THENPOKEC,46:POKEC+F,28:POKEC-1,28
- 19 RETURN
- 20 POKEA-M(D),32:POKEA-M(D)+1,32:POKEA-M(D)-1,32
- 21 POKEA-H(D)-22,32:RETURN
- 22 A1=A+30720:POKEA1-22,5:POKEA1,5:POKEA1-1,5:POKEA1+1,5
- 23 POKEA,23:POKEA-1,22:POKEA+1,24:POKEA-22,25:RETURN
- 24 D=INT(RND(1)*8)+1:H=INT(RND(1)*3)+3
- 25 FORB=1TOE
- 26 POKE36875,80:POKE36877,SP:POKE36878,3
- 27 X=INT(RND(1)*30)+1:PRINT"(CURSOR HOME,CURSOR DOWN)"
- 28 IF(C-F)/22<XTHENPRINT"(CURSOR HOME,CURSOR DOWN,CTRL6)LAND"
- 29 IPR=1ANDA<7680THEN75
- 30 IFA=F-1ORA=F+1ORA=F-22ORA=F+22THEND=INT(RND(1)*8)+1



JBS PRESENTS
HAWKS

An exciting game available exclusively from J. B. Software

Just when you think the Earth has been saved, the BEEBONIANS have invaded our solar system. Their objective - to destroy the planet and all its inhabitants.

You are the Earth's last chance. Armed only with a laser cannon, you have to destroy hordes of invading Beebonians in their Hawk fighters, each wave attacking with increasing ferocity and cunning. Even when you score a hit you are still not safe as they will attempt to ram your defences in their escape pods, kidnap you and drop you to your death from a great height. When cornered you do have an ace up your sleeve: A super ZAPPER, which destroys their entire fleet and restores your shelters but watch out - you only have a limited arsenal of Zappers and each one invokes a penalty.

HAWKS - a fast and furious action game in glorious colour with bonuses awarded for your daring skill and fast reflexes.

It's a simple but infuriatingly frustrating game pushing your arcade skills (and your patience) to the limit - and beyond.

Requires a 48K Apple and disc drive.

RETAIL PRICE

£12.50

Price exclusive of VAT
Prices are correct at time of going to print and are according to our Standard Terms and Conditions E and O E

Please send Cash/Cheque/POs with order to:
J. B. Software, 15 Shootersway Park,
Berkhamsted, Herts HP4 3NX.

MICROMART

INTRODUCING DATACLONE

The Specialists in Software Duplication

PROGRAMMERS URGENTLY REQUIRED — ANY AGE! by software publishing company. Both the production of original material and inter-micro translation work required.

UP TO 30% ROYALTIES ON ORIGINAL MATERIAL!

Excellent hourly rate of pay for translating programs. Must be fluent in at least one dialect of Basic — plus a knowledge of 6502, 6809 and Z80 assembly code an advantage. Please write to Box No. 300, 3rd Floor, 62 Oxford Street, London W1.



DATACLONE

1-7 I Warewood Avenue,
London NW1 6LE
Tel 01-724 3768 Telex 21879

UK 101 SOFTWARE ON TAPE

from the guy who wrote "Le Passe Temps"

- **GALACTIC HITCHHIKER (8K).** An adventure, all in machine code. A beauty! (£7.00)
 - **SUPERTREK (8K).** Sail boldly through the universe, zapping moving Klingons in real time Superb graphics. (£7.00)
 - **STARTREK (8K).** The old favourite, beautifully presented (£8.00)
 - **LUNAR LANDER.** A real challenge. You won't get down in less than 3 hours. (£3.00)
 - **HANGMAN.** Excellent graphics, P.E. said so! (£3.00)
 - **BASIC TUTOR (8 & 4K).** The only way to learn at the keyboard. (£12.00)
 - **LE PASSE-TEMPS.** You NEED this, if you haven't already got it. (£3.00)
 - **MAD MONK (8K).** It's ready at last! A machine code adventure with some truly remarkable graphics. This programme is in a class by itself (£9.50)
- These ORIGINAL PROGRAMS are compatible all 2K Monitors and are available for 16 & 48 and 32 & 48 displays (including enhanced Superboards)

HARDWARE

These kits are complete in every way. Full socketed high quality PCB, all components, switches etc. plus performed cable assembly for easy interconnection to J1, or our MOTHERBOARD SYSTEM. Now you can add on all those extras easily. Provides eight, yes EIGHT, fully buffered J1 type sockets. (£19.50)

- **8K STATIC RAM BOARD (£9.50)**
- **HISPEED CASSETTE INTERFACE.** At last, a system that works. COMPLETELY RELIABLE 4000 baud 18000 with reasonable cassette plus software for named file handling. A delight to use. (£19.50). For software in EPROM, add £8.00
- **VIDEO ENHANCEMENT.** Switch selectable 16 & 48 or 32 & 48 displays without touching your computer. (£19.50)
- **Monitor EPROMS** reblown to suit for just £2.50
- **8K EPROM BOARD (£19.50).** A 2K Extended Monitor is available in EPROM for £12.00 plus, coming soon, TOOLKIT in EPROM and BASIC V.
- **MONITOR BOARD.** Plug into Monitor socket to provide switch selection of up to 4 EPROMS. (£9.50)

AVAILABLE SHORTLY: EPROM Programmer, PIA/Sound Board Analogue Board and something rather nice on the graphics side.

All Inclusive:
Please add 15% V.A.T

Write or phone for further details
MERLIN (MICRO SYSTEMS) LTD.
93 High St., Eton, Cevaland Tel. (0642) 454883.

PROGRAMS

```

190 S$="
200 DE=10:C=D*2+1:P$=" " : P$=P$+S$+S$+P$
210 PRINT "J":GOSUB1070
220 GOSUB1610
230 SC$=P$+"SO COMPIL IT":SU$=P$+"STACK UNDERFLOW ERROR"
240 GOSUB1210:W$=LEFT$(W$,7)
250 IFMTHEN320:** COMPIL
260 GOSUB1380:REM SEARCH DICT
270 IFNTHENPC=P(N):PRINTP$"SO EXECUTE IT":GOSUB1040:GOTO520
280 PRINTP$"IS "W$" A NUMBER?":GOSUB1040:N=VAL(W$)
290 IFN<0ORW$="0"THENPRINTP$"YES IT IS":GOSUB1040
300 IFNORW$="0"THENPRINTP$"SO PUSH IT":GOSUB1040:GOSUB1450:GOTO240
310 PRINTP$W$ " IS UNDEFINED":I$="":NL=0:GOTO240
320 GOSUB1380
330 IFN=12ANDNL=0THENPRINTP$"I OUTSIDE LOOP ERROR":M=0:I$="":GOTO240
340 IFND0RND(N)>0THENPRINTSC$:GOSUB1040:GOTO400:** SPECIAL WORDS
350 IFN>0THENPRINTSC$:GOSUB1040:C(C)=P(N):C=C+1:GOTO240
360 PRINTP$"IS "W$" A NUMBER?":GOSUB1040:N=VAL(W$)
370 IFN<0ORW$="0"THENPRINTP$"YES IT IS":GOSUB1040:PRINTSC$:GOSUB1040
380 IFN<0ORW$="0"THENPC=C+.5:C(C+1)=N:C=C+2:GOTO240
390 PRINTP$W$ " IS UNDEFINED":M=0:I$="":NL=0:GOTO240
400 ON(N)GOTO410,420,440,470,480,510
410 PRINTP$IL$"IN COMPIL MODE":M=0:I$="":NL=0:GOTO240
420 IFNLTHENPRINTP$"MISSING 'LOOP'":I$="":NL=0:M=0:GOTO240
430 D=D+1:M=0:C(C)=0:C=C+1:N=D:GOSUB1630:GOTO240
440 D$=CHR$(34):GOSUB1210:D$=" "
450 C(C)=15:C(C+1)=LEN(W$):FORL=1TOLEN(W$):C(C+1)+L=ASC(MID$(W$,L,1))
460 NEXTL:C=C+L+1:GOTO240
470 C(C)=19:PC=C:GOSUB1520:C=C+1:NL=NL+1:GOTO240
480 IFNL=0THENPRINTP$"LOOP' WITHOUT 'DO' ERROR":I$="":NL=0:M=0:GOTO240
490 GOSUB1540:AD=PC:NL=NL-1
500 C(C)=21:C(C+1)=AD:C=C+2:GOTO240
510 PRINTP$IL$"IN COMPIL MODE":M=0:I$="":NL=0:GOTO240
520 IFCL(1)*256+CL(0)+CL(2)*32767+6*40THENGOSUB1560
530 IFPEEK(158)>0THENIFPEEK(PEEK(158)+622)=18THENPOKE158,0:GOTO240
540 IFC(PC)GOTHE590:** SYSTEM WORDS
550 IFC(PC)=0ANDRP=0THEN240
560 IFC(PC)=0THENGOSUB1540:GOTO610
570 IFC(PC)=.5THEN740
580 GOSUB1520:PC=C(PC):GOTO520
590 ONABS(C(PC))GOTO620,640,650,660,670,700,730,750,780,790
600 ONABS(C(PC))-1GOTO830,870,900,920,940,970,980,1020
610 PC=PC+1:GOTO520
620 GOSUB1490:IFERTHENI$="":NL=0:GOTO240
630 GOSUB1060:PRINTN:GOSUB1050:GOTO610
640 GOSUB1490:N1=N:GOSUB1490:N=N+N1:GOSUB1450:GOTO610
650 GOSUB1490:N1=N:GOSUB1490:N=N+N1:GOSUB1450:GOTO610
660 GOSUB1490:N1=N:GOSUB1490:N=N+N1:GOSUB1450:GOTO610
670 GOSUB1490:N1=N:GOSUB1490
680 IFN1<0THENN=N/NI:GOSUB1450:GOTO610
690 PRINTP$"DIVISION BY ZERO":I$="":GOTO240
700 IFD=21THENPRINTP$"DICTIONARY OVERFLOW":I$="":GOTO240
710 GOSUB1210:D$(D+1)=LEFT$(W$,7):P(D+1)=C:M=1:PRINTP$"COMPILING "W$
720 GOSUB1040:GOTO610
730 PRINTP$IL$"IN IMMEDIATE MODE":I$="":GOTO240
740 N=C(PC+1):GOSUB1450:PC=PC+1:GOTO610
750 GOSUB1060:IFRPTHENR(RP-1)+2:N1=C(N-1)+N:R(RP-1)=N1-1:GOTO770
760 D$=CHR$(34):GOSUB1210:D$=" ":PRINTW$:GOSUB1050:GOTO610
770 FORL=NTON1:PRINTCHR$(C(L)):NEXT:GOSUB1050:GOTO610
780 GOSUB1060:PRINT:GOSUB1050:GOTO610
790 IFRP=0THENPRINTP$"SORRY NO LOOPS IN IMMEDIATE MODE":I$="":GOTO240
800 SC=PC:GOSUB1540:S2=PC:GOSUB1490:N1=N:GOSUB1490
810 IFERTHENPRINTP$"NOT ENOUGH PARAMETERS FOR A LOOP":I$="":GOTO240
820 PC=N:GOSUB1520:PC=N1:GOSUB1520:PC=S2:GOSUB1520:NL=NL+1:PC=SC:GOTO610
830 IFRP=0THENPRINTP$"SORRY NO LOOPS IN IMMEDIATE MODE":I$="":GOTO240
840 SC=PC:GOSUB1540:S2=PC+1:AD=C(S2):GOSUB1540:LO=PC:GOSUB1540:UP=PC
850 LO=LO+1:IFLO=UPTHENPC=S2:GOSUB1520:NL=NL-1:PC=SC:GOTO610
860 PC=UP:GOSUB1520:PC=LO:GOSUB1520:PC=AD:GOTO610
870 IFRP=0THENPRINTP$"I' NOT ALLOWED IN IMMEDIATE MODE":I$="":GOTO240
880 IFNL=0THENPRINTP$"NO LOOP FOR 'I' TO BE IN":M=0:I$="":GOTO240
890 N=R(RP-2):GOSUB1450:GOTO610
900 IFSP=0THENPRINTP$SU$:I$="":NL=0:GOTO240
910 N=S$(SP-1):GOSUB1450:GOTO610
920 IFSP<2THENPRINTP$SU$:I$="":NL=0:GOTO240
930 N=S$(SP-1):S$(SP-1)=S$(SP-2):S$(SP-2)=N:GOSUB1640:GOTO610
940 IFSP<3THENPRINTP$SU$:I$="":NL=0:GOTO240
950 N=S$(SP-3):S$(SP-3)=S$(SP-2):S$(SP-2)=S$(SP-1):S$(SP-1)=N
960 GOSUB1640:GOTO610
970 GOSUB1490:GOTO610
980 GOSUB1210:GOSUB1380
990 IFN>17THENI=N-1:GOTO210
1000 IFN=0THENPRINTP$W$ " IS NOT IN THE DICTIONARY":M=0:I$="":GOTO240
1010 PRINTP$"PLEASE DO NOT FORGET THAT":GOTO240
1020 GOSUB1490:IFERTHENDE=10:GOTO610
1030 DE=N:GOTO610
1040 FORL=1TO100*DE:NEXT:RETURN
1050 FORL=196TO198:CL(L-196)=PEEK(L):NEXT:CL(3)=PEEK(216):RETURN
1060 GOSUB1570:FORL=196TO198:POKEL,CL(L-196):NEXT:POKE216,CL(3):RETURN
1070 M1$=" "
1080 M2$=" "
1090 B$=" "
1100 T$=" "
    
```

MICROMART

software for SHARP MZ-80A and MZ-80K

DUSTCOVERS — £5.95. For the MZ-80K or MZ-80A computers and the P3 and P5 printers. Black, waterproof, tailored. A must for every Sharp owner.

CONTRACT BRIDGE — £12.95. Complete 4-handed contract bridge — you against the computer. Full bidding, superb play, this is absolutely outstanding! Ingt Ruffs, slams finesse, Blackwood — they're all there. You can even bid or play a hand again, or even define your own hands! Unbeatable value — you'll play this time and time again. Order now, you won't find this program anywhere else.

FOOTBALL MANAGER — £6.95. Brilliant simulation of this, the most hazardous profession of all. Trade players, play matches, decide tactics. Build a team of world repute. But beware — we don't make it easy! You'll have to cope with injuries, the bank manager and, not least, irate Directors. Can you stand the pressure? Or will you fall, like so many before?

COSMIAD — £6.95. First Space Invaders, now Cosmiad! Watch out for the aliens peeling off to attack! Excellent.

AIRPORT '83 — £5.50. Full and exacting aircraft simulator. Pilot your plane to a safe landing.

COMPUTER ASSISTED LEARNING. Whole range of superb, meticulously assembled programs. Send for full details.

MZ-80K only — MOONLANDER £5.50, BIORHYTHM £4.95, BANK ACCOUNT £5.50, BACKGAMMON £5.50. Many more.

PRICES FULLY INCLUSIVE



Write or phone for full catalogue. Cash with order or ACCESS. Orders despatched by return.

HIGHLIGHT SOFTWARE

3 Nether Court, Halstead, Essex CO9 2HE
Telephone (0787) 475714

RGB COLOUR MONITOR only £99.95 (carr & vat)

We have on offer a limited quantity of 22" Colour Monitors with free Isolating Transformers. The VMC22 Colour Monitor Features a 22" Mul-ti-lard 110 degrees c. CRT and is designed to meet the high reliability and performance standards associated with the Games and Colour Graphics industries.

For shipping purposes the CRT plus Scancoil assembly are separate from the chassis. The lugs of the CRT allow it to be mounted in a standard 22" Colour TV Cabinet or a unit of your own design. The unit is assembled by plugging the wires from the chassis to the tube, and soldering the input connector, power connector and isolating transformers.

A comprehensive instruction sheet, and manual with circuit board diagrams will be supplied with each unit.

RAM BARGAINS

	1 OFF	25.99	100
4116.20ns	.80	.75	.68
4116.250ns	.75	.70	.55
2114.300ns	.85	.80	.75
2114.L200ns	.95	.87	.83
4516.100us.BBC Ram	3.10	2.95	2.80
4164.200us	4.80	4.60	4.20
2716.150us.C. Mos	4.20	3.95	3.50
6116.5v.450ns/	2.40	2.15	2.00
2716.Triplerall	6.00		
2732-450us	3.95	3.75	3.25
2532-450us	3.95	3.75	3.25

Other IC's available. Add 50p p&p + VAT @ 15%.

ATHANA FLOPPIES

Minis with free plastic library case + hob rings.

S/S S/D	£17.95 for 10	8" DISCS	
S/S D/D	£19.95 for 10	S/S S/D	£15.50 for 10
D/S D/D	£23.50 for 10	S/S D/D	£24.50 for 10
S/S T/Track	£26.50 for 10	D/S D/D	£25.50 for 10
S/S 96 Track	£28.50 for 10		

All other discs available. Add 05p P&P + VAT @ 15%.

OPUS SUPPLIES

10 BECKENHAM GROVE
SHORTLANDS,
KENT



01-464 5040 01-464 1598

ATARI 400/800 GAMES AND PROGRAMS

Cassette 1: GALAXY TREK
Cassette 2: HEXAPAWN, NOUGHTS AND CROSSES, TOWER OF BRAHMA
Cassette 3: KING, MAGICIANS CAVES
Cassette 4: MAZE, ROBOT CHASE, MUGWUMP
Cassette 5: NUMERICAL INTEGRATION, SOLVING SIMULTANEOUS EQUATIONS, BEST FIT POLYNOMIAL
All cassettes are £4.95 each.
Special offers:
3 cassettes for £12.95
5 cassettes for £19.95
Mr M Ward, 9 St Andrews Ave
Crewe, Cheshire, CW2 6JJ

pet/vic printer.

For £79.90 (inc. VAT)

Put a ZX Printer (£59.95 from Sinclair) on your PET/VIC using the SOFTEX PRINTERFACE — costing only £19.95 plus £1 p&p.

- * Very high-resolution graphics
- * Full VIC/PET characters
- * 42 column printer with superb formatting facilities
- * Use as normal PRINT/LIST syntax

Send orders/enquiries to
SOFTEX COMPUTERS,
37 Wheaton Road, Bournemouth BH7 6LH
Telephone 0202 422028
Please state exact computer model.

PROGRAMS

press 'C' you are told how much longer the voyage has to run.

As the voyage draws on, three effects can be seen. The first, stellar aberration, makes the stars seem to draw together around the destination star, so that even the sun (which is actually behind you) becomes visible ahead. Doppler shift is best known within the confines of earth for the fall in pitch of the sound made by a speeding object as it passes you (listen to police sirens and car horns), but astronomers know that Doppler shift can be seen in the spectra of stars either when they are travelling fast or, as in this case, when you are travelling fast past them.

It manifests itself as a 'colour shift' in the spectrum in which one end of the spectrum is effectively lost to the eye and the red end (if something is moving towards you) or the blue end (if something is moving away) increase in prom-

inence and size. Here, stars red-shift or blue-shift into invisibility. The colours used here are representative and in reality they depend on the colour of the star. Bear in mind that Doppler shift can only be seen on the spectrum of a star which is moving very fast — close to the speed of light, in fact, which gives an idea of how fast you are meant to be travelling in this simulation. The last effect that can be seen is that of Parallax, in which close objects move past faster than those further away.

When the voyage is over you are put back to the beginning, except that you are in a new location. Before loading or keying in the program, it is necessary to type in the following two direct commands to allow for the graphics: POKE 32*256,0 and then POKE 44,32 then NEW. The program runs on a VIC with either an 8k or a 16k memory expansion.

```

1 REM***INITIALISATION***
2 W=104:NS=94:PI=.245982:DIR(101),PH(101),TH(101)
3 FORI=1TONS:READR(I),TH,PH,:TH(I)=TH*/180:PH(I)=PH*/180:NEXT
4 GS=256*18:TA=3.7
5 POKE51,180:POKE55,180:POKE52,63:POKE56,63
6 FORI=0TO72:READA:POKE16308+I,A:NEXT
10 POKE36879,15:POKE36864,18:POKE36865,26:POKE36866,17:POKE36867,27:POKE36878,6*16
20 SYS16331:SYS16308:SYS16370
30 POKE36869,204
90 REM***INITIAL PLOT***
100 TH=0:GOSUB1100:I=0
102 REM***HIGHLIGHT STARS***
110 I=I+1:GOSUB2140:CL=255-CL:IFABS(PX)<W*ANDABS(PY)<W*THENGOSUB1000
120 GETA:IFA<>"A":ANDA<>"F":THEN120
125 IFA="F":THEN136
130 CL=255-CL:IFABS(PX)<W*ANDABS(PY)<W*THENGOSUB1000
132 GOTO110
136 POKE36869,192:POKE36867,52:PRINT"  DISTANCE":PRINT"#####R(I)"LTYSR"
137 DI=R(I):NM=23.28*LOG(.515*DI+1+SQR(.515*DI*(.515*DI+2)))
138 PRINT"#####JOURNEY TIME":PRINT"INT(NM)*MONTHS"
139 REM***LINE UP WITH DESTINATION***
140 SI=SIN(TH(I)):CS=COS(TH(I)):PG=PH(I):FORJ=1TONS
150 S1=SIN(TH(J)):C1=COS(TH(J)):C2=COS(PH(J)-PG):S2=SIN(PH(J)-PG)
152 CC=C1*CS+S1*SI*2
160 TH=ATN(SQR(1/CC+2-1)):IFCC<0THENTH=-TH
170 X=S1*C2*CS-C1*S1*S2:Y=S1*S2:IFX<0THENTH=PI/2:GOTO180
175 PH=ATN(Y/X):IFX<0THENTH=PI+PH
180 TH(J)=TH:PH(J)=PH:NEXT
190 GOSUB800
200 GETA:IFA<>"C":THEN200
215 FORTT=0TOMM
216 POKE36869,192:POKE36867,52:PRINT"  MONTH":FORI=1TO600:NEXT
218 POKE36867,27:SYS16308:SYS16331:SYS16370:POKE36869,204
220 GOSUB1100
230 GETA:IFA<>"C":THEN230
240 NEXT
248 REM***AFTER VOYAGE:CALCULATE NEW RELATIVE STAR POSITIONS***
250 FORI=1TONS:XO=R(I)*COS(TH(I))-X:CO=1/SQR(1+(R(I)*SIN(TH(I))/XO+2)
260 IFX<0THENC0=-CO
270 R(I)=XO/CO:TH(I)=ATN(SQR(1/CO+2-1)):IFCO<0THENTH(I)=-TH(I)
280 NEXT:SYS16308:GOTO100
700 REM***PLOT DISTANCE AND VELOCITY GRAPHS***
902 FORI=0TO4STEP4
710 POKEGS+I,64:POKEGS+3328+I,2:NEXT
720 FORI=0TO3328STEP208
740 POKEGS+207+I,102
750 NEXT:RETURN
800 POKE36869,204:POKE36867,27:SYS16308:SYS16331:SYS16370
806 GOSUB700:TD=1.94*LOG(.515*DI+1+SQR(.515*DI*(.515*DI+2))):SG=1.03*TD/208:HG=201
8/DI
810 FORI=0TO104
820 EX=EXP(SG*I):MC=4.815
430 PX=I:PY=HG*(EX+1/EX)/2-1:CL=85:GOSUB1000
840 PX=207-PX:PY=207-PY:GOSUB1000
850 PX=I:PY=207-(EX-1/EX)/(EX+1/EX):CL=170:GOSUB1000
860 PX=207-PX:GOSUB1000
870 NEXT:RETURN
1000 REM***GENERAL PURPOSE PLOTTING ROUTINE***
1002 M=MC*INT(PX/12.2)*208-PY:MP=3*2*(INT((12.2-PX*12.2)*INT(PX/12.2)))+5*2)
1010 POKEM,(PEEK(M)AND(255-MP))OR(MPANDCL)
1020 RETURN
1100 REM***CALCULATE DISTANCE AND VELOCITY SO FAR***

```

DRAGON 32 SOFTWARE

FAMILY PROGRAMS: 8 full length original home, utility, education programs, including Battle, Maths, Tunes, Finance, Quiz, Sarah, Oddjob, Ringo.

FUN AND GAMES 10 exciting games for young and old. Ideal for Xmas Parties etc. Including Gold, Noughts, Snap, Anagrams, Dice, Artst, Donkey, Musical, Brain and Circles.

£5 for each cassette, £9 for the pair
Send Cheque/PO to
SHARDS SOFTWARE,
10 Park Vale Court,
Vine Way, Brentwood,
Essex CM14 4UR.

Got a
DRAGON 32 or
TANDY colour
computer?

Then you need your own
monthly magazine "RAINBOW" for
colour computer users. Send £1.50
and large s.a.e. for sample issue to
ELKAN ELECTRONICS (Dept. PCW),
FREEPOST, 28 Bury New Road,
Prestwich, Manchester M25 6LZ
Telephone 061-798-7613 (24-hour
service).

MICROMART

SOFTWARE HOUSES,
WHOLESALEERS, DEALERS

YES.
**WE MANUFACTURE
CASSETTES**

DUPLICATING - Need 50 - 50,000
Program Copies within 10 days?

Short-run In-cassette copying, high-speed volume
duplicating, with on-cassette body printing, labelling,
over-wrapping, blister-carding etc. And YES - we
verify our work - methodically.

BLANKS - Need any length blank
cassette for copying or re-sale?

We manufacture tapes in bulk, with or without boxes,
as well as our own fully-packaged standard length
products.

We use high quality batch certified HM-1260 tape, for
error-free copies.

Please ring or write to Nigel Boyle today for full details - all
enquiries and material treated in the strictest confidence.

Phone
01 223 5955

Write to
BIBI Magnetics pcw
Freeport
London SW11 2BR

BIBI Magnetics Limited,
101/105 Plough Road, London, SW11 2BJ

Microcomputers and software
for home and business.

JUNIPER COMPUTING

PRINTERS - LOW PRICES	
EPSON MX80T3	£368.00
MX80FT3	£385.00
MX100T3	£493.00
MICROLINE 82A	£401.00
83A	£573.00
84	£1090.00
SEIKOSHA GP100-A	£220.00
GP100-VC	£243.00
GP250-X	£264.00
TEC F10-40 P/R	£1310.00
F10-55 P/R	£1606.00
QUME 10/35	£1312.00
9/45	£1844.00
9/55	£1950.00

Also available
DRAGON 32 £192.50
SANYO SLIM 3 CASSETTE
RECORDER £21.50
All prices include VAT. Carriage £5.00
per item. Prices subject to availability
and change.

8 Pembroke Green, Lea, Malmesbury,
Wilts SW16 9PB
Tel 06662-2689

CASES

Hold foam insert easily out to suit
your micro

23 1/2"x15"x4 1/2" £36
30"x18"x6 1/2" £45

made from aluminium/ply
Post and package 10% VAT extra

Cowfold Cases
*Redlion Stables, Cowfold,
West Sussex. RH13 8BT*
Tel: Cowfold 760

OSBORNE 1

Telex Conversion Unit
now available

4B microcentres

North Bar, Banbury, Oxon. OX16 0TF Telephone (0295) 66555

MICROMART

ZX SPECTRUM HARDWARE 24 line programmable Input/ Output Port



This new port has been designed exclusively for the ZX Spectrum and utilises MOS technology to minimise bus loading.

ZX Spectrum PPI Port £16.50
ZX 2 Slot Motherboard £16.95
ZX Stackable Connector £5.50

ZX SPECTRUM JOYSTICK

This new product is available fully built and comes with its own purpose built interface which is neatly housed in a small plastic box finished in black. The joystick has an ultra-smooth action which allows fast arcade type games to be played on a Spectrum.

There are a total of eight directions possible and also a "FIRE" button. Price £18.50
incl. VAT. Postage £1.



The prices are inclusive of VAT but postage must be added at 70 pence for a single item (100 pence for 2 or more items).

KEMPSTON ELECTRONICS
180A BEDFORD ROAD,
KEMPSTON, BEDFORD

OSBORNE 1

Multiple TV Output
now available

4B microcentres

North Bar, Banbury, Oxon. OX16 0TF Telephone (0295) 66555



"EDDIE"

THE NEW POWERFUL MAINFRAME STYLE
PROGRAM TEXT EDITOR FOR THE SIRIUS 1.
THIS FRIENDLY EDITOR FEATURES FULL
SCREEN DISPLAY & ONE TOUCH EDIT KEYS.

FUNCTIONS: Change, Delete, File, Find, Input, Quit, Repeat lines, Repeat find, Scroll, Top, Bottom, Up, Down, Get file, etc. Plus full line control. Supplied on CP/M 86 diskette that can be copied for running under MS-DOS. Price inclusive of diskette, documentation and VAT £29.95.

Send cash with order or enquire for further details to JOHN BARRETT,
60 MILL LANE, DORRIDGE,
WEST MIDLANDS B93 8NW.
Tel 05645 78458.

HISOFT PASCAL 4 INCREDIBLE SPEED INCREDIBLE PRICE

Hisoft are pleased to announce their latest Pascal compiler, the fastest and most powerful so far, at an amazingly low price. Hisoft Pascal 4 is an almost complete implementation of the Pascal language as give in the Pascal User Manual and Report (Jensen/Wirth) including POINTERS, RECORDS and (for disk systems) FILES. All major Pascal statements and data structures are supported together with many useful additions such as PEEK, POOK, USER, ADDR (returns the memory address of a variable) and, for tape.

The compiler produces Z80 object code directly (ie, no P-codes) and hence the resultant code runs very quickly indeed. Hisoft Pascal 4 requires only a 32K system in which to run (with plenty of room to spare) and can be supplied on cassette tape or 5 1/4" or 8" diskette to run under CP/M. The cassette tape version comes with its own tokenising editor and in a form which is easily adaptable to any Z80 system.

Hisoft Pascal 4 is a powerful and high quality piece of software which can be used for serious program development — we offer it at such a low price because we believe that such software is normally overpriced and out of reach of the individual.

Prices:

Special offer for Spectrum users Hisoft PASCAL 4 on tape	£25
HISOFT PASCAL 4 disk version (Nascom, Superbrain RTML380Z etc)	£40
ZDEV (a Z80 development system for Gemini GB05 or GB09 disk systems)	£45
NASCOM (a 4k NASCOM monitor)	£25
BAS12K (a 12K BASIC Interpreter under NASCOM)	£20
NASGEN (a 3K Z80 assembler under NASCOM)	£15
NASMEM (a 2K Z80 disassembler under NASCOM)	£10

Please add 15% VAT.

Send for more details from:

HISOFT,
60 Hallam Moor, Liden, SWINDON, SN3 6LS
Tel: (0793) 26616 (24hr telephone).

PROGRAMS

- 1102 TM=TT:IFTM>NM/2THENTM=NM-TT
- 1110 EX=EXP(.0858*TM):SH=(EX-1/EX)/2:CH=(EX+1/EX)/2:TH=SH/CH
- 1120 X=.97*(CH-1):IFTT>NM/2THENX=DI-X
- 1130 FORI=1TONS:GOSUB2140
- 1132 IFABS(PX<WANDAABS(PT)<WTHENGOSUB1000
- 1140 NEXT:RETURN
- 2140 REM**CALCULATE PARALLAX,STELLAR ABERRATION AND DOPPLER EFFECT***
- 2141 XO=R(I)*COS(TH(I))-X
- 2142 CO=1/SQR(1+(R(I)*SIN(TH(I))/XO)^2):IFXO<0THENCO=-CO
- 2150 CD=(CO+TH)/(1+CO*TH):MU=6000*(CH-SH*CO)
- 2160 AG=ATN(SQR(1/CD^2-1))*208/PI:IFCD<0THENAG=208-AG
- 2170 PX=AG*COS(PH(I))+6:PY=AG*SIN(PH(I))
- 2180 CL=85:IFMU>650THENCL=170
- 2190 IFMU<500THENCL=255
- 2200 IFMU<400THENCL=255
- 2210 MC=6376:RETURN
- 2800 REM**STELLAR DATA***
- 3000 DATA 900,98.5,12.520,83,1.6,470,83.5,9
- 3010 DATA 1600,91.25,6.1600,92.5,4,2100,99.25
- 3020 DATA 3.6,1500,90,75,7.5
- 3030 DATA 68,34,250,107,27.5,285,210,40,243
- 3040 DATA 88,35,249,78,33.5,285,90,35.5,272.3
- 3050 DATA 680,1.5,45,105,15,228,75
- 3060 DATA 150,34,81.2,45,31.5,88.2,96,28.5,77
- 3070 DATA 43,30,69
- 3080 DATA 9,106,349.1,680,118.6,34.5,7,2100,116,343.5
- 3090 DATA 250,106,5,355,14,2700,119,339.8
- 3100 DATA 11,85,336.7,210,83,339.4
- 3110 DATA 35,62,334.1,45,37.5,337,105,73,351.3
- 3120 DATA 160,67.5,355,1080,69.5,344
- 3130 DATA 570,40.5,30.9,105,48.5,43.8,1000,59
- 3140 DATA 31.9,680,50,31.9
- 3150 DATA 68,75,21.9,300,61.5,8.2,541,67,37.7
- 3170 DATA 36,70,236.25,103,62.5,229,32,71,242
- 3180 DATA 118,51,233.3
- 3190 DATA 220,100.5,249.2,32,91.5,259.7,90
- 3200 DATA 78.5,255
- 3210 DATA 21,151.5,60.8,31,167.4,183.8
- 3220 DATA 690,155.9,315,86,159.3,311.8,340,148.9,325.2,750,148.9,310.9,710,155.5,289.6
- 3230 DATA 340,156.5,303.3
- 3240 DATA 2400,130,329.5,105,114.1,328.8,140,127,340.9,124,140.4,349
- 3250 DATA 520,137,328.3,76,144.4,319.4,750,133.3,313.2,470,144.8,309.8,100,139.3,288.8
- 3260 DATA 4.3,150.4,231,490,150,240,55,126.2,239.1,160,138.5,250,2,570,143.3,245.6
- 3270 DATA 390,132.2,233,520,137.4,241.7,370,140.4,268.8,71,126.7,250.8
- 3280 DATA 84,81,298.5,190,70,296.3,43,74.5,278.5,82,69.5,287.5
- 3290 DATA 140,99,221,66,105.5,227.5
- 3300 DATA 16,81,152.5,340,79,153.9,90,77,163.9
- 3310 DATA 124,125,174.5,300,116,167,140,120,165,84,120,175.7,71,115,173.5
- 3320 DATA 124,120.5,179.1,250,111.1,163.4
- 3330 DATA 50,106.7,123.8
- 3340 DATA 780,80.5,124.3,210,62.5,104.1,109,95,103.2,570,75,86.9,360,60,112
- 3350 DATA .01,100,0
- 3800 REM**MACHINE CODE**
- 4000 DATA 169,18,133,1,169,0,133,0,168,145,0,200,208,251,230,1,166,1,224,32,208,243,96
- 4010 DATA 169,32,133,2,169,16,133,1,169,0,133,0,168,165,2,145,0,230,2,152,24,105,17,16
- 4020 DATA 201,221,208,241,160,0,230,0,165,0,201,17,208,231,96
- 4030 DATA 169,10,162,0,157,0,148,232,208,250,96

BBC Gomoku by Jeff Aughton

Although, in days of yore, PCW published a Gomoku game for PET, this program bears very little resemblance to it.

It runs on a BBC Model B in about 6k and includes instructions. It takes the computer a maximum of eight seconds to make its moves, which compares very favourably with some games of this type written in assembler. Certainly it's fast for a Basic program. Part of the reason for this speed is that the computer looks only one move ahead. In spite of this it plays a reasonable game and often makes seemingly peculiar

moves which turn out to be sensible on analysis. It makes a worthy opponent.

Draws are spotted immediately — ie, as soon as the computer knows neither player can win and not before. This is announced and the game can be finished without having to be played to an uninteresting end.

Should any reader require details of the author's algorithm — which can be applied to almost any two-player strategy game — they are welcome to get in touch with me (enclosing an SAE) and I will supply them with a flowchart.

- 10 REM GO-MOKU BY J. AUGHTON
- 20 MODE7
- 30 PROCInitial
- 40 REPEAT
- 50 MODE5:PROCgame
- 60 MODE7:PROCover
- 70 UNTIL Done
- 80 PRINT

ZX81 (16k) SPECTRUM (14k) STARTREK

Features an 8x8 Galaxy, Klingons and Starbases, short and long range scans, torpedoes and phasers, computer etc. PLUS normal or hyperdrive: choose your speed but watch the energy level. Galaxy Map: keep track of where you have been and whether there are any Starbases or Klingons there. Visual display of Enterprise's position and movement, and of the path of torpedoes. Messages from crew members. A user friendly long range scan. Five levels of play. And much more. Cassette with full instructions.

ZX81 £4.95
SPECTRUM £5.95 (Colour and sound too)

Gemini Software
36 Badminton Road
LEICESTER LE4 7RQ
Tel: 0533 64915

NEW FOR THE ZX81

Compose & play your own music — the easy way with the

Music Composer

* Full screen graphical display

* No special hardware required

* Full edit facility

Music composer supplied on cassette £5.95 (inc p&p)

SCREEN-SCENE

144 St Georges Rd, Cheltenham, Glos. Tel (0242) 28979.

PROGRAMS

```

90 END
100
110 DEF PROCinitial
120 PROCrules
130 READ W1%,W2%,W3%,W4%,W5%,W6%
140 DIM Table%(254,1,W%(252),Cell%(121))
150 PROCreadtable
160 VDU 23,224,16,56,124,124,124,124,56,16
170 B%=2:Att%=W1%
180 Mwin%=0:Ywin%=0:Draw%=0
190 PRINT " PLEASE PRESS THE SPACE BAR TO START"
200 REPEAT UNTIL GET$=" "
210 ENDPROC
220
230 DEFPROCreadtable
240 FOR I%=0 TO 254
250 ?(Table%+I%)=0:NEXT
260 Win%=1
270 FOR I%=1 TO 4
280 READ P1%,P2%,P3%,P4%,P5%
290 FOR J%=1 TO P2%
300 FOR K%=1 TO 7
310 X%=P1%
320 FOR L%=1 TO 5
330 Y%=Table%+21*X%-22
340 REPEAT Y%=Y%+1
350 UNTIL ?Y%=0
360 ?Y%=Win%
370 X%=X%+P3%
380 NEXT
390 P1%=P1%+P4%
400 Win%=Win%+1
410 NEXT
420 P1%=P1%+P5%
430 NEXT J%,I%
440 ENDPROC
450
460 DEF PROCgame
470 PROCstart
480 PROCboard
490 REPEAT
500 M%=1-M%
510 IF M% THEN PROCme ELSE PROCyou
520 IF N%>0 THEN PROCplay
530 UNTIL M%>1
540 PROCcomments
550 ENDPROC
560
570 DEF PROCstart
580 Win%=252:M3s=0:Y3s=0:Err%=0:First=1:Done=0
590 Lb%=34:Ub%=88
600 VDU 19,2,2,0,0,0
610 VDU 28,0,31,19,26
620 FOR I%=1 TO Win%
630 W%(I%)=0:NEXT
640 FOR I%=1 TO 121
650 Cell%(I%)=0:NEXT
660 ENDPROC
670
680 DEF PROCboard
690 GCOLOR,3:GCOLOR,130
700 COLOUR 0:COLOUR 131
710 CLG:CLS:VDU 5
720 FOR I%=192 TO 1072 STEP 80
730 MOVE I%,288:DRAW I%,992
740 NEXT
750 FOR I%=288 TO 992 STEP 64
760 MOVE 192,I%:DRAW 1072,I%
770 NEXT
780 GCOLOR,0
790 FOR I%=65 TO 75
800 MOVE 80*I%-5E3,264:VDU I%
810 NEXT
820 FOR I%=1 TO 11
830 MOVE 32,1024-64*I%:PRINT I%
840 NEXT:VDU 4
850 REPEAT
860 PRINTTAB(0,1)"WANT TO START? "
870 VDU 8:PROCinPut(1,77,90)
880 UNTIL In$="Y" OR In$="N"
890 IF In$="Y" THEN M%=1 ELSE M%=0
900 ENDPROC
910
920 DEF PROCyou
930 REPEAT
940 CLS
950 PRINT "LETTER? "
960 PROCinPut(1,64,76)

```

MICROMART

PET ARCADE

All of these games are written in 6502 machine code and have sound. They will run on all 40 column PETs with New Roms or Basic 4. Some are also available for 80 columns (phone for details).

COSMIC LEMMINGS (Kamikaze) £8

TANK ZONE (Battlezone) £8

SCRAMBLE (needs 16k) £10

CRAZY KONG! (needs 16k) £8

COSMIC BANDIT (Cosmic Guerilla) £6

SUPER GLOOPER (P*cm*n) £8

ASTEROIDS £6

INVADERS PART 2 £6

MANGROVE £8

PET PANIC £6

If you've got a PET and you haven't got our new Winter 1982 catalogue please phone at once for your FREE copy.

Add 15% VAT to prices. Post free.

SUPERSOFT

Winchester House, Canning Road, Wealdstone, Harrow Middlesex, HA3 7SJ.
Telephone 01-861 1166

Completed Integrated Accounts Systems to your PET.

Invoices laid out on your own stationary to your own design.

Electronic Aids (Tewkesbury) Ltd

Mythe Crest, The Mythes, Tewkesbury,
Glos. GL20 6EB

Telephone (0386) 831020 Or (0684) 294003

Printer Stands



- Handsomely crafted in 6mm tinted Perspex
- PSS model for Microline 80/82/83, Epson MX-80, Sheiksha GP100 etc. £16.95 +VAT
- PSL for Microline 84, Epson MX82 etc. £19.95 +VAT
- POT Printer Output Tray for fanfold paper £16.95 +VAT

Packing + Postage £3.50



CAMBRIDGE MICROELECTRONICS LTD
One Milton road Cambridge CB4 1UY
(0223) 314 814

PRINTER BARGAINS

MX80FT3 £322.00
MX100/3 £417.00
NEC PC8023 £284.50
OKI-80 £219.00

MICROS

Gemini Galaxy 1 £1450.00
Dragon 32 £169.95

COMPLETE SYSTEM

Galaxy 1 + Epson + Epson 80
+ Monitor £1765.20
Please add £5 carriage and
15% VAT to all others.

Walthamplan

(Computer Systems) Ltd

Priority Court, Priority Rd.
Torquay
0803 38236

: GO FORTH &*;

Complete DIY FORTH kit
Installation manual £10
How to do it + model + definitions + editor
Source code listing for one processor . . . £10
6502, 6800, 6809, 8080/Z80, 8088/8088,
9900, 1802
Manual + one listing £19
Ready to run
Lab Microsystems Z80 FORTH FOR CP/M
..... £45 + VAT
includes editors, assemblers, utilities, and
games; good documentation; 8" or 5" formats
FORTH on disc for most machines inc. PET,
TRS80, FLEX, CP/M, IBM, and more
..... from £50



MicroProcessor Engineering Ltd
21 Hanley Road Shirley
Southampton SO1 5AP
Tel: Southampton 775482

OSBORNE 1

Double Density
now available

4B microcentres

North Bar, Banbury, Oxon. OX16 0TF Telephone (0295) 66555

MICROMART

THREE YEARS PROVIDING SOFTWARE AND SUPPORT FOR THE TRS80 HAS TAUGHT US A LOT. SO NOW WE HAVE A HEAD START WITH THE SPECTRUM AND BBC MICRO.

MICROPATH

Why pay upwards of £500 for a critical path analysis package? MicroPath calculates earliest and latest start times, total and free float and the critical path of networks. All versions have optional printed output and permit easy editing and tape storage of networks. The TRS80 version can also use disk files. Available now for the TRS80 Model 1 and 3, the Genie, BBC Micro Model A and B and the Sinclair Spectrum. Complete with full instructions and an example network.

On cassette — £13.50

SPECTRUMON

A machine code monitor for the Sinclair Spectrum. Spectrumon allows you to examine blocks of memory, input and run machine code programs and store and load machine code from tape. Uses hex notation throughout. Optional printer output. Complete with full instructions.

On cassette — £5.50

BEEBTAPE

Tired of typing programs from the pages of books and magazines? Beebtape is a bi-monthly cassette of programs for your BBC Micro. There will be at least five programs in each issue and will include games, educational software, utilities, etc. Available by subscription only. The first issue is available now. Six issues on cassette — £21.00



MICRODATA

4 Greenbarnway, Blackrod,
Lancashire BL6 5TA
Tel: 0204 694265



MICROHELL BRINGS THE POWER OF UNIX TO CP/M

It adds these features to any CP/M 2.2 system:

- automatic searching across discs and user areas for programs and overlays
- re-direct console input and output
- re-direct printer output
- inter-program communication via 'pipes'
- execute batch files by just typing the name of the file
- multiple commands per line
- user definable prompt
- plus many more features

Only £96.50 plus VAT, manual available at £16.50. Postage and packing included. Supplied on 8 in. Standard CP/M disc, other formats available on request.

asro
INFORMATION
SYSTEMS

PO Box 159,
Brighton,
BN1 3NA
Tel (0273) 21979

Microshell is a trademark of New Generation Systems, Inc.

ASHFORD COMPUTER CENTRE

All makes of
micros
and accessories
supplied at large
discounts.

Atari users Group
Alternate Tuesday

Clarendon Road,
ASHFORD Midd'x
Tel: Ashford 44955

PROGRAMS

```

970  XX=ASC(IN$)-64
980  REPEAT
990  PRINTTAB(0,3)"NUMBER? ";
1000 VDU 8,8
1010  PROCINPut(2,47,58)
1020  Y%=VAL(IN$)
1030  UNTIL Y%>0 AND Y%<12
1040  N%=FN$square
1050  IF N%=0 THEN PROCabuse
1060  UNTIL N%
1070  ENDPROC
1080
1090  DEF PROCINPut(L%,Lo%,Hi%)
1100  K%=0:In$=""
1110  REPEAT
1120  Z%=GET
1130  IF Z%=127 AND K%>0 THEN PROCdel
1140  IF Z%>Lo% AND K%<L% AND Z%<Hi% THEN PROCadd
1150  UNTIL Z%=13 AND K%>0
1160  ENDPROC
1170
1180  DEF PROCdel
1190  K%=K%-1:In$=LEFT$(In$,K%):VDU Z%
1200  ENDPROC
1210
1220  DEFPROCadd
1230  K%=K%+1:In$=In$+CHR$(Z%):VDU Z%
1240  ENDPROC
1250
1260  DEF PROCabuse
1270  CLS:Err%=Err%+1
1280  ON Err% GOSUB 1320,1340,1360,1380,1400,1420
1290  PROCwait(350)
1300  ENDPROC
1310
1320  PRINT" You can't play there""It's already taken":RETURN
1330
1340  PRINT" That square is taken""Please try another":RETURN
1350
1360  PRINT" That's your third""mistake . Think!!!!":RETURN
1370
1380  PRINT" I'm getting tired""of this. Concentrate!":RETURN
1390
1400  PRINT" That was your fifth""idiotic mistake...":RETURN
1410
1420  PRINT" RIGHT!, THAT'S IT!""YOU LOSE A TURN !!"
1430  N%=-1:Err%=0:RETURN
1440
1450  DEF PROCme
1460  CLS:PRINT" Let me think..."
1470  IF First THEN PROCguess ELSE PROCthink
1480  CLS:PRINT" I WILL PLAY "
1490  VDU 64+X%,32,7:PRINT Y%
1500  PROCwait(200)
1510  ENDPROC
1520
1530  DEFPROCguess
1540  First=0
1550  REPEAT
1560  X%=3+RND(5):Y%=3+RND(5)
1570  N%=FN$square
1580  UNTIL N%
1590  PROCwait(280)
1600  ENDPROC
1610
1620  DEF PROCthink
1630  IF M3%<Y3% AND Y3%>1 THEN Def%=W2% ELSE Def%=W3%
1640  IF RND(1)<.9 THEN P1%=W4% ELSE P1%=W5%
1650  V%=9999
1660  FOR I%=Lb% TO Ub%
1670  IF Cell%(I%)=0 THEN PROCeval
1680  NEXT
1690  N%=K%:K%=K%+10
1700  X%=1+(K% MOD 11)
1710  Y%=K% DIV 11
1720  ENDPROC
1730
1740  DEF PROCeval
1750  T%=0:Twos%=0:L%=Table%+21*I%-21
1760  REPEAT
1770  Z%=W%(?L%)
1780  IF Z%=9 THEN 1840
1790  IF Z%=4 THEN T%=9999:GOTO 1840
1800  IF Z%=-4 THEN T%=999
1810  IF Z%=-2 THEN Twos%=Twos%+1
1820  IF Z%<0 THEN Q%=Def% ELSE Q%=Att%
1830  T%=T%+Q%*(Z%+1)-P1%*(Z%=3)
1840  L%=L%+1

```

Accounting Trainer for Spectrum BBC A&B, & 380Z

£15 for full 24-page A4 manual with 10K and 16K programs. Suitable for all elementary book-keeping work. Including Trial Balance, Profit & Loss, and Balance sheet

For details contact 01-554 6114 or write ELS, 481 Cranbrook Road Ilford, Essex.

