DON'T PANIC!
'Hitch-hiker's' arrives on disk
Join hundreds of leading companies – come to Silicon Valley in the heart of London for the very best hardware, software, training and above all – SERVICE.

The B.B.C., British Telecom, Coopers and Lybrand, Express Newspapers, Imperial College, London Business School, The First National Bank of Chicago, McDougall, The National Computing Centre, Rank Xerox, Thames Water Authority, The Institute of Chartered Accountants... These are just some of the many hundreds of companies and organisations who have dealt with us over the years.

Why do they come to Silicon Valley? Because whether you're a first time user or an established computer professional we try harder to provide friendly, helpful advice; a fuller service and better deals.

Whether you want the latest sophisticated multi-user system, accounts software or simple add-ons we can supply you quickly from our large depth of stock.

Shown above are just three of the many computers we can offer. From left to right they are: the Macintosh from Apple, the New AT from IBM and the Apricot from ACT.

What about our service? We have our own workshops, stores and maintenance facilities at our premises, which enable us to provide a comprehensive after-sales service.

We also offer a full range of training programmes for you and your staff.

BUY RENT OR LEASE FROM THE PROFESSIONALS

We are authorised dealers for the above

TEL: 01-833 3391

164 Grays Inn Road, London WC1
I am interested in the following. Please send me further information.

HARDWARE
SOFTWARE
WORD PROCESSING
NETWORKING
COMMUNICATIONS
TRAINING
COMPUTER SYSTEMS
GENERAL ADVICE ON
MICROS
SUPPLIES

Name
Position
Company
Address
Tel No.
Everyone can benefit from Effective Micro Training at Digitus

Introduction to Personal Computers
Provides a basic understanding of microcomputer hardware, software and peripherals. Establishes the criteria for selecting and using micros. Explains the rudiments of programming. 1 day. £105.

Introduction to PC DOS
Provides a concentrated introduction to PC/MS-DOS. Also reviews hardware components and popular applications. 1 day. £105.

Lotus 1-2-3
A workshop course with advice on the design of worksheets and on solving practical problems. 1 day. £105.

Advanced Lotus 1-2-3
Builds on existing Lotus 1-2-3 skills, presenting information on database, statistical and file functions. 1 day. £105.

1-2-3 to Symphony
An introduction to Symphony with practical experience of designing worksheets. 1 day. £105.

Introduction to Symphony
Provides a concentrated introduction to the main elements including spreadsheets, graphics, information management and "managers" wordprocessor. Teaches the basic skills needed to use these features. 2 days. £210.

Symphony Workshop
Consolidates basic skills and teaches advanced features including building systems with the integrated package and command language. 2 days. £210.

Spreadsheeting with SuperCalc
A workshop course with advice on the design of worksheets and on solving practical problems. 1 day. £105.

Spreadsheeting with Multiplan
A practical workshop course on this popular spreadsheet package. 1 day. £105.

Introduction to Framework
A workshop course on this popular wordprocessor package. 2 days. £210.

Information Management with Cardbox
A workshop course on design, applications and implementation. 1 day. £105.

Data Management with Delta
Teaches how to design, define and implement systems using this powerful data management package. 1 day. £105.

Working with dBASE II
Teaches the user how to build and query data. 1 day. £105.

Programming with dBASE II
Teaches programming using the dBASE procedure language and also file design and indexing. 2 days. £210.

dBASE II Workshop
Builds on existing dBASE skills to teach the more advanced use of the procedure language and the practical application of all these facilities. 2 days. £210.

Wordprocessing with WordStar
A practical workshop course which teaches basic skills. 1 day. £105.

WordStar Workshop
A workshop to consolidate basic skills and teach advanced commands. 1 day. £105.

MailMerge
Efficient use of WordStar for mailing using MailMerge. 1 day. £105.

Wordprocessing with Multimate
A practical workshop course which teaches basic skills. 1 day. £105.

DisplayWrite 2
A practical workshop teaching basic skills on this increasingly popular IBM-oriented wordprocessing package. 1 day. £105.

Fundamentals of BASIC
Develops the first principles of BASIC programming so that you can produce programs on a microcomputer. Gives practical hands-on experience of using micros. 2 days. £210.

Improve your BASIC
Brush up and improves BASIC programming technique, introduces sophisticated methods of file design, data organisation, access methods and control. Examines software tools. 2 days. £210.

Communications
Introduces the techniques of communicating between micros, from micros to peripherals and from micros to mainframes. 1 day. £125.

UNIX
An introduction to the facilities of the UNIX multi-user operating system. 3 days. £375.

UNIX Workshop
Further skills for those with responsibility for a UNIX system. 2 days. £250.

The C Programming Language
A tutorial on the main features of the C language, with extensive practical sessions on a multi-user system. 2 days. £250.

"C" Workshop
More advanced C programming skills. 2 days. £250.

MANAGING OFFICE AUTOMATION
A two-day seminar to prepare management to devise and implement a successful office automation strategy. It addresses key issues, presents current examples and provides the opportunity to discuss important aspects related to the needs of your organisation.

In-Company Training
Digitus provides courses tailored to the needs of individual companies, from seminars for management to detailed training for office and professional staff. Courses can be held on company premises, or at the Digitus Training Centre. Contact the Training Administrator for full details.

Digitus TRAINING

Send to, or phone:
The Training Administrator, Digitus Ltd.
Lading House, 10-14 Bedford Street.
Covent Garden, London WC2E 9HE
Tel: 01-379 696s Telex 27950 ref 3005
CONTENTS
Vol 8 No 1 January 1985

REGULARS

NEWSPRINT 106
The first look at Amstrad's disk software heads this month's list of activities behind the scenes.

YANKEE DOODLES 124
David Ahl peeks behind the US corporate facades to keep you up to date with what's happening in the States.

ORIENT EXPRESS 126
There's more to Japan than MSX machines, as our Japanese correspondent reports.

LETTERS 130
You write them, we publish them—assuming your vitriol's not too extreme that is.

SCREENPLAY 200
Nothing's impossible—soTony Hetherington returns from Impossible Mission with reviews of the best new games.

BIBLIOFILE 204
What do neo-surrealism and lengthy listings have in common? David Taylor provides the answer.

SUBSET 212
Invaluable machine code advice—plus an index so that you know where it's all stored.

COMPUTER ANSWERS 218
Problems with interfacing, machine coding or starting your own company? Simon Goodwin offers advice.

NETWORKS 220
Up, up and away—Peter Tootill provides access to the world of bulletin boards and commercial systems.

BANKS' STATEMENT 134
Martin Banks takes his toolkit to the problem of micro maintenance.

TJ'S WORKSHOP 196
Our resident terminal junkie emerges from behind his pile of printout to pass on the best hints and tips.

SCREENPLAY
Nothing's impossible—so Tony Hetherington returns from Impossible Mission with reviews of the best new games.

BIBLIOFILE
What do neo-surrealism and lengthy listings have in common? David Taylor provides the answer.

SUBSET
Invaluable machine code advice—plus an index so that you know where it's all stored.

COMPUTER ANSWERS
Problems with interfacing, machine coding or starting your own company? Simon Goodwin offers advice.

NETWORKS
Up, up and away—Peter Tootill provides access to the world of bulletin boards and commercial systems.

BIBLIOFILE
What do neo-surrealism and lengthy listings have in common? David Taylor provides the answer.

SUBSET
Invaluable machine code advice—plus an index so that you know where it's all stored.

COMPUTER ANSWERS
Problems with interfacing, machine coding or starting your own company? Simon Goodwin offers advice.

NETWORKS
Up, up and away—Peter Tootill provides access to the world of bulletin boards and commercial systems.

BIBLIOFILE
What do neo-surrealism and lengthy listings have in common? David Taylor provides the answer.

SUBSET
Invaluable machine code advice—plus an index so that you know where it's all stored.

COMPUTER ANSWERS
Problems with interfacing, machine coding or starting your own company? Simon Goodwin offers advice.

NETWORKS
Up, up and away—Peter Tootill provides access to the world of bulletin boards and commercial systems.
Benchtests & Reviews

Hitch-Hiker's Guide to the Galaxy
Douglas Adams makes his disk debut—giving Tony Hetherington a chance to play the game of the book of the play of the TV series of the radio programme.

Acornsoft's Viewsheet
Mike Liardet settles accounts with this spreadsheet follow-up to the View word processing package.

Sanyo 550-2
The latest desktop contender from Sanyo offers more memory and an upgraded operating system—Bob Piper puts it through its paces.

Tdi Pinnacle
Peter Bright breaks the Benchmark speed limits as he test-drives this multi-user system.

Datatalk
This is ZYX calling *CBA, we have an RQP for you—Peter Bright decodes a communications package with sophisticated encryption routines.

Koala Pad
Martin Banks paints his masterpiece—with a little assistance from this graphics pad.

Retrieve II
Flexibility and voice input are two of the features that make this a database package worth considering.

The Sound of Music
The hills may be alive with the sound of music, but what about your micro? Jane Dorner wields her baton.

Features

The Basic Art
Advice on how to program (and where to find) those useful algorithms you always knew just had to exist somewhere.

Pointing the Way
It's well known that different Basics have different commands, but what about the different floating point codes?

On Your Marks
See how they run—our Benchmark timings brought up to date.

Database Dossier
Comparative details of more than thirty database packages.

Teach Yourself C
Introducing a five-part series enabling you to get to grips with programming in C.
MICRO COMPUTER AND WORD PROCESSING COURSES ARE RUN CONTINUOUSLY 7 DAYS A WEEK (incl Sundays) at BROOK STREET BUREAU PLC'S TRAINING CENTRE, 192 OXFORD STREET, LONDON W1 (entrance 27 Market Place)

THE COURSES ARE SO GOOD THAT BANKS, GOVERNMENT BODIES, MULTINATIONALS, PUBLISHERS, PROFESSIONS AND SMALL BUSINESSES SEND THEIR STAFF TO US FOR TRAINING.

Wordstar (2 days) £85
Mailmerge (1 day) £40
Spellbinder (2 days) £85
dBase II (3 days) £195
Multiplan (2 days) £105
Lotus 1-2-3 (3 days) £195
Sage Accounting (3 days) £195
Microcomputer Overview and Keyboard Handling for Executives (2 days) £85
Basic (Beginners) (2 days) £65
Basic (Intermediate) (2 days) £65

NOTE: The above prices are TOTAL COSTS not per day - but VAT is to be added.

We use IBM and FX20 machines for the above and also offer Word Processing courses on dedicated systems (Wang, IBM, Displaywriter, AES and Wordplex).

All courses 10 am to 5 pm daily including Saturdays and Sundays.

Phone Keith to book your place or for further details: 01-637 5932
IBM+ACT
WITH EXTRAS

* Analysis of your requirements
* Highly competitive pricing
* Wide range of compatible software
* Staff training facility
* Rentals service available
* Try before you buy – we refund 95% of your rental if you purchase within first month of rental
* Trade-in on existing systems
* Expert installation service
* Micro data-transfer service

We specialise in networking your IBM PC's and Apricots together using the manufacturers' related products. These include IBM networking and clustering hardware and software and also the Point 7 and Point 32 from ACT.

As well as hardware from the leading manufacturers, you'll get friendly help and advice from 01 Computers, one of Britain's acknowledged experts.

And since we also handle the New Innovative Smart Integrated Business software package, we can really help you turn your personal computer into a powerful business tool.

Send in the coupon and find out how.

01 COMPUTERS LTD.
Southampton House, 192-206 York Road, London SW11 3SA
Telephone for a FREE demonstration Tel: - 01-228 2207 Telex 8954575 CTC LDN

WE'RE CENTRAL AND EASY TO FIND!
First, a question.
Who do you think are the world’s most avid consumers of microcomputers?
The ingenious Japanese? The fashionable French? The acquisitive Americans?
Believe it or not, it’s we British who own more micros per person than any other nation on earth.
Yet, despite its amazing impact, the microcomputer has only just begun to scratch at the surface of our lives. Without doubt, the best is yet to come.

Use and Abuse.
In several recent surveys, some astonishing facts about micro use and abuse were revealed.
It was discovered that the micro is hopelessly under-utilised. If you’re already a micro owner, your own experience may well confirm this unhappy state of affairs.

Brainpower. A source of knowledge.
For thousands of years, the key to self improvement has been in the hands of the written word. Now, thanks to the Brainpower range, it’s very much in the hands of the micro.
As the Brainpower range demonstrates, this does not require prior knowledge of micros, or how they work.
The Brainpower concept has been devised as integrated applications and educational software. And its aim is to stretch both your mind and your imagination.
It offers a unique way to realise your own full potential and that of your micro. In a way you could never hope to achieve from the printed word alone.
In this respect, the Brainpower range stands on its own.

A unique concept.
All the Brainpower titles share one thing in common, apart from their stimulating subject matter, that makes them unique.
You will find each title comprises three distinctive elements: A teaching program that helps you to get to grips
I KNOW HE'S GOTA BRAIN IN THERE. IF ONLY I COULD DISCOVER THE BEST WAY OF USING IT.

STAR WATCHER
The secrets of the heavens are yours. Isolate all the constellations as well as main stars for easy identification. Even turn stars and constellations on and off at will. Screen by screen, you will see exactly how the 1,500 brightest stars move through time and space. And all from any point on the Earth's surface at any time of the year.

Star Watcher is without doubt the definitive home observatory.

DECISION MAKER
Should you buy a new house? Change jobs? Have children? Start your own business? Such decisions should not be taken lightly. Armed with Decision Maker, you can be quite sure of examining every avenue, and arriving at a rational, structured answer.

If you value the way you run your life, you need Decision Maker.

NUMBERS AT WORK
Tackle all the number problems you're likely to face in daily and business life. From straightforward multiplication and division of fractions, through decimals, percentages, ratios, mark-ups and margins to compound interest, depreciation, VAT and PAYE.

Numbers at Work gives you a distinct edge, since you will be able to both understand and manipulate numbers at will.

PROJECT PLANNER
Project Planner teaches you how to divide even the most complex project down into meaningful components. Learn how to determine the length and importance of every single task, and those elements critical to the fulfilment of your plan. Even anticipate problems you hadn't envisaged.

You have the measure of any situation because you have the fullest possible grasp of all the factors which affect it.

FORECASTER
Forecaster takes the guesswork out of forecasting, by accepting that tomorrow's events will be best predicted on the basis of today's facts. Armed with Forecaster, sales targets and growth trends, even sporting events and election results can be accurately and very quickly predicted.

Invaluable to you in both your private and business life.

ENTREPRENEUR
Entrepreneur teaches you all the steps required to plan and start your own business. It will forecast your first 18 months' cash flows, generate your Profit and Loss Account and Balance Sheet. Help you in discussions with your bank manager and partners. Explain the notions of assets, liabilities, overheads, working capital, cash flow and break even point.

Invaluable to anyone who is planning a business venture.

your micro can test in each other.

with the subject at your own pace. An applications program to put what you learn into action. And finally, with each package, you get an expertly written book and interactive tutorial.

<table>
<thead>
<tr>
<th></th>
<th>SPECTRUM 48K</th>
<th>BBC B Tape</th>
<th>BBC B DISK 40/80 Track</th>
<th>COMMODORE 64 Tape</th>
<th>COMMODORE 64 Disk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tick your choice</strong></td>
<td>£14.95</td>
<td>£19.95</td>
<td>£24.95</td>
<td>£19.95</td>
<td>£24.95</td>
</tr>
<tr>
<td>Decision Maker</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Numbers at Work</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Star Watcher</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Entrepreneur</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Planner</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forecaster</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please add £1.50 for postage and packing

* I enclose a cheque or postal order, crossed and made payable to Triptych Publishing Ltd for £
* Please debit my Access/Barclaycard, number

NAME
ADDRESS
TELEPHONE
POSTCODE
SIGNATURE

Send to: Triptych Publishing Ltd, (TBL Book Service Ltd) FREEPOST, CAMBERLEY, SURREY GU15 3BR. All goods fully tested and returnable if in any way defective. Allow 28 days for delivery. *Delete as applicable.

BRAINPOWER
Christmas books for your micro—from Pitman and SAMS

**COMMODORE**

**Commodore 64 Programmer’s Reference Guide**
Commodore Computer
The bestselling book on the 64, packed with professional tips for successful and creative programming.
ISBN 0 672 22056 3/£9.95

**I Wish I Knew about the Commodore 64**
Jonathan Chapple
A simple and well-illustrated guide to understanding and programming this popular micro.
ISBN 0 273 02208 3/£5.95

**Commodore 64 Graphics and Sounds**
Timothy Orr-Knight
Helps you quickly master the 64’s powerful graphics and sounds capabilities.
Book - ISBN 0 672 22278 7/£6.95
Book with tape and disc –
ISBN 0 672 26186 3/£15.95 + VAT

**AMSTRAD**

**Amstrad Games Book**
Mark Ramshaw
A collection of exciting games for your Amstrad, including arcade-style space and combat games, maze games and many more.
ISBN 0 273 02284 9/£4.95

**GENERAL**

**Pitman Pocket Guides**
A series of handy, pocket-size guides to languages, machines, operating systems and word processors. Only £2.50 each

**Microcosm**
Hal Gashtan
The world’s first computer competition book. Use your computer to help you work through 13 verses and pictures to find a ‘phone number and name. The first person to ring the number wins £1000 and a flight on Concorde. An ideal Christmas present.
ISBN 0 946801 06 1/£6.95

**Kid Powered Graphics**
David Fiday
A simple, direct and jargon-free approach to programming low-resolution graphics.
224 pages ISBN 0 672 22229 9/£7.95

Available from all good booksellers
Pitman Publishing Ltd., 128 Long Acre, London WC2E 9AN
(For further information contact Helen Kitson on 01-379 7383)
RETURN FROM PARIS
Fly, drive or hitch - can 003.5 get the secrets home? Use your skills to choose appropriate transport on each stage of the journey.
BBC Disk only. £11.95

TREASURE HUNT
Work your way around the map and find the two keys to the treasure. Excellent use of Mode 7 graphics brings map reading skills alive - 2 programs, one uses references, one compass directions.
BBC £12.00  Disk £14.00

TANK TRACKS
Program a tank to reach its base. Beware of minis and the ‘Edge of the World’. Ideal as an introduction to problem solving. Programs consist of three commands - F = forward, L = turn left and R = turn right.
BBC £9.95  Disk £11.95

EQUATIONS OF LINES: Demonstrates the graphs produced by equations - type in your own equation and see the graph appear.
ED 1 - includes: Think of a Word, Counting On, Pye Charts, Simple Division Each £6.95  Disk £9.00
All these programs are used in our school - all were written with the educational user in mind.

Prices inclusive of postage and packing. VAT not included - add 15%. DISCOUNT - 5% schools, 15% Special Schools.

SUMMERFIELD SOFTWARE
Summerfield School 141 Worcester Road, Malvern, Worc. WR14 1ET.

FAST LOADERS
R.B.S.
A NEW GENERATION conversion utility, developed from the acclaimed Hypersave-64, R.B.S. converts virtually all your long loading cassette programs to TURBO-LOAD faster than the CBM disk drive. Multi-part and autorun programs are handled with ease. Converted programs load independently. No additional hardware, no pokes, no SYS calls, no user knowledge required. Load “The Hobbit” in 120 seconds. Tornado, Lightning load, Fastback now obsolete. R.B.S. will convert more programs than any competing utility. Cassette £7.50p.

HYPERSAVE-64
Retaining the flexibility which the programmer demands. Hypersave leaves you in control. 8 additional Basic commands. Save, load, verify up to 48K continuous Ram at HYPERSPEED with full error checking. Converted programs reload independently. Autorun facility. Hypersave also allows a small number of fast loading programs to be converted to Hyperload. Reviewed in Your 64 issue 2. Cassette £7.50p.

DISKUS 1
Introducing the new market leader. This is the simplest to use and most efficient tape to disk transfer utility yet devised. No program rewriting is required and transferred programs will automatically run when loaded.
★ For single, multi, and autorun programs
★ Automatic filename handling
★ Efficient use of Disk space
★ No user knowledge required
Diskus 1 will handle several program types which other utilities ignore, including headerless files. A bonus program is included which will transfer a number of fast loading programs to disk. Cassette £9.99p.

PRO-SPRITE

DOSOFT
2 Oakmoor Avenue
Blackpool FY2 0EE

FREE WITH EVERY ORDER:
SECRETS! A GUIDE TO CASSETTE I/O CONTAINING PREVIOUSLY UNPUBLISHED SECRET INFORMATION. FAST DESPATCH GUARANTEED.
CHEQUE/P.O. OR SAE TO:

ALL THREE ONLY £15.00P.
ALL PROGRAMS SUPPLIED WITH FULL INSTRUCTIONS AND MAY BE TRANSFERRED TO DISK.
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 let's 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.

APRICOT F1
a full blown business micro

For the first time business user a genuine business machine with some amazing 'high tech' features. — See the Apricot's mouse exercise previously complex tasks as a single key stroke, and the new interfaced device means there's no cable connection to the keyboard, giving desk top planning a new meaning.
- 256K RAM 720 single disk.
- MS-DOS and Concurrent CP/M.
- Vga display manipulation and special effects.
- Expansion and Coupon facilities.
- Colour/mono Monitor or VHF for your TV.
- Extremely light (under 3.8kgs) — totally portable.
- Price includes Super-Micr, SuperCalc, & Super-Planer software.
- Well over 1000 software packages now available.

LEASE F1
from £6 per week
CALL FOR DETAILS DEMO NOW

TRY BEFORE YOU BUY!

Bring your micro to us and match with our range of printers — full workshop facilities available to iron out all technical hitchs! CALL US FOR PRINT SAMPLES. TRADE or PRIVATE CUSTOMERS take advantage of our INTERFACING CONSULTANCY

INTERFACES & CABLES AVAILABLE FOR: VIC 20 NEW BRAIN COMMODORE 64 OSEBONE PET ORIC TANGY SPECTRUM DRAGON SHARP SINCLAIR OR and more!

MICROLINE LOW COST PRINTERS

In our opinion this range of printers represents the best value. From our service records we can tell that it has proved to be an extremely reliable printer. If you are looking for fast thru-put (Accounts or Data) printing check it out NOW!
- Up to 25° faster thru-put than nearest rival.
- Near letter quality (92/93/84)
- Ideal printer for business systems - Statements, invoices etc.
- Multi-parters - up to 6 copies.

EPSON MATRIX PRINTERS

- EPSON RX680T 100 cps £210 + VAT
- EPSON RX680FT 100 cps £410 + VAT
- EPSON FX80 160 cps £360 + VAT
- EPSON RX100 100 cps £390 + VAT
- EPSON FX100 160 cps £499 + VAT
- EPSON IQ1500 200 cps £1100 + VAT

HIGH SPEED HIGH QUALITY LOW PRICE!!

SHINWA CPA80 MATRIX PRINTER

Fantastic value — look at these features:
- Precision and Tracer feed is standard.
- 100 cps Bi-Directional target printing.
- True Descenders + Superscript.
- High Res. and Block Graphics.

NEW! TRIUMPH ADLER TRD 7020 DAISYWHEEL

- 20 cps up to 180 cps

MICRO GENERAL

(PCIW 1 )
Unit 25, Horseshoe Park, Pangbourne, Reading, RG8 7JW Tel: 07357 4466
“Significantly faster and more powerful than the IBM PC”

You can choose the right micro in just a few seconds.

But don’t take our word for it.

“Its flexibility leaves the IBM PC for dead”

“...you put up with the IBM for so long”

TURN TO PAGE 29

olivetti
software that's hard to beat...

**TASWORD TWO**
The Word Processor
“If you have been looking for a word processor, then look no further.”
CRASH June 1984
“The number of on-screen prompts, together with the excellent manual, make it ideal - even for an absolute beginner.”
PERSOINAL COMPUTER WORLD September 1983
“Without doubt, the best utility I have reviewed for the Spectrum”
HOME COMPUTING WEEKLY April 1984
TASWORD TWO ZX 48K Spectrum £13.90

**TASWORD MSX**
The Word Processor
The Tasman Word Processor for MSX microcomputers.
All the features of the Spectrum version.
TASWORD MSX MSX Computers £13.90

**TASCOPY**
The Screen Copier
Screen copy software for Spectrum with Interface 1 and Amstrad CPC 464. Print high resolution screen copies (in a choice of sizes), and also large 'shaded' copies with different dot densities for the various screen colours. Tascopy supports all eight pin dot matrix printers with Epson type control codes, e.g. Epson RX-80 and FX-80, Shinwa CP-80, Mannesmann Tally MT-80, Star DMP 510/515, Brother HR5, and also Amstrad DMP 1 with the CPC 464.
TASCOPY ZX Spectrum £9.90
TASCOPY 464 Amstrad CP 464 £9.90

**TASMERGE**
The Mail Merger
Transfer data from MASTERFILE to TASWORD TWO! Letters and forms typed on TASWORD TWO can be printed with addresses and data taken from MASTERFILE. The mail merge facility allows, for example, multiple copies of a letter to be printed, each containing a different name and address taken from your MASTERFILE data. To use TASMERGE you must have one or more microdrives as well as TASWORD TWO and MASTERFILE by Campbell Systems (version 9 or later).
TASMERGE ZX 48K Spectrum £10.90

**TASPRINT**
The Style Writer
A must for dot-matrix printer owners! Print your program output and listings in a choice of five impressive print styles. TASPRINT utilises the graphics capabilities of dot-matrix printers to form, with a double pass of the printhead, output in a range of five fonts varying from the futuristic DATARUN to the hand-writing style of PALACE SCRIPT. TASPRINT drives all dot-matrix printers with bit image graphics capabilities and can be used to print TASWORD text files. TASPRINT gives your output originality and style!
TASPRINT ZX 48K Spectrum £9.90
TASPRINT Amstrad CPC 464 £9.90

**TASWIDE**
The Screen Stretcher
With this machine code utility you can write your own Basic programs that will, with normal PRINT statements, print onto the screen in the compact lettering used by TASWORD TWO. With TASWIDE you can double the information shown on the screen!
TASWIDE ZX 48K Spectrum £5.50

**TASMAN PRINTER INTERFACE**
Plug into your Spectrum and drive any printer fitted with the Centronics standard parallel interface. Supplied complete with ribbon cable and driving software. The user changeable interface software makes it easy to send control codes to your printer using the method so successfully pioneered with TASWORD TWO. The cassette also contains fast machine code high resolution full width SCREEN COPY SOFTWARE for Epson, Mannesmann Tally, Seikosha, Shinwa, Star, and Tandy Colour Graphic (in colour!) printers. compatible with microdrives and ZX Interface 1.
PRICE £39.90

**TASMAN SOFTWARE**
All prices include VAT and post and packaging. Telephone orders: Leeds (0532) 438301
Available from larger branches of Boots.

If you do not want to cut this magazine just write your order and post to:
TASMAN SOFTWARE, dept. PCW, Springfield House, Hyde Terrace, Leeds LS2 9LN.
I enclose a cheque/P.O. made payable to Tasman Software Ltd. OR charge my ACCESS number
NAME
ADDRESS

COMPUTER ITEM PRICE

Outside Europe add £1 for each item

TOTAL £

Send me the FREE Tasman brochure describing your products. tick here.
I would like to know more about your programs for:
ZX Spectrum □ MSX □ Amstrad CPC 464 □
YOU CAN’T BUY CHEAPER!
PHONE NOW... 01-729 7121

IBM PC/XT Dual drive, mono display, keyboard
Some IBM AT and ATE available NOW

APRICOT F1, Portable, PC’s Xi, Point 7/32

COMPAQ Dual drive/Deskpro model 4

APPLE MAC 128/512

£1673/£2820

CALL

£1799/£4587

£1472/£2128

We accept official orders from UK Government and Educational Establishments.
Mail Order and Export Enquiries welcome. Callers by appointment.

SPECIALISTS IN EXPORT
(T.I.) Industrial Unit, Stanway Street, London N1 6RY

All prices exclude VAT CREDIT CARDS ACCEPTED

CANTERBURY SOFTWARE
East Kent’s largest range of computer software, including MSX

Discounts on all titles!

9 The Friars
Canterbury, Kent
Tel: (0227) 453531
Next to the new Marlow Theatre

Access and Barclaycard Welcome

ELECTRONIC SYNTHESIZER SOUND PROJECTS

E.S.S.P Distribution
COMPUTER-SYNTHESIZER SOUND AND VISION

BOOKS

‘The Synthesizer & Electronic Keyboard Handbook’
by Dave Crombie .................................................. £9.95
‘The Musician And The Micro’ by Ray Hammond
‘The Complete Synthesizer Handbook’
by Michael Norman & Ben Dickey
‘The Synthesizer: A Volume Set’ by Roland Corporation
‘Roland Drumatrix TR 606 Booklet’ by Sandy Feldstein
‘Boss Dr. Rhythm Graphic DR-110 Booklet’
by Sandy Feldstein
‘Yamaha DX Series - Information Booklet’ by Dave Briscoe
‘Guide to MIDI - 12 page Booklet’ by Roland Corporation

RECORDS & CASSETTES

JEAN-MICHEL JARRE “Zoolook” ................................ £5.70/£5.45
ISAO TOMITA “Dawn Chorus” ................................ £5.45/£5.70
TANGERINE DREAM “Poland: The Warsaw Concert”
(Double)

VANGELIS “Soil Festivities” ..................................... £5.95/£5.70

COMPACT DISCS

JEAN-MICHEL JARRE “Zoolook” ............................... £12.95
ISAO TOMITA “Dawn Chorus” ............................... £12.95
VANGELIS “Soil Festivities” .................................. £12.95

BADGES & STICKERS

“Keep Synthesizers Live” ...................................... 40p/30p
“I’m A Synthesizer Sympathiser” ......................... 40p/30p

ALL PRICES INCLUDE POSTAGE & QUALITY PACKAGING

PLEASE MAKE CHEQUES/PO’S PAYABLE TO E.S.S.P.

FOR FURTHER DETAILS ON ABOVE ITEMS AND OTHER
COMPUTER-SYNTHESIZER PRODUCTS AND SERVICES
PLEASE SEND AN S.A.E. TO E.S.S.P.

The Sound House
East Molesey
Surrey KT8 9JB
Telephone: 01-979 9997
We export Microcomputers and Peripherals to all Countries Any make. Any Quantities
BIG DISCOUNTS

send for comprehensive price list to:
Dept N
MICRO-X LTD
765-767 HARROW ROAD, LONDON NW10 5NY
TELEPHONE 01-966 6622 TELEX 915866 MICROX G.

LIGHT TO THE POINT

SPECTRUM 48K/COMMODORE 64
£17.25
DRAGON/TANDY
£11.50
inclusive
NO INTERFACE REQUIRED

Discover the exciting world of creating your own graphics on screen.
The Trojan Light Pen will draw boxes, circles, lines, freehand pictures, save and load pictures with full erase facility.
All in Hi-Res screen in any of 4 colours for the Dragon/Tandy, 8 colours for the Spectrum, and 16 colours for the Commodore 64.
For educational or leisure use.

DEALER ENQUIRIES WELCOME

TROJAN

Micro Computer Software & Accessories
Send cheque/P.O. to.
TROJAN PRODUCTS
166, Derlwyn, Dunvant, Swansea SA2 7PF
Tel: (0792) 205491.
The IBM compatible Multi-user system (up to 12 users)
15Mb hard disk and 2 user stations complete with VDU running IBM graphics £5,875
Each subsequent work station (8088 CPU 128K RAM) is complete with Keyboard, Monitor and Cables £1,395

LCC SPECIAL BUNDLE

<table>
<thead>
<tr>
<th>Description</th>
<th>RRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apricot F1 Monitor</td>
<td>£1,095.00</td>
</tr>
<tr>
<td>Printer Dot or Daisy Cables</td>
<td>£25.00</td>
</tr>
<tr>
<td>Disks</td>
<td>£45.00</td>
</tr>
<tr>
<td>Paper</td>
<td>£15.00</td>
</tr>
<tr>
<td>LCC SAVING</td>
<td>£1,694.00</td>
</tr>
<tr>
<td>YOU PAY</td>
<td>£1,455.00</td>
</tr>
</tbody>
</table>

NEW! apricot F1
True 16 bit inc. ACT Sketch, ACT Diary
Tutorial + SuperPlanner, SuperCalc, Super Writer + Software.

apricot F1E
315K single sided Sony 3.5
CP/M, Personal Basic, Dr Logo

256K Ram, 720 Disk Drive LSD Display
Bundled Software as F1

apricot Portable
from £695

apricot PC
2 x 730K Drives & Monitor
± £1,695

apricot x
10-256K Ram 10Mb Hard Disk inc Monitor
± £2,545

SANYO IBM COMPATIBLE
16 bit
runs most non-graphic software

HARD DISKS

<table>
<thead>
<tr>
<th>Description</th>
<th>RRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard Disks for IBM PC Sirius QX10 NEC</td>
<td>£1,295</td>
</tr>
<tr>
<td>10 Mb</td>
<td>£1,445</td>
</tr>
<tr>
<td>15 Mb</td>
<td>£1,355</td>
</tr>
<tr>
<td>20 Mb</td>
<td>£1,455</td>
</tr>
<tr>
<td>10 Mb Tape Streamer IBM PC</td>
<td>£895</td>
</tr>
</tbody>
</table>

PLOTTERS

<table>
<thead>
<tr>
<th>Description</th>
<th>RRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hewlett-Packard 7475/4A 6 Pen</td>
<td>£1,500</td>
</tr>
<tr>
<td>Roland DXy 880 8 Pen Plotter 200 msecs 100% HP 7475 Compatible</td>
<td>£660</td>
</tr>
</tbody>
</table>

MODEMS/MONITORS

<table>
<thead>
<tr>
<th>Description</th>
<th>RRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buzz Box Direct Connect Modem</td>
<td>£70</td>
</tr>
<tr>
<td>EPSON Acoustic Coupler CX/21</td>
<td>£160</td>
</tr>
<tr>
<td>Minor Miracle’s W2000 Modem</td>
<td>£130</td>
</tr>
<tr>
<td>Roland 14” RGB Hi Res for IBM</td>
<td>£375</td>
</tr>
</tbody>
</table>

ACCESSORIES

<table>
<thead>
<tr>
<th>Description</th>
<th>RRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floppy Disks</td>
<td></td>
</tr>
<tr>
<td>Printer Buffers</td>
<td></td>
</tr>
<tr>
<td>Daisywheels</td>
<td></td>
</tr>
<tr>
<td>Paper</td>
<td></td>
</tr>
<tr>
<td>Labels</td>
<td></td>
</tr>
<tr>
<td>Cables</td>
<td></td>
</tr>
<tr>
<td>Disk containers</td>
<td></td>
</tr>
<tr>
<td>Acoustic Hoods</td>
<td></td>
</tr>
<tr>
<td>NEC APC MONO</td>
<td>£1,985</td>
</tr>
</tbody>
</table>

SANYO M24
8088 CPU, 128K RAM (expandable to 256K) MSDOS
550 1 Drive 160K £749
± 550/160 2 Drives 160K ea £775
555 2 Drives 160K ea £999
550/730 2 Drives 730K ea £1,150
20-256K Ram £1,450

Dealer enquiries invited on all products.
Today's successful business needs more than microcomputers. It needs the Comart system: working together, sharing information, keeping pace with your own rate of company growth and expansion.

The Comart concept is simply breathtaking... the result so proven that Comart is already chosen system for commerce, industry and government departments throughout Britain.

And now, with the introduction of the Comart Workstation and the new CP2000 Series of Comart computers (utilising the latest Intel 80186 and 80286 Superchips), our system is powerfully fulfilled:

Both new and existing users will be able to derive the full benefits not only of a multi-user system, but of built-in Networking.

Comart's provision of Concurrent CP/M, the industry standard operating system, supports DRNET and graphics and, on the workstation, gives you access to the IBM PC software library.

Comart modularity means that even from modest single-user beginnings, you can continue to build on power and facilities without fear of the future.

Comart flexibility means you can give each individual user precisely the system capability required (making us uniquely cost effective).

And Comart's deep and vital roots—nationwide—guarantee that while you'll never leave us behind, we'll never leave you in the lurch.

So don't go it alone. Go for the Comart system.

(Complete and return the coupon and we'll send you full information on all our products — for starters—as well as the name and address of your nearest Comart dealer.)
AREN'T YOU SORRY YOU DIDN'T BUY BARBICAN?

You meant well but perhaps you were enticed by flashy advertising or give-aways. At Barbican we don't sell fancy copy or "give-away" plastic boxes. We put our money into producing the best diskettes that you can buy. You get both the best price and the best quality. Some "bargain" diskettes are nothing more than "seconds" manufactured in the United States and dumped abroad. Barbican Diskettes are first quality diskettes. In fact, if you like Dysan, 3M, Verbatim, et al, you'll love Barbican Diskettes. Here are just a few of the reasons why:

- Barbican Diskettes are lap polished for a super smooth recording surface to increase head life and ensure intimate head-disk contact.
- Barbican Diskettes have oxide lubricants built into their coating for long-term durability and error free operation.
- Our special liner provides continuous cleaning action during operation.
- Barbican Diskettes are made from heavy duty, homopolymer vinyl for higher storage and operating temperatures.
- Diskette jackets are specially formed to prevent warping, jamming and to tolerate rigorous handling.
- Each Barbican Diskette is tested track-by-track, bit-by-bit to be 100% error free.

AND ONE LAST THING: BARBICAN DISKETTES ARE WARRANTED FOREVER AND A DAY WITH AN OUTSTANDING THREE FOR ONE REPLACEMENT POLICY!

ALL THIS FOR ONLY £1.49 £1.59

(is includes: hub ring, Tyvec envelopes, write protect tabs and user labels)

PS If you really want the plastic box they're only £1.15 each.
QUALITY YOU EXPECT AT A PRICE YOU DON'T

BARBICAN MANUFACTURING
27A Half Moon Lane, London SE24 9TU

Phone orders: 01-274 6223
Access & Visa welcome

Orders only in packs of 25. P & P £2.50 per 25. Orders of 100 and over, 10% discount.
WHO'S KIDDING WHO?

Please send me FREE and without obligation details of the new service for home micro owners that........

PUBLISHES A FREE NEWSLETTER

OBTAINS MEMBERS DISCOUNTS

OFFERS FREE ADVERTISING

INVESTIGATES COMPLAINTS AND GUARANTEES REPLACEMENT/REFUNDS

I understand I will also receive a 'free copy' of the 'Home Micro' monthly Newsletter

NAME ____________________________________________

ADDRESS __________________________________________

SEND TO 'HOME MICRO' freepost 3 FLEET STREET, LONDON EC4B 4SL
HI-TECH DESKS AT DOWN TO EARTH PRICES.

The Apollo business desk range from Opus
- Prices from £100 (inc. VAT and delivery).
- 10 models available to suit leading computer systems.
- Sturdy steel underframes.
- Scratch resistant surfaces.
- Drawer for disc storage.

Looking for the best offer available
dBASE® includes, ABSOLUTELY FREE, the SYBEX BOOK "Understanding dBASE II" £279

OTHER SOFTWARE AVAILABLE

- dHit £69 Friday £175 Rescue £279
- Expressbase II £119 Comprofit DMS+ £195 dBase III plus PO £359
- Quickcode £179 Autocode £199 Retrieve II £539
- Quickfast £179 Infostar £259 Delta 2 IBM PO £495

- Please add VAT to the above prices which include carriage stating Computer type and Format required.

BOOKS

- Advanced dBase II Users Guide £31.30 Everyday's Database Primer £10.50
- Delta Data & You c. £18.95 The Illustrated dBase II Book £17.95
- dBase II for Every Business £13.50 Mastering dBase II Easy Way £16.45
- dBase II for First Time User £13.75 Understanding dBase II £17.95
- dBase II Guide for Small Business £16.50 (Free with dBase II) £17.95
- dBase II Users Guide £15.65 Using dBase II £15.50

MAIL ORDER ONLY

Send for latest Price List stating type of Computer & specific interests.

PARKINS ASSOCIATES (PCW 1)
20 RIDGEWAY, RAYLEIGH
ESSEX SS6 7BJ
Tel: 0268 - 749928

PARKINS ASSOCIATES

CREDIT CARD HOT LINE
01-482 1711

PERSONAL CALLERS WELCOME
We are situated by the junction of Camden Road, near the railway bridge
MONDAY-FRIDAY 9-6 SUNDAY 10-1

PARKINS ASSOCIATES (PCW 1)
20 RIDGEWAY, RAYLEIGH
ESSEX SS6 7BJ
Tel: 0268 - 749928

CASH/CHEQUE WITH ORDER OR ACCESS

ACCESS

COSMOS-80

80 CPS

DOT MATRIX PRINTER
FRICITION & TRACTOR FEED
EXCEPTIONAL PRINT QUALITY
COMPATIBLE WITH ALL MICROS
OPTIONAL RS232 INTERFACE

£169.00 + VAT = £194.35

OUR QL INTERFACE WILL ENABLE YOU TO CONNECT THE SINCLAIR QL TO MOST MAKES OF PRINTERS WITH PARALLEL CENTRONICS INTERFACE AND START PRINTING RIGHT AWAY.

Just £49.95 + VAT

EXCEPTIONAL VALUE
ORDER NOW WHILE STOCKS LAST
FIDELITY CM14 14" COLOUR MONITOR

£169.95 + VAT = £195.44

Also available in TV/monitor version at £195.95 + VAT = £225.34

12MHz Video Bandwidth
RGB RGBY and Composite Video medium resolution
Just the right choice for all popular makes of micros

CREDIT CARD HOT LINE
01-482 1711

PLEASE ADD £10 + VAT FOR DELIVERY.
POST YOUR CHEQUES/PoS TO:

DATASTAR SYSTEMS UK
UNICOM HOUSE, 182 ROYAL COLLEGE STREET, LONDON NW1 9NN
Telex 299531 UNICOM G

PERSONAL CALLERS WELCOME
We are situated by the junction of Camden Road, near the railway bridge
MONDAY-FRIDAY 9-6 SUNDAY 10-1

PCW 19
Would you like to have Power?

Meet the

THE UNINTERRUPTIBLE POWER SUPPLY systems

that are the complete answer to ALL of your problems!

With the POWER BANK "BLACK OUTS" will not affect the operation of your computer system. Micro Systems, Networks, Hard Disks, Printers, Telephone Exchange, Data Transmissions etc.

* Output derived constantly from self contained sealed for life batteries.
* Sine wave shaped output - voltage and frequency closely regulated.
* Genuine "NO BREAK" unit with continuous output ratings of 500-250 & 120VA.
* Much more than a "spike and surge" suppressor.

Far superior to a voltage stabilizer.
Overload and short circuit (output) indication and protection.
Bench or rack mounting (500VA).
Battery level monitored - mains on - mains off indication.

could you bank on that much power?

MANUFACTURED BY POWER TESTING (UPS) LIMITED
23 Tallon Road, Hutton, Brentwood, Essex CM13 1TE
Tel: Brentwood (0277) 233188, Telex 24224 MONREF 586

SPECTRUM 48K/DRAGON 32/COMMODORE 64/ACORN ELECTRON BBC 'B
SCISOFT TOP OF THE CLASS IN EDUCATION

WRITTEN AND APPROVED BY TEACHERS TESTED IN SCHOOLS
Played space invaders too long? Come down to earth with Scisoft.

INTERMEDIATE PACKS
French
German
Geography
Science
Maths Plus
Electronics
Intermediate Maths/Intermediate Maths II - £8.95 ea
Junior Maths - £5 ea

SELECTED TITLES AVAILABLE FROM MAJOR BRANCHES OF
WHITSMITHS
and all good Computer Stores

WRITTEN AND APPROVED BY TEACHERS TESTED IN SCHOOLS

INTERMEDIATE PACKS
French
German
Geography
Science
Maths Plus
Electronics
Intermediate Maths/Intermediate Maths II - £8.95 ea
Junior Maths - £5 ea

SELECTED TITLES AVAILABLE FROM MAJOR BRANCHES OF
WHITSMITHS
and all good Computer Stores

FULLY INTTEGRATED SOFTWARE PACKAGE

EASYWRITER II
EASYFILER
EASYCALC 3.2
SUPERCALC 3.2

MAIL ORDER ONLY
Please enclose payment with order.
Add 15% VAT to above prices. Post & Packing £2.

THE SOFTWARE WAREHOUSE
9 Lapponum Walk, Yeading, Hayes, Middx. UB4 9PN
Tel: 01-841 1209
AVAILABLE NOW FOR THE SINCLAIR QL
A full screen file management program designed for all QL owners — whether novice or expert

FILE _ DRIVER
The ONLY program capable of handling up to 8 Microdrives AND up to 100 files per Cartridge.

With the press of just ONE key FILE _ DRIVER provides:
★ DISPLAY of ANY Microdrive Cartridge directory
★ FORWARD/BACKWARD paging through file names
★ OPTIONAL SORT of Cartridge contents
★ AUTOMATIC FORMAT of new or used Cartridges
★ BACKUP of Cartridges, with/without OVERWRITE
★ ACCESS to any of these file commands:
COPY DELETE LOAD MOVE OVERWRITE PRINT RE-NAME

FILE _ DRIVER
FILE _ DRIVER reduces, to an absolute minimum the amount of typing necessary to perform routine file management tasks — BACKUP alone can save you 4500 key depressions on a 100 file Cartridge!

The FILE _ DRIVER program is supplied on a Microdrive Cartridge with an understandable USER GUIDE for ONLY £17.50 inc p&p. Post your cheque or P.O. to

QUALSOFT
Sinclair, QL and ZX microdrives are trade marks of Sinclair Research Limited

PAM COMPUTERS
FOR YOUR FIRST COMPUTER SYSTEM
When you buy a system from PAM COMPUTERS that is not all you get, with each system comes advice, training and ongoing support. We will advise you on the right system for your business having first assessed what your needs are.

COMPLETE SYSTEMS FROM:
£1550 + VAT

INCLUDING: MSDOS, SAGE ACCOUNTS, WORDSTAR, MAILMERGE, CALCSTAR, INFOSTAR, PRINTER, BOX OF DISKS, BOX OF PAPER & PRINTER CABLE

BASED ON THE SANYO MBC555 BUSINESS SYSTEM
With each system we supply 2 days free on-site training, plus training given on software purchased.

TAILORED ON-SITE TRAINING ...... £60 per day + VAT
Microcomputer Basics & operating system .......... 1 Day
SuperCalc ............... 1 Day
Wordstar/Mailmerge .......... 3 Days

3 TENNYSON ROAD, ASHFORD, MIDDX.
(07842) 48922

STAR GEMINI-10X
120CPS ● BI-DIRECTIONAL LOGIC SEEKING ● FRICTION TRACTOR AND ROLL HOLDER STANDARD ● DOWN LOADABLE CHARACTERS ● ULTRA HIGH RESOLUTION ● 80 COLS

£189.95 + VAT = £218.44
WHAT VALUE!

STAR GEMINI-15X AS ABOVE BUT 132 COLUMN
£315 + VAT = £362.25

STAR DELTA 10
QL COMPATIBLE
NO MORE TO PAY — START PRINTING TODAY
160 CPS ● BI-DIRECTIONAL LOGIC SEEKING ● PARALLEL AND SERIAL INTERFACE STANDARD ● 8K BUFFER ● FRICTION TRACTOR AND ROLL HOLDER STANDARD ● 80 COLS ● MANY MORE FEATURES TOO NUMEROUS TO LIST.

£319.95 + VAT = £367.94
STAR DELTA 15 AS ABOVE BUT 132 COLUMN
£460 + VAT = £529.00

CREDIT CARD
HOT LINE
01-482 1711

PLEASE ADD £10 + VAT FOR DELIVERY. POST YOUR CHEQUES/P.O.'S TO:

DATASTAR SYSTEMS UK
UNICOM HOUSE, 182 ROYAL COLLEGE STREET, LONDON NW1 9NN

PERSONAL CALLERS WELCOME
We are situated by the junction of Camden Road, near the railway bridge
Monday–Friday 9-6  Sunday 10-1

STAR ATTRACTIONS
"THE POWER BEHIND THE PRINTED WORD"

STAR GEMINI-10X

STAR DELTA 10
SuperCalc™ 3, Release 2

SuperCalc 3 with FastMath™ is faster than any other competitive spreadsheet. A lot faster. This means while you're waiting for others to calculate, you could be off and running with SuperCalc 3, Release 2. And on top of its astonishing speed, it's all on one disc to simplify usage. We've simplified the price, too. It's about £80 lower than its best known rival.

SuperCalc 3, Release 2 provides the broadest range of functional capabilities. You get a better data manager, and the most sophisticated graphics of any integrated program. Your spreadsheets will be more meaningful, more understandable.

Yet it's surprisingly easy to learn and use. From easy startup, to extensive tutorials, to deeper, more efficient modelling, the more you get into SuperCalc 3, Release 2, the better it treats you.

Speed, flexibility, depth... no wonder it takes you further, faster.

The fastest spreadsheet is understandably better.

Special offer:
Free demo diskette

☐ Please send me a Free Demo Diskette® so I can preview the features and effectiveness of SuperCalc™ 3 Release 2.

Name ____________________________
Address ____________________________
Tel: ____________________________

Post this coupon to:
Sorcim/IUS, 10 Station Road, Watford, Herts WD1 1EG. Tel: [0923] 46255.

*Diskette is designed for use with IBM-PC® or fully compatible hardware systems.
IBM-PC is a registered trademark of International Business Machines Corporation.

Easy Software working harder.

ONCE AGAIN DATASTAR OFFERS THE BEST VALUE IN PRINTERS

ALL PRINTERS ARE EX-STOCK — FULL TECHNICAL SUPPORT GIVEN

JUKI 6100 DAISYWHEEL

ONLY £325 + VAT = £373.75

FEATURES:
- 20 CPS (MAX.) PRINT SPEED
- BOLD AND SHADOW PRINTING
- SUBSCRIPTS AND SUPERSCRIPTS
- WORDSTAR COMPATIBLE
- DiABLO PROTOCOLS
- AUTO UNDERLINING
- STANDARD 2K BUFFER
- 1 YEAR PARTS AND LABOUR WARRANTY
- COMPREHENSIVE USER FRIENDLY MANUAL

SHEET FEEDER, TRACTOR AND RS232 AVAILABLE AS OPTION

DAISYSTEP 2000

OUR PRICE £225 + VAT = £258.75

FEATURES:
- 18 CPS
- BIDIRECTIONAL LOGIC SEEKING
- WORDSTAR COMPATIBLE
- QUME COMPATIBLE RIBBONS AND DAISYWHEELS
- PLUS MANY MORE

SHEET FEEDER, TRACTOR AND RS232 AVAILABLE.