SOFTWARE (LEVEL 2)
O' LEVEL FRENCH TUTOR — Pass 'O' level the easy way..... £10.00
SUPER COPY — copy is virtually all systems (M/C) tapes..... £6.50
MISSILE COMMAND POST — just like the arcades..... £7.50
QUICK KEYWORD ENTRY — speed up program entry (M/C)..... £4.50
FALLOUT 3 GUNFIGHT — Hall price, both for..... £5.00
HARDWARE
4K — 16K — simply plugs into Keyboard..... £25.00
16K — 32K — simply plugs into EXP.INT..... £20.00
32K — 48K — simply plugs into EXP.INT..... £20
LOWER CASE — vital for word processing..... £7
AMPLIFIER — Add sound to your programs..... £8
All prices include VAT and postage are for level 2 only. Specify disc (add £3.00) or cassette and system configuration. Mail order only cheques and postal orders to:
JD TRONICS, 42 CREDITON HILL, LONDON NW6 1HR
Send SAE for further details on all products

TRS80

PROGRAMS

```

1850 UNTIL ?L%=0
1860 IF Twos%>4 THEN T%=T%+W%
1870 IF T%>V% THEN V%=T%:K%=I%
1880 ENDPROC
1890
1900 DEF PROCPlay
1910 VDU 5
1920 MOVE 126+80*Y%:1036-64*Y%
1930 FOR I%=1 TO 5
1940 GCOL0,2:VDU 224,8
1950 PROCwait(30)
1960 GCOL0,M%:VDU 224,8
1970 PROCwait(30)
1980 NEXT VDU 4
1990 PROCupdate
2000 ENDPROC
2010
2020 DEF PROCupdate
2030 P%=2*M%-1:Cell%(N%)=P%
2040 K%=Table%+21*N%-21
2050 Q%=?K%
2060 REPEAT
2070 V%=W%(Q%)
2080 IF V%=9 THEN 2150
2090 IF V%*P%<0 THEN W%(Q%)=9:Win%=Win%-1 ELSE W%(Q%)=V%+P%
2100 IF V%=-3 THEN Y3s=Y3s-1
2110 IF V%=+3 THEN M3s=M3s-1
2120 IF V%=-2 AND P%<0 THEN Y3s=Y3s+1
2130 IF V%=+2 AND P%>0 THEN M3s=M3s+1
2140 IF ABS(W%(Q%))>5 THEN M%=(P%+5)/2:Win%=Q%
2150 K%=K%+1:Q%=?K%
2160 UNTIL Q%=0
2170 IF Win%=0 THEN M%=4
2180 N%=N%-23
2190 IF N%>0 AND N%<Lb% THEN Lb%=N%
2200 N%=N%+46
2210 IF N%<122 AND N%>Ub% THEN Ub%=N%
2220 ENDPROC
2230
2240 DEF PROCcomments
2250 IF M%<4 THEN PROCshowin
2190 IF N%>0 AND N%<Lb% THEN Lb%=N%
2200 N%=N%+46
2210 IF N%<122 AND N%>Ub% THEN Ub%=N%
2220 ENDPROC
2230
2240 DEF PROCcomments
2250 IF M%<4 THEN PROCshowin
2260 ON M%-1 GOSUB 2310,2350,2390
2270 CLS:PRINTTAB(T%,1)A%
2280 PROCwait(400)
2290 ENDPROC
2300
2310 Ywin%=Ywin%+1:A%="You win!!"
2320 B%="Well Played - but you were lucky !!!"
2330 T%=5:RETURN
2340
2350 Mwin%=Mwin%+1:A%="I've won!!!!"
2360 B%="WOW!!! -I really enjoyed that!!!!"
2370 T%=4:RETURN
2380
2390 Draw%=Draw%+1:A%="It's a draw!!"
2400 B%="No-one could have won that."
2410 T%=3:RETURN
2420
2430 DEF PROCshowin
2440 X%=152+80*XX:Y%=1020-64*Y%
2450 P1%=80:P2%=64
2460 IF Win%<204 THEN P1%=-80
2470 IF Win%<155 THEN P1%=0
2480 IF Win%<78 THEN P1%=80-P2%=0
2490 REPEAT
2500 X%=X%+P1%:Y%=Y%+P2%
2510 UNTIL POINT(X%,Y%)>M%-2
2520 MOVE X%-P1%,Y%-P2%
2530 GCOL0,3:DRAW X%-5*P1%,Y%-5*P2%
2540 ENDPROC
2550
2560 DEF PROCover
2570 PRINT B%
2580 PRINT "The score is now:"
2590 PRINT " You =";Ywin%
2600 PRINT " Me =";Mwin%
2610 PRINT " Drawn=";Draw%
2620 REPEAT
2630 PRINTTAB(0,9)"Do you want to Play again? "
2640 VDU 8:PROCinput(1,77,90)
2650 UNTIL In%="Y" OR In%="N"

```

MICROMART

BUSICALC £39

If your Commodore computer has at least 32k of memory plus disks, and you're prepared to spend nearly £200 on a 'spreadsheet' program then you really ought to consider VISICALC. It's a superb program.

If however you're not able to run VISICALC on your system, or are not prepared to invest such a large sum of money you ought to take a look at BUSICALC. It not only sounds similar, it looks much the same and has a similar range of facilities. All you need is 16k of memory and a cassette unit or disk drive. A printer will be useful, but it isn't essential.

Whether you use your computer in an office or at home, in industry or at university, BUSICALC can make it an even more powerful tool. It can handle jobs that would otherwise require a specially written program — or hours and hours of tedious paperwork. Just fill in the numbers that you know, then tell BUSICALC how to work out the others by entering simple formulae. BUSICALC can add or subtract, multiply or divide, calculate roots or powers, and perform special functions like totalling or averaging rows and columns. You can enter text on the sheet (for column headings, titles etc) and specify the number of decimal places for each calculated value — so with the help of a printer you can produce really smart reports.

BUSICALC 'sheets' can be saved to disk or tape for subsequent reworking, or access by other programs. It all sounds so simple that you wonder why somebody didn't think of it before. Actually they did — we're just doing it for a quarter of the price!

BUSICALC is available now for 40 and 80 column PET/CBM models and for the Commodore 64. At just £39 plus VAT (£40.50 on disk) it really is incredible value for money! Please give details of your equipment when ordering.

SUPERSOFT

Winchester House, Canning Road,
Wealdstone, Harrow,
Middlesex, HA3 7SJ, England
Telephone: 01-861 1166

Every computer needs a
CHATTERBOX! **NEW!**
"OK Spock, you win this time." **SAVE £££**
for **ZX81 SPECTRUM** **ONLY £49**

NASCOM, VIC. PET, BBC, APPLE, TRS80, IBM, CRAY, ETC (Please state)

At last! Genuine phonetic synthesis at a sensible price. Gives your computer an *unlimited* vocabulary (nothing more to buy!). Self contained speaker/amplifier, Sinclair connector etc, PLUS Expansion socket for BIG EARS AND Monitor socket for Music Board. Full instructions, technical notes and programme examples supplied with this outstanding educational unit.

DEALER ENQUIRIES WELCOME

As seen on BBC TV "Computer Programme"

*** BIG EARS *** **STOP! GO! LEFT! RIGHT!**

SPEECH INPUT FOR ANY COMPUTER

Hugely successful Speech Recognition System, complete with microphone, software and full instructions. **£49 BUILT TESTED & GUARANTEED ONLY**

PLEASE STATE COMPUTER: UK101, SPECTRUM ATOM, NASCOM2, Vic 20, Micron, ZX80/81, PET, TRS80, M280K, APPLE II, BBC MICRO

NEW: FAST MACHINE CODE FOR ZX SPECTRUM £7.40

ZX81/SPECTRUM

MUSIC SYNTHESISER (STEREO) + 16 LINE CONTROL PORT

Play 3-part music, sound effects, drums etc. Full control of attack, decay and frequency. Input/Output lines provide control and monitor facility for Home Security, Robot Control, Model Railway, etc. 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)
Extra 23 way connectors at £2.50 £25.50 (BUILT)

COLOUR MODULATOR KIT £15
RGB in, PALUHF out (not for ZX) BUILT £20

SPECIAL OFFER I.C. £18
SPEECH OUTPUT CHIP SX-01
Phoneme Speech Processor DATA £0.60

Please add VAT at 15% to all prices. All enquiries Barclay/Access orders accepted by telephone S.A.E. please

WILLIAM STUART SYSTEMS Ltd Dover House, Billericay Road, Herongate, Brentwood, Essex CM13 3SD, England Telephone: Brentwood (0277) 810244

COMPUTER CASE

UK101
NASCOM
MANY
OTHERS
5 1/4" drives
8" drives



SUPER
BOARD
TANGERINE
TUSCAN
BIGBOARD
MICROTAN

All single board computer housing problems are over. All your existing and future expansions will find a neat home for life. The case will house two 5 1/4" drives. Enquire for 8" drives. For fuller details and photo enclose SAE. Case size 24" deep 21" wide 8 1/4" high at the rear.

DISK DRIVES, BBC — all above named computers 5 1/4 inch SS, £139.00. SAE for DS Drives price lists.

MAIL ORDER ONLY VIEWING BY ARRANGEMENT

SILENT COMPUTERS LTD

27 WYCOMBE RD
LONDON N17
9XN
01-801 3014
24 hour
ANSAPHONE

MICROCOMPUTERS

Short intensive part time day and evening courses.

01-359 2465

Angel Islington Centre,
69 Upper St.
London N1

MICROMART

VIC + ZX81 £1.99

ASTRO SLED — Pilot your high powered sled through the jagged space canyon. With machine code for fast action. "Thankyou for Astro Sled. Its terrific!" — D Ledingham.

SPACE FIGHTER — A space dogfight simulator (the real-time section is in machine code). Fast and deadly. "I am very impressed with Space Fighter" — A Seagrave.

VIC INVADERS — Feature packed version for VIC only. Entirely in m/c, with hi-res, double size screen etc.

These programs are available for unexpanded VIC 20's and 16k ZX81's, on cassette, at the introductory price of £1.99 each, plus 60p p&p per order. Please state ZX81 or VIC20, and mention PCW when ordering.

ARCADIA SOFTWARE,
FREEPOST (no stamp required), Swansea, SA3 4ZZ

northern computers offer even more

Software
Disk Drive
Printers
Second Hand Computers
Tape Recorders
Books

Apple II
Apple III
BBC micro computers
Acorn Atom
VIC 20
Newbrain
Prestel adaptors

ALL ACCESSORIES SALES AND SERVICE

Easy parking off the M56
(Junc. 12)

Liverpool
Frodsham
Chester.

northern computers

Tel: Frodsham (0928) 35110

Churchfield Rd., Frodsham, Cheshire WA6 6RD

FORTH BARGAINS

Forth for Microtan
(Forth + Assembler) — Tape £15
(Forth only) — Listing £7
Latest Listings of Forth for 6502, 8080/280, 6809, 6800, 1802 £7 each

Installation Manual — All you need to know to get Forth and its editor running £5

6502 Macro Assembler — will work on any fig-Forth implementation — listing £5

M & J Software
34 Grays Close
Scholar Green
Stoke-on-Trent ST7 3LU
All prices inclusive of p&p etc.
Tel (0782) 517876

BBC MICRO

LANDFALL (32K)
A powered descent simulator with full cockpit display, including graphic and digital instruments. Very challenging and not for the faint-hearted!

SERPENT (32K)
Can you snatch the golden eggs from the maze before the savage serpents devour you? Becomes more frantic as the game progresses. Fast and totally addictive!
Both program on one cassette for only £6.50.

Cheques and PO's to: GT Software, 8 Bull St. Potton, Sandy, Beds.

PROGRAMS

```

2650 IF In$="N" THEN Done=1
2670 ENDPROC
2680
2690 DEF PROCwait(W%)
2700 T%=TIME
2710 REPEAT UNTIL TIME>T%+W%
2720 ENDPROC
2730
2740 DEF PROCrules
2750 PRINTTAB(14)CHR#141;CHR#134"CO-MOKU"
2760 PRINTTAB(14)CHR#141;CHR#134"GU-HURO"
2770 PRINT" This game is similar to noughts-and-"
2780 PRINT"crosses,the object being to create a"
2790 PRINT"straight line of";CHR#131;"FIVE OR MORE";CHR#135;"Pieces"
2800 PRINT"either horizontally,vertically or"
2810 PRINT"diagonally."
2820 PRINT" Notice that,unlike some versions of"
2830 PRINT"this game,a winning line need not"
2840 PRINT"contain";CHR#129;"EXACTLY";CHR#135;"5 Pieces and that I"
2850 PRINT"treat any move into an unoccupied"
2860 PRINT"square as legal-however many lines"
2870 PRINT"of 3 are created."
2880 PRINT" My Pieces are";CHR#130;"RED";CHR#135
2890 PRINT"and yours are";CHR#132;"BLACK"
2900 PRINT"(OOPS,I seem to have got my colours a"
2910 PRINT"bit mixed up !!)"
2920 PRINT" You may choose who starts but remember;"
2930 PRINT"that the first Player has an advantage"
2940 PRINT"and so I expect to have first go at"
2950 PRINT"least";CHR#133;"SOME";CHR#135;"of the time !!!"
2960 ENDPROC
2970
2980 DEF FNsquare
2990 NX=11*Y%-11+X%
3000 IF Cell%(NX) THEN NX=0
3010 =NX
3020
3030 REM TPIDTFK07BA,S.HT1-J.
3040
3050 DATA 10,-61,-20,220,55,135
3060
3070 DATA 1,11,1,134,1,11,11,11,-76,1,7,12,1,4,5,7,10,1,4
    
```

HOW TO MAKE EPSON, WORDSTAR AND OSBORNE SING AND DANCE

Continued from page 147

Supercalc models with Wordstar has forced me to make full use of this. I also prepare documents with a right margin at column 50 and reformat before the final print. Hence the following patches.

Default right margin 50 0380 33
Set screen size to 120 0249 78

Now let's put the icing on the cake by utilising the function keys of the Osborne. These can be used to make life very simple by merely transferring the ^P options directly to each function key. This reduces key strokes and you can put a prompt card behind the numbers on the alpha pad. But remember, the aim is flexibility. I have used the function keys firstly to combine couples of ^P options, and secondly to store sequences I may send directly from the keyboard (because I can't remember them).

To configure the function keys use SETUP, which is located on your CP/M system diskette. I won't explain how to use this. The Osborne manual does it far better than I could. Figure 2 shows my function key template.

Table 4 shows the values entered for each number. I have called the combination of Double Strike and Emphasised 'Super

Bold' and the Enlarged/Condensed combination 'Style 66'. Using these different options to the full, the screen can get cluttered with control characters (roll on the day when screens emulate printers!). I have put ^OD on the template, because I find it useful to be able to turn these control characters on and off easily. To achieve a zero with a slash through it is also cumbersome, hence function key 0.

We could put a few cherries on top of the icing by redesigning the print menu to reflect the changes we've made. Use DDT on WSMGS.OVR — consider this one your project.

I have enjoyed giving these three world-beaters a thorough bashing. However, my investigation has highlighted some areas of frustration. On the Wordstar front — wouldn't it be super if there were more ^P function keys available for us to access? Unfortunately ^PB ^PD and ^PS are now virtually redundant, but we're unable to amend them fully so that we can use them for something else. It would also be nice if there were some user-definable dot commands. I would use these for selecting line heights. On the Epson front — having a different deselect sequence for each option doubles the number of function keys needed. Also, most of my deselecting merely sets the printer back to its default

MICROAID LTD

IMAGewriter
for the 80 column PET (8032 and 8050)

Imagewriter is the most useful part of MicroAid's Wordprocessing Software. After two and a half years of continuous development and use the MicroAid Imagewriter has all the advantages of a powerful wordprocessor without the need for difficult and confusing directives in the text.

With the MicroAid Imagewriter what you see on the screen is what appears on the page. By using the powerful on-screen edit facilities of the PET the MicroAid Imagewriter allows you to input and edit text directly. This facility is coupled with powerful direct commands which allow a wide range of Wordprocessing functions and the loading, saving and merging of files.

The MicroAid Imagewriter can be upgraded to a full word processor by adding compatible modules later.

MicroAid Imagewriter is immediately available complete with ROM chip and documentation by sending £55 plus VAT (£63.25) to:
MicroAid Ltd., 5 Greenfield Crescent,
Edgbaston, Birmingham B15 3BE
Tel: (021 454 1089)

TRS80 — VIDEO GENIE SOFTWARE LIBRARY

25 Super programmes — machine code arcade games, simulations, competitive games, Adventurers, Dugeons & Dragons, puzzles & ball games; plus a few Education & Business programmes. Including: Breakout, Star Wars, Amazing 3D Mazes, Gambling Machines, Corridors of Doom & Trap it, to name a few. All 25 on one C48 cassette sent by return post for only £8.50 inclusive, or send a SAE for full details.

J T WILSON, (DEPT PCW) 9 Cotswold Terrace, Chipping Norton, Oxon. Tel: 0608 3059

values. I have tried using the initialisation string, but this is no good in the middle of a document. It sends a line-feed and a carriage return.

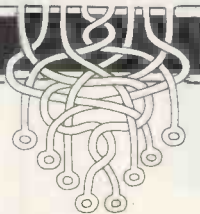
What about the Osborne? Well Adam, the pencil tray in the new case is a splendid idea, but where do I stick my template?

Stepping aside for a moment, I hear that Epson will soon be launching a new, super dot-matrix printer that will knock spots off the daisywheels. I can't wait to get my hands on it.

Lastly, the MX-80 I have been using is a type III. It has some differences to the type II. Notably, the lack of true sub/superscripts and proper underlining on the earlier

version. I am also told that the sequences may be different on the MX-100. Compare closely the relevant sections of your manual with the procedures herein. You should be able to establish the correct sequences for your printer. On some earlier MX-80s, using select and deselect in the same line cancelled the option before printing. The Osborne uses Wordstar version 2.26. Version 3 allows lines to continue beyond column 120 without wrapping round on the screen. If you're not using the Osborne the keyboard direct-entry sequences may be different. There is a good chance that the relevant memory addresses will be the same.

LEISURE LINES



646 entries were received to October's puzzle — either the puzzles are just too easy or the readership is growing at an astonishing pace. If we get that number of entries for the Manhunt competition, then we'll know that it's the latter reason!

Anyway it was a fairly easy puzzle and the answer was 29031 — most readers got it right. The winner, chosen by a random number generated on an HP41CV, was entry number 492 which came from Switzerland — E R Fulton. Congratulations! We hope you won't have to pay duty on your prize.

Incidentally we have not yet received acknowledgments for all prizes which have been sent out. Winners should have received their prizes by, at the latest, one month after their names are published. If you have not yet received your prize, please let us know.

Quickie

There are two stalls in a market selling apples. Stall A sells them at three for 10p, the other stall B at two for 10p. On Monday

each stall sells 300 apples, therefore stall A collects £10 and stall B £15 — a total of £25.

On Tuesday each stall again has 300 apples, but both stalls decide to combine and sell at five for 20p. At the end of the day, however they find that there is only £24 to be shared between them. What happened to the other £1?

Prize Puzzle

Runners in a marathon race are assigned consecutive numbers starting at one. One runner with a mathematical bent notices that the sum of the numbers less than his is equal to the sum of the numbers greater than his.

If there are more than 100 runners, but less than 1000, what number is he and how many runners are in the race?

J J Clessa

BLUDNERS



In December's 'Newsprint', under the heading 'Prizes, prizes', we inadvertently gave a Peterborough telephone number for Micronet 800. We are advised that this was incorrect, and is in fact a private residence. . . For details of the Micronet

800 service, please write to Petersham House, 57a Hatton Garden, London EC1B 1DT, enclosing details of your interests — home uses, business, or educational uses and stating the type of computer you use.

MICROMART

★ HOME COMPUTER USERS

★ PRODUCT INFORMATION SERVICE

★ Do you want the right computer for you? Do you want the right hardware? Or the right software? At the right price? If you're thinking about making a purchase but aren't sure just which product will suit you best who not seek a swift overall picture of what's around from us? Simply let us know what you're interested in and we'll send you a personal summary of what's available: facts, figures, suppliers, details. We'll also enclose as much manufacturers' literature as we can and add whatever related data we think might be worthwhile for you. We'll tell you of any special offers we're aware of, and even help you with your order if you wish. If we don't know how to answer your enquiry we'll try to find out: if we can't we won't take your money. Try us — we're here to help you make the right decision.

★ SECONDHAND COMPUTER REGISTER

★ We can also help if you want to buy or sell secondhand. We keep a register of currently available used computers and peripherals and send appropriate details from it to every interested enquirer. This advertisement appears in many computer magazines, which means a lot of people will read it. So, if you're looking for secondhand value write and ask us. If you want to sell, send us full details of what you have to offer and we'll do the rest. Registration costs £4 (or £3 if the total asking price is under £100), and will be maintained until you've sold. Each registration will be acknowledged.

★ ALL ENQUIRIES COST £1

★ Please send enquiries/registrations (including cheque/PO) to

★ DAVID HEARTFORD

★ 91 High Street, Evesham, Worcs WR11 4DT

★ SUPPLIERS: if we haven't contacted you please write to us.

MICRO-COMPUTER LITERACY BEGINS HERE... HOT OFF THE PRESS!!

RETAIL PRICE LIST AT 15/11/82

ITEM	R.R.P.
Vasicalc for the User by the User...	£10.00
Power of Vasicalc vol 1	£ 7.95
Power of Vasicalc vol 2	£ 7.95
Power of Supercalc	£ 9.95
Power of Vasicalc/Vasicalc/Visfile	£ 9.95
Power of Multipoint	£11.95
Generate Apple DOS	£23.95
Bag of Tricks	(add VAT) £9.95
What's Where in the Apple	£12.95
Apple II Word Processing...	£11.50
Computer Word Processing	£12.50
CP/M Word Processing	£17.50
The Custom Apple & other Mysteries	£11.95
Using 8502 on the Apple (Randy Hyde)	£12.95
IBM Personal Computer	£12.50
IBM PC Software & Expansion guide	£ 8.95
IBM PC Survival Guide	
Postage free	

For a detailed description of any of the above items and our complete catalogue, please send SAE, and indicate the items which interest you

TRADE ENQUIRIES WELCOMED.
114, WIDMORE ROAD
BROMLEY
KENT BR1 3BE
Tel: 01-460 2580/486 6982

CBM/PET PROGRAMS

2001/3000/4000/8000/CBM 64

GAMES + TUTORIALS + UTILITIES
BUSINESS + EDUCATIONAL
HUNDREDS OF TITLES TO CHOOSE FROM
— INCLUDING SOME YOU THOUGHT HAD GONE FOREVER — (GOT COMPU/THINK?)

SOFTWARE/FIRMWARE/HARDWARE

ALL THE NAMES YOU KNOW, PLUS SOME EXCITING NEW ONES.
SEND 25p STAMP(S) FOR CATALOGUE:-:-

CORALSOFT
65 CECIL AVENUE, HORNCHURCH, ESSEX
RM11 2NA MAIL ORDER ONLY

Sole Distributors

Softcentre

Programs

* INCLUDES FREE VOUCHER WORTH UP TO £5

ASCII KEYBOARDS

- Parallel 7 bit TTL output
- 5v Positive Strobe
- Full ASCII character set
- 62 keys inc. ESC, CAPS, REP, DEL, TAB etc.
- Single +5v supply required
- Circuit diagram supplied
- New — Unused — Guaranteed

Cased (685 x 232 x 78mm) | £34.50
Uncased (333 x 175 x 40mm) | £32.20
Inclusive of VAT and Postage (UK only).

Nameworth Limited

31 Barnfield, Hemel Hempstead, Herts, HP3 9QJ (0442-66878/48460).

TEXAS TI99/4A for only £139 (inc VAT)

Scoop purchase from Texas Instruments. The above include the manufacturer's £50 pay back scheme.

SAE for catalogue. Postage £4.50

COMPASS LTD
6 MARKET STREET
STANDISH, LANCS

If interested
in advertising
in
Micromart
please call
Gaye Collins on
01-636 6890

BACK ISSUES SERVICE

Here is a complete guide to all available back issues of PCW. A quick guide to their contents is shown below. Check the coupon overleaf for the issues you require.

Volume 1 No 1, 1978
The 77-68/Practical hints on kit building/Nascom 1/Charity case study/Flowcharting/Pontoon flowchart.

Volume 1 No 2, 1978
Kit building Basic — first steps/Case study — a software house/PET 2001/Research machines 380Z/School computing/E78 — Europa Bus.

Volume 1 No 3, 1978
More efficient programs/Cosmac 1802/The PDP11 Part 1/Small business computing — an approach/The Z80/EPROM programmer construction.

Volume 1 No 6 October 1978
Pilot/Assembly code programming/Small business case study/PET preening/Time tabling for schools.

Volume 2 No 1 May 1979
Chess programming/Using a small business computer Part 1/Smart 1/In defence of PET/+d Noughts & crosses

Volume 2 No 2 June 1979
Different computer languages/(MSI) 6800/Using a small business computer Part II/Demonstrations using the Apple II Part 1.

Volume 2 No 4
Apple medical application/North Star Horizon/Word processing/High speed cassette interface/Sorting/Buying a computer for a small business

Volume 3 No 12 December 1980
Benchtest: Microwriter/Printerfac: Series — Part 1/Sharp PC-1211 speed-up/Programs: TRS-80 Tarot, PET Cat & Mouse, PET Rebound, MZ-80K Alligatow Swamp, PET Connect, UK101 Minefield, PET Simon
Benchtest: Raand SP1

Volume 4 No 3 March 1981
Benchtest: Onyx C8002/Benchtest: Bigboard/Micro music software package/ALC circuit/Commons report/HP 43C/Programs: TRS80 Show Jumping, PET Grand Prix, PET Aircraft landing, PET Bouncy.

Volume 4 No 5 May 1981
Benchtest: Pascal 640/WP Benchtest: Magic Wand/PET colour/Low-cost digital tape system/Using calculator printers on micros/Apple music-

making/Multi-user Benchtest: MVT-Famos/Programs: PET Grand Prix, PET Aircraft Landing, PET Bouncy.



Volume 4 No 6 June 1981
Benchtest: NEC PC-8001/Multi-user Benchtest: MP/M/Benchtest: Sinclair ZX81/West Coast Faire report/Radio Teletype/WP Benchtest: Wordpro 4 plus/Budget tape interface/Further Casio quirks/Programs: UK101 Zor, PET Chords.



Volume 4 No 7 July 1981
Benchtest: Sharp PC-3201/Multi-user Benchtest: Acorn Econet/Case study: Accident investigation on TRS-80/Zilog Z8 family/WP Benchtest: Format-80/Pascal Benchmarks: readers' letters/Quicker Casio computations/Programs: ZX80 Sliding Letters, UK101 Car Rally, TRS-80 Calendar, UK101 m/c code to Basic converter, PET Exam Questions, MZ-80K Designer, ZX91 Sketch Pad.

Volume 4 No 8 August 1981
Benchtest: Tandy Model III/Viewdata update/WP Benchtest: Spellbinder/Printer survey/Micro-



holism/Programs: ZX80 Othello; Easter Sunday; Apple Mondrian; MZ-80K Duck Shoot; PET Gomoku; MZ-80K Football.

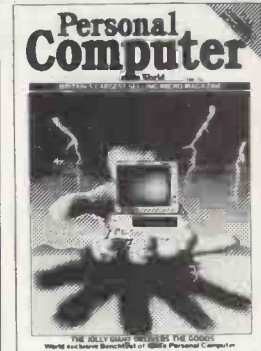


Volume 4 No 9 September 1981
Benchtests: Tandy Color Computer, Commodore VIC/Checkouts: Hi-Tech Speakeasy, Tantel/Multi-user Benchtest: HMSOS/WP Benchtest: Memorte III/Word proc program for PET/Apple dealership run by spastics/Printer facing extra/Calc Corner: Casio fx602p review/



Programs: PET Arithmetic test, ZX80 Eldorado, 380Z Memory test.

Volume 4 No 10 October 1981
Benchtest: OKI if-800/Checkouts: Heuristics speech link, Softy 2/Calc Corner: Texas TI51-111/Jeff Taylor on computer literacy projects/Introducing TJ's Workshop/Control your own Substation pt 1/Programs: TRS-80 Sailing.



Volume 4 No 11 November 1981
Benchtests: Osborne 01, IBM Personal Computer, Checkout: Sharp IQ3100 Microtranslator, Calc Corner: Casio fx702p, PCW Show report, Benchmark Summary, Euro Micro Chess Championship report, Programs: TRS-80 Sheepdog trial, ZX81 Sun and Planets.

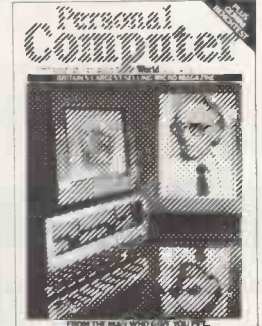


Vol 4 No 12 December 1981
Benchtests: Sharp MZ-80B Philips P2000/School network/ BBC Micro inside story/ 'Turtle' Graphics for Apple/ Forth language/ Curve fitting/ Calc corner: HP14C review/ Programs: PET Fantasy, ZX81 Battleships and cruisers.



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 For-

tune, TRS-80 Reaction Timing, ZX80 Laybrinth, Apple Letters.



Vol 5 No 2 February 1982
Benchtests: Sirius-I, Casio fx-9000p, Gemini Multiboard/Word Processor Benchtest: Scripsit 2.0/ Plotter Checkout: Watanabe/Hardware feature: High Density VDU card project/Music system: FREQOUT/Calc Corner: Aerial Navigation/Programs: Pet Haemophilia, Pet Cheese, TRS-80 Extra, Sharp PC1211 Exam, Personality test.



Vol 5 No 3 March 1982
Benchtests: Texas Instruments 99/4A, Hewlett-Packard 125/Choosing a Data base/Compsort DMS reviewed/Screenplay (new series)/Calc Corner: Hewlett-Packard Interface Loop/Programs: TRS-80 Solitaire, TRS-80 Ducks, Nascom Business Documents, MZ-80K Race Chase, ZX81 Graphplot.



Volume 5 No 4 April 1982
Benchtest: Monroe OC8820/DB Benchtest: FMS-80/Checkout: Sid 1/ Generating screen forms/Comal/Logo/Brain Dump-New series/Calc Corner: Casio FP-10 printer/Programs: TRS-80 Maths & Trig, PET Boot the Cat, ZX81 Resistor & Res code.

Vol 5 no 5 — May 1982
Benchtests: Apple III, Hitachi Peach/Database Benchtest: dBase II/3D

PCW SPECIALS

Benchtest Special £1.80.

All the best of PCW's

Benchtests of popular micros. Desktop computing £2.25. Comprehensive guide to using micros to help you in your Businesses.

BINDERS

Keep your copies in order with these strong, attractive yellow binders. £3.95 each (inc P&P)





Graphics Made Easy/Equation Solving/Calc Corner: fx 602 quirks/Programs: PET Mini-Animate, MZ-80K Catch, Apple Maze, Atari Sums For Kids, ZX81 Book Index, PET Stockmarket, Microtan 3D Rotation, Extra for MZ-80K, UK101 Crossword Notepad.

Vol 5 No 6. June 1982
 Benchtests: Sharp MZ-80A/ZX Spectrum/Database Benchtest: DBMS2/West Coast Faire Report/Lisp/VIC 20 games/Calc Corner: Sharp PC1500/Programs: RML Altered Basic/VIC-20 Large Characters/BBC Breakout/VIC-20 Trailblazer/MZ-80K



Next-to-Last-One/MZ-80K Tarot.

Vol 5 No 7 July 1982
 Benchtests: Mimi 801/Newbrain/Database Benchtest: Silicon Office/UCSD p-System/BBC Computer in-Depth/Apple II games/Calc Corner: TI88/Programs: ZX81 Hypocycloids/BBC Character Generator/TRS-80 Truth/PET Doc/TRS-80 Screen Dump/UK101 Screen Converter/PET boxes/Atari Earth.

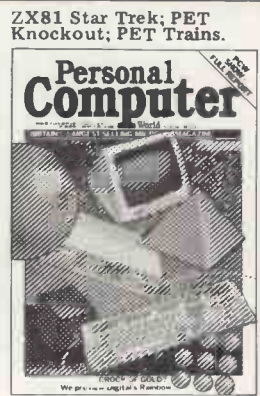
Vol 5 No 8 August 1982
 Benchtests: Sord M23/Dragon 32/Database Benchtest: Cardbox/Preview: Sony SMC-70/



UCSD p-System/RS232 Interface/Sirius graphics/NCC Show report/ZX81 Speech Checkout/Calc Corner: Casio fx602p/Programs: TRS-80 Quad-range/UK101 Conversion of units/PET Mopup/Apple Lifespan/Apple Trees/Nascom Snail Racing.



Vol 5 No 9 September 1982
 Benchtest: Olivetti M20/Word Processor Benchtest: Select for NEC/Database Benchtest: Aquila/Checkouts: Microwriter Revisited, E40 Data Compression/Screenplay: ZX81 Pt II/DIY Logo/P for Perfect/Beeb Colour Hi Res/RS232/Calc Corner: HP15 and 16C reviewed/Programs: Video Genie Extended Basic, ZX81 Alphabetising, PET File Comparison, BBC Music Player, PET Virus, BBC Radar, PET German Game, TRS-80 Cardshuffler.



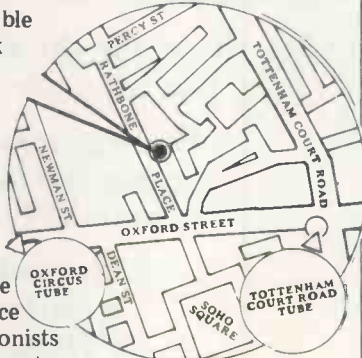
Vol 5 No 11 November 1982
 Benchtests: Canon CX-1; Hewlett Packard HP75/Database Benchtest: Conдор/Apple II Clock Calendar Card Part — Algebra checking/Benchmark summary/Bit Stik graphics for Apple/Calc Corner — HP41C, Casio fx702p programs/PCW Show report/Tiny printing on Centronics 739/Screenplay — Acorn Atom/Programs: Apple Piano; Apple Moon Module; PET Letterwriter; UK101 Logic; Atari Walls, Sharp MZ80K Area-filling;



Vol 5 No 10 October 1982
 Benchtests: HP-86; Positrol 9000/Database Benchtest; Personal Pearl/3D Graphics for BBC Computer/Hashing Techniques/Designing Your Own Database/CP/M-86 v MSDOS/Clock-Calendar Card for Apple II/Calc corner: hints for Sharp PC122/Programs: Intelligence test for computers/European Micro Chess Championship/Computer Scrabble/Spectrum books/Calc Corner — complex arithmetic on Sharp PC1211/Screenplay — TRS-80 Colour Computer/Programs — PET Firebird/Teepee Textpro/PET Search and Rescue/Atari Colour Selector.

BACK ISSUES CENTRE

We have a complete selection of all available PCW back numbers in our flashy new Back Issues Centre in the West End of London, just half a minute's walk from Oxford Street (close to Tottenham Court Road tube station). Of course, you could order them from our excellent mail order service using the coupon below, but by visiting in person you save on postage costs. The Back Issues Centre also often has back numbers of PCW on sale which we cannot offer through the mail order service because of shortage of stock. Our receptionists will also be happy to sell you a set of binders to take your subscription. And there's a range of interesting computer books on sale as well. Drop by next time you're in the West End. We're open Monday to Friday, 10am to 6pm. The address is 14 Rathbone



Place, London W1P 1DE.

Come up and see us...
Mon - Fri
10am - 6pm
Saturday
11am - 6pm



Vol 5 No 12 December 1982
 Benchtest: Epson HX-20/Database Benchtests comparison/Pluto Board/Walters 100 printer/Motorola MC68000/Ada/Intelligence test for computers/European Micro Chess Championship/Computer Scrabble/Spectrum books/Calc Corner — complex arithmetic on Sharp PC1211/Screenplay — TRS-80 Colour Computer/Programs — PET Firebird/Teepee Textpro/PET Search and Rescue/Atari Colour Selector.

CHANGE OF ADDRESS

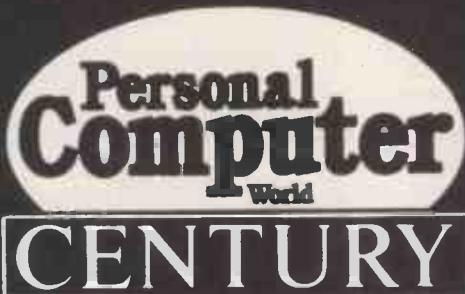
Readers should note that all mail order subscriptions, binders and back issue enquiries must now be addressed to 55 Frith Street, London W1. However, for personal callers only, a selection of PCW back issues, binders, micro-computing books etc can be purchased from the shop at 14 Rathbone Place, London W1.

Any one issue £1.50; all additional issues £1.00 each. Benchtest special £1.80. Desktop Computing £2.25. Binders £3.95 each. All prices include post and package. *Overseas orders requiring Air Mail postage add £1.00 per copy. Cheques/P.O. payable to Computing Publications Ltd,

53/55 Frith Street, London W1A 2HG Please allow up to 3 weeks for delivery and don't forget to state your name and full address with your order. Please send me the following copies of PCW. I enclose a cheque/P.O. for £. . . Please tick appropriate boxes.

Volume 1	Volume 2	Volume 3	Volume 4	Volume 5	Benchtest Special <input type="checkbox"/>
1 <input type="checkbox"/> 2 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/>	6 <input type="checkbox"/>	1 <input type="checkbox"/> 3 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/>	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/>	Desk Top Computing <input type="checkbox"/>
3 <input type="checkbox"/> 6 <input type="checkbox"/>	4 <input type="checkbox"/> 12 <input type="checkbox"/>	8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11 <input type="checkbox"/> 12 <input type="checkbox"/>	6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11 <input type="checkbox"/>		Binder <input type="checkbox"/>

Name _____ Address _____



35 PROGRAMS FOR THE DRAGON 32



Your search for programs for your Dragon 32 is over!

Here, for the first time, is an exciting collection of games and home applications.

These programs are simple to use and will make full use of the nine colour facilities of your Dragon.

This book will take you through Intergalactic Adventures, test your wits at Masterbrain and even help you to budget your home accounts!

£4.95 (paperback)

Available through bookshops everywhere. Should you experience any difficulty please fill in the order form below.

ORDER FORM

To: Department 01C
George Philip Services Ltd
Arndale Road
Wick, Littlehampton,
West Sussex BN17 7EN

Please send me _____ copy/copies of
35 Programs for the Dragon 32 at £5.45 per copy
(post paid)

I enclose my cheque/postal order for £ _____
(Please make your cheque/postal order payable to
George Philip)

Name _____

Address _____

Please allow 28 days for delivery

COST CONSCIOUS!

Heralding the beginning of a new age of low cost Word Processing Computer Systems

SMITH CORONA TP-1

- Dedicated Computer Printer
- Microprocessor Controller
- Serial, Parallel or IEEE Interface
- Lowest cost purpose-built Daisywheel

£485
+ VAT



BYTEWRITER

- Keyboard Printer
- Lift off facility
- Built-in self test
- Rigid carrying case

£485
+ VAT



DISCOM TRADING COMPANY
Dresden House, 51 High Street
Evesham, Worcs. WR11 4DA
Telephone (0386) 3591

Further Information Please

Name _____

Address _____

Postcode _____

Telephone _____

discom

infomatics MICRO BULLETIN

**BE UP-TO-DATE WITH ALL
THE VITAL NEWS IN THE
MICRO COMPUTER INDUSTRY.**

In our fast-moving business the right piece of news can often put you ahead of your competition ... alter your plans ... even the very strategy of your business ... but only if it reaches you in time.

The Infomatics group of publications is launching a new weekly newsletter to cater specifically for people in the micro computer industry. Published every Monday, the Infomatics Micro Bulletin will be packed with information about what is happening on the micro front – both hardware and software. Produced by the same publisher as Personal Computer World and MicroDecision, the micro newsletter will carry up-to-date information on what is happening in the US and Japan, as well as news from the UK.

We'll be talking about new products coming along from the Japanese and American manufacturers and spotting those who want representation in the UK and Europe. And we'll be reporting on those companies abroad which want to market British systems and software.

The information will be aimed at people in the business – software houses, dealers and manufacturers – rather than hobbyists and users. It will therefore be essential reading for those who want to stay up-to-date with events and pick up the best deals first.

Annual subscription to the Micro Bulletin is £85, and will include an automatic subscription to Infomatics magazine.

So send off now for this week's FREE issue of the Micro Bulletin and for details on how to subscribe.

To: Infomatics Micro Bulletin,
VNU Business Publications B.V.,
FREEPOST 38, London W1E 6QZ
Yes, please send me my free issue of Infomatics Micro Bulletin.

**FREEPOST
NO STAMP NEEDED**

Name _____

Company _____

Position _____

Address _____

Postcode _____

Telephone _____

How to turn your HP-41 into a handheld computer.



Introducing the Hewlett-Packard Interface Loop.

Starting today, your HP-41C or HP-41CV can be more than just a great little calculator. It's a great little computer, capable of controlling a quickly-expanding family of peripherals.

The new Hewlett-Packard Interface Loop (HP-IL) makes it all possible. HP-IL is an easy-to-use, low-cost interfacing system, specifically designed for battery-operable devices.

The Interface Module and Peripherals.

At the heart of the system is the Interface Module, which plugs into any one of four HP-41 ports. You can control up to 30 peripherals, using only one port in your HP-41 calculator.

One of the key HP-IL peripherals is the new Digital Cassette



Drive. This battery-operable device provides an

incredible 131,000 bytes of mass memory.

Another work-saving HP-IL peripheral is the new, battery-operable Thermal Printer/Plotter with enhanced formatting options and graphics.

This is just the beginning.

There are many more HP-IL products on the way. And they're all designed to provide the versatility and adaptability you expect from HP. You see, Hewlett-Packard is committed to a very big idea: small devices talking to each other, giving you big system capabilities – at small system prices!

**There's a
dealer list opposite
to help you
get started!**



**HEWLETT
PACKARD**

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

Aberdeen Tyseal Office Equipment.
 Bath Wilding Office Equipment.
 Belfast Cardiac Services Company.
 Birmingham John Mabon Associates;
 Research Micro Systems.
 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.
 Cardiff Sigma Systems (Calculators).
 Carlisle Thos. Hill International.
 Colchester Wilding Office Equipment.
 Croydon Wilding Office Equipment.
 Dundee Tayside Office Equipment.
 Edinburgh Holdene; Robox.
 Glasgow Robox.
 Gloucester Wilding Office Equipment.
 Halesowen Research Micro Systems.
 High Wycombe Wilding Office Equipment.
 Hornchurch Wilding Office Equipment.
 Ilford Wilding Office Equipment.
 Ipswich Wilding Office Equipment.
 Kingston-upon-Thames Wilding Office
 Equipment.
 Leeds Holdene; Wilding Office Equipment.
 Leicester A. C. Barratt & Co.; Sumlock Services.
 London City Business Machines -
 57 Houndsditch, Bethnal Green Road;
 Concept Business Systems, Dixons Photographic -
 123 Holborn, 64 New Bond Street;
 Landau Calculators - Bourne's Oxford Street,
 227 Tottenham Court Road; McDonald Stores -
 78 Oxford Street; Metyclean - 137 The Strand,
 92 Victoria Street; Mountaine -
 22 Cowper Street; Sumlock Bondain -
 263-269 City Road, 360 Euston Road,
 Cannon Street Station; Wallace-Heaton -
 127 New Bond Street; Wilding Office Equipment -
 278 High Holborn,
 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.
 Middlesbrough Thos. Hill International.
 Newcastle Thos. Hill International.
 Northampton A.C. Barratt & Co.
 Norwich Sumlock Bondain.
 Nottingham Bennett's (Typewriter & Office
 Suppliers).
 Oxford Science Studio.
 Reading Central Southern Calculators.
 Romford Wilding Office Equipment.
 Royston Herts Electroplan.
 Slough Wilding Office Equipment,
 The Xerox Store.
 Southampton Desk Aids.
 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 The Processor centre.
 Jersey The Processor centre.
EIRE: Dublin Abacus Systems.
 Tomorrow's World -
 Grafton Street, Henry Street.

All UK Comet branches.



OUT NOW— Software for your BBC Computer

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

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

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

Home Finance • Early Learning
 Fun Games • Games of Strategy
 Painting • Drawing • Music

The Computer Programme Programs Vol. 1
 The Computer Programme Programs Vol. 2

Price £10.00 (inc. VAT) each

ON SALE
 WHERE YOU
 SEE THIS
 SIGN



THE REAL
 SOFTWARE FOR
 YOUR BBC
 COMPUTER

Published by British Broadcasting Corporation

Super PRINTMASTER III

A revolutionary printer card for the Apple Computer.

The Super Printmaster III is so advanced there is no other like it in the world.

It means you now have the opportunity to operate with all the features of a word processing system and graphics, in colour. Sales letters will carry more impact, even graphics displays such as graphs, bar charts, can be printed in up to sixteen different colours and with a simple command, can be printed 16 times larger than normal size with as many copies as required.



It doesn't stop there! Used in conjunction with a Ram-Master you will be able to store all the data onto the ramcard, thereby freeing the computer during printing. This allows you to use the Apple for other functions — a real time saver. No additional software or hardware is required.

The Super Printmaster III, as well as having many hi-text features, also dumps from the screen both Hi-Res and Lo-Res graphics.

In the buffering mode your Super Printmaster III will 'cue' up to 255 of your print files; in fact it will take over the whole of your printer management.

So make the most of your Apple system, install the Super Printmaster III. You certainly won't be disappointed.

Dealer
Enquiries
Welcome



DIGITEK
APPLE EXPANDER CARDS

Digitek (International) Ltd.,
37c West Street, Horsham,
West Sussex, RH12 1PP, England.

Digitek, Super Printmaster III, Screenmaster 80, and Ram Master are registered trademarks of Digitek (International) Ltd. Apple is a trademark of Apple Computers Incorporated. CP/M is a trademark of Digital Research. Visicalc is a registered trademark of Visi Corp. Super Printmaster III patent pending.



CHROMASONIC business systems

The 64
from

commodore



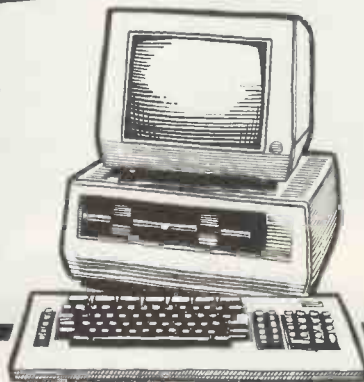
EPSON
MX-100
MX-80
MATRIX PRINTERS

01-263 9493/5
48 JUNCTION RD, ARCHWAY, LONDON N19 5RD Telex 22568

COMMODORE 700 SERIES



ACT
SIRIUS 1



SYSTEMS SUPPLIED NATIONWIDE

APPOINTED DEALER FOR

ALL THESE MANUFACTURERS

FULL SUPPORT ON ALL

PRODUCTS!

SOFTWARE:

PEGASUS

ACCOUNTS
SALES, PURCHASE &
NOMINAL LEDGERS
INVOICING &
STOCK CONTROL

WORD PROCESSING

SUPERSCRIPT (CBM)
WORDSTAR (TRANSTEC)
SELECT (SIRIUS 1)

VISICALC

FINANCIAL PLANNING

D.M.S.

DATA MANAGEMENT
PACKAGE

TEC

DAISY WHEEL
PRINTERS

SCM
SMITH-CORONA

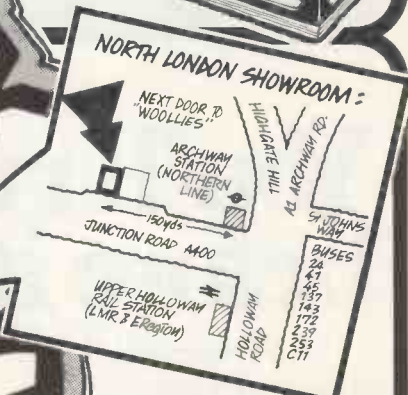


Leeds Office

'PHONE
FOR ADVICE, PRICE
& DEMONSTRATION

Northern Address: 6 WIGTON GROVE,
LEEDS LS17 7D2 Tel: (0532) 688397

SOFTWARE
HOTLINE:
01-263 7341



Post to **CHROMASONIC Business Systems**,
48 Junction Road, Archway, LONDON N19 5RD

Please send me further details about your
business systems. I am particularly interested in:

NAME:
POSITION:
COMPANY:
ADDRESS:
TELEPHONE:

commodore



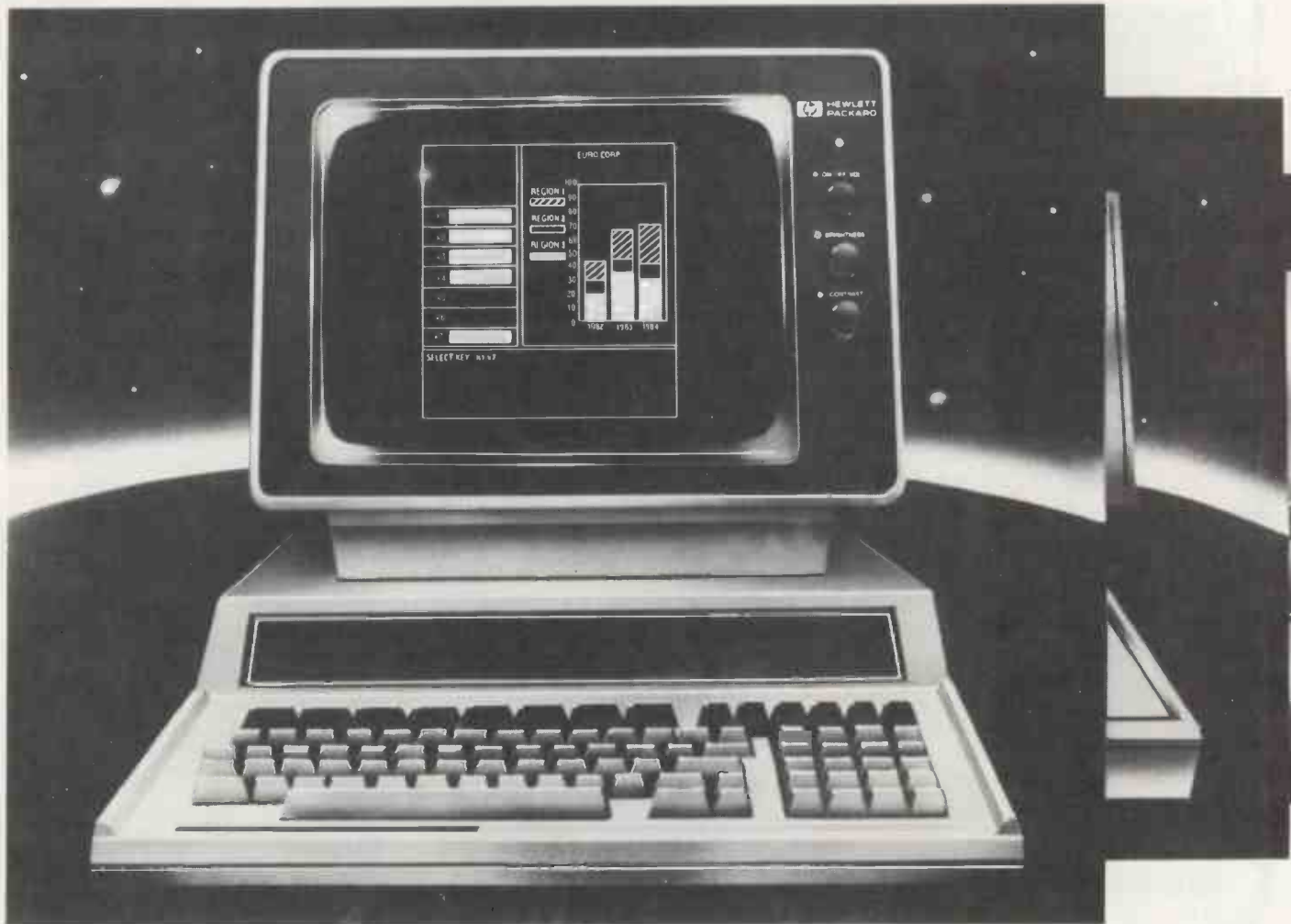
COMMODORE
500 SERIES

TERMS OF BUSINESS: Please add 15% VAT to all prices. Delivery charged at Cost.
Prices valid for cover date of this magazine. Access and Barclaycard orders welcome

POST YOUR
COUPON NOW!



The New HP-86



You'll run out of problems before it runs out of solutions.

With a basic price of *£1314 (disc drive, display monitor extra), Hewlett-Packard's new HP-86 is an affordable personal computer whose solutions expand right along with your needs.

Presentation graphics solutions.

Sales charts to organisation charts, you'll be able to create a variety of visuals to help get your ideas across. And you can do it in minutes.

Make pie charts, bar charts, line

charts, text slides, and overhead transparencies. In colour.

Computation and analysis solutions.

Consider the time-consuming worksheets you do.

Years ending June 30	1981	1982	1983	1984	1985	1986
NET SALES	230	274	460	518	561	
COSTS AND EXPENSES	123	130	174	225	249	275
COST OF GOODS SOLD	19	24	34	33	41	34
RESEARCH & DEVELOP	19	24	34	33	41	34

With VisiCalc® PLUS software, you change one variable; the HP-86 changes all the rest. Instantly. Even if it's a long-range forecast that used to require large, expensive computers.

Then, to top it off, you can turn the results into a graph.

Efficiency like that translates to money saved.

Letter, memo and report solutions.

You'll be able to compose reports without ever committing them to

Personal Computer

paper. Until they're just the way you want them.

Write and edit swiftly and efficiently on the computer's screen. Produce personalised form letters for a mailing list; then use an HP printer to give you 'original' copies.



Data communications solutions.

You'll have armchair access to news retrieval services or a number of other information bases. When you want to 'talk' to large computers at your branch offices or at your client's offices, you can do that, too.



you know you've got Hewlett-Packard engineering. Engineering backed by 40 years of experience.

So if you have problems, come and see the solutions. See Series 80 and the new HP-86, at your Hewlett-Packard dealer today.

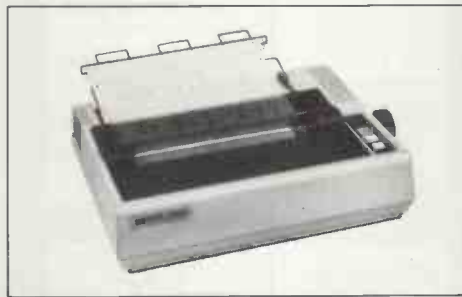
And peripheral solutions.



HP 9130 flexible disc drive. 270 Kbytes in a new, small package, with double-sized, double-density discs.



HP 7470 low-cost plotter, for full-colour hard-copy charts or overhead transparencies.



HP 82905B printer. A dot matrix printer with a wide variety of format and type options.

VisiCalc is a registered trademark of VisiCorp.

Disc drive £622. 9" monitor £216.

**Prices correct at time of going to press. Prices ex. VAT.*

Contact your nearest dealer for a demonstration:

- Aberdeen** Tyseal Computers, Tel: 55365.
Belfast Cardiac Services, Tel: 625566.
Birmingham John Mabon and Associates Ltd, Tel: 643 6351.
Microcomputers at Laskys, Tel: 632 6303.
Bournemouth South Coast Business Machines, Tel: 893040.
Brighton Office Machinery Engineering, Tel: 689682.
Bristol Decimal Business Machines, Tel: 214093.
Microcomputers at Laskys, Tel: 20421.
Cambridge Cambridge Computer Store, Tel: 65334. Hi-Tek Distribution Ltd, Tel: 0954 81996.
Chester Microcomputers at Laskys, Tel: 317667.
Dublin Abacus Systems, Tel: 951677.
Edinburgh Robox Office Equipment Ltd, Tel: 225 3871. Holdene, Tel: 557 4060.
Microcomputers at Laskys, Tel: 556 2914.
Glasgow Robox, Tel: 221 8413/4.
Microcomputers at Laskys, Tel: 226 3349.
Harlow IIT Instruments Services, Tel: 29522.
High Wycombe Rapid Recall Ltd, Tel: 0494 26271.
Kington Microcomputers at Laskys, Tel: 546 1271.
Leeds Holdene, Tel: 459459.
Leicester Sumlock Services, Tel: 29673.
Liverpool Microcomputers at Laskys, Tel: 236 2828.
London Albata Ltd, Tel: 730 7928. Sumlock-Bondain, Tel: 250 0505, 626 0487, 388 5702.
Microcomputers at Laskys, Tel: 636 0845.
Manchester Automated Business Equipment, Tel: 432 0708. Holdene, Tel: Wilmslow 529486.
Microcomputers at Laskys, Tel: 832 6087.
Nantwich First Business Centre, Tel: 0270 627505.
Nottingham Microcomputers at Laskys, Tel: 415150.
Preston Microcomputers at Laskys, Tel: 59264.
Reading CSE Computers, Tel: 61492.
Royston (Herts) Electroplan, Tel: 41171.
Sheffield Microcomputers at Laskys, Tel: 750971.
Slough Crellon Microsystems Ltd, Tel: Burnham 4300.
Southampton LTC Business Systems, Tel: 22958.
St Albans Albata Ltd, Tel: 74361/2.
Tunbridge Wells D.J. Harriott, Tel: 22443/4.
Worthing Office Machinery Engineering, Tel: 207292.
CHANNEL ISLANDS The Processor Centre, Tel: Jersey 77070.
Tel: Guernsey 28827.

 **HEWLETT
PACKARD**

And in any Series 80 personal computer, including the portable HP-85 and the high-powered HP-87,

PRODUCTS FOR ATARI® 400/800
FROM ELCOMP

BOOKS:

ATARI BASIC — Learning by Using

An excellent book for the beginner. Many short programs and learning exercises. All important features of the ATARI computers are described (screen drawings, special sounds, keys, paddles, joysticks, specialized screen routines, graphics, sound applications, peeks, pokes, and special stuff). Also suggestions are made that challenge you to change and write program routines.

Order #164 \$7.95

Games for the ATARI Computer

This book describes advanced programming techniques like player-missile-graphics and use of the hardware-registers. Contains many ready to run programs in BASIC and one called GUNFIGHT in machine language.

Order #162 \$7.95



Programming in 6502 Machine Language on your PET+CBM
2 complete Editor/Assemblers (Source code 3 hexdump + description plus a powerful machine language monitor (Hexdump)).

Order #166 \$19.95

How to program your ATARI in 6502 machine language
Introduction to machine language for the BASIC programmer

Order #169 \$9.95

SOFTWARE IN BASIC FOR ATARI

Invoice Writing for Small Business

This program makes writing invoices easy. Store your products in DATA statements with order-number, description, and price. The program later retrieves the description and price matching to the entered order-number. The shipping cost and the discount may be calculated automatically depending on the quantity ordered or entered manually. The description to the program tells you how to change the program and adapt it to your own needs. Comes with a couple of invoice forms to write your first invoices on to it.

Order #7201 cassette version \$29.95

Order #7200 disk version \$39.95

Mailing List

This menu driven program allows the small business man to keep track of vendors and customers. You can search for a name or address of a certain town or for an address with a certain note. 50 addresses are put into one file.

Order #7212 cassette version \$19.95

Order #7213 disk version \$24.95

Inventory Control

This program is menu driven. It gives you the following options: read/store data, define items, entry editing, inventory maintenance (incoming-outgoing), reports. The products are stored with inventory number, manufacturer, reorder level, present level, code number, description.

Order #7214 cassette version \$19.95

Order #7215 disk version \$24.95

Programs from Book #164

The programs from book no. 164 on cassette. (Book included)

Order #7100 \$29.00

Game Package

Games on cassette. (Bomber, tennis, smart, cannon fodder, etc.)

Order #7216 \$9.95



Microcomputer Hardware Handbook (845 pages)
Descriptions, pinouts and specifications of the most popular microprocessors and support chips.

A MUST for the hardware buff.

Order-No. 29

\$14.95

Care and Feeding of the Commodore PET

Eight chapters exploring PET hardware. Includes repair and interfacing information. Programming tricks and schematics.

Order #150 \$9.95

HOFACKER

Payment: check, money order, VISA, MASTER-CHARGE, Eurocheck.

Orders from outside USA: add 15% shipping. CA residents add 6.5% tax

*ATARI is a registered trademark of ATARI Inc.

*VIC-20 is a registered trademark of Commodore

SOFTWARE IN MACHINE LANGUAGE for ATARI

ATMONA-1

This is a machine language monitor that provides you with the most important commands for programming in machine-language. Disassemble, dump (hex and ASCII), change memory location, block transfer, fill memory block, save and load machine-language programs, start programs. Printer option via three different interfaces.

Order #7022 cassette version \$19.95

Order #7023 disk version \$24.95

Order #7024 cartridge version \$59.00

ATMONA-2

This is a tracer (debugger) that lets you explore the ATARI RAM/ROM area. You can stop at previously selected address, opcode, or operand. Also very valuable in understanding the microprocessor. At each stop, all registers of the CPU may be changed. Includes ATMONA-1.

Order #7049 cassette version \$49.95

Order #7050 disk version \$54.00

ATMAS

Macro-Assembler for ATARI-800/48k. One of the most powerful editor assemblers on the market. Versatile editor with scrolling. Up to 17k of source-code. Very fast, translates 5k source-code in about 5 seconds. Source code can be saved on disk or cassette. (Includes ATMONA-1)

Order #7099 disk version \$89.00

Order #7999 cartridge version \$129.00

ATAS

Same as ATMAS but without macro-capability. Cassette-based.

Order #7098 32k RAM \$49.95

Order #7998 48k RAM \$49.95

ATEXT-1

This wordprocessor is an excellent buy for your money. It features screen oriented editing, scrolling, string search (even nested), left and right margin justification. Over 30 commands. Text can be saved on disk or cassette.

Order #7210 cassette version \$29.95

Order #7216 disk version \$34.95

Order #7217 cartridge version \$69.00

GUNFIGHT

This game (8k machine-language) needs two joysticks. Animation and sound. Two cowboys fight against each other. Comes on a bootable cassette.

Order #7207 \$19.95

FORTH for the ATARI

FORTH from Elcomp Publishing, Inc. is an extended Fig-Forth-version, Editor and I/O package included. Utility package includes decompiler, sector copy, Hexdump (ASCII), ATARI Filehandling, total graphic and sound, joystick program and player missile. Extremely powerful!

Order #7055 disk \$39.95

Floating point package with trigonometric functions (0 - 90°).

Order #7230 disk \$29.95

Learn-FORTH from Elcomp Publishing, Inc.

A subset of Fig-Forth for the beginner. On disk (32k RAM) or on cassette (16k RAM).

Order #7053 \$19.95

Expansion boards for the APPLE II



The Custom Apple + Other Myseries
A complete guide to customizing the Apple Software and Hardware

Order-No. 680 \$24.95

We also stock the boards which are used in the book "The Custom Apple" (bareboards)

Apple I/O Board No. 605 \$39.00

EPROM Burner No. 607 \$49.00

8K EPROM/RAM Board No. 609 \$29.00

Prototyping board for the Apple II No. 604 \$29.00

Slot repeater board for the Apple II No. 606 \$49.00

Order two boards and get the book free!

COMING SOON! ORDER NOW!

A Look in the future with your ATARI

(Astrology and how to do your own horoscope on the ATARI 800. Order No. 171 \$9.95

FORTH on the ATARI - Learning by Using

Order No. 170 \$7.95

Books
+
Software
for
ATARI
VIC-20
OSI
SINCLAIR
TIMEX

ELCOMP PUBLISHING, INC

53 Redrock Lane

Pomona, CA 91766

Phone: (714) 623 8314

Hardware — ADD—ONS for ATARI

PRINTER INTERFACE

This construction article comes with printed circuit board and software. You can use the EPSON printer without the ATARI printer interface. (Works with gameports 3 and 4).

Order #7211 \$19.95

RS-232 Interface for your ATARI 400/800

Software with connector and construction article.

Order #7291 \$19.95

EPROM BURNER for ATARI 400/800

Works with gameports. No additional power supply needed. Comes compl. assembled with software (2716, 2732, 2532).

Order #7042 \$179.00

EPROM BURNER for ATARI 400/800 KIT

Printed circuit board incl. Software and extensive construction article.

Order #7292 \$49.00

EPROM BOARD (CARTRIDGE)

Holds two 4k EPROMs (2532). EPROMs not included.

Order #7043 \$29.95



EPROM BOARD KIT

Same as above but bare board only with description.

Order #7224 \$14.95

ATARI, VIC-20, Sinclair, Timex and OSI

New — for your ATARI 400/800

Astrology and Biorythm for ATARI (cass. or disk).

Order #7223 \$29.95

Birth control with the ATARI (Knaus Ogino)

Order #7222 cass. or disk \$29.95

Books + Software for VIC-20 (requires 3k RAM Exp.)

#4870 Wordprocessor for VIC-20, 8k RAM \$19.95

#4883 Mailing List for VIC-20, 16k RAM \$14.95

#141 Tricks for VICs - The VICstory Progr. \$9.95

#4880 TIC TAC VIC \$9.95

#4881 GAMEPACK I (3 Games) \$14.95

#4885 Dual Joystick Instruction \$9.95

INPUT/OUTPUT Programming with your VIC

Order #4886 \$9.95

#4896 Mini-assembler for VIC-20 \$19.95

#4881 Tennis, Squash, Break \$9.95

#4894 Runfill for VIC \$9.95

Universal Experimenter Board for the VIC-20

(Save money with this great board). This board plugs right into the expansion slot of the VIC-20.

The board contains a large prototyping area for your own circuit design and expansion. The construction article shows you how to build your own 3k RAM expander and ROM-board.

Order #4844 \$18.95

Software for SINCLAIR ZX-81 and TIMEX 1000

#2399 Machine Language Monitor \$9.95

#2398 Mailing List \$19.95

Programming in BASIC and machine language with the ZX-81 (82) or TIMEX 1000.

Order #140 (book) \$9.95

Books for OSI

#157 The First Book of Ohio \$7.95

#158 The Second Book of Ohio \$7.95

#159 The Third Book of Ohio \$7.95

#160 The Fourth Book of Ohio \$7.95

#161 The Fifth Book of Ohio \$7.95

#151 8K Microsoft BASIC Ref. Man. \$9.95

#152 Expansion Handbook for 6502 and 6802 \$9.95

#153 Microcomputer Appl. Notes \$9.95

Complex Sound Generation

New revised applications manual for the Texas Instruments SN 76477 Complex Sound Generator.

Order #154 \$6.95

Small Business Programs Order #156

Complete listings for the business user. Inventory, Invoice Writing, Mailing List and much more. Introduction to Business Applications. \$14.90

Sinclair ZX Spectrum

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

**From only
£125!**

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

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

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

Professional power— personal computer price!

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

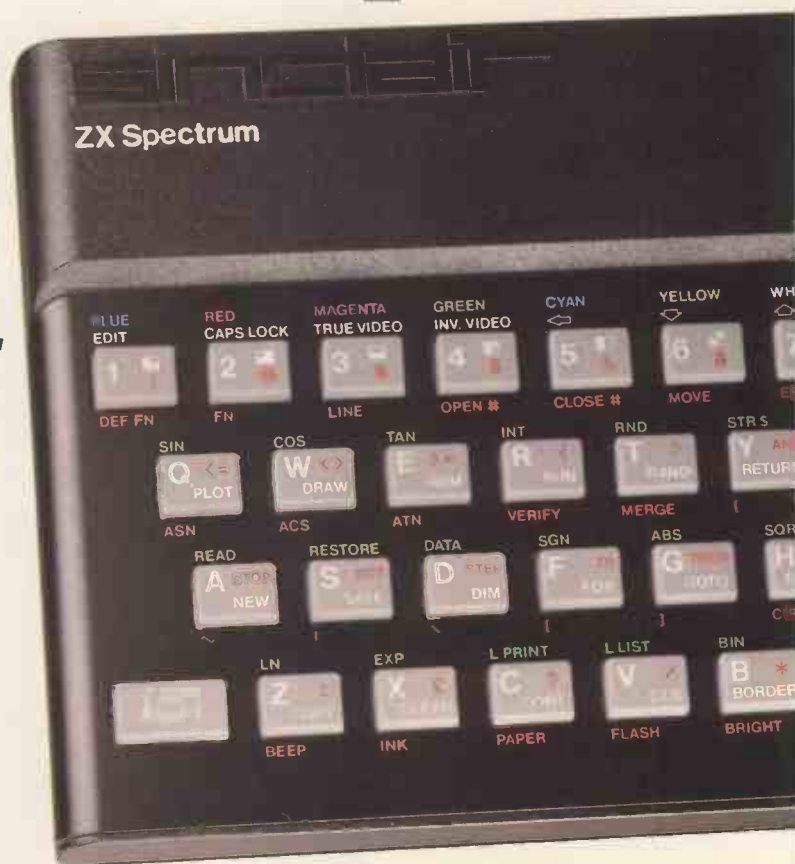
You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

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

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

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



Ready to use today, easy to expand tomorrow

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

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

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



Key features of the Sinclair ZX Spectrum

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

am



ZX Spectrum software on cassettes – available now

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

RS232/network interface board

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

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

sinclair

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

The ZX Printer – available now

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

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

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



The ZX Microdrive – coming soon

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

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

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

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

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



How to order your ZX Spectrum

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

Access or Trustcard.

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

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

Order

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

Please tick if you require a VAT receipt

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

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

*Please delete/complete as applicable

Signature

PLEASE PRINT

Name: Mr/Mrs/Miss

Address

PCW901

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



The choice is yours...

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

apple Popular desktop computers for personal and small business use.


comart Communicator range of sophisticated British S100 business systems.

commodore VIC-20, the ideal introduction to computing.

Cromemco Computer range for professional use, with numerous options.

**XITAN
SYSTEMS**

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

NorthStar  The Advantage desktop computer with business graphics.

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

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

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

WHICH MICROCOMPUTER?

WHICH PRINTER?

WHICH SOFTWARE?

WHICH SERVICES?

WHICH COMPUTER?

WHICH WORD PROCESSOR?

Be sure you make the right decision

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

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

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

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

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

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

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

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

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

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

THE WHICH? COMPUTER? SHOW
National Exhibition Centre
Birmingham
18-21 January 1983

FREE TICKETS WORTH AT LEAST £3 + INFORMATION PACK

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

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

Name _____

Position _____

Company _____

Address _____

Telephone _____

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

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

PCW/1/83

Nobody under the age of 18 will be admitted.



CABEL ELECTRONICS LTD.,
MOUNT ROAD, BURNTWOOD,
WALSALL, STAFFS WS7 0AX
Tel: 021 308 7075 TLX: 339671

MC 370M R.G.B. COLOUR MONITOR

14" Colour Monitor with a full 2 year guarantee,
moulded in a stylish cabinet to match your
computer.

The Advantages of Pure R.G.B.

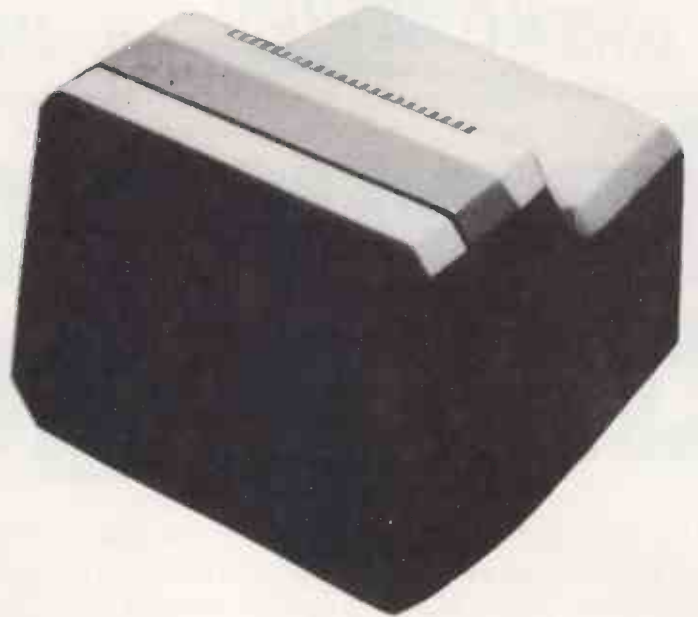
- 80 x 25 Charictor display
- Crisp definition on colour graphics
- Degaussing facilities
- Permanent link to your computer
- 3 x the band width of your normal TV

CABEL ELECTRONICS LTD., are
manufacturers of a complete range of colour and
monochrome monitors with 10 years of experience
within the television industry, our 2 year guarantee
proves our faith in our products.

REC. RETAIL PRICE £289.00 inc. VAT & Postage

See us at the Northern Computer Fair
Stand V23

Ring us for immediate delivery, most major credit
cards accepted.



**BUDGET
-- MINDED? --**

SINCLAIR ZX81-VIC20

--- BBC MICRO --- BBC MICRO

together with an exceptional
range of larger micros -
OSBORNE, SIRIUS, HP, TRS 80, APPLE,
ADVANTAGE and COMMUNICATOR
plus peripherals and media.



Cambridge Computer Store

1 Emmanuel Street
Cambridge CB1 1NE
Telephone (0223) 358264/65334
(closed 12.30 - 1.15 except Saturday)

DISKS DISKS DISKS

*** LOWEST PRICES - FAST DELIVERY ***

PRICE PROMISE

We will match any other lower price advertised in the current issue of PCW for single boxes in stock

5.25" DISKS - BOXES OF 10

	Price per Box (£)			QTY	AMOUNT
	1-4	5-9	10+		
VERBATIM					
MD525 S-Side/S or D-Den/S-Sec (40TR)	16.00	15.50	14.70		
MD550 D-Side/S or D-Den/S-Sec (40 TR)	23.50	22.70	21.90		
MD577 S-Side/D or Q-Den/S-Sec (77/80 TR)	32.00	22.30	21.80		
MD557 D-Side/D or Q-Den/S-Sec (77/80 TR)	32.30	31.40	30.50		
*10 and 16 Sectors at above prices. * Add £1.25 for Plastic Box					
MEMOREX					
3401 S-Side/S Den/S-Sec	14.70	14.20	13.70		
3421 D-Side/D Den/S-Sec	19.70	19.40	19.20		
BASF					
1X S-Side/S Den/S-Sec	15.00	14.60	14.00		
1D S-Side/D Den/S-Sec	18.80	18.40	17.80		
2D D-Side/D Den/S-Sec	23.00	22.40	21.80		
Head cleaning kit with fluid	16.30				
Library case	1.90				
Storage box with lock (70 disk)	29.00				
8" DISKS - BOXES OF 10					
VERBATIM					
FD34-9000 S-Side/S Den 26 Sect	26.50	24.00	21.50		
FD34-8000 S-Side/S Den Uninitial	27.00	25.50	22.90		
FD10-4008 D-Side/S Den 8 Sect	32.00	29.50	27.00		
DD34-4001 D2TM D-Side/D Den	31.00	28.50	26.00		
*Other types available on request					
POSTAGE/PACKING (UK)					
5.25" Disks/Cleaning Kit	£1/Box (75p/Box 10+)				
8" Disks	£1.30/Box (85p/Box 10+)				
Library Box	50p/Box (35p/Box 10+)				
Storage Box	£2.50				
	Total Exc. VAT				
	VAT 15%				
	Total Payable				

Please contact us for Quantity Discounts (10+ Boxes) and Trade Accounts. Official Orders welcomed.

Name Tel. No.
 Address
 Access/Barclaycard/Cheque No.
If you do not wish to cut out form send order separately

34 Cannonbury Avenue, Pinner, Middx HA5 1TS
 Telephone orders any time - we do the rest - 01-868 9548



Pinner Wordpro



Finding out about microcomputers used to be heavy reading

Now... the computer magazine you can understand.

We're booting out the jargon to give you facts that make sense.

It's all in Micro Update, at your newsagents from January 14.

Micro Update will be your one-stop guide to the micro scene - whether you're a home user or if you run your own business.

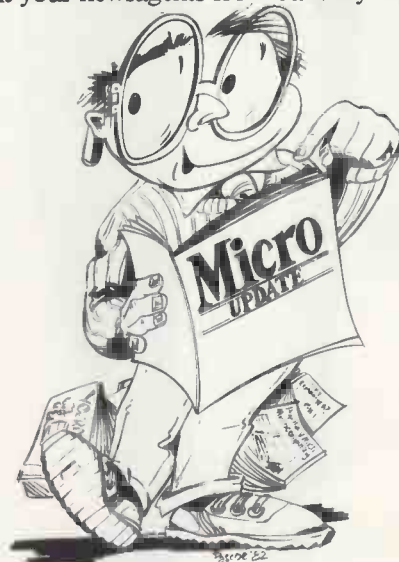
Every month we'll tell you what's best and what's best to avoid among the flood of micro products.

And our feature articles will be packed with information you can use. Our news pages will keep you up-to-date and our buyers' guides will be concise.

Micro Update has invented a new computer language. It's called English.

Just 75p will buy you our translation. Micro Update... the micro magazine that makes sense.

At your newsagents from January 14.



Micro UPDATE

Published by Argus Specialist Publications Ltd.

THE INSTITUTION OF ANALYSTS & PROGRAMMERS



An association which endorses the status of its members, encourages their high standards, assists their careers and promotes their interests is the essential foundation of every profession.

The Institution of Analysts & Programmers is the leading association for those engaged in systems analysis or computer programming for Commerce, Industry or Public Service. Membership of the Institution, as shown by the designatory letters Cmpn.I.A.P., F.I.A.P., M.I.A.P. and A.M.I.A.P. is widely recognised and respected. The Institution is the supervising authority for the Copyright Register whose protective legal service is available to all (members and non-members) who write original programs.

If your computer practice could make you eligible to join the Institution or if you wish to secure your right to royalties through the Copyright Register write or telephone

01 - 898 2385

The General Secretary

The Institution Of Analysts & Programmers
 WYE HOUSE, TANGIER ROAD, RICHMOND, TW10 5DW

NEW
DOUBLE DENSITY
NOW AVAILABLE

Every week, more and more people like you are going to work with an Osborne® personal business computer.

Henry Ford revolutionised personal transportation.
Now Adam Osborne has done the same for personal
business computing.

Virtually everything you need in a personal business
computer, to enable you to work faster and better with words,
numbers and ideas, is included in a portable carrying case
you can take with you everywhere.

It's easy to learn, simple to use, and quickly becomes
indispensable.

One price, £1,375,* buys it all.

The Osborne is available from a computer dealer near you.
This week you could be going to work with an Osborne.



To the Osborne Computer Corporation (UK) Ltd., 38 Tanners Drive,
Blakelands North, Milton Keynes MK14 5LL, Bucks. Tel: (0908) 615274.
Telex: 825220

Please send me full details of the Osborne 1.

Name _____

Address _____

Company _____

Nature of Business _____

OSBORNE 1

PCW/1/83

The £1,375 suggested retail price for the Osborne 1 (a registered trademark of Osborne Computer Corporation) includes a full business keyboard, built-in CRT display, two built-in floppy disk drives, CPU and 64 kilobytes of RAM memory, RS-232 and IEEE 488 interfaces, and the following software packages: WORDSTAR® word processing with MAILMERGE® (a trademark and a registered trademark of MicroPro International Corporation of San Rafael, California); SUPERCALC® electronic spreadsheet system (a trademark of Sorcim Corporation); CBASIC® (a registered trademark of CompuLink Systems); MBASIC® (a registered trademark of Microsoft); and CP/M® (a registered trademark of Digital Research).
* Plus VAT.

OUT NOW! 585 IDEAS FOR YOUR COMPUTER

IDEAS BOOK

In the Inmac catalogue ideas book check to see what is in the latest issue for you:

Cables, cables and more cables! How to order custom-built cables. When to use screened cables. How to choose the right EIA RS232 extension cables for your VDU's and how to connect your *Apple* or other micros to *Qume*, *Diablo*, *NEC* printers. Compatible cables for connecting new peripherals to your *DEC*, *Data General*, *Hewlett Packard*, *TI* computers.

Lifetime Floppies Read about Inmac Plus—the floppy with a lifetime guarantee! Choose from our range of 100% error-free disk cartridges, 100% flag-free

disk packs, each with a 3-years replacement guarantee.

New Ideas! Dozens of exciting new products—many never seen in Europe before now—and lots of helpful hints on getting more from your computer department.

Service and Quality—a promise you can rely on! We promise a *next-day* delivery service of our products, a *30-days risk-FREE trial*, and a *12 months* hassle-free quality replacement guarantee.

Send today for your *FREE 2-year* subscription with no obligation to purchase—but be warned: we know you will want to buy once you have read the Inmac catalogue ideas book!



Free! If you use a computer.

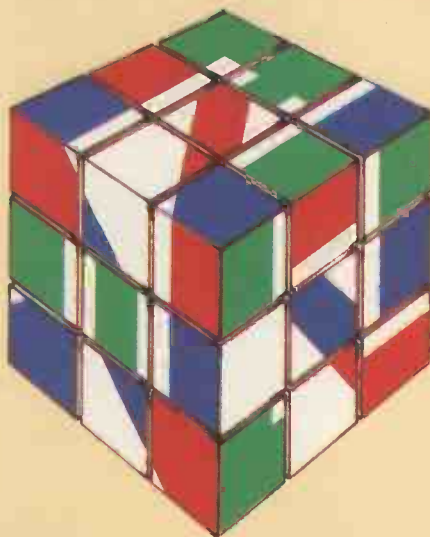


Ring Runcorn

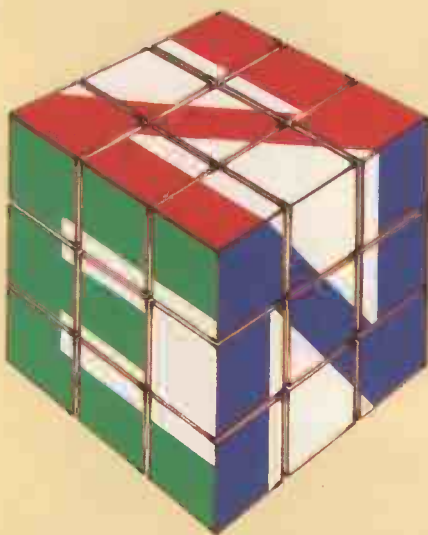
(09285) 64321

or send business card to Dept. 02
Inmac (UK) Limited,
18 Goddard Road,
Astmoor Industrial Estate,
Runcorn, Cheshire WA7 1QF

SOLVE THE "WHICH MICROCOMPUTER TO BUY" PUZZLE IN SIX EASY MOVES



1. 16 BIT MICROPROCESSOR
2. 128K RAM
3. DUAL FLOPPY DISKS
4. 12 INCH MONOCHROME VDU
5. MSDOS OPERATING SYSTEM
6. APPROXIMATELY £1400 (EX. VAT)



ZEN MICROCOMPUTERS LTD.

Please write for further details to:
ZEN MICROCOMPUTERS LTD, 5 ENGAINE, ORTON, LONGUEVILLE, PETERBOROUGH PE2 0QA

Name

Company

Address

Tel:

THE WORLD OF

BOS

BUSINESS OPERATING SOFTWARE

Choosing the right software... is the first and most important decision you have to make when choosing a computer.

Choose BOS, and you're choosing the most advanced business software for micro and mini computers available today.

BOS Reliability... BOS software has been tried and tested for over four years with 1000's of satisfied users all over the world—small firms, big businesses, DP departments, schools, accountants, doctors, solicitors and government departments. BOS software provides that assurance of maturity and reliability which no new software can hope to match.

BOS Portability... Now, for the first time, you can change or upgrade your computer and avoid the costs of software conversion. BOS software is equally at home working in single-user, multi-user or local networking mode and the unique BOS concept allows identical software to run on over 50 different computers including Apple II, Casu, Comart Communicator, DG Enterprise, DEC PDP-11 range, DMS 3/4, Durango, Equinox, IBM Series/1, IBM Personal, ITT 3030, MicroFive, Onyx, Panasonic, Northstar, Pertec, SD, Sharp PC3201, Sirius, Sord 223, Systime 500, Tandy TRS-80, TI model 1/2/4, Transdata, Trivector Triton 4, Triumph Adler 1600 range.

BOS Quality... Designed and built in Britain by top software professionals and accountants for use by British business, there is a fully integrated range of BOS software to match all your business needs.

Choose from:—

- BOS Sales Ledger**
- BOS Invoicing**
- BOS Purchase Ledger**
- BOS Nominal Ledger**
- BOS Inventory Control**
- BOS Payroll**
- BOS Fixed Assets**
- BOS AutoWriter**
- BOS AutoIndex**

BOS Nationwide Support... BOS software is written by MPSL, a world leader in microcomputer technology, and supplied and supported by over 50 selected independent BOS dealers throughout the country.

Remember, when you choose a computer, what you get out depends on the software you put in. So choose the best—choose BOS.

THE RIGHT SOFTWARE CHOICE

I'd like to know more about BOS software, BOS dealers and BOS compatible computers.

Name _____ Title _____

Company _____ Address _____

Telephone No. _____

Please return to David Blandford, Sales Director, MPSL, 87-89 Saffron Hill, London, EC1. Tel: 01-831 8811.

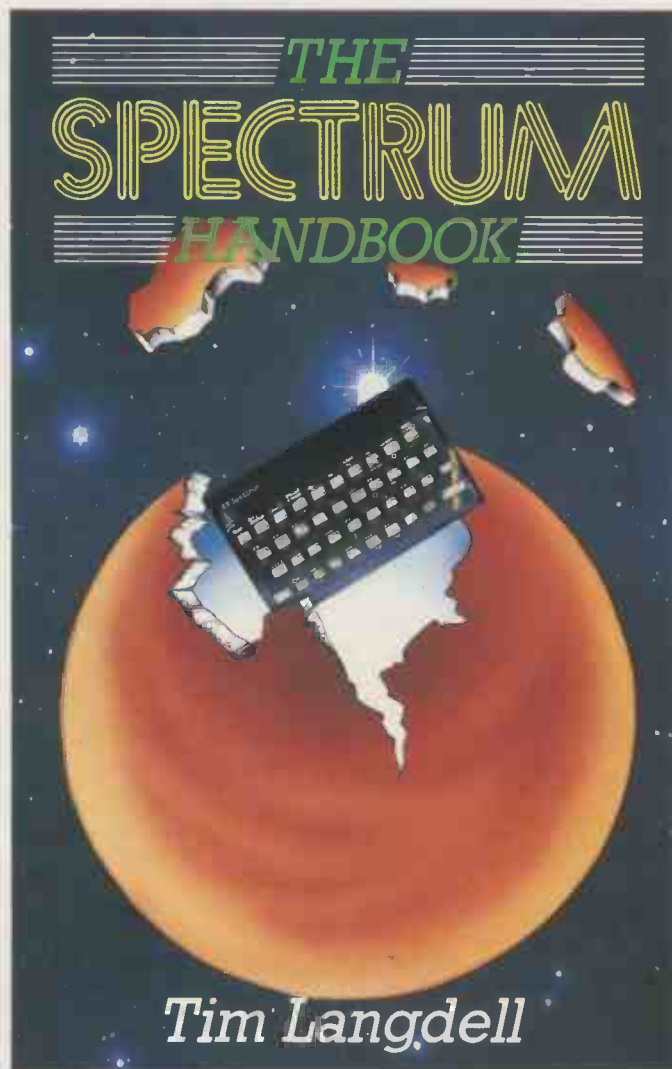
PCW 3

Personal
Computer
World

CENTURY

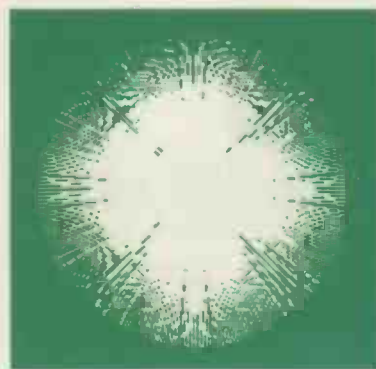
**A must for anyone who wants to take
their Spectrum to the limits – and beyond**

The Spectrum Handbook



The Spectrum Handbook offers its readers the opportunity of harnessing the power of the most exciting micro of the decade – The ZX Spectrum. Dr Tim Langdell believes that the machine's wide-ranging potential should be available to all Spectrum owners – not just those with previous computing experience. His step-by-step introduction opens the world of the Spectrum to beginners, whilst the wealth of hints and tips, exciting programs and comprehensive machine-code and applications chapters makes the book essential reading for even the experienced programmer.

**Contains more than 80 programs
224 pp £4.95 (paperback)**



This picture has been produced from a single line of Tim Langdell's *Spectrum Handbook*

*Available through bookshops everywhere.
Should you experience any difficulty please
fill in the order form below.*

ORDER FORM

To: Department 01C
George Philip Services Ltd
Arndale Road
Wick, Littlehampton,
West Sussex BN17 7EN

Please send me _____ copy/copies
of **THE SPECTRUM HANDBOOK**
by **TIM LANGDELL**
at **£5.45 per copy (post paid)**

I enclose my cheque/postal order for £
(Please make your cheque/postal order
payable to George Philip)

Name _____

Address _____

Please allow 28 days for delivery

CENTURY

DON'T WAIT FOR YOUR PRINTER ANYMORE

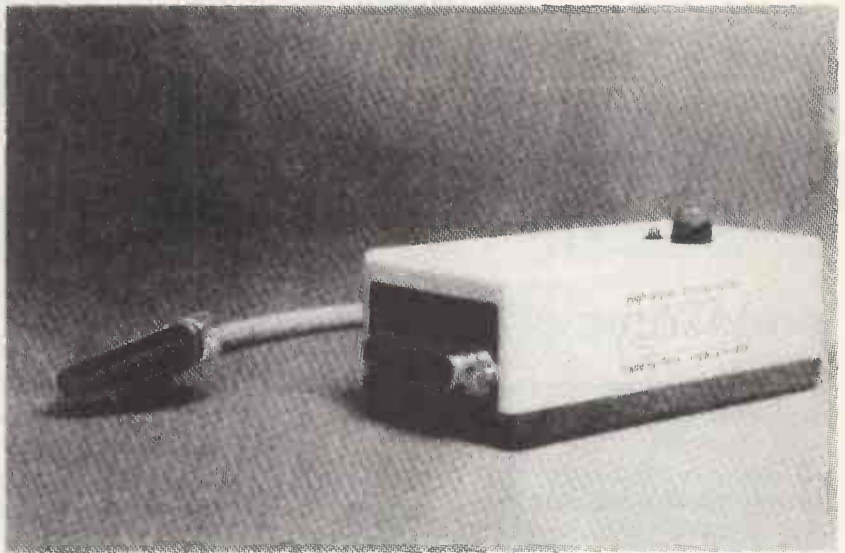
Now there is the R.A.L. Spooler!
This box takes up to 48K, (49000
Characters) in seconds and re-
leases your computer for further
input.

Up to 20 minutes of printing for a
Daisy type printer. Just plugs in
between your cable and printer.
Fully Centronics compatible!

You may use as many Spoolers
as you need, just chain them.

This 48K Spooler is fully trans-
parent, so there is no need to
change programmes.

No technical knowledge is
needed, it comes with its own
power supply, and we give a full
year (turn around) warranty.



48K SPOOLER £.119.00 +vat

Technical Information:

8 bit microprocessor, ROM, 48K
of memory, Centronics Parr. in-
out. Fully transparent. Own
power supply.

Price £ 119.00 + VAT incl. shipping in U.K.

U.K. order from : R.A.L. Microcomputers Ltd
P.O. Box 71, Guildford, Surrey
Send cheque or money order.

Cont. Europe : R.A.L. Microcomputers B.V.
P.O. Box 207, The Hague, Holland



WE MAKE PRINTING A PLEASURE!



Wiley Professional Software

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

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

BOOK/DISC COMBINATIONS

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

APPLE™ BASIC: DATA FILE PROGRAMMING SET

LeRoy Finkel & Jerald R. Brown

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

THE TRS-80™ MEANS BUSINESS SET

Ted G. Lewis

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

GOLDEN DELICIOUS GAMES FOR THE APPLE™ COMPUTER SET

Howard M. Franklin, Joanne Koltnow, & LeRoy Finkel

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

FAST BASIC: BEYOND TRS-80™ BASIC SETS

George A. Gratzner with Thomas G. Gratzner

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

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

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

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

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



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

PORTABLE MICRO'S

TAKING THE COMPUTER A STEP FURTHER

EPSON HX20

A computer small enough to fit into a briefcase yet with a full size typewriter keyboard, LCD virtual screen, printer and microcassette facility actually built in. High speed serial communication with other computers plus the Epson reliability - a world beater.

A FULL SIZE QWERTY KEYBOARD WITH 68 KEYS INCLUDING 5 FUNCTION AND 13 SPECIAL KEYS. LCD DISPLAY WINDOW SHOWING ANY 20 COLUMN BY 4 LINE PART OF A VIRTUAL SCREEN UP TO 255 CHARACTERS WIDE. 50 HOURS BATTERY LIFE WITH MAINS ADAPTER FOR OVERNIGHT CHARGING. BUILT IN PRINTER 5 x 7 MATRIX. 24 COLUMN WITH BIT ADDRESSABLE GRAPHICS. OPTIONAL BUILT IN MICROCASSETTE OR ROM PACK.

HX20UA PORTABLE MICRO UNIT WITH OPERATING MANUAL £402.00
HX20MC-SA MICROCASSETTE DRIVE £75.00



NEWBRAIN

You thought it would never arrive, but here it is with all those promises fulfilled. We never appreciated the full computing potential of the NEWBRAIN but suffice to say, it's a machine with a great future. We'll be able to tell you how to fully utilize the considerable power of the NEWBRAIN and take advantage of all that CP/M software.

THE NEWBRAIN IS A FULLY SPECIFIED PROFESSIONAL COMPUTER BUILT TO THE HIGHEST STANDARDS OF ENGINEERING AND RELIABILITY. CHOSEN BY LEADING OEM SUPPLIERS DESIGNED TO FACILITATE EASY EXPANSION FOR USE WITH THE CP/M OPERATING SYSTEM AND THE ADDITION OF 5 1/4" FLEXIBLE AND WINCHESTER DISKS; 12" GREEN PHOSPHOR PROFESSIONAL STANDARD MONITOR; 80 CPS PROFESSIONAL QUALITY DOT MATRIX PRINTER WITH PIN ADDRESSABLE GRAPHICS.

NEWBRAIN MODEL A £199.00
NEWBRAIN MODEL AD £229.00



HEWLETT PACKARD

HP75C A TOTALLY NEW PORTABLE PERSONAL COMPUTER.

An executive tool for the man in a hurry. 600 appointments can be held in memory. Never miss a board meeting or a birthday. In addition, - an impressive scientific aid to engineers and Scientists with magnetic card strips for handy programs and a magnificent BASIC.

HP75C SPECIFICATION 5" x 10" x 1" WEIGHING 26 oz. 16K RAM EXPANDABLE TO 24K. 48K OPERATING SYSTEM WITH 187 KEYWORDS AND FULL SCIENTIFIC BASIC. 8 BIT CPU. 32 CHARACTER LCD DISPLAY WITH SCROLLING TO 96 CHARACTERS; FULL INSTRUMENT AND PERIPHERAL CONTROL USING THE HPIL INTERFACE LOOP/30HR BATTERY LIFE WITH RECHARGER. 3 PLUG IN 16K ROM MODULES. A FULL REDEFINABLE TOUCH TYPE 'QWERTY' KEYBOARD WITH EDITING KEYS AND HIDDEN NUMERIC PAD. A BUILT IN PROGRAMMABLE ALARM/TONE GENERATOR AND APPOINTMENT CALENDAR. THIS IS ONE OF THE MOST COMPACT AND POWERFUL PORTABLES WITH HP'S SCIENTIFIC AND TECHNICAL BACKGROUND AND SUPPORT DOCUMENTATION. ITS POWER IS YOURS TO APPLY.

HP75C PORTABLE COMPUTER £728.40
HP-82700A 8K MEMORY MODULE £142.75



SHARP PC1500

This machine is the least expensive portable on the market. It is ideal for salesmen, contract engineers and anyone wanting to produce figures or small graphics for clients. Its 4 colour printer is a masterpiece of simplicity and it offers a medium speed BASIC for keeping standard programs in RAM. It is particularly useful for engineers who wish to do 'set calculations' on site and produce results on the spot. Great value for money.

WITH 16K BYTES OF ROM AND UP TO 11.5K BYTES OF RAM MEMORY, WITH BATTERY PROTECTION. UP TO 36 PROGRAMS STORAGE CAPACITY. BASIC PROGRAM LANGUAGE WITH TWO DIMENSIONAL ARRAYS AND VARIABLE STRINGS. QWERTY KEYBOARD WITH UPPER AND LOWER CASE. FULL RANGE OF SCIENCE AND MATHS FUNCTIONS (STATISTICS WITH MICROL SOFTWARE) ALARM CLOCK AND CALENDAR, MULTI TONE GENERATOR, MINI GRAPHIC 7 x 156 DOT MATRIX DISPLAY, ALL UNDER BASIC PROGRAM CONTROL. LINE WIDTH 26 CHARACTERS.

CE-150 FOUR COLOUR GRAPHIC PRINTER/TWO CASSETTE INTERFACE.

PC 1500 COMPUTER £147.78
CE150 PRINTER/TAPE INTERFACE £130.39
CE155 8K RAM MEMORY MODULE £69.52



Visit our Portable Micro Centre or contact us for further information.



Transam
Microsystems Limited

Telephone and mail orders accepted on Barclaycard or Access
All prices exclude carriage and VAT

59/61 Theobald's Rd. London WC1X 8SF. Tel: 01-405 5240/2113. Telex: 24224 (Ref. 1422).

For full proposed range of Portable Computers and typewriters, including the Osborne, Kaypro II, Teleram, Panasonic, Toshiba, Andromeda, Brother, Husky, please contact us for price and availability. Not all items are yet in production so it is best to telephone for delivery details.

THE PERSONAL COMPUTER WORLD SHOW COMES TO SCOTLAND



16-18 April 1983
in

The MacRobert Pavilion, Ingliston, Edinburgh

You heard how good the London edition of the show was in September? Well, it's coming to Edinburgh. Your chance at last to see more micros, software and peripherals than you could see in a year, without going South of the Border.

Micros for business, for the home, the trade and education . . . and experts on hand to answer your questions. Don't miss the first-ever Personal Computer World Show in Scotland. Especially if you're going to the Ideal Home Exhibition during holiday weekend. We're right next door!

Telephone Jenny King on 01-486 1951 for further details

OTHER-WORLDLY SOFTWARE **SOFTEK** AT DOWN TO EARTH PRICES

Imagine a program which instantly converts
SPECTRUM BASIC into Machine Code, and transforms
the **SPECTRUM** into a micro up
to 100 times faster than a BBC Model B...