NEW LOWER PRICES ON EPSON, STAR & BROTHER

THERMAL MATRIX PRINTERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Speed</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAR STX 80</td>
<td>60 cps</td>
<td>£129.95 + VAT = £149.44</td>
</tr>
<tr>
<td>BROTHER HR 5</td>
<td>30 cps</td>
<td>CALL FOR BEST PRICE</td>
</tr>
<tr>
<td>BROTHER EP 44</td>
<td>16 cps</td>
<td>CALL FOR BEST PRICE</td>
</tr>
<tr>
<td>EPSON FX 80</td>
<td>160 cps</td>
<td>£319.95 + VAT = £376.94</td>
</tr>
<tr>
<td>EPSON FX 100</td>
<td>160 cps</td>
<td>£498.95 + VAT = £573.79</td>
</tr>
<tr>
<td>STAR GEMINI-10X</td>
<td>120 cps</td>
<td>£169.95 + VAT = £219.44</td>
</tr>
<tr>
<td>STAR DELTA 10</td>
<td>160 cps</td>
<td>£319.95 + VAT = £376.94</td>
</tr>
<tr>
<td>STAR RADIX 10</td>
<td>200 cps</td>
<td>£498.95 + VAT = £573.79</td>
</tr>
</tbody>
</table>

PAPER — RIBBONS — LEADS — SHEET-FEEDERS — TRACTOR FEEDS — INTERFACES CALL FOR BEST PRICES

CREDIT CARD HOT LINE

01-482 1711

PLEASE ADD £10 + VAT FOR DELIVERY. POST YOUR CHEQUES/POs TO:

DATASTAR SYSTEMS UK
UNICOM HOUSE, 182 ROYAL COLLEGE STREET, LONDON NW1 9NN
Telex 295931 UNICOM G

PERSONAL CALLERS WELCOME — We are situated by the junction of Camden Road, near the railway bridge
MONDAY-FRIDAY 9-6 & SUNDAY 10-1
TAX-FREE EXPORT & DEALER ENQUIRIES WELCOME
DataTalk is simply the most advanced communications package for the IBM Personal Computer. With full colour windows, integral text editor, programmable function keys, terminal emulations, split baud rates, and a superb user interface, it will satisfy your most demanding communications needs. DataTalk costs £135 + VAT or £225 + VAT with optional file encryption.

Bringing
IBM Personal Communications
out of the dark ages.

See us on THORN EMI Stand No. V117 (Software Village) at COMPEC
DISKS – SAVE £££££
CDC 5¼" PER BOX Total inc p&l & VAT
SS/DD £10.90 £13.20
3M 5¼"
SS/DD £13.90 £16.60
DS/DD £19.30 £22.75
SS/QD £19.95 £23.50
DS/QD £23.50 £27.60
MAXELL 3½"
SS/DD £34.25 £40.10
DS/DD £54.00 £62.80
DISK STORAGE
10×5½" SEE 10 £1.95 £2.60
40×5½" ABA Lock-lid £13.50 £17.50
90×5½" ABA Lock-lid £16.50 £21.30
60×3½" ABA Lock-lid £17.00 £21.60

Ring us for equally incredible prices on:
RIBBONS, LISTING PAPER, 8" DISKS, LABELED,
ACOUSTIC HOODS, FIRE SAFES, ETC
Cheques payable to MICRO MEDIA
Rydal Mount, Baker Street, Potters Bar
Herts EN6 2BP
Tel: 0707 52698

STOPS PRESS
FOR ALL YOUR APRICOT REQUIREMENTS
1 THE QUADRANT, BRIDGE STREET,
GUILDFORD, SURREY GU1 4SG
TEL: 0483 578848

"A quick way of learning - quicker than the printed page". Mike McCann, Your Computer.

"It took 12 hours to teach a regime that would normally take 40 hours". Peter Marsh, Training Manager, Thomson Holidays.

"Vivid mental images are used as unforgettable memory joggers". Jane Bird, Sunday Times.

"Before you know it, you are constructing your own sentences". Mike McCann, Your Computer

"Undoubtedly the linkword cassettes are the most interesting, most enjoyable... of those considered". Jon Chambers, Next

"We found the course great fun and at the end a surprisingly large amount had sunk in". Which Micro?

"The vocabulary sticks in your mind effortlessly". Sally Clark, Computer Choice

"An outstanding success" Personal Computer World

FOR SCHOOLWORK FOR BUSINESS
FOR HOLIDAYS FOR ALL AGES

Linkword Language Courses are published on

<table>
<thead>
<tr>
<th>Machine</th>
<th>Publisher</th>
<th>Machine</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.B.C. (B)</td>
<td>Acornsoft</td>
<td>Amstrad</td>
<td>Protek</td>
</tr>
<tr>
<td>Sirius</td>
<td>A.C.T.</td>
<td>Spectrum</td>
<td>Silversoft</td>
</tr>
<tr>
<td>Apricot</td>
<td>A.C.T.</td>
<td>C.B.M. 64</td>
<td>Audiogenic</td>
</tr>
<tr>
<td>Apple</td>
<td>A.C.T.</td>
<td>Vic 20</td>
<td>Tansoft</td>
</tr>
<tr>
<td>I.B.M. P.C.</td>
<td>A.C.T.</td>
<td>Oric</td>
<td>Acornsoft</td>
</tr>
<tr>
<td>Q.L</td>
<td>Protek</td>
<td>Electron</td>
<td></td>
</tr>
</tbody>
</table>

All versions contain a programme
an audio tape and glossary.
(Prices from £12.95)

Versions available from
Boots, Smiths and leading retailers.

For further information write to:
Linkword, 41 Walter Road, Swansea.
PHONEMARK DO AS ENGLISH TRADERS AND COMPUTERS DO

Phonemark, one of the most reputable peripheral makers in Taiwan, now presents to you a variety of DATA cassette recorders to store and recall computer programs on cassette, and to run users' written programs and pre-recorded programs. Moreover all models available can compatible with Commodore, Sinclair, Apple II, Panasonic and many other major computer brands.

PM-4401C

PM-4402C

models:
RM-4401 compatible with Apple II, Panasonic JR-100 and JR-200, and other models from Japan or Taiwan.
RM-4401R with remote control facility for user's convenience, compatible with Sinclair computers and IBM PC.
PM-4401C compatible with Commodore VIC-20 or 64
PM-4402C compatible with Commodore VIC-20, 64, C16, 116 or 264
PM-C16 compatible with Commodore VIC-20, 64,

NEW

PM-C16

FEATURES:
HIGH SPEED: 15 TIMES DATA/AUDIO CASSETTE
SPEED SELECTION: 892 OR 14000 BITS/SECOND
RELIABLE: 1 SOFT ERROR IN 107 BITS TRANSFERRED
FULLY COMPUTER-CONTROLLED OPERATION
DRIVE-IN-USE INDICATOR
MEDIA INTERCHANGEABILITY BETWEEN DRIVES
EXTERNAL JACK FOR DUPLICATION WITH OTHER CASSETTE
MASS STORAGE: 128K

MODEL: 8500 COMPATIBLE WITH COMMODORE VIC-20 AND COMMODORE 64

Manufactured by:
PHONEMARK ELECTRONICS CO., LTD.
No. 5, Lane 220, Sec. 3, Chungyang N. Rd., Peitou, (112), Taipei, Taiwan, R.O.C.
Cable: "PHONEMARK" Taipei Telex: 26162 PHOMARK
Tel: (02) 894-5511, 895-3033, 895-1212/4
We'll teach you to realise the full power of the personal computer.

The Executive Computer Centre is a place of learning. Here are experts, who have prepared a range of executive courses designed to increase your knowledge in all aspects of personal computing.

They will show you how to get the most out of today's personal computers. They will inform you, instruct you, and motivate you. You will be given hands-on experience — one IBM PC for each delegate. You will be presented with carefully researched and considered advice, in a businesslike atmosphere.

The Executive Computer Centre runs courses in these software packages, using IBM PCs: Lotus, Symphony, Framework, Multiplan, Wordstar, Sycero, Visicalc, Volkswriter, Smart, DBase II, DBase III, Cardbox and Delta.

There are also courses using Apple, Apricot, Sperry, Olivetti and other hardware. The Executive Computer Centre is the best equipped, fully independent microcomputer training centre in London.

Choose from these selected courses or send for more details

Please send us your full course list
☐ Please telephone me to discuss my training needs
☐ Please reserve me _____ places on the course(s) indicated
☐ Introduction to Micros course: Friday January 11 1985
☐ Introduction to Spreadsheets course: Friday January 18 1985
☐ Introduction to Basic course: Friday January 25 1985
☐ Lotus 1-2-3 course: Tuesday January 15-17 1985
☐ Two day Smart wordprocessing course: Tuesday February 19-20 1985
☐ Two day Smart spreadsheet course: Tuesday January 22-23 1985
☐ Two day Smart database course: Tuesday February 5-6 1985

Name: 
Position - 
Company - 
Address - 
Telephone No - 

To: Executive Computer Centres
24-25 New Bond Street, London W1Y 9HD
Telephone: 01-629 9255

Executive Computer Centre
24-25 New Bond Street, London W1Y 9HD
Telephone: 01-629 9255
**SALE! SALE! SALE!**

**LOOK AT THESE SPECIAL PRICES**

SALE ENDS ON JANUARY 31st 1985

**HIKACHI PC**
- HITACHI PC: dual 320kb floppy; 132kb RAM; Keyboard; Colour monitor 15 1/2'b hard disk; Network facilities; MS-DOS, Purchased leger; Sales ledger, Nominal ledger, Payroll; Sales order processing; Microsafe.
  - All for only £2,495

**OLIVETTI PORTABLE**
- M10: 24kb RAM non-volatile memory. Professional keyboards; Parallel interface for printer. Contains a set of general purpose programs. Word processing (TEXT), address list management (ADDRES) and telephone/telecommunications (TELCOM).
  - HP -150: dual 720kb 3 1/2" disk drive; 256kb RAM; Keyboard; High resolution (512 x 390)
  - £1,995

**OLIVETTI M24**
- M24: dual 320kb disk drive; 128kb RAM; Keyboard; Monitor and MSDOS.
  - £2,199

**HEWLETT PACKARD**
- HP 11C: £11
- HP 15C: £78
- HP 12C: £75
- HP-41C: £129
- HP-41CV: £221
- Cassette drive: £250

**FOR IBM-PC, COMPAQ & OLIVETTI**
- WORDSTAR
  - PROF PAK £279
  - LOTUS 1-2-3 £345
- SYMPHONY £391
- WORDRAFT DELTA 2 £395

**EPSON PX-8**
- EPSON JX-80 Colour Printer £499
- RX-80 £230
- FX-80 £339

**MACKINTOSH CORNER**
- Macksintosh 128K RAM £445
- Macksintosh 512K RAM £445
- External disk drive £49
- ImageWriter Printer £139
- Typography £129

**EX-DEMO SHARP PC 5000**
- Sharp M-8000 £262
- Plus 128K RAM 32K ROM
- Plus Thermal Printer
- Plus Selector
- Plus Supercalc
- Plus Super Com disk

**APPLE II**
- Apple IIe £150
- Apple IIc £150
- Apple II+ £150
- Apple IIe Monitor £80
- Apple IIe Monitor £80

**PORTABLE COMPUTER**
- M21: dual 320kb drive monitor £1,699

**LETTER QUALITY PRINTERS**
- SILVER REED EXP 150 Parallel/Serial £279/£310
- EXP 150 Parallel/Serial £360/£399

**ORDERS ONLY**
- Tel: 01-937 3366 ext 11
- 01-937 3366 ext 12
- Tasha Business Systems
- 191 Kensington High Street, London W8

- All for only £2,495

- £380
- £325

- EWLETT PACKARD LAZER JET £99

**MACINTOSH CORNER**
- Macksintosh 128K RAM £445
- Macksintosh 512K RAM £445
- External disk drive £49
- ImageWriter Printer £139
- Typography £129

- HEWLETT PACKARD
  - HP 11C £11
  - HP 15C £78
  - HP 12C £75
  - HP-41C £129
  - HP-41CV £221

- Cassette drive £250

- FOR IBM-PC, COMPAQ & OLIVETTI
  - WORDSTAR
  - PROF PAK £279
  - LOTUS 1-2-3 £345

- SYMPHONY £391
- WORDRAFT DELTA 2 £395

- EPSON PX-8
  - EPSON JX-80 Colour Printer £499
  - RX-80 £230
  - FX-80 £339

- MACKINTOSH CORNER
  - Macksintosh 128K RAM £445
  - Macksintosh 512K RAM £445
  - External disk drive £49
  - ImageWriter Printer £139
  - Typography £129

- EX-DEMO SHARP PC 5000
  - Sharp M-8000 £262
  - Plus 128k RAM 32k ROM
  - Plus Thermal Printer
  - Plus Selector
  - Plus Supercalc
  - Plus Super Com disk

- APPLE II
  - Apple IIe £150
  - Apple IIc £150
  - Apple II+ £150
  - Apple IIe Monitor £80
  - Apple IIe Monitor £80

- PORTABLE COMPUTER
  - M21: dual 320kb drive monitor £1,699

- LETTER QUALITY PRINTERS
  - SILVER REED EXP 150 Parallel/Serial £279/£310
  - EXP 150 Parallel/Serial £360/£399
**BBC MICRO COMPUTER SYSTEM**

**BBC Computers**
- Model A $220
- Model B + DFS $198
- Model B + DFS + NFS $455
- Model B + DFS $198

**TORCH UNICORN PRODUCTS**
- EPB200 Parallel Card with 56K Free Software Package $299
- ZDP240 280 Card as above with 2 x 40K Drive + Software + £196
- HD940 20 Mixable Hard Disc + 40K Props $196
- 20 Way IEEE Socket with 256 RAM & UNIX OS $156
- UNICOMM Communication Package/low modem $156

**DRIVE ACCESSORIES**
- RS18 25 Way IEEE Socket $45
- 56 Way Centronics Plug $45
- 40 Way IEEE Socket $45

**PRINTER/COMPUTER SHARERS**
- Three Computers to one printer (parallel) £65
- Cable Set for 3 way sharer (1m long each) £25
- UV ERASERS
  - Control from a computer
  - Buffer, editing functions, printing facility, remote
  - Speed programming algorithms:
    - Bit programming capability and a selection of high
    - Fault detection features and automatic self test, 16

**3M FLOPPY DISCS**

**MONITORS**
- KAGA TAXAN 12" RGB + Software £328
- SANYO DM8112CX Hi Res 12" Green Screen £328
- KAGA KX101G Hi Res 12" Etched Green Screen £328
- KAGA KX102A Hi Res 12" Etched Amber Screen £328
- SANYO DM8112CX Hi Res 12" Green Screen £328
- LED Bargraph

**TEXTOLIJ ZIF SOCKETS**
- 24 pin £5.75
- 24 pin £5.75

**ENERG CHANGERS**
- Male £4.10
- Female £4.10

**TEXTOLIJ ZIF SOCKETS**
- 24 pin £5.75
- 24 pin £5.75
- 24 pin £5.75

**CONNECTOR SYSTEMS**

**PRINTERS**
- EPSON
  - RX80FT £225(a)
  - RX80FT £225(b)
  - RX80FT £225(c)
  - RX80FT £225(d)

**DIRECTORS**
- Single Drives £100 40T DS: SS550 £160(a) CSS50 with psu £150(a)
- 2 x 20OK 40T DS: SS550 £325(a) £325(b) with psu £162(a)
- 2 x 40K 40T DS: SS550 £325(a) £325(b) with psu £162(a)

**MONITORS**
- All monitors supplied with BBC lead
  - MICROVITEC 14" RGB £165(a)
  - 1451AP Standard Resolution £328(a)

**DISC DRIVES**
- 3 Colour Graphics Plotter/Work Station £490(a)

**DISC DRIVES**
- 3 Colour Graphics Plotter/Work Station £490(a)

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55

**DISC DRIVES**
- 10 Way £1.55
<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.P. Double Disk Drive</td>
<td>£750</td>
</tr>
<tr>
<td>H.P. 87 Computer</td>
<td>£495</td>
</tr>
<tr>
<td>H.P. 83 Computer</td>
<td>£295</td>
</tr>
<tr>
<td>H.P. 7470a Plotter</td>
<td>£390</td>
</tr>
<tr>
<td>H.P. 7225a Plotter</td>
<td>£600</td>
</tr>
<tr>
<td>H.P. 128k Expansion</td>
<td>£250</td>
</tr>
<tr>
<td>H.P. CP/M</td>
<td>£195</td>
</tr>
<tr>
<td>H.P. 1b (1m)</td>
<td>£10</td>
</tr>
<tr>
<td>H.P. Rom Drawer</td>
<td>£35</td>
</tr>
<tr>
<td>H.P. Serial I/F</td>
<td>£120</td>
</tr>
<tr>
<td>H.P. Plotter Rom</td>
<td>£30</td>
</tr>
<tr>
<td>H.P. I/O Rom</td>
<td>£80</td>
</tr>
<tr>
<td>H.P. Visicalc</td>
<td>£80</td>
</tr>
<tr>
<td>H.P. Graphics</td>
<td>£50</td>
</tr>
<tr>
<td>H.P. Linear Programming</td>
<td>£30</td>
</tr>
<tr>
<td>H.P. Mass Storage Rom</td>
<td>£40</td>
</tr>
<tr>
<td>H.P. 11c Calc</td>
<td>£50</td>
</tr>
<tr>
<td>H.P. 12c Calc</td>
<td>£50</td>
</tr>
<tr>
<td>H.P. 15c Calc</td>
<td>£75</td>
</tr>
<tr>
<td>H.P. Card Reader</td>
<td>£55</td>
</tr>
<tr>
<td>H.P. Printer (41c)</td>
<td>£80</td>
</tr>
<tr>
<td>H.P. Mem. Mods. (each)</td>
<td>£12</td>
</tr>
<tr>
<td>H.P. App. Packs; Stats; Maths; Fin. Dec; Navigation (each)</td>
<td>£12</td>
</tr>
<tr>
<td><strong>SOFTWARE</strong></td>
<td></td>
</tr>
<tr>
<td>Sharp F/FDS</td>
<td>£25</td>
</tr>
<tr>
<td>Sharp Assembler</td>
<td>£18</td>
</tr>
<tr>
<td>Sharp Mod. Lang.</td>
<td>£10</td>
</tr>
<tr>
<td>V.A.T. &amp; Stock Control (each)</td>
<td>£5</td>
</tr>
<tr>
<td><strong>Printer I/F</strong></td>
<td>£10</td>
</tr>
<tr>
<td><strong>Printer Card</strong></td>
<td>£18</td>
</tr>
<tr>
<td>P6 Printer</td>
<td>£190</td>
</tr>
<tr>
<td><strong>Apple 2 Europlus</strong></td>
<td>£275</td>
</tr>
<tr>
<td><strong>Apple 3</strong></td>
<td>£750</td>
</tr>
<tr>
<td><strong>Apple Disk Drive</strong> (boxed)</td>
<td>£125</td>
</tr>
<tr>
<td><strong>Apple compatible Disk Drive from:</strong></td>
<td>£75</td>
</tr>
<tr>
<td><strong>Apple Easywriter</strong></td>
<td>£15</td>
</tr>
<tr>
<td><strong>Apple 3 Profile</strong></td>
<td>£500</td>
</tr>
<tr>
<td><strong>GENUINE Apple Cards</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Language Cards</strong></td>
<td>£40</td>
</tr>
<tr>
<td>Pal Card</td>
<td>£40</td>
</tr>
<tr>
<td>Serial I/F</td>
<td>£45</td>
</tr>
<tr>
<td>Centronics I/F</td>
<td>£45</td>
</tr>
<tr>
<td><strong>Non Apple</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Video Card</strong></td>
<td>£40</td>
</tr>
<tr>
<td><strong>Eprom Card</strong></td>
<td>£40</td>
</tr>
<tr>
<td><strong>280 Card inc.soft</strong></td>
<td>£55</td>
</tr>
<tr>
<td><strong>U. H. F. Modulator</strong></td>
<td>£25</td>
</tr>
<tr>
<td><strong>SOFTWARE</strong></td>
<td></td>
</tr>
<tr>
<td><strong>P.F. S. Report</strong></td>
<td>£15</td>
</tr>
<tr>
<td><strong>APPLE 3</strong></td>
<td></td>
</tr>
<tr>
<td><strong>P.F. S File, c/w P.F. S. Rep.</strong></td>
<td>£30</td>
</tr>
<tr>
<td><strong>Pascal</strong></td>
<td>£50</td>
</tr>
<tr>
<td>Mail List Manager</td>
<td>£35</td>
</tr>
<tr>
<td><strong>Business Basic</strong></td>
<td>£27</td>
</tr>
<tr>
<td><strong>SYSTEMATICS SOFTWARE</strong></td>
<td></td>
</tr>
<tr>
<td>For Apple IIGIII (Bundled)</td>
<td></td>
</tr>
<tr>
<td><strong>RING FOR DETAILS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>ALL ARE BOXED WITH MANUALS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Kaypro 10</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Kaypro 4</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Slight Demo</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Contact</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Model 745</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Data Terminal</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Model 745</strong></td>
<td></td>
</tr>
<tr>
<td><strong>RING FOR DETAILS</strong></td>
<td></td>
</tr>
</tbody>
</table>

**MORGAN CAMERA COMPANY**

160 TOTTENHAM COURT ROAD, LONDON W1. TEL: 01-388 2562
New Issue Microtest Starstick & Joystick Package.
announcing the arrival of the new issue 2 + ROM.

Available now the new issue 2 + ROM Joystick comes in three forms:

OPTION 1 The Starstick ROM and Quickshot II Joystick
Price £22.85 + £1.00 P&P

OPTION 2 The Starstick ROM and Quickshot II Joystick
Price £25.50 + £1.00 P&P

OPTION 3 The Starstick ROM and Patch Lead (choose your own
Atari/Spectrum style joystick)
Price £20.50 + £1.00 P&P

OPTION 4 Send your old version Starstick ROM back to us for
reprogramming to issue 2 +
Price £13.50 + £0.50 P&P

VI.4 STARSTICK was 4K the new version has been squashed into 8K.

The new command summary and description is

- *STICK enables the ROM.
- *NSTICK disables the ROM.
- *SETSTICK program joystick.
- *SAVE save protocols set by *SETSTICK.
- *LOAD load protocols saved by *SAVE.
- *MAP remap current keyboard definitions.
- *CLEVER intelligent loading of software (ensuring ACORN compatibility).
- *PLONK relocate area of work memory used.
- *PROP1 proportional joystick emulator 1
- *PROP2 proportional joystick emulator 2
- *ANA patches joysticks via the analogue port.

MicroCache is a highly intelligent disk buffering system (cache) that dramatically boosts the performance of your microcomputer. It is totally transparent to the user, automatically monitoring your use of disks and quickly 'learning' which is in RAM. In this way, disk accesses are very substantially reduced, saving you time and reducing frustration. MicroCache is available for most CP/M and MS-DOS machines including IBM, Sirius, Apricot, DEC, NEC etc.

Printed by Microtest + ROM Joystick comes in three forms:

OPTION 1 The Starstick ROM and Quickshot II Joystick
Price £22.85 + £1.00 P&P

OPTION 2 The Starstick ROM and Quickshot II Joystick
Price £25.50 + £1.00 P&P

OPTION 3 The Starstick ROM and Patch Lead (choose your own
Atari/Spectrum style joystick)
Price £20.50 + £1.00 P&P

OPTION 4 Send your old version Starstick ROM back to us for
reprogramming to issue 2 +
Price £13.50 + £0.50 P&P

VI.4 STARSTICK was 4K the new version has been squashed into 8K.

The new command summary and description is

- *STICK enables the ROM.
- *NSTICK disables the ROM.
- *SETSTICK program joystick.
- *SAVE save protocols set by *SETSTICK.
- *LOAD load protocols saved by *SAVE.
- *MAP remap current keyboard definitions.
- *CLEVER intelligent loading of software (ensuring ACORN compatibility).
- *PLONK relocate area of work memory used.
- *PROP1 proportional joystick emulator 1
- *PROP2 proportional joystick emulator 2
- *ANA patches joysticks via the analogue port.

available from
MICROTEST LTD
18 Normandy Way, Bodmin, Cornwall PL31 1EX
Telephone: 0208 3812
OR ANY GOOD DEALER

Large picture shows BBC Computer System and a Quickshot II Joystick. Small inset just a few of the
joysticks that will work with the patch lead. Screenshot by kind permission of SUPERIOR SOFTWARE
All MICROTEST ROMs are fully TUBE © compatible. (TUBE © is a reg. trademark of Acorn Computers).

3 TIME-SAVERS

CACHE
MicroCache is a highly intelligent disk buffering system (cache) that dramatically boosts the performance of your microcomputer. It is totally transparent to the user, automatically monitoring your use of disks and quickly 'learning' which is in RAM. In this way, disk accesses are very substantially reduced, saving you time and reducing frustration. MicroCache is available for most CP/M and MS-DOS machines including IBM, Sirius, Apricot, DEC, NEC etc.

PRINTER BUFFER
Also included in MicroCache is a printer buffer. This enables printing to apparently occur immediately by 'printing to RAM'. Actual output to the printer occurs in background mode without delaying the user. The RAM used by the disk cache is dynamically shared with the printer buffer, whichever is causing you most delay automatically gets the most RAM. This is a much more cost-effective way of saving time than purchasing expensive add-on.

RAM DISK
Silicon Disk is the original 'RAM-disk'. It provides you with an extra 'disk' in RAM which is extremely fast and reliable. As with MicroCache, the Silicon Disk software will operate with any RAM that is suitable for your machine.

MicroCache
(including printer buffer) £195
Demonstration copy £25
Silicon Disk £95

WARNING: ONCE YOU HAVE TRIED THESE PRODUCTS YOU WILL NOT BE HAPPY USING YOUR MACHINE WITHOUT THEM.
ACORNSOFT PRESENTS

The Aviator

One man's flight to save his home town!

This new and sensational production will leave you breathless as you master the art of flying a Spitfire. You'll have to think fast as you battle with the controls. And the suspense will be unnerving as you try out your new-found skills on increasingly difficult manoeuvres.

Aviator is an exciting flight simulator which puts you in the pilot's seat. Earn your wings as you explore a 3-D graphical world and score points by successfully flying under a bridge and between skyscrapers. Then meet your ultimate challenge – you alone must save Acornsville from the advancing enemy. £14.95 cassette. £17.65 disc.

Plus full supporting programs.

Starship Command:
Are your reactions quick enough to fight off invading enemy spaceships? Will your performance report to the Star Fleet Admirals be good enough for them to warrant you another craft?
As Captain of a battle starship, only you and your skill can answer those questions. £9.95 cassette. £11.50 disc.

Free Fall:
You've been attacked in outer space. All your crew members are dead after the Alphoids injected the air supply to the space station with cyanide.
You managed to get your space suit on in time, now defend the vital computer tapes from the Alphoids.
But, be quick, you've only a limited amount of air. £9.95 cassette. £11.50 disc.

JCB Digger:
Get the Meanies before they get you! Dig holes for them to fall in, then fill them. Or scoop them up in your shovel and dump them in the sea.
The Meanies will become meaner and harder to destroy as your skill develops, testing you even further. £9.95 cassette. £11.50 disc.

Disc versions are available in the new dual 40/80 track format. These and many more Acornsoft BBC Model B programs are available from your local Acorn stockist.
Alternatively, you can order programs by sending a cheque or credit card details to Acornsoft at the address below. Credit card holders can also order by telephoning 0933-79300. Ring the same number for a free Acornsoft catalogue and Aviator poster.
Acornsoft, c/o Vector Marketing, London Road, Wellingborough, Northants NN8 2RL.
The price tag. It's something rather special. When you take a look at the new Goldstar MSX you'll find an asking price of around £240. Quite a bit less than most of the others. And since you're choosing a micro that's designed and built to one standard, that'll leave you a whole lot more for the super new MSX games or business software.

What is standard, of course, is the superb MSX specification.

There's one thing about this MSX that isn't quite standard.

State-of-the-art feature like 64K of 'user' RAM and 32K of ROM and 16K Video RAM place the Goldstar right at the top of the MSX league. Sixteen vivid colours and eight octaves of sound make it a great games player's micro. And there's a powerful Z-80A processor to take on a world of home office tasks.

Goldstar MSX. The brightest new star among micros that's unbeatable value for money. You'll find it at above standard computer dealers now.

GoldStar

Distributed by:
MICRO DEALER UK Ltd
29 Burrowfield, Welwyn Garden City Herts AL7 4SS
Tel: (07073) 28181 Telex: 23674 MDUKG
**From Micro-Rent, Britain's top-value specialist in microcomputer rental.**

**MACINTOSH**
£40 * PER WEEK

**APRICOT**
£40 * PER WEEK

**SIRIUS**
£46 * PER WEEK

**IBM PC**
£46 * PER WEEK

- Try before you buy
- Flexible terms — weekly, monthly, annual
- No capital outlay/immediate delivery
- Purchase option with rebate of rental

Micro-Rent is Britain's top-value microcomputer rental specialist. You can hire on a short term basis, and give the leading machines a thorough trial in your own office, before deciding on the right one for your needs.

If you already use a micro, Micro-Rent can supply additional machines for short-term projects, or to cover breakdowns. Extra printers or monitors also available.

Micro-Rent is independent of any manufacturer, and offers expert impartial advice on all aspects of microcomputer use.

**CALL TODAY 01-833 2531**

*Prices quoted are based on 3-month rental, excluding VAT.

**The deal that no other computer dealer can offer!**

Data Profile offers you all the expert help you need, in choosing the right system for your individual needs from the variety of software programs and hardware options available. Plus a very important extra. A guaranteed buy-back price if you find, as people often do, that your first machine isn't the one you want to stick with.

Because of its close association with MicroRent, Data Profile can give you almost any combination of rental, lease or purchase option.

So when you need the best advice, and the best terms for a business system, call Data Profile.

**Authorised dealers for Apple and ACT.**

127 Cloudesley Road, London N1

127 Cloudesley Road, London N1 01-833 2532
SEIKOSHA IMPACT DOT MATRIX PRINTERS

**GP-50A**
- Designed for the hobbyist.
- Printing speed—40cps
- 5 inch, 46 columns
- Centronics parallel interface
- Plain paper—low running cost
- GP-50S—Sinclair compatible model
- GP-55AS—RS-232C serial model...
- available soon.

**GP-100VC**
- Built exclusively for COMMODORE VIC-20/C-64
- Printing speed—50cps/50cps
- 10 inch, 80 columns
- Pin feed
- GP-100A—Centronics parallel model
- GP-100AS—RS-232C serial model
- GP-100AT—ATARI compatible model...available soon.

**GP-500A**
- A new generation of Seikosha low-cost, 10 inch, 80-column printer.
- Printing speed—50cps
- Pin feed
- Centronics parallel interface
- Low noise level
- GP-500AS—RS-232C serial model

**GP-550A**
- Features a 2-in-1 masterpiece—data processing and correspondence quality mode.
- Dual printing speed—50cps/25cps
- 10 inch, 80 columns
- Various character modes for special effects
- Friction and pin feed
- Centronics parallel interface
- Optional Interface—RS232C, ROM set for IBM PC.

**GP-700A**
- Superb 7-color graphic printing.
- Printing speed—50cps
- Colors specificable in dot units
- 10 inch, 80 columns
- 4-color cassette ribbon
- Friction and pin feed
- Centronics parallel interface
- Optional interface—RGB video for IBM PC, RS-232C, Apple II/III/E.

**BP-5420A**
- Multifunction business printer with super high-speed capability.
- 420cps (draft)/104cps (correspondence)
- Throughput—152 LPM at 132 chars./line
- 15 inch, 136 columns
- Pin feed and friction feed
- Paper width up to 15.5 inches
- BP-5420—IBM PC compatible model
- BP-5200—200/100cps, 15 inch.....available soon.

*Put your efficiency in our hands... SEIKOSHA*

**Give your computer system a speedy, efficient and cost-saving printer.**
Seikosha has everything—dedicated impact dot matrix printers to sophisticated models incorporating the latest technology and features.

SEIKOSHA CO., LTD.
SYSTEM EQUIPMENT DIVISION
4-1-1 TAIHEI SUMIDA-KU TOKYO 130, JAPAN
PHONE 03-625-4610 TELEX 262-2247 SEIKO J
FAX 03-624-8666
10 MB HARD DISC

**APRICOT**

WITH

10 MB WINCHESTER

ONLY £1995 + VAT!

PLUS

- FREE Monitor
- FREE Wordprocessor (Superwriter)
- FREE Spreadsheet (Supercalc)
- FREE Super Planner

INTEGRATED ACCOUNTS PACKAGE

- FREE Invoicing
- FREE Stock Control
- FREE Sales Ledger
- FREE Purchase Ledger
- FREE Nominal Ledger
- FREE Payroll
- FREE Mailing List

SPECIAL INTRODUCTORY OFFER

FREE B.T. APPROVED MODEM WITH EACH APRICOT BOUGHT BEFORE 31.12.84

1.4 MB FLOPPY

**SANYO MBC**

WITH 2 x 720KB FLOPPY DISC

ONLY £995 + VAT!

PLUS

- FREE Monitor
- FREE Wordprocessor (Wordstar)
- FREE Spreadsheet (Calcstar)
- FREE Super Planner
- FREE Invoicing
- FREE Stock Control
- FREE Sales Ledger
- FREE Purchase Ledger
- FREE Nominal Ledger
- FREE Payroll
- FREE Mailing List

1 YEAR WARRANTY & MAINTENANCE CONTRACTS AVAILABLE

TRAINING PROVIDED ON ALL SYSTEMS SUPPLIED

**APRICOT PC**

**DUAL 315K DRIVES (730K)**

**ONLY £1395 + VAT!**

PLUS

- FREE ACT 9" Monitor
- FREE Superwriter (Wordprocessor)
- FREE SuperCalc (Spreadsheet)
- FREE Super planner
- FREE CP/M 86
- FREE Concurrent CP/M
  256K Memory

**GALAXY BARGAINS**

IBM XT: 128K RAM, 360K floppy, 10MB Winchester, Monochrome Monitor and Printer Adaptor

£3695 + VAT

APRICOT PC: DUO 720K discs and monitor

£1595 + VAT

APRICOT Xi5: 5MB Winchester

£1995 + VAT

APRICOT Xi10: 10MB Winchester

£2195 + VAT

PLUS FREE INTEGRATED ACCOUNTS PACKAGE WITH THESE SYSTEMS

We also stock a wide range of Printers, Monitors, Disc Drives and Software Packages, plus many other Computer Systems at bargain prices.
BUSINESS COMPUTERS - ALL PRICES OF BUSINESS
MICROS ARE SUBJECT TO VAT @ 15%

IBM AUTHORIZED DEALER - IBM PC

IBM PC PORTABLE £ please call
IBM PC £ please call
IBM XT £ please call
PC NETWORKING £ please call

ACT APRICOT AUTHORIZED DEALER

*NEW* Apricot Colour Card for your Apricot PC or Xi

*NEW* Apricot 10" Colour Monitor

*NEW* Apricot Point 32 as above but with 20Mb Hard Disk

*NEW* Apricot Point 7 as Xi 10Mb and networks 6 additional Apricots

*NEW* Portable Computer Flat Screen 720K Cordless KB

*NEW* F1 Computer Colour 256K RAM

ACT APRICOT AUTHORIZED DEALER

*NEW* Apricot Colour Card for your Apricot PC or Xi

*NEW* Apricot Colour Card for your Apricot PC or Xi

ACT SIRIUS AUTHORIZED DEALER

Sirus 1.2 128K £ 2195
Sirus 4.2 256K £ 2895
Sirus SX 10mb 256k £ 3995

Sirus Network Please Call

COMMODORE

CBM 8296 SK £ 795
CBM 8550 £ 895
CBM 8250 £ 895

HOME COMPUTERS

ATARI

Atari 600XL £ 99.99
Atari 800XL £ 199.99
1050 Disk Drive £ 199.99
1010 Cassette £ 49.99

BBC

BBC Model B £ 389.00
BBC Model B + DFS £ 469.00
Disk Drives from £ 130.00
Cassette Units from £ 25.00
Acorn Electron £ 179.99

COMMODORE AUTHORIZED DEALER

CBM 64 £ 179.00
1541 Disk Drive £ 199.00
CBM SX64 Portable (+ free software) £ 199.00

SINCLAIR

Spectrum 16K £ 99.95
Spectrum 48K £ 119.00
Alphasmart 32 Printer £ 69.95

Also, full range of accessories:

Joysticks £ please call

Over 1000 Games £ please call

Educational £ please call

Computer Desks

Programs £ please call

Interfaces

Printers £ please call

Cables

Speech £ please call

Synthesizers

Cassette

Word Processing £ please call

Recorders

Data Base £ please call

Over 500 Books

Programs £ please call

Stock Control

Spectrum Dealer Group

We are now Torch/Unicorn Dealers for North London

Torch 280 Disc Pack £ please call
INCREDIBLE?

For a demonstration post coupon now!

Personal Computer Div.
P.O. Box 4PD, London W1A 4PD.

Name:
Address:
Tel.:

£1,990: for the P2009/16 - 16 bit, 352K RAM, 1x 640K floppy, MS-DOS 2.11, CP/M 2.2. Built-in 10 MB hard disk possible. Also runs 8 bit software.


Philips - with you every step of the way.

For the authorized dealer near you contact:
Kingsway Data Systems, 30 Guildford Street, Chertsey, Surrey, Tel.: (0 93 28) 68 911, Telex: 24667.

CP/M is a trademark of Digital Research Inc. p-System is a trademark of Softech Microsystems Inc. MS-DOS is a trademark of Microsoft Inc. WordStar and CalcStar are trademarks of MicroPro Int. Corp.

The affordable portable.
The BBC Micro is only 16" long. But it stretches indefinitely.

It stretches into schools where BBC Basic and the Econet networking system have helped make it Britain's number one number one

It's down at the doctor's, helping run the practice thanks to an ingenious program designed by two GPs.

It can take you to the theatre using its Prestel and Teletext adaptors. While helping out at the lab with its scientific monitoring interface. It has even been...
The BBC Microcomputer System. The world's best. And still growing.

The BBC Microcomputer System is designed, produced and distributed by Acorn Computers Ltd.
Computers, like people, are fallible. They need the right combination of code and care to perform effectively in the business or the home. And that requires first hand knowledge from you to create a healthy operating environment for your Commodore 64.

Knowledge about machine language, about the lesser known qualities of the 64, about the disc drives, graphics, and about the tricks and tips to keep your 64 on line. That's why First Publishing has now launched in the UK a series of high quality books and software packages to provide a complete health care kit for your 64. Commodore 64 users throughout Europe have already found it a tonic. We think you will, too.
Crestmatt packages may be reconfigured to suit individual business needs. We provide demonstration, support and training with on-site maintenance contracts available.
C.J.E. Micro's BBC Printerpacks
For Star, Canon & Juki Printers include:
1. The Printer
2. Delivery by Securicor
3. Cable to the BBC 1.3 Metres
4. Screen Dump Program (MIC Source)
5. Text Dump Program
6. Function Key set up Program. For use with WORDWISE
7. Function Key Label Printing Program. For use with above.
8. VIEW Printer Driver
9. 100 Sheets of Paper
10. Mains Plug with 3 Amp Fuse
11. Booklet giving details of using the printer with a BBC.
12. Character Defining Program for Downloadable-character-set

CANON PW-1080A CJE PRINTER PACK £345 Inc. VAT
CANON PW-1156A CJE PRINTER PACK £439 Inc. VAT
JUKI 6100 CJE PRINTER PACK £400 Inc. VAT
GEMINI 10X CJE PRINTER PACK £255 Inc. VAT

OTHER PRINTPACKS AVAILABLE FOR DRAGON & ORIC

Special RS 232 Printer Bargain
STAR DP8480 (8 Printing) £187.00 Inc VAT
Ideal for BBC/Newbrain/HX20 & Spectrum Int. 1
Phone for full specification

WE ARE A FULLY RECOGNISED ACORN DEALER

PRINTAID
Powerful UTILITY for BBC word processors.
Mail Merging.
Easy entry of printer control codes.

EXTRAORDINARY AVAILABLE
VAT INCLUDED WHERE APPLICABLE
PHONE/CREDIT CARD ORDERS WELCOME
Postage £5 per order on or as stated
Next day delivery for Printers/Disk Drives £8.00
FULL RANGE OF CONNECTORS & CABLES AVAILABLE
ON REQUEST

RINGER FOR SAMPLE PRINTOUT, FULL SPECIFICATIONS & LATEST PRICES

CJEmicro's
Dept PCW, 78 Brighton Road, Worthing
W. Sussex BN11 2EN (0903) 213900
Plug into the best brains in the world...

... by connecting your microcomputer via a modem to the Profitlogic database, a new on-line service devoted to providing its subscribers with up-to-the-minute news and knowhow from the world’s leading experts.

COMPUTING & HI-TECH: Reviews & breakthrough news. Smartware Index. Hi-tech glossary on-line. Software you can’t buy yet... yours for the asking.

BUSINESS INTELLIGENCE: Scan hundreds of Newsletters full of information in super condensed form. Inside the think tanks. Picking the world’s best business brains. Contact file... locates professional and expert contacts worldwide.


COMPUTING SECTION: What’s in it? Software you can’t buy yet... yours for the asking.

Profitlogic’s on-line Computing section contains programs ready to run on your computer.

If you have statistical, mathematical or financial analysis problems to solve, Profitlogic’s computing section contains the necessary tools. All the programs in this section are yours free without any other than connect time charge.

The FREE SOFTWARE is organised into several groups. cWARE programs include utilities such as: ‘sounds like’ (see description on dBASE section below), Indexers, Sorters, right into unix-like programs you can run under CP/M or MS-DOS and unix of course. Examples: diff, grep, unrotate, a complete editor, d-filer, pipe and filtering gear.

Programs in cWARE allow the creation of your own tailor-made database including the latest knowhow on building B-tree indexes for fast access.

dBASE: This file contains anything from utilities lie. upper to lower case functions for version 2.3 and 2.4, 35% faster than 2.4 rank function) to complete turnkey systems.

You can download complete commercial mailing list applications, order handling, mailmerging and foreign language mailhandling and investment and statistical utilities from the cWARE section re-written in dBASE code, all speed optimised and ready to run.

One of the latest additions is the ‘soundslike’ utility, which finds names on their sound rather than on spelling. Having your customer on the phone, you will instantly retrieve his name whether the spelling is English, French, Italian, German, Spanish or any other language.

-Further programs include statistics, investment analysis software and speed up and structure checking utilities; square roots and plotting, charts on the screen or printer and foreign language characters. Whatever you thought dBASE couldn’t handle is here for you to download.

Apart from the cWARE and dBASE sections there are special SIG’s (special interest groups) for BBC, CP/M (80 & 86), MS-DOS, IBM and unix operating systems.

Other Computing information: if you need to keep abreast in the Hi-tech and Computing field, Profitlogic provides you with instant information about new hard and software, technological breakthroughs and the latest news on artificial intelligence; without any need to sift through tons of paper. You just enter a few, but powerful search commands.

The Smartware Index answers questions like: Where to get a dBASE compiler? How to read and write dozens of disk formats from a BBC? How to run dBASE under unix. Whose buffer allows you to random print and mailmerge for days, while your machine does something else. Do you need a buffer that controls 4 printers with input from several micros? Does Framework really beat Symphony? How user friendly are the programs of tomorrow?

COMPUTING & HI-TECH: BUSINESS INTELLIGENCE:

INVESTMENT DATABANK:

All this is available for not much more than the annual cost of a good daily newspaper. Send for free details today.

Forecast Services Ltd., 27a Old Gloucester St., London WC1 N 3XX.
The U-MAN Series 1000 represents a major step forward in accessible computing power.

Open architecture: Like the venerable Apple II and the more recent IBM PC all the facilities are accessible. Accessible through powerful operating systems CP/M68K and UCSD p-system. Accessible for adding hardware for every application. Accessible because of the information we make available.

Remarkably well-equipped: The minimum model features 192K of RAM, 10MHz 68000 main processor, 6809 auxiliary screen and I/O processor, mono, colour and graphics display output, dual 800K floppies, built-in serial ports, clock & timer, Centronics port, sound generator, speech synthesiser, 10 bit A/D, 16 line parallel I/O, 4 slot (Apple compatible) expansion bus and 97 key keyboard. Models with 320K and 1MB RAM available now!

Remarkable value for money: From £2500 for the 192K dual floppy machine or £7500 for 1MB RAM with 40MB Winchester + 800K floppy. Optional mono or colour monitors. Works with virtually any printer.

Software NOW! — The UCSD p-system comes complete with development tools, Pascal compiler and 68000 assembler. FORTRAN 77 and BASIC compilers also available. The CP/M68K includes a 'C' compiler (compatible with UNIX systems) and 68000 assembler while CBASIC and Pascal MT+ are also available.

The U-MAN Series 1000 was developed and is being manufactured in Warrington, England. Ask for detailed literature and prices now!

SPECIAL support scheme for software and hardware developers with big discounts.

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

Distributor, OEM and dealer enquiries welcomed.

"make it easy on yourself"
Inter-computer communication is easy in anyone's language, thanks to the Protek Modem. Acoustic coupling provides a reliable link between the computer and the telephone line. There are no connection charges, the unit is totally portable. The flexible link between the mouth and ear-pieces ensures a reliable connection between most telephones.

£59.95

Interface Packs including software are available for the following computers:
- ZX Spectrum 48K £24.95
- BBC Model B Micro £14.95
- CBM 64 £14.95
- Oric Atmos 48K £24.95 (available September)
- Electron £24.95 (available September)

Features include:
- Two operating modes: 1200/1200:1200/75
- Battery powered
- Totally portable
- LED Indicator
- Compatible with any standard RS 232 Interface

APPROVED to use with telecommunication systems run by British Telecommunications in accordance with the conditions in the instructions for use.

AVAILABLE FROM LEADING COMPUTER STORES

Protek Computing Ltd, 1A Young Square, Brucefield Industrial Park, Livingston, West Lothian. 0506 415353.
Most schoolchildren will tell you that one computer prevails in British classrooms today. Acorn's BBC Micro.
With a hint of pride, they'll also tell you that they're fluent in the computer language which Acorn developed for the BBC Micro. It's called BBC Basic.
And if you ask their advice on choosing a home computer for around £200, they're likely to tell you that there's really only one sensible choice.
The £199 Acorn Electron.
Like its £399 stablemate, but unlike any other micro, the Electron speaks BBC Basic. Which means that children can easily carry on with their computer studies at home. And their parents can quickly start catching up, because BBC Basic is such a simple language to learn.

However, language isn't the only thing which makes the Electron outstanding among every other micro in its price range.

A powerful choice.
The Electron is a 64K microcomputer which has 32K of RAM, combined with another 32K ROM.
This simply means that it has more power than most people ever need from a home computer.
Nevertheless, it has been designed to help you make the fullest use of its power.
For example, its graphics have the highest resolution of any home computer bar none.
This is because Acorn specially designed the chip that controls the graphics. And it's among the most advanced chips of its kind.

Indeed, it delivers twice as many characters across the screen as the Electron's nearest rival.

It expands into a system.
With the Electron, even total newcomers have been surprised at how quickly they can find their way into the complex world of computing.
Where many computers have keyboards which are confusing and clumsy to operate, it has a keyboard just like an ordinary electric typewriter's.

And for issuing main commands, there are single entry keys. Instead of literally spelling out the command, letter by letter, you just push the relevant key and it's issued.
There's also a built-in loudspeaker which gives high quality sound.
And what is perhaps most exciting is that the Electron has the capacity to grow with your knowledge and ambition.

With Acorn's Plus 1 expansion module, it can link up with a printer, joy sticks and fast-load cartridge software including View and Viewsheet word processing and spread sheet programs.
With the Plus 3 module, which will soon be available, you'll have a disc drive system and will be able to enjoy all the speed and convenience of 3.5 inch discs.

But let's not get carried away too quickly. You can start using and enjoying your Electron as soon as you get it home.

All you need is your television set and a cassette recorder.

The speed of a business micro.

Some home computers respond pretty slowly to your commands. After you've pressed the keys, they leave you twiddling your thumbs for more than a mere few seconds.

The plodders, however, are a very long way behind the Electron. In fact, on processing speed, a recent bench test survey ranked the Electron up with such high fliers as the IBM PC and the Apple III. Both are machines which cost well over £1000.

It's an astonishing accolade when the Electron makes no greater claim than to be a micro which is designed to become part of the family.

Your starter for free.

With your Electron, you'll receive a free introductory cassette. It will give you a taste of the exceptional colour graphics. It will show you how the Electron can play and notate music.

And when it's given you some new ideas about home accounting, it will challenge you to a few games and even spend a few seconds doing your whole family's biorhythms for you.

But remember, although it holds 15 programs, the cassette will only give you a glimpse of the Electron's full potential.

Because the potential is as infinite as your own imagination.

No shortage of software.

Although the Electron is still a relative newcomer to the market, the range of software available for it is considerable.

Besides plenty of games, there are many educational programs for children of all ages, from play school to A level.

There's a great deal to keep adults occupied, too.

From money management to helpful domestic programs, even a range of foreign language programs, teaching the basics of French, German, Italian and Spanish.

And of course, with its simplicity and flexibility, the Electron could soon be processing programs created and written by none other than yourself.

You can find the Acorn Electron with its full complement of accessories and software at local Acorn dealers and major high street stores.

For the address of your nearest supplier, ring 0933 79300.

The Acorn Electron.
EVEN THE PRICE WILL KEEP YOU IN THE BLACK

This sleek, black Microvitec CUB medium resolution colour monitor has been designed to be totally compatible with the Sinclair Q.L. An ability to display 85 column text is combined with outstanding graphic capabilities — at a price that won’t break the bank.

£275 (inc. VAT)

Specification

Model: CUB 1491/003
14" Q.L. Monitor
RGB TTL input
Tube Resolution (pixels) 653(H) x 585(V)
Dot Pitch 0.43mm
Bandwidth 18 MHz

Also available in Standard Resolution version for only £225 inc. VAT.