48K ZX SPECTRUM COMPILER

METEORIOIS

This version has been hailed the best: 3 sizes of meteoroids, saucer, wrap-around screen, bonus ship at 10000 points, amazing explosions, rotate left/right, thrust, fire, hyperspace and shield. Full feature 'arcade' sounds and full colour. Works with Joysticks (from us at £19.50). Only £4.95 inc (16K or 48K).

SOFTIME

Amazing piece of machine code programming - produces a continuous real time clock on screen all the time - even when running/writing another program! Has alarm facility. For 16K or 48K, only £3.95.

SOFTEK SPECTRUM SOFTWARE

COMPILER

Benchmarks

	BBC	SPECTRUM (BASIC)	SPECTRUM (COMPILER)
BM1	1.0s	4.8	0.15
BM2	3.1	8.7	0.09
BM3	8.2	21.1	1.10
BM4	8.7	20.4	0.99
BM5	9.1	24.0	1.11
BM6	13.9	55.3	1.91
BM7	21.4	80.7	2.14

What the SUPER C compiler does is almost magical. It turns a program written in Spectrum BASIC into a machine code equivalent. SUPER C is child's play to use - simply type in a program as usual (or load from tape) and in a few key presses SUPER C turns it instantly into a super fast machine code version. It will compile virtually any Spectrum BASIC statement, plus a few features not available to you usually, but extra thought will be required for strings and floating point. There is no program you can write in BASIC which cannot be turned into a SUPER C version. However, enhancement packages will be available in the New Year to aid string handling, floating point, and will offer a host of other features - each for a nominal cost. With SUPER C your Spectrum will run faster than with either FORTH or PASCAL - and no new language to learn! SUPER C comes complete with extensive documentation, a manual written by Tim Langdell, example programs, and all boxed in a professional library case. Less than half the price of a compiler for any comparable micro, - £14.95 inc.

48K 30 MAZENTURE

A maze program and adventure in one. Amazing 'monster chase' animation and more than a hint of dungeons and dragons. 48K only. £5.95.

THE ZOLAN ADVENTURE

A full adventure crammed into 16K! Quite astounding how extensive and engaging this program is. £4.95.

Please rush me

Mr/Mrs

Address

or for INSTANT CREDIT CARD
order 7 days a week phone:
01-930 9232.

Send cheques or POs to:
329 Croxted Road, London
SE24. Tel: 01-674 4572

SOFTEK, SPECTRUM SOFTWARE

PETSPEED

FAST ENOUGH FOR THE HUMAN RACE

Our alien won't hang around for slow software. He wants crisp responses and really fast processing.

For the human race too, slow PET BASIC is not good enough. When we run a program, whatever it is, we want fast efficient action, on the bounce.

Petspeed can make any BASIC program run up to 40 times faster, including disk handling. We guarantee that PETSPEED is easier to use and generates faster code than any other PET BASIC compiler for Commodore Systems.

Using PETSPEED is about as simple as it could be. Just type in the name of your program, wait a few minutes and then watch your software run up to 40 times faster.

Petspeed is not simply a compiler, it contains a powerful OPTIMISER. While PETSPEED is compiling, it breaks your program down into tiny fragments and reassembles it removing the unnecessary and simplifying the complex.

Petspeed is fully compatible with PET BASIC and can compile any program.

Also available INTEGER BASIC COMPILER - 150 to 200 times the speed of Basic. Integer 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.

PETSPEED (8000 or 4000 series) £240

Also available for Commodore 64 & 720 machines

INTEGER BASIC (8000 or 4000 series) £165

SPECIAL OFFER: Petspeed PLUS Integer Basic for £320

Prices do not include VAT or postage and packing.

Write or phone today for a free copy of the 'Life in the fast lane' demonstration disk.



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





CRYSTAL RESEARCH LTD

XTAL BASIC 3

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

FEATURES

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

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



BBC FORTH

"rqFORTH" runs on BBC A or B and costs only £15, including its 70 page manual. It:

- * needs no added hardware;
- * runs up to 10 times faster than BBC BASIC;
- * includes full screen editor tailored for the BBCpu;
- * is FORTH-79 STANDARD and has fig-FORTH facilities;
- * provides 260 FORTH words;
- * is infinitely extensible;
- * allows full use of the MOS via its CALL & *MOS words;
- * provides recursion easily;
- * comes with a full 70 page technical manual;
- * is available NOW.

Price of £15 includes P&P/VAT

nascom

Extension Basic . £15/£30 ROM
Adds 30 new keywords to BASIC

Compression Assembler ... £12
Smaller source + higher speed

Q-DOS for G805 .. £25/£40 ROM

Asteroids m/c,g £7.90
Bomber m/c,g £4.90
Fantasy basic £5.90
Galaxy Invaders . m/c,g £5.90
Life m/c,g £5.90
Missile Defence . m/c,g £7.90
Nightmare PORK .. basic £4.90
Space Invasion .. m/c,g £6.90
Super Gulp eb,g £4.90
5-games Cassette . misc £5.90

P&P/VAT included. Most are OK with Nascom 1s (Nas-Sys/C.B).

Spectrum BBC nascom adventures

Colossal Adventure: The classic mainframe game "Adventure" with all the original treasures & creatures & 70 extra rooms.

Adventure Quest: Through forest, desert, mountains, caves, water, fire, moorland and swamp on an epic quest vs Tyranny.

Dungeon Adventure: NEW! The dungeons of the Demon Lord have survived His fall. Can you get to their treasures first?

Every Level 9 adventure is packed with puzzles and has over 200 individually described locations - a game can easily take weeks to complete! Only data and code compression allow so much to be provided.

Each adventure needs 32K and costs £9.90, including P&P/VAT.

Send order or SAE for catalogue, describing your computer, to

LEVEL 9 COMPUTING

Dept W, 229 Hughenden Road, High Wycombe, Bucks. HP13 5PG

ATOM

WAKE UP YOUR ATOM

A New book by Brian Lloyd. 20 great programs to make the most of your Atom, including the old or new colour board if fitted, plus copious programming tips. 128 pages £4.95

THE ATOM MAGIC BOOK

By Mike Lord. A wealth of games and other programs; storing speech in your ATOM, converting programs written in other BASICS, and many more useful software & hardware tips. £5.50

GETTING ACQUAINTED WITH YOUR ACORN ATOM

By Tim Hartnell & Trevor Sharples. 80 programs including draughts. £7.95

PRACTICAL PROGRAMS FOR THE BBC COMPUTER & ACORN ATOM

By David Johnson-Davies £5.95

RAM FOR YOUR ATOM (Or other 1MHz 6502/68XX machine)

16 or 32 Bytes; expand your ATOM to 28 or 38K RAM, ideal for Word Processing, Chess programs & Business software. To fit inside the ATOM or Eurocard rack mounting. Some types run from a single +5V supply. S.a.e. for details.

ATOM ROAM BOARD MZ165 £35.00 inclusive

Allows software switching between up to 3 utility ROMs and also 4K RAM fitted so you can load your own 'utility' programs from tape or disc. Simple plugs into sockets on ATOM board.

All prices inclusive of U.K. P & P & VAT where applicable. Overseas customers please add £1.50 surface mail.

TIMEDATA Ltd. Dept C

57 Swallowdale, Basildon, Essex SS16 5JG
Tel: (0268) 411125 (Mon-Fri)



TIMEDATA

TELEX!

FROM YOUR

OSBORNE 1



Commodore
version
soon

- AUTODIALLING
- WORDSTAR ORIGINATE
- STATUS REPORTS PLUS
- MULTIPLE SEND
- CONTINUOUS RECEIVE WITH OSBORNE DISCONNECTED
- BT APPROVED

Manufactured by a leading European Electronics group.

Subject to BT Regulations & charges. Eliminates need to pay for separate dedicated Telex terminal. No specialized operator required. Full support available. One year warranty. International Telex interface connections available. Regular telex destination numbers stored in memory.

Phone for details! TRADE & DEALER ENQUIRIES WELCOME

4Bmicrocentres Ltd.

North Bar, Banbury, Oxon. OX16 9TF Telephone (0295) 66555

COMPAS PASCAL



Fast. Compact. Interactive. COMPAS Pascal for your Z-80 based CP/M micro.

COMPAS is an interactive Pascal system for use on any Z-80 based microcomputer with CP/M*.

COMPAS is incredibly compact. In a single 16K byte program, **COMPAS** includes a native machine code compiler, an advanced onscreen editor, and all necessary run-time routines! This leaves you more free memory and disk space than any other Pascal system.

COMPAS compiles a large subset of Standard Pascal directly into native Z-80 machine code, at a speed of up to 5000 lines per minute on a 4MHz system! And a program written in **COMPAS** is 5 to 25 times faster than the same program in BASIC.

All major features of Pascal are supported by **COMPAS**, including INTEGERS, REALs with 11.5 significant digits, ARRAYS, RECORDs with variants, FILEs, and recursive PROCEDUREs and FUNCTIONs. Furthermore, many extensions are offered to give increased versatility, for instance STRINGs, random access data files, structured constants, in-line machine code, logical I/O devices, bit/byte manipulation, and program chaining with common variables.



Gemini Microcomputers

UK distributor:

Gemini Microcomputers Ltd.
Oakfield Corner, Sycamore Road
Amersham, Bucks HP6 5EQ
Tel: (02403) 28321 Tx: 837788

PolyData

Overseas distributor:

Poly-Data microcenter ApS
Strandboulevarden 63
DK-2100 Copenhagen O
Tel: 45 * 142 07 05

COMPAS is highly interactive. On finding an error during compilation, the compiler automatically invokes the on-screen editor and moves the cursor to the point of error, ready for immediate editing and recompilation.

COMPAS was designed with speed, efficiency, and ease of use in mind. **COMPAS** brings you the power of Pascal combined with fast compilation, high-speed execution, and easy editing and debugging. Let **COMPAS** show you the direct course to programming power.

Price £ 120.00 excluding VAT.

Dealer and OEM enquires welcome.

* **COMPAS** is currently available in Gemini, Superbrain, RML 380Z, Apple II 16-sector (SoftCard), and IBM 3740 8" disk formats. More formats are being implemented.

Please send me details of the **COMPAS** Pascal package.

Name: _____

Address: _____

Tel.: _____

PCW/1/83

Buy our
£475*

**Electronic Typewriter
and you have a
Daisy Wheel Printer
for your computer
absolutely FREE**



The T/Printer 35 is a superb portable typewriter that also doubles as a computer printer. It's the first electronic typewriter that's truly portable (it weighs only 17 pounds and is supplied with an ABS carrying case) and has all the features you'd expect of an electronic office typewriter. Except price.

Features include self-correction, dual function 100 character keyboard, triple pitch (10, 12 and 15 characters per inch), up to 12 in. wide paper—all with excellent print quality. And with Olivetti reliability.

Best of all, when you're finished using it as a typewriter, it's all set to go to work as a word processing quality computer output printer.

That makes the T/Printer 35 about the most versatile and cost effective piece of equipment you can buy. You get all the advantages of having a daisy wheel printer *and* electronic typewriter in a compact unit. And at one low price of £475*, including carrying case.

*The T/Printer 35 costs £475 with Centronics compatible parallel interface. With RS-232C interface it costs £535. Prices listed are exclusive of VAT.

DATARITE

Datarite Terminals Ltd
Caldare House
144-146 High Road
Chadwell Heath, Essex RM6 6NT
Tel: 01-590 1155

Buy our
£475*

**Daisy Wheel Printer
for your computer
and you have an
Electronic Typewriter
absolutely FREE**



The T/Printer 35 is the lightest weight and lowest cost daisy wheel printer you can buy for your computer. So it will fit within your budget and you can carry it wherever you take your micro. Yet it is tough enough to give years of reliable service. Interchangeable typefaces (standard Olivetti 100 character daisy wheels), variable pitch, multiple copies—all the features you would expect of more expensive word processing printers.

Yet the T/Printer 35 costs only £475 with parallel interface. Operating speed under computer control is approximately 120 words per minute of letter perfect output. What typist can equal that?

Then when you're finished using it as a computer printer, the T/Printer 35 is ready to go right on working as an electronic typewriter.

That's the dual-purpose T/Printer 35—the versatile computer printer that fits your budget.

Orders are shipped within the UK carriage-free. To order or for more information about the T/Printer 35:

DATARITE

Datarite Terminals Ltd
Caldare House
144-146 High Road
Chadwell Heath, Essex RM6 6NT
Tel: 01-590 1155

LONDON COMPUTER CENTRE



ACT Sirius 1

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

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

NEW

**Sirius
Hard Disk 10 Mb
Available Now!**

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

TELE-VIDEO SINGLE-USER TO MULTI-USER

NOW UPGRADED NO EXTRA CHARGE

802E 100K EXTRA DISK STORAGE
£2170

Superbrain compatibility
Faster disk access
Green Screen. True descenders
22 Function Keys
802DE 2 Mb Disk Storage £2295
802HDE 14 Mb Hard Disk 1
Mb Floppy £3990
806 6 User 10 Mb Hard Disk £4095
816 16 User 23 Mb Hard Disk £7385
800 64K User Station £1025

Prices above based on exchange rate \$2 = £

800 64 K user station £1025



CP/M Software

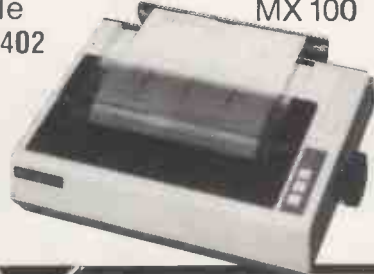
Wordstar £195
Spellstar £130
Grammatik £65
Foot Note £75
CPM/IBM £99
CPM/DEC £99
T Maker II £150
D Base II £395
Autocode £120
Milestone £195
Task £195

NEW

EPSON HX20
the Portable
Computer £402



Epson Type 3 MX 80/FT
MX 100



NEW

New Superbrain 2
from £1595
Dedicated Wordstar Keypad



AUTO SHEET FEEDER
£580

New! 12" Wide
Automatic
Sheet Feeder
fits all below



NEW

5Mb Hard Disk
Model 111 £995

Model I
48K System
2 Disk Drives
Green Screen
Complete £995

Model II
with TRS DOS
and CPM at
no extra charge
from £1995

Model III
16K £599
48K £649
48K with 2 disk
drives £1395



DAISY WHEEL PRINTERS LETTER QUALITY PRINTING



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

HARD DISKS

for Superbrain,
TRS 80 Model II, Apple

Model 6 6 Mb Formatted £1595
Model 12 11.5 Mb Formatted £1895

- * Specially designed Hybrid heavy duty power supply
- * Data Error Recovery



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

Demonstrations on all models.

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

The SHIVA Christmas Hamper

For the SPECTRUM

By Ian Stewart & Robin Jones

Easy Programming for the ZX Spectrum	£5.95
Computer Puzzles: For Spectrum & ZX81	£2.50
Machine Code and Better Basic	£7.50
Cassette: Spectrum Special 1	£4.95
By Martin Wren-Hilton	
Games to Play on your ZX Spectrum	£1.95

Normal
Published
Price

~~£22.85~~

£15.75
incl. p. & p.

For the ZX 81

By Ian Stewart & Robin Jones

PEEK, POKE, BYTE & RAM:	
Basic Programming for the ZX81	£4.95
Computer Puzzles: For Spectrum & ZX81	£2.50
Machine Code and Better Basic	£7.50
By Martin Wren-Hilton	
The ZX81 Add-on Book	£5.50

~~£20.45~~

£14.75
incl. p. & p.

Order the complete hamper and save yourself a packet!

Or make up your own with any 3 items for £10.50 (incl. p. & p.)

Offer open until 31st January 1983

All books and cassettes are also available individually at the normal published prices.

Hampers will be dispatched from 1st December onwards.

ORDER FORM

Please send me a SPECTRUM hamper, at £15.75

Tick here

Please send me a ZX81 hamper, at £14.75

I wish to make up my own hamper with the following, at £10.50

I wish to order 1 or 2 items only, at the normal published price:

£ _____

£ _____

NAME

ADDRESS

I enclose a cheque for £.....

Please debit my Access/Barclaycard/American Express

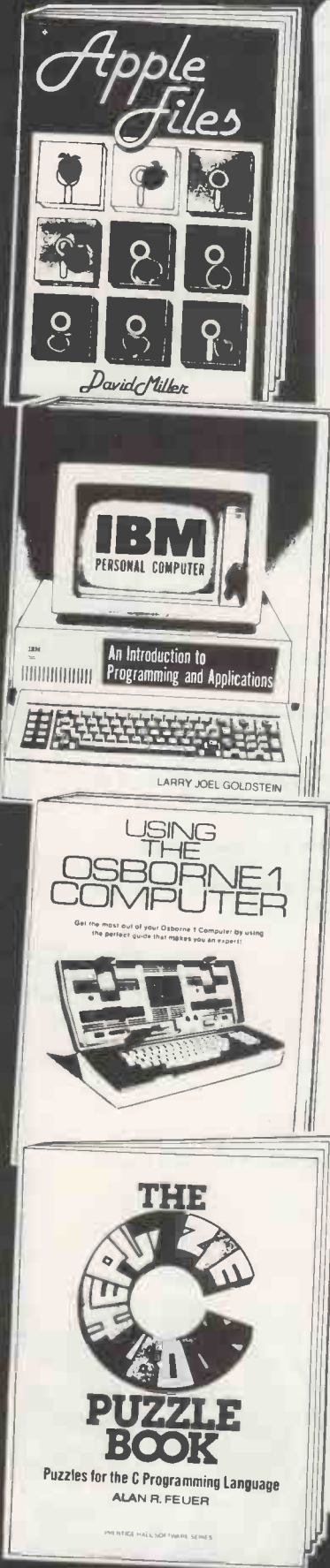
Account number

Signature

Shiva Publishing Limited
4 Church Lane, Nantwich, Cheshire CW5 5RQ
Telephone: (0270) 628272



NEW BOOKS from Prentice-Hall International



Apple Files

David Miller

A step-by-step guide for programmers with a knowledge of BASIC, this book shows you how to create your own files on the Apple. Sequential and random access files are explained with program examples from home, business, education and hobby applications. For advanced programmers the text includes up-to-date information on DIF files, EXEC files, Binary files, tape files and RWTS.

£11.95 420 pages 8359-0191-2

IBM Personal Computer

An Introduction to Programming and Applications

Larry and Martin Goldstein

For owners, users and potential buyers of the IBM Personal Computer, this book ranges from switching on the machine to programming in BASIC and applications in business, word processing, games and graphics.

£11.95 312 pages 89303-111-9

Using the IBM Personal Computer

T. G. Lewis

Topics covered in this handbook include word processing, spread sheet calculation and data management functions. The book provides a brief vocabulary guide, instructions for VisiCalc or SuperCalc, and programming tips with examples and illustrations.

£11.95 c. 250 pages 8359-8138-X
Due in January

Using the Osborne 1 Computer

T. G. Lewis

All the key operating functions are explained in this guide to uses of the Osborne 1 in word processing, programming and databases. A primer on BASIC, instructions for VisiCalc or SuperCalc, and illustrated information on using Wordstar, Easywriter and the CP/M operating system are included.

£11.95 224 pages 8359-8141-X

A UNIX Primer

Ann and Nico Lomuto

Written for the first-time user, this introduction stresses problem solving. Realistic case studies illustrate the subjects covered which include basic skills, efficient editing, advanced formatting features and advanced concepts.

£15.95 c. 272 pages 13-938886-9

The COMAL Handbook

Len Lindsay

Over 100 sample programs and procedures are provided in this guide to COMAL (acronym for Common Algorithmic Language), the language developed for use with Commodore products and CP/M based systems.

£10.35 c. 320 pages 8359-0878-X
Due in January

The C Puzzle Book

Alan Feuer

A workbook to be used with The C Programming Language (Prentice-Hall, £15.95), this book contains programs that explore many different aspects of the language, as well as guidelines for writing successful C programs.

£10.35 174 pages 13-109926-4

Implementing BASICs

How BASICs Work

William and Patricia Payne

The structure, functions and capabilities of the BASIC language are explained, as well as how to use the stack-oriented method to develop table-driven software. Specific techniques used in microcomputer language design and implementation are included.

£11.95 210 pages 8359-3044-0

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

Book Orders

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

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

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

Name _____

Address _____

I enclose a cheque/P.O. for £_____. Please add £1.00 per book for postage and packing. Payment should be made out to INTERNATIONAL BOOK DISTRIBUTORS. Please allow 28 days for delivery.

PCW1

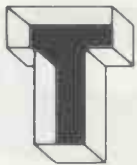
Prentice-Hall  International

SOFTWARE FOR CP/M®

HIGH QUALITY SOFTWARE - WITH HIGH QUALITY SERVICE

★ **NEW! 16 BIT SOFTWARE** • Wordstar £280 • Mailmerg £150 (£380 with Wordstar)
• CBasic - 86 £195 • Emulator 80/86 £115 • Ascom - 86 £100 • XLT - 86 £90 •

WORDSTAR - Professional word processing software. On-screen formatting, wordwrap, pagination, line and character count on view. Micro-justification on daisy-wheel printer. Search and replace. Block/paragraph manipulation. External file read/write. Background printing during editing etc.	£250	MICROSOFT FORTRAN COMPILER	£225
MAIL-MERGE - Powerful Wordstar enhancement for file merging and document personalisation.	£65	MICROSOFT COBOL	£330
DATASTAR Screen orientated system for Data Entry, Retrieval and Updating.	£175	MAGSAM - Versatile easy to use Keyed File Management System for Microsoft Basic or CBASIC.	£130
SUPERSORT - Sort, merge and selection program.	£125	CIS - COBOL - ANSII 74 Implementation to full level 1 standard. Supports random, indexed and sequential files, features for conversational working, screen control, interactive debugging, program segmentation etc.	£425
CONFIGURABLE BUSINESS SYSTEM (CBS) - Unique information management system with user definable files, powerful report generator, menu-driven for ease of use. No programming experience necessary!	£225	FORMS-2 - Automatic COBOL code generator for screen formats.	£100
ACCOUNTING PACKAGES by Median - Tec: PAYROLL, SALES, PURCHASE, NOMINAL Specially developed by UK software house to exacting specifications. Written in Microsoft Basic each package may be customised by end user, all are widely used. Ledgers are open item. Payroll caters for weekly and monthly pay.	£500 each	PASCAL-Z	£255
PROJECT COST CONTROL/JOB ACCOUNTING - A comprehensive set of programs to monitor budgets, account for expenditure and project completion etc. Ideally suited for contractors. Written in CBASIC-2.	£150	SUPERCALC FINANCIAL PLANNING SYSTEM	£165
STATISTICS PACKAGE - Over 25 routines including Regression & ANOVA	£100	CBASIC-2 - Extended Disk Basic pseudo compiler and run-time interpreter.	£75
MATHS PACKAGE - Over 40 easily used routines.	£100	THE FORMULA - unique system, report generator and database manager	£330
IBM - CP/M COMPATIBILITY - Powerful utility to transfer data to/from IBM machines in standard disk format.	£110	BSTAM - Telecomms facility for exchanging files between CP/M computers.	£110
MICROSOFT BASIC INTERPRETER	£155	ASCAM - Facility for communicating with other computers.	£95
MICROSOFT BASIC COMPILER	£205	TRANSFER - CP/M to CP/M file exchange - telecomms source code	£95
		MACRO 80 - Macro Assembler	£99
		CP/M 2.2 - Standard Version 8" Single Density.	£99
		Please contact us for availability of other products All orders must be PREPAID. Add £1 per item P & P (Minimum £2.00) and VAT CP/M is trade mark of Digital Research	



TELESYSTEMS LTD

P.O. Box 12, GREAT MISSENDEN, BUCKS, HP16 9DD

Telephone (02406) 5314



THE **ACT SIRIUS 1** WITH

JARMAN ACCOUNTING SOFTWARE

is available now from Logic Computer Systems

- Sales Ledger with Invoicing
- Purchase Ledger with Costing
- Nominal Ledger with Cash Book and Budgetary Control
- Payroll and Personnel Records
- Stock Control

Jarman high quality integrated accounting software, already available on other microcomputers, now realises the full potential of the Sirius 1.

For more information call us on (01) 222 1122 or 5492 to-day.

The only serious choice for business

LOGIC COMPUTER SYSTEMS

31 PALMER STREET, LONDON SW1H 0PR

(01) 222 1122 or 5492

LOGIC COMPUTER SYSTEMS specialises in the application of Microcomputers for business. Our services include systems development, installation, training and support. Please call for an appointment to discuss your requirements and to arrange a demonstration.

CONVERT YOUR ZX....

FULLER MICRO SYSTEMS ADD STYLE, POWER, VERSATILITY AND FULL TYPEWRITER KEYBOARD OPERATION TO ZX81 AND ZX SPECTRUM!



FULLER FD42 SYSTEM - The ideal Christmas Gift for ZX81 users!

The ZX81 is easily Britain's best selling small computer, and now costs an incredibly low £49.95. To celebrate this event, we are offering our equally popular FD42 system at an even lower price than before! It converts your ZX81 into a sturdy, attractive and professional unit, with full sized typewriter keyboard. **NOW ONLY £29.95** (plus £2.50 p & p)

ITS EVEN CHEAPER IN KIT FORM!

FD42 Keyboard and Case Kit _____ **JUST £24.95** (plus £2.50)

FD42 Keyboard Kit _____ **JUST £14.95** (plus 80p p & p)

OR WHY NOT BUY A COMPLETE SYSTEM!

If you are not lucky enough to already own a ZX81, an FD42 System, including computer, from us, and make an even bigger saving! ZX81, FD42 Keyboard and Case with power supply, reset switch, leads and manual - True Value £79.95.

SPECIAL OFFER £69.95 (plus £2.50 p & p)

FULLER MEMORY EXPANSION - a massive boost for your ZX81!

The basic ZX81 has only 1K of RAM - now you can add on an enormous 16K with our FD 16K Memory Module. FD 16K to mount on the back of ZX81 or Fuller Case.

FD 16K to fit inside Fuller Case, complete with RAM adaptor board. _____ **£24.95** (plus 80p p & p)

FD 16K to fit inside Fuller Case, complete with RAM adaptor board. _____ **£29.95** (plus 80p p & p)

FD 64K to fit inside case (incl RAM adaptor board) **£69.95**

FD 64K to mount on back of ZX81 or FULLER CASE **£64.95**

FULLER SOUND EXPANSION - a superb addition to your ZX Spectrum!

Clear, dynamic sound effects will really enhance your enjoyment of the new, exciting programs available for the sensational ZX Spectrum. Our new sound box comes complete with leads, volume control and loudspeaker. Just plug it into your MIC input, and it fits neatly onto the back of the Spectrum in a tough, plastic case.

_____ **JUST £6.95** (plus 80p p & p)

NEW! Programmable Sound Generator - adds exciting new sounds to the Spectrum range.

_____ **ONLY £19.95** (plus 80p p & p)

STOP PRESS! 16K Spectrum owners - upgrade to 48K with a Fuller Spectrum Upgrade Pack - complete with full assembly instructions. **£34.95** (Inc p & p)

FULLER ZX Spectrum Software

So little software is available for the Spectrum, you could count on Fuller to be one of the first! Star Trek, Flight Simulation and Death Star, all in attractively packaged cassette form.

_____ **£5.00** (plus 50p p & p)

FULLER FD SYSTEM for ZX SPECTRUM

COMPLETE SYSTEM for ZX SPECTRUM
£39.95
(plus £2.50 p & p)

Now, the famous FULLER keyboard and case unit has been adapted for Britain's fastest selling colour computer - the amazing ZX Spectrum! It has the same high standard as the ZX81 unit, a tough plastic case encloses the keyboard, Spectrum P.C.B. and power supply. The Keyboard has 42 keys including all the Spectrum graphic characters printed on to them, the full travel key switches have gold plated contacts and guaranteed life of 10⁶ operations.

IT'S SO EASY TO INSTALL! You simply unscrew the ZX P.C.B. from its case, screw it to the FD case, and plug in the keyboard. No soldering or technical knowledge required.

COMPLETE UNIT _____ **£39.95** (plus £2.50 p & p)

KIT FORM _____ **£33.95** (plus £2.50 p & p)

SPECTRUM MOTHERBOARD

Fits inside the Fuller case, allowing expansion to the ZX memory and I/O facilities.

2 SLOTS _____ **£15.95** (plus 80p p & p)

3 SLOTS _____ **£19.95** (plus 80p p & p)

SEPARATE SPECTRUM P.S.U.

9 volts DC at 2 amps.

Mains either 110v or 240v A.C. _____ **£5.95** (plus 80p p & p)

SPECTRUM PLUG PLANNER

A useful combination of 9v @ 2 amp power supply and three 13 amp sockets for computer and peripherals. Complete with 3 metres of cable and power jack

to fit Spectrum or ZX81. _____ **£18.95** (plus £1.00 p & p)



Mail to: **FULLER MICRO SYSTEMS**,
The ZX Centre, Sweeting Street, Liverpool 2.
Telephone: 051-236 6109

Please supply the following items:

ITEM	QUANTITY	PRICE	POSTAGE	TOTAL

I enclose cheque/p.o.

Or, please debit my Access/Barclaycard No. _____

Name _____

Address _____

Please send me further details, I enclose S.A.E.

P.C.W.1.83



THE
LATEST
 FROM THE
GREATEST



ACCOMEDIA LOCKABLE DISKETTE BOX

Designed and manufactured by ACCO, the UK brand leader in computer filing products.

- 60 disc capacity
- 5 1/4" + 8" disc versions
- Lockable hinged lid
- Full indexing

- ★ File them safely
- ★ Find them simply

Send for full details of this and other ACCOMEDIA/ACCODATA products.
 To Marketing Services Dept., Acco Company Limited,
 Bretton Way, Peterborough PE3 8YE
 Telephone : (0733) 264711

Name _____
 Company _____
 Address _____

 Telephone _____

ACCO, The Brand Leader No.1 in computer filing

Payroll & Accounting Software for 16 bit and 8 bit micros

Software systems for most business microcomputers including IBM Personal, Sirius and Rank Xerox

OPEN COMPUTER SERVICES

Aqua House Old Steine Brighton BN1 1EL

Tel. (0273) 672191

MIDAS S100 SYSTEMS

MIDAS 1 : From £895

MIDAS 2 : From £1,890

MIDAS 3D : From £3,100

MIDAS 86 — 16 Bit : From £3,520



- Our versatile **Z80** Microcomputers are available as standard units or custom configured to your exact specification from a comprehensive range of stocked **S100** boards.
- Disc storage capacity of the **MIDAS 3** can be 2M Bytes, expandable to over 80M Bytes with a Winchester Hard Disc Unit in our **MIDAS 3HD** range.
- **MIDAS** runs **CP/M** and **MP/M**. Other Software includes **M-BASIC**, **C-BASIC**, **FORTRAN**, **COBOL**, **CIS-COBOL**, and Word Processing.
A **MIDAS 3D** with 64K RAM and 2M Bytes on two 8" drives with two Serial I/O Ports and CP/M only **£3,100**
- Printers, VDUs and other peripherals stocked to give complete package system at keen prices.

BOARDS

We stock over 50 different S100 Boards all from quality manufacturers, such as Godbout, SSM, Micromation, Dual, Ithaca, Vector, S.D. Systems, Morrow, Pickles & Trout, etc.

PROCESSOR

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

EPROM

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

VIDEO BOARDS

24x80 I/O Drive
24x80 Memory Mapped

DISK CONTROLLERS

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

RAM

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

I/O BOARDS

2S/2P or 4S/2P or 3P/1S etc
A/D & D/A or 12 bit
IEEE 488 Interfaces

MISCELLANEOUS

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

MAINFRAMES

We are the sole distributor for Integrand Mainframes and Disc Enclosures, available in nine models including Desk Top and Rack Mounting, with or without provision for Disc Drives. All units totally enclosed, painted on all external surfaces and complete with power supply etc.

SOFTWARE

CP/M 1&2, MP/M, PL/1, C-Basic 2, M-Basic V5, XYBasic, Fortran 80, Cobol 80, Cis-Cobol, Pascal/Z, Pascal M/T, Forth, MAC, ZSID, Disassembler, Wordstar, Datastar, Wordmaster, Supersoft etc etc.

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

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

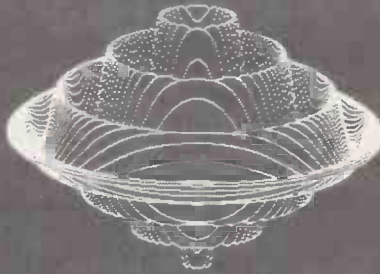
Write or phone for a catalogue.

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

COMPUTER AIDS

* INTELGRAPH *

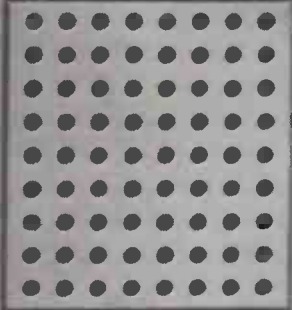
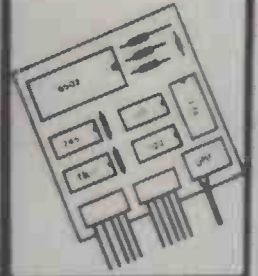
- * The New intelligent graphics card compatible with any computer with
- * A parallel or serial port.
- With the on board processor in command stunning displays can be achieved via a simple data transfer
- * 28 commands at your finger tips.
- Draw plot arc (circle, ellipse)
- User defineable characters
- Character expansion x1 to x5
- Scrolling windows, full cursor control to name only a few
- * 512x256 hi-resolution graphics
- * 80x25 text freely mixed with graphics
- * Video and RF TV output
- * Serial RS232 20 MA TTL 55-19200 Baud
- * Parallel input/output
- * Single 5V supply (+ - 12V for RS232)
- PCB + manual + 8K Eprom £55.00 inc
- 8K Assembled £130.00 inc
- 16K Assembled £150.00 inc
- Serial option £17.50 inc
- Parallel option £4.00 inc
- High bandwidth modulator £6.00 inc
- Postage and packing £2.50



33 BEARSDEN CRESCENT,
HINCKLEY, LEICS

Tel (0455) 634255

Computer Aids



You'll be glad you chose a personal computer with power enough to grow with your needs.



The ICL Personal Computer with power to grow as you need it.

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

The new ICL Personal Computer gives you more.

It's a versatile, professional personal computer. It can start with a single Visual Display Unit, naturally, and it has a wide range of functions to meet your increasing requirements. And it can grow larger than most other personal computer systems, because its capacity for additional hardware is greater.

Starting at £2,895 with one VDU

The ICL Personal Computer provides a range of options enabling you to

have a system tailored to meet your changing needs.

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

Wide range of integrated accounts and other application software available, providing limitless possibilities.

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

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

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

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



Johnson microcomputers

Johnson House · 75-79 Park Street · Camberley · Surrey
Telephone 0276 20446

Robophone Answering 24 hrs. Prestel page No. 200632

Mailbox No. 027620448

48 Gloucester Road · Bristol · Telephone 0272 422061
113 Stratford Road · Shirley · Birmingham B90 3AY
Telephone (021) 745 3246

G. W. COMPUTERS LTD

LONDON'S WEST END - NATIONWIDE OVERNITE SERVICE
 MORE PRODUCT RANGES - BETTER SERVICE
 PROBABLY THE WIDEST SELECTION OF NETWORKS... MICRO...
 AND PRINTERS ON DISPLAY NATIONWIDE

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

MBasic & word-star compatible
 1400 character record sizes
 mathematical scratchpad
 record relational indexes
 translatable to any language
 User-definable reporting
 field protection/classification
 sorts 'alpha or numeric' any window
 either-or, same as, greater, smaller

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

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

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

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

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

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

The record may look like this:

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

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

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

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

MICRO-COMPUTERS

G.W.L.	- G80 64K/INTFCE PORTS/K'BOARD	795.00
	- G80 V.D.U.	150.00
	- G80 DUAL D/DRIVES ENCLOSED	550.00
INTERTEC	- SUPERBRAIN 64K RAM/320K DISKS	1695.00
	- SUPERBRAIN 64K RAM/700K DISKS	2195.00
	- SUPERBRAIN 64K RAM/1.5M DISKS	2595.00
	- SUPERBRAIN 64K RAM/10M DISKS	call.
	- COMPUSTAR 64K RAM/OK DISKS	1495.00
	- COMPUSTAR 64K RAM/320K DISKS	1995.00
	- COMPUSTAR 64K RAM/700K DISKS	2495.00
	- COMPUSTAR 64K RAM/1.5M DISKS	2895.00
NORTH STAR	- ADVANTAGE 64K RAM/700K DISKS	£2095.00
	- ADVANTAGE 64K RAM/5.3M DISKS	£2995.00
	- HORIZON 64K RAM/700K DISKS	1950.00
	- HORIZON 64K RAM/3M DISKS	3595.00
	- HORIZON 64K RAM/18M DISKS	4595.00
TELEVIDEO	- 800 64K RAM/OK DISKS	1195.00
	- 802 64K RAM/700K DISKS	1995.00
	- 802H 64K RAM/5.3M DISKS	3250.00
	- 806 64K RAM/10M DISKS	4595.00
	- 818 256K/750K DISKS	£2950.00
	- SIRIUS 1 128K/1.2M DISKS	£2395.00
ACT VICTOR	- 9000 128K/1.2M DISKS	£2395.00
OSBORNE	- 1 64K RAM/200K DISKS	1250.00
IBM	- PC 64K RAM/640K DISKS	£2695.00
	- PC1 330K/640K DISKS	£2995.00
PET	8032 32K RAM	795.00
	8050 1 MEG DISKS	795.00
	64 CPM PERSONAL COMPUTER	call.
APPLE	II 64K RAM	675.00
	III 128K/143K DISKS	2095.00
ALTOS	AC5800-2 64K RAM/1M DISKS	1995.00
	AC5800-10 208K/10.5MEG DISKS	5495.00
NEC	PC8001/12 64K RAM/350K DISKS	1695.00
	APC 128K RAM/2M DISKS	call.
	CONCEPT 16 BIT PC	call.
CORVUS	G80 64K RAM/320K DISKS	1350.00
SANYO	G81 64K RAM NETWORKER	1250.00
ABC	24 64K RAM/700K DISKS	2195.00
	26 64K RAM/2.2M DISKS	3250.00

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

SYSTEM DEALS

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

and get completely ****FREE****
 cpm handbook .. 50 basic exercises .. 2000 sheets paper
 DBMS III .. magic wand w/proc .. magic calc
 mbasic 80 .. diagnostics .. most/dsort
 recover .. autoload .. instant basic
 cbasic .. disk/games .. library case
 ****total value 1480.00****

Buy a system including a hard disk and get FREE
 the G80/86 software packages value 690.00 also

PRINTERS

OKI	- MICROLINE 80	295.00
	- MICROLINE 82A	395.00
	- MICROLINE 83	695.00
	- MICROLINE 84	895.00
EPSON	- MX80/FT-3	375.00
	- MX100/FT-3	495.00
ANADIX	- DP 9000	895.00
	- DP 9501	1045.00
	- DP 9501 (A)	1145.00
QUME	- 9/45 R/O	1695.00
	- 9/65 R/O	1795.00
	- 9/35 R/O	1495.00
NEC	- 3510 R/O	1395.00
	- 7710 R/O	1795.00
	- 5520 KSR	2250.00
DRE	- 8820	1295.00
	- 8830	1695.00
TEXAS	- 810	1295.00
	- 825	1395.00
DIABLO	- 630	1695.00
RICOH	- RP1600	1495.00
OLYMPIA	- ESW 103 14 CPS	975.00
	- ESW 777 55 CPS	1025.00

PERIPHERALS & ACCESSORIES

CORVUS	- 6 MEG HARD DISK	1850.00
	- 11 MEG HARD DISK	2950.00
	- 20 MEG HARD DISK	3950.00
	- MULTIPLEXOR 7 STATION	695.00
	- MIRROR BACKUP CARD	695.00
INTERTEC	- COMPUSTAR 10 MEG HARD DISK	2950.00
	- CDC 96 MEG HARD DISK	7950.00
N*STAR	- 16 BIT U/GRADE	325.00
	- 18 MEG HARD DISK	2995.00
RODIME	- 6 MEG HARD DISK	1495.00
	- 12 MEG HARD DISK	1950.00
	- 26 MEG HARD DISK	3295.00
MORROW	- 5MG FIXED/5MG REMOVEABLE DISK	3295.00
GENIE	- 5-SIDED FLOPPY DRIVES	150.00
CDC	- D-SIDED FLOPPY DRIVES	225.00
	- D-SIDED D/TRACK DRIVES	375.00
MEMOREX	- SOFT HARD S/SIDED DISKETTES (10)	30.00
SCOTCH	- 104/2D DOUBLE SIDED (10)	50.00
S.B.E.	- SOFTBOX PET TO CPM (tm)	495.00
	- SIRIUS 8/16 BIT 5MHZ CARD	365.00
QUADRAM	- 64K PRINT SPOOLER/COPIER	250.00
BIZCOMP	- RS232/AUTO-MODEM 1200 BAUD	450.00
AST	- PORT EXPANDERS (4 TMNLS TO 1 PRT)	395.00
GIX	- PORT EXPANDER (SWITCHER)	95.00

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

SOFTWARE

G.W.L.	- BUS V8.00 (ACCOUNTS)	575.00
	- DBMS II (DATABASE)	£395.00
	- DBMS II (BY MAIL ORDER ONLY)	£250.00
	- DBMS III (DATABASE)	£575.00
	- DBMS III (BY MAIL ORDER ONLY)	£295.00
	- DSORT & MSORT (MBASIC FILES)	£75.00
	- SALES LEDGER	£95.00
	- PURCHASE LEDGER	£95.00
	- NOMINAL LEDGER	£95.00
	- STOCK-CONTROL	£95.00
	- ADDRESS-MAILER	£95.00
	- QASORT/QNSORT (500 RECS/14SEC)	£95.00
	- AUTOLOAD & RECOVER	25.00
MICROSOFT	- MBASIC 80	£150.00
	- FORTRAN 80	200.00
	- COBOL 80	320.00
	- BASIC COMPILER	£190.00
	- MU LISP/MU STAR	95.00
MICROPRO	- WORD-STAR	£250.00
	- MAIL-MERGE	£55.00
	- SPELLSTAR	100.00
	- DATASTAR	170.00
	- SUPER-SORT	120.00
	- W-STAR/M-MERGE/SP-STAR	350.00
BYROM	- BSTAM (COMMUNICATIONS)	75.00
	- BSTMS (TELE-COMMS)	85.00
DIGITAL	- DESPOOL	30.00
	- CBASIC	75.00
	- PASCAL MT	225.00
F.OELLER	- QUICKSCREEN	95.00
LEXISOFT	- SPELLBINDER	195.00
LIFEBEAT	- T/MAKER	155.00
M'FOCUS	- CIS COBOL	420.00
	- FORMS II	100.00
SORCIM	- SUPER CALC	185.00
	- PASCAL M	250.00
STANDARD	- QUIC-N-EASY	195.00
PEACHTREE	- MAGIC WAND	190.00
	- MAGIC CALC	175.00
S'SOFT	- DIAGNOSTICS	50.00
N'WEST	- STAPAK	250.00
OASIS	- THE WORD	35.00
ITHACA	- PASCAL Z	100.00
MICROSTUFF	- CROSS-TALK (TELE-COMMS)	95.00
WOOLFE	- MOVE-IT (MICRO TO MICRO)	45.00

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

TERMS & ETC

G. W. Computers Ltd [Grama (Winter) Ltd]
 55 Bedford Court Mansions
 Bedford Avenue
 London WC1 England.
 Tel: 01-636 8210, 01-631 4818. Telex: 892031 TWC G
 Boston office telex: 94-0890

24 hour answerphones - leave address for autopacks

We do not operate a reader's reply card service.
 Terms: C.W.O. or C.O.D. Prices exclude VAT.
 No dealers. The above lists are not exhaustive.
 Please call in only by prior appointment.

G80/86 SOFTWARE

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

Works on IBM, Sirius and
Victor 9000

and all micro-computers in our price list

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

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

Consider the advantages in these features. The user manual is contained in FIVE pages. All reports are generated by robot functions. Reliability tested (benchtest PCW June). Works in a network multi-user environment. Fast easy data entry. Files are re-organised and sorted automatically. Produced by the same people that originated 'BUSINESS' 'DBMS II', 'DB-CALC', 'AUTOLOAD AND RECOVER' 'ETC' and sold successfully over the past five years.

Also see our advertisement on previous page, the software above comes free with a system purchase. (excluding items marked ** and DBMS III)

THE G80/86 NETWORKS

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

1 hard-disk of 5 mbytes.	1 multiplexor	1-2 stations
2100.00	695.00	from 795.00

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

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

IMAGINE EVENTUALLY BEING ABLE ...

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

Enter **virtual console 0** and telephone your head-office to call all yesterday's ledger files and store them locally on your hard disk. Now switch to **virtual console 1** and while console 0 runs concurrently for about an hour, get a 1000 mail-shot running to the daisy printer.

Now switch to **virtual console 2** and while consoles 0/1 run concurrently, get the 'robot task' of producing a stock-re-order report out to the fast dot matrix.

Now switch to **virtual console 3** and while consoles 0/1/2 console run concurrently, do some programming, or file-re-organising, or any other task you might require.

Four virtual computers all running concurrently on one computer, batch processing to various devices or else queue-spooling their output through print buffers of up to 500k storage and spreading the load through time on fewer printers.

ZX81



High
Resolution
Graphics
£32

- * Stylish case fits neatly between ZX81 and Ram pack of 8K or more.
- * 256 x 192 pixels
- * Hi res display file independent of old display file.
- * Very fast and powerful graphics commands as extensions of Sinclair basic: SLOW / FAST CLS COPY PRINT PLOT all extended to hi res.
- * 114 PLOT modes including:
 - Points and various line types
 - Textured triangle fill
 - Absolute and relative co-ordinates
 - Line drawing to points off screen
- * Mixed text and graphics including PRINT at graphics cursor.
- * User defined graphics for space invaders etc
- * Screen COPY to printer
- * Extensive manual, excellent for school and home use, and full guarantee.
- * Arcade games available soon!

Post to:- Notting Dale Technology Centre (Ltd)
T.F.L. (ZX 81)
189 Freston Road
London W10 6TH (01-969 8942)

Please send me board(s) @ £32.00 each
+ £4.80 VAT plus 75p P&P

I enclose Cheque/P.O. for
Or I wish to pay by Access/barclay Card/Visa.

Card Number

Name and Address (PRINT)

Name

Address

Credit card holder's signature.

PLUTO

INTELLIGENT COLOUR GRAPHICS

Pluto provides YOUR machine with a high quality Colour Graphics Display.

Meet the Family:-

BABY PLUTO ... 320(H) x 288(V) x 8 Colour. 96K bytes of memory to provide two full screen buffers.
PLUTO..... 640(H) x 288(V) x 8 Colour. 192K bytes of memory to provide two full screen buffers.
Double resolution option. 640(H) x 576(V) x 8 Colour. Software selectable between 288(V) & 576(V).
Start with Baby and then Upgrade!

Pluto uses the latest technology to provide unprecedented performance and reliability on a single PCB.
Pluto may be readily connected to most Computer Systems or plugged straight into an 80-BUS or NASBUS.

Look at what Pluto offers:-

- 16 bit Intel 8088 microprocessor.
- 192K bytes of dual-ported display memory for fast flicker-free screen updates. (*Outside the host address space*).
- Fast parallel I/O interface usable with ALMOST ANY COMPUTER.
- Operates from a single +5v supply. .

Here are just some of the high level functions that Pluto provides:-

- Fast vector draw – over 100,000 pixels/sec. Lines can be drawn using REPLACE, XOR, AND, OR functions.
- Built-in character set providing an 80 x 28 character display.
- User definable characters or symbols.
- Spare display memory with memory management facilities for allocating symbol storage space or workspace.
- Rectangle Fill and Copy using nine logic functions.
- Fast access to single pixels.
- Write protected memory planes during copy.
- Double buffered screen memory for animated displays.
- Complex polygon colour fill.

New ROM now available with 25 extra commands including:-

- Arc and Circle Drawing
- Dotted Lines and Arcs
- Shape rotation through multiples of 90*
- Unique patterned fill functions

Pluto is **THE** OEM choice for quality graphics.

Pluto is **expandable**. Available very soon is an expansion board enabling **Pluto** to display 256 colours simultaneously from a very large palette for producing high quality shaded images.

Pluto prices:-

PLUTO	£399.00 plus VAT
DOUBLE RESOLUTION OPTION	£50.00 plus VAT
8MHz PROCESSOR OPTION (60% speed improvement)	£50.00 plus VAT
NEW ROM	£60.00 plus VAT
PLUTO MANUAL	£6.00 plus VAT

Dealer and OEM enquiries invited.