EVEN THE PRICE WILL KEEP YOU IN THE BLACK

This sleek, black Microvitec CUB medium resolution colour monitor has been designed to be totally compatible with the Sinclair Q.L. An ability to display 85 column text is combined with outstanding graphic capabilities — at a price that won’t break the bank.

£275 (inc. VAT)

Specification

Model: CUB 1491/003
14" Q.L. Monitor
RGB TTL input
Tube Resolution (pixels) 653(H) x 585(V)
Dot Pitch 0.43mm
Bandwidth 18 MHz

Also available in Standard Resolution version for only £225 inc. VAT.
**MINI PRICES ON MICRO DEALS!**

(We think they’re unbeatable.)

We are able to offer the systems below at least 10% less than manufacturers’ list prices – even more in the case of some machines – therefore offering you the chance of great savings on all your micro requirements.

### Hard Disk Machines

<table>
<thead>
<tr>
<th>Model</th>
<th>Ram/Storage Options</th>
<th>Configuration Details</th>
<th>List price</th>
<th>Discount</th>
<th>Our Price</th>
<th>Saving</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM PC XT</td>
<td>128 kb Ram 10 mb Hard Disk</td>
<td>1 x 360 kb Diskette Mono Display, keyboard, Printer Adaptor DOS V.2.0</td>
<td>£3433</td>
<td>15%</td>
<td>£2918</td>
<td>£515</td>
<td>New Low Price</td>
</tr>
<tr>
<td>APRICOT X15</td>
<td>256 kb Ram 5 mb hard Disk</td>
<td>1 x D/S 720 kb Micro Drive, Mono Display, Keyboard plus bundled Software</td>
<td>£2695</td>
<td>15%</td>
<td>£2291</td>
<td>£404</td>
<td></td>
</tr>
<tr>
<td>HP 150 5 mb</td>
<td>256 kb Ram 5 mb Hard Disk</td>
<td>1 x 264 kb Micro Drive, Touch Screen Display, Keyboard</td>
<td>£4395</td>
<td>20%</td>
<td>£3516</td>
<td>£879</td>
<td></td>
</tr>
</tbody>
</table>

### Portables

<table>
<thead>
<tr>
<th>Model</th>
<th>Ram/Storage Options</th>
<th>Configuration Details</th>
<th>List price</th>
<th>Discount</th>
<th>Our Price</th>
<th>Saving</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPAQ</td>
<td>256 kb Ram 2 x 360 kb Diskettes 9” Monitor, Keyboard, Parallel Port</td>
<td>MS.DOS Fully IBM Compatible</td>
<td>£2195</td>
<td>15%</td>
<td>£1865</td>
<td>£330</td>
<td></td>
</tr>
<tr>
<td>KAYPRO 10</td>
<td>64 kb Ram plus 10 mb hard Disk 1 x 360 kb Diskette</td>
<td>Keyboard, 9” Monitor, plus DBase II/Wordstar/Supercalc/ Micro Plan/Superterm</td>
<td>£2295</td>
<td>15%</td>
<td>£1950</td>
<td>£345</td>
<td></td>
</tr>
<tr>
<td>APRICOT PORTABLE</td>
<td>256 kb Ram 1 x 720 kb Micro Drive 80 x 24 L.E.D. Screen plus Supercalc/Planner/ Writer/Act Sketch/Diary, MS.DOS 2.0</td>
<td></td>
<td>£1695</td>
<td>10%</td>
<td>£1525</td>
<td>£170</td>
<td></td>
</tr>
</tbody>
</table>

### Printer Specials

- MANNESMAN TALLY MT 80.80 CPS Dot Matrix | £195
- QUEN-DATA DWP 1120.20 CPS Daisy Wheel | £245

### Ex-Demo Machines

- ACT SIRIUS 128 kb 2 x 1.2 mb Diskettes Keyboard, Monitor, plus Software | £1500
- APPLE IIE 128 kb/80 col. 2 x 140 kb Diskettes, Monitor, plus stack of Software | £995

### Low Cost Maintenance Available for All Equipment Sold

- E.G. IBM PC XT Configuration as above
- 1 yr. maintenance 48 hr. Response Parts & Labour | £300

Offers subject to availability and while stocks last.
Electronequip
(Authorised BBC Micro Dealer, and Econet service centre)

* CHRISTMAS SPECIAL OFFERS

*EPSON

RX-80FT £208.00 + VAT

FX-80 £312.42 + VAT
Printed price includes paper and BBC cable
Screen dump rom available for £11.50

TAXAN/KAGA *
KP810 £ Call

Printer price includes paper and BBC cable
Screen dump rom available for £11.50

VOLTMACE JOYSTICKS
* 10% off list prices

VOLTMACE DELTA 14B Joysticks
Inc. VAT 13.65

VOLTMACE DELTA 3B Twin Joysticks
Inc. VAT 18.99

NORDMENDE

14" TV/Monitor
£173.04 + VAT

Electronequip is an authorised Acorn service centre
and has been an Acorn dealer since the introduction
of the Atom. Our demonstration facilities include 20
station Econet and Torchnet systems.

3" Micro Disc £89.00
(incl. VAT)
Disc Interface &
Drive
£181.30 (incl. VAT)

Micro Disc Drive for
the BBC Micro

The Micro disc drive offers a method of low cost quick access to
programs. The drive is essentially a small version of a 5½" disc
drive and offers similar features to the larger drive.
The data is stored on a 3" disc, this is enclosed in a protective
hard plastic cassette which features a write protect switch.
The micro drive requires the standard Acorn disc interface, but a
new disc filing system rom. Acorn DFS may be exchanged for the
micro DFS for £2.30. The new micro disc filing system can read and
write to Acorn DFS discs.

All offers subject to availability
Prices subject to variation without prior notification
Prices for monitors & printers include BBC cable

BRANCHES
MAIL ORDER: 36-38 WEST STREET
FAREHAM, HANTS. (0329) 230670
SHOP/TECHNICAL: 59 WEST STREET
FAREHAM, HANTS. (0329) 230671
KINGS LYNN: 17 TENNYSON AVE. (0553) 3782

Access & Barclaycard Accepted
Large Stocks — 24 Hour Despatch Carriage 46p
<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPSON RX80</td>
<td>£219 inc VAT</td>
</tr>
<tr>
<td>EPSON RX80 FT</td>
<td>£255 inc VAT</td>
</tr>
<tr>
<td>EPSON FX80</td>
<td>£190.43 + VAT = £219</td>
</tr>
<tr>
<td>EPSON 8080 FT</td>
<td>£221.74 - VAT = £255</td>
</tr>
<tr>
<td>EPSON FX100</td>
<td>£329.57</td>
</tr>
<tr>
<td>JUKI DM6100</td>
<td>£703.48 + VAT = £234</td>
</tr>
<tr>
<td>Canon PW1080A (NLQ)</td>
<td>£294.79 - VAT = £339</td>
</tr>
<tr>
<td>RS232 Interfaces</td>
<td>£26.09 - VAT = £30</td>
</tr>
<tr>
<td>Daisysiep 2000</td>
<td>£216.52 - VAT = £249</td>
</tr>
<tr>
<td>Tractor unit/sheet feeders</td>
<td>£94.78 - VAT = £109</td>
</tr>
<tr>
<td>BBC Model B</td>
<td>£388.27 + VAT = £389</td>
</tr>
<tr>
<td>BBC 'B' with DES</td>
<td>£399.13 + VAT = £459</td>
</tr>
<tr>
<td>Amstrad CPC464</td>
<td>£157.39 + VAT = £181</td>
</tr>
<tr>
<td>6v power UHF</td>
<td>£24.35 + VAT = £28</td>
</tr>
<tr>
<td>ISL 8083 (IBM Comp)</td>
<td>£1173.39 + VAT = £1350</td>
</tr>
<tr>
<td>DEC 11 23 - 40 MB</td>
<td>£6086.96 + VAT = £7000</td>
</tr>
<tr>
<td>DEC 11 73 - 170 MB</td>
<td>£10434.78 + VAT = £12000</td>
</tr>
<tr>
<td>Opus disk drives</td>
<td>£86.09 + VAT = £99</td>
</tr>
<tr>
<td>Phoneline answering</td>
<td>£57.40 + VAT = £63</td>
</tr>
<tr>
<td>CALL 01-788 6311 FOR FURTHER DETAILS</td>
<td></td>
</tr>
</tbody>
</table>

**DAISYWHEEL**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>JUKI DM6100</td>
<td>£703.48 + VAT = £234</td>
</tr>
</tbody>
</table>

**microFAST**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1451/CIL Medium Res</td>
<td>£260 inc VAT</td>
</tr>
<tr>
<td>Amstrad CTM640</td>
<td>£132.18 + VAT = £152</td>
</tr>
<tr>
<td>Microvitec 1451</td>
<td>£195.65 + VAT = £225</td>
</tr>
<tr>
<td>Microvitec 1451/11.11.</td>
<td>£239.13 + VAT = £275</td>
</tr>
<tr>
<td>Microvitec 1451/11</td>
<td>£239.13 + VAT = £275</td>
</tr>
<tr>
<td>Microvitec 1451/11</td>
<td>£239.13 + VAT = £275</td>
</tr>
<tr>
<td>Taxan Kaga Vision II</td>
<td>£225.22 + VAT = £259</td>
</tr>
<tr>
<td>ISL18 Professional</td>
<td>£62.61 + VAT = £72</td>
</tr>
<tr>
<td>ISL20 Swivel 80 ccl.</td>
<td>£72.18 + VAT = £83</td>
</tr>
<tr>
<td>1431 (RGB PAL AUDIO)</td>
<td>£195.65 + VAT = £225</td>
</tr>
<tr>
<td>Microvitec 1431/11.11.</td>
<td>£239.13 + VAT = £275</td>
</tr>
<tr>
<td>Microvitec 1431</td>
<td>£239.13 + VAT = £275</td>
</tr>
<tr>
<td>Taxan Kaga Vision II</td>
<td>£225.22 + VAT = £259</td>
</tr>
<tr>
<td>ISL18 Professional</td>
<td>£62.61 + VAT = £72</td>
</tr>
<tr>
<td>ISL20 Swivel 80 ccl.</td>
<td>£72.18 + VAT = £83</td>
</tr>
</tbody>
</table>

**HISOFIT ULTRAKIT**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hisoft is pleased to announce a new compiler for the ZXSpectrum. Not a tiny-C but an extensive, easy-to-use implementation of the language. Allows direct execution of compiled statements. Supplied with function library. Available direct from Hisoft for £25, or write for further details.</td>
<td></td>
</tr>
</tbody>
</table>

**DEV PAC**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hisoft is pleased to announce a new compiler for the ZXSpectrum. Not a tiny-C but an extensive, easy-to-use implementation of the language. Allows direct execution of compiled statements. Supplied with function library. Available direct from Hisoft for £25, or write for further details.</td>
<td></td>
</tr>
</tbody>
</table>

**PASCAL**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A powerful and almost full implementation of Pascal - not a Tiny Pascal. A valuable and educational development tool, programs typically run 40 times faster than a BASIC equivalent. Spectrum version includes Turtle Graphics package. &quot;I haven't seen any other compiler that could match Hisoft's Pascal&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**HISOFIT**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A powerful and almost full implementation of Pascal - not a Tiny Pascal. A valuable and educational development tool, programs typically run 40 times faster than a BASIC equivalent. Spectrum version includes Turtle Graphics package. &quot;I haven't seen any other compiler that could match Hisoft's Pascal&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**for the ZXSpectrum**

Hisoft is pleased to announce a new compiler for this popular and effective systems programming language. Not a tiny-C but an extensive, easy-to-use implementation of the language. Allows direct execution of compiled statements. Supplied with function library. Available direct from Hisoft for £25, or write for further details.

All prices, UK delivered, relate to 48K Z8 Spectrum versions. Our software is available for many other Z80 machines e.g. Amstrad CPC 464, MSX, Memotech, SHARP MZ700, New-Brain, CP/M etc. Please write for details.
ACORN ELECTRON WITH FREE COMPANION EXPANSION UNIT

The Companion Expansion is a rugged aluminum case that bolts firmly onto the back of the Electron. It contains a six slot mother board with three connectors installed that can be used to expand your Electron to a more complete system.

APPLE MACINTOSH

"If you can point, you can use a Macintosh."
- 68000 Processor
- 128K RAM
- Built-in 400K Disk
- Macwrite
- Macpaint
- Built-in high resolution screen

MACINTOSH - £1690 + VAT

APPLE 2c

- 128K RAM
- Built-in Disk Drive
- 80 Column Display

Apple 2c £299 + VAT
2c Monitor £129 + VAT
Additional Drive £199 + VAT
Monitor Stand £27 + VAT
Appleworks Software £175 + VAT

PACKAGE DEAL £1299 + VAT

ACT APRICOT

APRICOT PC
FROM £1199 + VAT
APRICOT Xl
FROM £2199 + VAT

All Apricots come with MS-DOS, Basic, Supercaic, Superplanner, Superwriter.

SANYO

550 Single Drive
128K RAM
MS-DOS
BASIC
Wordstar
Calcstar
£649 + VAT
Additional Drive £150 + VAT

555 Dual Drives
128K RAM
MS-DOS
BASIC
Wordstar
Calcstar
Mailmerge
Report Star
Data Star
£849 + VAT

STOCK CLEARANCE

ACORN BBC

SPECIAL OFFER

- BBC B + 8 Program Tapes £347 + VAT

- BBC + Disk Interface + Disk Drive £525 + VAT

- BBC + Disk Interface + Disk Drive + Juki 6100 Printer + Leads + High Res Monitor + Workwise W.P. £949 + VAT
Write programs to unlock the multi-tasking power of your QL!

Metacomco now offers you three languages for the QL:

> Use ASSEMBLER for its speed, and for complete access to the QL’s many features.

> Use BCPL for systems programming: writing games, utilities, and applications packages.

> Use LISP for manipulating data structures, and for exploring the world of artificial intelligence.

Each language comes as a complete development kit with a screen editor and documentation, for only £59.95.

**THE ASSEMBLER**

> Standard Motorola 68000 mnemonics.

> English error messages.

> Produces code which can be EXECed, and run as a concurrent job.

> External references allow linkage to high level languages and other assembler modules.

> Macro expansions.

> Position independent, absolute or relocatable code can be produced.

> Conditional assembly.

> Large range of directives.

> Fully formatted listings.

> 30 character variable names and 32-bit values.

**BCPL**

> True compiler.

> Multiple BCPL programs can run concurrently.

> Full runtime library includes interfaces to QDOS graphics, window handling, file operations, etc.

> Exception handling provides diagnostics for debugging.

> Link loader allows linkage of separately compiled segments.

> Assembler and BCPL modules can be linked together.

> 32-bit variables use the full QL address space.

**LISP**

> Full support of QL features including windows, graphics, and screen handling.

> Compatible with Acornsoft Lisp for the BBC micro.

> Interpreter.

> Structure editor allows alteration of data structures.

> Prettyprinter displays programs in structured format.

> Tracer to aid in debugging.

> Garbage collector automatically recovers spare memory space.

> 28-bit integers and 250-character names.

**THE SCREEN EDITOR**

> Full screen editor within a user defined window.

> Edits any ASCII file including SuperBASIC source.

> Comprehensive range of commands.

The Development Kits are available now from HMV, Menzies and other leading retailers, or direct from Metacomco.

26 Portland Square, Bristol BS2 8RZ.

Tel: Bristol (0272) 428781

Phone today, or post this coupon to: Metacomco, 26, Portland Square, Bristol BS2 8RZ. Please send me:

___ copies of the QL Assembler Development Kit

___ copies of the QL BCPL Development Kit

___ copies of the QL Lisp Development Kit at £59.95 each.

I enclose a cheque for £

or please debit my ACCESS/VISA Account No.

Card expiry date

SIGNATURE

NAME

ADDRESS

POSTCODE

TEL NO

Price includes VAT, postage and packing UK mainland only. Delivery allow 28 days.
THE NEW SHARP MZ 5600.

Set the new Sharp MZ 5600 alongside any of its competitors and, for performance, you'll find there's no contest.

The MZ 5600 has the flexibility to grow, as your needs grow. Advanced features for software, including a multi-window function, giving up to four different sets of information on-screen simultaneously. High resolution graphics capability. Optional 'mouse' device for applications of a graphical, drawing or menu-driven nature. True 16-bit 8086 (8MHz), allowing large capacity, high speed processing.
What's more, the MZ 5600 is compatible with virtually all standard business software. And comes with free 12 months' on-site maintenance. The new MZ 5600 series. An outstanding performer.
From Sharp.

IT MAKES THE COMPETITION LOOK POSITIVELY UNTOGETHER.
The SENSIBLE SOLUTION™ is an innovative approach to microprogramming—a truly multi-user relational data/procedural language.

SENSIBLE SOLUTION is a complete language, with programs so compact that one page of its source code is equivalent to ten pages of BASIC language programming. Shorter programs and English Language commands make program creation, modification and debugging a pleasure.

SENSIBLE SOLUTION runs on CP/M™, CP/M,™ MS-DOS,™ DPC/OS,™ Turbo DOS,™ MM/MOST,™ n/STAR,™ NOVELLE™ and many other networks, with Unix™ soon available.

Features include
- Automatic screen and data file creation.
- Multiple screens in one program.
- Multiple key, multiple file B-tree data file handler.
- Virtually unlimited program size even in 64K RAM.
- Multi-user record and file locking on multi-user systems.
- Totally portable between operating systems.
- INQUIRE™ quick report utility.
- Easy-to-follow English language source code and commands.
- Program compiler—protecting source and increasing speed.

And now—accounting packages written in SENSIBLE SOLUTION which you, the end user, can easily modify to suit the personality and special requirements of your business.

Even if you've never used a computer before, you can program with SENSIBLE SOLUTION right away. It isn't just user-friendly; it's positively sociable!

Ring us up and we'll be delighted to show you why.

Business User Systems Ltd
46 Windsor Road, Slough, Berks, SL1 2EZ
Tel: (0753) 78844 Telex: 849323
The reasons single people join Dateline are often very varied, but come down to one thing — they are simply not meeting the sort of people they would like to meet.

Tim Stagg, a 31-year-old engineer from Pangbourne, found that the break-up of his marriage two years previously and the ending of another relationship since, had left his confidence rather dented. 'So I thought I'd try Dateline because at least that gives you a starting point for meeting people.'

At first Tim could not bring himself to actually telephone any of the girls whose names he received through Dateline; instead he made the initial approach by letter. He was delighted when girls started to telephone him, after receiving his name on their lists. For Tim it made the whole thing a lot easier, and a series of pleasant dates soon saw the return of his confidence. Fortunately, because on his third list from Dateline appeared the name of Christine Terry.

'Many of my colleagues were married'

Tim and Chris agreed to meet at a point halfway between his home and Basingstoke, where Chris worked as a student midwife. Having just moved to Basingstoke, and working unsocial hours, Chris found it very difficult to meet people. 'Many of my colleagues were married and I was getting very low,' said Chris, an articulate 29-year-old. 'I saw Dateline advertised and decided to give it a try.'

Chris had only been a member of Dateline for two weeks when Tim contacted her. Nevertheless, she managed to meet four people before that! But she was immediately taken with Tim when he phoned and was delighted when he suggested that they meet.

They agreed to meet in the car park of a pub and swapped car registration numbers as a means of identifying each other. Chris liked Tim immediately. 'Even seeing him sitting in his car, I thought 'We're going to get on!' Mind you, I thought that when he phoned up first of all. He was quite cheeky on the phone and I liked that.'

'Time just flew by…'

Tim was also very taken with Chris and their first evening was extremely successful. The time just flew by. It seemed we had, only just met and then it was time to go again. I can't even remember what we talked about!

They decided to meet again a week later (or sooner if you prefer), Tim had said, hopefully, and Chris went home to her parents for the weekend. She returned to Basingstoke rather earlier than anticipated on the Sunday and felt like seeing Tim again, so she phoned him and they met again at 'their' pub that evening. They've met nearly every night since!

Within three months of meeting each other, Chris and Tim were engaged and are planning a wedding in a year's time when Chris has qualified. Their families are very happy for them and Tim has found his friends very supportive. 'I thought they would laugh at me joining Dateline, but they didn't,' he said. 'After a while, especially after I met Chris, it made such a tremendous difference to me — I was so much happier. I would definitely advise anyone to join Dateline. I enjoyed nearly all my dates and even at worst had a pleasant evening each time. Dateline helped me get my confidence back and I enjoyed my membership.

Even though Chris was a member for such a short time she met quite a few people before finding Tim. 'Even just getting correspondence and phone calls was nice,' she said. And what advice would she give people who join Dateline?

'Give it time and you do meet the right people,' she said, smiling at Tim.

If you would like to be one of the many thousands of people nationwide who have been making friends and enjoying a new social life through Dateline, complete this simple questionnaire. We will send you confidentially and completely free, full details about Dateline and how it works, and details of just one of the Dateline members who are compatible with you. Send to: Dateline Computer Dating, 23 Abingdon Rd., London W8. Tel: 01-938-1011
SAKATA SCP800 Printer/Plotter from
4 colour graphics on either standard A4 stationary or 210mm paper roll at an affordable price.
Ideal for professional, business, educational and home use.
Centronics parallel interface. Adaptors available for most computers
96 ASCII character set and 13 inbuilt
graphic commands.

Introductory Price
£179.00 (e.r. £199)

U.K. Distributor
Datafax Ltd.

Datafax House, Bounty Road, Basingstoke, Hants RG21 3BZ
Tel: (0256) 464187
Telex: 268048

Prices shown exclude VAT
Trade enquiries welcome

Sakata-Shokai Ltd — Worldwide Distributors of the DUET 16 microcomputer

The problems of looking after your Micro...

As well as providing the solution however do present more than a
Like how do you prevent stop it from getting kicked divert the dog from
to many a problem, Micro's few of their own it gathering dust when not in use, when Mum's cleaning the lounge, showing it his affections, or even ensure it at least "arrives" safely when Dad decides to take it down to the local. We at P.A.S. realising these needs, have now developed a range of three superbly made protective cases designed specifically for Micro's. Each case is constructed from Solid Resin Fibreboard has a fully protective foam lining a carrying handle internal retaining strap, a double snap-fastening lid and a price that defies even Micro logic.

Please help, I am a long suffering Micro owner and wish to purchase case (tick appropriate box)

Lending cheque/P.O. to the value of
NAME
ADDRESS

PAS COMPUTER PRODUCTS LIMITED
UNIT 18, CENTRAL TRADING ESTATE
STAINES, MIDDLESEX TW18 4UX
Telephone: 62781

CASE HCA Takes Micro's - TX81, ZX Spectrum, Oric 1, CGL M5, CASE HCB Takes Micro's - VIC20, BBC '13', Commodore 64, Texas TI/99, Oric I, Dragon 32, Colour Genie, Sharp M7700, Acorn Electron, Lynx, Tandy Colour, Acorn 8000L, Acorn Atom. CASE HCA/C Can be adapted to take any of the above computers and various accessories such as Tape Recorder, printer, etc.

Prices apply to U.K. only.
SPECTRUM ADVANCED USER GUIDE
- by A C Dickens, M J Plumbley and L Whewell, this book is an essential supplement to the manuals provided with the components of the ZX Spectrum system. Both software and hardware aspects of the Spectrum system are covered including a complete BASIC reference section, detailed screen maps, microdrives, Interfaces 1 and 2, the network, ROM modules, joysticks, a full Z80 reference section, detailed ROM routines with many practical examples of their usage — in short, every Spectrum owner's dream come true.
ISBN 0 947929 02 9, 232 pages, £7.95

QL ADVANCED USER GUIDE
- by A C Dickens, this book is the authoritative guide to the Sinclair QL system. It provides a complete introduction to QDOS, covering multi-tasking, transient programs, resident procedures, heaps and stacks, traps and utilities, 8080 assembly programming plus much more. All of these features are illustrated by practical examples, and the powerful QDOS Experimentor program allows many facilities to be tried out from BASIC. All of the programs from the book are available on a microdrive cartridge which can be purchased with the book.
ISBN 0 947929 00 2, 352 pages, £12.95 (book) £9.95 (+ VAT) microdrive cartridge

BBC BASIC ROM USER GUIDE
- by M J Plumbley, this book contains a detailed description of the BASIC ROM as used in the BBC Microcomputer and Acorn Electron. BBC BASIC 1, BBC BASIC 2 and Electron BASIC are all covered in considerable detail. Extensive reference sections cover the ROM routines and error recovery, allowing sophisticated features to be added to BASIC programs. Many examples are provided (available on cassette) allowing 'Bad programs' to be salvaged, new commands to be added, procedures to be overlaid plus much more.
ISBN 0 947929 04 5, 360 pages, £9.95 (book) £6.95 (+ VAT) cassette

ORIC ADVANCED USER GUIDE
- by L Whewell, written for the ORIC 1 and Atmos computers, this guide is an essential supplement to the manual provided with the machine. The book contains a COMPLETE COMMENTED ROM DISASSEMBLY plus lots of information on the disc system, sound chip, 6502, ULA, BASIC variable storage, intercepting interrupts and a complete circuit diagram.
ISBN 0 947929 01 0, approx 290 pages, £9.95 available end Sept 84

ELECTRON ADVANCED USER GUIDE
- by A C Dickens and M A Holmes, this guide describes the facilities of the Acorn Electron in the detail required by the serious programmer, and acts as a supplement to the 'Acorn Electron User Guide'. Both the hardware and the software aspects of the Acorn Electron System are covered, including 'X' OSBYTE calls, pager ROM software, using events and interrupts, programming the ULA, interfacing to the expansion bus, a complete memory map and a full circuit diagram.
ISBN 0 907876 17 X, 256 pages, £9.95

Order from: Adder Publishing, PO Box 148, Cambridge CB1 2EQ

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectrum Advanced User Guide</td>
<td>£7.95 (no VAT)</td>
</tr>
<tr>
<td>QL Advanced User Guide (book)</td>
<td>£12.95 (no VAT)</td>
</tr>
<tr>
<td>QL Advanced User Guide (microdrive)</td>
<td>£11.44 (incl VAT)</td>
</tr>
<tr>
<td>BASICROM User Guide (book)</td>
<td>£9.95 (no VAT)</td>
</tr>
<tr>
<td>BASICROM User Guide (cassette)</td>
<td>£6.95 (inc. VAT)</td>
</tr>
<tr>
<td>ORIC Advance User Guide (book)</td>
<td>£9.95 (no VAT)</td>
</tr>
<tr>
<td>Acorn Electron Advanced User Guide (book)</td>
<td>£9.95 (no VAT)</td>
</tr>
</tbody>
</table>

PLEASE ADD £1.50 P&P/BOOK
I enclose my cheque/P.O for £
NAME
ADDRESS

Dealer enquiries welcome
ALL PRICES CORRECT AT TIME OF GOING TO PRESS BUT SUBJECT TO CHANGE

---

MicroSight I on the BBC model B includes:
- A CCTV camera with lens and tripod.
- MicroEye vision interface 256 x 300 resolution with 8 bit video plus all cables.
- Fully documented hardware and software.
- MicroSight software package with area perimeter routines as well as disk and printer dumps.
- Hi Res software package with mode 0 display, disk and printer dumps and thresholding.
- Package using mode 2 high quality display.
All for £495 + VAT

MicroScale
An image processing package with editing area and perimeter calculations, dimensioning, windowing, threshold and contrast setting.

MicroEye
Vision interface 256 x 300 resolution 256 grey levels with full documentation and software for BBC Sirius, IBM, Apple, RML, CBM etc.

MicroSight II
Image analysis for the IBM PC with:
- Object area measurement (absolute and %)
- Perimeter measurement to user defined scaling
- User definable and standard windows.
- Disk and printer dumps.
- Dimensioning and object counting.
- Fully documented C software.
- £1950 + VAT

Also available for Hewlett Packard and Sirius.

For further details contact:

Dighurst Ltd.
Leaden Hill, Orwell, Royston,
Herts. SG8 5OH
Telephone (0223) 208926

---

ADDER
for Advanced Computer Books and Software

---

For advanced computing solutions.
You don’t have to cut corners to get a great deal on Personal Computers.

Except this one.

PCL are Europe’s leading Personal Computer Dealers. And right now, we have an incredible offer called Investment Portfolio.

It means unbeatable prices on hardware and software ranges from IBM®, ACT and Compaq, as well as the best advice and after sales service available anywhere.

The more PCs you buy, the bigger the discounts. So cut out this coupon now, and drop it in the Out Tray in the Morning.

IBM® is the registered trade mark of International Business Machines.

Name: ____________________________ Title: ____________________________

Company Address: ______________________________________________________

Tel no: __________________________________________

PCL. The Computer Planning Consultants.
Planning Consultancy Limited. 46-47 Pall Mall, London SW1Y 5JG. Tel: 01 839 8890.
**PRIORITY ORDER**

Please send me:

**PRINTERS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canon PW 1080A</td>
<td>£273 + VAT</td>
</tr>
<tr>
<td>Shinwa CP80</td>
<td>£173 + VAT</td>
</tr>
<tr>
<td>The New Shinwa CPA 100/CPS</td>
<td>£195 + VAT</td>
</tr>
<tr>
<td>DaisyStep 2000</td>
<td>£195 + VAT</td>
</tr>
<tr>
<td>MP165</td>
<td>£275 + VAT</td>
</tr>
</tbody>
</table>

80 col. 165 CPS with an INCREDIBLE 75 CPS N.L. quality

**STOP PRESS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.L. Instant Printer</td>
<td>Serial cable, serial Interface</td>
</tr>
<tr>
<td></td>
<td>with Shinwa CP80 — £219 + VAT</td>
</tr>
<tr>
<td></td>
<td>with Canon PW 1080A — £379 + VAT</td>
</tr>
<tr>
<td></td>
<td>Complete Package — Ready to print</td>
</tr>
<tr>
<td></td>
<td>Spectrum/plus Interface — £35 + VAT</td>
</tr>
<tr>
<td></td>
<td>Commodore 64 Interface — £45 + VAT</td>
</tr>
</tbody>
</table>

**MSX**

**COMPUTERS**

**CANON MSX V20 IS HERE**

full MSX spec. Only £232 + VAT

Don’t delay. Priority orders only

**DISC DRIVES**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>5¼“ Single 400K</td>
<td>£185 + VAT</td>
</tr>
<tr>
<td>5¼“ Dual 800K</td>
<td>£350 + VAT</td>
</tr>
</tbody>
</table>

**BUSINESS SOFTWARE**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lotus 123</td>
<td>£295 + VAT</td>
</tr>
<tr>
<td>Symphony</td>
<td>£425 + VAT</td>
</tr>
<tr>
<td>Compsoft Delta</td>
<td>£495 + VAT</td>
</tr>
</tbody>
</table>

Send for SAMPLE PRINT CHART (Just £1.00 total price — refunded on order)

Philips V7001 12” green screen £63 + VAT

JVC 14” RGB Colour Med. Res. £150 + VAT

JVC 14” RGB Colour High Res. £230 + VAT

**KONAMI CARTRIDGE GAMES**

10 Titles for MSX £5 off RRP

Now £13.90 + VAT each

Inc Track and Field

The new JUKI 6300 ultimate daisywheel now twice as fast 40cps with 16” platen. Serial or Parallel: £730 + VAT

JUKI 6100 still available for just £295 + VAT

Full range of Printwheels £12.50 each + VAT

**Massive Monitor Promotion**

**FOLLY MICRO**

0730 894078
0730 67057

10 College Street, Petersfield, Hampshire

9am-9pm every day or send SAE for full range

We have no connection with any other retailer

SHOWROOM NOW OPEN
Whether you’re operating from home, school or office, the Hago PCW (Ref 816) adds the professional touch to your computer layout. Handsome, sturdy, with a place for everything, the Hago PCW is the home every personal computer deserves.

See your local dealer NOW!
If unavailable order direct from Hago.

ONLY £82.75

See your local dealer NOW!
If unavailable order direct from Hago.

Sturdy steel frame finished in chocolate brown with simulated teak worktop. Mounted on castors for complete mobility.

Keyboard worktop adjusts from 20¼" to 29¼" high.

Shelf for disc drives, tape recorder, printer etc.

Overall size: 31¼"d x 36¼"h x 22¼"w.

Hago Products Limited,
Shripney Road, Bognor Regis,
West Sussex. Tel: (0243) 863131

Please send me (qty) Hago (R816) workstations at £82.75 each inc. P&P.
I enclose my cheque for £
or debit my Access/Visa*Account No. 
Name (Block Capitals)
Address

Signature

* Please delete as applicable
ATA IS EXPANDING!
Geographically and our product range. We can supply the complete range of hardware and software for Apple, Apricot, Sirius, Hewlett-Packard and IBM peripherals.

Do you sell micros successfully?
If so we would like to talk to you. Ring Ann Rossi (0727) 34361
Export specialists – ring or telex for details!

£499
£765
£1499

AT A DIVISION OF ALBETA

BARGAIN BOX
We have a selection of demonstration hardware and software for sale.

Apple
Apple Ie 128K RAM... 848
Single 315K disk drive
F1 — 256K RAM... 985
Single 720K disk drive

Apple II Systems
Apple Ie 64K plus Disk Drive and Controller... 695
Apple Ie 64K plus
DVO Disk Drives and Monitor Ile...
Apple Ie 128K plus
Monitor Ile...

Macintosh System
Macintosh plus 15" Imagewriter, MacWrite and MacPaint...

Apricot Systems
Two Disk Drives
5/5 & monitor...
Two Disk Drives D/5 & monitor...

Potters
Hewlett-Packard HP7470...
Hewlett-Packard HP7475...

TERMS AND CONDITIONS
For delivery please add
£5.199 + £5.200-£1499 + 13%
£1500 + 11/2%
CASH/CHEQUES WITH ORDER

APPLE HARDWARE
Apple Ie...
Apple IIc ...
Macintosh...

PRINTERS
Imagewriter 10" carriage...
Imagewriter 15" carriage...
Imagewriter Accessory Kit...
Apple Daisy Wheel Printer...
Epson RX80 100 Cps...
Epson RX80 FT...
Epson RX100...
Epson FX80 180 Cps...
Epson FX80 FT...
Ricoh 1300 Flow Writer...
Ricoh NP1400...
Silver Reed Exp 500...
Brother HR15...

ACCESSORIES
Apple 80 Col Card...
Apple 80 Col Card Extended...
IEEE - 488 Interface card...
Parallel Interface Card...
Super Serial Card...
Joystick Ile...

IBM PERIPHERALS & SOFTWARE
Wordstar...
Multimate...
Select...
Dbase II...
Dbase III...
Friday...
Cardview...
PFS...
PFS Report...
PFS Write...
Lotus 1-2-3...
Tkl Solver...

BARGAIN BOX
25% OFF ABOVE PRICES

COMPUTERS WITH ORDERS
Please allow 10 days for clearance. PLC's, public sector etc 30/60 days credit available on official orders, subject to 5% credit charge.

IBM PC AUTHORIZED DEALER
LONDON 01-833 0044
SHEFFIELD 0742-700802
ST. ALBANS 0727-34361
POTTER BAR 0707-571113
SOUTH WEST 02915-700

DON'T DEAL WITH THE REST, DEAL WITH THE BEST

DATA

The market leaders...

NEW! APRICOT F1
F16 — 128K RAM...
Single 315K disk drive
F1 — 256K RAM...
Single 720K disk drive

APPLE II SYSTEMS
Apple Ie 64K plus Disk Drive and Controller...
Apple Ie 64K plus
DVO Disk Drives and Monitor Ile...
Apple Ie 128K plus
Monitor Ile...

MACINTOSH SYSTEM
Macintosh plus 15" Imagewriter, MacWrite and MacPaint...

APRICOT SYSTEMS
Two Disk Drives
S/5 & monitor...
Two Disk Drives D/S & monitor...

POTTERS
Hewlett-Packard HP7470...
Hewlett-Packard HP7475...

TERMS AND CONDITIONS
For delivery please add
£5.199 + £5.200-£1499 + 13%
£1500 + 11/2%
CASH/CHEQUES WITH ORDER

CHEQUES WITH ORDERS
Please allow 10 days for clearance. PLC's, public sector etc 30/60 days credit available on official orders, subject to 5% credit charge.

IBM PERIPHERALS & SOFTWARE
Wordstar...
Multimate...
Select...
Dbase II...
Dbase III...
Friday...
Cardview...
PFS...
PFS Report...
PFS Write...
Lotus 1-2-3...
Tkl Solver...

BARGAIN BOX
25% OFF ABOVE PRICES

COMPUTERS WITH ORDERS
Please allow 10 days for clearance. PLC's, public sector etc 30/60 days credit available on official orders, subject to 5% credit charge.

IBM PC AUTHORIZED DEALER
LONDON 01-833 0044
SHEFFIELD 0742-700802
ST. ALBANS 0727-34361
POTTER BAR 0707-571113
SOUTH WEST 02915-700

UNIVERSAL ELECTRICAL DISTRIBUTORS

SOUTH VEST CWRT-V-GAER,WOLVESNEWTON,GWENT ,NP6 6PR.

TELEXES 25102 and 54574
Treat your eyes to a
Romag CEAF. Only £19.95

Unique technology: British made laminated glass, aspherically curved Contrast Enhancement Antiglare Filter.

Up to now, contrast-enhancing filters have always been flat — and so has their performance, because the screen of your TV, monitor or VDU is curved.

Up to now, most filters have been plastic — because it takes mindbending technology to bend optical-quality laminated glass.

Up to now, filters have been expensive — awkward production techniques have meant price tags from around £50 to well over £100.

Forget all that: the Romag CEAF is here. British designed and manufactured by space age military technologists, CEAF is profiled to fit your display screen, giving you the ultimate in contrast enhancement and antiglare performance. For under £20, this first generation of eye-friendly filters diffuses all specular reflections, gives sharper image clarity from edge to edge of the screen and greatly enhances display colours.

Mounted and removed in seconds by invisible velcro fastenings, the anti-static, anti-shatter CEAF is a major step forward in the operational safety of computer displays — unprotected screens can cause blurred vision, watery and itchy eyes, headaches and (according to such authorities as the Institute of Ophthalmology) even permanent changes in eyesight.

Scratch-resistant, durable and easily cleaned without expensive sprays and agents, 9", 12" and 14" CEAFs are available from leading retailers at only £19.95 including VAT. Or fill in the Freepost coupon and your CEAF will be despatched within 48 hours. Orders can also be placed around the clock by phoning the CEAF Department on (091) 414 5524, quoting your Access Card number. For other screen sizes, please ring or write — the CEAF prices for 'specials' would be considered very competitive... if there was any competition!

To FREEPOST ROMAG, CEAF Dept. PCW Blaydon on Tyne, Tyne & Wear NE21 5SG. Telephone: (091) 414 5524

My TV/Monitor/VDU is: (make) (model) (size)

My Computer is: (make/model)

Please send me: 9" CEAF(s) 12" CEAF(s) 14" CEAF(s) at £19.95 each, inc. P&P.

I enclose cheque/P.O. No. for £ made payable to ROMAG.

OR My Access Card No. is

Name

Address

Tel:

The filter which eliminates all competition
CEAF is a Registered Trade Mark.
25 ss/dd 5 1/4" diskettes in a MEGA•BOX £29

With RHINOCOTE

– it’s tough!

Our Quality Promise
You can order XLTron disks with confidence. We buy our disks in bulk from international manufacturers, to our specifications, then test, grade and retest them in our London laboratories. Every order of 25 or 50 comes packed in the same top quality rigid plastic storage box, our MEGA•BOX. With four dividers. Every order of 10 comes packed in our disco-box library case.

Fully Guaranteed
The XLTron quality control is so stringent that we can give our famous 'two for one' guarantee. If you find a faulty disk, return it to us, and we’ll send you two in exchange immediately. All part of our five year guarantee.

XLTron 5 1/4" Floppy Disks Prices

<table>
<thead>
<tr>
<th>Code</th>
<th>Type</th>
<th>Product Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>SS/DD</td>
<td>XLTron</td>
</tr>
<tr>
<td>4</td>
<td>DS/DD</td>
<td>XLTron</td>
</tr>
<tr>
<td>5</td>
<td>SS/DD</td>
<td>XLTron</td>
</tr>
<tr>
<td>6</td>
<td>DS/DD</td>
<td>XLTron</td>
</tr>
</tbody>
</table>

Features: Write protect notch, centre hubs, double and single density. Tyvex® sleeves, and with Ammiflat®.

Other brands too!
We also stock 3M and Athana Disks. Prices are for boxes of 10. All disks 48tpi

<table>
<thead>
<tr>
<th>Type</th>
<th>Product Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Athana</td>
<td>SS/DD</td>
</tr>
<tr>
<td>3M</td>
<td>DS/DD</td>
</tr>
</tbody>
</table>

For details of our 8" floppy disks ring 01-631 0255.

Help Lines
If you want help or information to place an order ring our 'hot line' on 01-631 3600 or if you need technical advice ring 01-631 0255.

Official Orders
We accept orders from all government bodies, schools, universities, libraries, armed forces etc. We despatch on receipt of an official purchase order. If you can't raise a cheque without an invoice just post or telephone your order and we'll send you a pro-forma by return.

Personal Callers Very Welcome
We're now established in our new showroom in Alfred Place. You can save our £2.00 delivery charge by calling in—you'll be welcome from 10.00 a.m. till 5.00 p.m. Saturday 10.00 a.m. - 4.00 p.m.

Pre-formatted Disks
New!
Save yourself time and trouble—we can supply pre-formatted disks for nearly every computer. Available in boxes of 10. Single sided for AES Plus, Olivetti ETV 300, Phillips 5002/3/4 etc. £15.00 (Code F1) and machine name.

Machine name.
Double sided for DEC Rainbow/Professional, Phillips 5020 (Prospect), IBM Displaywriter, Canon AS100 etc. £24.00 (Code F2). Please specify your computer and machine part number when ordering.

Disco Technology Ltd., Lex House, 3-6 Alfred Place, London WC1, England. Please send me the following:

Fill in the coupon or send written orders.

Name
Signature
Address
Postcode

I enclose a cheque for £ or debit my Access/Diner card number

© Tyvex is a registered name of Du Pont
© Ammiflat® is a registered name of Disco Technology Ltd
© XLTron is a registered name of XLTRON Ltd.
We are official Acorn Dealers with high standards to maintain and take pride in efficient and friendly advice and service.

See our extensive range of printers, monitors, disc drives, software and books.

### New Low Prices

**NEW LOW PRICES**

Link two or more micros to one printer, plotter, modem, etc., or vice versa:

- **ROBUST CONSTRUCTION**
- **SCREENED, METAL HOUSING**
- **FULLY TESTED**
- **BI-DIRECTIONAL**
- **24-HOUR DESPATCH**
- **CARRIAGE PAID**
- **OFFICIAL ORDERS ACCEPTED**

**SERIAL DATA SWITCHES:** RS232/V24, 25 way "D" connectors (Female)

<table>
<thead>
<tr>
<th>Lines</th>
<th>1 to 8 &amp; 20</th>
<th>All 25 lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model R2</td>
<td>2 way switch</td>
<td>£49 Model V2</td>
</tr>
<tr>
<td>Model R3</td>
<td>3 way switch</td>
<td>£57 Model V3</td>
</tr>
<tr>
<td>Model R4</td>
<td>4 way switch</td>
<td>£65 Model V4</td>
</tr>
<tr>
<td>Model R5</td>
<td>5 way switch</td>
<td>£73 Model V5</td>
</tr>
<tr>
<td>Model RX</td>
<td>2 way crossover</td>
<td>£65 Model VX</td>
</tr>
</tbody>
</table>

**PARALLEL DATA SWITCHES**

IBM PC Printer Switches (25 way "D" sockets)

| Model C2 | 2 way switch | £79 Model P2 | 2 way switch | £85 |
| Model C3 | 3 way switch | £99 Model P3 | 3 way switch | £77 |
| Model C4 | 4 way switch | £119 Model PX | 4 way crossover | £89 |
| Model C5 | 5 way switch | £139 (1x36 way and 2x35 way sockets) |
| Model CX | 2 way crossover | £119 Model M2 | 2 way switch | £79 |

- **PLEASE ADD VAT AT 15% ALL ITEMS CARRIAGE PAID**
- All items ex-stock guaranteed for 12 months
- Trade-Educational and export enquires welcome

**PHARMACY**

**FOR APRICOT**

**£225.00**

COMPLETE PACKAGE

Apricot printer and software from

£1,675

Rent complete package from £13.78 per week (less tax relief) includes full maintenance, contract and insurance

Also available for Sirius

**SAN ENTERPRISE**

2/8 MADRID ROAD

GUILDFORD, SURREY

Tel: (0483) 578910

Dealer Enquiries Welcome

**IN BROMLEY**

BROMLEY'S FIRST

SPECIALIST COMPUTER STORE

We are official Acorn Dealers with high standards to maintain and take pride in efficient and friendly advice and service.

See our extensive range of printers, monitors, disc drives, software and books.
NEW! From XLtron

**SUPERDISK**

The 96 tpi 5 1/4" disk for any system.

with HARDKOTE - it's tough!

SUPERDISK is suitable for any user, any computer, any format. Single sided, double sided, 48 or 96 tpi. Every SUPERDISK has been individually tested and approved in our London Laboratory. Whatever your requirement SUPERDISK is the answer.

Special introductory offer until 15th January, 1985 only - 10 SUPERDISKS in a disco-box £20 plus VAT and P&P. From 16th January, 1985 prices must rise!

* Introductory offer

The midi-box

15 ds/dd disks in our midi-box at a bargain price.

Our new midi-box has some great features. It's made of high impact PVC and holds up to 30 5 1/4" disks, but is one of the neatest on the market. Measuring 6 1/2" x 6 1/4" x 3 3/4" the ridged lid conveniently holds the disks you are working on ready to hand. And with 15 ds/dd disks with HARDKOTE it's a bargain at only £25.00 all in.

A Box and a half for the price of one!

‘Two for one’ guarantee

If you find a faulty disk, send it back and we will immediately send you two in return.

Disco Technology Ltd.,
Lex House, 3-6 Alfred Place
LONDON WC1
01-631 3600 for telephone orders
01-631 0255 for technical enquiries

Call in – Save £2.00

Our new premises at Alfred Place are within minutes of Tottenham Court Road, Goodge Street and Warren Street tube stations. Call in and save postage.

To: Disco Technology Ltd.,
Lex House, 3-6 Alfred Place, London WC1

Fill in the coupon or send written order.
Please send me:
10 SUPERDISKS at £25 including VAT and P&P in a disco-box
15 ds/dd XLtron disks in a midi-box at £25.00 including VAT and P&P.

I enclose a cheque to the value of £
or debit my
Access/Diners card
Number
Signature
Address

© XLtron is a registered name of Disco Technology Ltd.
© ANIMIS7 is a registered name of XLTRON Ltd.
ACORN COMPUTERS

- Bros: £215 (039) £220. Interface to run the above printers from Vic and the Commodore 64. Interface £61 (062) £69.
- Smith Corona TP1 Daisy wheel printer £252 (0251) £282.
- Epson RX80F/T 2314 (0286) £316.
- Epson FX80 £359 (0336) £388.
- Combined matrix printers and electric typewriters:- Brother EP22 £173 (0166) £186, Brother EP44 £399 (0358) £388.
- Brother FIR5 £162 (0146) £170.
- Shinwa CTI CP80E225 (0218) £359.

COMMODORE COMPUTERS

- Commodore 64 starter pack £75 (085) £115.
- Commodore C16 starter pack £75 (085) £115.
- Commodore 48K £209 £234.
- Interfaces for Vic 20 and the Commodore 64. -Centronics £45 £44.
- Commodore cassette recorder £43 (044) £50.
- Printer cassette convertor + compatible cassette recorder £99 (038) £115.
- Bargain package: -ordinary mono cassette recorders to be used with the Vic 20. Vic 20 starter pack £75 (085) £115.
- Convertor to allow most Plus/4 E305 (0281) £301.
- Commodore 64 C16 starter pack £145 (0142) £162.
- Commodore ZX81 £43 (044) £50.
- Interface for Spectrum £102 (092) £112.
-ZX printer has £31 (033) £38. Spectrum printer interface with cables:
- MS801 Printer £235 (041) £260.
- MPS801 Printer £235 (041) £260.
- RS232 £45 (041) £46.

COMPUTER ACCESSORIES

- COMMODORE

- 16 DIL SUB-MINIATURE RELAYS

- MIGHTY MICRO

- MIRACLE, TELEMOD, PACE PRINTERS

- ALPHACOM, COSMOS, BROTHER, EPSON, CANNON, MANNESMAN, OLIVETTI, PANASONIC, JUKI, SHINWA, STAR, TAXAN

- DISK DRIVES

- OPUS, PACE, CUMANA

MACINTOSH IBM APPLE APRICOT LISA

Purchase/Sales Ledger (inc. job analysis) £595.00
Complete Business System .......... £1,350.00

Purchase/Sales/Order Processing/Invoicing/Stock Control Dealer Enquiries Welcome
EVERYTHING YOU WANT FROM A HOME COMPUTER

1. ATARI 64K 800XL - £129: The Atari 800XL has many facilities and includes such advanced specifications that you will be amazed by its performance. At the new reduced price of only £129 inc VAT for a full specification 64K computer with a proper full stroke keyboard, we believe that the 800XL cannot be beaten. Compare Atari with the competition, just look at these specifications:

- **COLOUR CAPABILITIES:** 16 colours and 16 intensity levels giving 256 different colours (all of the 256 colours can be displayed at the same time).
- **OPERATING SYSTEM:** 24K ROM including Atari Basic programming language and a self diagnostic test program.
- **KEYBOARD:** Full stroke design with 62 keys including help key and 4 special function keys, International character set and 29 graphics keys.
- **SOUND:** 4 independent sound synthesizers each capable of producing music across a 31.5 octave range of a wide variety of special sound effects. (Additional programming can achieve an octave range of up to nine octaves)
- **DISPLAY:** 11 graphic modes and 5 text modes. Up to 320x200 resolution. Maximum text display 24 lines by 40 columns.
- **USER PROGRAMMABLE**

2. ATARI 400 16K GAMES MACHINE - £29: We have several Atari 400 games consoles/computers with 16K RAM. The price is £29 (for a reconditioned model) or £39 for a new machine. Both come with 12 months guarantee. The Atari 400 can play all 800X5 ROM cartridge games and is expandable up to 48K RAM. Computer upgrade with Basic Programming Kit (£22) optional extra.


4. ATARI 1050 DUAL DENSITY DISK DRIVE - £199: 5.25" disks holding 127K randomly accessible bytes provide both expansion and flexibility for your 400/800 or XL system with new high quality DOS. All customers who purchase a Disk Drive from Silica will be automatically given a FREE set of 100 programs on 3 Disks recorded on both sides.

5. ATARI 1020 4 Colour Printer - £249: For word processing letters in professional type. Print speed of 20 chars per second. At the new reduced price of only £129 inc VAT for a full specification 64K computer with a proper full stroke keyboard, we believe that the 800XL cannot be beaten. Compare Atari with the competition, just look at these specifications:

6. ATARI 1027 LETTER QUALITY PRINTER - £249: For word processing letters in professional type. Print speed of 20 chars per second.

7. ATARI TOUCH TABLET - £249: Enables you to draw and paint pictures on your TV screen, with the touch of a stylus. At the new reduced price of only £129 inc VAT for a full specification 64K computer with a proper full stroke keyboard, we believe that the 800XL cannot be beaten. Compare Atari with the competition, just look at these specifications:

8. ATARI SUPER CONTROLLER - £9.95: The ultimate joystick with double fire button to give you a greater competitive edge in your games.

9. ATARI SUPER CONTROLLER - £9.95: The ultimate joystick with double fire button to give you a greater competitive edge in your games.

10. ATARI 800XL 48K OUT OF STOCK

ATARI 400 16K NOW ONLY £29

SEE TEXT SECTION 2.

So fill in the coupon below with a literature enquiry or order and begin to experience a specialist Atari service that is second to none...

**OFFER FOR A LIMITED PERIOD ONLY**

We will be sending all Computers and Disk Drives by a next day Securicor delivery service at our own expense.

**NEXT DAY DELIVERY - FREE**

All goods despatched from Silica Shop are normally sent by first class post or parcel post FREE OF CHARGE. As a special introductory offer for a limited period only we will be sending all Computers and Disk Drives by a next day Securicor delivery service at our own expense.

**SILICA SHOP ARE THE NO1 ATARI SPECIALIST**

Silica Shop are now firmly established as the No 1 Atari retail/mail order and wholesale specialist in the U.K. We already offer our service to over 120,000 customers, 10,000 of whom have purchased Atari Home Computers. Because we specialise (and with a turnover of £1 million) we are able to keep prices low by bulk purchases. Ring one of our 45 staff and we will be glad to be of service to you. Complete the coupon below and we will send you our Atari pack with our 16 page price list and XL colour catalogue.

**LETTER QUALITY PRINTER - £249:**

**ATARI 1020 4 Colour Printer - £249:**

**TRAK BALL - £19.95:**

**SUPER CONTROLLER - £9.95:**

**FREE COMPUTER OWNERS CLUB:** This is open to all Atari computer owners irrespective of where you purchased your equipment. Membership is FREE and entitled you to receive bulletins giving details of new releases and developments. Send now for your FREE information pack, price list & colour catalogue.

**FREE COMPUTER OWNERS CLUB:** This is open to all Atari computer owners irrespective of where you purchased your equipment. Membership is FREE and entitled you to receive bulletins giving details of new releases and developments. Send now for your FREE information pack, price list & colour catalogue.

**SILICA SHOP ARE THE NO1 ATARI SPECIALIST**

Silica Shop are now firmly established as the No 1 Atari retail/mail order and wholesale specialist in the U.K. We already offer our service to over 120,000 customers, 10,000 of whom have purchased Atari Home Computers. Because we specialise (and with a turnover of £1 million) we are able to keep prices low by bulk purchases. Ring one of our 45 staff and we will be glad to be of service to you. Complete the coupon below and we will send you our Atari pack with our 16 page price list and XL colour catalogue.

**LETTER QUALITY PRINTER - £249:**

**ATARI 1020 4 Colour Printer - £249:**

**TRAK BALL - £19.95:**

**SUPER CONTROLLER - £9.95:**

**FREE COMPUTER OWNERS CLUB:** This is open to all Atari computer owners irrespective of where you purchased your equipment. Membership is FREE and entitled you to receive bulletins giving details of new releases and developments. Send now for your FREE information pack, price list & colour catalogue.

**PAYMENT:** We accept cash, cheques, postal orders and all Credit Cards. We shall offer credit facilities over 1, 2 or 3 years, please write for a written quotation.

**NEXT DAY DELIVERY - FREE:** All goods despatched from Silica Shop are normally sent by first class post or parcel post FREE OF CHARGE. As a special introductory offer for a limited period only we will be sending all Computers and Disk Drives by a next day Securicor delivery service at our own expense.

**SILICA SHOP LTD, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX Telephone: 01-309 1111 ORDER NOW-OR SEND FOR A FREE COLOUR BROCHURE**

To: SILICA SHOP LTD, Dept PCW 0185, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX Telephone: 01-309 1111

**LITERATURE REQUEST:**

☐ Please send me your FREE colour brochures and 16 page price list on Atari Computers.

☐ I own a Videogame ☐ I own a Computer

Address:

Postcode:

**ORDER RENT:**

☐ PLEASE SEND ME:

☐ 800X/64X Computer £129

☐ 400 16K Games Machine £29/£39

☐ 800XL Games Machine £129

☐ 1010 Disk Drive £199

☐ 1020 4 Colour Printer £99

☐ 1027 Letter Quality Printer £99

☐ Touch Tablet+ Cartridge £19

☐ 1050 Program Recorder £24

☐ 1050 127K Disk Drive £19

☐ 1027 Letter Quality Printer £99

☐ Touch Tablet+ Cartridge £19

☐ 1050 Program Recorder £24

☐ 1050 127K Disk Drive £19

**ALL PRICES QUOTED ARE INCLUSIVE OF VAT - POSTAGE & PACKING IS FREE OF CHARGE**

☐ I enclose Cheque/P.O. payable to Silica Shop Limited for the following amount £

☐ CREDIT CARD - Please debit my:

Access/Barcard/Visa/American Express/Diners Club Card Number
**LOWEST PRICES**

*EXPERT ADVICE* *EXPRESS DELIVERY* *EXPORT ARRANGED*

**01-947 8562**

Worldwide Computers Limited, Spa House, 11-17 Worple Road, Wimbledon, London SW19 4JS Telex: WOWICO 8955888

### COMPUTERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apricot F1 256K RAM</td>
<td>£949.00</td>
</tr>
<tr>
<td>Apricot 256K 2x315 D/D+Monitor</td>
<td>£1399.00</td>
</tr>
<tr>
<td>Apricot 256K 2x720 D/D+Monitor</td>
<td>£1549.00</td>
</tr>
<tr>
<td>Apricot 256K 5 MB HD D+Monitor</td>
<td>£2099.00</td>
</tr>
<tr>
<td>Apricot 256K 10MB HD D+Monitor</td>
<td>£2275.00</td>
</tr>
<tr>
<td>BBC Micro Computer</td>
<td>£1199.00</td>
</tr>
<tr>
<td>Commodore VIC 20</td>
<td>£78.25</td>
</tr>
<tr>
<td>Commodore 64</td>
<td>£1199.00</td>
</tr>
<tr>
<td>Commodore SX 64 (Portable)</td>
<td>£575.00</td>
</tr>
<tr>
<td>Commodore Plus 4</td>
<td>P.O.A.</td>
</tr>
<tr>
<td>Epson Portable PXB</td>
<td>£649.00</td>
</tr>
<tr>
<td>Epson Portable PX 8+RAM</td>
<td>£799.00</td>
</tr>
<tr>
<td>Epson QX10 + RX80+Cable</td>
<td>£1599.00</td>
</tr>
<tr>
<td>IBM PC 64 1xDisk</td>
<td>£320.00</td>
</tr>
<tr>
<td>IBM PC 64 10MB Disk</td>
<td>£320.00</td>
</tr>
<tr>
<td>IBM PC XT 10MB Disk</td>
<td>£259.00</td>
</tr>
<tr>
<td>IBM Portable 1xDisk</td>
<td>£78.25</td>
</tr>
<tr>
<td>IBM Portable 10MB Disk</td>
<td>£78.25</td>
</tr>
<tr>
<td>IBM PC AT 1xDisk</td>
<td>£175.00</td>
</tr>
<tr>
<td>IBM PC AT 20MB Disk</td>
<td>£175.00</td>
</tr>
<tr>
<td>Kaypro 2</td>
<td>£899.00</td>
</tr>
<tr>
<td>Kaypro 10MB</td>
<td>£1850.00</td>
</tr>
<tr>
<td>Sanyo MBC555 2x160K Disk Drive</td>
<td>£899.00</td>
</tr>
<tr>
<td>Sinclair Spectrum 48K+6 Pack</td>
<td>£100.00</td>
</tr>
<tr>
<td>Sinclair Spectrum 64K</td>
<td>£139.00</td>
</tr>
<tr>
<td>Sanyo 128K 2 MB</td>
<td>£1650.00</td>
</tr>
<tr>
<td>Sanyo 256K 2.4 MB</td>
<td>£2150.00</td>
</tr>
<tr>
<td>Sanyo 256K 1.2+10.6MB</td>
<td>£2950.00</td>
</tr>
<tr>
<td>Televideo</td>
<td>£1599.00</td>
</tr>
<tr>
<td>Wren Computer</td>
<td>£849.00</td>
</tr>
</tbody>
</table>

### PERIPHERALS

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>12in Apricot Monitor (+£50)</td>
<td>£289.50</td>
</tr>
<tr>
<td>Colour Monitor for Apricot F1</td>
<td>£350.00</td>
</tr>
<tr>
<td>Cables</td>
<td>£10.00</td>
</tr>
<tr>
<td>Commodore 1701 Col Monitor</td>
<td>£175.00</td>
</tr>
<tr>
<td>Epson Acoustic Coupler</td>
<td>£130.00</td>
</tr>
<tr>
<td>F1 9&quot; Mono Monitor</td>
<td>£175.00</td>
</tr>
<tr>
<td>Luxor 800 Pixel Colour Monitor</td>
<td>£475.00</td>
</tr>
<tr>
<td>Microvitec 20&quot; Colour Monitor</td>
<td>£280.00</td>
</tr>
<tr>
<td>Sanyo 2112 Green Screen 15MHS</td>
<td>£65.00</td>
</tr>
<tr>
<td>Sanyo 3177 Col Hi Res 600PISC</td>
<td>£279.00</td>
</tr>
<tr>
<td>Sanyo 3125 Col Med Res 400PISC</td>
<td>£175.00</td>
</tr>
<tr>
<td>Sanyo 8112 Green Screen 18MHz</td>
<td>£85.00</td>
</tr>
<tr>
<td>Sinclair Expansion Pack</td>
<td>£85.00</td>
</tr>
<tr>
<td>Monitor for QL</td>
<td>£265.00</td>
</tr>
<tr>
<td>VM12MHI Monitor Grn Srn 4 IBM</td>
<td>£144.00</td>
</tr>
<tr>
<td>Keyboards, cables, interfaces, tractor feeds, sheet feeds, disks, software, up grades, listing paper, ribbons, daisy wheels available for most products.</td>
<td></td>
</tr>
</tbody>
</table>

### DOT MATRIX

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admate JP80 Dot Matrix Printer</td>
<td>£169.00</td>
</tr>
<tr>
<td>Anadex DP 9000</td>
<td>£799.00</td>
</tr>
<tr>
<td>Brother M1009 Dot Matrix Print</td>
<td>£155.00</td>
</tr>
<tr>
<td>Canon PW 1080A (NLQ)</td>
<td>£395.00</td>
</tr>
<tr>
<td>Canon PW1150 A (NLQ)</td>
<td>£385.00</td>
</tr>
<tr>
<td>Commodore MPS 801</td>
<td>£155.00</td>
</tr>
<tr>
<td>Commodore MPS 802</td>
<td>£250.00</td>
</tr>
<tr>
<td>Epson RX80T</td>
<td>£190.00</td>
</tr>
<tr>
<td>Epson RX80 F/T</td>
<td>£215.00</td>
</tr>
<tr>
<td>Epson FX80</td>
<td>£320.00</td>
</tr>
<tr>
<td>Epson RX100 F/T Printer</td>
<td>£340.00</td>
</tr>
<tr>
<td>Epson FX100 F/T</td>
<td>£425.00</td>
</tr>
<tr>
<td>Epson LC 1500 NLO Printer</td>
<td>£895.00</td>
</tr>
<tr>
<td>Mannesmann Tally MT80</td>
<td>£195.00</td>
</tr>
<tr>
<td>Mannesmann Tally MT160</td>
<td>£395.00</td>
</tr>
<tr>
<td>Mannesmann Tally Pipy Plotter</td>
<td>£450.00</td>
</tr>
<tr>
<td>Mannesmann Tally MT180</td>
<td>£580.00</td>
</tr>
<tr>
<td>MP 165 NLO Printer</td>
<td>£295.00</td>
</tr>
<tr>
<td>OKI Microline 82A Printer</td>
<td>£249.00</td>
</tr>
<tr>
<td>OKI Microline 83A</td>
<td>£389.00</td>
</tr>
<tr>
<td>OKI Microline 84 (P)</td>
<td>£629.00</td>
</tr>
<tr>
<td>OKI Microline 92 (P)</td>
<td>£365.00</td>
</tr>
<tr>
<td>OKI Microline 93 (P)</td>
<td>£499.00</td>
</tr>
<tr>
<td>OKI Microline 2350 (P)</td>
<td>£1449.00</td>
</tr>
<tr>
<td>Panasonic KP 1091 (IBM + NLO)</td>
<td>£275.00</td>
</tr>
<tr>
<td>Radix 10 (NLO)</td>
<td>£449.00</td>
</tr>
<tr>
<td>Radix 15 (NLO)</td>
<td>£549.00</td>
</tr>
<tr>
<td>Shinwa CP80 AF/T Para</td>
<td>£189.00</td>
</tr>
<tr>
<td>Star Delta 10</td>
<td>£319.00</td>
</tr>
<tr>
<td>Star Gemini 10X</td>
<td>£195.00</td>
</tr>
<tr>
<td>TEC 1550 (P)</td>
<td>£459.00</td>
</tr>
<tr>
<td>TEC 1550 (S)</td>
<td>£499.00</td>
</tr>
</tbody>
</table>

### DAISY WHEELS

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brother HR5</td>
<td>£130.00</td>
</tr>
<tr>
<td>Brother HR1</td>
<td>£255.00</td>
</tr>
<tr>
<td>Brother HR15</td>
<td>£325.00</td>
</tr>
<tr>
<td>Brother HR25</td>
<td>£555.00</td>
</tr>
<tr>
<td>Brother HR35</td>
<td>£695.00</td>
</tr>
<tr>
<td>Daisy Step 2000 (20CPS)</td>
<td>£225.00</td>
</tr>
<tr>
<td>Diablo 620 (RO)</td>
<td>£675.00</td>
</tr>
<tr>
<td>Diablo 630 (API)</td>
<td>£1310.00</td>
</tr>
<tr>
<td>EP 44 Personal Elec. Printer</td>
<td>£190.00</td>
</tr>
<tr>
<td>1600 Flowriter IBM-PC 8K QD</td>
<td>£1449.00</td>
</tr>
<tr>
<td>Hitachi 672 Plotter</td>
<td>£395.00</td>
</tr>
<tr>
<td>Juki 6100</td>
<td>£319.00</td>
</tr>
<tr>
<td>Juki 6300 Printer (40 CPS)</td>
<td>£825.00</td>
</tr>
<tr>
<td>Quen-Data Daisywheeler Printer</td>
<td>£225.00</td>
</tr>
<tr>
<td>Quem Letter Pro 20</td>
<td>£450.00</td>
</tr>
<tr>
<td>Quem 11/40 (RO)</td>
<td>£1175.00</td>
</tr>
<tr>
<td>Richo RP1300</td>
<td>£875.00</td>
</tr>
<tr>
<td>Richo RP1600</td>
<td>£1175.00</td>
</tr>
<tr>
<td>Smith Corona TP1</td>
<td>£175.00</td>
</tr>
<tr>
<td>TEC 10-40 D/W Printer</td>
<td>£845.00</td>
</tr>
</tbody>
</table>

All prices excluding VAT
WHY MICROSOFT
LOVE MT 80

Most leading low cost Micros, eg BBC, Dragon and Sinclair QL love the MT-80 printer from Mannesmann Tally. It is fully hardware compatible and with a range of cable options, gives trouble-free straight through plug-in facilities.

You'll love it too, for its sophisticated looks, and its range of standard features, which include 80 col, 80 cps optimised bi-directional printing with dot addressable and line graphs, quick tear-off facility, friction and tractor feed, and easy change cassette ribbon. And all for an ex-VAT price of around £200.

Options include <55dBA sound reduction kit and 2K buffered serial interface.

The dealer who supplies you is supported by Mannesmann Tally, Europe's leading printer manufacturer. Your guarantee of continued support and assistance throughout the life of the printer.

Ask your nearest dealer for a demonstration, or phone us today for full details. Either Annie, Sali, Terry or Geoff will be only too pleased to help you.

MANNESMANN
THE FIRST NAME IN PRINTING

Mannesmann Tally, Molly Millar's Lane, Wokingham, Berkshire RG11 2QT
Telephone (0734) 791619/791533 Direct Lines or (0734) 788711 Switchboard
Warning: these gar
Acornsoft have now unleashed eight more merciless games onto unsuspecting BBC micro owners.

Ranging from ‘Gateway to Karos’, where putting a foot wrong could mean instant death. To the relentless antics of Drogna which could have you dying with laughter.

**Gateway to Karos.**

An adventure game in which you’ll need all your patience and ingenuity just to stay alive. Your objective is to find the Talisman of Khoronz but, whichever path you choose, you’ll be beset by treachery. Serpents lie in wait and magical phenomena are in abundance. Should you find the Talisman, you’ve still to find your way back.

**Labyrinth**

A superb real-time game with fast 3D graphics. As you guide Mork through the Labyrinth, he’ll have to eat fruit to keep going. Crush the Tiger-Moths, shoot the Flitterbugs, dodge the Threshers and find the Magic Crystals which lead to new and more challenging levels of the Labyrinth.

**Tetrapod.**

You’re in an arena littered with dormant lizards, killer bees and other hostile creatures with whom you’ll have to do battle to survive. But beware of your own laser bullets, as they bounce off the arena walls.

**Drogna.**

A game for two people – preferably with devious minds. There are two vaults containing diamonds and your job is to collect and transfer them to your home base. While your opponent is out collecting you could sneak in and steal his loot . . . but keep an eye out for him doing the same to you.

**Crazy Tracer.**

An arcade style game where you’re in charge of a paint roller. Guide your roller around a maze of rectangles while evading monsters who are committed to destroying it. Gain extra rollers and bonus points by painting different objects. But you’ll have to avoid running out of paint.

**Volcano.**

Mount Crona has erupted after 150 years of silence. And your mission as an Emergency Rescue Helicopter Pilot is to save sightseers stranded on the slopes. Time is of the essence as the lava approaches the sightseers. But you’ll have to take time to evade — or shoot — the boulders being hurled from the volcano.

**Carousel.**

A re-creation of the fairground shooting gallery — with a difference. Shoot down all the ducks, owls and rabbits before you run out of ammunition. Watch out for the low-flying ducks. If you fail to shoot these, they’ll steal your bullets and reduce your chances of success.

**Meteor Mission.**

On an alien planet are six stranded astronauts. Launch your capsule from the Mothership and by avoiding — or shooting — meteors and alien craft, pick up the astronauts one at a time and return them to the Mothership.

All games – with the exception of Gateway to Karos which is currently only available on cassette – can be bought direct in either cassette or disc form. You will find all these programs at your local Acorn stockist. To find out where they are, or to order by credit card, simply ring 0933 79300 during office hours.

Alternatively, you can order the games by sending off the coupon below to: Acornsoft, c/o Vector Marketing, London Road, Wellingborough, Northants NN8 2RL. Please allow 28 days for delivery.

---

To: Acornsoft, c/o Vector Marketing, London Road, Wellingborough, Northants NN8 2RL.

Please send me the following software games:

<table>
<thead>
<tr>
<th>PROGRAM</th>
<th>QUANTITY</th>
<th>DISC/CASSETTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gateway to Karos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kingdom of Hamil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetrapod</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drogna</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crazy Tracer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volcano</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carousel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meteor Mission</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL**

Price Cassette: £9.95; Disc: £11.50

I enclose PO/Cheque payable to Acornsoft Ltd. Or charge my credit card.

Card Number:

Barclaycard/Access (Delete)

Name__________________________

Address_______________________

Signature______________________

Postcode______________________

ACORNOSFT
Addons, easy as A...B...C.

We are major UK Distributors for Riteman, Astar, Concept keyboards, Cumana products and Tec drives; offering prompt supplies of these excellent add-ons to dealers nationwide.

All the quality products pictured are available now, plus a wide range of consumables – ribbons – diskettes – cables etc: START BUILDING YOUR STOCKS NOW FROM ADDONS – THE PERIPHERAL PEOPLE.

Cumana... The Best Name In Memory ... from £104

Tec The Risk Out Of Buying Disk Drives ... from £65. Ask about 3½" drives, and media ...

Concept ... the last word on QWERTY ... from £69

Microvitec ... Monitor your progress with the best of British Quality ... from £199

Astar MCP80 ... 4 colour sheet or roll feed printer/plotter £179. Low profile, High standard ...

Prices are subject to VAT and delivery charges.

Right Price, Right Size, Right Speed, That's Riteman ... from £249

Simple as One, Two, Three.
If you're looking for an Epson* or IBM** compatible dot matrix impact printer that's lower in price, smaller, durable, and fast enough to keep pace with your work flow . . . we'd like to show you a Riteman!

Four great new printers. All priced well under comparable Epson models. All substantially smaller. Yet solid as a rock. With print speeds up to 50% faster than the competitors.

The Riteman Plus, Riteman II, Riteman 15, and Riteman Blue Plus with IBM graphics. All are backed by a full one-year warranty. And, as you can see, they're great-looking, too!

So see your dealer today . . . and get the Riteman for your printing job!

Epson is a registered trademark of Epson America, Inc. **IBM is a registered trademark of International Business Machines Corp.

UK Distributors
Addons Limited, Unit 30, City Industrial Park, Southern Road, Southampton, SO1 0HA
Telephone: (0703) 34775/6
Suddenly, quality plotting is within reach of every computer user...
Penman... the world’s first robotic plotter from only £199 + VAT

Penman is an entirely new concept in plotting. It is robotic, working almost like the human hand to draw smooth curves, perfect circles and dead straight lines... without staircases.

Penman is simple, reliable, very compact and truly portable; yet can plot on any size paper, on any smooth horizontal surface.

Use Penman at work, at home and at school... as a printer, robot, mouse and desktop plotter for BASIC and LOGO. Use it for design, or to produce graphs from spreadsheets, scribe captions and notices. The only limit is your imagination.

If you hurry, Penman can be bought before 31st January 1985 at special introductory prices that really are within your reach.

Everyone can afford to use Penman

At work Spreadsheet graphs, floor plans, charts, headlining, symbols, engineering drafts.

At school Logo, mapping, result plots, robotics and control, maths and physics.

At home Garden planning, music scores, drawings, games and robotics.

Penman Products Limited,
8 Hazelwood Close, Dominion Way,
Worthing, W. Sussex BN14 8NP.
**DISKING NEWS**

Business is not created between companies but between people.

"Everyone wants responsibility, but nobody wants accountability.

Well, when we accept your order we're accountable and we accept full responsibility for getting you your order, and we will not rest until you've got it. That's what we're here for. Someone has to work in this country, after all we'll be in the minority soon!

FREE with EVERY ten-pack of diskettes from DISKING, SEE 10

**LIBRARY BOX**

Also available individually for £2.50 exc VAT either for 5¼" (SEE 10) or any 3½" microdisks (SEE 10-3)

**PLUS**

Disking Colour Coders

With every TWO Ten-Packs of ANY 3½" 5¼" or 8" disks by Verbatim, Memorex, Dysan or Maxell purchased at these prices, we will pack a Super Disking Calendar Clock worth £8.95 absolutely FREE.

Buy four Ten-Packs, and you will receive two Calendar Clocks and so on.

*Excluding diskettes purchased from bargain corner.

**OFFER ENDS 28th FEBRUARY 1985**

---

**MEMORY EXCELLENCE**

Memorex diskettes are everyone's favourite and work well in ALL computer programs.

5½ INCH DISKETTES

Certified for single or double density and with hub ring reinforcement.

**PRICES EXC VAT**

<table>
<thead>
<tr>
<th>1-2 packs each pack</th>
<th>95p</th>
<th>100+</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-5 packs each pack</td>
<td>75p</td>
<td>5+</td>
</tr>
<tr>
<td>6-9 packs each pack</td>
<td>60p</td>
<td>POST FREE</td>
</tr>
<tr>
<td>10+ packs POST FREE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ALL SEE 10 library boxes**

**MEMOREX CLEANING KITS**

| 1 off 60p each | 42.90 | 41.90 |
| 2-7 off 40p each | 42.90 | 41.90 |
| 8+ off POST FREE |      |      |

---

**DISKING SUPER PROMOTION**

Free Clock Value £8.95

---

**Means Business**

Executive Mini 100 & Executive Micro 50

The ultimate in quality, these beautiful Austrian made storage boxes in luxurious two tone dark brown come with everything one could ever want. The lids not only swing open and shut, but are also removable if shelf space is prohibitive. They come with ingenious dividers where even the tabs are adjustable and protected from dirty finger marks. The wonderfully engineered locking mechanism comes with 2 keys and a master filing tab. Buy 3 and STEAL one FREE.

---

**Diskette Storage**

**Budget Micro**

30 Microdisk capacity (or 12 compact 3" disks) stored in 3 compartments. Smart two tone beige/brown with strong steel hinges.

**BUDGET 50**

50 Microdisk capacity in smart two tone brown, complete with four dividers and no scratch rubber feet.

---

**Disking Swing-lid Lockable Box**

60 Microdisk capacity, complete with keys, dividers, tags and even built in carrying handles. Buy 3 and STEAL one FREE.
DYSAN — FOR THE DISCERNING

96 tpi Suitable for 77 or 80 track operation
48 tpi Suitable for 35 or 40 track operation

Maxell — THE GOLD STANDARD

Mixed 5/4" and 5 1/4" Double Density Diskettes Certified for Single OR Double Density 48 tpi with hub
ring reinforcement

PRICES EXC VAT

<table>
<thead>
<tr>
<th>Part No</th>
<th>S/S D/DD</th>
<th>S/S D/D</th>
<th>D/DD D/D</th>
<th>Sub Total exc VAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>401-01</td>
<td>$1.60</td>
<td>$2.00</td>
<td>$2.50</td>
<td>$6.10</td>
</tr>
<tr>
<td>401-02</td>
<td>$1.60</td>
<td>$2.00</td>
<td>$2.50</td>
<td>$6.10</td>
</tr>
<tr>
<td>401-03</td>
<td>$1.60</td>
<td>$2.00</td>
<td>$2.50</td>
<td>$6.10</td>
</tr>
<tr>
<td>401-04</td>
<td>$1.60</td>
<td>$2.00</td>
<td>$2.50</td>
<td>$6.10</td>
</tr>
</tbody>
</table>

Prices Exc VAT

Maxell® DataLife Certified for single OR double density and with hub ring reinforcement

PRICES EXC VAT

<table>
<thead>
<tr>
<th>Part No</th>
<th>S/S D/DD</th>
<th>S/S D/D</th>
<th>D/DD D/D</th>
<th>Sub Total exc VAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2-00</td>
<td>$1.50</td>
<td>$2.00</td>
<td>$2.50</td>
<td>$6.10</td>
</tr>
<tr>
<td>D2-01</td>
<td>$1.50</td>
<td>$2.00</td>
<td>$2.50</td>
<td>$6.10</td>
</tr>
<tr>
<td>D2-02</td>
<td>$1.50</td>
<td>$2.00</td>
<td>$2.50</td>
<td>$6.10</td>
</tr>
<tr>
<td>D2-03</td>
<td>$1.50</td>
<td>$2.00</td>
<td>$2.50</td>
<td>$6.10</td>
</tr>
</tbody>
</table>

For more information, please contact DISKING FREEPOST, Liphook, Hants, GU30 7BR, UNITED KINGDOM

OFFICIAL GOVERNMENT ORDERS WELCOME

We supply Government bodies including Schools, Universities, Colleges, Hospitals, the Unions, Research Establishments, Armed Forces, the Ministry of Defence and Local Authorities world-wide. We will despatch within 24 hours of receipt of your official order number received either by post or by telephone and all orders are handled in the strictest confidence and to the letter. All orders are subject to credit check and without an invoice please post or telephone your order and we will send a pro-forma invoice by return for your accounts department to pay against.

CARD CREDIT ORDERS

All orders sent on the approved machine qualify for a FREE Disking Loyalty Card to

we welcome Access, Diners, VISA & Mastercard. We offer a cash guarantee and a 30 day money-back guarantee.

URGENT ORDERS

If you're in a hurry, use the word "URGENT" at the back of your order.

NAME:_____________________________
ADDRESS:________________________
TELEPHONE:_______________________

Access, VISA & Diners Cards Welcome

PCW 185
**UNBELIEVABLE SAVINGS**

**COMPUTERS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-1600</td>
<td>£199.50</td>
<td>SANYO</td>
</tr>
<tr>
<td>E-1700</td>
<td>£299.50</td>
<td>SANYO</td>
</tr>
<tr>
<td>E-1800</td>
<td>£399.50</td>
<td>SANYO</td>
</tr>
</tbody>
</table>

**MATRIX PRINTERS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>2110P</td>
<td>£199.50</td>
<td>SANYO</td>
</tr>
<tr>
<td>2120P</td>
<td>£299.50</td>
<td>SANYO</td>
</tr>
<tr>
<td>2130P</td>
<td>£399.50</td>
<td>SANYO</td>
</tr>
</tbody>
</table>

**DAISYWHEEL**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>2110P</td>
<td>£199.50</td>
<td>SANYO</td>
</tr>
<tr>
<td>2120P</td>
<td>£299.50</td>
<td>SANYO</td>
</tr>
<tr>
<td>2130P</td>
<td>£399.50</td>
<td>SANYO</td>
</tr>
</tbody>
</table>

**PRINTERS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-1600</td>
<td>£199.50</td>
<td>SANYO</td>
</tr>
<tr>
<td>E-1700</td>
<td>£299.50</td>
<td>SANYO</td>
</tr>
<tr>
<td>E-1800</td>
<td>£399.50</td>
<td>SANYO</td>
</tr>
</tbody>
</table>

We are a small Systems and Software House on the outskirts of Munich, with an expected turnover this year of 500,000 Deutsch-Mark. In order to extend our sales activities, we are looking for a range of small Microcomputer and Personal-Computer products.

If you are interested in becoming associated with us in the rapidly expanding West-German market, please write with product details to:

The Managing Director
PTS GmbH
Grubmullerfeldstrasse 54
8035 Gauting
West Germany

---

**MAYFAIR MICROS**

BLENNHEIM HOUSE, PODMORE ROAD, LONDON SW18 1AJ

TEL: 01-870 3255 / 871 2555

We accept official orders from UK Government and Educational Establishments. Mail Order and Export Enquiries welcome. Carriers by appointment.

---

**‘O’ LEVELS**

not just revision but full tuition software (Spectrum 48K)

**MATHS**

8 programs

<table>
<thead>
<tr>
<th>Program</th>
<th>Price</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differentiation</td>
<td>£395.00</td>
<td>SANYO</td>
</tr>
<tr>
<td>Integration</td>
<td>£495.00</td>
<td>SANYO</td>
</tr>
<tr>
<td>Calculus</td>
<td>£595.00</td>
<td>SANYO</td>
</tr>
</tbody>
</table>

**PHYSICS**

7 programs

<table>
<thead>
<tr>
<th>Program</th>
<th>Price</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat and Temperature</td>
<td>£395.00</td>
<td>SANYO</td>
</tr>
<tr>
<td>Electricity and Magnetism</td>
<td>£495.00</td>
<td>SANYO</td>
</tr>
<tr>
<td>Waves and Optics</td>
<td>£595.00</td>
<td>SANYO</td>
</tr>
</tbody>
</table>

**BIOLOGY**

6 programs

<table>
<thead>
<tr>
<th>Program</th>
<th>Price</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell Biology</td>
<td>£395.00</td>
<td>SANYO</td>
</tr>
<tr>
<td>Genetics</td>
<td>£495.00</td>
<td>SANYO</td>
</tr>
<tr>
<td>Evolution</td>
<td>£595.00</td>
<td>SANYO</td>
</tr>
</tbody>
</table>

**COMP. SC.**

7 programs

<table>
<thead>
<tr>
<th>Program</th>
<th>Price</th>
<th>Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Processing</td>
<td>£395.00</td>
<td>SANYO</td>
</tr>
<tr>
<td>Computer Architecture</td>
<td>£495.00</td>
<td>SANYO</td>
</tr>
<tr>
<td>Artificial Intelligence</td>
<td>£595.00</td>
<td>SANYO</td>
</tr>
</tbody>
</table>

Each Subject Only £7.95 inc P&P

GCE TUTORING, DEPT PCW, 40 BRIMMERS HILL, WIDMER END, HIGH WYCOMBE, BUCKS

---

UNBELIEVABLE SAVINGS

**SOFTWARE**

All major Software Programs Supplied at Low Cost

<table>
<thead>
<tr>
<th>Program</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>D BASE III</td>
<td>£360.00</td>
</tr>
<tr>
<td>WORDSTAR</td>
<td>£195.00</td>
</tr>
<tr>
<td>OPEN ACCESS</td>
<td>£360.00</td>
</tr>
<tr>
<td>LOTUS 123</td>
<td>£295.00</td>
</tr>
<tr>
<td>SMARTMONITOR</td>
<td>£420.00</td>
</tr>
<tr>
<td>MULTIVAT</td>
<td>£240.00</td>
</tr>
<tr>
<td>BASE II</td>
<td>£230.00</td>
</tr>
<tr>
<td>DMS DELTA</td>
<td>£395.00</td>
</tr>
<tr>
<td>FRAMEWORK</td>
<td>£345.00</td>
</tr>
</tbody>
</table>

---

**FUTURE**

New Release — Unix Multi User Accounts Software.
Educational Software

BBC Micro
ZX Spectrum
unexpanded VIC
Electron
ZX81
Apple
PET
Commodore 64
Dragon (book only)

All software for the above computers.

MICRO ENGLISH (BBC, Electron), complete English Language O-Level, self-tuition or revision course of 24 programs, includes 'Speak and Spell' programs (no extras required), 2 diskettes. £24.50.

MICRO MATHS 24 program revision or self-tuition course to O-Level. £24.50 (except ZX81 £12.00).

FRANCIS DRAKE ADVENTURE GAME Authentic, historical, graphics, adventure game. £6.50.

ANIMATED ARITHMETIC Teaches using moving colour pictures (not words). Ages 3-8. £6.50 (disk £7.50).

BRAINTEASERS Book of programs to puzzle and amuse. £5.95.

"Excellent" - EDUCATIONAL COMPUTING.

Immediate dispatch Micro Maths, Micro English and Master Maths.

Phone or send orders or requests for free catalogue (200 programs) to:

LCL
26 Avondale Ave.
Staines, Middx.
Tel:0784 58771

Do you own or use two or more computers with incompatible disk formats? Then you need our universal «FILE MOVER»

This easy-to-use file transfer program enables you to transfer any type of files - including .COM-, .CMD- and .EXE-types of files - from one computer to another by means of a serial link - even if they use different operating systems! A special protocol with checksums and automatic retransmission ensures error-free file transfers.

Available for CP/M, CP/M-86 and MS-DOS (PC-DOS).

Prices: For CP/M
For CP/M-86 or PC-DOS (M-S-DOS) £49.95
For any two o/s's £99.95

We also offer the following easy-to-use and well-documented utilities:

• XSUB for CP/M-86
• DSK UTILITY PACKAGE for CP/M (2.2)

Includes disk dump and patch, disk test, duplication and various file recovery utilities.

The file recovery aid alone makes it worth the price. "...very well designed and friendly human interfaces" (Microsystems).

TERMINAL for CP/M, CP/M-86 and PC-DOS (MS-DOS) £99.95

converts your microcomputer into a powerful terminal. Includes ASCII file upload and download facilities.

Disk Formats available: 8" ss/dd, IBM-PC/XT, DEC Rainbow 100, Osborne, Zenith hard and soft sector, Superbrain (Jr), DEC-VT 180 (DD), TI Professional (DD), Kaypro II, Access ss/dd, NEC PC-8001 A, XEROX 820 (SD), Xerox 820-II (DD), TRS-80, Mod 1 (Omikron (CP/M), TRS-80, Mod 3 (MM/CP/M), Morrow Micro Decision.

Include £5 per order for handling and shipping. Specify computer, disk format and o/s.

VISA accepted.

The unique bollé
IREX 90 + VDU Glasses

THE LEADERS IN EYE WEAR TECHNOLOGY ARE NOW FIRST IN THE FIELD WITH THE UNIQUE BOLLE IREX 90 PLUS VDU GLASSES, DESIGNED SPECIFICALLY TO IMPROVE THE RESOLUTION OF SCREEN IMAGES RECEIVED BY THE EYE AND TO INCREASE EFFICIENCY.

This major breakthrough in eye wear technology has been developed in conjunction with NASA for the American Space Programme, in the production of a unique organic lens material which provides 100% protection against ultra violet absorption and 90% plus against infra red rays.

Don't buy a Computer System until December 27th.
**SUPERCAL III**

- **Software**: D BASE II, KEYBOARD, FRAME WORK, LOTUS 1-2-3, EMPIRE, D BASE PLUS, OPEN ACCESS.
- **HARD DISK**: 30MB, 40MB (90K).

**PRINTERS**

- **Brother**: 128k RAM Card with manual & disk.
- **Grosberg**: 256k RAM Card with manual.
- **Brother**: Keyboard Buffer Card (with disk).
- **Grace**: 1MB Buffer.
- **Brother**: Keyboard Card (with disk).
- **Ricoh**: 512k Buffer.

**PERIPHERALS**

- **Bruder**: 256k Buffer.
- **Grosberg**: 1MB Buffer.
- **Brother**: Keyboard Card (with disk).
- **Ricoh**: 512k Buffer.

**COMPUTERS**

- **Brother**: 128k RAM Card with manual & disk.
- **Grosberg**: 256k RAM Card with manual.
- **Brother**: Keyboard Buffer Card (with disk).
- **Ricoh**: 512k Buffer.

**MONITORS**

- **Sanyo**: 12inch & 14inch monitors.
- **Toshiba**: 15inch & 17inch monitors.
- **Commodore**: 14inch & 17inch monitors.
- **Smith Corona**: 14inch & 17inch monitors.

**TERMINALS**

- **Kaye**: 10X F/T 160cps 80 columns.
- **Delta**: 15X F/T 160cps 132 columns.

**SERVICES**

- **Sign & Print**: Available.

**TREAT YOURSELF! AT THESE PRICES YOU CAN AFFORD IT!!**

**PRINTERS WHEEL**

- **DAISY**

**DRIVES: MEGABYTES FOR MICROPONDS!**

- **5¼" ½ Height SS/DD 160KB Apple Compatible**: £109
- **5¼" ½ Height 500KB 40/80**: £119
- **5¼" ½ Height 1MB 40/48**: £125
- **5¼" ½ Height 1.6MB 40/80**: £159
- **3½" ½ Height 2MB 40/80**: £199
- **3½" ½ Height 500KB**: £199
- **3½" ½ Height 1MB**: £125
- **8½" Full Size 1.6MB**: £309
- **8½" Size 1.6MB**: £282

**SUPERCAL III**

- Multiplan
- Printfree Accounts
- PIF files
- Print free report

**PRINTERS - DOT MATRIX**

- ADAMS 95-87B 80 column
- AMDEX 160 column (Dot matrix)
- CANON 80 column (Epson)
- EPSON 80 column (Epson)
- HSR 80 column (Epson)
- BROTHER 80 column
- IMPACT 80 column
- NOKIA 80 column

**COMPUTERS**

- MICROVITEC 8 BIT 16 CHANNEL AD Card £59.95
- RICOH CLOCK CARD (TIME 11) £138.95
- SEIKOSHA DE 12410P 350cps
- SMITH CORONA DELTA 84A 200cps
- CHERRY GP-500 Parallel or Serial £289

**TERMINALS**

- POA: £39.95
- YANJEN QVT-103 Green 14" £619
- QUME QVT-103 Green 14" £9,95
- MICROVITEC 144/266 11¼" Hires £339
- SANYO DMS12 14" Colour Display £429
- SANYO DMS12 14" Colour Display £299
ChipChat modems are the most versatile and up to date available at the price. With autoanswer as standard and intelligent autodial with speed conversion as an option, ChipChats may be used to access computers and databases such as Prestel, Micronet, HomeLink and BT Gold.

ChipChats support the CCITT V21 protocol: 300/300 baud and the V23 protocol: 1200/75, 75/1200 and 1200/1200 (half duplex). Where local regulations permit, Bell standard operation may be used for dialing US databases.

ChipChats use the latest technology and provide valuable extra features such as auto-disconnect to save your telephone bills, and speed conversion for operation with IBM PCs. A full complement of LEDs monitor data flow and the status of handshake lines on the Cannon D-type connector.

ChipChats have been designed with our experience of manufacturing BT approved intelligent terminals, they provide the facilities and data rates you need at the touch of a button or they can be left unattended under computer control.

ChipChats are supported by a large range of communications software packages and terminal emulations for the IBM, Sirius, Apricot, Apple and BBC micros.

Ring for details and special package deal prices.

**ChipChat**

**CC2123A** Autoanswer £150.35
£149.90 inc VAT

**CC2123AD** Autodial £165.13
£189.90 inc VAT

P&P £2.70 + VAT

**SALE**

**I.B.M.**

**GOLFBALL PRINTERS**

**SALE PRICE £39.99 + VAT**

**INTERFACE EXTRA**

5" Monitor (New).......................£40.00 + VAT
Keyboards............................from £4.00 + VAT
Mini Cassette Drives...............£20.00 + VAT
Centronics Printers (New)from £150.00 + VAT

PCB's, FANS, POWER UNITS, ETC.
COME AND LOOK AROUND

**P & R COMPUTER SHOP**

Salcote Mill, Goldhanger Road,
Heybridge, Maldon,
Essex.

PHONE: (0621) 57440
HOURS: MON-FRI 9am-5pm SAT 9am-12am

Don't buy a Home Computer until December 27th.
*** CUT PRICE MICROS ***

Apricot & 2x315K Drives .................................. £1236
Apricot & 2x 720K Drives .................................. £1396
Apricot XI & 10 meg Hard Disk .......................... £2196
Apricot XI & 5 meg Hard Disk .......................... £1995
Sirius 1 & 10 meg & Monitor ........................... £3196
Sirius 1 & 2.4 meg & Monitor ........................... £2316

Any Four Pegasus accounting modules £800

Apricot XI with 10 meg & 4 Pegasus accounting modules and 12" Monitor £3096

Cut Price Disks, software and other supplies also available

Call MCS on 01-802 0019

All prices exclude VAT, please add £10 p&p on all Micro Computers. Government and Local Authority orders welcome

78-82 KIRKTON ROAD
LONDON N15
YOUR GUIDE TO THE 21ST CENTURY

Practical Robotics is the only magazine concerned solely with robots in the home and classroom. Every issue we carry the latest news and reviews and a special Educational Robotics section.

January/February
TOY SPECIAL
Plus: Helping the disabled
Finding brains for robots

THE WRITTEN WORD

Brother Daisywheels
HR15 Friction feed, parallel or serial, 13cps £345
Keyboard £135
Tractor £75
SF £190
HR25 23cps, wide carriage £555
HR35 35cps, 16.5" carriage £710
Daisystep Daisywheel
2000 Friction feed, parallel, 20cps, Wordstar compatible, amazing value at just £220
RS232 interface £55
Juki Daisywheel
6100 Friction feed, 20cps, 2k buffer, Wordstar compatible, excellent performer £348
RS232 £50 tractor £50 shiftfeed £207
Canon NLo Dot Matrix
PW1080A Friction and tractor, 160cps £348
(W1080 NLO), 2k buffer, 80cps, Epson code compatible £272
PW1155A 15" carriage £348
RS232 £70
NLo ROMS £25
Ribbons £4.75
Epson Dot Matrix
RX80 Tractor, parallel, 100cps, low cost printer at £115
RX80FT Friction and tractor £229
RX100 Wide carriage RX80FT £348
Don't buy a Peripheral until December 27th.

If the printer or monitor you want is not here please give us a call.
Please add VAT at the current rate to all prices. Advertised prices are subject to change without notice £5/£6, and are based on cash with order terms, insured carriage £8 (+VAT) per box, postage £2 on small orders. Callers by appointment only please.

THE WRITTEN WORD (Marketing)LTD
(Formally Golden Valley Computers Ltd)
11 Tarsmill Court, Rotherwas Industrial Estate, Hereford HR2 6JZ Tel: (0432) 271114
IF YOU HAVEN'T GOT AN OKI PRINTER, YOU'LL NEED YOUR HEAD EXAMINED SOON.

OKI IS O.K.

Imagine a head that can print 500 million characters - 1/4 million A4 pages - without giving you a headache. Imagine an OKI 2410. 500 million characters of needle sharp quality - the OKI 2410 is the no. 1 professional standard for heavy duty applications. It's also the clearest proof for the superiority of OKI performance - performance that didn't occur by chance, but was shaped to perfection by OKI's robotic production assembly line. The robots themselves are OKI designed and characterise the futuristic and clear headed thinking of the company.

While other printers give you breakdown headaches, OKI heads will still be working. No need then to look for your headache pills - just contact us at the address below and we'll send you full information on not only the 2410 but the entire range of OKI printers including the best selling MICROLINE family range.

If you'd rather see one in the flesh, call in on your local dealer - if he hasn't got an OKI printer, he'll need his head examined.

X-DATA Ltd. 750/751 Deal Avenue Slough Trading Estate, Berks SL1 4SH
Tel. Slough, (0753) 72331 Tlx. 847728
December 27th:

Laskys Big Name Sale.