 **research ltd.**

6 Laleham Avenue · Mill Hill · London NW7 3HL
Telephone: 01-959 0106

URMSTON COMPUTER CENTRE

(1 mile from M63)



SHARP

P.C. 1500
MZ 80A
MZ 80B
and peripherals
in stock

Call in for a demonstration

SOFTWARE: MZ 80A/K

Books for many popular computers

*(we don't employ salesmen
just computer engineers!)*

**URMSTON COMPUTER CENTRE
BAR INSTRUMENT CO. LTD**

124 Flixton Road, Urmston, Manchester
M31 3BG

Telephone: 061 747 4626

filemaster

VERSATILE FILE HANDLING FOR TR880 & GENIE

- * 9 fully definable variable length fields - up to 45 ch.
- * PLUS a comment field of up to 192 characters
- * user determined record length
- * handles files with several thousand records
- * field lengths can be changed during editing
- * random access of records from disk with automatic updating
- * sequential access of records from disk with automatic updating
- * backward or forward listing for random accessed files
- * alphabetically sorted index automatically created
- * 3 searching options
- * 4 totalling options
- * 5 listing options
- * 10 formatting options
- * fast machine code sort - no key files
- * full listing options for sorted file without saving to disk
- * comprehensive formatting of records for display and printing
- * automatic display and print option
- * single key print option for a displayed record
- * user defined pause option during printing
- * files may be extended or merged
- * extensive status prompt includes date of last change
- * user friendly prompting avoids distracting menus
- * overlay techniques provide maximum use of memory
- * fully compatible with single or multiple drive systems
- * plain language instruction manual
- * £45.00 + P&P - for full information send s.a.e. to:

THOMASON ASSOCIATES 2 Honiton Way, Bedford MK40 3AN

A.C.G.

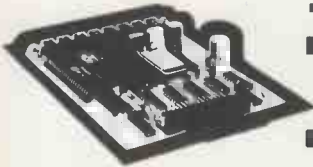
ASHBY COMPUTERS
& GRAPHICS LTD -

PRINTER BUFFERS

- AT UNBEATABLE PRICES!

New RS232 serial Printer Buffers, that plug directly into your EPSON matrix printer, without modification!

- Baud rates from 50 to 19,200
- Odd/Even or no parity
- 7 or 8 bit word length
- 1 or 2 stop bits



■ **EB16** 16K plug in printer buffer,
£94.95 plus V.A.T. FROM A.C.G.

■ **EB60** A MASSIVE 60K bytes of
plug in printer buffer,
£139.95 plus V.A.T. FROM A.C.G.

(Approx size EB16 - EB60, 100mm x 130mm)

New STAND ALONE RS232 printer buffers

- Baud rates from 50 to 19,200
- Odd/Even or no parity
- 7 or 8 bit word length
- 1 or 2 stop bits



■ **SB16** 16K stand alone printer buffer,
£149.95 Plus V.A.T. FROM A.C.G.

■ **SB60** 60K stand alone printer buffer
£189.95 plus V.A.T. FROM A.C.G.

(Approx size SB16 - SB60, 130x70x218mm)

12 THE GREEN, ASHBY-DE-LA-ZOUCH
LEICESTERSHIRE. LE6 5JU. TEL (0530) 411485

SOFTWARE Try before you Buy

If you need software on a trial or short-term basis - you need ATLANTA RENTALS.

Famous names in our huge library of software include all Visicorp products, Micromodeller, Desktop/Plan, Microfinesse, Microplanning, TABS, Padmade, Wordstar, Cardbox, Format-80, dBase II etc, etc.

We also provide the hardware - Apple II and Apple III, Sirius 1 and now the IBM, plus top quality printers, monitors, hard and floppy disk drives, sheet feeders, line plotters and all peripherals to complete the rental picture.

No capital expenditure, no membership nonsense, and no waiting. Fixed charges, full support and friendly people.

Rental hotline 01-729 1411

Atlanta Data Systems

350/356 Old Street, London, EC1V 9DT. 01-739 5889

* Business purposes only

Reliable hardware alone is not enough

Today's micro-computers are extremely efficient business machines with large information storage capabilities and amazing computing speeds. However, the quality of the output is only as good as the software input. With a Toshiba T-200 micro-computer not only will you have a high quality computer but also you will have a range of software available to you that will meet virtually any business need from single and double entry book-keeping, invoicing, wages and salaries, inventories. Both in our own highly efficient Toshiba business BASIC and in the wealth of software available with CP/M.*

The T-200 has yet more trumps in its hand. It's well styled, manufactured by one of the world's most substantial technology operations with a heavy R and D commitment and a proven success in the home, office and industry.

When you buy a Toshiba T-200 you also get the finest back-up from the largest business equipment retailer in Europe with our own 120 outlets throughout the UK. So wherever you are back-up and help is not far away.

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

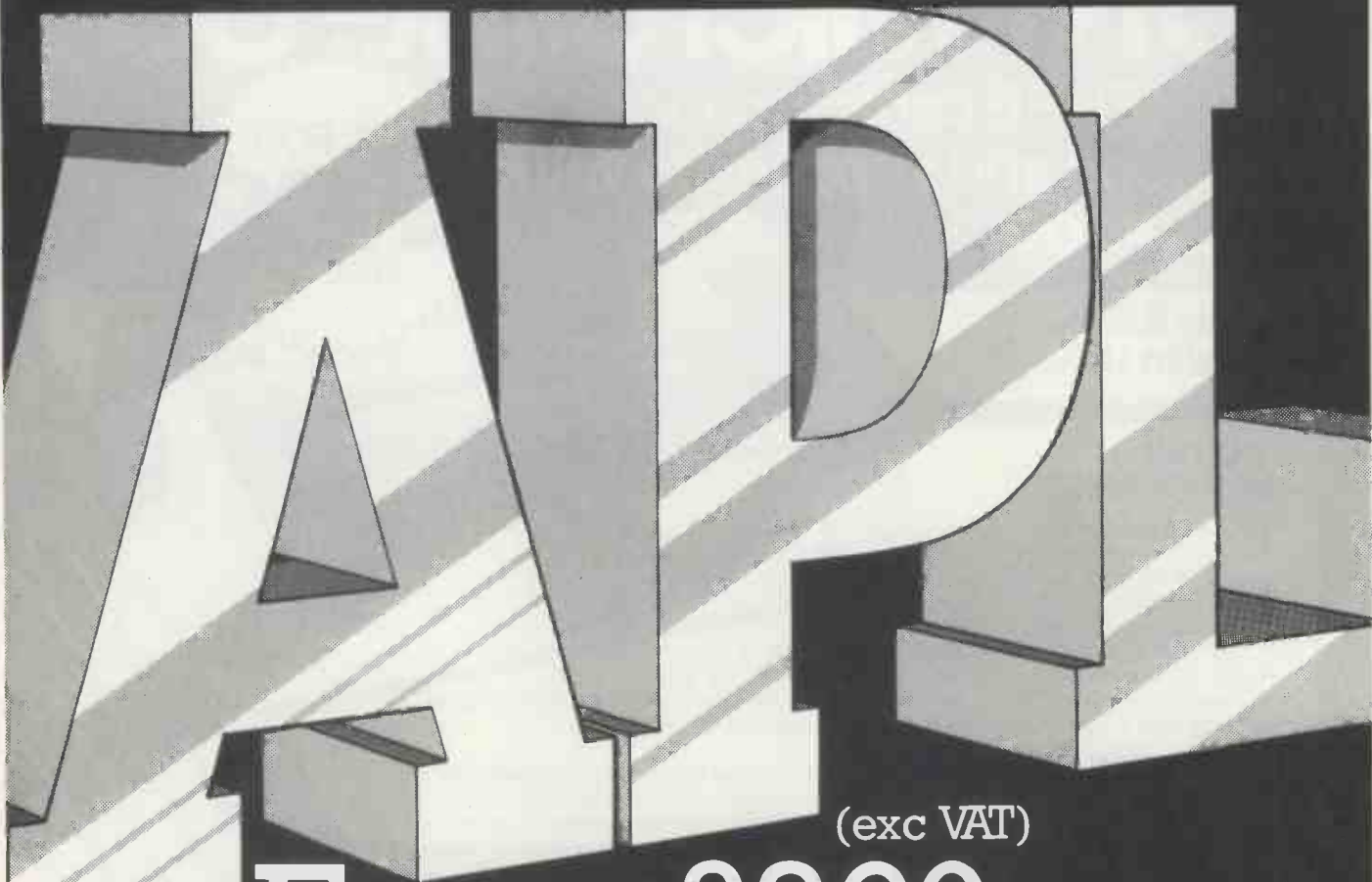
**Toshiba micro computer
T-200 from £ 2400,-**



	Office International
	International House Windmill Road, Sunbury Middlesex, TW 16 7HR Tel: Sunbury 85666
Send for more details today.	
<hr/>	
Name	
<hr/>	
Address	
<hr/>	
Tel.	

TOSHIBA
... in touch with tomorrow

NOW YOU'RE TALKING



(exc VAT)

From £360

with VIZ::APL and your Micro

- VIZ::APL will run on most Z80 based micros with diskette storage.
- VIZ::APL gives your Z80 micro IBM 4300 capabilities.
- VIZ::APL is based on the IBM APL programming manual (GC26-3847-2) and the proposed ANSI standard.
- VIZ::APL enables you to run a megabyte of work space on a micro.
- VIZ::APL can be learnt quickly – programmers can be productive within days.
- VIZ::APL can cut systems development costs by up to 70% or more.
- VIZ::APL comes complete with conversion keytops, character generation EPROM's and self tutor text.
- VIZ::APL utilities include Graphics, Prestel Interface, a Reporting Language, a File Handler and Communications Driver.

- VIZ::APL is now available from Berisford Information Technology Ltd – fill in the coupon for further details or call Patrick McVeigh 01-481 9144.



BIT

Berisford House
50 Mark Lane
London
EC3R 7QJ
01-481 9144

To Berisford Information Technology Ltd.

Please supply further details on

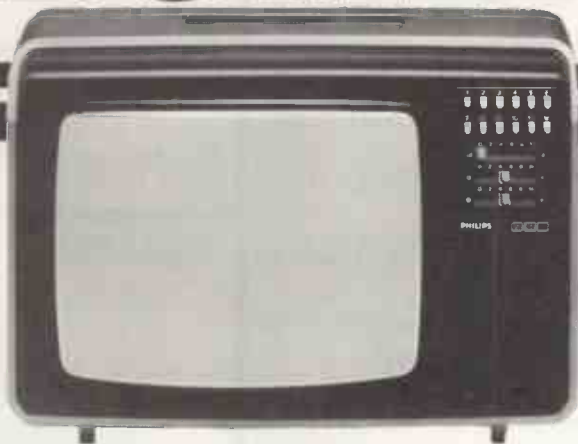
- Berisford Information Technology
 VIZ::APL

Name _____

Company _____

Address _____

Cumana drives BBC Micro best!



The 'ice on the cake' is that, because the Cumana Drive has its own power supply, it can be used with many other Micros when connected via the appropriate cable. Cumana supply a Drive connecting cable which has a standard 34 way edge connector plus 34 way BBC connector in the same cable length. This allows the Cumana Drive to be connected to numerous makes of micro without the need to change connecting cable. And the Japanese manufactured disk drives are quiet and utterly dependable.

CS50A	Single sided 40 track TEAC drive in a cabinet with own power supply 100K	£199
CD50A	2 single sided 40 track TEAC drives in a cabinet with own power supply 200K	£369
CS50E	Single sided 80 Track TEAC Drive with cabinet and own power supply 200K	£265
CD50E	2 single sided 80 Track TEAC Drives in cabinet with own power supply 400K	£495
CS50F	Double sided 80 Track TEAC Drive with cabinet and own power supply 400K	£345
CD50F	2 double sided 80 Track TEAC Drives with cabinet and own power supply 800K	£619
	2 drive Cable for BBC Micro	£15
	2 drive Cable for BBC Micro plus TRS80, Video, Genie etc.	£18

UPGRADE KITS

A → B £90

CUMANA LTD

Unit 1, The Pines Trading Estate, Broad Street,
GUILDFORD, Surrey. GU3 3BH. Tel: (0483) 503121.
Telex: 859380 CUMANA.

**CUMANA DRIVES +
OWN POWER SUPPLY
= BIG PLUS FOR
BBC MICRO USERS
... JUST FOR
STARTERS**

**... PLUS NO HASSLE
12 MONTH WARRANTY**

Please add VAT to all prices

**DEALER & EDUCATIONAL ENQUIRIES WELCOME --
GENEROUS DISCOUNTS AVAILABLE**

GREAT COMPUTERS AT FANTASTIC PRICES

Full training, installation, maintenance and support available.



APPLE

Apple II 48K	£599
Disk drive W/controller	£300
Disk drive	£250
12" Green monitor	£85
Colour monitor & card	£270
80 column card	£170
Microsoft CP/M* & Z80 Card	£200
16K RAM card	£75

*CP/M is a registered trade mark of Digital Research

PORTABLE COMPUTERS

Epson HX20	£402
Expansion Unit extra 16k RAM plus 16k ROM	£80
Microcassette drive	£75

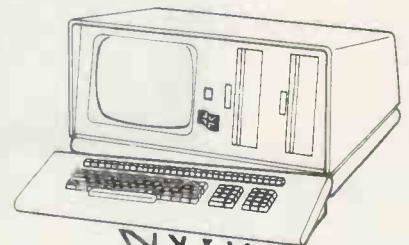
A4 size with full keyboard, printer and 4 line LCD display.



COMMODORE

Vic20	£135
Commodore 64	£279
8032 32k	£750
8096 96k	£999
4022 80cps	£330
8023 150cps	£750
8300 Daisywheel	£1170

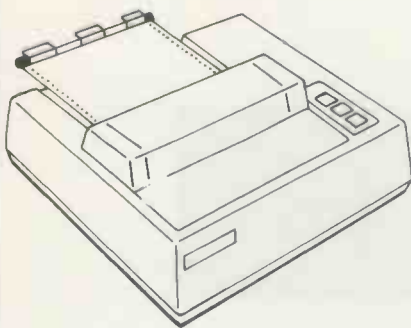
LSI M-Three



- 64K
- 2x5¼" Floppies
- Separate keyboard with numeric pad
- 12" Green screen 80 columns
- User programmable function keys
- includes CP/M operating system
- 8" floppies and Winchester hard disks also available.
- With RICOH 1300 and Wordstar keyboard £2675

*Phone for special CP/M software prices.

PRINTERS



EPSON

MX80 Tractor 80cps	£295
MX80 FT friction 80cps	£330
MX82 High res 80cps	£320
MX82F/T 80cps	£360
MX100 100cps wide carriage	£435

OKI

Microline 80 80cps 80 col	£210
Microline 82A 120cps 80 col	£299
Microline 83A 120cps 132 col	£470
Microline 84 200cps 132 col	£779

DAISY WHEEL PRINTERS

Olivetti Praxis 35	£455
Ricoh RP1300	£925

*Prices do not include interface to computers

Comprehensive range of supplies, diskettes, ribbons listing paper etc.

All prices Exclusive of VAT

Showrooms open Mon - Fri 9 - 5 pm

Sat 9 - 1 pm

SIMMONS MAGEE TWICKENHAM

Simmons Magee Computers Ltd. 13 York Street, Twickenham Middx. 01-891-4477

Creative Programmers

The Home Computer Software Division of THORN EMI Video Programmes Limited has vacancies for Programmers with creative ability.

Successful applicants will join one of our young, enthusiastic teams working in one of the fastest growing areas of computer software development, and will have responsibility for the creation and writing of entertainment programmes. There are opportunities for advancement within the division, and rewards are influenced by individual creative ability. Based in Central London.

Applicants, male or female, should have programming experience, particularly in Assembler (6502, 9900) and a keen interest in writing entertainment software. Graduates with relevant experience will be considered. A knowledge of video games would be a distinct advantage.

An attractive salary is offered, plus the normal benefits associated with a major employer.

Please write or telephone for further details and an application form, or send in a full C.V. to:

Mr. R.J. McNulty, Personnel Manager,



THORN EMI
Video Programmes

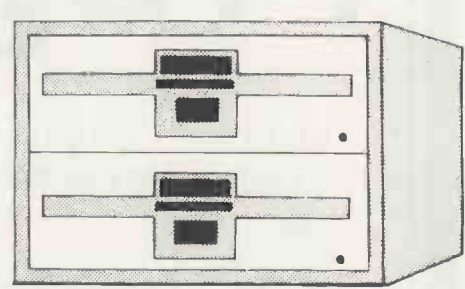
THORN EMI HOUSE, Upper Saint Martin's Lane,
London WC2H 9ED. Tel: 01-836 2444. Ext: 551.

A THORN EMI Company

MICROAGE ELECTRONICS

BBC Microcomputers 'B's and expanded 'A' IN STOCK NOW!

BBC Model 'B' wordprocessing pack at a low price of **only £699. Save £44.** Normal price £743.
The Pack consists of: BBC Model 'B' GP100 Printer Cables, Cassette Player Word Processing ROM 1,000 sheets of paper. Then add the GP100A Printer at only £215. The lowest price ever.



THE ACORN ATOM
Large stocks of all Atom kits, machines, disk-packs, ROMs and accessories. Software includes Atomcalc, FORTH, LISP, Adventure etc. Ring or write for list, prices etc.

BBC MACHINES

Model A, 32K RAM + 6522 Chip **£329.00**
Model B **£399.00**
Model B + Disk Interface **£494.00**
BBC Dust Covers **£3.95 + £1.00 p&p**
BBC Compatible Single Disk Drive (100K) **£235.00**
BBC Compatible Dual Disk Drive (200K) Manual utility disk **£389.00**
BBC Dual Slimline Disk Drive (Double Sided & Density 800K) **£799.00**
Verbatim Single Sided Diskettes 10 for **£22.50**
Verbatim Double Sided Diskettes 10 for **£39.99**
Let us fit a disk interface in 24hrs **£95.00**

BBC MONITORS

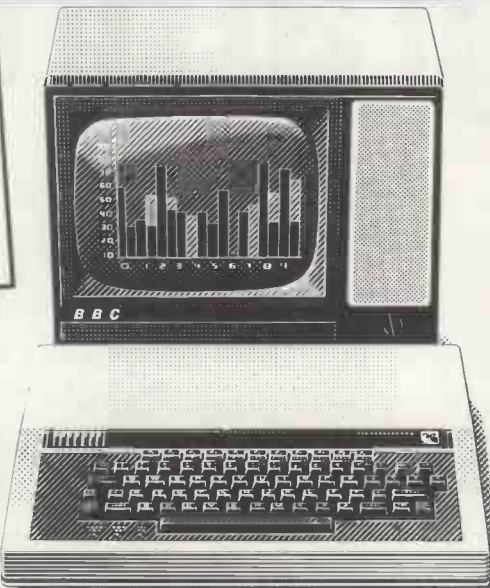
14" RGB Microvitec Colour Monitor (as used in the BBC Computer Prog.) **£284.00**
RGB Lead for above **£4.95**
12" Zenith High Res. Green screen Monitor **£95.00**
BNC Cable for above **£4.95**

BBC CASSETTE PLAYER

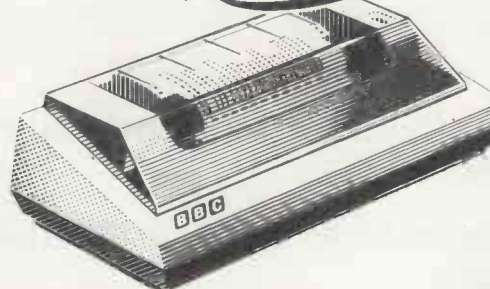
Official Version inc. Leads, tape counter, Battery/Mains etc. **£28.00**
+ £2.00 p&p
Blank Data Cassettes 10 for **£3.50**
+ £1.30 p&p
DIN to Jack Lead **£3.50**
+ £1.00 p&p
Official Joysticks per pair **£13.00**
+ £1.30 p&p

By Courier

Large items such as Computer:— 1 item **£7.**
2 items **£10** 3 or more **£13**



Win a £100 or a £50 token!
Free entry into raffle with every order.
For details write or phone Microage.

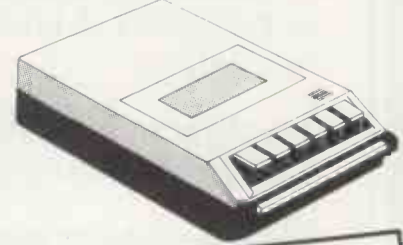


PRINTERS

Acorn AP-80A now down to **£189.00**
Acorn AP-100A now down to **£215.00**
AP Ribbons **£4.95**
+ £1.00 p&p
Epson MX-80 F/T 111 (new model, Dot matrix High res. graphics, 80 or 132 chars. per line) **£390.00**
Prices include cable & paper
Epson Dust Cover **£4.95**
+ £1.00 p&p
Parallel printer cable **£15.00**

BOOKS

Practical Programs for BBC & Atom **£5.95**
BASIC Programming on the BBC Micro **£5.95**
Programming the 6502 (Zaks) **£10.75**
6502 Assembly Language Programming **£11.95**
BBC Micro Revealed **£7.95**
Creative Graphics, Graphs & Charts, LISP & FORTH all at **£7.50 each**
Postage Rates
Small items such as Ribbon, books & software:— 1 item **£1.00**, 2 items or more All Dust Covers **£1.00 p&p** 50p per unit



SPECIAL WORD PROCESSING PACK — SAVE £150!!
BBC 'B' with 800k disk drive, word processing ROM and Epson printer — list price £1,752. Our price **£1,599.**

Barclaycard and Access

welcomed All prices include VAT

We accept official orders from educational establishments. We specialise in mail-order, all over the world—send large S.A.E. for lists and info pack.

24hr answerphone for credit-card holders. Phone in for 'express' despatch.

ALL PRICES INCLUDE VAT. FOR FURTHER DETAILS AND MAIL ORDER LIST SEND LARGE S.A.E. Open Mon - Sat 9am - 6pm. Thurs 9am - 1pm

MICROAGE ELECTRONICS
135 HALE LANE EDGWARE MIDDLESEX HA8 9QP
TEL: 01-959 7119 TELEX 881 3241

Sparrow 10

10 MEGABYTE REMOVABLE STORAGE SUB-SYSTEM



**“Unbelievable!” “Incredible!”
“10 Megabytes on a floppy!?”
“It had to happen...”**

These are typical comments from people who see our remarkable disc drive for the first time. But seeing is believing...

What did they see? ...

A Low Cost, High Capacity (10 MBytes), Fast (35 msec average access time, 3/6 secs start/stop), removable media, simple in design, shock resistant, contaminant resistant, small (same fit form as an 8" floppy drive), low power consumption (55 watts), integrated LSI controller, easy to interface disc drive.

Become a believer, come and see the SPARROW 10 for yourself.

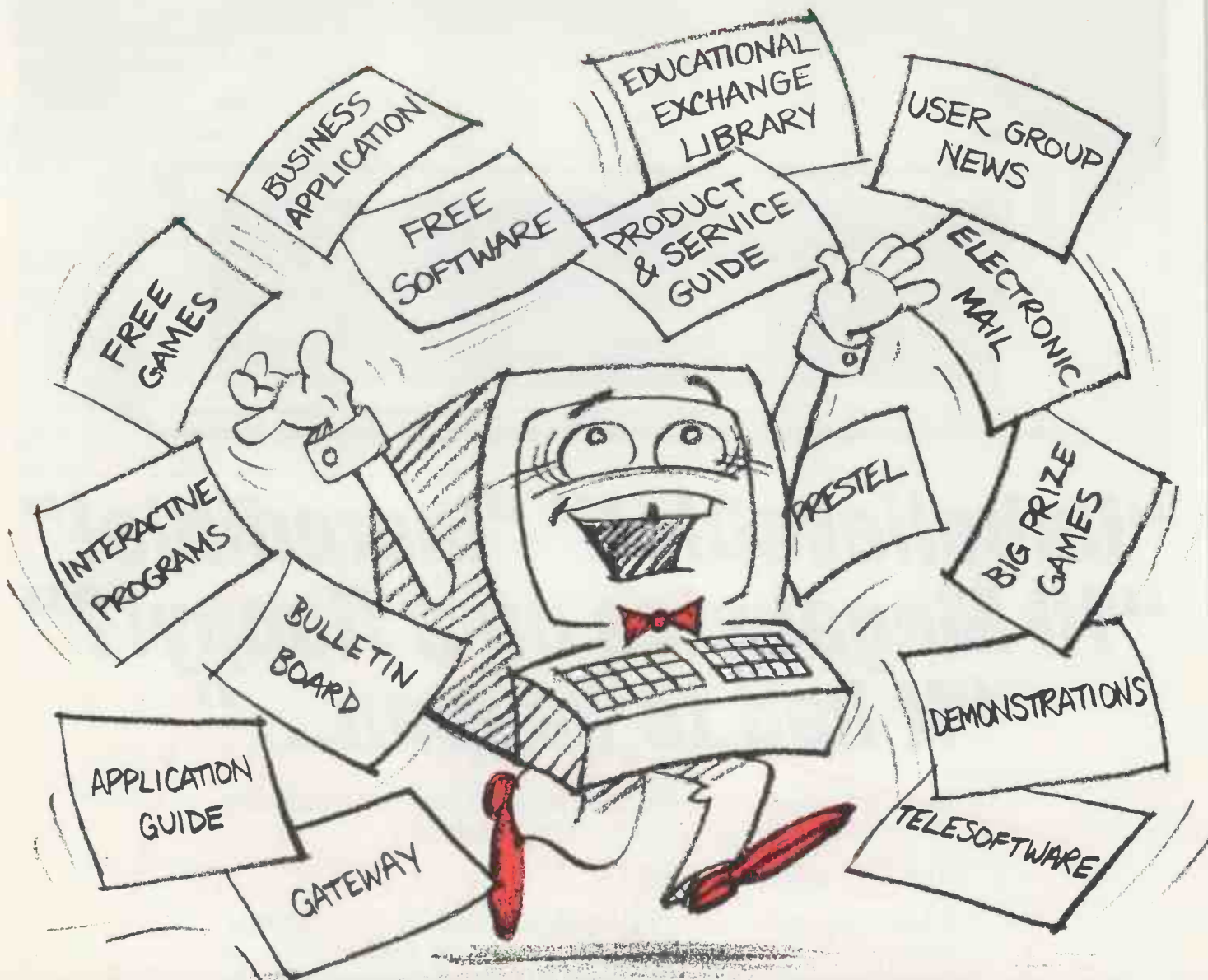
Sparrow
Computer

United Kingdom: Tel: (0753) 76533
France: Tel: (33) 1 362 1010
West Germany: Tel: (49) 6121 700862

SPARROW COMPUTER UK OFFICES: 45 Ledgers Road, Slough, Berkshire, England. Telex: 847212

SPARROW COMPUTER BV, a company registered in the Netherlands with limited liability.

MORE IDEAS THAN MORE PROGRAMS THAN LESS MONEY THAN



PROGRAMS FOR EDUCATION, HOME, BUSINESS, AND GAMES – FOR SINCLAIR, BBC, RESEARCH MACHINES, APPLE, COMMODORE, ACT SIRIUS, TRS-80, IBM, ICL, and more each month. . .

HOW THE MICRONET 800 SERVICE WORKS:

Most micros connect by a standard DIN plug and coaxial cable to an adaptor. They're portable, so you can use the system wherever you put your computer and telephone.



Simply dial Micronet's number and enter your subscriber number into the keyboard. A 'welcome to Micronet' message appears on the screen. You're on-line to one of the world's largest databases.

PRESTEL

MICRONET 800's

thousands of ideas – packed pages – games, education, business software, club news and information.

When you have all the information you need – or you've finished 'downloading' software to your computer's memory – just switch off the telephone link at your keyboard and replace the receiver.

IN A THINK-TANK. IN A SOFTWARE HOUSE. IN YOU'D EXPECT.

Whether you bought your computer for games, business, or education, you can spend a lot of time wondering what to do with it. And then spend a lot of money on packaged games and applications software.

NOW you can bring your computer to life – economically – by joining the amazing new MICRONET 800 service: a vast database with hundreds of FREE games, plus business and education software, computer news, special offers and 'big prize' opportunities for you to compete against the system – and win!

MICRONET 800 is packed with ideas and information. And there's no waiting – you get programs straight down the phone line! Updates on operating systems... school and college programs

... gobble man... invaders... business packages. They're constantly renewed. And hundreds of them are free: you simply turn on your micro, dial up MICRONET 800 and LOAD.

Sounds expensive? Here's the surprise!

All you pay for is a low-cost adaptor (in most cases just £49) to link your computer to your telephone, plus a MICRONET 800 subscription of about £1 per week. Then, via your computer and telephone line you will be able to access over 30,000 ideas-packed 'pages' of the MICRONET 800 service, and call down the software you want to your own computer! Look at just a FEW of the services already available on Micronet for you to call on:

- **Free Telesoftware:** Indexed by subject and by name of micro, a huge selection can be loaded down onto your computer.
- **Educational Exchange Library:** Schools and colleges are already preparing to display programs written by students and teachers, so many can benefit from them easily and economically.
- **Applications Guides:** Quick-reference guide by subject and by micro name shows you available applications software. You can move from the guide to further details held on the system if you wish.
- **Demonstrations:** Check through the features of the software packages that interest you – privately and without obligation. Order only if you're sure it's what you need.
- **Purchase 'Downloadable' Software:** Many 'telesoftware' programs can be bought from the system and loaded down direct to your micro. But

don't worry – there's plenty of warning if any MICRONET service you're planning to use carries a charge.

- **Electronic Mail:** A mailbox service on Prestel allows you to exchange messages with other Prestel or Micronet users. Messages are held securely and only you can collect them.
- **Bulletin Board:** For an additional subscription you can operate your own bulletin board – club news, for example, like tips, swap-shop for second-hand items and so on.
- **Phone-In:** If you're away from your computer but need to send a message to another Micronet user – call the Micronet 800 service by phone and we'll send the message for you.
- **Prestel:** Over 200,000 pages of information on British Telecom's established service. Facts and advice on finance, business, entertainment, features

and even direct bookings for travel, holidays, etc.

- **Product and Service Guide:** A constantly updated reference source – covering product comparisons, software reviews, dealership and price details and all the 'best buy' information.
- **Action Advertising:** Includes features, just like a magazine, including jobs and classified ads. If you've read an article that interests you, through MICRONET you can find out about the manufacturer, the dealers, the prices, and even order the product via your micro!
- **User Group News:** The Amateur Computer Club and many others like ALCC, BASUG, ICPUG, TUG, TRS 80 UG, will maintain their news and reference service on Micronet.
- **Big Prize Games:** Micronet offers a range of games and quizzes to keep you entertained and involved – and there'll be big prizes too!

SOUNDS FANTASTIC? THAT'S JUST THE START!

MICRONET 800 is a completely new service and we'll be adding to it all the time. Find out more about what Micronet 800 has in store for

you: return this coupon TODAY and we'll send you a FREE FACTS FOLDER on Micronet 800 services and details of how you can join!



micronet
800

**IT BRINGS YOUR
COMPUTER TO LIFE!**

Send to: MICRONET 800, Petersham, House, 57a Hatton Garden, London EC1B 1DT.

Yes, I am interested in the MICRONET 800 service. Please keep me in touch with developments and send me details of the low-cost Micronet 800 adaptor.

I am interested in earning money on software I develop for the system.

I am interested in: Home uses Business uses Educational uses

Name _____

Address _____

Telephone _____

Type of computer _____

PCW/1/83

**POST
TODAY**

DISCOVER ORMBETA

-IT'S LIGHT YEARS AHEAD

Set your sights on nothing less than Ormbeta, the most powerful and versatile DATABASE SYSTEM you could have in your armoury.

It's written in PASCAL... the language of the future for business and scientific applications, and business accounting packages are already available from over 150 U.K. dealers for every size of company, from corner shops to multinationals.

The specially developed 'p' operating system enables Ormbeta to be used with a galaxy of popular microcomputer hardware... IBM, Osborne, Apple, Xerox, Sirius, Victor, Sage - Virtually any micro on the market!

As for our recommendations and approval? Apple have gone a stage further by actually installing our new Beta 'Turbo' System at their European Headquarters!

Naturally Ormbeta is constantly being updated to keep us ahead of the field, but examples of typical packages

already available include Beta Database, Sales/Purchase/Nominal Ledgers, Payroll and Stock Control. Exclusive packages can also be prepared, such as those we've developed for Estate Agents, Catering Management, Club Membership and Golf Handicapping. Why not take your first step in the fight towards greater efficiency by contacting us for details of your nearest Ormbeta Dealer?

Ormbeta Software

Please send me further details
OR I am interested in becoming an
Ormbeta Dealer

Name _____


Address _____

Tel: _____



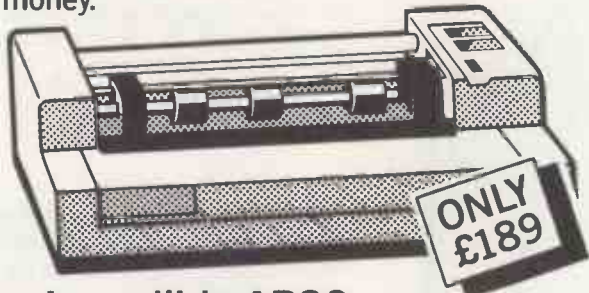
**ORMSKIRK COMPUTER
SERVICES LTD.**

Wheatsheaf Walk, Burscough Street,
Ormskirk, Lancashire L39 2XA
Telex: 627110 & 628702
CHACOM G Prefix 'ORMBETA'

 **ORMSKIRK (0695) 77043**

Follow us to MICROAGE ELECTRONICS for printer value

At Microage you can now get the very best value in microcomputer printers. We've selected only the best printers available so you can choose confidently, knowing you're getting the best value for money.



The Incredible AP80

The AP80 is probably the world's **LOWEST COST**, compact 80-column graphic dot-matrix printer available.

It can produce single and double width characters and has the ability to produce any pattern through its dot-matrix capability.

The AP80's robust construction and its unique "unihammer" make it an extremely cost effective and efficient printer.

Its features include

80 Cols 30 cps ● Dot Matrix Unihammer action ● 96 ASCII standard characters ● Up to 8" paper width ● Upper and lower case ● Double width printing ● Standard interface: Centronics

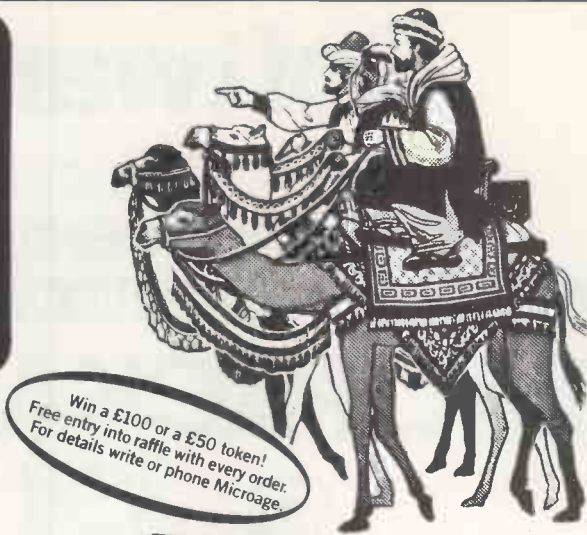
The Amazing AP100

Big brother to the AP80 the AP100 is a wider more sophisticated version of the AP80 with a full graphics capability and the ability to take standard width computer stationery, the AP100 is an ideal choice for anyone with a microcomputer.

Its features include:

80 cols 30 cps ● Dot Matrix Unihammer action ● 116 ASCII standard characters ● Full graphics capability ● Up to 10" paper width ● Upper and lower case ● Double width printing ● Centronics interface: ● Friction feed. Only £215.

Free courier delivery



The Outstanding MX80 FT Type 3

The MX80 is a flexible, high quality and extremely reliable graphic, dot matrix printer.

Its superb performance is due to a number of outstanding features. High resolution graphics, a wide range of type sizes, a quality 9 x 9 dot matrix head and up to 132 chars per line are just some of the exceptional features on this ideal printer for microcomputers. Only £390.

Specifications

132 cols 80 ● Logic-seeking, Bi-directional printing ● 9 x 9 Dot matrix printhead ● 96 ASCII standard chars with descenders ● Full graphics capability ● Several type sizes ● Automatic underlining ● Standard interface Centronics ●



Official Orders Accepted

MICROAGE ELECTRONICS

135 HALE LANE EDWARE MIDDLESEX HA8 9QP TEL: 01 959 7119 TELEX 881 3241

DEALER ENQUIRIES WELCOME
CALL 01-959 7119
FOR TRADE PRICES



Software News

INNOVATIVE TRS 80-GENIE SOFTWARE



from the professionals

TRIAL PACKAGE



The Snapp utilities Extended Basic, Built In Functions, Mapping Support, Autofile and the Garbage Collector are all described in our catalogue. Literature is also available from us on request. These programs are available for the machines listed below.

All of this software is installed into the Disk Basic interpreter of the host machine and thereafter is fully integrated into TRSDOS Basic. Once installed it is entirely transparent to the user.

Extended Basic has six separate utilities within it, including cross reference; variable dump (including values), compression, string and keyword find.

Built In Functions contains a large number of new commands and utilities to aid the programmer, the exact number depending on the machine. For instance, one can POKE up to 255 bytes at one time, sort a number of arrays, erase any or all arrays from the Array Table, PEEK multiple bytes at one time, calculate passwords, exchange the contents of variables and so on.

The Garbage Collector gets over that big failing of Microsoft Basic whereby the machine appears to hang from time to time whilst it sorts out its string area.

Automap is a product designed to automate for the Basic programmer the tasks of presenting information on the VDU and accepting information from the keyboard operator.

Autofile carries out very similar tasks to Automap, but instead of interfacing between the keyboard and the VDU, it interfaces between the keyboard and a file.

These utilities are hard to describe but once you use them, then like us, you will never let them go. They are almost miraculous in their use and are the greatest programming time savers that we have ever seen. They are, however, expensive. This Trial Package has, therefore, been produced to provide a "sample" of these utilities for a very low price. The catch is that this sample can only be installed on one of your disks containing Disk Basic and can only be accessed on that disk 99 times. This is more than sufficient to give the user an idea of the very real and very important advantages of using these utilities.

Model I & III (LDOS) £ 7.00
Model III (TRSDOS) £17.50

Model II (TRSDOS 2.0) £25.00
Model II (TRSDOS 4.1) £37.50

All the above plus V.A.T. p & p 75p

other machines

We have started to supply some of our more popular programs in non TRS-80 format for other machines as follows:

BBC (MODEL B)

JUMBO

The 747 simulation that has swept the TRS-80 community worldwide! So memory tight that there was no room for full colour.

Cassette £17.25

MYSTERIOUS ADVENTURES

The English written, machine language series of adventures. Seven in number, at the moment the following are presently available on the BBC:

The Golden Baton

The Time Machine

Arrow of Death Part I

Arrow of Death Part II

Cassette (each) £10.06

FAIRYTALE

Basic adventure mainly aimed at the kids but for all the family! Uses a scenario of nursery rhymes and fairytales within which to find the treasures.

Cassette £10.06

V.A.T. included

p&p 75p for any quantity

TEL: [0424] 220391/223636

MOLIMERX™ LTD

A J HARDING (MOLIMERX)

TELEX 86736 SOTEX G

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

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

INNOVATIVE TRS 80-GENIE SOFTWARE

from the professionals

DATA-WRITER

Data-Writer is, for most microcomputers, a new concept in Database Management. It adapts techniques which have been known and used on mainframe computers for quite a long time. A "normal" microcomputer Database Management program constructs its file in a single plane and is probably more accurately described as a file handling system. All of the data written into each record is filed away on disk in the same place, and it is all recalled and acted upon by the computer as one chunk of data.

Data-Writer approaches Database Management in an entirely different manner in that, subject to one or two requirements, it is not concerned as to how the database came about or the form of it. Indeed, one of the most attractive features of the program is that the data itself can even be written on a word processor — not by Data-Writer at all. So far as we have been able to ascertain, any word processor may be used that writes a plain ASCII file. Certainly AJEDIT and Scripsit are supported. If you do not have a word processor, or do not wish to use it for the manufacture of your database, then there are sections in Data-Writer which in themselves constitute mini word processors and enable the user to manufacture a database very easily.

In the foregoing paragraph we use the words "word processors" in the plural, and this gives a clue to a rather important feature of Data-Writer. The whole concept of the software is that it is a Management program. A number of earlier databases have suffered very seriously from what the author no doubt thought was economic writing, in that if a section of a program (for instance the word processing section) is used by a number of sections, only one is included and is accessed by various sections. At first sight this might indeed appear to be economic writing and we suppose in fact it is, but the result is that the disks are continually thrashing around as access is made to them. Disk access is probably the slowest task that the CPU carries out and if it is done frequently it slows the program down very considerably. Many past Database Management programs have suffered from this deficiency. Data-Writer on the other hand has a mini word processor in each section of the program where it is needed. This has the great advantage of obviating the necessity for the drives to be thrashing around, but almost as importantly means that the format of the mini word processor can be changed for the various sections of the program, so that the best advantage can be made of it in each. Thus every section is entirely separate and gives a very high degree of efficiency and user friendliness.

There are very few restrictions with Data-Writer. The number of records which one can handle in any given database is, essentially, unrestricted although any that span disks would have to have different names. In any event as the Sort section of the program does have a restriction of sorting 4,500 records at a time, this effectively imposes a restriction on the length of the file if one intends to be able to sort it all at one time. The maximum number of fields permitted to a record is 20 and the maximum number of characters per field depends on whether you use the Entry section of Data-Writer to enter your data or whether you use a word processor. In the latter case the maximum number of characters per field is 240. In the former it is 35. The maximum number of characters per field label or title is 20.

Data-Writer has a very powerful mathematical section whereby many complex mathematical functions can be carried out on your data. Up to 20 equations may be defined per run. The section will have available 10 scratch pad memories for use and as the calculations are carried out in double precision they will be carried to 16 decimal places.

Data-Writer also contains a very powerful "Mail Merge" section. Almost any personalisation can be added to a letter or report, and once again the letter or report may be constructed either on the mini word processor provided in Data-Writer or by way of an external one. Indeed we should make it clear that this remark applies to all data manipulation in Data-Writer. In other words, a word processor may be used at any time when its functions would be helpful in Data-Writer. To return to the Mail Merge feature, Data-Writer supports up to 20 different insertions per letter or report and the form letter may be of any length up to 6,000 characters, which we believe is about two and a half A4 sheets.

The Sort is a two level one and supports the extraction of stipulated data from a field. It is what might be called of fair speed. The two key levels make it powerful but as the Select section is so good, the Sort does not get used as often as would be the case in other Databases.

Data-Writer is made up of 10 sections or sub-programs as follows:

Entry	Manage	Maths	Sort	Letters
Edit	Statistics	Select	Labels	Reports

We have already mentioned many of them, others such as Edit are self-explanatory. The Labels section enables you to create pretty well any form of label required, including the ability to have them printed up in a from one to four across format. The Letters section enables you to create a form letter in Data-Writer if you do not wish to use an external word processor. Statistics is a method for searching the database for errors, and as the title suggests, extracting essential statistics from it.

The important sections not yet touched upon are Manage and Select. Taking the latter first, this section enables you to create a sub-set of the database by selecting from the file contents. It is immensely powerful and supports nine equivalency relationships, such as "less than" or "greater than" etc. Furthermore, the two logical relationships AND and OR may be used freely. In this way one can Select from the database to pretty well any specification required. The Management section of the program enables the user to completely re-structure his database without having to Edit it manually. New fields may be added or old ones deleted. They may be re-arranged or even appended one field to another. Indeed, this can be taken even further in that the whole database may be merged or split as required.

The Reports section enables the user to write reports such as inventories, accounts, bibliographies, insurance coverage report, in fact an endless list of applications. Because the Report section contains its own Text Editor, the report contents and format can be controlled at will and literally an infinite number of formats may be adapted.

Data-Writer is one of the most powerful Database Management systems that we have seen available for a microcomputer and certainly is the most powerful that we have seen for the TRS-80 and Video Genie machines. Once the database has been manufactured, either by Data-Writer or a word processor, one has complete and utter control over it and the ability to manipulate any part of it; not only the ones mentioned above, but many others which we have not had the space to list. Data-Writer is compatible with the Model I and Model III Tandy machine, the original Video Genie, together with the Genie I and II. A version for the Model III Genie will be available shortly.

Data-Writer is Compiled Basic, hence its DOS compatibility is dependent upon the compatibility of the Microsoft Compiler. Due to Microsoft's disinterest in supporting any other DOS apart from TRSDOS and the non availability of a Tandy Model III Compiler, we recommend customers to use Data-Writer with TRSDOS or LDOS on the Model I and the proprietary DOS supplied on Data-Writer for the Model III. Other DOS's may well be compatible after patching and as we have said the criteria is whether they are compatible with the Microsoft Compiler.

Data-Writer — All Models . . . £78.00 + V.A.T. = £89.70

P & P . . . £1.25



MOLIMERX LTD

A J HARDING (MOLIMERX)

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

TEL: [0424] 220391/223636

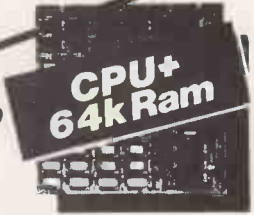
TELEX 86736 SOTEX G

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



BITS & P.C.S.

Alive and well and living in LEEDS



CPU £125.00
plus V.A.T.

CPU plus 64k RAM

£225.00 plus V.A.T.

64k RAM £125.00 plus V.A.T.

COMPLETE TWIN DISK SYSTEM

£675.00 plus V.A.T.

I/O Card £125.00

plus V.A.T.



**80x25
Video
Controller**

MULTIBOARDS use 80-Bus and are fully Nascom compatible e.g. disks, enhanced video, Input/Output or Ram expansion.



**Floppy
Disc
Controller**

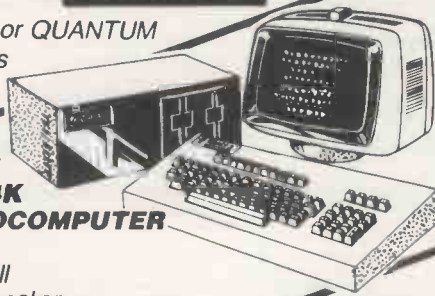
MULTIBOARDS make computers **MULTIBOARDS** enhance:-

GEMINI, Nascom or QUANTUM
Send for full details

The QUANTUM 2000



is ideal for business applications. It can have up to THREE drives giving 2.4 megabytes of disk storage. Its expansion capabilities are almost infinite, thanks to the flexibility of Multiboard plus 80-Bus.



GEMINI GALAXY 64K 2.2 CP/M MICROCOMPUTER

A cost effective solution to the small business, educational or home user requiring a reliable Z80 based CP/M computer
From **£1450.00** plus V.A.T.

BITS & P.C.S. have been in the MICROCOMPUTER business for several years. We believe in giving good service at competitive prices.

We have never sold anything else but Microcomputers, we believe in giving our customers all the help we can, both before and after sales.

On display and available from our LEEDS showroom are:- GEMINI, NASCOM, QUANTUM, SHARP, TEXAS, DRAGON, SINCLAIR, EPSON, SEIKOSHA, RICOH, etc. Also available is a full range of BOOKS, INTERFACES AND PERIPHERALS.

We are an official Sharp computer centre

As one of SHARP'S biggest distributors, we always have stocks. We have the expertise to advise you on interfaces and software. We developed the QUANTUM MZ 80k Hi-Res which gained official SHARP approval.

PLEASE CALL FOR LATEST PRICES.

MZ80A with £75.00 free software **£475.00** plus V.A.T.

MZ80B with 64k plus GRAPHICS RAM

£850.00 plus V.A.T.

PC1211 £65.00 plus V.A.T.

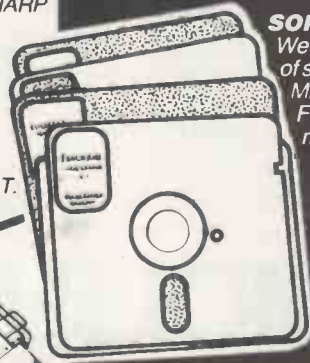
CE122 PRINTER £60.00 plus V.A.T.

PC1500 £145.00 plus V.A.T.

CE150 PLOTTER £130.00 plus V.A.T.

QUANTUM MZ80k

HI-RES £100 plus V.A.T.



SOFTWARE

We have a comprehensive range of software available for all Microcomputers sold by us.

For the CP/M based machines we have:-

- (a) The full CP/M software suite
- (b) All CP/M languages
- (c) WORD PROCESSING PACKAGES
- (d) AURORA BUSINESS PACKAGES
- (e) Data Bases



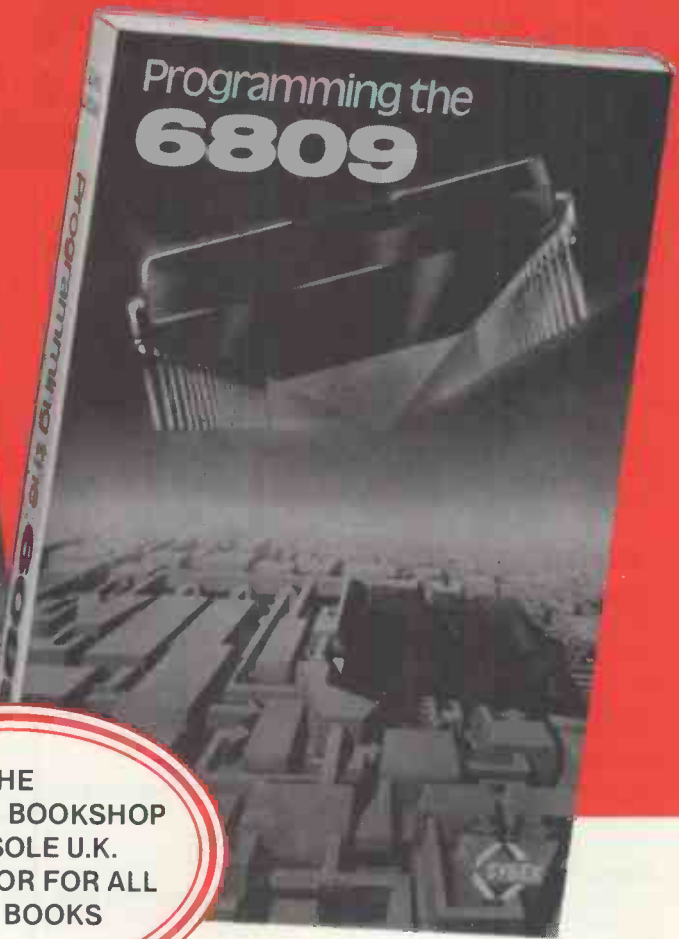
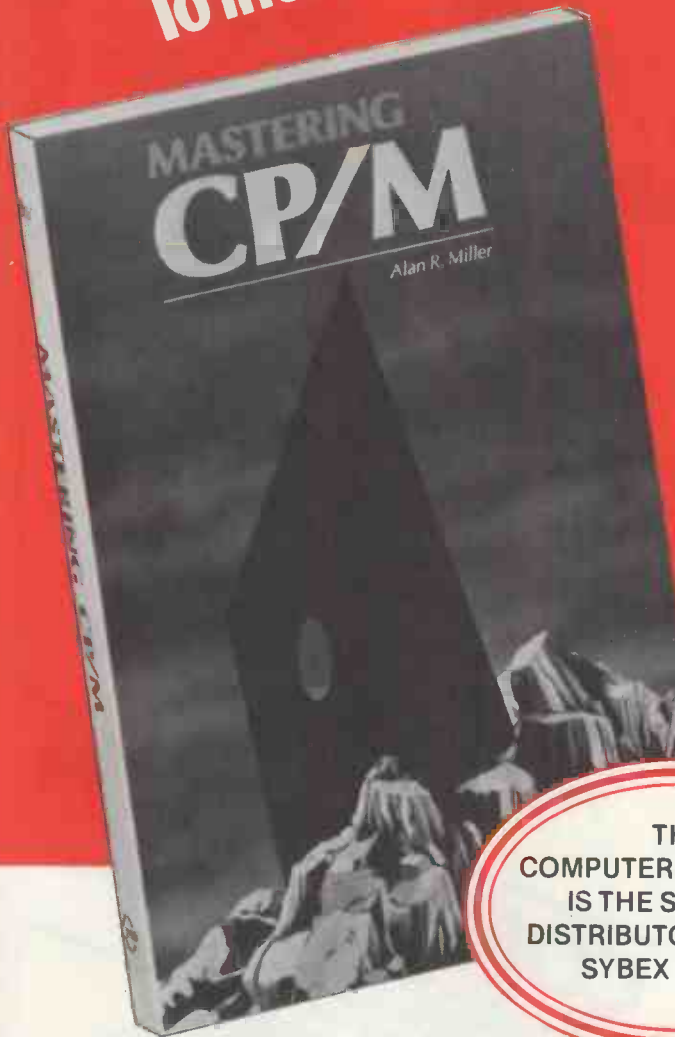
We stock the following printers:- EPSON, NEC, SEIKOSHA, BROTHER, RICOH, and more important, we know how to interface them to a variety of computers.

Please call or write for full details
Bits & P.C.S. Computer Products Ltd.,
Leeds Computer Centre, The Balcony,
60/62 Merrion Centre, LEEDS.
Tel: 0532-458877



2 NEW BOOKS FROM SYBEX

To increase your technical knowledge!



THE
COMPUTER BOOKSHOP
IS THE SOLE U.K.
DISTRIBUTOR FOR ALL
SYBEX BOOKS

Mastering CP/M

by Alan R. Miller

Ref. C302, 352 pages

ISBN: 0-89588-068-7

Only £12.95

This book is an advanced guide to using, altering, and adding features to the CP/M operating system. Its aim is to give the reader a deeper understanding of the CP/M modules, particularly the BIOS (Basic Input/Output System) and the BDOS (Basic Disk Operating System). To this end, the author introduces the **macro**, a powerful tool for developing and organising assembly language programs. An instructive and useful library of macros is developed in the book; the 8080 assembly language programs that make use of these macros are designed to explore the subtleties of CP/M, and, in many cases, to expand upon the power of the CP/M commands. The reader is guided through a step-by-step process of discovery, leading to a more thorough understanding of the organisation and operation of CP/M. A well-written and fascinating book.

Get these invaluable books from your Local Computer Store or Book Shop. In case of difficulty enclose cheque, plus £1.50 postage and packing.

Programming the 6809

by Rodnay Zaks & William Labiak

Ref. C209, 520 pages

ISBN: 0-89588-078-4

Only £12.50

This book explores all essential aspects of assembly level programming using the 6809 microprocessor. Users at all programming levels will find this a useful reference for learning how to write both simple and complex assembly language programs, and for understanding the inner workings of any system based on the 6809 microprocessor. Programming the 6809 is organised so that the reader proceeds systematically through all the basic concepts and techniques required to build increasingly complex programs. In addition to this step-by-step approach, several useful appendices and a thorough index make this book essential to the 6809 programmer user.

Dept. PCW

**The Computer
Bookshop**



30 Lincoln Road, Olton, Birmingham B27 6PA

Together we're unbeatable!

**RAVEN
COMPUTERS**

AN UNRIVALLED RANGE
OF SOFTWARE & SERVICE



**ACT
sirius 1**
BRITAIN'S BEST SELLING
16 BIT COMPUTER

Raven First Again!

RAVEN COMPUTERS of BRADFORD are pleased to announce their appointment as the VERY FIRST PULSAR SOFTWARE CENTRE IN THE U.K. This super new range of software has been produced specifically for 16 bit micros by ACT (Microsoft) Ltd. It's very-user usable, very fast and very competitively priced.

Now Available

Full accounting software written in 16 bit mode. Packages include Sales, Purchase and Nominal Ledgers, Invoicing, Data Analysis, Stock control and of course Payroll.

These British written programmes are currently in Sirius Format and will shortly be available for the IBM PC and other leading 16 bit micros.

NEW

Pulsar Select

The super new word processing package which includes a mailing facility and a spelling dictionary. Only £295

Pulsar Multiplan

The best spreadsheet system available on the market. Outperforms any other available system. Only £150

Financial Modelling

Choice of two Super systems. Both systems are well proven and are a must for any accounts forecasting.

Prices from: £400-595

Micronet

The critical path for project planners. Can handle networks of up to 4000 activities. Screen prompts. Will analyse most networks in under 5 minutes. £650

Milestone

The inexpensive but powerful project planner for the beginner or professional. Will handle up to 300 and is super fast. £295

Database

FMS 80 The world's leading Management System with multi file access and ultra fast data entry and retrieval. Unlimited records, single pass selection Automatic sort and update, prints to your own format. Contains the EFM program generation facility and lots of other features which make it the worlds No. 1. Described as the Rolls Royce at Rover Prices. £650

Database II

The Sirius Corporate Database. Not as comprehensive or powerful as FMS 80 but very usable for the first time operator £365

Sirius Dataflow

The compact fast data entry and retrieval system which integrates with Sirius Mailflow. It has a powerful report generator and is in full 16 bit mode. £125

Sirius Mailflow

Mailshots made easy with this powerful mailing system. It allows cut sheet or continuous paper, has default options and even types envelopes. Does mailshots directly from Sirius Dataflow. £75

Hard Disc Systems.

External hard discs available from 5Mb to 80Mb allowing networking on the Sirius or a powerful stand alone system.

Sirius 80 Card.

The CP/M card which allows you to run 8 bit software on the Sirius without diluting any of the Sirius's advanced features. From £299

Raven Computers offer only the best hardware and software which is available NOW and at the right price!

Join Us - Together we're Unbeatable.

If you're
sirius about
getting your
ACT together
1 should try
RAVEN

COMING SOON

Hard and Software for IBM PC, DEC RAINBOW,
HITACHI 16Bit Micros C.COMPIER, BASIC 86 COMPILER
for CP/M, LINIER PROGRAMMING, and lots of other
Super New Packages direct from the USA.

The North's
leading Sirius
distributor.



RAVEN

COMPUTERS

153 Sunbridge Rd
Bradford BD1 2NU

Tel: 0274 306966/309386



SHARPSOFT

WITH THE SHARP USER IN MIND

JOIN NOW! – 1983 SHARPSOFT USER NOTES (now international). Only £5.50 for a UK Subscription and £10.0 Overseas.

Supporting the Sharp MZ-80A, MZ-80K and MZ-0B Computers.

This 80 page (approx) publication is issued 3 times a year. Each Issue contains programs, programming tips and information, rather than advertising commercially available products.

All Members have the opportunity of purchasing, at competitive prices, peripherals and software.

The SHARPSOFT USER NOTES first came into existence in January 1980 and a limited number of Back Issues are still available.

1980 Issues 1/2/3 £3.00 (£6 overseas).

1981 Issues 4/5/6 £7.50 (£12 overseas)

complete with 2 Free MZ-80K/A

FORTH language tapes

CURRENT MEMBERSHIP in excess of 1,000
If in doubt – send for details

SHARP PC 1500 POCKET COMPUTER AND ACCESSORIES

SHARP PC 1500 Pocket Computer	£149.95
SHARP CE 148 RS232 & Centronics Interface Unit	£149.95
SHARP CE 15A Application Tape	£14.95
SHARP CE 150 4 Colour printer/dual compact cassette interface	£132.25
SHARP CE 151 4K Add on memory module	£49.95
SHARP CE 152 Cassette Recorder/Player	£39.95
SHARP CE 153 Add on Soft Card	£79.95
SHARP CE 155 8K Add on memory module	£79.95
SHARP CE 158 8K Add on memory module with battery backup	£89.95
SANYO Small portable compact cassette recorder compatible with PC1500/CE150	£29.95
SANYO Small portable mini cassette recorder compatible with PC 1500/CE 150 and Philips dictating machines	£45.95
SHARP CSR 150 Paper rolls (packed in 10s)	£2.92
SHARP EA 850B 4 Spare black pens for CE 150 printer	£3.09
SHARP EA 850C 4 Spare pens one of each colour red, black, blue & green	£3.09

NEW RELEASE FROM SHARPSOFT

Sharpsoft Information Retrieval System

"SIRS" is a new Database written in modular form. The hub of the SIRS system will allow you to create records, search, sort and allow output to screen or printer. This unique 'add-on' style package will allow you to expand your system with an optional Report Generator or Calculation Pack.

For further information on this package send a stamped addressed envelope for more details or £2.00 for the Operator Manual (this will be refunded on purchase of system).

A full range of CP/M Business Software available:

Accounting – Word Processing – Data Management – Financial Planning

SHARP MZ-80A 48K RAM Micro Computer	£499.00
SHARP MZ-80AEU Expansion Unit for MZ-80A	£100.00
SHARP MZ-80FB Dual Floppy Disc Drives for MZ-80A complete with interface card, cables, CP/M operating system and Sharp Disc BASIC & Manual	£799.00
SHARP MZ-80B 64K RAM Micro Computer. 320x200 High Res. Screen Software controlled cassette unit	£899.00
SHARP MZ-80EU Expansion Unit for MZ-80B	£50.00
SHARP MZ-80FB Dual Floppy Disc Drives for MZ-80B complete with interface card, cables, CP/M operating system and Sharp Disc BASIC & Manual	£799.00
SHARP MZ-80P4 150 cps Dot Matrix Printer	£845.00
SHARP MZ-80P5 80 cps Dot Matrix Tractor Feed Printer	£415.00
SHARP MZ-80P6 80 cps Dot Matrix Tractor & Friction Feed Printer	£475.00

The SHARP MZ-80 P4, P5 and P6 PRINTERS come complete with interface card, printer cable and ROM. Just specify which computer it is required for.

For further information send a stamped addressed envelope for "Connecting a Printer to my SHARP" an easy to understand information sheet.

SHARPSOFT DUST COVERS

Keep out harmful dust and grime

SHARP MZ-80K	£5.25
SHARP MZ-80A	£6.00
SHARP P3 Printer	£4.95
SHARP Dual Disc Drive	£4.50
SHARP MZ80K Expansion Box	£4.00
EPSON MX 80 F/T Printers	£4.95

SOFTWARE

Superb new ADVENTURE Games:

- ☆☆ DARK STAR ☆☆ MEXICAN ADVENTURE ☆☆
- ☆☆ HAUNTED HOUSE ☆☆ SECRET KINGDOM ☆☆

These have been specially commissioned by Sharpsoft to run on the MZ-80A, MZ-80K and MZ-80B: many hours of excitement and frustration, speeding through space, lost in deserts or under the magical spell of a medieval kingdom.

EDUCATIONAL:C.A.L. BUSINESS

Kings & Queens (History)	Wordpower	} 3 well produced programs
Multi-Base Arithmetic	Datapower	
Children's Maths	Labelpower	} professionals and hobby-
Type Teacher		ists alike
Physics	Critical Path Analysis	

GAMES

Asteroids – Towering Inferno – World Cup Manager – Ravenous – UFO Phoenix – Cricket – Super Golf – Minopoly – Election '84 – and many, many more plus exciting new additions every three months.

We have undoubtedly the best selection of quality games available for the Sharp MZ-80A, MZ-80K and MZ-80B Computers.

A SUPER CHRISTMAS IDEA!

£5.00 Gift Vouchers to be exchanged at any time during the coming year for any product in our catalogue.

UTILITIES

ZEN ASSEMBLER (£22.50)	ZEN TOOLKIT (£7.85)
ZEN DEBUG (£14.50)	RELOCATE (£11.50)
TAPE COPY (£11.50)	SHORT COMPRESSOR (£5.85)

BOOKS

Peeking & Pokeing the Sharp MZ-80A	£4.30
Peeking & Pokeing the Sharp MZ-80K	£4.30
Beginners Guide to MZ-80K Micro Computer	£3.95
DISCOVER FORTH	£10.95
INTRODUCTION TO FORTH	£6.95
BASIC for BUSINESS	£11.50
BASIC Programs for Scientists & Engineers	£11.50

ALL PRICES INCLUSIVE OF V.A.T.

Please send a stamped addressed envelope for FULL Software/Hardware details or phone: 01-739-8559 (24 HRS) leaving your name, address and telephone number with particulars of your interest.

SHARPSOFT

WITH THE SHARP USER IN MIND

SHARPSOFT LTD. CRISALLEN HOUSE, 2ND FLOOR, 86/90 PAUL STREET, LONDON, EC2.

TEL: 01-739-8559

BACKUP YOUR WINCHESTER ONTO A FLOPPY

with our **CP/M**-based utility program **CLIP**

- As fast as PIP and simpler to use
- Compresses text or data to less than half size
- Backs up larger files by splitting onto multiple floppies, recreated when copied back

Price £75.00 + vat, post free in U.K.

CP/M Formats include ICL/RAIR, VECTOR, SUPERBRAIN/SIGNET, IMS, XEROX, NORTH STAR/COMART, TELEVIDEO, NEC, Z80-APPLE, OSBORNE, 8" IBM and others.



KEELE CODES LTD

University of Keele, Keele, Staffordshire, U.K. Tel: (0782) 629221 Telex: 36113
24-hour telephone service: Access accepted.

CLIP is a development of our **E40** file compression utility, with many file handling features too. CLIP (**C**ompressed **L**ibrary **I**nterchange **P**rogram) does all that the name implies. It takes care of most of the chores in building an ordered file library, and can make automatic notes of its own operations. For completeness, it handles uncompressed files too, so that the powerful file-handling capacity is available for every task. Use CLIP with all-floppy systems as well. CLIP your files and clip your costs.

* CP/M is a trademark of Digital Research

Write or call for further details

SPECIAL OFFERS

PETS



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

VIC

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

BOOKS

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

2'ND HAND

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

APPLES apple

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

PRINTERS

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

SOFTWARE

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

NEW DRAGON COMPUTER

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

ACCESSORIES

All types of accessories and stationery supplied.

Floppy Disks
Storage Boxes
Printer Ribbons
Tractor Feeds
Cassettes
Maintenance

Stationery
Continuous Labels
Daisy Wheels
Auto Sheet Feeders
Dust Covers
Installation & Training

DEMONSTRATIONS AT YOUR PLACE



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



SEE THE NEW SYSTEME

Systeme S500
MULTI-USER. MULTI-TASKING 16BIT MICRO. VERY FAST & POWERFUL.



DAVINCI COMPUTER SHOP

65 High Street, Edgware, Middx. HA8 7DD.

Open Mon-Fri 9.00-5.30
Sat 9.30-5.00

Telephone: 01-952 0526





GRAPHIC SPACE GAMES

FORCE FIELD	10.95
SPACE SEARCH II	12.95
SPACE DOGFIGHT II	13.95
SITTING TARGET	9.95
ORBITTER	9.95
GALACTIC ATTACK	10.95

ACTION

CANNONBALL BATTLE	9.95
GRANDPRIX	9.95
MOTORWAY	9.95
BARREL JUMP	10.95
SKI-JUMP	11.95
MAZE EATER	12.95
CHOPPER RESCUE	11.95

ADVENTURE

LOST UNDERGROUND	10.95
------------------	-------

CHALLENGE

SNOOKER	9.95
INTELLIGENT OXO	9.95
CROSSWORD	9.95
NIM	5.95
PONTOON	5.95

BASIC PROGRAM GOSUBS

SCREEN PRINT	5.95
STRINGS HANDLER	5.95
ALPHABETIC SORT	5.95
PRINTER FORMAT	5.95

MACHINE CODE SUBROUTINES

DOT PLOT	5.95
ALPHABETIC SORT	5.95
SPEAKER TONES	7.95
SHAPE MOVER	6.95
BLACK/WHITE SCREEN	5.95

UTS MEANS LOW PRICES



ZX SPECTRUM CAZZETTE

GALACTIC ATTACK	RADAR LANDING
SPACE MISSION	ATTACKER
LUNAR LANDER	GALACTIC DOGFIGHT
PLASMA-BOLT	ZION ATTACK
STARTREK	IVASIVE ACTION

10 POPULAR PROGRAMS FOR £9.95

APPLE SUPER - DISK

SPACE INTRUDER	SPACE SEARCH
GALACTIC CHALLENGE	STARTREK
SNOOKER	SPACE-SHIP
SPACE DOGFIGHT	LUNAR LANDER
PHASER	JET FLIGHT

ALL FOR JUST £9.95

THIS MONTH'S SNIPS

Yes, that's less than £1 a program

ZX spectrum

COLOUR SPACE GAMES

INFINITE SEARCH	11.95
GALACTIC ATTACKER	10.95
ORBITTER	9.95
SITTING TARGET	9.95
SPACE DOGFIGHT	12.95

ACTION

TEN MILE GUNS	9.95
OVERTAKE	9.95
GRANDPRIX	11.95
SKI-JUMPERS	11.95
MAZE-EATER	12.95

ADVENTURE

TUNNEL ESCAPE	9.95
RESCUE MISSION	9.95

CHALLENGE

INTELLIGENT OXO	5.95
NIM	4.95
PONTOON	5.95

GENERAL

AUTO-VICE	6.95
ELECTRONIC WORKSHOP	10.95

BUSINESS

CALCULATOR	15.00
ALPHABETIC SORT	13.95
DATABASE	49.95
ADDRESS FILE	30.00
CALCULATOR	15.00
FILING CABINET	30.00
ALPHABETIC SORT	13.95



POSTAGE FREE TO U.K.
ORDER DIRECT TO:

U.T.S.
P.O. Box 96
HARROGATE
NORTH YORKSHIRE
HG3 2UZ

PLEASE SEND ME

CHEQUE ENCLOSED, VALUE

NAME

ADDRESS

POSTCODE



FLOPPY DISC DRIVES

SINGLE AND DUAL DISC DRIVES
40 OR 80 TRACK FOR BBC MICRO

Includes utility disc and Dos Manual Phone for prices:—

BBC MICRO

BBC COMPUTER MODEL 'A'	£262.00 + VAT
BBC COMPUTER MODEL 'B'	£349.00 + VAT
BBC COMPUTER WITH DISC	£410.00 + VAT

MONITORS

High resolution 18 MHZ 12"
Green Phosphor Monitor

£99.00 + VAT

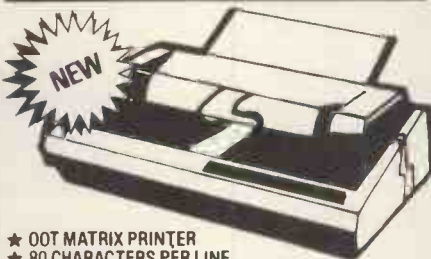
Includes Cable



OTHER ITEMS AVAILABLE FOR THE BBC MICRO

Books, Cables, Joy Sticks, Cassette Decks, Dust Covers,
Teletext Adaptor, Speech Upgrade.
SEND FOR PRICE LIST

SEIKOSHA GP-100A



- ★ DOT MATRIX PRINTER
- ★ 80 CHARACTERS PER LINE
- ★ 30 CHARS/SEC
- ★ FREE HI-RESOLUTION 'DUMP OUT' LISTING

£179 + VAT. Carr £6

BBC Printer Cable £16 + VAT

BBC MICRO

WORD PROCESSOR
ROM £46.00

CHESS	£11.50
ASTEROIDS	£ 8.95
GLAXIAN	£ 8.95
BILLIARDS	£ 8.50
FROGGER	£10.00
GOLF	£ 8.00



BBC MICRO MICRO UPGRADES

RAM KITS: Upgrades the Model 'A' to 32K RAM
Supplied with full fitting instructions. £29.90 + VAT

ANALOGUE KITS: Suitable for adding joysticks,
controllers etc. £15.00 + VAT

PRINTER INTERFACE & I/O PORT: Enables a
Centronic Interface printer to be attached . . . £16.00 + VAT

MODEL 'A' TO MODEL 'B' UPGRADE
£89.00 + VAT (fitted)

DISC EXPANSION £80.00 + VAT

DISC DRIVES from £179.00 + VAT

COLOUR MONITORS from £229.00 + VAT

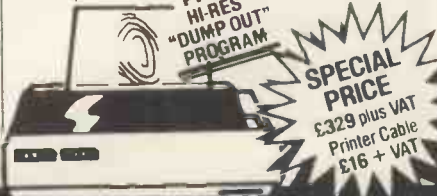
Send for details on other items, cables, cassettes, plugs,
software etc.

WHY NOT SEND YOUR MACHINE TO US FOR
UPGRADING?

PRINTERS

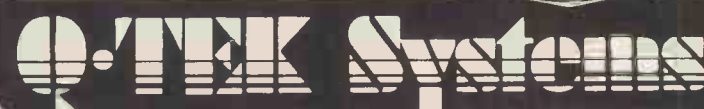
EPSON MX80 F/T3 — The printer recommended for the
BBC Microcomputer.

- ★ Dot Matrix Printer
- ★ 80 Cps
- ★ Hi-Resolution Graphics
- ★ Bi-directional Printing



FREE HI-RES "DUMP OUT" PROGRAM

SPECIAL PRICE
£329 plus VAT
Printer Cable
£16 + VAT



Telephone STD (0438) 65385
2 Daltry Close, Old Town, Stevenage.



THE ACORN SPECIALISTS

BBC MICROS EX STOCK

- Upgrades • Add-ons • Books
- Peripherals • Software

ACORNSOFT

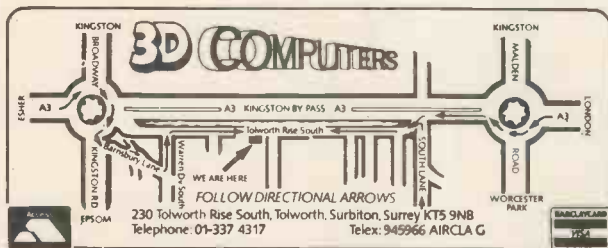
BBC SOFT

BUG-BYTE

PROGRAM POWER

Available over the counter.

MAIN **BBC** AGENT FOR
WARRANTY REPAIRS & SERVICE



Integrated Business Software Cassette based Sharp MZ80A

DIRECTORY

Maintains Name and Address files for mailing lists, Sales Accounts, Purchase Accounts etc. Prints selective lists & labels in variety of formats. Alphanumeric Account and Sorting codes.

PRICE LIST

Maintains Product files. 4 Prices, VAT, Supplier, Location, Type codes. Prints selective lists & shelf/article labels in variety of formats.

SALES LEDGER

Comprehensive 'Balance Forward' ledger. Statements, Aged balances, Status & Debtors Reports, VAT Analysis. Uses Name and Address file from Directory. Optional automatic updating from Invoicing.

PURCHASE LEDGER

Comprehensive 'Balance Forward' Ledger. Remittance Advices, Aged Balances, Status and Creditors Reports, VAT Analysis. Uses Name and Address file from Directory.

INVOICING

Plain or pre-printed paper. User defined invoice length. VAT analysis and summary. May use Name and Address file from Directory for customer details and Products file from Price List for Product details. Optional automatic update of Sales Ledger accounts and Stock files.

STOCK CONTROL

Complete Stock system. Stock held, on-order, allocated cost and Sell values. Prints selective reports of stock position in variety of formats. Uses Product file from Price List for product details. Optional automatic updating from Invoicing.

DAY BOOK ENQUIRY

Comprehensive analysis of Day Books output from Sales and Purchase Ledgers and Invoicing. Selection and sorting on any or all items. User defined report format. Automatic totalling.

Build up a complete business system — one program at a time
£16.75 each (VAT and Post & Packing included)
Send cheque, P O, cash, credit card no. to:

3D Computers Ltd. 230 Tolworth Rise South,
Tolworth, Surbiton, Surrey KT5 9NB 01-337 4317

THE HR1 THE FINEST PRINTER/TYPEWRITERS MONEY CAN BUY.

Only £650 + VAT



The HR1

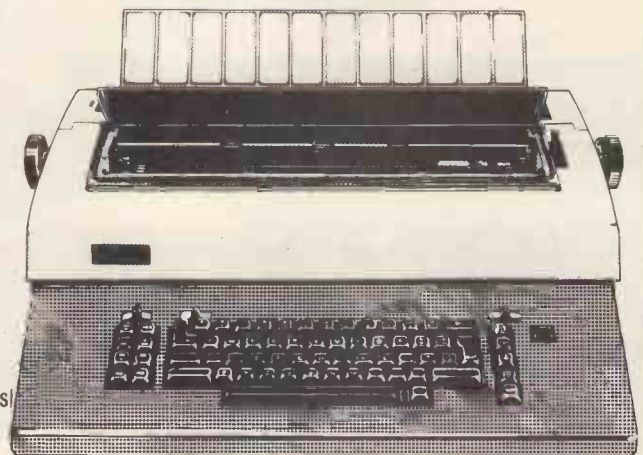
Bi-directional — 17 CPS — some features as below, but without keyboard and lift off facility.

Compatible with

SHARP
OSBORNE
APPLE II
APPLE III
TELEVIDEO
TANDY
BBC
MIMI
TEXAS 30/30
PET
HEWLETT PACKARD
SUPERBRAIN
SIRIUS
XEROX
IBM

In fact most computers!

THE CROWN RANIER ONLY £795 + VAT



CROWN RANIER — The leader of all interfaced daisy wheel printer/typewriters: Here's why:

The unbeatable Crown Ranier is the only heavy duty daisy wheel printer/typewriter which runs on a linear motor — no belts or cables to break, stretch or wear — and uses the IBM ribbon and lift off correctors. The reliability has become legend in these days of expensive electronic typewriter breakdowns.

CENTRONIC — IEEE — RS232 INTERFACES — No external boxes — interchangeable daisywheels — variable pitch — three free daisy wheels — automatic whole line correction — easily copes with standard printed forms — 195,000 characters per ribbon (at least twice the average character length) — standard lift off correctors — a printer/typewriter at the flick of a switch.

Perfection as a typewriter (now used by local authorities and multi-nationals), perfection as a printer.

Beware of lightweight, low cost machines — these can never give long term reliable service. **THIS MACHINE WILL!!** The professional machine.

Ask you local computer or office equipment dealer for further information. **EX STOCK DELIVERY.**

SOLE UK DISTRIBUTOR. TRADE ENQUIRIES INVITED



CROWN BUSINESS CENTRE

**56-58 SOUTH ST., EASTBOURNE,
SUSSEX. (0323) 639983.**

HAVEN HARDWARE ZX PRODUCTS

ACCESS CARD ORDERS ACCEPTED (Ring 094-686-627 24 hour ansafone)
SAE for details: 4 Asby Road, Asby, Workington, Cumbria CA14 4RR
Prices include VAT and P&P

Some of our products are also available from the following agents:
THE BUFFER SHOP, 374A STREATHAM HIGH ROAD, LONDON SW16
MICROWARE, 5 ST PETER'S LANE, LEICESTER
PHILLIP COPLEY HI-FI, 7 CLIFFORD COURT, OSSETT, WEST YORKSHIRE

TRADE ENQUIRIES WELCOME

ZX80 & ZX81 HARDWARE

Repeating Key module KIT £3.95 BUILT £5.95 (As reviewed by *Popular Computing Weekly* & *Sinclair User*)

Inverse Video Module KIT £3.45 BUILT £4.95 (As reviewed by *Popular Computing Weekly*)

Keyboard Beeper Module KIT £7.50 BUILT £8.90

Keyboard Entry Module KIT £2.95 BUILT £4.95

Input/Output Port KIT £10.95 BUILT £14.95 (Can be used with 16K RAM and printer without motherboard)

Programmable Character Generator KIT £17.95 BUILT £24.95

3K Memory Expansion BUILT for only £12.00. The most reliable memory expansion available.

Full-Size Keyboard with Repeat Key KIT £19.95 BUILT £24.95. The first of its kind. Built version plugs in.

ZX Edge Connector 23-way Long gold plated pins £2.95. ZX Spectrum version £3.50

Spectrum input/output port KIT £11.95 BUILT £15.95. Plugs onto back of Spectrum/no expensive mother board required.

ZX SPECTRUM SOFTWARE CASSETTES

Repulser Repel the aliens attack before the city dome is penetrated. £4.95

Fruit Machine Colour graphic representations of fruits. Including HOLD and GAMBLE. £4.95

Solitaire Alpha-Numeric move entry £4.95

Patience The popular card game (cheat proof) £5.95

Mancala The Chinese Logic Game £5.95

SPECIAL OFFER Circuit diagram of I/O port free with any Spectrum software cassette.

WE ALSO STOCK A LARGE RANGE OF RESISTORS, CAPACITORS, ETC.

CITY MICROSYSTEMS LIMITED

65 LONDON WALL, LONDON EC2M 5TU
01-588 7272/3/4





The NEW Generation Microcomputer 1Mb Disc
Capacity 128K RAM CP/M-80 compatibility available.

BRITISH MICRO



MINI 802 now available. 700K disk drives, CP/M
operating system. Computer & Monitor.

COMPLETE BUSINESS ACCOUNTING SYSTEMS WORD PROCESSORS
PROGRAMME PACKAGES FOR MOST APPLICATIONS

ADVICE, TRAINING AND MAINTENANCE

ALL YOUR COMPUTER REQUIREMENT READILY AVAILABLE

IN THE CENTRE OF THE CITY- LONDON EC2

VISITORS TO OUR OFFICES MOST WELCOME

let the
DRAGON 32
fire your
imagination . . .



for only £199.50
Plus £5 Post & Packing

*No other computer offers
you all these features
at any price . . .*

- 32K RAM MEMORY
- PROFESSIONAL STANDARD KEYBOARD
- 1 YEAR WARRANTY
- 9 DISPLAY COLOURS
- 5 DISPLAY RESOLUTIONS
- EXCEPTIONAL GRAPHICS CONTROL
- 5 OCTAVE SOUND GENERATOR
- DIRECT MUSIC COMMANDS
- REAL-TIME CLOCK/TIMER
- MICROSOFT EXTENDED COLOUR BASIC
- PLUG-IN CARTRIDGES AVAILABLE
- CENTRONICS PARALLEL PRINTER PORT
- SOCKETS FOR JOYSTICKS
- SOCKETS FOR FULL CASSETTE CONTROL
- EXCELLENT CASSETTE FILE HANDLING
- COMBINED AUDIO/DATA INPUT FACILITY
- AUDIO OUTPUT VIA T.V.
- EXPANDABLE TO 64K RAM
- POWERFUL 6809E MICROPROCESSOR
- FREE 160 PAGE TRAINING MANUAL
- BRITISH MADE

Available now from:

ComServe

98 TAVISTOCK STREET, BEDFORD MK40 2RX.
TELEPHONE: BEDFORD (0234) 216749

SPECTRUM



Make the most of your Spectrum, with these
acclaimed books from the experts!

PROGRAMMING YOUR ZX SPECTRUM

Tim Hartnell and Dilwyn Jones

More than 100 routines and programs, 230 pages, and value for every Spectrum user. Learn how to make the most of user-defined graphics (with a Pacman-like program, DOTMAN), sound, colour, and such commands as ATTR, SCREEN\$ and BRIGHT. From the co-ordinator of the National ZX Users' Club, Tim Hartnell. Just £6.95.

THE SPECTRUM SOFTWARE LIBRARY

**60 GAMES AND APPLICATIONS FOR THE
ZX SPECTRUM!**

By David Harwood

Arcade games, intelligent board games, brain games and utility programs. They're all here in this massive collection of 60 tested programs for the Spectrum, compiled by Interface columnist David Harwood. Just £4.95.

Interface,
Dept., PCW
44-46 Earls Court Road, London, W8 6EJ

Please send me:

() PROGRAMMING YOUR ZX SPECTRUM—£6.95

() THE SPECTRUM SOFTWARE LIBRARY—£4.95

() A sample issue of INTERFACE, the monthly magazine
published by the National ZX Users' Club—£1.00

I enclose £

Name

Address

COMPUTER[®]

Little Genius presents
the perfect lunch break

SCRABBLE

Play against the computer
For 1 to 4 players

Built-in dictionary
Play at 4 levels

ONLY £24.95 (inc VAT)

Requires Apple II with 48K and one disk drive.

COMPUTER SCRABBLE produced exclusively by Little Genius Ltd.
SCRABBLE trade mark and copyright licensed by Scrabble Schutzrechte und Handels GmbH
(a J W Spear & Sons PLC subsidiary).

"The SCRABBLE program was written by Peter Turcan of Turcan Research Systems Ltd.
as part of a PhD research study into word structures and their analysis through 1979-82".

01-267-7679

22 Inverness Street London NW1

**TRADE
ENQUIRIES
INVITED**



DIGITAL SOLUTIONS

... offers the 2 step alternative
to expensive computing

Step 1. Find the lowest price elsewhere.

Step 2. Compare against our example prices or
call us. We will offer you a better deal in
99% of cases.

... By careful budgeting we are able to offer value
unheard of before in the computer marketplace.

EPSON printers:	Speed	Our price	Saving on retail price
MX80 Type 3	80cps	£269	£80
MX80 Type 3 F/T	80cps	£299	£90
MX82 F/T	80cps	£329	£80
MX100 Type 3 F/T	100cps	£399	£100

Price includes a one year FREE guarantee. Also includes centronics interface -
all other types such as RS232 and IEEE available at discounted rates.

Smith - corona daisywheel letter printer (TP/1) available
for £425, a £60 saving on the list price.

WINCHESTER technology for APPLE users:

Formatted capacity	Our price	Saving on retail price
3mb	£1150	£200
5mb	£1250	£200
6mb	£1300	£200
15mb	£2200	£290
21mb	£2400	£400

All the above prices are subject to £10 P+P and VAT.

Orders to:

DIGITAL SOLUTIONS LTD
28 Rowley Rd, St Neots, Cambs
PE19 1UF

Or Call:

0480 52870
(head office)

We now offer the incredible
new EPSON HX20
portable computer.
For full details see the review
in last month's issue of
this magazine.

Prices are:

EPSON HX20 (including battery charger)	£402+vat
as above with carrying case	£411+vat
MICROCASSETTE drive	£75+vat
EXPANSION memory unit	£80+vat
BAR-CODE reader	£82+vat

- ☆ FREE ribbon cartridge
- ☆ FREE rolls of paper for integral printer
- ☆ FREE delivery to mainland U.K.
- ☆ Can be used in conjunction with all EPSON printers

Software packs available from £30+vat

Soon to be available: TV Adaptor

Acoustic coupler

ALSO NEW:

FUJITSU SPA830 ... the new world leader in high power
daisy wheels. 70 characters per second!!!

	RRP	Our Price	Saving
SPA830	£1895	£1695	£200
Operator cntrl panel	£750	£650	£100
Sheet feeder	£80	£70	£10

DEATH VALLEY

TERMINALS

Televideo 910	£415.00
Televideo 920C	£525.00
Televideo 925	£548.00
Televideo 950	£630.00
Hazeltine Esprit	£430.00
Lear Siegler ADM5	£449.00
Lear Siegler ADM36	£735.00

MONITORS

High Resolution 24mHz (Green Screen)	£89.00
Med. Resolution 18mHz (Green Screen)	£79.00

SHEETFEEDERS

Available for most printers.	
Sheetfeeders from	£450.00
Tractors from	£99.50

APPLE II WINCHESTERS

6 Megabyte Winchester	£1450.00
9 Megabyte Winchester	£1650.00

(Both back-up to floppy)

SOFTWARE

Standard packages such as DMS WORDSTAR etc. at discount prices.

PRINTERS

Epson MX80 Model 3	£297.00
Epson MX80 F/T	£325.00
Epson MX82 T	£311.00
Epson MX82 F/T	£339.75
Epson MX100 F/T	£406.25
RS232 Interface	£29.70
Pet/IEEE	£33.50
Pet Cable	£16.25
APPLE 2/2 Board	£69.00
Print Head	£24.90
OKI M80 A	£225.00
OKI M82 A	£306.50
OKI M83 A	£405.75
OKI M84 A	£785.00
Star DP 848P	£249.00
Star DP 848S	£278.00
Anadex DP 9000	£725.00
Anadex DP 9000A	£848.00
Anadex DP 9500L	£725.00
Anadex DP 9501 =	£840.00
Anadex DP 9501A	£910.00
Diablo 630	£1395.00
Qume 9/45 RO	£1425.00

These are the more popular printers but we can supply all leading names at similar discounts. We also supply buffered printed interfaces at discount prices.

COMPUTER SYSTEMS

Introducing the new British Minstrel System MINI COMPUTER PERFORMANCE AT MICRO PRICES

The MINSTREL is the latest British computer, designed to offer high performance, reliability and value for money.

The system is based on the Central Processing Unit formula enabling convenient siting and access. The system has MULTI-USER capability and has already gained favour in national companies and educational establishments.

EXAMPLE SYSTEM ONE

MINSTREL Central Processing Unit (CP/M or HMSOS)
5 Megabyte Winchester Drive
400K Quad Density Floppy Drive
Televideo 910 Multifunctional Terminal
OKI M82A Printer (120 cps. Pin and Friction RS232/Centronics)
PRICE £3198.00 (With 21 Megabyte Winchester £3652.00)

EXAMPLE MULTI-USER SYSTEM

MINSTREL CPU with 21 Megabyte Winchester and floppy drive unit
THREE Televideo 910 Terminals
TWO OKI M82A Printers
PRICE £5650.00

Prices are plus VAT. P & P free on interfaces, software and cables. Goods despatched by Express Carrier on remittance. Carriage charged (purely at cost) for deliveries beyond 35 mile radius.

Please contact us for further information on any computer product you require. Our advice will always be free.



**DEATH VALLEY
COMPUTERS**

P.O. BOX 54 WORCESTER

TEL: 0905 640400

TELEX: 337300 TAYLEY G

Made for each other - Scripta II + Apple II or III

SCRIPTA II - the perfect compliment to the Apple computer system. Always there in your office or home to produce the highest quality printout on any form or letterhead.

The KSR can be supplied complete with an Apple interface card and connector cable ready to start work with your favourite word or data processing programme.

Its dual role 'ON-LINE' computer terminal, 'OFF-LINE' daisywheel typewriter, ensures the most cost-effective investment currently available.

NOTE: - The SCRIPTA KSR is wholly manufactured by Olympia International in West Germany and is eligible for a full commercial on site parts and labour Maintenance Contract. It is NOT a standard typewriter modified by someone else.

RRP £1098 + VAT, optional tractor unit £150 + VAT. Apple drive card and cable £74 + VAT.

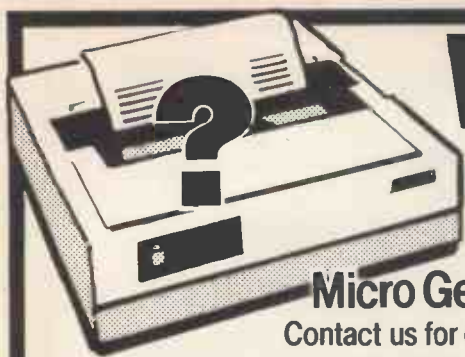
For further information, demonstration or order details, write, ring or call Sole U.K. Distributor:

DATAPLUS Dataplus Ltd., 39/49 Roman Road, Cheltenham,
GL51 8QQ. Tel: 0242-37373, telex 43594 DATA G.

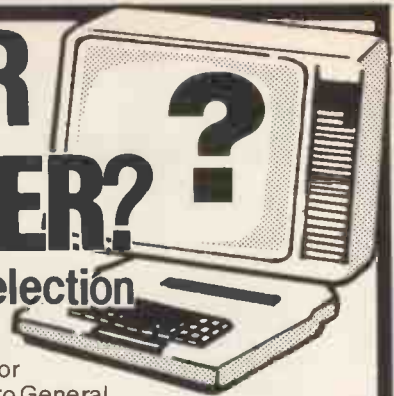
Dealer and OEM
enquiries welcomed.



SCRIPTA II



Which PRINTER FOR What COMPUTER?



Micro General the specialists for Printer Selection

Contact us for our expert advice on all your Interfacing problems

It's not just a question of plug in and lets go. There are now over 200 different connector situations. How do you know that your computer will accept the printer of your choice? We at Micro General do not sell boxes off the shelf. As computer engineers we help you to choose and install the right printer for your computer. The advice is free and it could save you some embarrassing mistakes - Buy from us for peace of mind.

MICROLINE RANGE

From **£235 + vat**

Microline 80 80 cps £199+vat
Microline 82A 120 cps £349+vat
Microline 83A 120 cps £499+vat
Microline 84 200 cps £799+vat
(The M84 has High Res. Graphics plus Near Letter Quality print)

NEW ADDITIONS TO THE MICROLINE FAMILY
(All with Near Letter Quality printing and High Resolution Graphics)

Microline 92 160 cps £449+vat
(80 cols. at 10 cpi)

Microline 93 160 cps

Full Width (136 cols. at 10 cpi) £649+vat

EPSON TYPE III

From **£349 + vat**

The Type III printers now have Auto-underline, Super-scripts, Sub-scripts & High Res. Graphics.

MX-80T Tractor only £349+vat

MX-80F/T Friction/Tractor £389+vat

MX-82T Tractor only £369+vat

MX-82F/T Friction/Tractor £409+vat

MX-100 100 cps Full Width £499+vat



WE ARE PROUD TO ANNOUNCE A BRAND NEW MID-RANGE PRINTER -

THE OKI 2350

From **£1,895 + vat**

Fast 350 cps printing. Skip speed 600 cps. High Resolution Graphics. Near Letter Quality on the Mod 2 Model. Superb reliability - no routine maintenance.

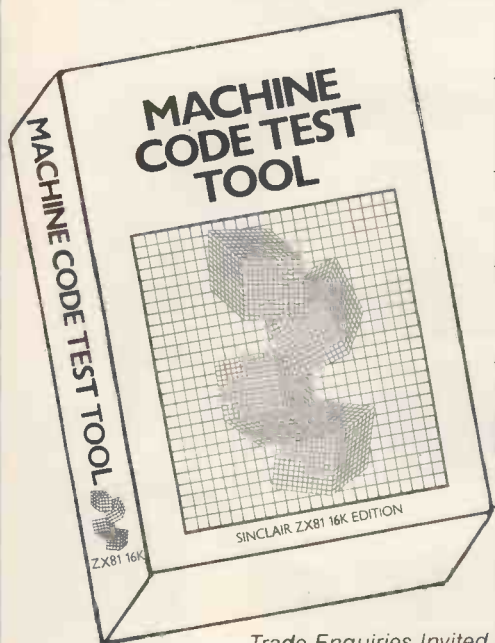
Call for details of the **SPRINTER 32K** BUFFER/ADAPTOR UNIT

Price from **£249 +vat.**

Micro General

■ Always call for the best possible price Access/Visa
(DEPT PCW) 6 The Birchwoods, Tilehurst, Reading, RG3 5UH Tel: 0734 25226

At Last Your Chance To ~~Crack~~ The Machine Code



Trade Enquiries Invited

Also available from most branches of **WHSMITH**

ZX81 and SPECTRUM OWNERS

- * If you are interested in finding out how a computer REALLY works and want to experience TRUE PROGRAMMING POWER - THE MACHINE CODE TEST TOOL is the answer.
- * The MACHINE CODE TEST TOOL is a utility program which comes complete with tutorial course enabling you to enter, test, display and debug hexadecimal machine codes simply and quickly.
- * THE MACHINE CODE TEST TOOL is constructed to help the absolute beginner who wishes to explore this fascinating subject, or the expert keen to polish up his machine code programs.
- * A HEX: decimal conversion routine is contained within the program as standard.

Post to: OXFORD COMPUTER PUBLISHING, P.O. Box 99. Oxford

Please send me Machine Code Test Tools at £9.95 each

Tick box for edition required ZX81 SPECTRUM

Send cheque/postal order to above address

NAME

ADDRESS

POSTCODE PCW125

Allow up to 28 days for postage

APPLE BOARDS FOR DATA ACQUISITION AND CONTROL

We now have available a range of Apple interface boards suitable for use in university and industrial applications. We also offer a technical enquiry service to advise those who wish to connect various pieces of equipment to an Apple.

In addition, if we do not stock a particular interface board we will be happy to quote for its development. We provide a rapid turnabout on all orders.

EPROM PROGRAMMER

Will program 2758, 2716, 2732, 2732A and the new 64K bit single 5V supply EPROMS

RECOMMENDED
RETAIL PRICE
£89.00

VIA BOARD

Provides Apple II with two 8 bit input/output parallel ports, a serial port and two timers – including a Real Time Clock

£47.50

EPROM EXPANSION BOARD

Holds up to six 2716 EPROMS

£39.00

SINGLE CHANNEL ADC

140 micro-second conversion time 8 bit ADC provides full 8 bit resolution between any two levels within 0-+5V range

£29.00

16 CHANNEL 8 BIT ADC

Less than 100 micro second conversion time 8 Bit ADC

£49.00

SINGLE CHANNEL 12 BIT ADC WITH SAMPLE AND HOLD

20 micro second conversion time, external trigger on board sample and hold, Unipolar or Bipolar range adjustable to $\pm 10V$ Bipolar or +20V Unipolar

£160.00

SINGLE CHANNEL DAC

8 Bit adjustable 0-+10V full scale buffered voltage output DAC (settling time 500 nano seconds)

£28.00

★ Dealer Discounts Available. Tel: 01-543 3711

Intelligence Research for Memory

BUY YOUR ADD-ON MEMORY FROM BRITAIN'S PREMIER
MANUFACTURER OF MICRO COMPUTER MEMORY BOARDS

★ WE OFFER THE MOST COMPETITIVE PRICES IN THE U.K. ★

APPLE

16K
64K
128K
256K

SIRIUS/VICTOR

128K
256K

IBM

64K
128K
192K
256K

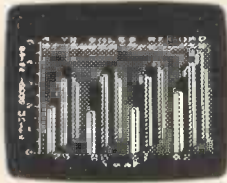
GENEROUS DEALER DISCOUNTS GIVEN



**Intelligence
Research
Limited**

NELSON HOUSE
271 KINGSTON ROAD
LONDON SW19 3NW
Telephone 01-543 3711

Business minded?

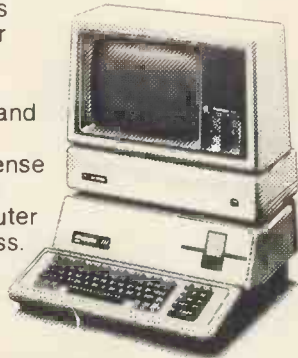


The Apple III helps you mind your own business. Whether you're a doctor, lawyer or business proprietor. Simply because you don't need to

be a computer expert to put the power of an Apple III to work on your business. So you can do word processing, business planning, forecasting & graphics. On your terms. Without spending time and money coming to terms with a computer service.

Ask for a demonstration and we'll show you why it makes sense to buy an Apple personal computer for your business.

And keep it to yourself.



 **apple computer**
Authorized Dealer

LEICESTER computer centre limited

67 Regent Road, Leicester LE1 6YF. Tel: 0533 556268

Increase your word power

Pound for pound, the Apple III is the most powerful personal computer you can buy.

Combine it with Apple Writer III™ software and you have the most powerful personal word processor you can buy.

Combine all the above with our Mail List Manager™ and you have the final word.

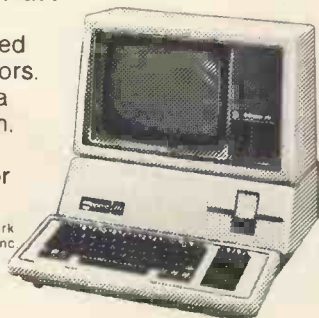
You can make letters, letter perfect. You can target your letters to the right regions and titles. And you can turn out thousands of personalized letters.