- We stock a huge range of big name computers, peripherals and games.
- Unique demonstration and comparison facilities.
- Credit to suit your pocket.
- Nationwide after sales service. 14 day exchange.
**LOWEST PRICES**

*EXPERT ADVICE* *EXPRESS DELIVERY* *EXPORT ARRANGED*

01-947 8562

Worldwide Computers Limited, Spa House, 11-17 Worple Road, Wimbledon, London SW19 4JS Telex: WOWICO 8955888

### COMPUTERS

<table>
<thead>
<tr>
<th>Computer Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apricot F1 256K RAM</td>
<td>£949.00</td>
</tr>
<tr>
<td>Apricot 256K 2x315 D/D+Monitor</td>
<td>£1399.00</td>
</tr>
<tr>
<td>Apricot 256K 2x720 D/D+Monitor</td>
<td>£1549.00</td>
</tr>
<tr>
<td>Apricot 256K 5 MB HD.D+Monitor</td>
<td>£2099.00</td>
</tr>
<tr>
<td>Apricot 256K 10MB HD.D+Monitor</td>
<td>£2275.00</td>
</tr>
<tr>
<td>BBC Micro Computer</td>
<td>£320.00</td>
</tr>
<tr>
<td>Commodore VIC 20</td>
<td>£78.25</td>
</tr>
<tr>
<td>Commodore 64</td>
<td>£159.00</td>
</tr>
<tr>
<td>Commodore SX 64 (Portable)</td>
<td>£575.00</td>
</tr>
<tr>
<td>Commodore Plus 4</td>
<td>PO.A.</td>
</tr>
<tr>
<td>Epson Portable PX8</td>
<td>£649.00</td>
</tr>
<tr>
<td>Epson Portable PX8 + RAM</td>
<td>£799.00</td>
</tr>
<tr>
<td>Epson GX10 + RX80+ Cable</td>
<td>£1599.00</td>
</tr>
<tr>
<td>IBM PC 64 1xDisk</td>
<td>£950.00</td>
</tr>
<tr>
<td>IBM PC 64 10MB Disk</td>
<td>£1600.00</td>
</tr>
<tr>
<td>IBM PC XT 10MB Disk</td>
<td>£2400.00</td>
</tr>
<tr>
<td>IBM Portable 1xDisk</td>
<td>£1444.00</td>
</tr>
<tr>
<td>IBM Portable 10MB Disk</td>
<td>£2288.00</td>
</tr>
<tr>
<td>IBM PC AT 1xDisk</td>
<td>£3345.00</td>
</tr>
<tr>
<td>IBM PC AT 20MB Disk</td>
<td>£3456.00</td>
</tr>
<tr>
<td>Kaypro 2</td>
<td>£899.00</td>
</tr>
<tr>
<td>Kaypro 10MB</td>
<td>£1850.00</td>
</tr>
<tr>
<td>Sanyo MBC555 2x160K Disk Drive</td>
<td>£899.00</td>
</tr>
<tr>
<td>Sinclair Spectrum 48K-6Pack</td>
<td>£100.00</td>
</tr>
<tr>
<td>Sinclair Spectrum 64K</td>
<td>£139.00</td>
</tr>
<tr>
<td>Sinclair Q.L. Computer</td>
<td>£330.00</td>
</tr>
<tr>
<td>Sirius 128K 1.2MB</td>
<td>£1650.00</td>
</tr>
<tr>
<td>Sirius ’1 256K 2.4MB</td>
<td>£2150.00</td>
</tr>
<tr>
<td>Sirius ’1 256K 1.2+10.6MB</td>
<td>£2950.00</td>
</tr>
<tr>
<td>Televideo</td>
<td>PO.A.</td>
</tr>
<tr>
<td>Wren Computer</td>
<td>£849.00</td>
</tr>
</tbody>
</table>

### DOT MATRIX

<table>
<thead>
<tr>
<th>Printer Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admate JP80 Dot Matrix Printer</td>
<td>£169.00</td>
</tr>
<tr>
<td>Anadex DP 9000</td>
<td>£799.00</td>
</tr>
<tr>
<td>Brother M1009 Dot Matrix Printer</td>
<td>£155.00</td>
</tr>
<tr>
<td>Canon PW 1080A (NLQ)</td>
<td>£295.00</td>
</tr>
<tr>
<td>Canon PW1156 A (NLQ)</td>
<td>£355.00</td>
</tr>
<tr>
<td>Commodore MPS 801</td>
<td>£155.00</td>
</tr>
<tr>
<td>Commodore MPS 802</td>
<td>£250.00</td>
</tr>
<tr>
<td>Epson RX80T</td>
<td>£190.00</td>
</tr>
<tr>
<td>Epson RX80 F/T</td>
<td>£215.00</td>
</tr>
<tr>
<td>Epson FX80</td>
<td>£320.00</td>
</tr>
<tr>
<td>Epson RX100 F/T Printer</td>
<td>£340.00</td>
</tr>
<tr>
<td>Epson FX100 F/T</td>
<td>£425.00</td>
</tr>
<tr>
<td>Epson LQ 1500 NLQ Printer</td>
<td>£395.00</td>
</tr>
<tr>
<td>Mannesmann Tally MT180</td>
<td>£195.00</td>
</tr>
<tr>
<td>Mannesmann Tally MT160</td>
<td>£395.00</td>
</tr>
<tr>
<td>Mannesmann Tally Pixy Plotter</td>
<td>£450.00</td>
</tr>
<tr>
<td>Mannesmann Tally MT180</td>
<td>£580.00</td>
</tr>
<tr>
<td>MP 185 NLQ Printer</td>
<td>£295.00</td>
</tr>
<tr>
<td>OKI Microline 82A Printer</td>
<td>£249.00</td>
</tr>
<tr>
<td>OKI Microline 83A</td>
<td>£389.00</td>
</tr>
<tr>
<td>OKI Microline 84 (P)</td>
<td>£629.00</td>
</tr>
<tr>
<td>OKI Microline 92 (P)</td>
<td>£365.00</td>
</tr>
<tr>
<td>OKI Microline 93 (P)</td>
<td>£499.00</td>
</tr>
<tr>
<td>OKI Microline 2350 (P)</td>
<td>£1449.00</td>
</tr>
<tr>
<td>Panasonic KP 1091 (IBM + NLQ)</td>
<td>£275.00</td>
</tr>
<tr>
<td>Radix 10 (NLQ)</td>
<td>£449.00</td>
</tr>
<tr>
<td>Radix 15 (NLQ)</td>
<td>£549.00</td>
</tr>
<tr>
<td>Shinwa CP80 AF/T Para</td>
<td>£189.00</td>
</tr>
<tr>
<td>Star Delta 10</td>
<td>£319.00</td>
</tr>
<tr>
<td>Star Gemini 10X</td>
<td>£195.00</td>
</tr>
<tr>
<td>TEC 1550 (P)</td>
<td>£459.00</td>
</tr>
<tr>
<td>TEC 1550 (S)</td>
<td>£499.00</td>
</tr>
</tbody>
</table>

### DAISY WHEELS

<table>
<thead>
<tr>
<th>Printer Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brother HR5</td>
<td>£130.00</td>
</tr>
<tr>
<td>Brother HR1</td>
<td>£225.00</td>
</tr>
<tr>
<td>Brother HR15</td>
<td>£325.00</td>
</tr>
<tr>
<td>Brother HR25</td>
<td>£555.00</td>
</tr>
<tr>
<td>Brother HR35</td>
<td>£695.00</td>
</tr>
<tr>
<td>Daisy Step 2000 (20CPS)</td>
<td>£225.00</td>
</tr>
<tr>
<td>Diablo 620 (RO)</td>
<td>£675.00</td>
</tr>
<tr>
<td>Diablo 630 (API)</td>
<td>£1310.00</td>
</tr>
<tr>
<td>EP 44 Personal Elec. Printer</td>
<td>£190.00</td>
</tr>
<tr>
<td>1600 Flowriter IBM-PC 8K.QD</td>
<td>£1449.00</td>
</tr>
<tr>
<td>Hitachi 672 Plotter</td>
<td>£395.00</td>
</tr>
<tr>
<td>Juki 6100</td>
<td>£319.00</td>
</tr>
<tr>
<td>Juki 6300 Printer (40 CPS)</td>
<td>£825.00</td>
</tr>
<tr>
<td>Quen-Data Daisywheel Printer</td>
<td>£225.00</td>
</tr>
<tr>
<td>Qume Letter Pro 20</td>
<td>£450.00</td>
</tr>
<tr>
<td>Qume 11/40 (RO)</td>
<td>£1175.00</td>
</tr>
<tr>
<td>Richo RP1300</td>
<td>£875.00</td>
</tr>
<tr>
<td>Richo RP1600</td>
<td>£1175.00</td>
</tr>
<tr>
<td>Smith Corona TP1</td>
<td>£175.00</td>
</tr>
<tr>
<td>TEC 10-40 D/W Printer</td>
<td>£845.00</td>
</tr>
</tbody>
</table>

### PERIPHERALS

<table>
<thead>
<tr>
<th>Peripherals</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>12in Apricot Monitor (+ £50)</td>
<td>£289.50</td>
</tr>
<tr>
<td>Colour Monitor for Apricot F1</td>
<td>£350.00</td>
</tr>
<tr>
<td>Cables</td>
<td>£10.00</td>
</tr>
<tr>
<td>Commodore 1701 Col Monitor</td>
<td>£175.00</td>
</tr>
<tr>
<td>Epson Accoustic Coupler</td>
<td>£130.00</td>
</tr>
<tr>
<td>F1 9&quot; Mono Monitor</td>
<td>£175.00</td>
</tr>
<tr>
<td>Luxor 800 Pixal Colour Monitor</td>
<td>£475.00</td>
</tr>
<tr>
<td>Microvitec 20&quot; Colour Monitor</td>
<td>£280.00</td>
</tr>
<tr>
<td>Sanyo 2112 Green Screen 15MHS</td>
<td>£65.00</td>
</tr>
<tr>
<td>Sanyo 3117 Col Hi Ress 600PISC</td>
<td>£279.00</td>
</tr>
<tr>
<td>Sanyo 3125 Col Med Ress 400PIS</td>
<td>£175.00</td>
</tr>
<tr>
<td>Sanyo 8112 Green Screen 18MHz</td>
<td>£385.00</td>
</tr>
<tr>
<td>Sinclair Expansion Pack</td>
<td>£85.00</td>
</tr>
<tr>
<td>Monitor for QL</td>
<td>£265.00</td>
</tr>
<tr>
<td>VM12MHI Monitor Grn Snn 4 IBM</td>
<td>£144.00</td>
</tr>
<tr>
<td>Keyboards, cable, interfaces, tractor feeds, sheet feeds, disks, software, up grades, listing paper, ribbons, daisy wheel</td>
<td></td>
</tr>
</tbody>
</table>

All prices excluding VAT.
### DISKS

**DISKS**

![DISKS](image)

**BEST PRICES - TOP QUALITY - FAST DELIVERY**

---

**QUALITY FACTORY SEALED DISKS NORMALLY SAME DAY DESPATCH**

<table>
<thead>
<tr>
<th>BOXES OF 10 DISKS</th>
<th>Prices per Box (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DYSAN</strong></td>
<td>1-4 5-9 10-49</td>
</tr>
<tr>
<td>10/40 DISKS</td>
<td>14.00 13.25 12.50</td>
</tr>
<tr>
<td>20/80 DISKS</td>
<td>14.00 13.25 12.50</td>
</tr>
<tr>
<td>20/10 DISKS</td>
<td>13.50 12.75 12.00</td>
</tr>
<tr>
<td>10/1 DISKS</td>
<td>12.00 11.25 10.50</td>
</tr>
</tbody>
</table>

---

**ACCESSORIES**

- **HCX5** Head Clean Kit with Fluid
  - 14.90 14.00 13.00
- **LCS** 5.25 ECS Library case
  - 17.50 16.50 15.50
- **LB90-S** Lockable Box 40 Exp inc Disk Pen
  - 15.50 14.50 13.50
- **LB90-5** Lockable Box 100 Exp inc Disk Pen
  - 16.50 15.50 14.50
- **VCK-5** Verbatim 5" Head clean kit
  - 6.60 6.00 5.00
- **VCD-3** Verbatim 5" HD disk (per 10)
  - 17.50 16.50 15.50
- **DL-5** Disk Labels 1005 colors/4 tabs
  - 4.50 4.25 4.00
- **DM-5** Disk Mailers & box caps (per 100)
  - 24.00 23.00 22.00
- **VDDA-5** Disk Drive Analyser (Apple II/III)
  - 36.00

---

**BASEF (Qualimetric)**

**Special Offer - FREE Library Box**

<table>
<thead>
<tr>
<th>10/40 DISKS</th>
<th>Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/40 DISKS</td>
<td>13.50</td>
</tr>
<tr>
<td>20/80 DISKS</td>
<td>13.00</td>
</tr>
<tr>
<td>20/10 DISKS</td>
<td>12.50</td>
</tr>
<tr>
<td>10/1 DISKS</td>
<td>11.50</td>
</tr>
</tbody>
</table>

---

**ACCESSORIES**

- **LB90-7.5** Lockable box 40 Exp inc Disk Pen
  - 15.50 14.50 13.50
- **VERBATIM DATALIFE (Five Year Warranty)**
  - FD36-4000 S"/side D 24.00 23.00 21.50
  - DD36-4000 S"/side D 24.00 23.00 21.50
  - DD36-4000 D"/side D 27.75 26.75 25.25
- **MEMORY DATALIFE (Five Year Warranty)**
  - 5"/side D 3"/side D
  - 22.50 21.50 20.50
- **BASEF (Qualimetric)**
  - 15/50 S"/side D 30.00 29.00 28.00
  - 20/10 S"/side D 26.00 25.00 23.50

---

**ACCESSORIES**

- **LB90-8** Lockable box 40 Exp inc Disk Pen
  - 16.50 15.00 13.50
- **VERBATIM 8" HD clean kit 4" D"/side 10.50 9.50 8.50
- **VDD-8** Verbatim 8" HD clean kit 6.10 5.60 5.00
- **VDD-10** Verbatim 8" HD clean kit (per 10)
  - 12.50 11.50 10.50

---

**PAPER - LABELS - CASSETTES**

- **PAPI** 9.5"x11" 6000 sheets A4
  - 11.00 10.50 10.00
- **LMBI** 8mm 54s 2000 labels
  - 21.50 20.50 19.50
- **C12** Quality Screw Assembly (100)
  - 45.00 4.30 4.10

---

**PRICES PROMISE**

We will better any genuine delivered price advertised in the current issue of PSW彭氏或 other RIBBON - PRINTERS - SOFTWARE

---

**TELEPHONE ORDERS ANYTIME --- WE DO THE REST**

34 CANNONBRIDGE AVENUE PINNER MIDDX BA1 1TS
01 868 9548

**Pinne Wordprocessor**

---

**Shipping**

**Postage/Package (UK)**

<table>
<thead>
<tr>
<th>Size</th>
<th>Post/Parcel</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.25/5.25 Disk, H/DVD</td>
<td>£1.50 (5+)</td>
</tr>
<tr>
<td>5.25/5.25 Disk, NM/DVD</td>
<td>£1.50 (5+)</td>
</tr>
<tr>
<td>5.25/5.25 Disk, H/DVD</td>
<td>£1.00 (10+)</td>
</tr>
<tr>
<td>3.5 HDV</td>
<td>£1.00 (10+)</td>
</tr>
</tbody>
</table>

**VERBATIM**

- FD36-4000 S"/side D 24.00 23.00 21.50
- DD36-4000 S"/side D 24.00 23.00 21.50
- DD36-4000 D"/side D 27.75 26.75 25.25

**MEMORY DATALIFE (Five Year Warranty)**

- 5"/side D 3"/side D
  - 22.50 21.50 20.50

**BASEF (Qualimetric)**

- 15/50 S"/side D 30.00 29.00 28.00
  - 20/10 S"/side D 26.00 25.00 23.50

**ACCESSORIES**

- **LB90-8** Lockable box 40 Exp inc Disk Pen
  - 16.50 15.00 13.50
- **VERBATIM 8" HD clean kit 4" D"/side 10.50 9.50 8.50
- **VDD-8** Verbatim 8" HD clean kit 6.10 5.60 5.00
- **VDD-10** Verbatim 8" HD clean kit (per 10)
  - 12.50 11.50 10.50

**PAPER - LABELS - CASSETTES**

- **PAPI** 9.5"x11" 6000 sheets A4
  - 11.00 10.50 10.00
- **LMBI** 8mm 54s 2000 labels
  - 21.50 20.50 19.50
- **C12** Quality Screw Assembly (100)
  - 45.00 4.30 4.10

---

**RIBBON - PRINTERS - SOFTWARE**

Phone or write for very competitive prices on a large range of goodes.

Please contact us for Quantity discounts (50+ boxes) and Trade Accounts. Official orders accepted from Government or Educational Establishments.

---

**Description**

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postage/Package Options</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post/Parcel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S/5.25/5.25 Disk, H/DVD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.25/5.25 Disk, NM/DVD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.25/5.25 Disk, H/DVD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5 HDV</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VERBATIM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FD36-4000 S&quot;/side D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DD36-4000 S&quot;/side D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DD36-4000 D&quot;/side D</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MEMORY DATALIFE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5&quot;/side D 3&quot;/side D</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BASEF (Qualimetric)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15/50 S&quot;/side D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20/10 S&quot;/side D</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ACCESSORIES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LB90-8</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VERBATIM 8&quot; HD clean kit 4&quot; D&quot;/side</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDD-8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VDD-10</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PAPER - LABELS - CASSETTES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPI 9.5x11 6000 sheets A4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LMBI 8mm 54s 2000 labels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C12 Quality Screw Assembly (100)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LOOKING FOR SOFTWARE?

★ We hold a library of information on software
★ This library contains detailed information on business software for micros and minis
★ You can use it as a single impartial source of information to assist you finding the correct software
★ Our computer will list all the options that fit your requirements so you can be satisfied you have made the right choice
★ Once we have found what you're looking for we can then put you in contact with a supplier who is qualified to show you the software working
★ OUR SERVICE IS FREE AND IS DESIGNED TO SAVE YOU TIME AND ENERGY IN UNNECESSARY RESEARCH
★ Phone this number and we will help you find the software you need

SOFTWARE INFORMATION LIMITED

01-405 2983/3985
COM
All items over £150 available on our easy credit terms.
Phone or write for details

Smith Corona range of printers Now in Stock -

(P)=Parallel-Centronics
Seikosha GP700A Colour (P)
Seikosha GP550A (P)
Seikosha GP500A (P)
Seikosha GP505 (Spectrum)
EPSON FX100 F T (13)
EPSON FX80 (P)
EPSON RX80 (P)
Canon 1156A NLO (P)
Canon 1080A NLO (P)
Brother HR5 (P or S)
Juki 2200 Daisywheel (P or S)
Modems available for Easylink and Telecom Gold
Brother EP22 Dot Matrix (S)

PRINTER/TYPEWRITERS

Daisystep 2000 (P)
Juki 6100 (P)
Smith Corona TP1 (P or S)

DAISYWHEEL LETTER QUALITY

TDK 5114
BASF 3' z
DYSAN 514
VERBATIM 514
3M 514
BASF 514

CASH & CARRY COMPUTERS

PERSONAL CALLERS WELCOME AT OUR EXTENSIVE SHOWROOMS

SUPERDISKS

LONDON'S LOWEST PRICES ON FLOPPY DISKS

Prices per box of ten ex VAT

| BASF | £10.95 | £12.20 | £19.80 | £22.50 |
| BASF | £13.55 | £19.50 | £20.05 | £24.00 |
| BASF | £16.50 | £23.50 | £22.50 | £30.50 |
| BASF | £16.80 | £24.90 | £24.90 | £32.00 |
| BASF | £17.50 | £25.50 | — | £33.00 |
| BASF | £34.90 | — | — | — |

Add 70p for P&P per box of 10 disks

CASH & CARRY COMPUTERS
53-59 High Street, Croydon, Surrey CRO 10D.

TOP SHOWROOM SERVICE

ROCK BOTTOM PRICES

The UK's Best Printer Prices

Only a sample of our massive range of printers shown here - phone for further details

DAISYWHEEL LETTER QUALITY
Smith Corona TP1 (P or S), £19.95 + VAT = £27.94
Juki 6100 (P), £20.05 + VAT = £24.00
Brother HR5 (P or S), £22.50 + VAT = £27.94

DOT MATRIX PRINTERS
Brother HR50 (P or S), £12.20 + VAT = £15.25
Canon 1058A NLQ (P), £20.05 + VAT = £24.00
EPSON RX80 (P), £22.50 + VAT = £27.94
EPSON RX100 (P), £26.25 + VAT = £32.05
EPSON RX100 FT PLUS (P), £34.25 + VAT = £41.35
EPSON RX100 FT (P), £39.95 + VAT = £47.90
EPSON PX100 FT (P), £46.50 + VAT = £54.95
Seiko shiki GP100A (P), £49.39 + VAT = £59.60
Seiko shiki GP100A (P), £91.89 + VAT = £111.00
Seiko shiki GP100A (P), £91.89 + VAT = £111.00
Seiko shiki GP100A Colour (P), £106.99 + VAT = £128.65
Shinwa CT80 (P), £175.00 + VAT = £212.50
(PI)=Parallel-Centronics (S)=Serial RS232
Smith Corona range of printers Now in Stock -

INSTANT CREDIT Up to 36 months to pay
All items over £150 available on our easy credit terms.
Written details available on request.

SUPERDISKS

LONDON'S LOWEST PRICES ON FLOPPY DISKS

12" MONITORS - GREEN SCREEN
Sanyo 2112 Mod Res. £20.00 + VAT = £24.00
Sanyo 3112 Mod Res. £20.00 + VAT = £24.00

14" MONITORS - COLOUR
Commodore 1201 Grey/White £175.00 + VAT = £213.00
Toshiba CM424 Grey/White £175.00 + VAT = £213.00
Maxell 1246 512K Sanyo £175.00 + VAT = £213.00
Maxell 1246 64K Sanyo £175.00 + VAT = £213.00
Microdot 580 512K Mod Res. £265.00 + VAT = £318.25
Microdot 580 128K Mod Res. £265.00 + VAT = £318.25
Microdot 580 64K for Spectrum £265.00 + VAT = £318.25
Microdot 1441 MS 128K Res. £265.00 + VAT = £318.25
Sanyo 2125 Mod Res. £265.00 + VAT = £318.25
Sanyo 3113 Med Res. £265.00 + VAT = £318.25
Sanyo 3115 High Res. £265.00 + VAT = £318.25

COMPUTERS

DaisyScan 2000 £252.13 + VAT = £289.95
DaisyScan 2000 £234.74 + VAT = £269.95
DaisyScan 2000 £217.35 + VAT = £249.95

Daisy Scan £209.00 + VAT = £246.40

SANYO MBC 555 Business Computer £795.00 + VAT = £914.25

BBC £209.00 + VAT = £246.40

M.U. £217.00 + VAT = £249.95

SANYO MBC 555 Business Computer £234.74 + VAT = £269.95

SANYO MBC 555 Business Computer £209.00 + VAT = £246.40

APRIOCT COMPUTERS - Fantastic Prices - Phone NOW!

MSX COMPUTERS - In Stock Now

Toshiba SX1066 64K £219.95
Sanyo MBC 1066 64K £254.74 + VAT = £295.95
Sony H8756 64K £252.13 + VAT = £289.95
JVC H8756 64K £265.04 + VAT = £305.95

MAIL ORDER + EXPORT + TRADE
Hot Line Phone 01-686 6362

Delivery by Securicor (3 day) please add £5.00 + VAT per item.
Send off the coupon or order by telephone quoting your Access, Barclaycard or charge my Access/Barclaycard No

To: Cash & Carry Computers, 53-59 High Street, Croydon, Surrey CRO 10D.

Please supply

I enclose my cheque for £________ including delivery by Securicor/FTT/LT

Full range of MSX accessories available

Mail Order + Export + Trade

Hot Line Phone 01-686 6362

Delivery by Securicor (3 day) please add £5.00 + VAT per item.
Send off the coupon or order by telephone quoting your Access, Barclaycard or charge my Access/Barclaycard No

Or you can Telex your order on: 946220 Attn 19001135

We accept official orders from PLC's, Government Departments and Educational establishments.

These prices correct until superseded by next advertisement.

Please delete

PCW 99
What's good for our dealers is good for you.
When we decided to address the business computer market, we found a dilemma.

Do customers want the accessibility and accountability of a local independent dealer, or do they want the confidence of dealing with a substantial public company?

The answer: Both.

The result: SBC.

SBC is a network of professional independent dealers individually vetted against stringent criteria, with the backing of a £30 million organisation.

Everything we give to our dealers enhances their service to you, from competitive products and prices, to exceptional leasing and maintenance deals.

We have taken some of the best dealers and given them more. So what's good for our dealers is good for you.

For the best of both worlds in business micros, contact your nearest SBC dealer or complete the coupon now!
THE PRICEBREAKERS!

IBM PC AND XT
Various options available. Call for details.

NEW IBM PORTABLE
£2195.00 ex VAT

OLIVETTI
Very fast. Fully IBM compatible.
£1595.00 ex VAT

CALL ABOUT OUR AMAZING AUTUMN OFFERS!

OLIVETTI
Very fast. Fully IBM compatible.
£1595.00 ex VAT

10MB Version £3200.00 ex VAT

CALL ABOUT OUR AMAZING AUTUMN OFFERS!

APRICOT
Standard
Full 16 Bit 8086 based Micro with 256K RAM. Mono Screen. 2 x 315K Floppies. MS DOS. Basic, Supercalc, Superplanner, Superwriter.
£1795.00 ex VAT

Xi as standard Apricot but with 5MB Winchester in place of one Floppy Drive
£2695.00 ex VAT

CALL ABOUT OUR AMAZING AUTUMN OFFERS!

NEW Portable from £1695.00 ex VAT

F1 Series from £795.00 ex VAT

Free Software Seminars held on Second and Fourth Thursdays of every month.
Ring Susan for details on Windsor 50111

106 St Leonards Road, Windsor, Berkshire, SL4 3DD
Tel: Windsor (07535) 50111 Telex: 848521

Authorised dealer for

Specialists in Computer Aided Design

FREE SOFTWARE SEMINARS
To: KGB Micros Ltd. 106 St. Leonards Road, Windsor, Berkshire SL4 3DD
Please send me full details on the Free Software Seminars.

Name
Position
Address
Tel.
The first QL adventures from TALENT!

**The Last Kingdom of Zikul**

Explore the ancient dwelling-place of the Dwarves - where the Wizard guards the last precious secret.

A classic and complex text adventure with hundreds of locations and a huge vocabulary. Set in real-time with traps, tasks, puzzles and mazes - and a special note-pad feature to aid you.

"the quality of the game is superb"
Micro Adventurer

**PRICE**
£19.95
+ 50p postage and packing

---

**WEST**

You are on the track of a notorious gang of bank robbers who have gone to ground near an abandoned mining town deep in Indian territory. Your task - to outwit and outgun the robbers, collect as much loot as possible and piece together clues on how to escape.

A demanding and exciting text adventure for the experienced games-player, using over 200 words and as many phrases. There are over 130 locations to search - not all of them easy to find. Events happen in real-time outside your control - Indians charge, rattlesnakes slither past and robbers appear and shoot at you. How long can you survive?

**PRICE**
£19.95
+ 50p postage and packing
(Also on CBM 64, BBC & Electron)
This is the key to unlock the secrets of getting fast results with these fully integrable software programs.

WORD RESULT and CALC RESULT are a word processor and financial spread sheet whose stand alone qualities are only surpassed by one thing . . .

THEIR OWN TOTAL INTEGRATION.

Word Result and Calc Result have been created with true integration — giving you the freedom to use each program either separately or together. In today's office, where work overlap and machine overload can become a big problem, Calc Result and Word Result can help you take the strain.

Why not send the coupon in TODAY and find out what else these programs have to offer?

WORD RESULT / CALC RESULT
£275 + VAT each or £465.00 + VAT for both

Please rush me details of WORD RESULT / CALC RESULT
NAME
COMPANY
ADDRESS
POSITION

Send to: HANDIC SOFTWARE LIMITED, 5, Albert Road, Crowthorne, Berkshire RG11 7LT. Tel: (0344) 778800

Dealer enquiries welcome.
16 BIT CO-PROCESSORS FOR Z80 SYSTEMS

The HSC 16 bit Co-processors attach to any Z80 computer system. CP/M-80 systems can be upgraded to 16-bit operating systems — MS-DOS 2.1 and CP/M-68K, with no programming effort. Co-processor RAM can be used as RAMDISK under CP/M-80.

CO1686 with 8086 processor (6 MHz), 246K RAM, MS-DOS 2.11, RAMDISK and interface software, Z80 Interface £675.00

CO1668 with M68000 processor (6 MHz), 256K RAM, CP/M-68K (with ASM and C Compiler), RAMDISK and interface software, Z80 Interface £745.00

Enclosure and power supply £125.00

C COMPILERS

C/80 Compiler from Software Toolworks £50.00

C/80 Mathpak for floats and longs £30.00

Aztec C II for CP/M-80 £155.00

BDS C Compiler £125.00

Q/C Compiler (Z80 and compiler source) £95.00

LATTICE C £420.00

AZTEC C-86 for MS-DOS & PC-DOS £195.00

DeSmalt C Compiler MS-DOS and PC-DOS £125.00

LISP-80 Software Toolworks £50.00

LISP-88 from Software Toolworks (MS-DOS) £50.00

IQ LISP for MS-DOS £150.00

FORTH-83 FROM LABORATORY MICROSYSTEMS

Z80 Forth £85.00

PC Forth £85.00

8086 F orth MS-DOS 2.0 or CP/M-86 £85.00

Software Floating Point Extension £80.00

8087 Floating point support (PC F orth & 8086 F orth) £80.00

PC F orth+ , 8086 F orth+ (32 bit addresses) £195.00

Native Code Compilers £195.00

Uniform-read, write and format 100 formats (inc PC-DOS) for Ep son OX-10, Osborne 1 DD, Kaypro, NEC, Xerox and more £75.00

Books on C, Lisp, F orth, Pascal, 68000, 8086 available Please add £3.00 postage and VAT

System Science
6-7 West Smithfield, London EC1A 9JX
Tel: 01-248 0962

INCREASE YOUR SYSTEM'S SPEED WITH ONE SIMPLE PLUG IN UNIT

INTERFACES

IEEE TO PARALLEL EXCLUDING P.S.U. IF1200 £65.95
IEEE TO PARALLEL IF1210 £59.95
IEEE TO RS232 IF1310 £79.95
RS232 TO PARALLEL IF2310 £69.95
CBM 64 TO PARALLEL IF2310 £59.95

PRINTER BUFFERS

EXTERNAL SPOOLERS (MAINS POWERED)

INPUT OUTPUT
PARALLEL PARALLEL 8K BIF210 £79.95
PARALLEL PARALLEL 16K BIF211 £89.95
PARALLEL PARALLEL 32K BIF212 £120.00
PARALLEL PARALLEL BIF231 £195.00
PARALLEL RS232 8K BIF213 £109.95
PARALLEL RS232 16K BIF214 £119.95
PARALLEL RS232 32K BIF215 £149.95
PARALLEL RS232 64K BIF216 £149.95

PARALLEL RS232 8K BIF310 £99.95
PARALLEL RS232 16K BIF311 £109.95
PARALLEL RS232 32K BIF312 £119.95
PARALLEL RS232 64K BIF313 £149.95
PARALLEL RS232 8K BIF314 £99.95
PARALLEL RS232 16K BIF315 £109.95
PARALLEL RS232 32K BIF316 £119.95
PARALLEL RS232 64K BIF317 £149.95

RS232 RS232 8K BIF321 £99.95
RS232 RS232 16K BIF322 £109.95
RS232 RS232 32K BIF323 £119.95
RS232 RS232 64K BIF324 £149.95

RS232 PARALLEL 8K BIF321 £109.95
RS232 PARALLEL 32K BIF322 £119.95
RS232 PARALLEL 64K BIF323 £149.95

INTERNAL SPOOLERS FOR EPSON PRINTERS

PARALLEL 8K SPOOLER BIF220 £50.95
PARALLEL 16K SPOOLER BIF221 £69.95
PARALLEL 32K SPOOLER BIF222 £109.95
PARALLEL 64K SPOOLER BIF223 £139.95

ALL PRICES EXCLUSIVE OF VAT

DEALER ENQUIRIES WELCOME

IBEK SYSTEMS
437 STONEY STANTON ROAD,
COVENTRY, WEST MIDLANDS
TEL: 0203 661162

STRIDE MICRO, formerly SAGE COMPUTERS, have introduced a range of supermicros that set new standards in performance and expandability

FLOATING POINT PROCESSOR
10 OR 12 Mhz 68000 CPU
VME BUS (2 SLOTS)
p-SYSTEM, UNIX V, BOS, MOSYS, IDRIS, CP/M-68K, and more

Strategic Applications Software are specialists in multi-user p-System software for the Sage. Our extensive experience in software development makes it possible for us to offer a unique level of after-sales support and maintenance.

OMNINET LAN
MULTI-USER 4 — 22 PORTS
640K — 448 MBytes DISK
256K — 3 MBytes RAM
PRICED FROM £2,900

STRATEGIC APPLICATIONS SOFTWARE

Strategic Applications Software Ltd. 6/7 Benjamin Street, London EC1 01-608 0818.
<table>
<thead>
<tr>
<th>FEATURES</th>
<th>SINCLAIR SPECTRUM PLUS</th>
<th>ACORN ELECTRON</th>
<th>COMMODORE 64</th>
<th>ATARI 800XL</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 &quot;SOUND&quot; VOICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAX 256 COLOURS ON SCREEN AT ONE TIME</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIAGNOSTIC &quot;SELF TEST&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CASSETTE &quot;SOUND TRACK&quot; CAPABILITIES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64K RAM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROGRAMMABLE JOY STICK PORTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPRITES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CARTRIDGE SLOT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MONITOR SOCKET</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BUILT-IN &quot;BASIC&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMMUNICATIONS CAPABILITIES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REAL KEYBOARD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
AT £169, LOOK HOW THE ATARI 800XL COCKS A SNOOK AT THE COMPETITION.

AT LAST, SERIOUS HOME COMPUTERS ARE UP AGAINST SERIOUS COMPETITION. THE ATARI 800XL OFFERS EVERYTHING COMPETITORS IN OUR PRICE RANGE OFFER. AND AS YOU CAN SEE ON THE LEFT, A GREAT DEAL MORE. PLUS SOFTWARE PRICES THAT START AT LESS THAN £10.

FOR FURTHER DETAILS CONTACT YOUR NEAREST ATARI DEALER: BOOTS, CARREFOUR, CO-OP, CURRYS, DIXO‘S, GRANADA, LASKYS, LEWIS‘S, LITTLEWOODS, MAKRO, RUMBELOWS, SILICA SHOP, SPECTRUM, VALLANCES, WIGFALLS, AND ALL OTHER COMPUTER SHOPS.
PROGRAMMERS

WE ARE LOOKING FOR TOP QUALITY PROGRAMMES TO MARKET IN THE UK AND ABROAD. THE PROGRAMMES MUST BE OF TOP QUALITY AND IN MACHINE CODE WITH GOOD GRAPHICS AND SOUNDS AND ORIGINAL CONCEPT. WE ARE LOOKING FOR PROGRAMMERS TO CARRY OUT WORK ON NEW MACHINES SUCH AS THE C.B.M/16 AMSTRAD AND M.S.X. WE CAN SUPPLY THESE MACHINES TO CARRY OUT WORK FOR MIRAGE. WE ARE ALSO OFFERING £500 PRIZE FOR THE BEST PROGRAMME RECEIVED BY THE END OF FEBRUARY 1985 WHICH WE WILL DECIDE TO MARKET. WE OFFER AN OUT RIGHT PAYMENT OR 10% PLUS PAYMENT OR 20% ROYALTIES. FOR MORE INFORMATION CONTACT THE SOFTWARE MANAGER HE WILL BE GLAD TO LISTEN TO ANY QUESTIONS YOU MAY HAVE.

SOFTWARE HOUSES

WE ARE LOOKING FOR TOP SELLING PROGRAMMES TO DISTRIBUTE TO OUR WIDE RANGE OF OUTLETS THROUGHOUT THE UK AND GIVE YOU A VERY FAST SERVICE TO HELP WITH YOUR SALES AND TO MAKE THE MOST OF YOUR PRODUCTS. SEND A SAMPLE COPY OF YOUR PRODUCTS WITH RATES AND TERMS FOR A FAST ASSESMENT. FOR MORE INFORMATION CONTACT THE SALES MANAGER HE WILL BE GLAD TO HELP AND ASSIST YOU.

DEALERS AND DISTRIBUTERS

DEALERS     WE HAVE THE BEST SELLERS FROM THE BEST PRODUCERS; WE ALSO OFFER VERY GOOD RATES AND TERMS TO HELP YOU AND US TO ACHIEVE THE BEST SALES AND SERVICE. FOR MORE INFORMATION CONTACT THE SALES MANAGER.
DISTRIBUTERS   HAVE YOU GOT THE MIRAGE RANGE ON YOUR SHELVES, IF NOT THEN CONTACT THE SALES OFFICE FOR SAMPLES AND RATES.

SALES MANAGER  SOFTWARE MANAGER
T.C. SAPHIER             C.A. SAPHIER
NOTE WE HAVE MOVED TO NEW PREMISES
Hantanex, the name behind the screens in over 90% of professional video game machines, has come out into the open with its new BOXER range of monitors for personal computers.

First in the range is the BOXER 12" high resolution monochrome monitor. The elegantly styled cabinet houses a black screen with an etched faceplate for minimal reflection and features a green 80 column display for clear easy viewing.

The compact, portable BOXER is compatible with most personal computers and is unbeatable value at £99.50 inc. VAT, and has 12 months guarantee.

Further information and illustrated leaflet available from:

HANTAREX (UK) LTD.,
Unit 2,
Lower Sydenham Trading Estate,
Kangley Bridge Road,
London SE26 5BA.
Tel: 01-778 1414.
Trade in—Trade up!
To an Apple IIe, Apple IIc or a Macintosh
—or an IBM PC or a Compaq

OK, so you like your present Apple a lot. But, there can be many advantages in moving up to one of Apple's new, powerful and practical machines—if only the problem of what to do with your present machine can be solved.

We have the answer.

We need supplies of Apple II+ and Ile we will lovingly clean, polish and restore them to like new, before finding them new homes, so we will make all you Apple owners an offer.

We will take your trusty aide in part exchange for a new Apple Ile, Apple Ilc, or a Macintosh. The trade we can give will be dependent on the configuration and age of your present machine.

Interested? Call Steve McLean today on Rossendale (0706) 217744 for immediate attention.

NEW APPLE PRICES

Appleworks—£175
Logos Apple Ilc £129—£75
Access Apple II—£52
Apple Ilc 64K Computer—£587
Apple Ilc 64K Computer (Disk Drive with Controller)—£795
Apple Ilc 64K Computer (Duodisk with Acc. Kit Ilc, Monitor IIc)—£995

Imagewriter Printer 10"—£385
Imagewriter Printer 75"—£525
Imagewriter Acc. Kit Apple Ilc—£118

The Apple IIe with Ilc Monitor & Stand.

The New Apple Credit Card

Yes, you may be eligible for up to £1500 instant credit on Apple Computer Systems and Apple branded products! Providing you are 21 or over, permanently resident in the UK, and have a valid bank credit or cheque card, you could be buying your new Apple System on our new Apple Credit Card. Just pull into one of our offices, complete our application form and, subject to a telephone call, then you could be walking out with your brand new Apple System! If you can’t come in, then simply phone or write to any P & P Micro Distributors office and ask for an application form.

Your form will be sent to you immediately, simply complete and return—we pay the postage, so you don’t even need a stamp.

You can repay your account by a variety of methods, and spread the cost to suit yourself.

Buy your Apple the easy way—call for Apple Card today.

*Instant credit available subject to acceptance. APR 29.8% repayment by direct debit: APR 34.4% repayment by any other method. Rates may vary. Facility provided by Weibel Cardholder Services.

We regret that Apple Card will not be available in Northern Ireland, the Isle of Man and the Channel Islands.

PRICES DO NOT INCLUDE VAT PLEASE ADD 15%

Head Office: TODD HALL RD., CARRS INDUSTRIAL ESTATE, HASLINGDEN LANCS.
GLENMORE RD., LONDON, SW16 6AY Tel: 01-677 7631/01-769 1022
DALE STREET, BILSTON, WEST MIDLANDS, WV14 7JY Tel: 0902-43913

Northern Ireland: Progware Huset, Okernveien 145, N-OSLO 5. Tel: 47 2 64 55 77

LINES OPEN FOR ORDERS 8am—6pm Mon-Fri (Lancs) 9am—1pm Sat (Lancs)
10am—3pm Sat (London) 9am—6pm Mon-Fri (London & Bilston)
A 3-DIMENSIONAL PERSPECTIVE FLIGHT-COMBAT GAME WITH THE ADDED DIMENSION OF SPEECH

Flyer Fox, a one-player, 3D simulation, is part of Tymac's Game Gems series. Fast arcade action combined with dazzling, high resolution graphics and software generated speech puts you right in the game with an impact you never thought possible!

Tymac Talkies — No Extra Hardware!

Sitting in the cockpit of your sleek jetfighter, you escort a commercial jumbojet through the once-safe international skies. Suddenly your scope lights up and the reason for your presence streaks by. A Mig fighter has ruthlessly opened fire on the helpless airliner. It breaks off and you give chase. You track him on your scope. You veer left. You fire. You veer right. The ground zooms past. He tries to evade, but you doggedly follow, knowing that you must not allow him to complete his mission of destruction. Suddenly you receive a mayday from the airliner - another Mig is attacking. Afterburners, blazing, you streak back to the rescue, in defence of freedom of the skies!

AVAILABLE FROM: BOOTS, WEBSTERS, MICRO DEALER, MICRO DEAL, AND OTHER LEADING DISTRIBUTORS AND ALL GOOD SOFTWARE DEALERS.

WATCH FOR FORTHCOMING RELEASES INCLUDING GANDALF THE SORCERER™ SPECTRUM VERSIONS AVAILABLE SOON

TRADE DISTRIBUTOR ENQUIRIES INVITED!

TYMAC (UK) LTD 43-48 NEW STREET BIRMINGHAM 021 643 8899
Guy Kewney's first-hand look at the news this month includes an exclusive look at Amstrad's disk software, the truth about which Expert went bust, and an on-the-spot review of Comdex Fall from Las Vegas.

Drive with care
Included in the price of the drive is a disk of software containing CP/M, DR LOGO, various Amstrad utilities and extra CP/M utilities. But before getting too excited about the possibility of a cheap CP/M system, it's worth examining exactly what is on offer. Although this is a complete CP/M implementation and does provide an 80-column display (unlike Commodore's CP/M), there's a problem with the Amstrad's disk format or TPA.

This is the area of memory available for application programs to run in. On the Amstrad this totals 39.5k which is less than many CP/M programs such as WordStar and dBaseII need. Furthermore, suppliery CP/M programs that do fit in 39.5k have to be persuaded to convert their programs to Amstrad 3in disk format. With the machine not being marketed in the US, it's likely that only British software houses will consider doing this.

That said, the Amstrad software is still impressive. DR LOGO, Digital Research's Logo, is a thorough language and is well worth studying. However, I can reveal the name of the distributor who is licensing this software from Quest. The bundled software and documentation — all designed to be easy to get up and running. To set up the disk system, it's necessary to plug a cartridge containing the disk controller ROM into the Floppy Disk socket of the back of the Amstrad, and then connect this via the cable to the long, slim disk drive unit. Both the cartridge and the disk drive match the main unit's dark grey colour scheme. Also available is a second drive without controller cartridge which enables the system to be expanded to its maximum of two drives.

Legal at last
By reducing its ambitions somewhat, B & L Software of Idaho may have beaten Digital Research to the punch with Multi-Job, a multi-tasking product for the IBM.

DR's Concurrent DOS is designed to run on virtually any machine with an 8088 or 8086 family chip. Multi-Job, however, is written only for the IBM.

The claims for it (which Newsprint covered briefly when Pete and Pam got hold of it) are that it will run up to nine PC-DOs programs at the same time.

The new version, at last, will cope with programs using more advanced versions of IBM's operating system than version 1.0.

I have promised not to reveal which distributor it was that started its career with Multi-Job by buying £20,000 worth of illegal copies from Starware, in Washington — illegal copies, moreover, which wouldn't run. But came up with the message that it was an illegal copy, and crashed.

However, I can reveal the name of the distributor who is selling this new (authorized) version at £100 — it is Impex Software on (01) 900 0999 — which must be the longest number in the London phone book to dial.

The company is also distributing Electronic Disk at £8.99, and Printer Spooler at £25. Electronic Disk uses part of the internal memory as a very fast disk. Printer Spooler carries on printing while you get on with other work.

Apple's party piece
The (unofficial) word from Apple's UK bosses comes in the form of knowing winks, nudges and subtle hints this month indicating that something really special is to be unveiled at the Annual General Meeting.

My sources in the US tell me that, candidly, Apple had better have a good rabbit to pull out of its hat because it's in need of a boost. It's short of cash.

Frankly, if Apple came to me with a request to borrow money and an offer to pay me interest on it next year, I'd lend whatever I had.

Certainly, I have never known Apple to have such a big, white smile as it is showing, with the 'Test Drive'
get hold of) and an Apricot simultaneously. Passing files from one machine to another, however, wasn't easy, and was only possible between the Apple models. I could have plugged in an Apple Ile, too.

But for the hard disk to work well requires the Macintosh software writers to wake up to the fact that people need bigger disks than the Mac gives. If you want to put your programs on the hard disk, you'll find that a great many users have copy-protected their stuff in a way that prevents this.

Officially, Apple's rules about copy protection are: you must have the original disk in the machine, but can run from a copy. PFS File and Report won't work like that (a new version is promised) and neither will Macintosh Pascal.

Mistaken identity

Everybody knows that Expert Systems International, ESI, went bust last month, right? Wrong! It was Expert Software International which crashed, and which bears no relation to Expert Systems.

Actually, the company doesn't seem as upset as you might think at the living ESI, where (after an initial panic) it discovered that it was getting so much extra publicity that it was almost worth the bother. It was a very opportune moment for the company to launch Prolog-2 - "believed to be the world's most sophisticated version of the artificial intelligence language, Prolog."

That's all the excitement you get for today: it runs on the IBM, Mac, and Sirius, and Apricot and Rainbow machines will have versions by March or April — but the drawback is that it costs £2000.

'You've got to be a serious software developer to be interested,' confirmed Alex Godall at Expert Systems. Details on (0865) 242206.

Sprinting home

A neat little tape recorder which loads Spectrum programs at four times normal speed was released some months ago by Challenge Research. Called the Sprint, it costs around £69. For anybody who uses the Spectrum to write their own programs, it's wonderful.

The Sprint works by plugging directly into the

There's an interesting computer battle, using country-wide networks, just starting. It could end up going into the City of London before 1985 is out.

It may not be a battle officially, but from the outside the race to supply every school in the country with electronic mail looks very like a tussle.

And with the Times Network for Schools launched, but with CAMPUS (Computers And Modems Project for Use in Schools) not due to be revealed for another two months, it's a shame that we can't really give readers a form guide for predicting the likely outcome.

So, what do we know is that The Times has decided to sell modems worth £400 and software worth — well, whatever communications software is worth, so, say £50 — to every school in the country — at a cost of £150, plus a user fee of £69 per term.

On the other hand, the Prestel-backed Prism group was planning to give away £200 Prestel-style modems to schools. No, it wasn't Microset, it's a rival service.

Or is it?

The Times network uses electronic mail services provided through Telecom Gold, or BTG (as it has to be called). Eventually, the plan is to buy The Times network's own Prime computers, and move the users, the information databases and the bulletin boards onto them, leaving Gold behind — but BTG doesn't seem to be altogether aware of this plan.

The Campus network, if it happens, will use Prestel. Unlike the TNS it will not allow users to connect their computers to each other, nor will it work at the very fast 1200/1200 bits per second speed of TNS intelligent (error correcting) modems.

And, from what is known so far, the TNS looks much more ambitious, offering big databases, opportunities for big companies like Memorex and National Computer Club to sponsor special information services, promotions, competitions through retailers, and so on.

To make the fight look more interesting, one of the contenders has nobbled itself. Prism managing director Bob Denton, fighting for a "time of stability" and holding only 35 per cent of the shares in the company he co-founded, told Richard Hease, the other founder (weighing in the 51 per cent of the shares) that the company didn't want to do it his way, he would offer his resignation.

Richard Hease, wanting to use Denton's Wild West talents (as his enemies see it) to scour the world for new and exciting ideas, accepted his resignation.

A week later, they were still playing games, with Hease offering Denton a consultancy role to handle Campus, and Denton saying firmly that 'I can live without Prism, let's see if Prism can manage without me,' and refusing. You could make a living on bets as to whether there will be a reconciliation, and it, then when, but it's worth noting that Denton isn't selling his shares.

There's no denying the rivalry between the two groups of pioneers at the grass-roots level. But there is the irony of the fact that Richard Hooper, communications king of the Seventies, is in charge of both projects from within British Telecom Developments.

Unfortunately, we had to go to press before getting a chance to talk to Hooper — so watch for next month's fascinating episode.
system via the back expansion slot, and feeding information from the tape directly into memory. It gets its power from the Spectrum too, and gets its speed increase by running the motors of the tape drive fast.

There are snags, however, some caused by copy-protection systems, others by considerate program writers. The copy-protection problem is one we can despair of overcoming. A very nice program called Dark Star, for example, just wouldn't load. Well, it looked nice when I saw it demonstrated at the PCW Show but it may be a load of rubbish because it's the longest ever Spectrum program and life is just too short. And the Challenge Sprint can't cope.

The considerate programmers can be managed. They are the people who have pity on you, and know you don't enjoy spending five minutes watching the TV screen go flier and the Spectrum go chirrup. So, they load in sections with little animated graphics, and then load the next section. Too late! The Sprint has already gone half way into the next section.

Challenge says there's a way round it, by tapping any key to disable the 'pause' statement. It works, but it really is more trouble than I think it's worth.

Details on (0707) 44063.

Big business

Exciting new machines for the business market from Commodore? Recently appointed software development manager, Gail Wellington, celebrated her arrival to head up a special project team aiming to take Commodore back into the business market. Wellington, who 'confirming' that the company does plan to chase IBM.

'The Commodore PC and Z8000-based machines, previewed earlier this year in Hanover, will play an important part in the new operation,' was the official statement. Wellington added: 'We will be bringing them to the UK early in 1985, together with a number of other machines which are going to have an extremely dramatic effect on the market. In fact, we believe that the industry is in for some big surprises from Commodore.'

Big surprises, eh? Certainly the appearance of any Commodore business machine any time in 1985 would be quite a surprise after all the false dawns from that company.

But the word from inside suggests that the PC will not be the portable Hyperion-based system, but a desktop machine based on a subsequent evolution of Bytec's PC imitation 'which this time would be genuinely compatible' with the IBM.

And the main hopes of the top brass lie in the Amiga, which it hopes will go into business and home markets. Business and home markets together, something Commodore had dreamed of for some time with the 64, and it remains just a dream for the immediate future. I think Commodore has a simple choice.

Either, it comes out with one business system, and one office system, in 1985 — or alternatively it comes out with a dual-purpose machine in 1987. That's when the market will converge on that level. And even then, there will always be a market for something costing £2000 to £4000 in business terms, but nobody is going to spend that on a home machine — period.

Homing in on the truth

The reason that the home computer market 'is likely to fall off from a peak of 1.5 million per year to 1.2 million by 1988' is that 'the market will become mature'.

A report making this prediction has just been released by Market Assessment Publications — and it looks certain to walk right back to the pavilion before starting to bowl. Microsoft, which (as Digital Research will remind you at any opportunity) is not primarily an operating system company, chose two days later as the date for announcing a system of linking MS-DOS machines.

The announcement was impressive, say those who managed to attend, because it was the first time Microsoft had announced something before IBM.

Those less impressed remembered last year's announcement of windowing on Concurrent. That, too, by the way, was not announced as an IBM product at the time.

Had Microsoft and myself managed to agree on which date Bill Gates would be available for me to interview, I would have enjoyed asking him just how soon MS Net would appear. As it was, I showed up at a hotel while he was sitting back in the first-class lounge of an aeroplane over the Atlantic, and I didn't get much sense out of him as a result.

Equally, I failed to check with ACT boss, Roger Foster, over when GEM would be available on the Apricot, on which I am still anxiously expecting to see appear a version of Concurrent which runs IBM PC-DOS programs.