All at a price that's less than some dedicated word processors.

Come in for a demonstration.

You'll never be at a loss for words again.

*VisiCalc is a trademark of Personal Software, Inc.



C. J. E. Microcomputers

BBC
SPECIALISTS

VAT included where applicable

QUALITY DISK DRIVES

Single drive 40 track single sided 1 x 100k	£200.00
Dual drive 40 track single sided 2 x 100k	£350.00
Dual drive 80 track double sided 2 x 400k	£799.25

All drives are cased with own PSU for reliability, and include connecting cables and utilities disk.
Delivery £4.00

SOFTWARE FOR THE BBC MICRO

MISSILE CONTROL the first implementation on the BBC Micro of the popular arcade game. (32K)	£9.00
MAZE MAN an authentic version of the popular arcade game. (32K)	£6.00
BALLOONS a highly original game that soon becomes compulsive playing. (32K)	£6.00
DISSASSEMBLER the memory dump routine includes a scrolling back in memory facility. (16K)	£5.00
MISSILE CONTROL, MAZE MAN & BALLOONS use the Keyboard or Joysticks for control	

30+ PROGRAMS FOR THE BBC MICROCOMPUTER

This Book contains program listings, with explanations & tips on using the BBC Micro

GAMES UTILITIES GRAPHICS & MUSIC

Most programs will run on Model's A & B

Edited by C.J. Evans, various Authors.

A pair of cassettes with all the programs is available.

BOOK	£5.00
BOOK & CASSETTE SET	£9.00

LEADS

The BBC Micro comes without a cassette lead.	
7Pin Din to 2x 3.5mm & 1x 2.5mm minijacks	£4.00
7Pin Din to 5Pin Din & 2.5mm minijack	£4.00
7Pin Din to 7Pin Din	£4.00
7Pin Din PLUGS	Two for £0.65
6Pin Din PLUGS (for RGB socket)	Two for £0.65
5Pin Din PLUGS (360° for RS232)	Two for £0.65

RS423 TO RS423 (BBC Micro to BBC Micro)	
Two metre cable	£4.00
Four metre cable	£5.00

TELEVISION/MONITOR LEADS full range available

Phono plug to Co-ax with high quality cable 3 metres	£3.00
BNC Plug to BNC Plug	£3.10
BNC Plug to Phono Plug (i.e. BBC Micro to Rediffusion TVRM)	£2.20
RGB 6PIN DIN to 6PIN DIN 1 metre	£4.00
2 metre	£5.00

PRINTER CABLES

BBC to 36 way Centronics Type connector	£17.50
BBC to 25 way D Type (for use with RS232)	£9.50
BBC to 40 way edge connector (Centronics 739)	£20.00
TORCH to 36 way Centronics Type connector	£20.00

Blank C30 Computer Cassettes

Ten for £4.50	
15 Way D type Plug with Cover	£2.75
Computer graphics design pads 100 sheets	£4.00

BBC UPGRADE KITS

RAM UPGRADE (100ns)	£23.00
KIT A Printer & I/O Port	£9.50
KIT B Analogue Port	£8.00
KIT C Serial I/O & RGB	£10.00
KIT D Expansion Bus/Tube	£7.50
Full Upgrade Kit (Model A to B)	£58.00
6522 VIA (Included in Kit A)	£4.50

All components full specification

STAR DP8480 PRINTER

From £250.00 Inc VAT

80 CPS : 80/96/132 COLS
BIDIRECTIONAL LOGIC SEEKING
TRACTOR WITH FRICTION FEED

CENTRONICS version	£217.39 + £32.61 VAT = £250.00
RS232 version	£235.00 + £35.25 VAT = £270.25
High Res Graphics option to allow BBC Screen dumps	£15.00/£20.00
(24HR SECURICOR DELIVERY FOR PRINTERS)	£8.00

VAT Included where applicable

Send SAE for full Price List of our large range of accessories.

POSTAGE Add 50p per order or as stated

C. J. E.

Dept (PCW), 25 HENRY AVE, RUSTINGTON,
W. SUSSEX. BN16 2PA (09062) 6647

Microcomputers



FROG RACE **£5.95**

(Super fast M/C with sound!!)

Enter a world of Logs, crocs, lorries and lady frogs. Where the quickness of your eye and the thrust of a stabbing finger are all that lies between you, a watery grave, and a new game!

FORTRESS OF EVIL **£7.95**

(M/C & Basic 3-D Adventure)

An adventure that gives a 3-D view of current location. All the usual "adventure" commands, e.g.: "N", "S", "D", etc., plus an inventory command. Very fast room drawing graphics.

You enter the fortress by a secret entrance and armed only with a book of spells, your task is to slay the evil wizard.

How did we write this for the price?

Well we didn't!

We have a rather good programmer to do it for us.

STAR TREK 4.0 **£5.95**

(Basic Mission Programme)

As captain of the ENTERPRISE, your mission is to . . . well you've heard it all before.

We advertised this programme many STARDATES ago, but the KLINGON Customs Officers in LONDON, overpowered our defenceless package on its journey from the U.S., and it has only just escaped. We have less than 100 of these programmes to warp out to you, so first come, first served.

To celebrate the release from captivity ALGRAY has authorised the issue of two £1 commemorative discount vouchers for each purchase of STAR TREK 4.0 to use against future purchases.

ALGRAY SOFTWARE

Please put me on your mailing list.

Name

Address

Town/City

Machine Memory Disks

Signed

ALGRAY
 FREEPOST ALGRAY
 Algray House, 33 Bradbury Street,
 Barnsley, South Yorkshire.



Westbourne Business Systems Limited

18 GARWAY ROAD LONDON W2 4HN

CAN YOU SAY 'YES' TO ANY OF THESE?

- You don't know which microcomputer to buy.
- You've bought a microcomputer but can't find the right software for your needs
- You've bought a microcomputer and packaged software but it doesn't meet all your requirements
- Your microcomputer supplier can't help or isn't interested

If so give us a ring on 01-221 2791

WE CAN HELP

We supply hardware *and* software expertise

RING US NOW



NONVOLATILE 64K MEMORY MODULE



- 64K Nonvolatile Ram Module
- 10 year Data Retention
- Size only 100x50x25mm
- High Speed 150 NS
- Standard Din Connector



22 BARDSLEY LANE, GREENWICH, LONDON SE10 9RF
 Tel: 01 853 0868. Telex: 896691 TLXIR Attn.GIL

INDEPENDENT NATIONAL USER
GROUP FOR THE BBC MICRO



REGISTERED REFERRAL CENTRE
FOR THE BBC PROJECT

DEVOTED EXCLUSIVELY
TO THE BBC
MICROCOMPUTER

BEEBUG FOR THE BBC MICRO

CURRENT MEMBERSHIP
EXCEEDS 10,000

BRITAIN'S LARGEST SINGLE-MICRO USER GROUP

MEMBERSHIP NOW EXCEEDS 10,000

10,000 members can't be wrong – BEEBUG provides the best support for the BBC Micro. BEEBUG Magazine – now 36 pages – devoted exclusively to the BBC Micro. Programs – Hints & Tips – Major Articles – News – Reviews – Commentary. PLUS members discount scheme with National Retailers. PLUS members Software Library. 10 Magazines a year. First issue April 1982. Reprints of all issues available to members.

April Issue: 3D Noughts and Crosses, Moon Lander, Ellipse and 3D Surface. Plus articles on Upgrading to Model B, Making Sounds, and Operating System Calls.

May Issue: Careers, Bomber, Chords, Spiral and more. Plus articles on Graphics, Writing Games Programs, and Using the Assembler.

June Issue: Mazetrap, Mini Text Editor, Polygon; plus articles on upgrading, The User Port, TV set and Monitor review, Graphics part II, More Assembler Hints, Structuring in BBC Basic, plus BBC Bugs.

July Issue BEEB INVADERS and other programs – plus articles on using the Teletext mode, BBC cassette bugs fix, Software Review, using user defined keys. More on structuring in Basic. Using the User Port, and many hints and tips.

September Issue: High/Low Card Game, and Hangman Programs. Articles on Logic on the Beeb, Debugging, Moving multicoloured characters, creating new colours, Operating system 1.1. Plus Postbag, Hints and Tips, and Procedure Library.

October Issue: Program Features: Alien Attack; Calendar Generator; Union Jack; Memory Display utility. Plus articles on Beebugging; Improving Key Detection; Acorn Press Release on O.S.H.2; and Issue II Basic; The Tube and Second Processor Options; or New Series for less experienced users; and Software Reviews.

November Issue: Program Features: Racer (excellent 16K racing car game), Mini Text Editor (Mk2), Transparent Loader, Music with Memory, Harmonograph Emulator, New Character set for Modes 2 & 5; and cassette block-zero – bug retrieve. Plus articles on sound and envelope design – includes indispensable envelope editor program; Debugging Part 3, BBC Basics – Memory Maps and addressing explained; Serial Printer Port (RS423) and RGB upgrade. Plus a large number of Hints & Tips, and a guide to our past issues and their contents.

SOFTWARE DETAILS

BEEBUGSOFT : BEEBUG SOFTWARE LIBRARY
offers members a growing range of software from
£3.50 per cassette.

1. Starfire (32K). 2. Moonlander (16K). 3D Noughts and Crosses (32K). 3. Shape Match (18K). Mindbender (16K). 4. Magic Eel (32K). 5. Cylon Attack (32K). 6. Astro-Tracker (32K).

Utilities: 1. Disassembler (16K). Redefine (16K). Mini Text Ed (32K).

Applications: 1. Superplot (32K). 2. Masterfile (3K).

Send £1.00 & SAE for Sample

Membership: UK 4.90 for six months, 8.90 for one year.

Overseas one year only: Europe £15.00, Middle East £18.00. Americas & Africa £20.00. Other Countries £22.00

Make cheque to BEEBUG and send to: BEEBUG Dept 6, 374 Wandsworth Rd, London SW3 4TW

For editorial material send to: The Editor, BEEBUG, PO BOX 50, St. Albans, Herts AL1 2AR

DISCOUNT FOR EXPANSION!

Printers*****

Epson MX80FT/3	£330 (or £315 cash/chq)
Epson MX80T/3	£300 (or £285 cash/chq)
EG 603 Tractor + Friction + Roll Feed	£200
Daisywheels	from £480

Disk Drives*****

TEAC from Cumana	
40 Track Single Drive	£185
40 Track Double Drive	£315

Genie Expansion Interface

EG 3014 with 16K RAM	£175
Adaptor for TRS80 Computer	£15

Video Genie/TRS80* Enhancements***

48K Memory Extension, easily fitted **inside the keyboard unit**. No Expansion Interface required. £43.50
Lower-case Hardware Kit with true descenders, £ sign and ↑
£19 including software listing.

The ROM

For TRS80 (3 chip ROM) and Video Genie (remove one I.C. and plug in replacement). Alleviates key bounce. Automatic check for our Feature ROMs improves TRS80 tape loading. Personalised message on power up. Optional lower case driver

£14.95

NEW NEW NEW NEW The ROM

For 2 chip ROM TRS80's. As above but without personalised message

£18.95

Books

Full list on application. Includes:
Disassembled handbook for TRS80 (Richcraft)
Vol. 1. (The ROM decoded and calls etc.) £6.45
Vol. 2. (Using ROM subroutines) £8.75
Vol. 3. (Disassembler, peripherals, I/O) £10.50
Vol. 4. (Teletype/Morse techniques) £14.50
Vol. 5. (Special for Radio Amateurs) £12.50

Computers

Genies 1 & 2 £290
Genie 3. The finest yet. POA
Genie 4. The fabulous colour computer with Standard
Microsoft Basic £172
Dragon 32 £172

Feature ROMs

For TRS80 Model I and Video Genie. Plug-in units fit on expansion edge connector. Compatible with expansion interfaces, using "splitter cable". Plug-in unit including one Feature ROM:

Video Genie	£29.95
TRS80	£34.50
Splitter Cable	£14.50
Feature ROMs for above	£18.95

Feature ROM A includes:-
1) Keyboard Inverter (Typewriter style)
2) Key Repeat
3) Single Key Commands
4) Flashing Cursor
5) Machine Code Monitor & Editor
6) System Load & Save (Back-up facility will save full 16K on cassette)

Feature ROM B includes:-

- 1) Keyboard Invert
- 2) Line Renumbr
- 3) Single Key Commands
- 4) Cursor Flash
- 5) Basic Program Merge
- 6) Basic Program Compress

Tantel-Prestel Adaptor

With cuts interface for computers full colour Teletext access. Standard UHF TV connection £160

ALL PRICES ARE EXCLUSIVE OF VAT & CARRIAGE. (TELEPHONE FOR FURTHER DETAILS).

GENERAL NORTHERN MICROCOMPUTERS LTD.

8 WHITWORTH ROAD, SOUTH WEST INDUSTRIAL ESTATE, PETERLEE, Co. DURHAM SR8 2JJ
TELEPHONE: PETERLEE (0783) 860314

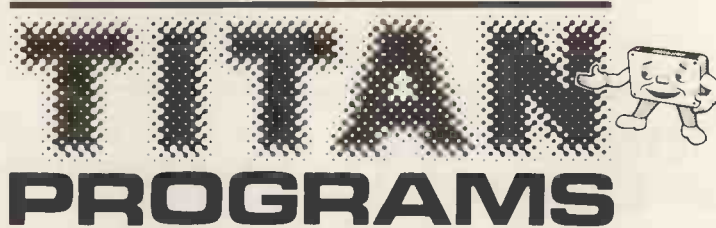


WANTED PROGRAMMERS

Right Now! TITAN are looking for young dynamic and enthusiastic freelance programmers to enhance their already established range of arcade quality software for most types of home computer systems (e.g. Spectrum, Vic, Atari, Oric).

If you feel that you fit these requirements and have a sound knowledge of machine language then waste no more time; write in the strictest confidence to Titan Programs Development Dept., The Computer Palace, 46 Market Place, Chippenham, Wiltshire, SN15 3HU.

What was once a hobby could be the start of a career that could change your life!



apple goodies from SPOT

High Speed Serial Interface Card

With full handshake – no more lost data. Switchable line lengths and Baud rates. DOS, Pascal and CP/M compatible. With full spec.

£75.00

Parallel Card – with lead and plug	£69.00
Numeric Keypad	£75.00
16K RAM Card	£69.00
16 Channel A/D Card	£89.95
8 bit parallel I/O Card	£69.95
EPROM Programmer Card	£69.00
EPROM Reader Card	£59.00
RGB Color Card with switch selectable text colors	£85.00
Discs – BASF SSSD, per 10	£15.00
Paper – 11 x 9.5", per box of 2000	£12.00

PAYROLL – 200

Very easy to use. Gives full calculation of all pay details. 8 user definable parameters for additions or deductions which may be pre or post tax. Hourly, Weekly or Monthly pay. Uses attractive pre-printed stationary for payslips and Giro's. Full report of dues for N.I. and Tax with coin analysis. Conforms with all IR Tax regulations.

£295.00

Other specialist software –

Bar Stock Control	£150.00
Shoe Wholesalers	£350.00
Builders Estimating (CP/M)	£650.00
ZAPPLE – Disc Doctor	£45.00

Please add Postage, Packing plus VAT at 15% to all orders.
Postage £1 per item except paper at £3 per box.

Many Other goodies in stock – please ask for list.

Suppliers or computer systems, software, and for all of your computer requirements.



NEW STREET
KELHAM INDUSTRIAL ESTATE
DONCASTER
☎ Doncaster (0302) 25159

FULLY AND PARTLY INTEGRATED ACCOUNTING SYSTEMS FOR COMMODORE 4032, 8032 or 8096

Full system – a very flexible system with invoices laid out to suit almost any invoice form, sales ledger, purchase ledger, nominal ledger, cash book etc.
£900 + VAT

Purchase ledger, nominal ledger and cash book
£400 + VAT

Sales ledger and invoicing
£680 + VAT

Sales ledger and invoicing with foreign currency facility
£750 + VAT

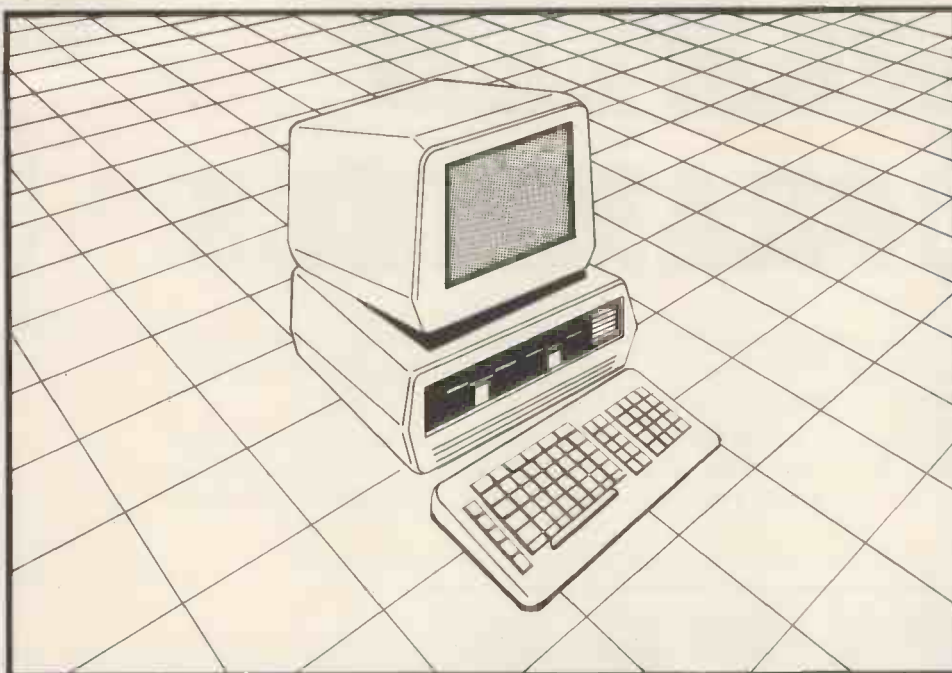
Write or phone for full details and a demonstration or diskette

Trade enquiries welcome

ELECTRONIC AIDS (TEWKESBURY) LTD

Mythe Crest, The Mythe, Tewkesbury,
Gloucestershire, GL20 6EB
Tel: 0386 831020/0684 294003

 **ozwise computers**



 **apple® II**

IBM

VIC-20

 **ACT
Sirius 1**

EPSON

**PUTTING COMPUTERS
INTO PERSPECTIVE**

Call now for **free professional advice**, for details of our **computer courses** and latest **special offers**.

236 Imperial Drive, Rayners Lane Harrow, Middx HA2 7HJ 01-429 1060

16K MEMORY EXPANSION

FOR YOUR COMMODORE VIC 20 –
£60 ? £50 ? EVEN £40 ? – FORGET IT !!

FORGET HIGH PRICES AND PAY THE
PRICE YOUR BANK BOOK CAN AFFORD

£34.50 (incl. VAT:P+P)

DESIGNED AND BUILT IN BRITAIN BY PLUS 80.

★ FULL ONE YEAR GUARANTEE WITH ★ INSTANT REPLACEMENT
DON'T DELAY – SEND CHEQUE/P.O. NOW (MADE PAYABLE TO PLUS 80) TO:

PLUS 80 60a MIDDLE ROAD, HARROW, MIDDLESEX HA2 0HL. 01-575 1908

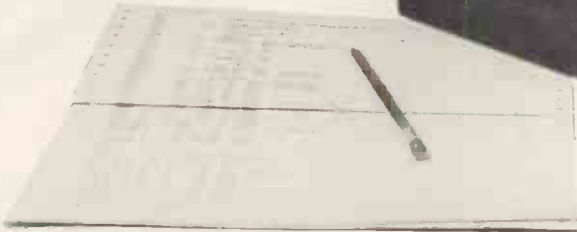
PATENT PENDING. ALLOW 28 DAYS DELIVERY.
LOOK FOR NEW PLUS 80 PRODUCTS IN NEW YEAR.

Presenting the CONCEPT-09

The new British micro computer system that brings together the processing power of the 6809 micro processor with the renowned FLEX operating system at a price as impressive as the performance.

CONCEPT-09 features:
6809 micro processor. 56k dynamic ram. 2k system rom. 4k user eprom. Dual 5.25 inch disc drives. Serial port for terminal. Centronics compatible printer port. Uncommitted parallel port. FLEX disc operating system.

£995 plus VAT



Additional software includes:

Editor. 6809 Macro assembler. Debug. 68000 cross assembler. Pascal compiler. Basic compiler. Forth. Stylograph word processor. Mail merge. Sort merge. Record management system. Dynacalc electronic worksheet.

Micro Concepts

8 SKILLICORNE MEWS · QUEENS ROAD · CHELTENHAM · GLOUCESTERSHIRE GL50 2NJ

Telephone: Cheltenham (0242) 510525

PLEASE
PHONE FOR
LATEST
PRICES

MICRO-MADNESS CRAZY PRICES!

All goods sold are brand new and with full manufacturer warranty.

PRINTERS

EPSON PRINTERS	£
MX82	345
MX82FT	338
MX80 Type III	278
MX80FT Type III	314
RS232 Interface	30
RS232 Interface with 2K Buffer	53
MX100 Type III	418
Serial Interface Type III	60
IEEE - 488 Parallel Interface	37
Apple Interface (Non-Graphics) + Cable	49
Apple Interface (Graphics) + Cable	57
TRS80 Interface	22
Ribbon for MX80/82 Series	5
Ribbon for MX100 Series	9
CENTRONICS PRINTERS	
737 - 2 Parallel	337
739 - 2 Parallel	433
150 - 2 Parallel	430
152 - 2 Parallel	495
152 - 4 Serial	558
1 Cartridge Ribbon for 150/152	4
1 Zippack Ribbon for 737/739	3
ANADEX PRINTERS	
DP9000A Serial/Parallel (Graphics)	945
DP9001 Serial/Parallel	884
DP9001A Serial/Parallel (Graphics)	945
DP9500L Serial/Parallel	838
DP9500 Serial/Parallel (Graphics)	905
DP9500A Serial/Parallel (Graphics)	1006
DP9501 Serial/Parallel (Graphics)	951
DP9501A Serial/Parallel (Graphics)	1006
DP9620A Serial/Parallel (Graphics)	1093
Ribbon for DP9000/9500 Series	10
Apple II Graphics Interface Card	120

APPLE INTERFACE CARDS AND ACCESSORIES

MC 8-Slot Expansion Chassis	361
Clock Calendar Card	142
Supertalker - for talking programs	151
ROM - Plus Board	84
RAMplus	99
ROMwriter	96
Copyplus ROM	33
Ramex 128K	245
Ramex 16K	64

WALTERS PRINTER - BRITISH MADE

120 - Parallel

I.D.S. PRISM PRINTERS

Prism 80 Full Option Inc. Colour	1031
Prism 80 - Graphics/Sprint/Auto Sheet Feed	827
Prism 80 - Graphics/Sprint	730
Prism 132 Full Option Inc. Colour	1186
Prism 132 - Graphics/Sprint/Auto Sheet Feed	973
Prism 132 - Graphics/Sprint	879
Black Ribbon for Prism	11
4 Colour Process Ribbon for Prism	11
4 Colour Primary Ribbon for Prism	22

INTEGREX COLOUR PRINTERS

CX80 Colour - Parallel	707
Apple II Interface Card	88
CX80 Colour - RS232 Serial	767
CX80 Colour - IEEE	755
CX80 Colour - RS232 3.7K Buffer	830

SMITH CORONA DAISY WHEEL PRINTERS

TP1 Daisy Wheel - Parallel	430
TP1 Daisy Wheel - Serial	430
IEEE Interface Box for TP1	67

PRINTER INTERFACE CARDS FOR APPLE II

CPS Serial Printer Card	100
CPS Multifunction Card	108
CPS Printer Cable (Please Specify)	10

MONITORS

KAGA VIDEO MONITORS	£
High - res. 12" B/W Inc. Cable	86
High - res. 12" Green Inc. Cable	86
High - res. 12" Amber Inc. Cable	86
12" RGB Colour Monitor	212
Apple II RGB Card + Cable	42
RGB Cable for Apple III	8
RGB Cable for IBM P/C	8
APPLEFAN & ACCESSORIES	
Applefan Standard Unit	58
Cassette Connector Set	4
Disc Drive Connector Set	14
Eurocolour TV Output	4
Games Connector Set	9
Monitor 40/80 Char. Display Switch	9
Mains Output Set	7
Printer Connector Set	14
Graphics Tablet Connector	13

DEMONSTRATION/TRANSIT CASE

For Apple + 2 Disc Drives 49

Terms of business: Cash/cheque/P.O.S. with order.

P & P: Interface cards and ribbons - per unit 50p

Printers, monitors, and cases - per unit £6

VAT: All prices are exclusive of VAT. Please add 15% to the total cost including P & P.

Goods damaged in transit will be replaced FOC.

Please send me the following goods:

Total (inc. P&P) _____ 15% VAT _____

I enclose cash/cheques/P.O.S. for sum of _____

Name _____

Address _____

PCW/1/83

AIMGRAM AIMGRAM LTD 31 Roman Gardens, Kings Langley, Herts WD4 8LG Tel: Kings Langley (09277) 68211

ZX81 MACHINE CODE?

ZX.ASZMIC rom transforms ZX81 into an
Assembly Language programming unit

NEW
under-the-keyboard board
for ASZ.MIC & BASIC
Now available - ask
for details when
ordering



£ **39.95**
total*

⊗ FULL-SCREEN EDITOR

Sixteen shift keys take you into a world with a word processor feel. A blink cursor moves at your command to control insertion, rubout, line or string deletion, auto-scroll & page flip up or down. Text block operations. Ultra-fast editing.

⊗ MULTI-FILE SYSTEM

Declare as many files as you like, with any names you like, & they are automatically handled by the Operating System. Merge them, delete them, print, save & load them, & edit them by name. Superb flexibility with a simple but powerful system.

⊗ TOTAL ASSEMBLER

Full Z80 mnemonics, unlimited length labels, ORG & EQU directives, proper assembly listings with errors flagged on screen or printer. Relocatable object code & options to facilitate cross-assembly. Interpretive immediate execution available.

⊗ POWERFUL DEBUG

All the usual dump, modify, fill & copy commands; plus breakpoints, single stepping, context control, the convenience of interpretive execution mode, full use of the names in your program, Command Macros, autodump, and full operating system interface.

⊗ HI-RES GRAPHICS

255 x 144 resolution under program control to give you truly convincing graphics. With the power & flexibility of assembler you can really use this high definition.

⊗ MUCH, MUCH MORE

Repeat function on all keys. Double height titling on printer. Lots of extras. But more important than all these features, attractive though they are, is the fact that ZX.ASZMIC is an integrated development system in which everything fits together to give you a tool which can satisfy the professional programmer by simplifying all stages of the program development process. It is excellent for those who are taking the first steps into real programming but the more expert you become the better you realise just what ASZMIC can do for you. If you are at all interested in machine code it will be worth your while to find out more.

Comprocsys limited

I enclose £39.95. Please rush me ZX, ASZMIC + manual.

Name

Address

.....

.....

Sole UK agents: CAPITAL COMPUTERS LTD
1 Branch Rd, Park St, St Albans AL1 4BJ
Phone: 0727 72917

Cheques payable to Comprocsys ASZMIC a/c



LANGUAGES FOR
MICROCOMPUTERS

Pro Pascal

Full ISO Standard Pascal

Pro Fortran

Full ANSI 66 Fortran

These implementations individually meet the most demanding requirements. And they can be combined together, allowing applications to take advantage of the best features of each language.

Available now for Z80 micros with CP/M or CDOS.
Versions for 8086 and 68000 under development.

Prospero Software Ltd. 37 Gwendolen Avenue, London SW15 6EP
Tel. 01-785 6848

Go on a computer date

(and take along the wife and kids)

Friday 7th January '83

(10.00am-6.00pm)

Saturday 8th January '83

(10.00am-6.00pm)

Sunday 9th January '83

(10.00am-4.00pm)

These are the dates of the London Home Computer Show. On display will be a complete cross section of the hard and software available to the home-user.

The emphasis is on the lower end of the price bracket, with computers from £50-£300.

You will be able to chat to the manufacturers and play with the computer before you buy.

So bring along the wife and kids (who'll probably be more of an expert on what you're buying than you)

Admission £1.50p (Children under 8 and O.A.P.s FREE)

*And if you're in a party of 20 or more, there's a 25% discount.

SAVE 50p

Present this token duly completed when buying your ticket for a 50p reduction. Only 1 token allowed per person.

Name Mr/Mrs/Miss

Address

Signature P.C.W.

THE LONDON HOME COMPUTER SHOW.

Royal Horticultural Society's Old Hall, Vincent Street, London SW1.

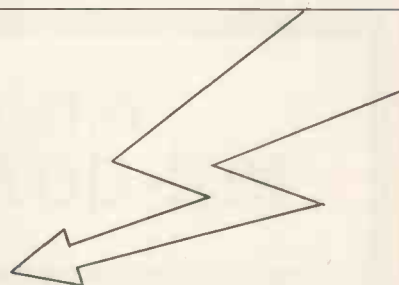
**For advanced bookings for parties of 20 or more, please send cheques payable to Argus Specialist Publications Ltd. (Dept. LHCS), 145 Charing Cross Road, London WC2H 0EE. Telephone 01-437 1002.*

POWER FAILURE "SPIKES" "GLITCHES"



A disaster for companies running computers. "NOT" if you have "BATTPOWER" – the uninterruptable power supply.

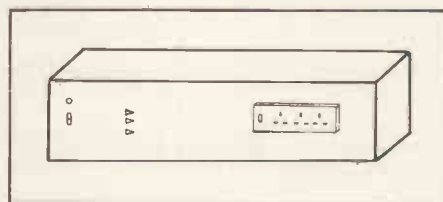
When Battpower is between the mains and your computer all your worries are over.



In the event of a power failure you may carry on operating your computer and ancillaries for at least one hour with our basic unit, costing only £599.00 plus VAT. Featuring:

- ★ QUARTZ FREQUENCY CONTROL
- ★ REGULATED SINE WAVE OUTPUT
- ★ INTERCHANGEABLE BATTERY PACK
- ★ TOROIDAL TRANSFORMER TECHNOLOGY
- ★ 300 VA OUTPUT
- ★ EASY TO INSTALL

Alternative units, with longer operating times, also available.



We also specialise in the VIC 20 and Commodore 64 Computers.

LOW, LOW PRICE OF: £125.00 inc. VAT.

We also carry a comprehensive stock of hardware and software for the above computers at very competitive prices. i.e. COMMODORE VIC 20 GAMES CARTRIDGE FOR £18.95 INC. VAT. COMMODORE 64 also in stock for only! £343.85p including VAT.

RING US FOR OUR LATEST PRICES

EE ECCLESTON ELECTRONICS 8 LEGGE LANE, BIRMINGHAM B1 3LG.
TELEPHONE: 021-236 6220/1226

AWARI

- ★ The ancient African game of logic. It takes 2 minutes to learn the rules but far longer to master the tactics.
- ★ Select the 'Goat-herd' level of play and it's an addictive game for children (8+) that exercises their minds – not their laser fingers.
- ★ Select the 'Witch-doctor' level and it's a threat to your sanity. We haven't beaten it and we wrote it!

ADVENTURE

- ★ Over 200 places to explore in this machine code game using advanced data compression techniques.
- ★ No random elements – you will need skill, cunning and a sense of humour as you explore caves, forest and castles.
- ★ Evade ruthless pursuers and overcome a host of obstacles.
- ★ Multiple word commands and single letter abbreviations.

£1000 IN PRIZES

FANTASTIC VOYAGE

(ZX81 16K ONLY)

This real-time graphics simulation set inside the human body was written by a lecturer in anatomy. You are injected into the blood stream in your miniature submarine. Navigate the arteries, veins and heart to the brain, where a blood clot must be destroyed. Features a real vascular map. You will be attacked by lymphocytes which must be destroyed using arcade game type graphics. Everything you do uses up precious energy. Three display formats – a lateral and frontal body scan plus blood vessel name, a close-up scan and a laser-sight for fighting lymphocytes.

★★ Buy both Awari and Adventure and enter the 'Foilkade Challenge' competition. Details with cassette or send SAE.

ALL GAMES £5.95 EACH, 2 FOR £9.95, 3 FOR £13.95 (ANY MIX) INCLUSIVE

FOILKADE LTD

DEPT PR32
66 LITTLEDEAN, YATE
BRISTOL BS17 4UQ

**Knights Sharp prices
MZ-80A £419, MZ-80B £747**

DEAL A24+1 £419 SHARP MZ-80A with 56k internal memory + 24 programs including Geography, Spacefighter, Home Budget, Basic Tutorials, Startrek, Invaders, Arithmetic, Scramble, Breakout, Bank Reconciliation, Mortgage etc.

DEAL A36+2 £429 MZ-80A with BASIC and PASCAL languages + 36 programs including those detailed above + 12 in Pascal.

DEAL A50+4 £439 MZ-80A, BASIC, PASCAL, and FORTH + 40 Programs
DEAL A40+4 £449 MZ-80A, BASIC, PASCAL, FORTH, 40 programs + **KNIGHTS EXPERT MACHINE CODE LOADER.**

DEAL A113+4 £475 SHARP MZ-80A with four languages – BASIC, PASCAL, FORTH, MACHINE CODE and 112 programs to get you off to a flying start.

DEAL A150+6 £525 MZ-80A, 4 languages, 150 programs, COMMANDER + **MONITOR PLUS**

DEAL B1+3 £747 SHARP MZ-80B with 76K internal memory, BASIC + MACHINE CODE.

DEAL B2+75 £899 MZ-80B with BASIC, MACHINE CODE, KNIGHTS EASY ASSEMBLER, DISASSEMBLER, KNIGHTS DOUBLE PRECISION BASIC and 75 programs.

DEAL P5 £363 SHARP P5 PRINTER SYSTEM for MZ-80K, A or B

DEAL P6 £418 SHARP P6 PRINTER SYSTEM for MZ-80K, A or B

DEAL MZ-80FD £657 Dual FLOPPY SYSTEM for MZ-80A or B.

DEAL ADS £1575 Complete MZ-80A micro system, dual floppies, printer, expansion + 150 programs.

DUAL BDS £1999 Complete MX-80B micro system, dual floppies, printer, expansion + 75 programs.

DEAL 400+63 £199 ATARI 400, with BASIC and 63 programs.

DEAL 800+63 £379 ATARI 800 with BASIC and 63 programs.

DEAL 810+63 £259 ATARI FLOPPY DISK UNIT and 63 programs.

We are now in our 9th year of selling Sharp without ever having charged to repair a Sharp product. Ring or write for our newsletters and software catalogue – we have hundreds of programs for Sharp and Atari. All prices exclude VAT but include Securicor delivery.

Knights Computers
108 Rosemount Place, Aberdeen Tel: 0224 630526

**Quality
Computer
Media**

**at
discount
prices**

come to Password



Uncertain about the disk or ribbon for your machine Call Password for online advice.

Disk storage Labels Paper
Ribbons Furniture
cleaning kits
Binders
Disks

Free

Plastic library
case with each
ten pack

Verbatim Datalife
The industry standard.
All mini disks are double
density with hub rings

5 1/4"

MD525	SS	40 track	£18.95*
MD550	DS	40 track	£24.95*
MD577	SS	77 track	£26.95
MD557	DS	77 track	£34.95

* Single density compatible

8"

FD1500	SSSD	£22.95
FD9000	SSSD	£28.95
FD8000	SSDD	£29.95
DD4001	DDDD	£34.95

**BASF
Disk Media**
These disks are high
quality at low prices

All disks
come with
Factory guarantee
10/16/32 sectors
available at the
same price

5 1/4"

SSSD	£16.75
SSSD	£20.75
DSSD	£22.75
DSSD	£25.75

8"

SSSD	£21.90
SSDD	£25.90
DSSD	£28.80
SSSD 32 sector	£27.35



cheap paper can damage your printer

Our stationery is superior heavyweight low dust paper
We have over 30 formats to choose from
Labels available on request

- ◆ One part music ruled 65gsm
2000 11 x 9 1/2 £10.95
2000 11 x 14 1/2 £12.90
2000 11 x 15 5/16 £13.50

- ◆ New mini packs for the small user
Plain 70gsm with perforated edges
(72 cuts/inch gives ultra smooth edge)
Ideal for letters/forms and archive listings
1000 11 x 9 1/4 £8.36
1000 12 x 9 1/4 £8.67

UK postage and packing

Disks 8" £1.30 each pack 5 1/4" £0.95 each pack
Library cases (EGLY) £0.50 each (30) £2.60 each
(60) £2.60 each
Ribbons £0.35 each Binders £2.60 each box
Paper (1000) £2.60 each box (2000) £3.50 each box
Cleaning kit £1.30 each

Add 15% VAT to total price. Cheques. Postal Orders to:

Password Electronics Ltd Freepost Southampton
68 Commercial Road S09 1BG
Wyndham Place
Southampton
Hants SO1 0GD
Tel 0703 332130

◆ **Disk storage**

Egly Plastic library cases 5 1/4" holds 10 £2.00 8" holds 10 £2.20
Plastic flip top large storage easy access 5 1/4" holds 30 £4.35 8" holds 60 (lockable) £18.95

◆ **Professional ribbons from GEHA**

Richo RP 1600	M. Strike	£3.36
NEC Spinwriter	M. Strike	£3.32
Diablo H/type II	M. Strike	£2.60
Qume	M. Strike	£1.73
Epson MK80	Nylon	£5.32
Commodore PET	Nylon	£5.32
Sharp CE/MZ	Nylon	£5.32
Centronics zip pack	Nylon	£2.69

We have ribbons for most popular machines

◆ **Verbatim Disk Drive Head Cleaning Kit**

No anyone can clean heads safely and quickly
No messy fluids use as a normal disk
Cleaning Kit £6.25 Extra Disks(10) £11.50 Specify 8" or 5 1/4"

◆ **Printout binders**

Paper Size	Vinyl	Pressboard
12 x 9 1/4	£25.00	£23.00
11 x 9 1/2	£25.00	£26.00
11 x 14 1/2	£30.50	£28.50

All prices are for 10 packs. Other sizes available

DO YOU WANT

- to buy your first computer?
- to change to a bigger computer?
- to expand your present system?

**then contact
everyman computers**

We can demonstrate and supply:

Commodore VIC-20 and 64; Sharp MZ 80A and B;
Genie I, II and Colour Genie; D.A.I.; and the new
Dragon 32.

We can supply most types of peripherals:

Printers, disc-drives, monitors, cassette recorders,
expansion units, system cables, etc. Also, the new voice
recognition system for the VIC-20 - "Big-Ears".

We keep an extensive range of software:

Arcade games, adventure games, family games, 'O'
level education, 'teach-yourself' programming,
accounts for small businesses or clubs (stock, payroll,
purchasing and sales).

**We also stock dustcovers and a good selection of books on
computing.**

Barclaycard, Access and Credit facilities available.



**EVERYMAN
COMPUTERS**

14 Edward Street, Westbury, Wilts BA13 3BD
Telephone (0373) 864644

**UCSD p-system
for Nascom**

The renowned UCSD p-system has now
been adapted for Nascom microcomputers
with virtually any combination of Nascom
or Gemini drives, 5" or 8".

A complete operating system, with screen editor, macro
assembler, optional Pascal, BASIC and FORTRAN,
Native Code Generator and TurtleGraphics, there is a
comprehensive and highly portable range of business
and applications software available and virtually
complete software compatibility with other computers
running UCSD - including Sirius, IBM, Apple and Sage.

Basic p-system (includes screen editor and
macro assembler) £225

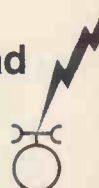
Compilers:
Pascal £140
FORTRAN £195
BASIC £125

Add VAT at 15%

Gemini / Galaxy / Quantum versions soon

Large SAE to:

**Mike York, 9 Rosehill Road
LONDON SW18 2NY
Tel. 01 874 6244
for further details**



VIC20 - ZX81

THE HOME DOCTOR SERIES

Exciting Breakthrough In Home Health Advice

Announcing the launch of a series of computer programs designed to educate and advise on a comprehensive range of medical topics whilst being FUN to use.

The text has been prepared by Dr Vernon Coleman who writes from 10 years experience in a busy general practice, and who is widely acclaimed for his many books on medical topics.

The cassettes in the series cover the following topics:

- | | |
|----------------------------|---------------------------------|
| 1. Basic Medicine | 4. All About Children |
| 2. Mainly for Women | 5. How Healthy Are You? |
| 3. Mainly for Men | 6. 101 Home Nursing Tips |

The computer programs are not intended to replace professional medical advice but rather to complement this by educating users on preventative medicine and how to cope with medical problems when they arise. The programs would therefore be equally useful in schools, homes and in industrial applications as part of health screening programs.

Each cassette costs £6.75 plus £0.45 postage and packing although as a special offer to Personal Computer World readers all 6 cassettes are available for £35.75 post free.

Users should indicate whether the cassettes are for VIC 20 or ZX81. VIC 20 owners require a 3K or 8K RAM pack and ZX81 owners require a 16K RAM pack to run all of the programs.

Please allow 28 days for delivery.



EASTMEAD COMPUTER SYSTEMS LTD
Eastmead House, Lyon Way, Camberley
Surrey GU16 5E2 TEL: 0276 682041/2

BBC Micro SOFTWARE

FROM

FERNLEAF MICROSYSTEMS

- WORD-EDITOR £12.50 (p+p inc) model B**
4 pages of text to write, delete, save, load, insert, draw tables, print etc. Package includes Manual. Ideal for almost all writing needs.
- HOME-FINANCE £12.50 (p+p inc) model B**
Another must for the BBC micro owner. Package manipulates 10 separate accounts; handles direct debit, standing orders, financial forecasts plus printouts, includes manual.
- SKY-BIRD £9.00 (p+p inc) model B**
Incredible game in fast real time graphics, exciting sounds & multi coloured graphics. Guide the flight of the sky-bird behind mountains, avoid the lazer hawk but watch out for unknown dangers behind the hills. Employs skill and returns untold enjoyment for all.



We offer quality software to
complement the quality of this micro.
We also write software to order.
Enquire in writing.
Enclose SAE.

Orders to: **FERNLEAF MICROSYSTEMS**

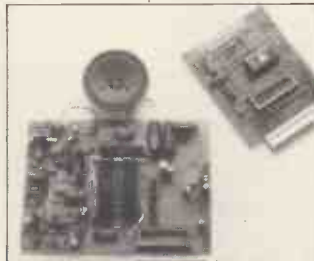
Retail dealers
offered big
discounts

**SILVERGROVE
INNHAMPS WOOD
CROWBOROUGH, SUSSEX
TN6 1TE**

VIEWDATA PRESTEL TELETEXT

TXV30 FULL EDITING VIEWDATA 14" COLOUR PORTABLE AND MONITOR

A full or local editing Viewdata terminal or 14" colour or Video Monitor. In Viewdata operation Prestel Teletext and 12 channel infra red remote control UHF/VHF colour receiver. With keyboard or microcomputer operation full or local editing may be made to Viewdata Terminals or with Telesoftware option programs can be directly loaded into the micro other options include cassette, 8 page store, printer. The unit has also RGB or Video to be used as a Professional Monitor. Normal Price £414 but until 1 Jan £360 as a special offer on orders received before this date.



MXV05/2 COMBINED VIEWDATA MICROCOMPUTER ADAPTOR.

An add-on combined Prestel, Teletext Viewdata Adaptor for attachment to UHF set and microcomputer for Viewdata and Telesoftware direct loading. Works with most popular micro's via a parallel or RS232 Ports includes; Full or Local Editing, Teletext with 6 channel TV reception and an optional infra red remote control is available for use without the micro for normal TV Prestel or Teletext operation, other options include cassette, 8 page store and printer. £299

MXV07 UNIVERSAL PRESTEL TAN- DEM TELESOFTWARE ZX81 ADAPTOR.

An inexpensive intelligent terminal viewdata adaptor for the ZX81 and tandems with most popular micros. The adaptor gives Prestel and Viewdata autodialing facilities to the Sinclair ZX81 which can receive Viewdata Prestel or directly automatically load telesoftware from the databases. With a micro in tandem the micro can have full telesoftware and Viewdata Prestel facilities. £50

BXVB07 ZX81 EPROM ADAPTOR BOARD

The adaptor board uses 2716 or 2732 PROMs for convenient running of programs with the Sinclair ZX81 attaches to the rear edge connector with ports for extra RAM and the MXV07 Prestel Telesoftware Adaptor.

LION VIEWDATA TV

18 Harcourt Terrace, London SW10. (SAE with enquiries please).

FOR BBC MICRO

FORTH ROM £34.72

Includes fitting instructions, manual for BBC version
Full manual (not necessary if already conversant
with Forth) £6.75
Colour Monitor/TV (switchable) £226.00

ACOUSTIC COUPLER £49.72

Send programs and data over your telephone -
works via the cassette interface.
Add VAT to the above (not for manual) - carriage free
in UK.

Coming soon!

Fast cos
Modem
Prom Blower
Computer aided learning package

Also: Sales & Service on the following:

Acorn, BBC, Commodore, Apple,
Dragon, Epson HX20, SWTPC, Epson,
Seikosha, Smith Corona (Daisy Wheel)

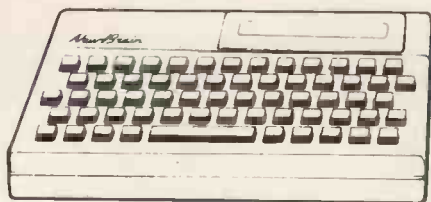
Supply:

Chips, paper, tapes, disks, cables,
connectors

H.C.C.S. Associates

**533 Durham Road, Low Fell
Gateshead, Tyne & Wear NE9 5EY
Tel: (0632) 821924**

★ **NEWBRAIN MODEL A** ★
ELSTREE COMPUTER CENTRE £199.50



MODEL A.D.

- 80 CHARACTER DISPLAY PER LINE
- 4 CHARACTER SETS
- VERY FAST: ACCURATE KEYBOARD
- IDEAL FOR BUSINESS USE

AD £229 plus VAT £263.25

A £199 plus VAT £228.50

p&p £2.75

★ SOFTWARE JUST RELEASED. SEE LIST ASIDE.

ELSTREE COMPUTER CENTRE
32 DEACONS HILL ROAD
ELSTREE, HERTS, WD6 3HL
Tel: (01) 953 6921

OFFICE HOURS 9-6 MON-FRI.

★ ATTENTION ZX81 OWNERS !! ★

If you own a ZX81 we will offer you up to £40
against a NewBrain (this is a limited offer)

NEWBRAIN SOFTWARE

From the software house of Elstree Computer Centre
A superb range of easy to use programmes
Purpose made and designed for the
fabulous Newbrain Computer

● Word Processor	£56.75+VAT
● Database	£59.50+VAT
● Invoice and credit note programme	£59.50+VAT
● Invoice and credit note review	£22.50+VAT
● Sales Ledger	£65.00+VAT
● Stock Control	£29.50+VAT
● Customer Information File	£36.50+VAT
● Bank and Cash balance	£29.00+VAT
● Inventory	£29.50+VAT
● Mailing List	£31.75
● Home expenses	£25.00

AND MORE

Send large S.A.E.

ELSTREE COMPUTER CENTRE
32 DEACONS HILL ROAD, ELSTREE, HERTS WD6 3HL
Tel: (01) 953-6921

EXPORT AND DEALER ENQUIRIES WELCOME

Please note we are open throughout the
Christmas holidays except Christmas Day.
Open Sundays by appointment.



SNAPSHOT

Not just another Apple bit copier

SNAPSHOT will copy any program that runs on a 48K Apple II (except for programs that require a Z-80 card or that repeatedly access their own disc while running). SNAPSHOT is a peripheral card that uses your language card* to interrupt a running program and dump the entire contents of 48K and registers to an unprotected backup disc.

- Repeatedly interrupt and resume any program
- Full monitor capabilities to examine, modify, trace, single-step, or disassemble an interrupted program
- Copies from DOS 3.2 to DOS 3.3
- Faster and easier to use than any bit copier
- Lets you suspend work with one program while you use another
- Makes almost all previously unlistable program listable
- Permits transfer of almost all protected programs to hard disc or 8" disc as binary files. Puts several protected programs on one disc.

RAMEX AND DIGITEK 16K RAM cards available!
Dealer price available

Ring 01-900 0104

PRICE £95.00 from Dark Star Systems

Dept P, 54 Robin Hood Way, Greenford, Middx, UB6 7QN
Tel: 01-900 0104

Terms: Add 15% VAT. P&P included. Check with order, please. Postage £1 outside UK, £5 outside Europe. Dealer terms available. *Requires one drive and Apple, Microsoft, Ramex or Digitek language/RAM card. Other brands: specify when ordering.

COMMODORE 64

The new Commodore 64 with its in-built 64K memory, high resolution graphics, 16 colours, three dimensional effect, excellent music synthesizer, second processor and CPM capability, full range of peripherals and interfaces and compatibility with PET software is the ultimate in PERSONAL COMPUTERS with the power to perform as a true business machine.

Price £275 + VAT (Special Introductory Price)

NETKIT II

Universal Communications for the Commodore PET

Why buy an expensive terminal when you can use a CBM/PET and still be able to run normal business software.

NETKIT II is being used in many varied and diverse applications, not only as an intelligent or dumb terminal to mini or mainframe computers, but also to support CBM/PET to CBM/PET communication with shared processing and transfer of programs and data.

NETKIT II is now available for all series of CBM/PETs and is supplied with a comprehensive operation and applications manual.

Price £150 + VAT.

*Yorkshire
Microcomputers*

28 RAMSHILL ROAD SCARBOROUGH NORTH YORKSHIRE YO11 2QF
TEL: (0723) 78136 TELEX: 527579

EPROM PROGRAMMERS FOR THE PET AND APPLE COMPUTERS

- All programmers can read/programme 2716(2k) 2532(4k) Eproms
- All you will ever need to make hard copies of your machine code programs.
- Independently powered

PET £62.00
APPLE £90.00

*PET owners free program for making your own character set

*Including VIA board to plug into slot #X



PET SUPERBOARD 32

Select up to 8 ROM/EPROM, RAM/ROM from any available ROM Socket under programme control

- No wires, switches or soldering required
- Plugs onto expansion port leaving port still available
- You can run a 32k machine code program from one ROM location
- Takes any combination of 2k/4k ROM/EPROM, RAM/ROM
- Can be plugged into the character generator to give up to 8 different on board character sets

£62.00

APPLE VIA BOARDS

The board contains a 6522 VIA, containing 2 programmable timers, a shift register, 4 handshaking lines, 2x8 bit programmable I/O ports. The board can be inserted into any available slot 1 to 7.

single £32.00
double £42.00

VIC and ACORN EPROM PROGRAMMERS

For details see above £62.00

ACORN MONITOR CHIP

10 commands to simplify machine code programming. Plus full screen editor, repeat key function and flashing cursor

£20.50

PET/VIC

Edge connectors plus covers

£6.50

E/PROMS

2532 £8.50; 2716 £4.50; RAM 6116 P-3 £8.50

All prices include VAT and p&p. Official orders welcome

CID

4 ALBERT ROAD, MARGATE,
KENT, CT9 5AN
Tel: (0843) 294648

COMPUTER INTERFACE DESIGNS

Available in
NORTH LONDON
NOW



ACT SIRIUS 1
16 BIT MICRO

with wide range of business software
Leasing facilities available

TOWN & COUNTRY COMPUTER SYSTEMS

Systems House, 489a Hertford Road, Enfield, Middx
Tel: 01-805 0903, Open until 10pm Tue, Wed, Thur & Sat until 1pm for demonstrations.

Linsac's ZX Companion series has received excellent press reviews:

"Far and away the best" — *Your Computer*

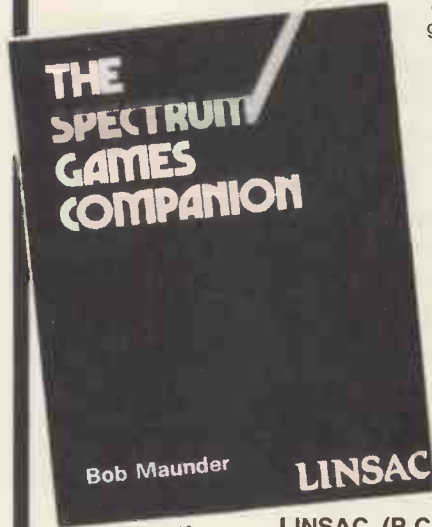
Thoughtfully written, detailed and illustrated with meaningful programs ... outstandingly useful" — *EZUG*

'The Spectrum Games Companion' is the latest addition to the series and is aimed at the games player and programmer alike. Twenty-one games designed specifically for the ZX Spectrum are included, with clear instructions on entry and play. Each program is explained fully with complete details on how it is designed and written. Introductory chapters show how to set up and use the Spectrum and how to create your own games. Later sections cover number games, word games, board games, simulation

games, dice games, card games and grid games. If you want to enjoy your ZX Spectrum and learn its secrets at the same time then this is the book for you!

Bob Mauder is co-author of 'The ZX80 Companion' and author of 'The ZX81 Companion'. He is a Senior Lecturer in Computer Science at Teesside Polytechnic, holds an MSc degree in Computer Science, and is a Member of the British Computer Society.

The Spectrum Games Companion is available from good book shops, or send £5.95 to:



ONLY
£5.95

LINSAC, (P.C.W.) 68 Barker Road,
Middlesbrough, Cleveland TS5 5ES

ISBN 0 907211 02 X

Postage is free within the U.K. —
add £1 for Europe or £2.50 outside Europe.

**YOUR QUICK-LEARN
WAY TO BASIC
OR COBOL**

**IN YOUR OWN
HOME,
IN YOUR OWN
TIME,
AT YOUR OWN
PACE.**

Learn computer programming quickly and easily through the renowned ICS "Open College" system, taking the course at your own pace and in your own time.

Use the famous ICS study texts, backed up by your own expert tutor, and learn computer programming, the proven way, with ICS home study.

Courses:
Introduction to Computer Programming
Programming in BASIC
Programming in COBOL



Approved by CACC



Member of ABCC



ALL DETAILS FREE—SIMPLY RETURN THE COUPON BELOW

Please send me your prospectus on Computer Programming



Name _____

Address _____



Post to: Dept 347Y
ICS School of Computer Programming
160 Stewarts Road,
London SW8 4UJ



01-622 9911
(all hours)

CHANNEL 8 SOFTWARE

£100 off the ATARI 800

NOW ONLY £399.00 COMPLETE WITH BASIC

COMING SOON, THE ULTIMATE IN PLAYER MISSILE DESIGN UTILITIES "THE CONSTRUCTOR"

NOW IN, A FULL TYPEWRITER KEYBOARD FOR THE ATARI 400 FITS INSIDE THE MACHINE IN PLACE OF THE TOUCH KEYBOARD ONLY £79.95.

MURDER AT AWESOME HALL Cassette (16K) **£12.95**
 SKY SNAKES Cassette (16K) **£9.95**
 BOMB HUNTER Cassette (16K) **£16.50**
 CAVES OF DEATH Cassette (24K) **£19.95**
 CAVES OF DEATH Disk (32K) **£19.95**

ATARI AM 400 Computer (16K) **£199.00**
 ATARI 400 Computer (16K with BASIC) **£249.00**
 ATARI 800 Computer (16K with BASIC) **£399.00**
 ATARI 810 Disk Drive **£299.00**
 48K Conversion for ATARI 400 (Exchange Price) **£99.00**

NORMAN AUDIO stock a wide range of Software from the following Manufacturers:

Avalon Hill, Atari, Channel 8 Software, Atari Program Exchange, Inhome Software, Adventure International, Arcade Plus, The English Software Company, Santa Cruz Educational, Personal Software, Datasoft Inc., Spectrum Computers, Thorn EMI Video.

ALL PRICES INCLUDE VAT & POST & PACKING. E & OE

NORMAN AUDIO LTD 51 Fishergate, Preston, Lancs. Tel. (0772) 53057

VIC-20

16k Adventure

STAR WARP II

A fast-action real-time space adventure — choose a ship to suit your style and explore Space for the Confederacy. Face dozens of Alien ships and in hundreds of planetary systems. With Hyperspace, Star Bases. . . . A real test of skill!!! **£8**

THE LAIR

Explore the 700+ caverns of The Lair seeking the fabled Treasure. But be careful — the caves are inhabited with Orcs, Sprites, Balrogs and . . . little blue men! **£8**

Soft Toys 2 — Games for 6.5k

This is what they thought at COMMODORE: Casinó — 'A new idea . . . Excellent graphics.' Simon — 'A new use of music that can be enjoyed by the entire family.' Lunar Lander — 'Excellent graphics', Maths Maze — 'For ages 3 to 93.' Hangman — 'One of the better Hangman games.' **£8**

* SPECIAL OFFER! *

FREE arcade game on cassette (worth £5) when you order two or more Soft Toys cassettes before 31-12-82.

Write **NOW** for a catalogue.

All prices include P&P 1st class. Send cheque/PO to:
soft toys 14, Lockharton Avenue, Edinburgh EH14 1AZ. Tel: 031 443 2005

IRVINE BUSINESS SYSTEMS LTD

NEW SPECIAL OFFER

5¼" disk drives double sided double density (400K) for only £195 each.

NEW PRODUCT

IBS 750 Single Card Computer

You get the following features on a single card for only £475.

- ★ Z80 CPU 4 MHZ
- ★ 64K Ram
- ★ 2 Serial Ports
- ★ 4 Parallel Ports
- ★ IEEE 488 instrument Port
- ★ Floppy Disk Controller
- ★ 80×24 Video Generator
- ★ Keyboard Port
- ★ CTC
- ★ Real Time Clock with battery back-up
- ★ Monitor in PROM
- ★ CP/M with Bios available

For further information contact:

IRVINE BUSINESS SYSTEMS
 1 Montgomery Place,
 Irvine, Ayrshire KA12 8PN
 Telephone: (0294)
 Telex: 777582 (mark attention IBS)



APPOINTMENT

Microcomputer Product Support Specialist

Atari Home Computer users deserve the best support and advice we can give them. Due to our rapid expansion the senior person in this group has been promoted and we are looking to replace him.

To be considered you must be a micro enthusiast with Atari specific knowledge and be confident in dealing with hardware, software and peripheral problems.

Your basic discipline should be computing and you should be competent in BASIC and ASSEMBLER.

Your personality must be energetic and outgoing with a pleasant telephone manner. As well as dealing with customers on the phone you will attend exhibitions and user group meetings. You will also be responsible for training other Atari staff, maintaining reference sources, and giving the service group hardware repair support.

Based in Slough, some travel is involved, and therefore a full driving licence is required. Preferred age range is 25-35 as it is unlikely that anyone under 25 years of age will have sufficient experience.

We offer a very competitive salary supported by a generous benefits package. If you can bring us a flexible and analytical approach, prospects for career development could hardly be better. We're succeeding in a fast-moving field. We're looking for someone (male or female) to succeed with us. Please write today with full personal and career details to:



David Konrath, Atari International (UK) Inc., Atari House, Railway Terrace, Slough, Berkshire.

ZX81 16K RAMPACKS

WHY NOT buy now, one of the super new RAM PACKS from GROUND CONTROL? The standard version gives 16K of user ram, while the (S) version is fitted with a keyboard sounder enabling much faster entry of programs and less eyestrain due to audible feedback every time a key is pressed. The well engineered case ensures a snug fit to the ZX81.



PRICES. (All inclusive for UK. For Europe add £2.00 postage.)

16K RAM PACK (S)£24.95
STANDARD RAM PACK£19.95

Availability is usually by return for credit cards, 5 days for cheques. There is a 14 day money back guarantee if not satisfied. Please send SAE or IRCs with all enquiries.

Make cheques/P.O.s. payable to GROUND CONTROL and send to: GROUND CONTROL, Alfreda Avenue, Hull-bridge, Essex SS5 6LT.

Tel: 0702-230324. (Mon-Fri 9-5)

*Access/Barclaycard no. _____
*Cheque/P.O./Cash. _____

*Delete if not applicable

Please send me: no. _____ *STANDARD RAM PACK/
16K RAM PACK (S)

NAME _____

ADDRESS _____

Postcode _____

Disk Utilities for CP/M

for
ANY
DISKETTE
FORMAT

These general disk utilities work on ANY single user CP/M 2.x system, with ANY diskette size and format, and many hard disks. All are menu driven, and easy to use.

DDUMP makes it possible to examine and patch any byte on any sector, addressed by track and logical sector number — or addressed by allocation block number, both in HEX and ASCII format. May be used to study how CP/M allocates disk storage, to examine or repair a damaged disk and to recover lost data.

DTEST tests a disk for bad spots. Bad sectors are locked out from later use by CP/M by automatically collecting them in a «garbage» file. All errors are reported to printer and/or console. Reduces probability of later disk crashes. Indispensable for hard disks, as media cannot be replaced. Use DTEST before disk errors ruin your work!

DUSER enables you to have access from one user area (user number) to programs and/or files stored on other user areas, without having to keep duplicate copies of files on the disk. DUSER makes this possible by copying file entries from one user area to another, thus saving considerable disk storage space.

DDUP duplicates disks. It is independent of disk controller, drive, disk size and format. It only requires that source and destination disks are of the same format and density. It will also replace bad sectors on the source disk with blank sectors on the destination, thus enabling you to automatically recover (what can be recovered from) damaged files.

UNERA recovers accidentally ERAsed files.

Price: Only £19.95 each. All 5 together £69.95.

Complete set of 5 manuals: £12.00.

Specify format: 8" SS/SD, 5" HS Heath/Zenith or 5" Osborne disk. Include £5 per order for handling & shipping. VISA accepted.

Dealers/distributors inquiries invited.

Order from your dealer,
or directly from:

ELEKTROKONSULT AS
Konnerudgaten 3
N-3000 Drammen
NORWAY

CP/M is a trademark of Digital Research.

PIMANIA

THE ADVENTURE GAME THAT'S FOR REAL! £6,000 PRIZE!

Will you be the first to locate the Golden Sundial of Pi in time and space, and be rewarded with the original? Exquisitely crafted by the winner of the De Beers Diamond International Award, from gold, diamond and the most precious of the earth's riches.

PIMANIA where saxophones turn into hanggliders, where music meets madness and where the Pi Man rules supreme! He'll talk with you, he'll befriend you, he'll betray you, he'll even do the Hokey Kokey! Animated cartoon graphics! Full musical score! Spectacular colour and sound effects! Includes free hit single "Pimania", with vocals by Clair Sinclair and the Pi Men!

It could take you a week to play, it could take you a lifetime! PIMANIA, "the best evidence that computer gaming has come of age... an adventure enthusiast's dream!" (Computer & Video Games)

An investment at £10 (48K Spectrum) £8 (16K ZX81)

AUTOMATA Ltd. (F)
65a Osborne Road
Portsmouth PO5 3LR
England

PRINTER BONANZA!

EPSON PRINTERS AT UNBEATABLE PRICES



MX80 FT III £305 + VAT

MX82 FT III £315 + VAT

MX100 FT III £415 + VAT

Interfaces to any machine supplied—please ask for price



All printers carry a 1 Year Guarantee and come with paper. Shipment is by Securicor to your door—Please add £7 + VAT carriage.

Payment by Cheque, Access, Visa etc.
All prices Apply to 31st Jan. 1983.

IMMEDIATE
DELIVERY.

Shipments throughout UK by Securicor.
We can export to most countries in the world.



Micro-Spares

We cannot and will not be beaten on Price!

19 Roseburn Terrace, Edinburgh EH12
031-337 5611 (24 hrs)

STAR SOCCER



AN EXCITING NEW GAME
FOR THE ZX81 (16K)

- ★ ALL THE ACTION OF REAL FOOTBALL
PASS — SHOOT — DRIBBLE — TACKLE
CORNERS — FREE KICKS — THROW-INS
- ★ YOU PLAN THE MOVES — SEE THE PLAY
IN HIGH SPEED GRAPHICS
- ★ MATCHES BETWEEN 12 TOP CLUB SIDES
AND 12 *STAR* WORLD CUP SQUADS
- ★ MORE THAN AN ARCADE GAME
MORE THAN A SIMULATION

'A truly original and absorbing game'

ONLY £5.95

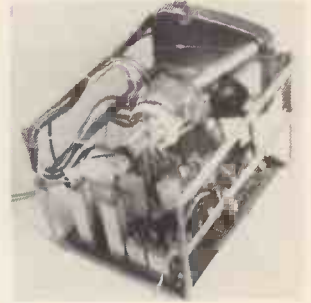
Please make cheques and postal orders payable to:

Watson Software Services Ltd.

1, Ivy Cottages, Long Road West, Dedham, Essex CO7 6EL

Allow 14 days for delivery

MONITORS



HIGH RESOLUTION - AND LOW COST!

Either cased or open frames to
OEM's. The specification is right,
the price is even better.

Phone or write to our Sales
Manager, Richard Cox, for
immediate action.

CROFTON ELECTRONICS LTD

35, Grosvenor Road, Twickenham, Middx, TW1 4AD.

Telephone: 01-891 1923/1513 Telex: 295093 CROFTN G

Happy Memories

Part type	1 off	25-99	100 up
4116 200ns	.83	.72	.66
4116 200ns	.75	.65	.60
4816 100ns for BBC comp	2.45	2.10	1.95
4164 200ns	4.95	4.45	4.20
2114 200ns Low power	1.15	1.00	.90
2114 450ns Low power	.95	.85	.80
4118 250ns	3.25	2.85	2.65
6116 150ns CMOS	3.70	3.20	2.95
2708 450ns	2.60	2.25	2.10
2716 450ns 5 volt	2.60	2.25	2.10
2716 450ns three rail	5.75	5.00	4.65
2732 450ns Intel type	3.75	3.25	3.00
2532 450ns Texas type	3.75	3.25	3.00

Z80A-CPU £4.35 Z80A-PIO £3.25 Z80A-CTC £3.25
6522 PIA £3.98 7805 reg £0.50 7812 reg £0.50

Low profile IC sockets: Pins 8 14 16 18 20 22 24 28 40
Pence 9 10 11 14 15 18 19 25 33

Soft-sectored floppy discs per 10 in plastic library case:
5 inch SSSD £17.00 5 inch SSDD £19.25 5 inch DSDD £21.00
8 inch SSSD £19.25 8 inch SSDD £23.65 8 inch DSDD £25.50
74LS series TTL, large stocks at low prices with DIY
discounts starting at a mix of just 25 pieces. Write or 'phone
for list

Please add 30p post and packing to orders under £15 and VAT to total
Access and Barclaycard welcome, 24hr service on (054 422) 618
Government and Educational orders welcome. £15 minimum
Trade accounts operated, 'phone or write for details



HAPPY MEMORIES (PCW), Gladestry, Kington,
Herefordshire. HR5 3NY. Tel- (054 422) 618 or 628

BRAINWAVES FOR NEWBRAINS

SECRETARY Only requires an inexpensive cable to
turn your Newbrain and Printer into a word processor.
Provide full editing facilities, including loading & saving
of text to cassette. Enables you to print letter, circulars,
labels etc.
Cassette & manual £25.00

DIARY Keep track of all those appointments, including
names, dates & times. Loads & saves on cassette auto-
matically. Search by name or date. Invaluable for the
busy manager or salesman.
Cassette & manual £10.00

TELEPHONE Records all your contacts, customers, or
companies, lists telephone numbers, names & addresses.
Full search of records by 3 different means.
Cassette & manual £10.00

Above Prices include P&P. Sent by return.

BRAINWAVE COMPUTING LTD

2 & 3 Belchamp Road
Tilbury-Juxta-Clare
Essex CO9 4JT
Tel: 0787 237831

AT LAST! A SENSIBLE PRINTER STAND AT A SENSIBLE PRICE



Patents Pending.

■ Stands neatly on a desk top. ■ Printout stacks tidily in the tray. ■ Supply paper locates underneath the printer – can stay in its carton for convenience. ■ Sturdy design, brandy white finish only. ■ Discounts for multiple orders.

Accommodates most makes of 80-character printers including ■ EPSON MX80 ■ MICROLINE 80

Send coupon or telephone for details.

Advanced Resources. St. Gabriels, Much Birch, Hereford HR2 8HY. Telephone: (0981) 540 262

Please send leaflet and order form for the Advanced Printer Stand.

Name: _____

Address: _____

State Printer Model _____

PC1/83

Adding high resolution colour graphics to your Nascom or Gemini system need not cost more than £199.

Introducing the new **Microvector MV256** adding a high Resolution Colour Graphics capability to your **NASCOM** or **GEMINI** computer system.

- ★ High resolution display. 256 x 256 x 4 planes (16 colours).
- ★ 32k of display memory with flicker-free update (Outside of the host computers memory address space).
- ★ Non-interlaced 50Hz CCIR 625 line display format.
- ★ High Quality PAL UHF output with intercarrier sound facility.
- ★ Composite B/W video 75 ohm output (16 grey levels).
- ★ Red, Blue & Green video 75 ohm outputs (sync. mixed on each) available on MV256B only.
- ★ Audio & light pen inputs.

The **MV256** uses the **Thomson EF9365** graphics display processor to provide high level graphics functions in hardware.

- ★ Ultra fast vector and character generation give full animation capability (typ 800 000 pixels/sec, max 1300 000 pixels/sec).
- ★ Selectable line types (continuous, dotted, dashed, dotted-dashed).
- ★ 96 ASCII character set. Programmable character sizes and orientations.
- ★ Rectangle fill, clear screen and scan screen operations.
- ★ Host computer access to display memory via registers.
- ★ Comprehensive display status information.
- ★ Light pen control.
- ★ NMI interrupt generation (on board link option).

MV256A **£199** + VAT MV256B **£220** + VAT

Both the **MV256A** and **MV256B** are supplied built and tested with comprehensive documentation and programming examples, Postage & Packing free.

Colour Video monitor 10 inch 0.6 mm pitch tube 9MHz bandwidth, suitable for use with MV256B. Also has PAL decoder enabling direct connection to domestic video recorder.

Arfon Light pen, Plug in, compatible with Micro Vector board.

£199 + VAT
& CARR.

£50 + VAT

Cable Accessories available.

For further information please contact:

CLIMAX COMPUTERS LTD

17a Broad Street, South Molton, Devon. Tel: (07695) 2314

Software for SHARP microcomputers

PAYROLLS. All adhere to the INLAND REVENUE regulations, produce payslips on plain paper and a full printout for record purposes. Fully menu driven, simple to use.

MZ-80K/MZ-80A		MZ-80B increased capacity, higher speed	
Tape	Weekly £120.00	Tape	Weekly £120.00
	Monthly £120.00		Monthly £120.00
Disk	Weekly £150.00	Disk	Weekly £150.00
	Monthly £150.00		Monthly £150.00
	Combined £275.00		Combined £275.00

MZ-80K Stock Control £170.00
Stock Control and Invoicing £285.00

MZ80B Letterwriter £45.00
Cashbook Cassette £65.00
Disk £95.00

Revive £20.00

Bstam £90.00

All prices exclude VAT at 15%.

For further details write or ring:

MICROTEK

15 Lower Brook St. Ipswich Suffolk IP4 1AQ
tel. Ipswich (0473) 50152/52466

where software meets hardware





Top Quality BASF

DISKS

- Individually tested by manufacturer
- 5¼" single sided, single density, soft sectored
- Same day dispatch by first class post

In boxes of 10

£14.95  
plus £1 p&p per box (UK)

10 in library case

£16.85
plus £1.50 p&p per box (UK)

Please add 15% VAT to total and send cheque/PO to:

STOCK ELECTRONICS

Plot 8, Forest Vale Road,
Forest Vale Industrial Estate
Cinderford, Glos GL14 2PH
(0594) 25360

NOW AVAILABLE FROM HILTON COMPUTER SERVICES LTD.

(AUTHOR OF THE BEST BANKING PROGRAMS IN THE WORLD!)

The P.B.S. Bank reconciliation is believed to be the first such program to be available for the Sinclair ZX81 and the ZX Spectrum.

Just look at some of its features:

- Automatically matches bank statement items with transactions recorded in your "Personal Banking System".
- Lists all outstanding items such as uncleared cheques, funds received but not advised to you, bank charges - highlights all discrepancies. No more scratching around to try and find out why your statement balance is different to what you expected.
- Full search facilities allowing on-screen correction of any item.
- Saves and loads data to and from tape (ZX81 version, at double speed). Exchanges data with the main P.B.S. program. No need to save programs.
- Single key operation - uses m/c keyboard scan for single letter commands (ZX81 version).
- Extremely easy to use. No jargon to wade through before you get started. Demonstration program included.
- All item lists, searches (with totals), etc. can be output to your ZX printer.
- Full instructions included.
- Unique after sales maintenance provided.
- Operates in conjunction with "Personal Banking System" (Full input and correction facilities plus automatic posting of standing orders on due dates).

So banish the headaches, make life easier for yourself, send £15 for the Personal Banking System plus P.B.S. reconciliation and users manual.

Existing clients need only send £5 for the P.B.S. bank reconciliation which will operate with their present P.B.S.

The Personal Banking System (as reviewed in Popular Computing Weekly - 1st July) is available separately for £9.95 for cassette and user manual. ZX81 P.B.S. owners can order the Spectrum version for just £5.

Dragon versions also available.

Please specify whether ZX81 (16K) or ZX Spectrum (48K).

Guaranteed software available from Hilton Computer Services Ltd.
14 Avalon Road, Orpington, Kent, BR6 9AX.

Your P.B.S. is never out of date!

ASCO BUSINESS

43 Windmill Way, Reigate, RH2 0JB Reigate 48055

ACT
SIRIUS 1



Beautifully designed
powerful & versatile
128k RAM. Disc drive of
1.2Mbyte. Superb graphics
and a great deal! £2395

OLIVETTI
PRAXIS 35



£395

- * Daisy Wheel Electronic typewriter/printer
 - * Centronics Interface
 - * Friction Feed
 - * Correction Ribbon
 - * Choice of typestyles
- With Serial RS232 Interface at £435

OLIVETTI ET121 AT A SPECIAL PRICE!

FREE CASSETTE WITH
YOUR DRAGON **£173**

Dragon Word Processor
only £15.95

Dragon data base	= £17.35
Joysticks (pair)	= £17.35
Ghost Attack	= £21.70
Other Cartridges	= £17.35
Cassettes	= £6.91



ADD VAT. SAME DAY DESPATCH. FREE DELIVERY.

SPELLING CHECKER

The features of PROOF include

- Large dictionary of 44,711 words.
- Dictionary contains 1,170 proper names and 659 place names.
- British and American spellings included—either can be selected at run time.
- Plurals of nouns, comparatives of adjectives and all tenses of verbs are included.
- PROOF automatically deals with possessives such as table's, compound words and lines which end with hyphens.
- Alternative spellings, such as civilize and civilise, are included in the dictionary.
- Main dictionary can be extended by adding user created dictionaries.
- Comprehensive 120 page manual.
- PROOF is menu driven.
- Fast interaction by single keystrokes.
- 9 different combinations of input and output plus 4 different operating modes.
- Up to 11 lines of the local context of each spelling mistake may be displayed.
- PROOF can provide the line numbers where spelling mistakes occur.
- PROOF gives a word count.
- PROOF can be used to check individual words typed in at the keyboard.
- Demonstration file included.
- 30 day money back guarantee.

System requirements: 48K Apple][, twin 5 1/4" drives, video monitor, 16 sector DOS. PROOF can accept input from the keyboard or from standard Apple][text or binary files.

Software (2 disks) and manual: £120 + VAT.

Manual: £12 + VAT (credited on purchase of software).

Cambrian Software, Gwynllys, Groeslon, Caernarfon, Gwynedd, LL54 7ST.
Telephone: 0286-831072 (day or night).

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

- Software and manual: £120 + VAT. Manual: £12 + VAT.
 Further details.

Name

Address

Tel. No.

Cambrian Software, Gwynllys, Groeslon, Caernarfon, Gwynedd, LL54 7ST.
Telephone: 0286-831072.



SINCLAIR
COMPUTERS

UK prices are shown first. The bracketed prices are export prices which include insured air-mail postage to all the countries of Europe including Norway, Sweden, Finland and Denmark. For overseas customers outside Europe an extra £5 postage per item is charged: zx81 £43.43 (£52), zx printer £52.13 (£61), ZX spectrum 16K £152 (£160), zx spectrum 48K £202 (£210), zx microdrive n/a (n/a), zx rs232 n/a (n/a), 5 printer rolls £10.43 (£18), Ram packs: 16K £26.04 (£28), 32K £39 (£41), 56K £49 (£51).

DRAGON 32 £173

COMMODORE
COMPUTERS

Commodore 64 £299. Vic 20 £130. Kit to allow the use of an ordinary mono cassette recorder with the Vic 20 and the Commodore 64 £6. Commodore cassette recorder for these computers £36.50. Super expander high resolution cartridge £27.95. We stock most accessories.

BBC
MICROCOMPUTER

A model £260. B model £347.

GENIE
COMPUTERS

New colour Genie £173.50, 16K ram card £44. Light pen £15. Accessories for Genie 1 and Genie 2: EG3014 32K £189. Disc drives single £199, dual £369. Double density convertor £72. High resolution graphics £82. Printer interface £36.

UK101 AND
SUPERBOARD

32x48 display expansion kits UK101 £9, Series 1 Superboard £14. 32K memory expansion board £60. Cegmon £22.50. Word processor prog £10. Centronics interface kit £10. Cased disc drives with DOS single £275, double £415. Stand alone floppy disc controller £85.



PRINTERS

Buy any of the below and get a free interface kit and word processor program for UK101 or Superboard. Epson MX80FT3 £349. Epson MX100/3 £449. Seikosha GP100A £189. OKI Microline 80 £235. OKI Microline 82A £333. OKI Microline 83A £446. Microline 84 £742.

5V POWER KITS

Fully stabilized 5V computer and TTL power kits. 1.5A £7.83, 3A £12.17, 6A £20.87.

SHARP
COMPUTERS

We can supply Epson MX80 and MX100 printers to run direct from the MZ80K (i/o box not needed) for £39 plus printer price. We also specialise in interfacing printers to the MZ80K, MZ80A and MZ80B both with and without the i/o box.

Postage £1 on Sinclair products (UK), £3.50 on other computers. £4.50 on printers and 50p on other orders. Please add VAT to all prices. Official credit and overseas orders welcome.

SWANLEY ELECTRONICS

Dept PCW, 32 Goldsel Rd, Swanley, Kent BR8 8EZ

Tel Swanley (0322) 64851



A FASCINATING INTRODUCTION TO PROGRAMMING

LOGO II MODEL B

The first implementation on the B.B.C. Microcomputer of the graphics language LOGO. This language is now popular in American schools as an ideal educational program. It can graphically demonstrate the ideas of defined procedures, sub-routines, loops and even recursive programming. LOGO II is a much improved version of our original LOGO program and now works in different screen modes and includes the ability to list or delete defined words. These may also be saved on tape. This program will give an excellent introduction to computers and LOGO language.

**£10.00
+vat**

Professional B.B.C.
software for homes
COMPUTER

CONCEPTS

BARCLAYCARD

VISA

Buy it with Access

16 Wayside, Chipperfield,
Herts, WD4 9JJ. tel (09277) 69727

Quantity discounts available - ask for details

DATABASE SOFTWARE

97 Defoe Drive
Park Hall
Stoke-On-Trent
ST3 5RS
Telephone (0782) 330552

Look - all new programmes for the following machines:

1K 2x81 Games Packs 1 & 2. Machine code versions of stunt cycle, demon driver, invaders + many more. Simply the best 1K progs, on the market; £4.75 each inc VAT + P&P.

BBC



You're on a platform in space and you are lost in an amazing 3D maze. Find your way out before you run out of energy and are lost forever. Full use of colour graphics + sound. M/C + basic. £7.50 inc VAT + P&P.

BBC MICROCOMPUTER A* & B*

*with 32K

BBC Micro 32K A or B. Beeb-Chase. A superb rendition of an old favourite. Startling colour + graphics + sound. P. Man type game £7.50 inc VAT + P&P.

BBC Micro 32K A or B. Cookbook Wizardry

Show your wife just how useful the Beeb can be. Over 35 recipes - in colour. £7.50 inc VAT + P&P. Also available for the SPECTRUM 48K - £7.50 inc VAT + P&P.

BBC Micro A or B. Educational for Schools & Colleges

Hydraulics - Fundamentals of Area, volume flow etc. (14yrs +)
Electric - Fundamentals of current, resistance etc. (14yrs +)
Each programme sets random questions. £5.50 each inc VAT + P&P.

VIC 20 - (Unexpanded) "Chicken Run" For the younger player - shoot the foxes before they get your chickens. £5.50 inc VAT + P&P.

VIC 20 - (Unexpanded) "Dambuster" - Careful or you will drown. Stop the madman from breaking the wall. £5.50 inc VAT + P&P.

Atari 400/800 16K. Family Hangman. Up to 6 people play.

Large vocabulary of words and superb graphics & sound use. Joystick reqd. Must be seen! £7.00 inc VAT + P&P.

We also offer high quality tensai, recorders for most micro's at an unrepeatable price of £22.00 inc VAT + P&P.

Watch this space for more innovative software for Spectrum, VIC & 64, Jupiter Ace etc. P&P on all items: 50p. All cheques/POs to Database Software. Programmes stocked at Computer Cabin, Silverdale, Staffs and Coventry Micro Centre, Coventry.

DEALERS WANTED

MAIL ORDER ONLY. EXPORT ORDERS WELCOME.
ALL PROGRAMMES & GOODS GUARANTEED 1 YEAR

STIRLING

- Come on in and talk to us, we take the hard work out of choosing the right system, whether its for personal, educational or business use.
- Highly competitive prices.
- No obligation demonstration.
- 12 months parts and labour guarantee and a full after sales service back-up
- Apple Level 1 Service Centre.
- Mail order service.

Streamline your business with Apple II and save over £300 on the system list price. Apple II gives your business an extra edge, a complete system aimed at business growth and efficiency can cost as little as £1600. Improve your business with an Apple!

THE 6809 CENTRE

We carry the widest range of 6809 based Hardware and Software.

Hardware products include:-
DRAGON 32 the best value home computer **£199.50**. Including a wide range of Software.

POSITRON British built multi-user machine, at a very competitive price, running Flex and OS-9 Software systems prices start at **£3,400**.

S.W.T.P.C. the industry Standard, bus-oriented, 6809 based system with full expansion capabilities. Software on Flex or Unixflex.

STIRLING 77-68 6809 based, Kit System on a range of 8" square boards, with 64K memory boards, cassette interfaces, memory mapped VDU boards, more boards under development. Design notes **£1.00**. 64K board **£28.75**, other boards **£12.00**.

Software products include:-
FLEX SYSTEM SOFTWARE Full range always in stock, with simulators, 68000 cross assemblers, Fortran 77, all for 6809 Flex machines.

OS-9 SYSTEM SOFTWARE with more interest in the 6809 multiuser, multitasking operating system, we are increasing our stock of program using this system.

DYNACAL, the 6809 spreadsheet programme, at **£140**.

STYLOGRAPH, the 6809 word processing package, **£173**.

Ring us for full details of our 6809 Software. All prices include VAT.

STIRLING MICROSYSTEMS

The logical answer to buying computers

241 Baker St., London NW1 6XE Mail Order Hot Line 01-641 7671



The only thing we discount is the price.

- CREDIT FACILITIES (NAME DAY POSSIBLE)
- AFTER SALES SERVICE
- MAIL ORDER
- EXPORT

M.O'BRIEN
MICROCOMPUTER DISCOUNTS

95 High Street
Wimbledon Village
London S.W.19
93 Butts Road
Open 9.00 am - 5.30 pm
Tuesday/Saturday
Closed all day Monday

Prices include VAT and postage where applicable. There are no hidden charges or extra charges.

01 946 1528/0331

apple computer

APPLE III £2150

APPLE II 48K £659
DISK II (with controller) £314
DISK II (w/o controller) £285

Prices includes VAT

Computer plus Video Monitor III and information Analyst Software Package comprising of: VisiCalc™ III, The Apple Sophisticated Operating System (SOS) and Apple Business BASIC Language.

Additional Disk Drive III £319

TABS

Software
Foundation Module
Sales Ledger
Purchase Ledger Module
Nominal Ledger Module
Stock Control Module

Special prices on request

SOFTWARE

APPLE VISICALC £107
APPLE VISIDEX £107
APPLE VISIPILOT £97
APPLE VISITREND/PLOT £137
APPLE VISITERM £80
APPLE VISIFILE £137
APPLE ESTATE AGENT £345 (inc VAT)
MICRO MANAGEMENT
ACCOUNTS £517 (inc VAT)

VIC-20

VIC 20 £159
VIC C2N £39
VIC PRINTER £299
VIC D.DRIVE £200
VIC 3K RAM £26
VIC 8K RAM £39
VIC 16K RAM £65

GAMES
CARTRIDGES
£17.00

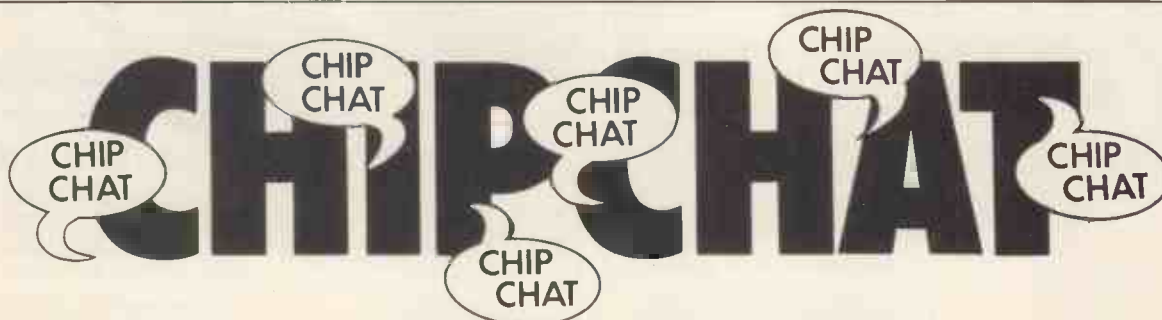
Prices inc VAT.

Printers

CENTRONICS
EPSON MX80
EPSON MX80FT
OKI
MANNESMAN
DIABLO
RICOH
NEC
TEC
STAR
ANADIX
SEIKOSHA

ADVERTISERS INDEX

Asco Business	302	Datarite	243	Jupiter	24/25	Raven Computers	272
Apple Orchard	92	Digitus	1	JRS Software	57	RAL	235
Atari	191	Digitek	218	Johnson	251	Rair	58
Arborcraft	28	Digitolve	90	Kram Electronics	27	Simmons Magee	260
Access Data	133	Digital Solutions	280	Kuma Computers	175	Spectrum Computer Grp	84/85/86/87
Atlanta	255	Dovness	11	Knight	292	Software Ltd	181
Audio Computers	IBC	Deans	19	KGB Micros	4	Stirling Microsystems	303
Almarc	80	Dark Star	295	Keelecodes	274	Swanley	302
Acornsoft	49	Data Base	303	Lifeboat Associates	31	Startech	32
Apple Takeaway	59	Da Vinci	274	London Micro Sys	5	Starton	250
Adda Computers	63	Delta Systems	27	Leicester Compent	284	Shiva	245
Acco	249	Delta Plus	281	Logic Computers	247	Small Systems	279
Aimgram	289	Death Valley	281	London Comp Store	244	Sinclair	224/225
A.M. Electronics	57	Data Link	56	Level 9	241	SRS	134
Action Computers	257	Discom	76/215	Linsac	296	Soft Option	62
Ashby Computers	255	Elektroksort	299	London Home Comp	291	Silicon	61
Acorn Computers	239	Epson	143	L.V.L.	135	Soft Toys	297
Algray	285	Equinox	146	Lion TV	294	Sparrow Comp	263
Argus	229	Elstree	295	L&J Computers	51	Spot Computer Systems	287
Automata	299	Eastmead	294	Little Genius	280	Sharp	96/97
Advanced Resources	301	Eccleston Electronics	291	Micro Value	15/16/17	Silica Shop	75
Akhtar	70	Electronic Aids	287	Micro Spares	299	SGS Software	26
Bits and PC's	270	Elcomp	222	MPI	82/83	Sumlock Bondain	6
Beebug	286	Environmental Equipment	54	Microsoft	48	Stage One	14
Brighton Micro	40/41	Everyman	293	Microage	262/267	Softtek	238
B.I.T.	258	Eltec	174	Microgeneral	282	Software House	49
BBC Publications	217	4B Microcentre	241	Microconcepts	289	Satellite	28
Brighton Computer Centre	151	Fuller	248	Microtek	301	Sharpsoft	273
Bug Byte	36/37	Fernleaf	294	Maplin	52/53	Stock Electronics	301
B.B. Electronics	60	Foilkade	292	Microcentre	IFC	Telexsystems	247
Bonsai	105	Ground Control	299	Molmerx	268/269	Technomatic	78
Benton & Brown	297	Grama	252	Micronet	264/265	3D Computers	276
Cambridge Software	71	Gemini Microcomputers	242	Micro Products Software	233	Thorn	120/121/264
Climax Computers	301	GNCS	29	Microcomputer Spacedrome	67	Triumph Adler	144
Comart	12/13	General Northern Micro	286	Microcomputer Services	293	Timedata	241
Commodore	46/47	Graffcom	23	Map 80	92	Town & Country	296
Computer Aids	251	Grama	253	Millbank	28	Titan	287
Computer Plus	134	Grundy	38/39	Nottingdale	253	Thomason	255
Computer Concepts	303	Gamer	30	Norman Audio	297	Tandy	186
Camana	259	Gallid	60	Oric Products	34/35	Tabs	33
Comserve	278/279	Greenwich	285	Ormskirk	266	Transam	237
Clearsons Franchising	92	Gemini Mark	66	O'Brien Hi-Fi	303	Torch	72/73
Cambridge Computer Store	228	HAL	109	Oxford Comp Systems	240	TwickenhamComp	298
Caxton Software	99	Happy Memories	300	Oxford Comp Publishing	282	Tri Data	64
Crofton Electronics	300	HCCS	294	Office Int	256	Tycom	151
CW/P	123, 125 & 127	Hewlett Packard	216/217/220	Olive Branch	28	Transtec	65
Cream Computers	8	Haven Hardware	277	Open Comp Services	249	U.Microcomputers	42
Crown Business Systems	276	Horizon	79	Osbourne Comp	230	U.T.S.	275
Compsoft	89	Hilderbay	30	Ozwise	288	Urmston	255
Crystal Electronics	241	Hilton Comp Services	302	Office Efficiency	55	Understanding	298
Consmarc	68, 69	I.O. Research	254	O.E. Ltd	185	Vincelord	7
Cambrian Software	302	I.O. Technology	152/153	Personal Computers	OBC	John Wiley & Sons	134/236
City Microsystems	277	I.C.E.	81	Prentice Hall	246	Watford Electronics	77
Chromasone Electronics	219	Interface	278	Peachtree	43/44/45	Which Computer Show	227
Computer Bookshop	271	Intelligence U.K.	283	Pace	184	Watson	300
Computer Interface	296	Imagine	223	Pinner Wordpro	229	Westbourne	285
C.J.E. Microcomputers	284	Informatics	215	Precision Software	115	X. Data	10
Comart	88	Island Software	22	Premier Business Systems	18	Xitan	226
Cabel	228	Inst of Analysts and Progs	229	Password	293	Yorkshire Micros	295
Comprocsys	290	Irvine Business Systems	297	Popular Computing	142	Zen	232
Comcen	20/21	Interext	296	Prospero Software	290		
Calpac	30	Inmac U.K.	231	Plus 80	288		
Camputers	9	Jayman Electronic Devices	71	Q Tek	275		

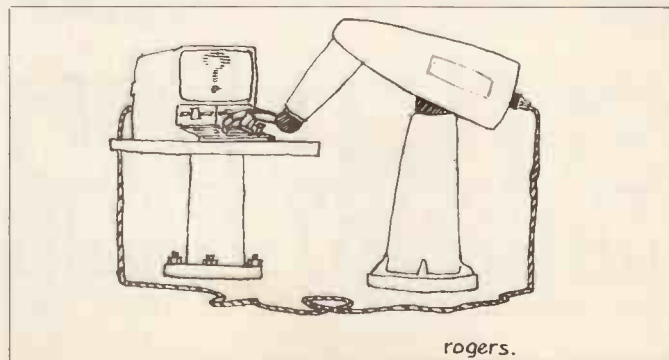


We hear that the erstwhile editor of a certain other micro magazine was running a talking database at Compec. This is great, fine etc, but the speech synthesis was related to spelling. Imagine, then, the confusion when, the poor overworked machine tried its best to say 'Cholmondeley'; and just think of the incredible verbal gymnastics had the machine been told to read 'Mr St John Beauchamp, 122 Beaulieu Avenue, Gloucester' ... Our handsome Editor was spirited off to Madrid recently by Philips (the makers of that good-looker, the P2000) for the launch of the P3000. After having spent some time watching a show in which "chimpanzees were hurled around"

(to quote another member of the party), and even more time on the traditional ceremony of the bottle (getting drunk to you) everyone who went was presented with an ashtray bearing their picture at the bottom of it. We plan to use this particular ornament as a spittoon if Rodders ever lets us see it... Rumours are circulating in the busy microcomputer world that CP/M is not a registered trademark in the UK. This leads us on to two points: a) how many other American companies have made this same mistake? and b) how long will it take for some shark to register CP/M in the UK and sell it for a ridiculous sum to Digital Research? ...

Peachtree Software is certainly 'blossoming', as its recent advertising says (see Dec PCW, page 33). Those who have read this ad will know that it's directed at hardware and software suppliers, encouraging them to enter into a Peachtree 'software

partnership'. Perhaps the partnership here is actually the one that involved Peachtree's partnership manager and his assistant leaving but a fortnight before this column was written. They'll have to change the photo in that ad now...

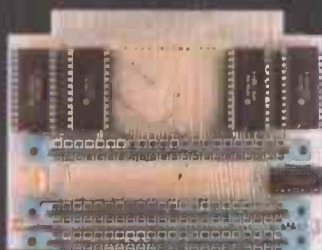


MORE MEMORY FOR MICROS!

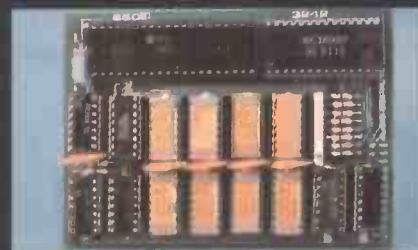
look at what we can offer:



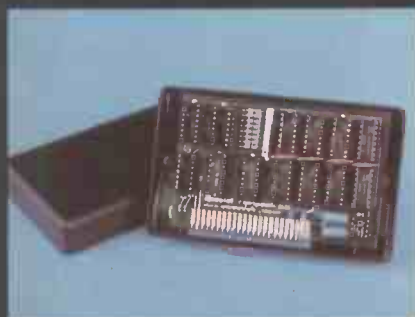
RAMPACK
for SINCLAIR ZX81



VCS 8K for VIC
8k RAM + 3 slots **£44**



DUO1 for ATOM
64k RAM only **£70**



16K - the only upgradable
to 56k on the market -

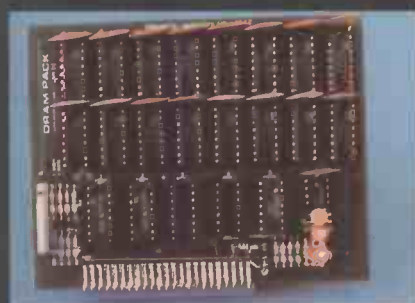
OUT OF STOCK



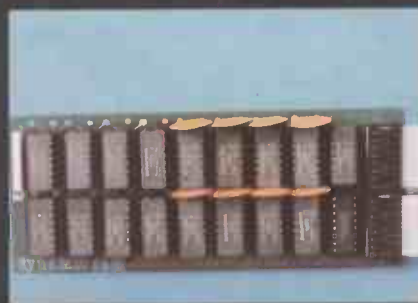
add up to 20k RAM + 16k ROM
VCR 20 for VIC
4K - £24, 2k increment - £5



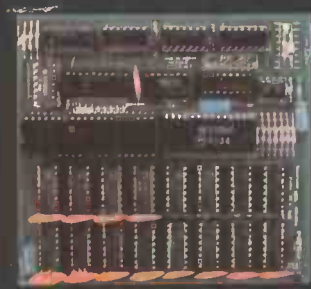
DRC for PET
64K - £80 128K - £130



32K bytes - £29



32K add on RAM £46

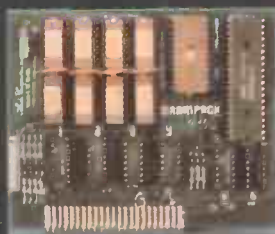


32K add on RAM £69

TRS80-V.GENIE UK101:



56K - exceptional low
power consumption -
£44.90



**64K + Eprom programmer &
user port - only £79**

FOR A FREE BROCHURE, RING LINDA OR
SUE ON SOUTHEND (0702) 613081
FOR CREDIT CARD ORDERS, RING JACKIE
OR PAM ON SOUTHEND (0702) 618144

CHEQUES AND P.O.'s TO:

AUDIO-COMPUTERS

87 BOURNEMOUTH PARK ROAD,
SOUTHEND ON SEA - ESSEX SS5 2JJ
ALL PRICES INCLUDE V.A.T. AND POSTAGE
TELEX 995337 G AUDCOM
A TRADEMARK OF SOLIDISK LTD.

You'll manage better with an Apple beside you



Whatever you do, you'll do it better with an Apple Desktop computer. Over 400,000 businessmen throughout the world have found how an Apple can put enjoyment back into their work.

The friendly computer.

With an Apple on your desktop, you can handle amazing feats of calculation, financial projections, as well as storing, organising and retrieving information the way you need it.



For little more than the price of a photocopier, Apple helps take the drudgery out of office routine.

It's good for business. And any business.

Whatever you do—from accounting or farming to medicine or retail—there's a vast range of software specially written for Apple.

Apple can even do word processing. And now there's Apple III, a new big brother for Apple II. So that you can choose the Apple that's right for your business.



Your personal Apple dealer.

Personal Computers Limited is the nation's longest established Apple dealer and as a result, we at Personal Computers have had plenty of experience cutting big problems down to size . . . with microcomputer systems. Our highly trained staff will be very happy to give you the benefit of that experience on any problem — big or small, together with full support from our excellent maintenance department. Come and see us — we will help you to get the most from an Apple.

Personal

Computers

218 & 220/226 Bishopsgate,
London EC2M 4JS Tel. 01 377 1200