In other words, on this launch, I really feel the old warning 'wait till you see it in the shops' applies as much as on any of the other unlikely sounding products mentioned in these pages with enthusiasm and pleasure.
# MICRO DISCOUNTS LTD.
## MICRO DISCOUNT LTD OFFERS THE BEST PRICES AROUND

**Computers**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apricot Portable</td>
<td>POA</td>
</tr>
<tr>
<td>Apricot F1</td>
<td>POA</td>
</tr>
<tr>
<td>Apricot 256k 1 x 315 D/D + Monitor</td>
<td>£1200.00</td>
</tr>
<tr>
<td>Apricot 256k 2 x 315 D/D + Monitor</td>
<td>£1350.00</td>
</tr>
<tr>
<td>Apricot 256k 2 x 720 D/D + Monitor</td>
<td>£1500.00</td>
</tr>
<tr>
<td>Apricot 256k 10Mb HD/D + Monitor</td>
<td>£2225.00</td>
</tr>
<tr>
<td>COMMODORE 64</td>
<td>£150.00</td>
</tr>
<tr>
<td>COMMODORE VIC 20 Starter pack</td>
<td>£102.00</td>
</tr>
<tr>
<td>COMMODORE SX 64</td>
<td>£585.00</td>
</tr>
<tr>
<td>EPSON QX10 + RX80 + Cables</td>
<td>£1579.00</td>
</tr>
<tr>
<td>EPSON PX 8 (PORTABLE + software)</td>
<td>£625.00</td>
</tr>
<tr>
<td>ORIC ATMOS 48k</td>
<td>£138.00</td>
</tr>
<tr>
<td>SANYO MBC 555 2 x 160k D/D + Monitor</td>
<td>£870.00</td>
</tr>
<tr>
<td>BBC MODEL B</td>
<td>£310.00</td>
</tr>
<tr>
<td>SANYO AS ABOVE BUT NO MONITOR</td>
<td>£780.00</td>
</tr>
<tr>
<td>APPLE Lisa</td>
<td>POA</td>
</tr>
<tr>
<td>APPLE MACINTOSH</td>
<td>£1600.00</td>
</tr>
<tr>
<td>APPLE 11C</td>
<td>£800.00</td>
</tr>
<tr>
<td>APPLE 11E</td>
<td>£450.00</td>
</tr>
<tr>
<td>APPLE PERIPHERALS</td>
<td>POA</td>
</tr>
<tr>
<td>*AMSTRAD WITH COLOUR MONITOR</td>
<td>£300.00</td>
</tr>
<tr>
<td>*AMSTRAD WITH MONOCHROME MONITOR</td>
<td>£220.00</td>
</tr>
<tr>
<td>*SINCLAIR QL</td>
<td>£380.00</td>
</tr>
<tr>
<td>ATARI 600 XL</td>
<td>£117.00</td>
</tr>
<tr>
<td>FUTURE FX 20 + SPELLBINDER</td>
<td>£1583.00</td>
</tr>
</tbody>
</table>

**Printers**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADMATE F/T 180CPS</td>
<td>£160.00</td>
</tr>
<tr>
<td>ANADEX DP 9000B 180CPS</td>
<td>£786.00</td>
</tr>
<tr>
<td>ANADEX DP 9820B 240CPS</td>
<td>£910.00</td>
</tr>
<tr>
<td>ANADEX DP 9725B COLOUR</td>
<td>£1086.00</td>
</tr>
<tr>
<td>ANADEX DP 6500B 500CPS</td>
<td>£1999.00</td>
</tr>
<tr>
<td>ANADEX WP 6000 330CPS</td>
<td>£1855.00</td>
</tr>
<tr>
<td>NEWBURY DATA PRINTERS</td>
<td>POA</td>
</tr>
<tr>
<td>EPSON P40 PX8 MODEL</td>
<td>£70.00</td>
</tr>
<tr>
<td>EPSON P80</td>
<td>£135.00</td>
</tr>
<tr>
<td>EPSON JX 80 COLOUR</td>
<td>£450.00</td>
</tr>
<tr>
<td>EPSON RX 80 T</td>
<td>£185.00</td>
</tr>
<tr>
<td>EPSON RX 80 F/T</td>
<td>£212.00</td>
</tr>
<tr>
<td>EPSON RX 100 F/T</td>
<td>£338.00</td>
</tr>
<tr>
<td>EPSON FX 80</td>
<td>£318.00</td>
</tr>
<tr>
<td>EPSON FX 100</td>
<td>£420.00</td>
</tr>
<tr>
<td>EPSON LQ 1500</td>
<td>£867.00</td>
</tr>
<tr>
<td>EPSON WP 6000 500CPS</td>
<td>£1790.00</td>
</tr>
<tr>
<td>EPSON FX 100</td>
<td>£867.00</td>
</tr>
<tr>
<td>EPSON JX 80 COLOUR</td>
<td>£1790.00</td>
</tr>
<tr>
<td>STAR GEMINI 10 X</td>
<td>£185.00</td>
</tr>
<tr>
<td>STAR DELTA 10</td>
<td>£310.00</td>
</tr>
<tr>
<td>BROTHER HR3</td>
<td>£125.00</td>
</tr>
<tr>
<td>BROTHER HR15</td>
<td>£245.00</td>
</tr>
<tr>
<td>BROTHER HR25</td>
<td>£350.00</td>
</tr>
<tr>
<td>BROTHER EP 44</td>
<td>£166.00</td>
</tr>
<tr>
<td>COMMODORE MPS 801</td>
<td>£165.00</td>
</tr>
<tr>
<td>SMITH CORONA TP1</td>
<td>£147.00</td>
</tr>
<tr>
<td>UCHIDA</td>
<td>£210.00</td>
</tr>
<tr>
<td>QUIME 1140</td>
<td>£1139.00</td>
</tr>
<tr>
<td>CANON PW1080A</td>
<td>£270.00</td>
</tr>
<tr>
<td>JUKI 6100</td>
<td>£310.00</td>
</tr>
<tr>
<td>CUMANA DISC DRIVES</td>
<td>POA</td>
</tr>
<tr>
<td>IBM EQUIPMENT AVAILABLE</td>
<td>POA</td>
</tr>
<tr>
<td>*COMMODORE C16</td>
<td>£130.00</td>
</tr>
<tr>
<td>*COMMODORE +4</td>
<td>£280.00</td>
</tr>
<tr>
<td>*ENTERPRISE 64 (FLAN)</td>
<td>£185.00</td>
</tr>
<tr>
<td>OLIVETTI EQUIPMENT AVAILABLE</td>
<td>POA</td>
</tr>
<tr>
<td>SEAWARS for Sinclair QL</td>
<td>£19.95</td>
</tr>
</tbody>
</table>

*INC VAT

We offer the widest range of printers on the market at the best prices, one year's guarantee on all products.

A wide variety of peripherals available, please enquire. Hundreds of discount prices available.

Orders are strictly cash with order, in London area only COD available.

Send all enquiries orders to:

**MICRO DISCOUNT**

C/O VANTAGE COMPUTER CONSULTANTS LIMITED,

220 BALHAM HIGH ROAD, LONDON SW12 9BS

Please state clearly when ordering what you require and your name and address. Carriage in London area is £5.00, all other places £10.00. All prices are exclusive of VAT. Please allow 14 days for goods to reach you.

EXPORT ORDERS WELCOME. CALLERS BY APPOINTMENT

UK GOVERNMENT AND EDUCATIONAL ESTABLISHMENT ORDERS WELCOME.

Tel: 01-675 2964, 9.30 to 5.00 Monday to Friday
Approval for the Minor Miracles modem, which works to just about every communications standard in the world, didn’t come quickly, but at last you can buy one and use it legally. This will no doubt come as a great relief to the thousands of people who already have one plugged into their new-style BT sockets. Details from dealers, or from Miracle Technology in Ipswich, on (0473) 50304.

Irritatingly, the company doesn’t quote a Telecom Gold id ... forecast period.’ It’s the bit where the analysis turns to the UK market today that will cause upset inside Commodore. John Baxter, head of Commodore, has long been telling anyone who will listen that his company is matching Sinclair computer for computer and is heavily outselling in terms of money. But what about market shares? Market Assessment says: ‘Sinclair remains undisputed market leader with 43 per cent of the market share, followed by Commodore with 22 per cent, and Acorn with 10 per cent.’ Makers of other home micros shouldn’t get too encouraged by the report’s belief: ‘that the home market isn’t really going to shrink, but just change into a ‘domestic management’ market.’ It says that tragedy is inevitable: ‘At present there are around 38 brands of computers, many of which are relatively small and lack the public awareness which established names have. And, it adds: ‘How long these relatively small ones will survive is a matter of debate, but a reduction in the number of models available seems inevitable. The smaller machines look vulnerable, especially if MSX quickly gains popularity.’ Details of the report on (01) 278 9058.

French invasion
French company SMT—maker of the Goupil micro (which means the ‘fox’), is limbering up for an assault on—well, not on the British market, not exactly. It’s more complex than that. The company has taken offices down in East Putney, and is planning to get UK deals going—a special machine to run the MUMPS programming language has been demonstrated, for instance.

But Gregory Labru, the head of the UK office, says that this plan is to sell ‘the Anglo-Saxon market.’ This includes the UK, of course. But it also includes South Africa, America, and most puzzling of all, French-speaking Canada! The fox micro isn’t likely to get a quick response from UK buyers. It’s almost totally unlike anything else on the market, with the possible exception of the old Ohio Scientific range—it’s a system based on the Motorola 6809, with the options of add-in 8088 and 280 chips, too.

Labru seems to understand that he has his hands full—he says he’s prepared to take two years selling without making an operating profit to get his company established. In France, the machine profits handsomely from anti-American chauvinism—after the IBM and Apple, it’s France’s third bestseller, and gets the bulk of sales from Government, Defence and nationalised industries— including a big educational chunk.

Details should be sought from the company’s publicity manager, Anthony Kenyon, since by press time, launch plans and phone installation plans had all been postponed ‘due to unforeseen circumstances.’ And Kenyon is contactable on (01) 378 6697.

Address
unknown
Full marks to Telecom Gold for getting the Times Network for Students (see page 107) going. If the company’s so clever, why can’t it keep track of its existing customers?

Just today, I received a BTG message from a subscriber. As is standard practice on BTG systems, you reply automatically, typing “R” and the thing sends the response back without your having to type in the address. Except it doesn’t. You get a letter back from POSTMASTER saying that the letter is ‘undeliverable.’ Clever, isn’t it?

And do you know, I bet the only response I get from BTG about this is a complaint that it is Telecom Gold, not British Telecom Gold, and I stop using the BTG abbreviation.

Stop here
Files on a QL can be compressed ‘to about half their usual size,’ according to Digitex Computers.

The company has announced an £18 program called STOP, or storage optimiser, and if it works well enough for you, it should pay for itself after you’ve saved the price of the next three microdrive cassettes.

A version for the Spectrum at £13 is expected sometime this month.

Details of this, and of ways to back up Winchester disks on a QL (using floppies or microdrives) from the company at 4 Amwell House, Isleworth, Mddx TW7 6NX—no phone.

Grapes of wrath
WH Smith didn’t start off its Computer Shop at Waterloo station very auspiciously, unless you think the threat of legal action from IBM was a good omen.

The shop, opened, selling computers including the Advance 86, an imitation IBM PC, just a week after IBM’s lawyers wrote to WH Smith, and also to Ferranti (who build the Advance), and Advance and said: ‘Stop it.’ The cause of the dispute is the chip with the read-only memory routines that handle basic input/output functions. IBM says, as it did with Eagle, and with Corona, and with one Far Eastern imitator of the PC, that the ROM bears an uncanny resemblance to IBM’s own ROM. And that is protected by copyright and patent.

You would be quite wrong to suppose that anybody who can add and subtract can understand the 24-hour clock. So difficult is the problem that ABI Software, educational specialists, has been able to launch a game called ‘Time Trucker’, which helps children aged 8-14 to understand the relationship between the 12-hour analogue and 24-hour digital clock.

Apparantly the relationship ‘between time and distance is reinforced while driving round country roads, collecting a full lorry load of farm produce... and returning to the depot within a specified time limit.’ It costs £8 for the Commodore 64.
Caxton can pick winners

BrainStorm – the powerful thought organiser

Touch’n’Go – the 24-hour typing course

Cardbox – the electronic card index

Will your program be our next bestseller?

Caxton is on the lookout for professionally crafted computer programs. Do you have something as good as Cardbox, Touch’n’Go or BrainStorm?

Do you relish the prospect of writing manuals, designing packaging, drafting advertisements and brochures, selling, distributing and supporting your brainchild? Or would you prefer to get cracking on your next masterpiece?

If you would rather hand all those tasks (and more) to a professional organisation dedicated to giving your product the best possible exposure then Caxton is the company to help you.

If your program is innovative and aimed at the PCDOS/MSDOS business market, why not send us a product synopsis and summary of key benefits?

We look forward to hearing from you.

To: David Tebbutt
Caxton Software Ltd
10/14 Bedford Street
Covent Garden
London WC2E 9HE
Tel: 01-379 6502
The answer is an Apricot

Come and see the very latest additions to the fabulous range of ACT Apricot Microcomputers at your local ACT ComputerWorld store now.

The Apricot portable and F1 personal computers set new standards for innovative design and competitive pricing. Both machines provide 256 Kbytes of RAM and a single 720 Kbyte 3.5" disk for mass storage. In addition a cordless keyboard, a revolutionary infra red ‘mouse’ for cursor control and a full range of useful software make the systems really easy to use.

Visit an ACT ComputerWorld and evaluate these machines at first hand. You can be sure of expert advice and guidance on the choice of system best suited to your needs together with a full range of ancillary products such as software, printers, computer stationery and floppy disks.

ACT ComputerWorlds are ACT’s national chain of professional business centres, so you can rely on the quality of their judgement and expert product knowledge.

And their commitment won’t end when you buy an Apricot. All ACT’s ComputerWorlds provide a full after sales support, including training and fast and efficient service facilities.

See the impressive new Apricots at an ACT ComputerWorld today.
Apricot F1: A full function business computer for £2995 exc. VAT. Complete with colour and a complete range of easy-to-use software to make you productive right away.

from COMPUTERWORLD

LIVERPOOL
Churchill House, Ti he barn Street, Liverpool. Tel: 051-236 1112

LONDON
359-361 Euston Rd, London.

MANCHESTER
Centurion House, Chester Street, Manchester. Tel: 061-832 8322

NUNEATON
46 Church Street, Nuneaton. Tel: 0203 328967

PLYMOUTH
4 Hoegate House, 36th Street, Plymouth. Tel: 0752 667700

READING
70-72 Kings Road, Reading. Tel: 0734 508787

SHREWSBURY
Park House, 38a Alwy Foye, Shrewsbury. Tel: 0743 68167

SOUTHAMPTON
5 London Road, Southampton. Tel: 0703 336344

SWINDON
8 Sheep Street, Swindon. Tel: 0793 762449

TELFORD
Hazeldine House, 1 Ford Town Centre, Telford. Tel: 0952 506664

WOLVERHAMPTON
Security House, Cheadle Street, Wolverhampton. Tel: 0902 712121

Please send me details on:

☐ Apricot F1.
☐ Apricot Portable.
☐ Other ComputerWorld products and services.

Name:

Company:

Position:

Address:

Telephone No.

We talk business, not computers

* Excluding monitor.
* Optional on basic system.
* All prices correct at time of print.

Please return coupon to:
ACT ComputerWorld, ComputerWorld House, 43 Calthorpe Road, Edgbaston, Birmingham, B15 1TS. Tel: 021-455 8484.
Cumana, now the best name in sight.

Cumana, the best name in memory for a range of disk drives, now introduce the first of a new range of computer products. A low cost and fully guaranteed graphic plotting aid for the BBC Micro. This compact display cursor moving device simplifies programming with the touch of the stylus. The product comes complete with a programming instruction booklet and has uses in graphics, computer aided design, education and games.

- Mouse substitute
- Smart keyboard supplement
- Education
- Flexible numeric keypad
- Graphic input device
- CAD/CAM system
- Only £69.95 inc. V.A.T.

Cumana Limited, Pines Trading Estate, Broad Street, Guildford, Surrey, GU3 9BH.
Telephone: Guildford (0483) 503121
Telex: 859380

CUMANA®
The best name in memory
One advantage that the Touch Screen HP150 has over the original IBM PC is not the touch screen, but the fact that HP put an HP interface bus into it. This makes it possible for Protek to provide a local network — of sorts — good enough to have several 150 users working on the same file, held on a Winchester disk. Prices start at £2000 for a five megabyte disk, rising to £5500 for a 45 megabyte drive with built-in floppy. Details on (01) 245 6844.

'Ve have rigorously examined the routines,' said an IBM official, 'and found that they are 90 per cent identical with our own. Furthermore, such changes as have been made appear mainly cosmetic in nature.

And, worst of all: 'Even the known errors in the BIOS software have been reproduced identically.'

At press time, the official 'no comment' screen from Smiths and Ferranti was broken only by suggestions that a new version of the software was available.

Skeptics who felt that a new ROM, produced inside three weeks, was unlikely to work, may have a point.

However, sources inside the company say that it's true, and there really is a new ROM. 'We were working on new BIOS routines anyway,' said a programmer, 'because of compatibility problems.'

In other words, despite being a 90 per cent imitation, it still didn't do exactly the same things as the IBM micro?' No.

It didn't escape the attention of industry watchers that the IBM legal move came two weeks before Ferranti announced that it had taken over, not just manufacturing rights, but also distribution of the Advance 86.

The main point of taking over distribution is to get dealers. Dealers have spoken to show a noticeable reluctance to get involved in placing orders for a computer which may be the subject of a legal action by IBM.

Also, WH Smith admits, sales of the Advance 86 have been 'disappointing. All three subjects of IBM's wrath will be hoping that, by the time IBM has checked out the new ROM, they will actually have it working, and that they will be able to do a deal to allow previously assembled machines to be shipped — a deal along the lines of the one which IBM struck with Corona last February.

On the other hand, a deal along the lines of one struck with Eagle must also be a worrying possibility — because that deal ended with the collapse of Eagle, and (sources say) its likely bankruptcy in the US courts this month.

Making a quick profit

Since it costs £800 to turn a small Macintosh into a 512k one with Apple's own 256 Kbit chips, and since (if you use cheaper 64 Kbit chips) it costs only £180 to provide the memory, look for Pete and Pam to announce a £400 upgrade which will be very profitable for them in the next month or so.

Details on (0706) 217744.

Sold to Tandy

A communications package for MS-DOS machines (and old CP/M ones) which can handle both Prestel graphic and normal ASCII files, has been sold to Tandy for its model 2000.

The program is called Comm, and is a greatly upgraded version of the original Lion House Comm.Com which appeared two years ago. Unlike many comms programs, this one includes a quite useful text editor.

Details from Lion Micro on (01) 580 4581.

Fair exchange?

The number of people sending in copies of Lotus Symphony and asking for part-exchange on their old 1-2-3 disks is not (says Mitch Kapor) significant.

The original idea at Lotus was that the old (1-2-3) program could be upgraded to the new (Symphony) for only $200, for anyone who sent in a disk with 1-2-3 on it.

It appears to have worked pretty well, with Lotus turnover now bigger than MSA, which was previously accepted as the world's biggest software company. And MSA has shot itself in the foot with too-clever marketing by Peachtree, leaving Lotus home and dry on the top of the software heap.

But Kapor does acknowledge that a trivial, minuscule percentage of Symphony users have asked for their old 1-2-3 back. Critics suggest that the problem is bigger than Kapor would like to believe. 'They have thousands of requests,' suggested one American industry observer, 'and they have a problem in that they don't have the old disks to give back. And we are literally seeing some people who say 'never mind the $200 refund, just give me 1-2-3 because Symphony is too much.' Lotus does have two answers to the problem. For those who simply find Symphony too complex (a minority, surprisingly, of complainers), Kapor reckons time and practice will solve most snags.

For the more significant number of people who find that Symphony won't accept their very biggest 1-2-3 spreadsheet templates, Kapor is launching a new software tool which will give Symphony users more memory inside the IBM PC.

And, coming soon, will be 'add-in applications. These will be new sections of the orchestra (to coin a phrase). 'It's as if we didn't provide a word processor with Symphony, and decided to offer one as an add-in application, part of the Symphony,' Kapor told me shortly before the launch.

The biggest Lotus announcement of the next few months, however, will be the Macintosh version. This isn't the same as Symphony, nor the same as 1-2-3.

Recommended by Sinclair — the £300 colour monitor best suited to the QL is apparently Data Efficiency's Sinclair Vision model.

MBS Data Efficiency will also handle warranty and servicing for the box. Details on (0442) 80155.
As threatened by Quest three months ago, there are now disks for the OL.

Nicely packaged to match the OL styling, including CP/M-88k, they start at £250 for a 200k drive.

Possibly more fascinating in the long term, however, is the announcement that Quest is importing the first micro laser disk storage system — the Shugart Optimem. The only disappointment is that Shugart was talking about a £5000 price when it showed prototypes a year ago, and Quest is talking £1000 for each system attachable to the Apricot or IBM micros. Ah, well, details on (04215) 66321.

Symphony on the IBM family of machines has only one database, with the various application bits and pieces interpreting it in different ways — the graphics session sees it as pictures, the text processor as words, the section sees it as pictures, the different ways — the graphics pieces interpreting it in the text processor as words, the section sees it as pictures, the different ways — the graphics pieces interpreting it in

It's exciting news that Dixons has cut the price of the Hitachi MBE 16002 by half, and stuffed in £900 worth of software (WordStar Professional, Nucleus Generator and Calomaster).

What puzzles me a little, enough to draw it to your attention, is Dixon's claim that this is IBM-compatible. When I tried out a Hitachi MBE 16002, it wasn't compatible, it just used MS-DOS. That may be good enough for most purposes, especially using the software supplied, and at £1295 plus VAT, it's a useful colour system. But if there happens to be a particular IBM program you want to run, better take it along to the store to test.

Dixons also tells me the Hitachi deal is 'unbeatable' — something it says about everything it sells. It means that if you can get a cheaper version, it will refund the difference in price.

It wasn't As threatened by Quest three months ago, there are now disks for the OL.

Nicely packaged to match the OL styling, including CP/M-88k, they start at £250 for a 200k drive.

Possibly more fascinating in the long term, however, is the announcement that Quest is importing the first micro laser disk storage system — the Shugart Optimem. The only disappointment is that Shugart was talking about a £5000 price when it showed prototypes a year ago, and Quest is talking £1000 for each system attachable to the Apricot or IBM micros. Ah, well, details on (04215) 66321.

Symphony on the IBM family of machines has only one database, with the various application bits and pieces interpreting it in different ways — the graphics session sees it as pictures, the text processor as words, the section sees it as pictures, the different ways — the graphics pieces interpreting it in

It's exciting news that Dixons has cut the price of the Hitachi MBE 16002 by half, and stuffed in £900 worth of software (WordStar Professional, Nucleus Generator and Calomaster).

What puzzles me a little, enough to draw it to your attention, is Dixon's claim that this is IBM-compatible. When I tried out a Hitachi MBE 16002, it wasn't compatible, it just used MS-DOS. That may be good enough for most purposes, especially using the software supplied, and at £1295 plus VAT, it's a useful colour system. But if there happens to be a particular IBM program you want to run, better take it along to the store to test.

Dixons also tells me the Hitachi deal is 'unbeatable' — something it says about everything it sells. It means that if you can get a cheaper version, it will refund the difference in price.

It wasn't
**MORSE: THE TOP TEN SYSTEMS**

There's never been a better time to buy a business micro, and there's never been a more friendly store to buy from. Morse have the right products, service, and the greatest value. These are our top ten systems, most with a printer and software at no extra charge. Call today!

<table>
<thead>
<tr>
<th>#</th>
<th>System</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IBM PC “STARTER” PACK.</td>
<td>Our top selling system, the Morse “Starter” package is ideal as the basis for word-processing or spreadsheets. It's got 128K, dual 360K disk drives, and mono display <strong>SAVE £420</strong> with our free dot-matrix printer, cables, paper and disks! At Morse: <strong>£2116</strong></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>IBM COLOUR PC.</td>
<td>This 128K system comes with colour and graphics display. It's great for Lotus 1-2-3, Flight Simulator etc. Morse save you <strong>£520</strong>, because we're giving away a word-processing program, the NEC PC 8023 printer, cables, a box of paper and disks. Now <strong>£2669</strong></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>IBM XT.</td>
<td>The 10Mb Winchester version of the PC. Our two packs both have printers and software. The Morse “Full House” system has 640K &amp; <strong>FREE LOTUS 1-2-3 XT’s from £3645</strong></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>COMPAQ DESKPRO.</td>
<td>All you ever wanted from a computer is in this new superfast computer. Morse stock the Model 4, with internal 10Mb Hard disk and tape backup, <strong>all for £5595</strong></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>COMPAQ PLUS.</td>
<td>Compaq Portable + 10Mb Winchester = strength + value. 256K, Graphics, Colour. We won't let you buy it <strong>UNLESS YOU TAKE LOTUS 123 AT NO COST!</strong> <strong>£3945</strong></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>COMPAQ PORTABLE,</td>
<td>the No.2 PC in the U.S. It's got 256K, graphics, 2x360K drives and of course, portability. SAVE <strong>£300!</strong> Morse supply spreadsheet and database in the price. <strong>£2195</strong></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>APRICOT XI.</td>
<td>With the superfast and super powerful 10Mb version of the Apricot, Morse are giving away the Brother HR15 daisyw heel saving 15% In black and with software: <strong>£2990</strong></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>APRICOT PC.</td>
<td>Compact, powerful, friendly, British. Morse supply the hugely popular Apricot with <strong>FREE £390 PRINTER</strong>, paper and cable. Two disk sizes, 2x720K: <strong>£1990</strong> 2x315K: <strong>£1790</strong></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>APRICOT PORTABLE.</td>
<td>The computer you talk to. 256K, flat 80x25 display, 720K disk, all in 12lb. package. Morse supply this machine from stock with a FREE £95 MOUSE! From <strong>£1695</strong></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>APRICOT F1,</td>
<td>incredible value full specif ication business micro. It comes with wordprocessor, spreadsheet etc. In stock, with FREE MOUSE <strong>£1095</strong></td>
<td></td>
</tr>
</tbody>
</table>

### MORSE HARDWARE

DEC RAINBOW 100, includes 132 column display, dual 400K disks, CP/M 86/80, choice of monitor, floor stand, training and 1 year on-site maintenance from DEC. Was £2295, at Morse only **£1350**

SANYO MBC 555 Complete business system including software, green monitor and printer: **£1350**

TELEVIDEO Tele-PC only **£1790**

### MORSE NEWS

Lotus 1-2-3 now available ex-stock on Apricot **£375**. On demo now, Apricot Point 7 multi-user network.

### OSBORNE EVENT

Morse have purchased a large amount of new, used and ex-demo Osbornes. All are boxed, complete with manuals, software and 30 day warranty. Software: CP/M, WordStar with MailMerge, SuperCalc, C & M-Basics. 80 column display, double density disks, blue casing: £650 52 col d.density, blue case: £450 52 col dd, older brown case: £350 We also have DataStar, SuperSort, cables etc. These bargains will be snapped up, so call in today!

### MORSE COMPUTERS

78 HIGH HOLBORN, LONDON WC1V 6LS. 01-831 0644. TELEX 916509.

---

**SURPLUS**

From our surplus, used and ex-display stock. Call for details on these and many other items.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>TELEVİDEO TS803</td>
<td>CP/M, with software (£2000)</td>
<td>£1600.00</td>
</tr>
<tr>
<td></td>
<td>TELEVISION TPC1 Portable CP/M with Software</td>
<td>£1350.00</td>
</tr>
<tr>
<td></td>
<td>Hewlett Packard HP83 (£1595)</td>
<td>£295.00</td>
</tr>
<tr>
<td></td>
<td>HP787, list £1595</td>
<td>£495.00</td>
</tr>
<tr>
<td></td>
<td>HP 725 A Plotter</td>
<td>£550.00</td>
</tr>
<tr>
<td></td>
<td>HP 7470 2 pen plotter</td>
<td>£690.00</td>
</tr>
<tr>
<td></td>
<td>HP VisCalc, CP/M etc</td>
<td><strong>Phone</strong></td>
</tr>
<tr>
<td></td>
<td>EPSON MX100, list £499</td>
<td>£325.00</td>
</tr>
<tr>
<td></td>
<td>Brother HR1 daisy</td>
<td><strong>£399</strong></td>
</tr>
<tr>
<td></td>
<td>Apple Ile Quickfile</td>
<td>£35.00</td>
</tr>
<tr>
<td></td>
<td>Apple II disk drives</td>
<td>£40.00</td>
</tr>
<tr>
<td></td>
<td>Apple II VisCalc</td>
<td>£40.00</td>
</tr>
<tr>
<td></td>
<td>Apple II VisTrend/Plot</td>
<td>£60.00</td>
</tr>
<tr>
<td></td>
<td>Apple II EasyWriter</td>
<td>£50.00</td>
</tr>
<tr>
<td></td>
<td>Apple II Language Cards</td>
<td>£20.00</td>
</tr>
<tr>
<td></td>
<td>Apple colour/80col cards from</td>
<td>£65.00</td>
</tr>
<tr>
<td></td>
<td>Apple Comm cards</td>
<td>£30.00</td>
</tr>
<tr>
<td></td>
<td>Apple Mailmerge</td>
<td>£15.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Xerox 590 typewriters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ribbons &amp; spare Golfballs from</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sinclair ZX81</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sharp M2804a list £477</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sharp CP/M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CP/M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HP 83 Infomast</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VIP 20 Starter pack, new</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VIC 20 3K RAM pack</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VIC 20 8K RAM pack</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Atari 400 New</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Atari 16K RAM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Apple thermal printer, new</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Used Epson FX80 (almost new)</td>
</tr>
</tbody>
</table>

Many more too numerous to mention. Sorry - no mail order on surplus items - available to callers only. All Morse prices exclusive of VAT at 15%
The news to come is interesting.

What we can expect is that the money Visicorp raised (it got finance from investors, and also sold off the development rights to VisiOn to Control Data) will go into new products from both the Visi and Paladin stables.

In particular, there will be an IBM version of the Flashcalc product which sells quite well to Apple users, and applications to run under the VisiOn 'environment' - in particular, graphics.

A product called PC Paint is due for release very shortly, aiming to offer the sort of enjoyable drafting tools you get on a Macintosh with MacPaint, together with a 'frame grabber' for getting outside pictures into the machine.

Also, prices on VisiOn will come down sharply.

In the UK, the most interesting aspect is that Paladin/Visicorp (PVC?) is setting up a local office under John Wells. Queries to him should be routed through Richard Packer at Rapid Recall on (0494) 26271.

Not so elite . . .

Sanity seems to have reared its ugly head - perhaps only temporarily - in the offices of Acornsoft, from whence comes the amazing BBC Micro game, Elite.

The game uses areas of memory in the BBC Micro which quite a lot of other people use for disk filing system software. The result is that Opus DDDOS won't boot the system, and Microwares DDWS will boot but not run it. Opus reports that 'as a direct result of the good and the bad

As expected when the Einstein was launched, Tatung has come up with a low-cost diskette option for the second drive - a kit.

The disk kit costs £149, and provides around 500K extra. The low cost is because the power supply, cables and controller circuits are already to be found inside the Einstein.

Details from publicity agents Peter Toland or Brendan Hanrahan on (021) 236 7532.

Important discovery

As expected when the Einstein was launched, Tatung has come up with a low-cost diskette option for the second drive - a kit.

Earlier responses from Acornsoft to users who had bought the game, but were unable to run it because of having Microwares disk software, had been cold and unhelpful - very much, it must be said, in the Acorn tradition of doing nothing to make life easy for imitators.

There is, however, a gulf between not making things easy, and being unhelpful to the point of obstinacy; and it's good to see Acornsoft on the right side of the gap.

Elite, by the way, is a cult on other versions.'

"We thought we had the rights," said a distinctly peevish on behalf of the company, "but we now hope to work with the authors on other versions."

My own rating (two weeks after buying the game) is dangerous and I'm on my sixth galaxy.

Mind you, I have a complaint for the manufacturers of the lasers.

I can quite understand that technology is limited. If my lasers are strong enough to destroy the thickness of a space-going trader ship hull, then I altogether accept that they get hot. And after a while, they stop working until they cool down. Fair enough.

But why, in the name of the Pan Galactic Gargle Buster, when the front laser gets overheated, does the rear weapon go too? And why does the mining laser never get hot at all?

ddf will boot but not run it. Opus reports that 'as a direct result of consultations with Acornsoft, we have produced a modified interface which is Acorn compatible, and will allow users to run Elite.'

Microwares says it worked it out by itself, and version 2.0 of the DDWS runs it, fine.

Earlier responses from Acornsoft to users who had bought the game, but were unable to run it because of having Microwares disk software, had been cold and unhelpful - very much, it must be said, in the Acorn tradition of doing nothing to make life easy for imitators.

There is, however, a gulf between not making things easy, and being unhelpful to the point of obstinacy; and it's good to see Acornsoft on the right side of the gap.

Elite, by the way, is a cult on other versions.'

"We thought we had the rights," said a distinctly peevish on behalf of the company, "but we now hope to work with the authors on other versions."

My own rating (two weeks after buying the game) is dangerous and I'm on my sixth galaxy.

Mind you, I have a
DELTA 2

DELTA gives your computer the power to breeze through the management of any record keeping situation — whether it’s stock control, personnel, customer files, mailing, library, car fleet management, club records, or course bookings. DELTA is totally versatile and very user friendly — there are thousands of applications for this exciting program.

Your staff will really enjoy using DELTA. They’ll be able to create their own records, store information, and sort and search the files. DELTA has its own calculation program PLUS its own report generator to print lists, reports, mailing labels and even personalised letters (DELTA has its own letter writing option as standard!)

DELTA also links with LOTUS 1-2-3, MULTIPLAN and WORDSTAR. It’s the perfect way to make the most of your data.

If you haven’t already looked at DELTA now is the time to do so. You can see it at Compsoft’s headquarters near Guildford, or we’ll recommend the best local supplier in your area. Training courses, User Club and 'Hotline' service provide a totally professional after-sales backup.

Ring us today or clip the coupon and we’ll send you a beautiful 12 page full colour guide to database software. Or ring us and we’ll help in every way possible.

DELTA is available for most microcomputers including the IBM PC, Apricot, HP 150, Sirius, DEC Rainbow, etc, etc.

DELTA is also distributed on the IBM PC and PC/XT by IBM UK Product Sales.
Has Apricot gone bananas?

£1,095*
That figure can't be right can it? Sure its rivals are offering half the features for twice the price? Yes and yes. Which makes starting off with any other business computer a no-no.

**HARDWARE MADE EASY.**

Sophisticated as the Apricot Fl is, it's tailor-made for a first-time user. A tutorial is included in the free software to start you off at square one. You'll soon be rattling on about the powerful 256k memory at your beck and call. (ie: lots more room for programs and info)

How the expansion board can treble that figure. Plus the huge 720k disk capacity and Systems Expansion box to increase processing and storage.

Not to mention 92 keys (how does anyone scrape by with 58?) with numeric pad for speedy calculations.

**PIXELS GALORE.**

Any idea what high-resolution sixteen colour graphics mean, resolved to 640 x 256 pixels? Well you'll know it when you see it. It means a brighter pin-sharp colour picture – much easier on the eye during a hard day at the office.

**OF MICE AND MEN.**

Mice make any computer easier to use. Our mouse and the keyboard itself are both cordless.

Like the remote control of your TV set they are worked by infra-red. Simply point the mouse at the screen and twiddle the ball with your thumb to zoom in on the appropriate piece of data.

**PROGRAMS, PROGRAMS.**

Your free software includes a SuperWriter program (word processor, spelling checker and mailing facilities); SuperCalc – a spreadsheet package with financial projections; and SuperPlanner, your “mission control” complete with address list.

**FROM LITTLE APRICOTS...**

Amazingly some of our competitors still have software which is incompatible with some of their hardware.

Rest assured, our Fl can be linked to each and every one of our Apricots. (Along with just about any monitor including your TV)

It will also operate the most advanced software such as D-Base III and Lotus 1-2-3.

So as your business grows, your Fl can grow with it.

Please send me details of the Apricot Fl. To: ACT (UK) Ltd., FREEPOST, Halesowen, West Midlands B63 1BR. Or Freefone Apricot via Operator.

Name
Position
Company
Address
Tel

**THE ANSWER IS AN APRICOT FL**

El 99.95 EXCLUDING VAT. MONITOR OPTIONAL

ACT (UK) LTD., FREEPOST, HALESOWEN, WEST MIDLANDS B63 1BR.
applications written in Trojan,' he said, 'including sales ledger, bought ledger, word processing, stock control and video tape hire management.

But the real reason for the price difference — it costs £250 on the Mimi — is that as part of the BMG, we feel we ought to give our partners a boost.'

Details on (0256) 469871.

System evaluation

Engineers wanting to play with the bigger versions of the IBM PC's processor — 188, 186 and 286 — can get hold of evaluation kits from Intel. The smaller micros cost £117, the big one costs £208. With these kits plus a few hundred pounds of other components, including a hard disk, it would be possible to build quite a big system since they include dynamic memory controller, text co-processor, Winchester disk controller, video interface controller and graphics controller as well as the basic processor chip.

Details from Rapid Recall on (0494) 26271.

Battle of the bulge

Olivetti has 'won the battle hands down' against IBM. I am assured of this by no less a source than Olivetti's new press agency, which has been appointed to 'handle a campaign in which Olivetti's M24 and M21 micros will compete aggressively against the IBM PC.'

Won the battle? What battle? 'Olivetti has no option but to go for the throat,' said Tim Wickes, account director at the press agency. 'IBM's dominance of the PC market has little to do with technology, and lots to do with marketing. One look at the products and you can see that Olivetti has won any technical battle hands-down.'

Now, says the unstoppable Wickes: 'It's gloves-off in the marketing arena.'

I do hope nobody gets trampled in the panic inside IBM HQ.

Backing up Unix

Just one more exciting announcement of a plan 'to increase the amount of software available for Unix System V, the emerging system standard for multi-user computers,' this time from NCR.

The company has teamed up with Unix Europe Ltd to encourage independent software vendors to develop high quality software packages.

What do they get? A list of people with Unix System V Computers, printed on the back of a cigarette packet? Money?

No, they get a 40 per cent discount on the NCR Tower, recommended by Tim Wickes as 'it's gloves-off in the marketing arena.'

TROJAN, the company which has little to do with the products and you can see that Olivetti has won any technical battle hands-down.'

Now, says the unstoppable Wickes: 'It's gloves-off in the marketing arena.'

I do hope nobody gets trampled in the panic inside IBM HQ.

Backing up Unix

Just one more exciting announcement of a plan 'to increase the amount of software available for Unix System V, the emerging system standard for multi-user computers,' this time from NCR.

The company has teamed up with Unix Europe Ltd to encourage independent software vendors to develop high quality software packages.

What do they get? A list of people with Unix System V Computers, printed on the back of a cigarette packet? Money?

No, they get a 40 per cent discount on the NCR Tower, recommended by Tim Wickes as 'it's gloves-off in the marketing arena.'

TROJAN, the company which has little to do with the products and you can see that Olivetti has won any technical battle hands-down.'

Now, says the unstoppable Wickes: 'It's gloves-off in the marketing arena.'

I do hope nobody gets trampled in the panic inside IBM HQ.

Backing up Unix

Just one more exciting announcement of a plan 'to increase the amount of software available for Unix System V, the emerging system standard for multi-user computers,' this time from NCR.

The company has teamed up with Unix Europe Ltd to encourage independent software vendors to develop high quality software packages.

What do they get? A list of people with Unix System V Computers, printed on the back of a cigarette packet? Money?

No, they get a 40 per cent discount on the NCR Tower, recommended by Tim Wickes as 'it's gloves-off in the marketing arena.'

TROJAN, the company which has little to do with the products and you can see that Olivetti has won any technical battle hands-down.'

Now, says the unstoppable Wickes: 'It's gloves-off in the marketing arena.'

I do hope nobody gets trampled in the panic inside IBM HQ.

Backing up Unix

Just one more exciting announcement of a plan 'to increase the amount of software available for Unix System V, the emerging system standard for multi-user computers,' this time from NCR.

The company has teamed up with Unix Europe Ltd to encourage independent software vendors to develop high quality software packages.

What do they get? A list of people with Unix System V Computers, printed on the back of a cigarette packet? Money?

No, they get a 40 per cent discount on the NCR Tower, recommended by Tim Wickes as 'it's gloves-off in the marketing arena.'

TROJAN, the company which has little to do with the products and you can see that Olivetti has won any technical battle hands-down.'

Now, says the unstoppable Wickes: 'It's gloves-off in the marketing arena.'

I do hope nobody gets trampled in the panic inside IBM HQ.

Backing up Unix

Just one more exciting announcement of a plan 'to increase the amount of software available for Unix System V, the emerging system standard for multi-user computers,' this time from NCR.

The company has teamed up with Unix Europe Ltd to encourage independent software vendors to develop high quality software packages.

What do they get? A list of people with Unix System V Computers, printed on the back of a cigarette packet? Money?

No, they get a 40 per cent discount on the NCR Tower, recommended by Tim Wickes as 'it's gloves-off in the marketing arena.'

TROJAN, the company which has little to do with the products and you can see that Olivetti has won any technical battle hands-down.'

Now, says the unstoppable Wickes: 'It's gloves-off in the marketing arena.'

I do hope nobody gets trampled in the panic inside IBM HQ.

Backing up Unix

Just one more exciting announcement of a plan 'to increase the amount of software available for Unix System V, the emerging system standard for multi-user computers,' this time from NCR.

The company has teamed up with Unix Europe Ltd to encourage independent software vendors to develop high quality software packages.

What do they get? A list of people with Unix System V Computers, printed on the back of a cigarette packet? Money?

No, they get a 40 per cent discount on the NCR Tower, recommended by Tim Wickes as 'it's gloves-off in the marketing arena.'

TROJAN, the company which has little to do with the products and you can see that Olivetti has won any technical battle hands-down.'

Now, says the unstoppable Wickes: 'It's gloves-off in the marketing arena.'

I do hope nobody gets trampled in the panic inside IBM HQ.
If you’ve ever fancied a plotter, printer, turtle, robot or mouse, take a look at the Penman which combines all these functions to one degree or another.

The robot plotter costs £217 (as ever, add on the VAT) and can be connected to 'virtually any computer which has an RS232 interface.'

Penman can be commanded to move by programming in the appropriate instructions from your RS232 machine.

But to make life a little easier, application software is available for the Apple II and BBC — and for use with a range of standard business packages on IBM's PC.

Other machines in line for treatment include the Commodore 64, the QL, the Mac and ACT's Apricots. Penman can be contacted on (0903) 209081.

and 'a completely free copy of Unix System V.'

When I was a lad, no worthwhile software developer would touch a minority machine unless he got one free, but we'll see.

At least Tony Lazzerini, marketing manager at OCR for the Tower, has no doubts. His scheme will, he says, 'fuel the growth of Unix as a standard.'

And he adds: 'In exactly the same way that PC-DOS has become a standard because of the large quantity of software available, this program will create the same groundswell for Unix System V.'

'Until recently,' Lazzerini remarks, 'Unix has been criticised because of the lack of applications software.'

We can, certainly, agree with him there. Tower prices start at £10,000, and Lazzerini is on (01) 388 8171.

**Final offer**

While stocks last: the original (but in the smart blue case) Osborne now costs £500, including WordStar, two Basics, and SuperCalc. And with an 80-column board, the price is £660. VAT extra, says Mike Healy, boss of Osborne distributor, Future Distribution.

If you buy one, place an order now for a Drive C RAM disk. With the RAM disk, you find yourself the owner of the fastest WordStar machine in the world, complete with a big printer buffer, and it's just amazing. Mind you, it does cost close to £600 extra — but it's worth it.

Details on (0908) 615274.

**Shooting for the 16-bit market**

The 16-bit bus built into the ITT 3030 is being put to use with a slot-in 80186 processor card.

This announcement — from the Arrow Computer Systems' subsidiary which started marketing the multi-user system in 1984 — gives me a chance to point out that the 8-bit model is based on the Z80, and not the 8088 I referred to last November.

Entry level price for the dual processor version is about £2530, compared to £1440 for the Z80-based CP/M version with one 800k floppy. For 8-bit users wanting to upgrade, the 80186 card with 128k of RAM costs £1147.

For details on the cost of setting up a multi-user system call Arrow on (03727) 42557.

**Small print**

The IBM printer is not, quite, an Epson. The machinery is, but there is a different chip inside it, which doesn't print in exactly the same way as an ordinary Epson.

The price, however, is a little different, which has encouraged Quad Eight/Westrex to come out with its own ROM chip set which it plugs into Epson printers, so that the Epsons behave like IBM Epsons.

The cost is just an extra £20 to £25, says the company, and it has details on (01) 576 0957.

**Live from Comdex**

A computer show with more than 1400 exhibitors spread over six sites is not the easiest place to find new products — especially when there are Las Vegas's other distractions to contend with. But Macintosh-related activity, another second processor for the McCarthy, and three new portables stood out.

Among the add-ons for the Mac was the Hyperdrive from General Computer — an internally mounted 10Mbyte hard disk unit which loads Macpaint in seven seconds as opposed to the usual 22.

Macphone is a telephone management system from Inter-Matrix with an auto-dialling handset attached. The accompanying software includes a phone directory, a calendar, a memo pad and a time-billing facility.

Macphone will prove to be interesting competition for Warner's Desk Organiser, which was previewed for the Mac. They both offer similar features. However, the Macphone may have the edge as it can run concurrently with other packages.

Although Lotus was not exhibiting at the show, its Jazz integrated package was demonstrated on the Apple stand — combining word processing, spreadsheet analysis, database management, communications and business graphics.

Acom previewed the 82016 second processor which will be connected to the BBC Micro via the Tube. The 82016 is accompanied by C, Pascal, Lisp, Fortran 77 and up to one megabyte of memory.

Three new laptop computers were launched or previewed, ranging from the $3000 Texas Instruments Prolite, through the Sord IS-11C to the $999 NEC PC8401A. The Prolite features a 16-bit 80C08 processor, 256k RAM, an 80 x 25 LCD display and a built-in 720k, 3½in drive. Via the expansion bus at the back of the computer the user can add a range of peripherals including a second drive, a modem and a portable thermal transfer printer. Files created on the Prolite can be transferred to an IBM PC or TI Professional via a PC interface.

The Sord IS-11C is also PC-data compatible but only via an additional cartridge. The basic Sord machine has a 280A processor, 80k of RAM, an 80 x 25 LCD display and a built-in microcassette recorder. The Sord IS-11C also offers a bundled-in word processor and communications package.

Bundled software is the major feature of the new NEC portable, the PC84108, as it includes portable CP/M, WordStar-to-go, Calc-to-go, and Personal Filer. It has a PD 70008C processor (280-compatible), 64k RAM, and an 80 x 16 display.

Infocom announced its entry into the business computing market with the preview of its database applications program, Cornerstone. Cornerstone is aimed specifically at the non-technical user: it contains some helpful features such as field length, which can be changed at will, and a built-in calendar which understands input such as 'last Friday' and 'next month'. Cornerstone will cost $495 and will soon be available for the IBM PC.
Our US reporter, David Ahl has encouraging news for word processing users, and announces tough competition in the disk market.

1984. On the bright side, the company announced it had become profitable as of September 1984.

Knoware Inc, founded by two MIT professors, marketed an interesting software package that purported to teach executives how to climb the corporate ladder by learning how to use their personal computers. Apparently it wasn't well received, and Knoware recently filed for liquidation.

At the 1984 Softcon show, Ovation was touting a new integrated software package. 'It will run rings around Symphony, Framework and Windows,' said the enthusiastic Ovation personnel. But the product was never completed. Today, after discarding most of its 40 employees, the firm is for sale. Ever optimistic, president Thomas Gregory hopes that someone will eventually market the product.

Handwriting on the wall? In June 1984, Rodney Zaks of Sybex Computer Books invited 20 notable computing pioneers to Pioneer Days in San Francisco. It was a gala media event. Then, three months later, each of the pioneers received a letter from the credit manager of the Hyatt Regency which said: 'Sybex has not paid for your account and your charges have been placed on your personal credit card.' Pretty shabby, Sybex.

For a games software maker the busiest season is before Christmas, but that was when Activation laid off 30 more workers. In just a year, the workforce has decreased from 400 to 150. President James Levy expressed hopes that the bottom has been reached and the market will rebound.

Random bits

IBM is overwhelmed with orders for the AT. Dealers have been put on allocation and the lead time to get a system is now about three months. IBM has also announced a further delay in the shipment of Microsoft Windows from November 1984 to June 1985. Apparently the designers are having trouble with speed, graphics capabilities and reliability... Microsoft isn't alone. Gordon Mustain of Rising Star announced yet another delay in the release of Valdocs 2.0 for the Epson OX-10 to increase the speed of the word processing module and add additional features...

Film giant Eastman Kodak has entered the floppy disk business. Initially it plans to sell disks made by Ovation and several other domestic and foreign producers, prior to producing its own media in Guadalajara, Mexico. Hotels are becoming more responsive to the needs of modern business travellers. For example, the Hyatt Regency in Phoenix rents an IBM PC (and software) for $6 per hour. In Minneapolis, the Omni Northstar rents an IBM PC and printer for $10 per hour; Lotus Symphony costs an additional $10... Having lost $3 million in the first nine months of 1984, Management Science America (MSA) has put Peachtree Software up for sale. So far, no takers. Peachtree recently bought two educational software publishers, Enterware and Design Ware but killed off the Edu-Ware label. Now, Design Ware plans to re-introduce the label... Deserting the ship? Ronald Mickwee, chairman of Eagle Computer, recently sold his entire stock holdings of 128,500 shares... Doubleday paid one of the biggest advances ever for a computer book, $1.3 million, to Stewart Brand for the Whole Earth Software Catalog. To make money on the deal, Stewart expects Doubleday will have to sell more than 500,000 copies. I'd be surprised if it touches 100,000... Rumours: VisiCorp will merge with a new Sunnyvale-based company, Ballard and founders Dan Fystraf and Peter Jennings will not have a role in the new company... Apple will discontinue the Lisa line in 1987 and concentrate on the larger Macs plus a new 16-bit Apple IIx.
THE RIGHT TOOLS FOR THE JOB?

If you've been looking around for business software, you'll probably know all about the latest gadget. It's called "integrated software". A little bit of everything, crammed into one do-it-all package.

But if you're really serious about running your business, you'll know how important it is to get the best possible tool for every job.

That's why we developed Smart Software. The Smart Word Processor, the Smart Spreadsheet with Graphics and the Smart Data Manager are all state-of-the-art, fully-fledged packages in their own right. On their own, they match the best. Yet together, they integrate totally in every way to form a complete software system.

If you think your business might need something a little more powerful than the latest all-in-one software gadgets, you're in good company. A group of America's top corporate decision makers recently voted Smart Software the overwhelming victor in an integrated software showdown that included Lotus Symphony© and Framework© from Ashton Tate.

Call one of our distributors now for more details about Smart Software. It could be one of the smartest moves you'll ever make.

Paradigm Southampton House 192-206 York Road
London SW11 3SA Tel: 01-228 5008 Telex 8954575
MBS Soft Ltd Unit A Horton Trading Estate Stanwell Road
Horton Slough Berks Tel: 02812 4515 Telex 848945

Smart Software
from Innovative Software Inc.
Smart Software is a registered trademark of Innovative Software Inc.
War of the standards

Sony's 3½in micro diskette is gaining acceptance as the de facto standard for the micro-size floppy disk. There has been a lot of confusion and competition on whose floppy would emerge victorious: among the contenders were Sony's 3½in, the Hitachi and Matsushita group's 3in and Dyson's 3¼in. The reason for this is that the world's largest disk drive manufacturer, Y-E Data Company of Tokyo, has recently announced the result of its year-long evaluation on micro disks. The company's report concluded that the 3½in was the best for business applications, taking into consideration the manufacturing costs of the drives.

Y-E Data spent more than a year evaluating drive production technology, which included the drive performance and reliability aspects of both the 3in from the Hitachi/Matsushita group, and the 3½in from Sony.

With Y-E Data's announcement, the number of manufacturers adapting to the 3½in drive will probably rise dramatically. The focus of Y-E Data's evaluation was placed on a drive's reliability in business use when mass produced at low cost. For business use, a disk drive must be compatible with 8in disks and have a storage capacity of 1.6Mbyte per disk. Y-E Data concluded that the mass production 1.6Mbyte 3in drive will be far more costly compared to the cost of producing a drive of the same capacity using 3½in drives.

Toshiba has received an OEM order of one million 3½in diskette drives from the US giant IBM. Toshiba was among the 20-plus contenders who fought for the big order. Toshiba has only recently joined the disk manufacturing business, and had originally been planning to produce 3in drives. However, because of IBM's decision and Y-E Data's evaluation, it quickly switched its production line to the 3½in drive. The company's production capacity is presently 200,000 units per month. It would now appear that buying a 3in series diskette drive, other than the 3½in Sony version, would be risky.

Y-E Data has not yet revealed its findings on the disk size for home hobby computers.

Lighter printing

Liquid crystal printers claiming to be the next generation printers will be available soon. Epson and Casio have both announced their products for the spring. The liquid crystal (LC) printer prints one full page at a time. LC printers have a similar capability to laser printers. However, the cost of an LC printer is much cheaper than a laser printer due to its simple printing mechanism. It can also produce a very high quality printing result at high speed.

The heart of the LC printer is the part called the 'liquid crystal shutter.' Light is unable to pass through the liquid crystal board when a certain amount of electric voltage is applied. As soon as the voltage is removed, however, the light can freely pass through. By inserting a number of micro-size liquid crystal boards between the light source and the light-sensitive drum, the LC shutter controls the printing function.

Unlike a dot-matrix printer which forms characters by arranging the dots, the LC printer can achieve a high quality and high density printing result, and reverse printing is a very simple process.

Watch this space

Casio has started shipping data bank wrist-watch computers. The new watch, called the 'Casio data bank read sensor', can recognise the handwritten alphabet and numeric characters. Characters you write on the glass surface of the watch with your finger become input data to the device and are consequently stored in its memory.

The watch can store a maximum of one kbyte of data — the equivalent of 50 names and telephone numbers. Each entry consists of eight alphabet characters and 12 numeric digits. The watch features an eight-digit calculator function which also uses the same handwritten character recognition. The product costs $70, and is the result of Casio's integration of its two earlier products — the character recognition wrist-watch calculator and the data bank wrist-watch with touch-key input function.

Dressed not to kill

A special cloth to protect the human body from potentially harmful electromagnetic radiation has been announced from Takase Co of Osaka. Government health authorities in Japan have not yet reached any specific conclusion as to the risk of radiation on the human body, but Takase has quickly taken advantage of the average VDU user's fear. The idea is that by wearing a cloth made of a special material called 'metax', you are protected and safe from the effect of the harmful electromagnetic fields commonly found in any computing hardware environment. Metax is made of polyester and coated with a thin nickel film. It is claimed to help reduce the electrostatic charge in the human body.

IBM moves to Japan

IBM Japan has announced a series of new 16-bit micros for the Japanese market. The machines are marketed as the lower end systems of the existing IBM 5550 16-bit business micro which has sold well in Japan for nearly two years. The new series consists of four models - JX1, JX2, JX3 and JX4 (the JX1 is the low end system and JX4 the highest). The series was designed by Fujisawa Lab of IBM Japan, and Matsushita will manufacture them — which is the same arrangement as its predecessor, the 5550, had. All JXs use the Intel 8088 chip (the same as the IBM PC and XT) and run PC-DOS 2.1 (the JX version). This processor/OS combination makes the new machines program-compatible with the IBM PC. Data compatibility is also offered with a 5¼in diskette. With this data and program compatibility, the vast choice of PC software has finally reached Japanese shores.

The low end model JX1 has 64K RAM but the JX4 can have a maximum of 512K. Although the JX1 has no disk unit, the JX4 can have up to three 3½in Sony standard drives. The series uses a TV set as the display unit and costs $550 for the JX1 with no diskette drive and £1240 for the JX4, which includes a twin 3½in diskette unit. The JX series covers the range from PC Jr to the higher end of the PC and there are three operating modes. Japanese is the main processing mode but the PC mode is also supported.

Going into overdrive

Hitachi has developed a desktop mass floppy disk drive which has a capacity of five gigabytes per spindle. The machine stores 500 tightly-packed 8in floppy disks in a small, sealed case and rotates all 500 together by a powerful motor.

The most notable feature of the device is its low cost. While it offers a massive storage capacity comparable to higher end hard disk drives, the cost per bit of the new device is only one tenth of the hard disk because it uses low cost floppy disks. Each floppy disk is separated by a 'spacer' made of stainless steel. The data transfer speed of the device is 0.7Mbyte/s. This is faster than an optical disk. An interesting development to watch.
"I'M A TOSHIBA HX10. I'VE GOT ALL THE BEST BITS FROM EVERY OTHER HOME COMPUTER. AND MORE. I HAVE A 64K MEMORY, LIKE THE COMMODORE 64. A CASSETTE INTERFACE, LIKE THE BBC. TWO JOYSTICK PORTS, LIKE THE COMMODORE 64. A BUILT IN POWER SUPPLY, LIKE THE BBC. 16 USEABLE COLOURS, LIKE THE ACORN ELECTRON. OVER 70 FULL STROKE KEYS, LIKE THE BBC. A CARTRIDGE SLOT, LIKE THE COMMODORE 64. A PRINTER INTERFACE, LIKE THE ORIC ATMOS. SOUND OUTPUT THROUGH THE T.V., LIKE THE COMMODORE 64. AN AUDIO/VIDEO OUTPUT CONNECTION, LIKE THE COMMODORE 64. RF BUILT IN LIKE THE BBC. AND: A SEPARATE 16K VIDEO MEMORY, UNLIVE MOST NON-MSX COMPUTERS. 32 SPRITES, MORE THAN MOST NON-MSX COMPUTERS. AND I USE MICROSOFT EXTENDED BASIC, LIKE EVERY OTHER MSX COMPUTER."

"NOW, WITH A SPECIFICATION LIST LIKE THAT, NO WONDER YOU'VE GOT A 64K MEMORY."

You'd expect one of the best-selling home computers in Japan to have a specification list as big as its memory. But the Toshiba HX10 doesn't just limit itself to that. It was developed along with other Japanese home computers to operate on one language: MSX. You can swap programs, games, cassettes, even peripherals like disk drives, printers, and joysticks: they're all compatible with every other MSX computer. All of which makes MSX the system of the future.

So if you want a computer that won't be obsolete in a few years, buy an MSX. If you want one of the best-selling MSX computers in Japan, buy a Toshiba HX10.

TOSHIBA

FOR MORE INFORMATION ON THE TOSHIBA HX10 CONTACT TOSHIBA (UK) LTD., TOSHIBA HOUSE, FRIMLEY ROAD, FRIMLEY, SURREY GU16 5J. TEL: (0276) 681691.
After everything that's been said in praise of Amstrad's CPC464, is there anything to add?

Plenty.

The CPC464 is an enthusiast's dream come true.

Few applications are beyond its capabilities, with its sophisticated features, complete expansion bus connector for sideways ROMs, serial interfaces, disk drives and modems.

No wonder the press is in raptures over it.

**The CPC464 system.**

It comes complete and ready-to-go. Here's what you get for that incredibly low price.

- 64K of RAM (42K available), 32K of ROM, colour monitor or green screen VDU, typewriter style keyboard, integral cassette data recorder and a very fast extended BASIC.
- The CPC464 offers you high resolution graphics, 80 column text display, up to 8 text windows plus a graphics window and a palette of 27 colours.
- Not to mention a 3-voice, 7-octave stereo output you can feed through a hi-fi amplifier and speakers.
- Now we think you'll agree, that's some system.

**Low cost disk drive.**

An inexpensive floppy disk system is available which includes CP/M* (giving you the option to access 3000 proven programs) and LOGO with its famous educational applications.

Optional disk drive DD1-1 including interface CP/M* and LOGO £199.95

---

CPC464 green screen VDU (GT64)
The first low-cost personal computer to be approved by the British Electrotechnical Approvals Board.

Printer port.

The CPC464 has a built-in standard parallel printer interface which offers you the facility to provide permanent reference of program listings, letters, invoices, anything that requires ‘hard copy’.

Optional 80 column dot matrix printer DMP-1 operates at up to 50 characters per second. Combined with the CPC464, it offers a high performance text processing system for only £199.95.

Joysticks.

Power supply modulator.

You can bring those arcade games stunningly to life with the optional joystick controller which has a socket for a second stick.

The optional power supply and modulator enables the CPC464 to be connected to any home colour TV.

Amsoft. Fast growing software.

The high quality software takes full advantage of the CPC464’s high speci- fication and speed loading capability. Which means even complex programs can be loaded quickly.

A range of software is already available. And it’s growing rapidly.

Educational programs, business applications and arcade games are all designed to utilise the CPC464’s impressive graphics, sound and processing abilities.

£249
Computer complete with green screen VDU (GT64)

£359
Computer complete with colour monitor (CTM640)

CPC 464 complete with monitor and dataducer

Amstrad Club Membership.

Whether you’re interested in commercial applications or you’re a games fanatic, you’ll want to join the Club.

Members enjoy immediate benefits like the privilege card, Club binder, regular magazine, competitions for valuable prizes and contact with other Amstrad users.

Boots Comet Dixons
Menzies Rumbleows AND OTHER COMPUTER STORES

I’d like to know more about the exciting CPC464 complete computer system.
Please send literature right away.

NAME
ADDRESS

To: Amstrad Consumer Electronics plc, Brentwood House, 169 King’s Road, Brentwood, Essex CM14 4EF Tel: Brentwood (0277) 228888.

†Trade mark Digital Research

ONE GREAT IDEA AFTER ANOTHER

POSTCARD:

PCWF

The first low-cost personal computer to be approved by the British Electrotechnical Approvals Board.
Each to his own

With reference to your Benchtest of the Sharp MZ-5600 (November 1984), I would like to take issue with a comment made by the reviewer.

In the opening paragraphs of the article, the reviewer states that he is puzzled by 'the thinking behind the choice of outdated CP/M-86 and a non-IBM PC compatible implementation of MS-DOS'.

This reminds me of the early days of microcomputer use when quite a few of the 'uninformed' were convinced that if it wasn't TRS-80 compatible, it was antiquated. IBM-DOS has been through as many as three versions, none totally compatible with the other. After Digital Research stuck out so long for compatibility and achieved a de facto standard with CP/M-86, it became necessary to bring out an operating system for the 16-bit world. CP/M-86 was born, and the level of compatibility with the old CP/M-80 is very high. This has led to software becoming available for a CP/M-86 in a very short amount of time. Wonderful—then along came MS-DOS; the differences between the operating systems being quite trivial, yet enough to make programs for CP/M-86 incompatible with MS-DOS—no advantage. Shortly after, Version 2 of MS-DOS arrived, which is not even fully compatible with the first. The IBM name carries a lot of weight and many have copied the machine (as many copied the TRS-80), and if you want to rip off someone's software, then the compatibility between different machines makes that easy. But if you want a fast, efficient computer with decent graphics, then the IBM PC is very slow (like another de facto standard with MS-DOS) and the graphics are very average. MS-DOS is permanently damaged files with the greatest of ease, while its successor, MS-DOS II, is actually slower (in implementations I have seen) than the first version. I would argue that the rush for compatibility has slowed down progress in the 16-bit world by an intolerable amount.

Take a look at the Zenith Z100, an 8/16-bit machine, totally compatible with both CP/M-80 and CP/M-86 simultaneously, as well as (if you must) a 'kind' of MS-DOS. There are other examples of fast, efficient, cost-effective machines: the Sharp MZ-5600 looks to me like another potentially good example.

For my money (and I've used and dealt with professional machines for quite some time), forget IBM compatibility and take each machine on its merit. If it runs CP/M-86 or even CP/M-80, you won't find any shortage of software. When Digital Research finally gets Concurrent CP/M-86 right (how many perfect working installations have you seen?), then with any luck this will kill off MS-DOS altogether (Concurrent runs MS-DOS programs, MS-DOS does not run Concurrent CP/M-86 programs). Until then there are thousands of packages available for CP/M-80 and CP/M-86.

P Scargill, London

WordStar below par

In your September issue's 'Teach yourself Lisp' series, Dick Pountain makes the amazing assertion that 'Lisp people tend to be Spartan, almost monastic souls, unspoiled by full-screen editors... Boy, has he got it wrong!' Poor souls who struggle with Lisp on personal machines may think WordStar is good, but those who use real Lisp systems such as InterLisp, MacLisp, and so on would liken using WordStar to using a hand calculator. Their editors are probably the most sophisticated in the world: they'll automatically indent functions for legibility as they are typed in, balance brackets for you, and move whole nested brackets expressions about as one piece. Add to that the fact that they'll let you work with several files at once, each in its own window... They'll also automatically draw up calling trees (the Lisp equivalent of flow charts) of the routine you're using and all those called by any it calls. And if you ask them nicely, they'll even go away and find out where the function you are working with is called, and show you each call in turn. And all these functions are called up by a mouse... I don't think WordStar is quite up to that lot, is it?

Robert Inder, Edinburgh

Multi-lingual bent

Tony Hetherington's answer to Dr Alex Longhurst of Leeds University (''Viva Espana! Computer Answers,' November) engaged my attention, as I recently tackled the same problem with a vastly more humble machine than the IBM PC, namely my Commodore VIC-20 (with expanded memory and an 80-column cartridge), on which I run Word Manager for word processing.

I needed a character set which included the normal alphabet, plus the seven special characters used in the German language. These seven are included in the ROM of my printer (a Star Gemini 10X - which offers eight international control codes), but two special characters cannot be accessed because of the necessary ASCII codes when in Text mode.

The French language, which I shall also be requiring, poses an even greater problem. Once again (with the Gemini 10X) two of the special characters require the missing ASCII codes, and in addition the circumflex accent is a separate character which needs to be printed by backspacing - a function not included within Word Manager.

The answer has proved to be the writing and saving of a 'Download Character Set' program, with which I program my printer by loading and running it immediately before running the Word Manager program. Certain standard characters must, of course, be sacrificed. Before typing this letter I programmed my printer for my German character set, and I am therefore able to demonstrate how I have reallocated certain keys (which fortunately are not usually needed for normal narrative text):

Key

Print

Left arrow
A

Encircled 'a'
B

Up arrow
ä

LH square bracket
O

Right square bracket
U

Greater than
ü

A French character set requires 10 rather than seven special characters, which does stretch the capacity of the VIC-20 keyboard to the limit. I have come to the conclusion that, above the seven keys detailed above, as for German, it is probably the 'hash', the '&', and the '}' which will have to be reallocated.

I note that Dr Longhurst's budget figure for a word processing package is £4000. You may be interested to know that my own system, which has an 80-column display, a typewriter-style keyboard with programmable printer, and is disk-based, can be obtained for about £850, including VAT. Word Manager may not be as sophisticated as WordStar or Perfect Writer, but it does have 80 columns and full onscreen editing and formatting, plus plenty of other very useful functions, and it's probably the best word processor available for the VIC-20.

My hardware is as follows: Commodore VIC-20 (obsolete but still obtainable at some stores); Stack four-slot motherboard; 16k RAM cartridge; Display Manager 80-column cartridge (with which Word Manager is 'bundled'); Commodore 1541 disk drive; Star Gemini 10X printer; Star Universal/Commodore parallel interface; and a Philips V7001 'green screen' monitor.

As regards price, the above system is unlikely to be
beaten until a disk drive becomes available for the Amstrad CPC 464. I very much enjoy reading your magazine.
John W Dunster, Chigwell, Essex

Advance problems resolved
I have recently purchased the Advance 86B personal computer, produced by Ferranti and marketed by WH Smith. There have been suggestions that the after-sales service and maintenance are inadequate. I had cause to utilise the service after a board came loose following a jolt during transport. The service was conducted by a company called NAS, and I'm pleased to say it was carried out in a friendly and efficient manner within 24 hours.

However, I have a Juki 6100 printer, also now marketed by WH Smith, and I had problems finding out how to configure Perfect Writer, supplied with the Advance 86B, to run this printer. After consulting the British division of Perfect Software Inc, it transpires that the Juki 6100 can use the same configuration as the Diablo printer which is already programmed into Perfect Writer. Thus, depending on the daisywheel used, the Juki 6100 can be run on the Diablo 10, 12, 15, or PS settings. I hope this is of assistance to anyone purchasing the same combination.
KA Kristianson, Kingston, Surrey

In defence of C
I feel I must defend the C programming language against Dr Jovett's accusations ('Slow, slow, Quill Quill slow', Communications, November).

Dr Jovett refers to the fact that C's handling of strings is not part of the language; movement, comparison, and so on are all performed by calls to a run time library. While this may appear cumbersome in the source code, it is not necessarily a slow method; those routines should be written in assembler and would be very fast on a 68000, even when moving data one byte at a time. A string move can be written in five lines of assembler and moves 200,000 characters per second (from memory to memory).

Also, since C strings are delimited by a closing null (zero code), they need not be counted to be moved — the string move simply checks for a zero in its source string. There is also the point that using strings is not the best way of handling text in buffers. Moving a paragraph might be better done using pointers to the start, finish, and destination of the block, the length of the paragraph being found by simple subtraction.

The real cause for Quill's poor performance (short of dreadful design) is likely to be the operating system interface which puts the characters back on the screen. I can't comment on this, since I don't own a QL.
Mike Corlett, Ilford, Essex

The Nascom lives!
We were horrified to read in your article 'Accessible Amstrad' (November PCW) that the Nascom is no longer in production.

While we have discontinued the Nascom 1, which was the original machine, we are still manufacturing substantial quantities of Nascom 2 and Nascom 3 systems.

The Nascom 2 is available in both kit and ready-built form and together with the advanced video controller, floppy disk controller, 64k RAM, and many other accessories, still offers both the hobbyist and professional user one of the most flexible systems. The Nascom 3 utilises the Nascom 2 together with a number of other boards to form a complete standalone machine running under either CP/M or NAS-DOS.

Should further details of products be required, then we would be only too happy to supply details on request.
Peter Seddon, General Manager, Lucas Logic Ltd, Warwick

Setting new standards
I read with considerable interest the article by Mike Liardet on the newly released version of Logo by LCSI for the Spectrum (October PCW). I found the review topical because of the current educational interest in Logo and the significant scarcity of anything like full versions for the common educational microcomputers. One point, however, I feel is worthy of some further attention.

The use of Benchmarks is admirable, but if they are to be of use to readers in evaluating a version of Logo for their particular purposes, the Benchmarks must reflect both the language facilities and the type of use to which the language is to be put.

In the case of the Basic Benchmarks developed by PCW, they are useful because they use common Basic statements ignoring only graphics, filing and system commands. They use a good cross section of the statements which 'average' programmers will use on 80 per cent of the lines of their programs, and they separate the statement types. Translating them into Logo is, I feel, not useful. The Benchmarks do not test the graphics which most users of Logo will feel important, nor do they test the effective memory size which will limit the depth of recursion and the number of procedures which can be used. The list processing properties have likewise been ignored.

The Hilbert Benchmark, while producing a pretty picture, includes rather too many types of statement to enable a user to disentangle their various time effects. A new set of Logo Benchmarks is needed, and it may be prudent to give this matter some thought considering the wide use of the PCW Basic Benchmarks.

SJ Waller, London SE2

We'll be publishing some Benchmarks especially written for Logo in the February issue. Let us know what you think of them — Ed

A matter of speed
In his review of the word processor Workwriter (November PCW), Peter Jones described as fast a save to disk of 80 lines in 9.5secs. I think this is very slow.

I have an Apricot (two x 320k) which I use a lot for word processing, and I found the SuperWriter package tiresome in its slow writing to screen and disk, and constant use of overlays. I am currently using a word processor called PRO-TEXT, priced at £125 plus VAT from MLH Technology, Comberbach, Cheshire, which does not depend on overlays and is fast enough, both to screen and disk, to avoid frustration.

'Dear Timmy, we apologise for the somewhat late delivery of your patent micro computing machine . . .
For example, the average document, which is not restricted to 80 lines, once in the workspace, can be saved in about a second.

MLH is perhaps better known for its DeSmet C package, and it was when buying this that I found the company was developing a word processor. I have a special interest in PRO-TEXT, in that I served as a guinea pig in its later development; nevertheless it has met my needs, and it shows what can be done.

AD Ryder, Bolton, Lancs

**Inadequate accuracy**

Now that Sinclair has settled down to supplying customers with the JM version of SuperBasic with the QL, may I offer an update on the published Benchmarks:

<table>
<thead>
<tr>
<th>Model</th>
<th>QL</th>
<th>QL*</th>
<th>BBC*</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM1</td>
<td>2.1</td>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>BM2</td>
<td>6.4</td>
<td>6.6</td>
<td>3.1</td>
</tr>
<tr>
<td>BM3</td>
<td>10.7</td>
<td>9.6</td>
<td>8.2</td>
</tr>
<tr>
<td>BM4</td>
<td>10.3</td>
<td>9.3</td>
<td>8.7</td>
</tr>
<tr>
<td>BM5</td>
<td>13.2</td>
<td>11.8</td>
<td>9.1</td>
</tr>
<tr>
<td>BM6</td>
<td>26.1</td>
<td>24.4</td>
<td>13.9</td>
</tr>
<tr>
<td>BM7</td>
<td>61.8</td>
<td>42.7</td>
<td>21.4</td>
</tr>
<tr>
<td>BM8</td>
<td>25.8</td>
<td>20.9</td>
<td>51.0</td>
</tr>
</tbody>
</table>

Ave 19.6 15.8 14.6

*Taken from previous PCW reviews*

This shows the worthwhile increase in speed which the latest version of SuperBasic offers. The point that the QL offers a useful increase in speed over both the BBC and the Commodore 64 on more complex programs such as polynomial curve-fitting, has already been made by others. However, I would like to question Sinclair's design philosophy which has given us a serious computer whose mathematical accuracy (7 sig fig) is worse than most £10 hand-held calculators.

While I don't suppose many businessmen dealing with figures bigger than £99,999.99 would buy a QL, this is clearly inadequate for many students. There seems to be a growing market among financially hard-pressed postgraduates for cheap, serious computers; I know of at least three in Oxford who have bought QLs for word processing. Having bought a QL myself, my money is now waiting for the first decent, double-precision floating point compiler to be offered. In trying to create a new market sector Sinclair might have just missed the boat!

Roger MacNichol, Oxford

**Fighting off...**

Having an interest in both classic motorcycles as well as computers, I observed the advent of the MSX machines with some trepidation. It reminded me of the early Sixties when Japanese motorcycles came on the market. They were simple, reliable and cheap; just what the public wanted, even though the Gold Stars and Bonnevilles of the time were much more powerful.

The question I keep asking myself is: have the Japanese realised the public's needs with MSX? Are the BBCs and QLs not akin to the Gold Stars and Bonnevilles?

Beware that the British computer industry does not suffer the same fate as the British motorcycle industry.

Huw Williams, Clwyd

... the Japs

Nobody can ignore the fact that the Japanese MSX micros have finally arrived. Although they are clearly overpriced, prices will no doubt fall in time. Their standard may at first appear a boon, but I believe that it's probably their downfall. When you strip a micro down, what is it? The processor, the basic sound, graphics and interfaces. If you standardise these things, what are you left with? The same machine in a different coloured box. There will be small variations: different keyboard layout, printer ports in different places, and so on. But the result could be that instead of choosing between, say, a Spectrum, an Electron, a Commodore, a Goldstar MSX, Hitachi MSX and Toshiba MSX, the choice would be between a Spectrum, an Electron, a Commodore and MSX. Once the choice for MSX is made, then the choice of which MSX is made. So, instead of the market being divided into sixths it will be divided into quarters. This would mean that MSX companies will have to share a quarter between, say, 10 companies and the likes of Sinclair will get a full quarter.

While Toshiba and Hitachi can put up with a reduced share of the market they will not have the same punch as was expected. This may cause some of the smaller companies to pull out of the market or go under.

A Kelly, Birkenhead, Merseyside

**The early bug catches the man**

I recently saw the film Edison the Man (1940) on television. In it, Edison is portrayed saying: 'Jumbo (the dynamo) developed some bugs at the last minute.'

1940 is a bit early for 'bugs', isn't it?

David Ainsworth, London SW15

**Beethoven's last laugh**

I have been a professional computer user for many years during which period I have been a regular reader of PCW.

I thought that I was immune to the necessary but occasionally informative evil of advertising. However, the brainless twit(s) who designed the double-page advert entitled 'Roll-over Beethoven' for Island Logic designed the double-page advert entitled 'Roll-over Beethoven' for Island Logic on pages 300-301 of the November issue plumbed new depths of bad taste. The very idea that these megalomaniac morons could believe that their music program would turn the 'average man in the street' into a towering genius like Beethoven I find truly incredible.

I'm sure that the only thing in this advert that would make the late Ludwig turn in his grave (at about 10MHz I should think) would be the smug little conclusion that 'Mr Beethoven, as you decompose, we compose'.

Ugh!

Les Hatton, New Malden, Surrey

(Music packages may be fun but they're no competition to Beethoven. I hope the review of similar software in this month's issue puts things into better perspective — Ed)
PICK UP THE PHONE FOR THE BEST PORTABLE PACKAGE.

(0280) 816087

APRICOT from £895

SANYO from £749

OSBORNE from £1295

SANYO = ===

EPSON QX10 £1735

EPSON PX8 £798

FREE WITH EVERY SYSTEM:-
Bundled software including Word Processing, Spreadsheet BASIC and Operating System.

(ALL PRICES + VAT)

Impartial advice from trained consultants.
On site training.
On site servicing & fully equipped workshops.
Complete After Sales telephone support.

FRASER Associates Limited

1 Bristle Hill, Buckingham MK18 1EZ Telephone (0280) 816087
State of repair

Martin Banks takes his toolkit to the tricky problem
of micro maintenance and insurance.

Once upon a time, a friend of mine got a job as a computer operator. When he was enroled in his chair and had vaguely learned how to twiddle the knobs, he invited me over to visit him in his new abode.

When I arrived, I found him sitting at a large console surrounded by several very large metal cabinets. 'There it is,' he said, 'a Ferranti Atlas computer.' The Atlas was one of those classic 'computer-the-size-of-a-house' machines, full of thermionic valves and other gizmos. This one also had Gordon.

Gordon, my friend informed me, came with the Atlas from Ferranti. He was the resident engineer and spent his working day rummaging around in the bowels of the machine, clutching a soldering iron and a screwdriver. Making the Atlas work was no job creation scheme: Gordon worked long and hard to ensure that the beast carried out its (now relatively menial) duties. He was also a whizz at making the beast play Christmas carols on its loudspeaker a long, long time before the likes of Commodore and Sinclair came on the scene, but that's another story.

Computing has come a long way since then, to the front parlour, the pocket and beyond. The subject of Gordon, or, more specifically, the subject of maintenance and repair, hasn't come quite so far.

To the majority of professional computer users (that is, those who run mainframes and minis in the traditional way), the need for a fast, reliable maintenance and repair service is well appreciated. A computer system of that type represents a considerable investment, and the best way to make it pay is to keep it working efficiently. This understanding of the subject has been good enough to allow a whole industry of third party maintainers to grow up to complement the manufacturers' service departments. They have accurately costed out the economics of maintenance to the point where every user knows that he is signing for an extra charge of 10 per cent of the purchase price per year as the cost of maintenance. This is all well and good where the purchase price is £50,000 or more; however, 10 per cent of that still represents a sizeable chunk of money, and a fair amount of service can be provided for it.

Down at the micro end of things, the situation is rather different. Five thousand pounds represents the all-up price of a handy, small business system — something like an IBM PC, Apple, Macintosh or ACT Apricot, with software and a printer. The majority of computer units sold at the low-end are even smaller than this. A BBC Micro will realise some £40 for maintenance on this basis, while a Spectrum qualifies (unless you can get it replaced under warranty, of course). Things are changing, though. Manufacturers are looking closely at a new class of 'professional' user. Many have launched, or are just about to launch, products into this area. These new machines have a superior specification to the standard home games micros, including the minimum provision of a disk interface (or equivalent) and access to business-oriented software. In many cases, this means running CP/M.

The potential of this new marketplace should not be underestimated. Psion, for example, would not have gone to the trouble and expense of creating its suite of QL-based business packages just on the off-chance that it might sell some. Computer users are developing fast and want to do more than play games. Many can make use of a suitable machine in their work, especially if they're self-employed or running a side-line business. They need the greater power and flexibility of 'professional' hardware and software. They also need the machines to work.

Once people start to depend on their computer for more than entertainment; once that nasty subject, earning money, becomes involved, they're unlikely to look benignly on the computer should it break down. If these new machines don't prove to be tolerably reliable, wailing and the gnashing of teeth will be heard all round.

In part at least, users have failed to appreciate that a computer is much more complicated than a portable radio, that it takes a skilled person to fix one, and they are liable to go wrong. When the system breaks down they'll be amazed at the price being asked to fix it, yet they'll have shunned the option of taking out a maintenance contract at the time of purchase, partly on the misunderstanding that they 'never go wrong' and partly at the horror of 'paying that much, every year!'

Even if such people wanted to take out a contract, the choice is currently limited. Most third party maintainers regard this end of the business as unprofitable — which it is if approached in standard maintenance company style. For them to consider the business in the first place means the user facing an annual contract charge of 50 per cent of the purchase price at least — and that's just the charge for ringing the door bell.

There's a living to be made in this market however, even at the lowest end, although the right way to achieve it is still unclear. I would have a chain of franchised repair shops around the country, combining the best of small business with the buying power of a large company to get the best prices on spares. Others, such as the recently announced Micro-Repair Club, are attempting to combine the expertise of a maintenance company (in this case, Computeraid) with the backing and actuarial skills of an insurance company (Domestic and General Insurance). Computeraid is part of the Thorn-EMI group, another bit of which puts Spectrums together for Uncle Clive. This inside knowledge means they will happily fix Spectrums and (expectantly) make money out of the £25 annual fee (nee insurance premium).

Whichever way the market is eventually tackled, someone will succeed. If these new machines are to sell to the types of users predicted, they're going to want such a service, and will be willing to pay for it.
Hitch-hiker’s Guide to the Galaxy

Are you searching for the meaning of Life, the Universe and Everything? Forget it!
Tony Hetherington has found it in Infocom’s humorous and impressive adaptation of Douglas Adams’ Hitch-hiker’s Guide to the Galaxy.

In 1978 a radio series was broadcast on Radio 4 called The Hitch-hiker’s Guide to the Galaxy. There then followed a second series and a book of the same name. Then a second book was written which was followed by another. Meanwhile it had become a television series and also a stage play. Now it’s a computer game.

It is, however, unlike any other computer game that I have played. Published by the American software house Infocom, The Hitch-hiker’s Guide to the Galaxy has all the trademarks of the excellent interactive fiction series, but there is a slight difference.

The game disk is accompanied by the demolition orders for your home and planet, a ‘Don’t Panic’ badge, a piece of fluff, a small polythene bag (with which to attack microscopic space fleets) and the exceedingly useful peril-sensitive sunglasses — which you naturally cannot see through.

Adams is said to have enjoyed a number of Infocom’s adventures and thought it would be a good idea to do one based on Hitch-hiker’s. He initially contacted the company via a bulletin board and further discussions followed in a series of English pubs (which was cheaper, although response time may have been slower) before Steve Meretsky was given the job of programming (Steve had previously written the Infocom adventures Planetfall and Sorcerer).

The resulting game is a curious mix of the humour and imagination of Douglas Adams and the depth and quality of an Infocom adventure. It is also a difficult adventure to solve.

Strategy
As with the other Infocom adventures Hitch-hiker’s Guide consists of a series of logical problems which form the plot of a story in which you are the leading character. Your degree of success in tackling these problems determines the consequent route of the story.

You play the part of Arthur Dent and awaken one morning in a darkened room to discover that you have a dreadful hangover. On clambering out of bed and taking an aspirin you begin to feel slightly better: the irony of your situation is that this day will turn out to be the worst day of your life. In the next half hour your house is due to be demolished by a bulldozer (because it’s simply in the way) and the Earth is scheduled to be destroyed by a Vogon constructor fleet to make way for a hyperspace bypass.

Just in time you and your friend, Ford Prefect, whom you always thought was from Guildford but is actually from a small planet near Betelgeuse, hitch a lift on the Vogon spaceship and the adventure continues.

If you’ve seen any of the previous versions of Hitch-hiker’s and are now assuming that the game has the same plot and solution, don’t. You’re in for quite a surprise.

Although the characters are the same, and you’ll come across similar creatures, places and situations, the difference is that you have to take a leading role rather than be led through the action. A good comparison is The Hobbit by Melbourne House, wherein you play the part of Bilbo who is helped and lead through the story but takes the leading role in the game.

Therefore, it’s up to you to find the answers to the obstacles which are placed in your way and to solve problems. You can consult about many things — but don’t be too surprised if the editor for the section you require was out at lunch when the guide was compiled. As already stated the problems which you have to solve are logical and have logical solutions — but only if you apply the rather strange logic that exists in Hitch-hiker’s.

To illustrate: the problem of getting a babel fish out of the babel fish dispenser. In the book and radio series Ford merely pops one into your ear but in the game you’re not so lucky. After consulting the guide you realise that putting a babel fish in your ear is an excellent idea as it will allow you to understand and be understood by anyone or anything in the galaxy.

Consequently you are determined to get one so you press the button on the dispenser, but the fish shoots out the slot across the room and through a hole in the wall. You notice that there’s a hook above the hole, so you hang your dressing gown on the hook in order to block the hole, and try again. But this time the fish hits the gown and falls down a drain. Not to be defeated in your objective you cover it with a towel. However, when the next fish lands on the towel, before you’ve had time to do anything, a cleaning robot charges in, picks up the fish and disappears through a robot panel near the floor.

After some frantic hair-pulling you borrow Ford’s satchel and place it in front of the panel and confidently depress the button.

Unfortunately, your lap of honour is interrupted by the following message: a single babel fish shoots out the slot. It sails across the room and hits the dressing gown. The fish slides down the sleeve of the gown and falls to the floor, landing on the towel. A split-
second later, a tiny cleaning robot whizzes across the floor, grabs the fish, and continues its breakneck pace towards a tiny robot panel at the base of the wall. The robot ploughs into the satchel, sending the babel fish flying through the air in a graceful arc. A small upper-half-of-the-room cleaning robot catches the babel fish and exits.

Don't be surprised if your computer acts strangely. At one stage I was informed that there was an exit to port but when I tried it, I was told that I couldn't go that way. In frustration I typed 'starboard' but was told that I could and had gone port and that it had lied before!

And don't be too easily deterred: your progress through the game will undoubtedly improve as you tune into the game's 'brand of logic', a state which I only achieved half-way through the third sleepness night spent hitch-hiking.

To help you get there, here's a brief description of some of the characters and creatures in Hitch-hiker's.

Ford Prefect is a researcher for the galaxy, a public relations man for the company whose attempts to install Genuine People Personalities into machinery has unhappily resulted in Marvin the paranoid robot and an overprotective computer called 'Eddie'.

During your adventures you will also meet the Vogon captain who is green and blubbery and recites poetry (aaagh!), a warlike alien wearing black-jewelled battle shorts, and the incredibly stupid but equally dangerous and ravenous bugblatter beast of Traal. This incredibly stupid monster thinks that if you can't see it, it can't see you!

If you try something a little silly (which could be the answer, so it's always worth a try), it doesn't respond with the all-too-usual 'You can't do that.' Instead it either gives you a helpful error message or passes a comment which can range from 'You're letting things get to you too much, try and relax' through to 'Are you sure you're allowed to be playing with this computer?'

Well, how do you solve the problems in Hitch-hikers? Here are a few tips that I've gleaned from the game.

Once you have tuned into the game's peculiar logic, you should ensure that you read everything carefully (including this review). Every word and object in Hitch-hiker's are there for a reason — even if the reason is only to confuse you. Also you should consult the guide about anything and everything as it contains some important hints. Be prepared to try anything no matter how dangerous or silly it may at first seem; but before you do, use the game's save facility so that you can restore it if things don't turn out too well.

Finally, don't assume for one moment that the game is the same as the book or radio series; even your main objective is different.

Prices and availability

The Hitch-hiker's Guide to the Galaxy is available on disk for numerous machines including the IBM PC (this was the version used for the review copy), Apple II, Macintosh, DEC Rainbow, HP150 and 110, Commodore 64 and Atari. Most versions cost £34.50 with the last two being slightly cheaper at £30.20.

Documentation

The guide is in a class of its own and even contains footnotes to its entries. These, of course, can be read and usually contradict what the guide has just told you. Just for fun I decided to read through the footnotes. When I came to footnote 10 the computer responded with: 'Isn't it fun reading through the footnotes?'

Conclusion

The Hitch-hiker's Guide to the Galaxy is the first Infocom adventure to have a strong outside influence in the shape of Douglas Adams. This has undoubtedly improved an already impressive format and produced a genuinely funny and challenging game. Infocom classes Hitch-hiker's as a Standard Level game but it's hard Standard and more difficult to solve than some of the company's Advanced material.

There will be two groups of people who will particularly relish this game: the 'Hitch-hikers' for whom this will be their first Infocom adventure; and the Infocom adventurers who will be introduced to the humour of Adams. Those lucky people who already know both won't be disappointed.

Last but not least, the Washington Post once said: 'If it's 2am it must be Infocom.' On the experience of the last few days I'd like to add: 'If it's 4am it must be Hitch-hiker's.'

UK distributors include Softsel on (01) 844 2040.
Computer programming is a craft. Given the raw ingredients of a programming language, a skilled programmer can blend them together into a fine piece of wood into an exquisite piece of furniture by using different types of joints and various skills acquired over the years.

As with any craft the acquisition of skill comes partly with experience, but it can be more readily acquired by sound teaching and well-written text books. A valuable source of reference for anyone wanting to learn programming lies in a three-volume set of books by an American academic, Donald Knuth. These books are collectively entitled 'The Art of Computer Programming'.

Knuth has planned seven volumes in the series, and has completed three volumes to date. Volume one introduces the basic concepts and defines what an 'algorithm' is, giving numerous examples. It also deals with 'information structures'. Volume two covers random numbers and arithmetic, and volume three deals with sorting and searching.

The books present the material as a pleasing blend of descriptions, formal presentation and set problems (and answers), and there are also interesting background histories and bibliographies. They have long been the computer science student's bible, but here they are presented for a new generation of apprentice programmers learning their craft outside the confines of academe. These books will be invaluable to anyone interested in what goes on 'under the bonnet' of computer systems.

Apart from the genuinely useful material, the books are also rich in a huge variety of algorithms that you always knew existed but were unable to find. One of my favourites is the algorithm to calculate when Easter falls (Fig 1). Easter is the first Sunday following the first full moon on or after 21 March. Did you know that this algorithm was devised by a Neapolitan astronomer in the sixteenth century? And that the only application of arithmetic in the Middle Ages was for determining Easter? Oh, yes — the volumes are a mine of information!

Knuth has invented an assembly language called MIX, which he uses to present the algorithms. We'll convert some of these MIX programs into the micro world's lingua franca — Basic.

Introduction

Volume one contains general introductory material, and begins by defining the word 'algorithm'. An algorithm is an unambiguous set of rules for performing a task which must be expressed in such a way that the algorithm always terminates. This condition is important. It is relatively easy to construct procedures that never terminate under some conditions — the 'infinite loop' that should be familiar to all programmers.

One of the earliest algorithms to be formally presented as such was Euclid's Algorithm to determine the greatest common divisor of two integers. (The greatest common divisor, or GCD, is the largest number that will divide both: for example, the GCD of 12 and 18 is 6.)

2000 REM CALCULATE DATE OF EASTER FOR THE YEAR Y A.D.
2010 REM RETURNS N FOR DAY AND M FOR MONTH
2020 REM GET "GOLDEN NUMBER" (1 TO 19)...
2025 DEF FNREMN(A,B)=A-INT(A/B)*B:REM DEFINE REMAINDER FUNCTION
2030 G=FNREMN(Y,19)+1
2040 REM GET CENTURY C...
2050 C=INT(Y/100)+1
2060 REM LEAP YEAR AND LUNAR ORBIT CORRECTIONS...
2070 X =INT(365.25/4)-12:Z=INT((365/4)+25/75)-5
2080 REM FIND SUNDAY...
2090 D=INT(35/4)-X-10
2100 REM CALC EQPACT...
2110 E=FNREMN(11*D+20+Z-X,30):IF E=25 AND G=11 THEN E=E+1
2120 REM CALC FULL MOON...
2130 N=44+E:IF N>31 THEN N=N-31
2140 REM ADVANCE N TO A SUNDAY...
2150 N=N+7-FNREMN(D+N,7)
2160 REM MARCH OR APRIL?
2170 IF N>31 THEN N=N-31
2180 RETURN

Fig 1 Easter algorithm

1000 REM EUCLID'S ALGORITHM
1010 REM RETURNS GREATEST COMMON DIVISOR OF M AND N
1020 REM ANSWER RETURNED IN N
1025 DEF FNREMN(A,B)=A-INT(A/B)*B:REM DEFINE REMAINDER FUNCTION
1030 R=FNREMN(M,N):REM CALC REMAINDER K FROM M/N
1040 IF R=0 THEN RETURN:REM N IS THE ANSWER IF ZERO REMAINDER
1050 M=N:REM INTERCHANGE AND ROUND AGAIN

Fig 2 Euclid's algorithm
and 30 is 6.) The Basic variant is presented in Fig. 2. The algorithm requires a ‘remainder’ or ‘modulus’ function; most versions of Basic don’t have one, but the DEF FN facility can be used to create one:

```
DEF FNREMN (A,B) = A - INT (A/B) * B
```

Following the introduction to algorithms, Knuth outlines the basic mathematics needed to study some of the subsequent material. Unless you’re mathematically inclined this is rather daunting, but fortunately isn’t mandatory: the mathematics is needed for the theoretical study of the algorithms. The

theory arises because it isn’t sufficient to know that an algorithm will work; it’s also important to know that it will work reasonably quickly. Determining if this is possible is called ‘analysis’. In other words, it’s the mathematics of algorithm design and analysis. The mathematics is needed for the theoretical study of the algorithms. The

Given the raw ingredients of a programming language, a skilled programmer can blend them together into a fine working system by using his problem solving skill...

Queuing operations propel the deque through memory and without this trick would quickly fail, even if the deque were comparatively empty. Note that the BACK pointer marks the next position for an addition to the back of the deque, not the position of the last element. This wastes one location in the array, in the sense that an overflow will occur when one location is still free, but without doing this it is much more difficult to differentiate between an empty deque and an overflowed one. Knuth devotes a lot of attention to the issue of storage management, as good

storage management minimises problems with storage overflow. For example, if there are several stacks, queues or deques used by a program which are all initialised with fixed capacity, the program fails as soon as one overflows even though many of the others are almost empty. This unsatisfactory state of affairs can be improved by arranging for all the available storage to be pooled, then allocated in small chunks as it’s needed. If a deque overflows, a larger storage area can be requested from the pool, the data copied across, and the old storage area returned to the pool of free storage. Storage manage-

Input to a computer is very much like queuing: the characters in the input stream arrive at the keyboard in unsequenced order and must be sequenced before being transferred to internal storage. Queuing operations propel the deque through memory and without this trick would quickly fail, even if the deque were comparatively empty. Note that the BACK pointer marks the next position for an addition to the back of the deque, not the position of the last element. This wastes one location in the array, in the sense that an overflow will occur when one location is still free, but without doing this it is much more difficult to differentiate between an empty deque and an overflowed one. Knuth devotes a lot of attention to the issue of storage management, as good

... if you’re really keen you can get MIX up and running on your own machine and use it to work through some of the exercises. This is a good way to learn assembler programming.

```
Fig 4 Diagrammatic linked list
```

```
Fig 5 Insertion and deletion by manipulating pointers
```

```
Fig 6 Adding a new node to the list
```

```
PCW139
```
Insertion and deletion in a linked list is also useful for handling any other information structures, such as linked lists. The linked list solves the insertion-deletion problem of the sequentially allocated list. Each item in the list is stored along with a pointer to the next, which therefore need not be adjacent in memory. For example, a list of the numbers 101 to 105 can be represented in memory as follows:

<table>
<thead>
<tr>
<th>Location</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 2</td>
<td>101 7</td>
</tr>
<tr>
<td>3 &amp; 4</td>
<td>not used</td>
</tr>
<tr>
<td>5 &amp; 6</td>
<td>103 11</td>
</tr>
<tr>
<td>7 &amp; 8</td>
<td>102 5</td>
</tr>
<tr>
<td>9 &amp; 10</td>
<td>105 0</td>
</tr>
<tr>
<td>11 &amp; 12</td>
<td>104 9</td>
</tr>
<tr>
<td>13 onwards</td>
<td>not used</td>
</tr>
</tbody>
</table>

In this example, both data and pointer each require one storage location, but it's possible to have lists where this is not the case and even where the amount of data varies between the different 'nodes'. The pointer following 105 is 0. As 0 is an impossible location (in this example), this indicates the end of the list. A linked list can be drawn diagrammatically as in Fig 4.

Insertion and deletion in all linked lists is handled by manipulating the pointers: for example, deleting the node with 103 is achieved by changing 102's pointer (Fig 5).

Ideally, the node at 103 should be handed back to the pool of free storage so that its storage area can be re-used later: for example, if you wanted to add a new node to the list (Fig 6).

Apart from their use in representing live data, linked lists also form the basis of many storage management algorithms. At any given moment in the program's execution, the free storage will be in several isolated fragments. A single variable indicates the location of one — any one will do. This contains a pointer to another, and so on. Unless all allocations and deallocations are for a fixed size, the size of each will need to be recorded. As long as the node is large enough this can be stored with the pointer, thus each free node may start with a size value, then a pointer, and then the remaining free space. Assuming the pointer and size value each consume one location, a typical free list is shown in Fig 7.

The code to manage such a storage list is given in Fig 8, and demonstrates that there's nothing difficult about storage management. The free storage area is the array XI(), which is initialised as just two free blocks; the first of length 2, with the second immediately following it and occupying the rest of the array. The first block is never allocated, but is kept solely for its pointer to the next free block. If this pointer were held in a variable, FREELIST, for example, then changes to the first block would need to be coded as a special case since they would alter the value of FREELIST and not a pointer in XI(). In this example, all storage requests must be for an even number of locations as this will guarantee that no free blocks of length 1 are created. (A block of length 1 cannot contain a pointer and a length value.)

The deallocation routine can be made a lot more effective by arranging for adjacent free blocks to be merged together. As it stands, storage will become more and more fragmented until the free storage is just a long chain of tiny blocks.

. . . programming tasks, especially non-numerical work, demand some skill at restructuring data. In fact, some programming languages implement many of the facilities described by Knuth.'

Knuth has much more to say on storage management including garbage collection, where it's unnecessary to explicitly free a block when it's no longer needed — the system can work this out for itself. There are also many alternative algorithms for maintaining freelists, each with pros and cons which are discussed at length.

Another major type of information structure is the 'tree'. A tree is more complex than a linked list in that each node contains several pointers, not just one. The pointers are to the 'children' of the node (the jargon for computer trees borrows heavily from that of family trees); these children in turn may point to grandchildren, and so on. It isn't usually desirable for each node to have a different number of pointers, depending on the number of children, so frequently just two pointers are used: one to the first child; and another to the next sibling of the node. For example, the tree structure:

```
   A
  /|
 B C
```

is represented with two pointer nodes as:

```
  A
/|
B<<<C
```

(where '<<<' denotes sibling pointers). With this structure it is only slightly more difficult to access, say, the
Reductions are given for warranty periods

THE company for computer maintenance
CHM can offer comprehensive maintenance contracts on systems at
FIVE PER CENT
of the cost of the system per year
NATIONWIDE

Very few can offer a service that is both nationwide and comprehensive – CHM can.

This cost is for a comprehensive contract on your computer system, including parts, labour and travelling with a twenty-four hour response time.

With service centres located throughout the mainland, CHM provide maintenance services to thousands of computer users. CHM can meet all your maintenance requirements including maintenance of large networked computer systems. CHM make quality maintenance services available to more and more computer users every day.

We look after Apple, Commodore, IBM PC and XT, ACT Sirius, ACT Apricot, Kaypro, Osborne, ICL Micro, Superbrain, Compaq computers; Rodime, Corvus, Davong, Tall Grass, Nestar hard disks; Ricoh, Oki, Centronics, Qume, Epson, Diablo printers, and lots more.

Service is on site. Manufacturers parts are used. The service offered is superior to the level of support that dealers can offer. CHM is recognised by many manufacturers. Be safe – go to CHM.

CALL OUR HOTLINE NOW.

**IBM PC XT**
with the monitor and keyboard
£285 PER YEAR

**ACT Apricot**
with monitor and keyboard and two disk drives
£133 PER YEAR

**Apple II**
with two disk drives and monitor
£113 PER YEAR

Immediate cover available! Phone now!

Computer Hardware Maintenance Limited
Marty's Yard Hampstead London NW3 1QW
01-431 0320 Throughout the country

Phone now on our central number 01 431 0320 for cover in England, Scotland and Wales, or clip the coupon. Systems that are in manufacturers warranty can be covered at lower cost. The advantage is that you have a fast on-site service. Unusual makes are also covered, don't hesitate to call.

Dealers we support your clients.

*Special offer for limited period only.*
Nth child of a node, than it would be with multiple pointers. Note that A, C, D and G have no 'younger' siblings, so their pointers are simply null. Likewise, D, E, F and G have no offspring.

Tree structures can be very useful for working with mathematical expressions, where the tree structure exactly represents the order of evaluation: for example, \(3 \times \text{LN}(X + 1) - A \times X^2\) is represented as a tree:

```
               ____________
              |               |
             A              X
               |               |
              LN              1
               |               |
             +               |
               |               |
              B               |
               |               |
             +               |
               |               |
              3               |
```

Knuth develops all the algorithms necessary for symbolically differentiating such a tree. The answer is generated as another tree structure, and issues such as copying tree structures, and ordering the nodes for evaluation, are all dealt with along the way.

With the above representation, it's not readily possible to determine the parent of a node as there are no pointers back to it. In tree processing, it's usual to maintain a stack of the parents en route to the current node — the earlier work on stacks and queues is of value here. It's also possible to use the null pointers of childless or youngest-sibling nodes to point back; this is called a threaded tree. It has the advantage that no stack is needed, so it's impossible for it to overflow. To determine whether your Basic interpreter uses threaded or unthreaded trees for evaluation of expressions, type:

```
PRINT ((((3 + 4))))
```

for ever more pairs of brackets. If it eventually gives a memory error, this is a strong indication that it's using a stack for handling the evaluation. Microsoft's Basic finally runs out of space with 72 pairs of brackets — not a serious limitation!

The last major topic to be covered under Information Structures is the 'array', which is represented in Basic by the multiply dimensioned use of DIM. For example, DIM A(3,3) defines a 2D array with 27 elements (or 64 if the lower bounds are 0 and not 1).

Representing arrays in this fashion can be highly inefficient if the contents of the array are sparse. Some arrays are triangular, with all zeroes above the diagonal, or diagonal with all zeroes except the diagonal, and so on. Knuth suggests a linked allocation method for these circumstances. Each non-zero element in the array is represented by a node containing the value, its row and column numbers, and pointers to the next (non-zero) node above it and to the left of it. Zero elements are not there, so consume no extra storage. In addition, each row and column starts with a dummy node, not an array element, but enables the processing of empty rows and columns.

A further refinement is for the linkages to be 'circular'. This means that the pointer in the last node of a sequence is not null, but points to the first node. With this scheme of pointing, the notion of first and last disappears. Such an array, containing only three non-zero elements, is shown in Fig 9.

With this type of structure, great storage savings can be made with large sparse arrays, and the access time for any given element need not be excessive.

As the array is sparse there should be only a few elements on each list. This means that it should be comparatively fast to find any element.

It's even faster if the array is being scanned in some systematic fashion, as is the case with most numerical algorithms. It's also worth noting that this type of representation allows for new rows and columns to be inserted with minimal changes to the structure, or data moving.

Conclusion

We have taken a look at the first of Knuth's Art of Computer Programming volumes, and introduced most of the major topics dealt with in the book. I hope the reader's appetite for improving his programming techniques is sufficiently whetted, and strongly recommend this book as an instructor and reference manual.

*References
The Art of Computer Programming by Donald E Knuth; Addison-Wesley Publishing Company.
Volume 1 Fundamental Algorithms.
Volume 2 Seminumerical Algorithms.
Volume 3 Sorting and Searching.
THE THRILLING 2nd GENERATION RACING CAR SIMULATION FROM LIMBIC SYSTEMS UK LTD.

TURBO 64

COMMODORE 64

AVAILABLE FROM GOOD RETAILERS

LIMBIC SYSTEMS UK LTD.
HENSINGTON ROAD, WOODSTOCK, OXFORD OX7 1JR
TEL (0993) 812700

£7.95
Now that 14 per cent of households have a video recorder and a video camera can be bought for about the same cost as a medium size computer, the production of electronic home movies is an attractive proposition. The extremely low cost of tape compared to processed film, the fact that tape can be reused almost indefinitely and the instant replay facility are just a few of its many advantages over film. The main disadvantage, and the factor that retarded the transition from film to tape for some years in the professional world, was the difficulty of editing. The first professional videotape edits were done by coating the edge of the tape with microscopic iron particles to make the magnetic tracks visible, making an accurate cut between frames with a razor blade and joining the pieces in the required order with sticky tape. This was a time-consuming method and one which could not be used with home video formats, or indeed with modern professional formats, because of the narrow angle of the tracks along the tape and the risk of damage to the video heads by the splice.

Gradually the razor blade method was replaced by electronic editing: this simply means that selected sections of the original tape are copied in whatever order required to a second tape, a method known as assemble-editing. This leaves the original tape uncut, the same shots can be copied again to the edited tape which can be erased and reused. The snag (there’s always one) is that there has to be some loss of picture and sound quality in the copying process. Although this is discernible with home formats, it’s still quite acceptable.

Assemble-editing
To assemble-edit you have to do is connect the video and audio outputs from the play-in machine to the inputs of another, the record machine, and push the appropriate buttons. Starting with a blank tape in the record machine run the play-in machine first, and just before the beginning of the first shot press the record button in the recording machine, going to pause on that machine at the end of the shot and keeping the record tape in position while you spool through the original tape to a point just before the start of the next shot to be played in. Unfortunately, the reaction time must be measured in microseconds, and you need to be familiar enough with the original material to know, say, a second before a car comes round the corner into shot.

What is needed is some way of uniquely identifying each frame of the original tape, not only so that the numbers can be written down and accurate shot lists compiled, but so that equipment can be developed to recognise the exact moment that a particular frame is being played and start the recording machine. Similarly, it could recognise the ‘out’ frame and hold the recorder in pause. The professionals invented ‘Timecode’, a digital signal recorded on a second audio track which carries information relating to hours, minutes, seconds and frames. Microprocessors in their machines were programmed not only to generate the timecode for recording, but to read it in the playback mode and control the machines to position tapes accurately, start and stop recording; in fact, all the functions of their machines.

Application
Now, let’s see what we need to make our home computer write and read our own version of timecode and control the machinery. We will confine ourselves to controlling the record/record-pause function of the record machine because we can do this with the minimum of hardware and without delving into the works at all. Most recorders have a camera socket, and included in this will be video and audio inputs and a tape run/stop circuit from the camera trigger which controls the record/record-pause function we need. On VHS recorders, which mainly use a 10-pin camera connector, the relevant connections are as follows:

- Pin 1 — video input
- Pin 2 — video ground (screen)
- Pin 6 — tape run/stop
- Pin 7 — audio input (-20 db)
- Pin 8 — audio ground

When pin 6 is open circuit or below a volt or so, the tape will run. When it is pulled up to around +4 or 5 volts, the tape will stop. Since these are TTL levels, they are just what we get out of one of the pins of a parallel port. If your recorder does not have a 10-pin plug, you’ll have to do a little research on your particular model.

The tape run/stop function on Betamax machines is flipped each time the camera trigger is pressed, so the port output will have to send a short pulse at each run/stop transition rather
than remain high or low. We already have the hardware to send and receive the audio tones carrying the timecode in the form of the cassette interface, so apart from a bit of experimenting with levels, the hardware side of things is under control. In order to record the timecode and still retain the original sound track, a stereo machine is necessary. If you don’t have access to a stereo machine and the audio track is needed, it can be copied to sound cassette or tape, edited and copied back to the edited video tape using ‘audio dub’, after the picture editing is completed. On most stereo machines the audio dub mode records on one of the audio tracks only, and it’s to the input of this track that we connect the cassette output from the computer. The other machine, the one used to record, does not need to be stereo.

If you have a stereo machine the technique is as follows:

1. Rewind the original tape to the beginning, run the timecode program in the write mode, press audio dub and leave it to run through to the end of the tape.
2. Connect the output from the track holding the timecode to the cassette input of the computer and run the timecode program in read mode. Now you can play the tape a number of times to decide on the shots you want to use and to make a list of ‘in’ and ‘out’ points. Whenever the tape is playing your VDU will be showing a ‘time’ in hours, minutes, seconds and frames which exactly identifies each frame.
3. When you’re ready to start copying, connect the two machines with video and audio (not the track with timecode, of course) and the record/record-pause control wire to the computer port. Enter the ‘in’ and ‘out’ times for the first shot, press RECORD-PAUSE on the record machine and PLAY on the play-in machine.

If you’ve got the software right everything should happen without a hitch.

Writing the timecode program

My own timecode program runs under CP/M on a Nascom 2/Gemini computer, but in order to have the RE output from the modulator on the Nascom, the VDU output is sent to the 48-column Nascom display instead of the Gemini IVC. The Nascom cassette I/O routines are also used but keyboard input is via CP/M; altogether a rather non-standard arrangement. Rather than go into details of this version I’ll outline the basic facilities that are needed, together with some possible ‘whistles and bells’, and ways of providing them.

The program has two modes: ‘write’ and ‘read’. Since it is mainly used in the latter mode this is what is run on initialisation. In this mode the cassette input port is continually scanned and in periods when the flag from the UART indicates that there is no data ready, the keyboard is scanned for a possible command. When a complete code...
sequence is read from the UART it is first displayed on the screen then compared with the codes held in two stores, the 'run' store and the 'stop' store. If a match is found, a bit of the selected port is set or reset to control the record machine.

Essential among the commands which can be called from the read mode are routines to enter a timecode from the keyboard to either of the stores, and a command to switch the program to the write mode. Useful additional commands include those which cause the timecode currently being displayed to be entered into either of the stores, commands to increment or decrement either store by one frame, and direct commands which flip the port control bit and thereby control the recording machine manually from the computer keyboard. It is desirable to display the timecodes currently held in the run and stop stores as well as the current tape position code, but since the recorder takes time to run up to speed and switch stop stores as well as the current tape bit and thereby control the recording commands which flip the port control commands to increment or decrement be entered into either of the stores, timecode currently being displayed to

mands include those which cause the recording will be after the time held in

position code, but since the recorder

determined by experimenting

to achieve video

synch🍉ion on BBC

machines by using one

of the external sync

boards available

specifically for this,

and to insert the

timecode display by an

electronic switch

controlled by the

program.'

VDU and scans the keyboard for a possible command. The timecode is then incremented by one frame and the process repeated 25 times per second. There are two ways this timing can be achieved; the perfectionist method uses a simple sync-pulse separator to examine the video signal from the recorder and supply a TTL pulse to an input port corresponding to field sync,

a loop in the program testing for this before continuing. The other way, which does not require any additional hardware, simply includes a delay loop which is adjusted by trial and error; accuracy of about one second in five minutes can be attained by this method.

The only essential command to be entered from the write mode is one to switch to read, but commands to write from zero, to write from a pre-set starting time or to continue from the last time held in the main store, are useful.

To make for compact code and fast handling, timecode values are stored as four-byte ECD codes, each byte corresponding to frames, seconds, minutes and hours, in that order. Since binary-coded decimal handles values up to 99 in one byte by considering it as two 4-bit groups, and the largest values that can occur in timecode are 24 for frames, 59 for seconds and minutes, and 23 for hours, it follows that the most significant bit in each byte will always be zero. By setting this bit of the 'frames' byte before writing it to tape, we can mark the beginning of each sequence for the read routine.

Writing the sub-routines

The screen display can consist of a short menu of commands, the contents of the 'go' and 'stop' stores, and the main timecode display; the current tape position. This can be displayed in the conventional form 01:59:59:24 using spaces and colons between figures, which makes for good

readability.

However, as the timecode will normally occur in timecode are 24 for frames, 59 for seconds and minutes, and 23 for hours, it follows that the most significant bit in each byte will always be zero. By setting this bit of the 'frames' byte before writing it to tape, we can mark the beginning of each sequence for the read routine.

Writing the sub-routines

The screen display can consist of a short menu of commands, the contents of the 'go' and 'stop' stores, and the main timecode display; the current tape position. This can be displayed in the conventional form 01:59:59:24 using spaces and colons between figures, which makes for good

readability.

However, as the timecode will normally occur in timecode are 24 for frames, 59 for seconds and minutes, and 23 for hours, it follows that the most significant bit in each byte will always be zero. By setting this bit of the 'frames' byte before writing it to tape, we can mark the beginning of each sequence for the read routine.

Writing the sub-routines

The screen display can consist of a short menu of commands, the contents of the 'go' and 'stop' stores, and the main timecode display; the current tape position. This can be displayed in the conventional form 01:59:59:24 using spaces and colons between figures, which makes for good

readability.

However, as the timecode will normally occur in timecode are 24 for frames, 59 for seconds and minutes, and 23 for hours, it follows that the most significant bit in each byte will always be zero. By setting this bit of the 'frames' byte before writing it to tape, we can mark the beginning of each sequence for the read routine.

Writing the sub-routines

The screen display can consist of a short menu of commands, the contents of the 'go' and 'stop' stores, and the main timecode display; the current tape position. This can be displayed in the conventional form 01:59:59:24 using spaces and colons between figures, which makes for good

readability.

However, as the timecode will normally occur in timecode are 24 for frames, 59 for seconds and minutes, and 23 for hours, it follows that the most significant bit in each byte will always be zero. By setting this bit of the 'frames' byte before writing it to tape, we can mark the beginning of each sequence for the read routine.

Writing the sub-routines

The screen display can consist of a short menu of commands, the contents of the 'go' and 'stop' stores, and the main timecode display; the current tape position. This can be displayed in the conventional form 01:59:59:24 using spaces and colons between figures, which makes for good

readability.

However, as the timecode will normally occur in timecode are 24 for frames, 59 for seconds and minutes, and 23 for hours, it follows that the most significant bit in each byte will always be zero. By setting this bit of the 'frames' byte before writing it to tape, we can mark the beginning of each sequence for the read routine.
make the timecode display much larger than the ordinary character height used for the menu, and so on. This can be achieved with most computers by using screen-gra- phics routines.

The routines to compare the current tape position with the contents of the various stores are simply two successive 16-bit subtractions, returning a zero flag if a complete match of all four bytes is found. The routine to enable a timecode to be entered from the keyboard to the run-display, the stop or the current store, needs to convert each pair of ASCII values (tens and units) to one BCD value, set bit 7 if it’s the frame byte and store it. Ideally, some form of error checking should be included to prevent non-numerals or values larger than the maximum being entered.

The increment by one frame’ routine, used both as a command and by the write routine, utilises an increment instruction followed by a decimal accumulator adjust instruction to convert from binary to BCD on the contents of the frame store.

This is followed by a check to see if the value of 25 has been reached; if so, the figure is set to zero and the contents of the seconds store incremented and compared with 60, the process continuing for up to 24 hours. The decrement routine is similar except that after decrementing and decimal adjusting each value it is compared with 99.

The routine to write timecode to and read it from tape can be adapted from the cassette routines in the operating system. When the UART is busy, the keyboard should be scanned for a possible command.

**Potential**

If you can devise a way of synchronising the video output of the computer with the videotape playback, it’s possible to make a straight,unedited copy of the original material with the original sound and the timecode display inserted in the picture. This is known as a viewing copy, and enables you to use slow-motion playback to examine the action very carefully and select the exact frame number. Once this viewing copy is made, the original tape is not used again until the final editing session, saving it from the risk of accidental erasure when running the tape to and from compiling the shot list.

It should be possible to achieve video synchronisation on BBC machines by using one of the external sync boards available specifically for this micro, and to insert the timecode display by an electronic switch controlled by the automatic gain control circuit in the record machine from spoiling your artistic efforts. Any really elaborate artistic efforts. Any really elaborate...

---

Thanks to my colleague, Geoff Higgins, a former videotape editor and fellow Z80 machine code enthusiast.
Acornsoft's Viewsheet

Serious applications for home micros are still few and far between. Viewsheet from Acornsoft is a straightforward but powerful spreadsheet which transforms the BBC Micro into a simple business machine.

Mike Liardet figures it out.

The difference between home and business computers is ever decreasing, as the prices of business systems fall and home computers become more sophisticated. Similarly the gap between home and business computer software is closing and there is now a trickle of very sophisticated home computer software products. One such product is Acornsoft's recent release: Viewsheet.

Viewsheet is a spreadsheet system for the BBC Micro. Although of prime interest to serious home users, it is also worthy of any business application. It has a blindingly fast calculation speed, an advanced multiple windows facility, and the ability to link multiple models. It is one of a range of products from Acornsoft, including database and word processing, designed to inter-communicate.

Published by Acornsoft, the software publishing arm of Acorn, Viewsheet was released in October 1984, following two years of intensive development effort. The software was not actually written by Acorn, but by another Cambridge company called Protechnic Computers Ltd — also the author of the BBC word processor, View.

Installation

Viewsheet is sold in a compact little box containing a manual, reference card and a keynote template. The software itself lies in a 16k ROM chip, protected by an electrostatic-proof sponge mat. This ROM chip must be housed in one of the BBC's 'sideways ROM' sockets — of which the BBC Micro has five specifically for optical software such as Viewsheet. Once installed, the chip can stay there indefinitely (unless you plan to run more than five ROM products), which is just as well, as it is not designed for repeated insertions and extractions.

The benefit of software in ROM is that it is available as soon as the computer is switched on, and none of the internal RAM is taken up with software. On the other hand ROM chips cost more than cassette tapes, which unfortunately pushes up the price of the product. There is also the problem of installing the chip: this is dealt with by an accompanying leaflet containing full instructions. If you are not technically minded the idea of inserting chips into the guts of your precious computer may seem a little intimidating. But the instructions are quite explicit, and a screwdriver is the only tool necessary. There's no soldering — the chip is simply pressed into a waiting socket (a process which takes no more than five minutes, including the time spent reading the instructions).

My only difficulty with installation was caused by the identifying label on the top of the chip. It is vital that the chip is placed the right way round, and the leaflet explains that a notch on top of the chip indicates its correct position. In my case the label obscured the notch, but peeling it back revealed all, and one careful push had it in place.

Getting started

When the BBC is switched on, whichever chip is in the rightmost of the five sideways ROM sockets is given control. If it's Viewsheet, then Viewsheet is automatically started; but whichever chip is activated, it will be in a state known as 'command mode'. This is where a variety of commands can be typed in at the keyboard, and the application itself is not on display.

Most ROM-based packages for the BBC support a common core of commands, relevant to all applications; for example, NEW clears out memory, erasing an existing spreadsheet for Viewsheet, or word processor text for View. There are special disk commands (if you have disks), and commands like LOAD, SAVE and PRINT have predictable effects, depending on the host application. It is possible to switch applications in command mode by typing "*" followed by the application name: if Viewsheet is not in the rightmost socket, it can be activated following switch-on, by typing "*SHEET".

As soon as Viewsheet has been activated, spreadsheeting can begin by pressing the ESCAPE key. This key toggles between command mode and application mode, and in the case of Viewsheet the application mode results in a fairly orthodox display of the first 19 rows and first few columns of an empty spreadsheet. The number of columns visible depends on the currently selected 'display mode'.

The BBC Micro offers eight different display modes, numbered 0 to 7. The possibilities include high-resolution graphics, or colour, or 80 or 40 characters per line. Viewsheet can operate with any of these, or even cope with changes in mid-session, but the best display is obtained with number 3.
which has 80-characters per line and optional inverse characters. Unfortunately, the display image is too small to show all characters that could be displayed by the spreadsheet model. Nevertheless, it is best to start with this, and opt for a 50-line display mode if memory gets tight. In command mode, the type of display can be changed using the MODE command - thus MODE 3 switches to a 30-line display image that only shows 60 characters so that 80 can fit on a line. Following this, the ESCAPE key switches the display back to the spreadsheet.

**Basic facilities**

When spreadsheeting, the first four columns of the screen contain status information or echo text typed in at the keyboard; the rest of the screen displays the spreadsheet itself. Initially most of the area is blank until something is entered into the spreadsheet. The left-hand side is earmarked for row numbers, and the top of it for column identifiers: A, B, C and so on. In display mode 3, nine 8-character columns can be accommodated.

For basic spreadsheeting, Acornsoft has introduced few innovations in Viewsheet. The familiar cursor hovers over one of the cells, and can be moved up, down, left or right by pushing one of the arrow keys at the right of the keyboard. The screen window can be shifted to a new portion of the spreadsheet by directing the cursor there. The spreadsheet extends to 255 rows and 255 columns in all. As on most 8-bit computers there is insufficient memory to display all 80,600 cells available (see Benchmarks box).

Text numbers and formulae can be entered into the spreadsheet by moving the cursor to the required cell, and then typing in whatever is required. Viewsheet sorts this out, and automatically recalculates following any modification. The use of these keys is explained in the manual but, as a source of quick reference for the expert, Viewsheet is supplied with a keyboard template which can be fitted just above the keys. This merely summarises the function of each key.

The BBC is equipped with 10 function keys at the top of the keyboard which are coloured in a contrasting red. The use of these keys is explained in the manual but, as a source of quick reference for the expert, Viewsheet is supplied with a keyboard template which can be fitted just above the keys. This merely summarises the function of each key.

The function keys can also be pressed in conjunction with the control keys, allowing for up to 30 functions in total. The template is arranged in three rows, to cover all thirty possibilities. Only seven entries are blank, so 23 of the 30 possibilities are used by Viewsheet.

**Windows**

In addition to the conventional basic spreadsheet editing facilities, Viewsheet offers some advanced features. In particular, it is possible to define multiple windows. Multiple windows are useful when it is necessary to view distant parts of the spreadsheet simultaneously. Two single column windows are aligned vertically on the screen, showing different numeric display format, numbers of decimal places and left or right justification.

Viewsheet provides for up to 10 windows on the spreadsheet, nine of which are inactive, while one is defined to occupy the entire screen. This is, of course, a rather limited use of Viewsheet's windowing capability, but appears to the user as a perfectly normal spreadsheet, as described above. In fact, there is no need to know about windowing in the initial stages of using Viewsheet. The 10 windows are numbered 0 to 9, and to initiate a non-trivial usage it is necessary to enter the one active window, otherwise there is no room for anything else. The sole active window, number 0, can be changed by pressing the 'edit window' function key, and specifying that window 0 is to be altered. Each window has a number of attributes which 'edit window' can change: to reduce it in size, alter the style of display, or the way it works.

Two of the attributes specify the top left and bottom right cells to be displayed. For window 0 these are set to A1 and 119 by default. The intersection of A1 and 119 determines the initial window display, a rectangle of cells with A1 at the top left and 119 at the bottom right, but these values do not prevent the window from displaying other parts of the spreadsheet. Normal cursor moves have the usual scrolling effect within the window; thus the two cell references are more significant for the size of window implied, that is, 19 rows by nine columns. Changing 119 to B5, say, shrinks window 0 to just 10 cells, leaving plenty of room for other windows below it and to the right.

A new window can be created by using 'edit window', but for a different window number, and as before the top left and bottom right can be specified. It is possible for the window to focus just on a single cell, when top left and bottom right are the same. Another way is the display option of 'more windows'. For a window, which must be either beneath or to the right of a previously defined window. In addition, windows can have different column widths as well as different numeric display format, numbers of decimal places and left or right justification.

Each window has an 'Options' attribute and, initially, for all bar window 0, the window-off option is in force. Thus to activate a window this must be turned on. But it can be turned on in various ways: row and column identifiers can be visible or not, and there is a primitive graph option (which displays numbers as asterisks in order to produce horizontal bar graphs), or the window can be synchronised to other windows.

Synchronisation can be useful if, say, two single column windows are aligned vertically on the screen, showing different parts of a month's data. With synchronisation a cursor move in one window will automatically change the other window to the same number.

When several windows are on screen simultaneously, only one cursor is present, in one window. Although the window is smaller than the single original window, it operates in an identical fashion, except that other windows may be synchronised to it. To move the cursor to a new window requires the 'next window' keystroke.

Although sophisticated displays can be arranged, they may require some thought and planning. Fortunately, Viewsheet allows window definitions to be loaded and saved independently;
this means that a complex window arrangement can be reused with several spreadsheet models.

Finally, should the window definitions be in error, and require more screen display than is actually available, then the excess is automatically clipped from the display. This situation can also arise if the display mode is changed to fewer characters per line. Unfortunately, it is not a rarity for an inferior display mode to be needed. The BBC model B has 32k of RAM, but the spreadsheet data must share this with the data for the display itself. The best display mode (MODE 7), with only 40 characters to a line, leaves all of 24k for the spreadsheet data. (The Benchmark performance tests were done with both modes.)

The memory difficulty is due to a flaw in the BBC Micro, rather than Viewsheet itself being a source of trouble with other software as well. Thus the best solution is to improve the hardware: for example, by buying an Aries RAM board. This contains all the necessary display memory, and thus the full quota of RAM would be available to Viewsheet, even with MODE 3.

**Advanced facilities**

There are a number of advanced spreadsheet features in Viewsheet, which I shall touch upon lightly. Initially the rows of the spreadsheet are numbered, and the columns are identified by letters, but Viewsheet allows these to be changed selectively. Thus more meaningful row headings can be used; for example, row 10 might be renamed as 'SALES', and columns A to L as 'JAN' to 'DEC'. These new headings can be used in cell references of the form JAN 29 instead of A29 or FEB SALES' instead of B10.

It is possible to protect individual rows or columns, but not single cells, against accidental deletion or changes. This is useful for setting up turnkey applications, where an unskilled user can be protected from inadvertently destroying part of the model.

Printouts from Viewsheet are, like the display, handled by a window facility. In addition to the 10 display windows there are 10 printer windows, which are specified in the same fashion as above. On specifying the PRINT command, all the active windows are printed with the required formats. A printout can be made to mirror the screen display, although normally it is more useful to take advantage of the larger dimensions of printer stationery to print out the full width and length of a model. But this is a great deal of flexibility, and different style printouts can be quickly obtained by switching the various printer windows on and off before issuing the PRINT command.

It is also possible to print to disk or cassette, so that the spreadsheet can be subsequently read as a text file into Acornsoft's word processor. View. Like printing to paper, this facility makes full use of the printer windows.

If you have disk drives, then Viewsheet's workspace is not just limited to the non-display RAM in the BBC, but it is possible to use up to five auxiliary arrays of numbers, on disk. Each array can have up to 255 rows and columns, with a maximum of 10,710 elements in all. For five arrays, this means spreadsheet models can contain over 50,000 numbers in total. Any element in any array can be read or written automatically during spreadsheet recalculation.

Apart from greatly expanding the capacity of the system, this feature also enables consolidation operations to be performed. Each array could contain the figures for different departments in an organisation and a simple read then sum loop can consolidate all the data into a spreadsheet. Of course, disk access can slow down calculations, but the manual contains hints for optimising this, and the facility enables tasks to be performed that would not normally be feasible on an 8-bit micro.

**Documentation**

Viewsheet is supplied with a paperback-size, spiral-bound manual of about 140 pages which covers in two parts, starting with a tutorial, and then a reference section. Both parts are well cross-referenced by an index.

The tutorial section is very clear, and contains a number of screen illustrations. It assumes no prior knowledge of the BBC Micro. Not unreasonably, it does not describe how to set up the BBC hardware, but apart from that it is completely self-contained. From the operational point of view there is no need to refer to any of the BBC manuals in order to use it.

The reference section gives a brief rundown for every aspect of Viewsheet, including details of all the available commands (in command mode), function keystrokes, and so on.

The remaining documentation comprises a reference card, the chip installation instructions and the keyboard template. Both the keyboard template and the reference card are invaluable as a quick guide when you become familiar with the system. If you are continually switching between several packages, each with its own template, it is a little inconvenient to change them: the template is held in place under a transparent plastic strip which must be sprung open to replace a template making it difficult to get the new one correctly aligned with the function keys.

**Conclusion**

The BBC Micro can be used either as a home or as a simple business machine, and Viewsheet complements it nicely: it is very simple to use but it is also very fast and powerful.

Having the software in ROM circumvents the usual home computer problems of slow tape loading. The software is also compatible with the BBC disk drives.

My only major reservation about Viewsheet is the limited RAM storage capacity of the BBC Micro, which restricts the size of spreadsheet models. Viewsheet mitigates this by permitting auxiliary data storage on the disks, but the use of an auxiliary RAM board would also be of help.

Viewsheet costs £59.80 (inc VAT). For more information contact: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2PL on (0933) 79300.
Choosing a printer is a lot easier than choosing a computer.

There are dozens of quality printers from which to choose. With quality price tags of around £250. The Brother M-1009, however, breaks all the rules. Stays defiantly below the £200 barrier. Though it has far more than its fair share of features, it maintains the extraordinarily low price of £199.95.

Travels at a steady fifty. In the speed stakes, the M-1009 is certainly no slouch, being fully capable of up to 50 characters per second.

Providing bi-directional and logic seeking printing for normal characters and uni-directional printing for super and sub script and graphics.

Prints on any paper. Being an impact printer, the M-1009 will print on virtually any paper, including letter headings, invoices and standard office stationery. It will even print two copies together with your original.

A superb character recommendation. In its price range, the M-1009 has a great deal more character than many printers. 96 no less, plus international type and graphic characters. Reliability comes as standard.

Built to the same exacting standards as Brother's elite office printers, the Brother M-1009 already has faultless credentials for reliability. Its 9 pin dot matrix head, for example, has an astonishing 20 million character service life.

One printer that doesn't block out the light. Many home computers tend to be a little on the large side. In contrast, the compact M-1009, at only 7 cm high, keeps a discreet profile.

Well designed, reliable - and conscientious. The Brother M-1009.

The future at your fingertips.
The enhanced model of the Sanyo 550 series, the 550-2, sets out to answer the criticisms of its predecessor. But it's still not IBM compatible, although it does offer more memory and an upgraded operating system. Bob Piper assesses the machine's value for money.
The price of the original Sanyo 550/555 series raised a few eyebrows back in early '84. Comparing the Sanyo's value for money with its competition was very much a no contest situation. With Micropro software, valued at more than the retail price of the system, bundled in, it just had to win hands down. But feedback from dealers indicates that despite this apparent giveaway price the machine took a little while to take off. This may well have been due to natural suspicion on behalf of the buying public and the belief in the old adage: 'You get what you pay for.'

It has subsequently become apparent, however, that the Micropro software may be a little too ambitious for the machine, as the 160k disk drives tend to fill up very quickly. Furthermore, it was launched at a time when MS-DOS compatibility was more of an optional extra rather than the necessity it tends to be these days. It now seems rather a pity that an 8088-based MS-DOS machine should not run off-the-shelf IBM software and sales have undoubtedly suffered as a result.

Sanyo, however, had always planned an enhanced model which would go some way towards answering those criticisms, but it has taken longer than expected to reach the market.

The 550-2 and 555-2 are upgraded versions of the original model which distinguish themselves by having 360k disk drives and running the updated MS-DOS version 2.11. The disk drives are over double the capacity of the original model, and both that and the implementation of MS-DOS version 2.11 should improve the machine's compatibility with IBM software.

At £1390 for the 555-2 and £999 for the 550-2, both prices excluding monitors, but including the same software as before, they are around £391 and £250 more expensive respectively. Whether the improved compatibility and enlarged disk drive capacity justify the price increase is one of the questions I hope to answer in this Benchtest.

**Hardware**

The 'three-box' configuration takes on a whole new meaning with the Sanyo as it is probably one of the most angular designs currently available. The colour monitor shares the same modest footprint as the processor and is almost cube-shaped. With the monitor sitting on top of the processor the overall impression is one of a well-integrated, if somewhat lofty, design. The finish, in common with many Japanese computers, is more akin to a hi-fi system than a business micro, and, although initially attractive, its sheet metal construction may not stand up to the rigours of an office environment.

The low profile processor stands on a shiny black plinth and has a compact footprint of 15in x 14in x 4.5in. The front of the unit houses the two TEAC drives superficially identical to those fitted on the earlier Sanyo. The difference is that these are double-sided, and working with the updated version of MS-DOS, offer a useful formatted capacity of 360k each, exactly the same as the IBM PC. The disk drives feel very robust and the 90 degree rotation locking lever is pleasant to use. Although not inaudible, they are reasonably quiet. Their one peculiarity concerns the read/write light which, as with the earlier model, is most unhelpful, being illuminated all the time a disk is present in the drive, irrespective of whether it's being accessed or not.

To the right of the disk drives is the on/off button. This is not only vulnerable from the user point of view but is prone to damage while the machine is in transit. Obviously it would be better if the button were recessed to prevent inadvertent operation while the machine is in use, and to give greater protection from transit bumps. It would also be a worthwhile improvement to add an on/off indicator LED.

The rear of the 550/555-2 is unchanged from the earlier model. On the far left is an amazingly short mains lead, less than five feet in length. The problem is compounded by the fact that cable is fixed at the computer end, encouraging users who require a longer lead to splice extra pieces on to it; a very undesirable practice. This type of penny pinching may be understandable on a toaster costing £15, but is inexcusable on a professional machine which costs in excess of £1000.

Located adjacent to the mains lead are a hi-fi style external earth screw and a 1630mA mains fuse.

In order to keep the selling price down, there are only a limited number of interfaces supplied as standard. The first is a centronics-style parallel printer port. This will enable users to plug in most types of dot-matrix without encountering any configuration or compatibility problems. Users whose printer has a serial interface will have to purchase the optional RS232C board.

Further along to the right are the two video outputs. The standard 550/555-2 can support RGB and composite video monitors via DIN and phono sockets respectively. On the far right is a DIN-style keyboard socket.

Above these ports are two blanked-off panels which allow the optional RS232C interface and Apple compatible joystick to be fitted at a later date.

Once again the latter is not of much use to the average businessman and in any case will not have any ready made software available to exploit it. However, it may prove of interest to users who intend to write their own programs in Sanyo Basic.

In order to look inside the 550/555-2 five cross head screws need to be removed — two on each side and one at the rear — before sliding the thin sheet steel cover off. Although by no means the best I've seen, the standard of construction is still quite respectable. Once again, however, signs of cost-cutting are evident.

The power supply, for example, which occupies the lower right-hand side of the machine, is only partially...
screened and tends to be spread out over a larger area than appears necessary. The fan, which is not easily visible in operation is not irritating so, actually draws air through the machine's upper casing and exhausts it out through the base plane underneath the plinth.

The very compact motherboard occupies the remaining two thirds of the base plane and is partially obscured by the disk drive sub-chassis located above it. This can be removed by unplugging four connectors, extracting five screws and withdrawing both drives together.

The motherboard has no bus expansion facilities and, therefore, contains most of the necessary electronics. The CPU is an Intel 8088 running at a remarkably slow 3.6MHz. The IBM, which uses the same processor, is now regarded as something of a sluggard but its operating speed is 4.77MHz. The latest IBM compatibles, using the full 16-bit 8086 chip running at 8MHz, make the Sanyo seem very slow. But such relative comparisons are not very meaningful, especially bearing in mind the cost difference: the Sanyo should still be fast enough for its intended environment in small businesses.

As standard both the 550-2 and 555-2 come with 128k of non-parity checking memory, which can only be expanded to a maximum of 256k using Sanyo supplied hardware. The upgrade kit is supplied in the form of loose chips which plug into sockets adjacent to the existing RAM. Upgrade kits are available in two 64k steps: the first to 192k and the second to 256k.

Under certain circumstances the Sanyo allocates 16k of ordinary RAM to video RAM to boost the complement to 48k. An 8259A interrupt controller supports up to eight levels of interrupt, and sound generation is controlled by a 8405 chip limited to producing a variety of beeps and burps. The loudspeaker is located well to the rear of the machine and mounted on an internal bulkhead. Adjacent to the 8088 is a spare socket intended for the almost mythical 8087 arithmetic co-processor. There is still only a limited amount of IBM software which can exploit this magic chip, so for the moment its inclusion on the Sanyo seems even less useful.

The RS232C option comprises a small board which bolts onto the backplane and plugs into a 20-pin connector on the motherboard. Although it defaults to a 1200bps baud rate, this can be changed by running a simple assembly language or Basic program detailed in the manual. It cannot, however, be changed permanently, so the program has to be run each time the machine is booted up. Furthermore, it has other parameters that cannot be changed, and may not, therefore, suit some of the devices that are hooked onto it. The RS232C port is initialised by a LISART 8251 and provides one start bit, eight data bits, no parity, and one stop bit.

Although the 550/555-2 will work with a wide variety of monitors, not surprisingly Sanyo recommends two of its own as the most suitable. The CRT 70, as supplied with the review machine, is a 14in colour monitor and the CRT36i a budget monochrome monitor.

The CRT 70 is a large unit with a 13.5in screen diagonal but its design and finish complement the processor very well. Its size and the lack of a tilt swivel base, however, do not lead to a very ergonomic hardware configuration. If the monitor is located on top of the processor it is only possible to swivel it by 15 degrees before the feet fall off the edge of the processor.

Visible beneath the highly reflective screen are the on/off switch and pilot LED. Cleverly camouflaged behind a hinged front panel are further controls for 50/60Hz operation, horizontal centring, brightness and colour intensity. The rear of the unit has a fixed mains cable — this time a good deal longer — and the vertical hold control. The RGB cable has locking clips on the monitor connector but proved to be rather difficult to insert correctly at the processor end.

The 550/555-2 has a graphics resolution of 640 x 200 pixels and produces its text characters from a 6x7 matrix in an 8x8 cell. The normal display mode is 80 characters by 25 lines.

In use the monitor works very well. Although the character set is very similar to the IBM unit, even down to its coarseness, the display is clear and stable at all times. Colour displays are pleasant without being garish.

Screen-handling when running MS-DOS applications software does seem frustratingly slow. It takes around 15 seconds to load WordStar, about twice as long as modern IBM compatibles, and much of the delay appears to be attributable to sluggish screen-handling.

The keyboard is probably the part of the 550/555-2 that most betrays its shoestring price. The upper plastic moulding looks cheap and is attached.
to a very crude steel base plate which includes two dual position (up or down) rear edge tilt stands.

The computer reset button, however, is a gem, ideally located and well-recessed on the left-hand side of the keyboard adjacent to the point where the tightly coiled cable exits.

The 84 keys are split into three main groups. On the far left are five function keys which can be used in the shift mode to simulate the IBM PC's 10.

The qwerty keypad has a fairly conventional core with a useful LED status indicator on the CAPS lock key and a not so useful one on the GRAPH lock key. This key must be regarded as a hangover from Sanyo's involvement in home computers and places the qwerty keypad in a mode that produces predefined simple graphics characters very similar to those found on the now defunct Sharp MZ-80K. These characters are not usable at system or application software level but can be accessed from Sanyo Basic. In any event it is highly unlikely that business software houses are falling over themselves to write packages which exploit this facility.

The qwerty keypad features a usefully large RETURN key and BACKSPACE/RUBOUT key. The INSERT/DELETE key is used by WordStar to toggle the insert mode on and off. Although there is no separate ALT key, the SHIFT and CONTROL keys produce the same effect when pressed simultaneously.

The far right keypad has a dual function similar to the IBM of numeric entry and cursor control. The functions toggled by the NUM Lock key on the qwerty keypad, but, unfortunately there is no LED status indicator, so it is impossible for the user to know what mode the keypad is in at any time. In my opinion, this is a very irritating omission.

The numeric keypad has further similarities with the IBM unit. It has PGUP, PGDN functions but rather strangely the down cursor arrow is illogically placed on the 5 and not the 2 key.

The red BREAK key operates conventionally in Basic and produces a useful Control-C at system level. It is worth noting that all alphanumeric keys have an autorepeat facility. Unfortunately there is no key to dump the contents of the screen onto a printer.

The use quickly becomes apparent that the keys are ideally placed and angled. Key action is a little on the light side and the stops are reached earlier and at greater velocity than anticipated—an experience that rapidly leads to tender fingertips. Sanyo could improve the situation by fitting stiffer or dual rate return springs.

One final point regarding the keyboard is that the type ahead buffer can store a mere seven characters; a limitation that may prove irri?ant to experienced typists.

**System software**

The revamped Sanyo is supplied with MS-DOS version 2.11. The main difference is that it formats disks with nine sectors, instead of the old eight, giving 80k of formatted storage on each side of the disk. The series 2 Sanyo also uses double-sided drives giving a total capacity of 360k per drive.

The system utilities provided have been kept to a bare minimum. There are FORMAT and DISKCOPY commands but strangely the Sanyo cannot format and copy disks simultaneously. The notoriously unfriendly line editor EDLIN is included and the PRINT command will enable files to be printed from system level.

There are some omissions, however: for example, the MODE command which is normally used to program the RS232C ports and set up the video defaults. This kind of utility is very useful as it can be incorporated into an AUTOEXEC file which will customise the computer to specific user requirements each time it is booted up. Of course the reason it is not included is that the Sanyo does not have a serial port as standard and even when one is added most of its parameters are fixed.

It is, therefore, unlikely that the Sanyo will prove to be a good machine for communications unless a more sophisticated RS232C interface is made available.

The good news for owners of the 550/555-1 series is that they will shortly be able to buy MS-DOS version 2.11 for only £25.

A demo program written in Basic is included on the system disk which runs well in colour but is more useful for shop window displays than impressing friends.

Sanyo Basic itself is rather confusing. At first sight it appears to be a cut down Microsoft Basic, but Sanyo assured me that it is entirely its own work. Programs written in it can be compiled by a Microsoft compiler providing no graphics commands are included. Forgetting for the moment any connection with the Microsoft interpreter, it is quite a comprehensive Basic and should not leave users disappointed.

Another peculiar aspect is the amount of memory which is left after the interpreter is loaded. The review machine displayed a mere 27896 bytes whereas Sanyo insisted that it should be in excess of 41000 bytes.

**Benchmarks**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>1.8</th>
<th>7.5</th>
<th>15.9</th>
<th>15.9</th>
<th>17.2</th>
<th>29.8</th>
<th>56.8</th>
<th>96.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BM2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BM3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BM4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BM5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BM6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BM7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BM8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**All timings in seconds. For a full listing of the Benchmark programs, see p 185.**

Sanyo could not work out why the review machine displayed this idiosyncrasy but did explain that around 16k of RAM would be allocated to video RAM while in Basic.

Loading Compaq Basic, a version of Microsoft BASIC, left only 15913 bytes for user program.

Sanyo Basic does boast a very easy to use line editor which utilises the cursor control and INSERT/DELETE key to great effect.

For users who require full transportability of programs, Microsoft's GWBASIC is available for the Sanyo as an optional extra.

**Applications software**

Of course the real good news about the Sanyo is both the standard and quality of the Micropro software bundled in with the package.

For some reason the review 555-2 was supplied with software intended for a 550-2, so it was lacking several facilities which are so well known it's not necessary to look at each of them in detail.

Despite an intimidating list of Micropro names the software can be split into three groups: word processing, spreadsheet, and database.

Infostar, Reportstar, Datastar, and Filesort are the components of a database. The package is best summed up as a relatively simple card index type system coupled to a powerful reporting facility. Data is entered via Datastar and the reports generated using Reportstar.

High speed sorting is covered by Filesort and Infostar links the database into WordStar/Mailmerge and Calcstar to form a very rudimentary integrated system enabling data to be transferred between them.

Some users, however, may not find that the comprehensive Micropro package meets all their needs. There are a wide variety of vertical market packages available but memory and graphics limitations have prevented integrated packages like Symphony...
SYSTEM OFFERS: FREE STOCK AND INVOICING SYSTEM AND FREE PRINTER CABLE

Specialists in Business and Accounting Systems

SANYO BUSINESS SYSTEMS
SANYO MBC 555 128K ................................................................. £799
SANYO MBC 55Q 2 × 360K DRIVES ....................................... £1159
SANYO MBC 558 + 10Mb HARD DISK ................................. £2065
SANYO MBC WINCHESTER DISK + TAPE STREAMER
SUBSYSTEMS 5-20Mb ........................................................ FROM £1500

IBM COMPATIBLES
ITT XTRA ........................................................................... £1795
OLIVETTI M24 ................................................................. £1595
OLIVETTI M21 PORTABLE PC ......................................... £1930
OLIVETTI M10 PORTABLE PC .......................................... £430

EASY ACCOUNTS. The professional 5-module Accounts System for only ..................................................... £395

DEALER ENQUIRIES WELCOME

ASHGOLD BUSINESS COMPUTERS LTD
490 NEASDEN LANE, LONDON NW10
Tel: 01-208 0263
the Sanyo 555-2 series and is extremely useful as it covers the specific implementation of each Micropro package on the 550/555-2 series and is extremely useful as it details the action of the function keys as well as provides handy command reference charts for each package. Also included with every Sanyo is an audio training guide prepared by Headline communications famous for its How to use... series of software tutorials. The two audio cassettes, disk and booklet take a raw beginner right from square one on learning how to use MS-DOS, through to programming in Basic and using the Micropro software. Providing the user has a handy cassette deck, audio guides can prove a novel and strangely addictive way of learning the basics of computing.

Prices

The Sanyo's pricing structure is impressive both for its simplicity and its value for money. There are just two models in the new range. The Sanyo MBC 550-2 with a single 360k disk drive costs £999 excluding monitor but including Micropro's WordStar and Calstar. The Sanyo MBC 555-2 with dual 360k disk drives costs £1390 excluding monitor but including Micropro WordStar, Mailmerge, Spellstar, Calstar, Datas, Reportstar, and Filesort. Recommended monitors are the colour CRT70 at £499 and the monochrome CRT36 at £127.

The additional 128k RAM costs £181 and the RS232C interface board £50.

Conclusion

The 550/555-2 is most likely to appeal to small businesses and Sanyo, obviously aware of this fact, has packaged the machine in a thoughtful manner. Included is a full suite of professional software on the dual disk drive model, which should meet the needs of its targeted users for quite a while. Furthermore, Sanyo, aware that the Micropro software included are not state of the art packages as far as user-friendliness is concerned, has thrown in an interesting audio cassette-based tutorial.

It is something of a disappointment that the new models are not IBM-compatible bearing in mind the similarities in processor operating system and disk drives, but at least Sanyo is honest about the fact, even if some dealers may have been less so in their advertising campaigns for its predecessor.

However, the fact that the 550/555-2s are much closer to the design of IBM than before should ensure users will have a fair chance at future software and disk drive compatibility.

Sanyo assures me that its series 2 machines should be available by the time you read this Benchtest. The 550/555-2 comes with a 12 month guarantee on all parts bar the disk drives, which are only covered for three months. After this period various levels of maintenance are available through Systems Reliability Ltd or dealer appointed service facilities.

To achieve such a low selling price Sanyo, as before, has only supplied the bare essentials in the hardware department. The lack of a flexible serial interface, the marginal processing speed, and the non-parity checking memory all point to this fact. But to be honest the users at which the Sanyo is aimed are unlikely to be troubled by such deficiencies. For them the 550/555-2 may not be state of the art technology bristling with features that will never be used, but simply a technically competent and remarkably complete machine at a very attractive price.
If you're loaded down with ledgers, fed up with filing and tired of ploughing through paperwork, you need Sage.

Sage produce the only fully integrated one diskette accounting/book-keeping program on the market at just £375 complete. It's the simple, efficient and inexpensive solution to small business accounting problems.

Easy-to-learn and easy-to-use, Sage Accounts now offers even more functions than before. Sales and Purchase Ledgers • Nominal Ledger • Cash Book • Journal Entries • Trial Balance • VAT Return • Monthly and Annual Accounts • Age Analyses • Statements • Budget Variance Reports • Credit Control Features • Audit Trail – all together in one compact and comprehensive package.

In addition, Sage Plus provides invoice production linked to stock files and integrated with the sales and nominal ledgers.

Sage is suitable for use on most business micros and is fully automatic – which means no shuffling through a pile of disks to find the program you need. It's also complete and self-contained – no expensive modules to buy every time you need a new function.
You'll also be glad to know that while Sage is putting your accounting system in the pink, it won't put you into the red. Sage Accounts costs just £375 complete – a fraction of the price of most of the alternatives.

So don't risk making an expensive mistake.

Call 01-200 0200 or clip out the Coupon

Sage Accounts £375 • Sage Plus £695 • Sage Payroll £195.

Please send me more details of Sage Accounting Programs and my nearest dealer.

Name: ____________________________
Position: __________________________
Company: __________________________
Address: __________________________
Tel: ________________________________

Sagesoft Limited, NEI House, Regent Centre, Newcastle upon Tyne NE3 3DS.
Tel: 091 284 7077, Telex: 53623 SAGESL G.
BENCHTEST

TDI Pinnacle

TDI's proud boast about the Pinnacle is that it's 'blindingly fast'. Peter Bright takes a look at this elegant but powerful multi-user micro, aimed at the education and software development markets, to see if he can keep up.
Get rich quick plan A — import a potentially successful product from the US. This scheme is well used by many British firms; ACT is perhaps the best example with the Sirius. Many other firms in the UK have trodden the same path with varying degrees of success.

One such company is Bristol-based TDI. It started out importing the Sage range of supermicros and distributing the UCSD p-System in this country. TDI’s latest venture is a cooperative deal with the US firm Pinnacle Technology of Texas to produce a TDI-badged machine that it can sell in Britain alongside the Sage range.

The result is the TDI Pinnacle, an allegedly blindingly fast Motorola 68000-based multi-user micro. I took a closer look.

**Hardware**

The first thing I noticed about the Pinnacle was how small it is. Its grey sheet metal casing measures only 17ins wide by 1.5ins deep by 4ins high. When you consider that it’s supposed to be one of the most powerful micros you can buy it seems small indeed, especially when you compare it with the vastly oversized proportions of something like the IBM PC.

The casing construction is pleasingly simple and cheap to produce. It consists of just two pieces of sheet metal; the bottom piece has its front and back bent up to form the front and back panels, and the top uses a similar trick to form the sides.

Apart from being elegant and simple, it’s also very cheap. Grown men have turned white at the cost of tooling up for injection-moulded casings on micros. This is fine if you’re building Apricots and the like, but when you’re talking about comparatively low volumes, then the economics don’t look too good. Sheet metal is a much better material.

The front of the machine is very plain — the review machine had a sticky plastic strip which displayed the Pinnacle name and the TDI logo. Below this was a single, half-height floppy disk and a half-height hard disk. Nothing else.

Unfortunately, the rear panel isn’t much more interesting. To the left is the cooling fan and working to the right we have on/off switch, power input, seven RS232 ports, a small reset switch and a decidedly unstandard centronics parallel printer port.

The only odd-looking feature of the rear panel is two banks of DIP switches, a hangover from TDI’s popular imported Sage micros. These switches are used for broadly the same functions as on the Sage: you can play with communications line settings, set which hard disk partition the system boots from, and so on. Having the switches on the outside is much better than burying them within the machine’s casing.

Getting inside the machine is easy — remove four screws and slide off the lid. Once inside, the main circuit board is revealed. Below this are the power supply unit, and the floppy and hard disk units.

The main board is very well made and laid out. Pinnacle Systems in the States makes many circuit boards for the US defence department, so standards should be high (sic).

The main PCB on the review system was dominated by the main processor chip and the RAM chips. The main processor is the well-used Motorola MC68000; the most widespread use by far of this chip is in Apple’s Macintosh,
but many multi-user business micros also use it.

The Pinnacle differs from other micros using this chip in that it runs the 68000 flat out at a staggering 12MHz with no wait states. If you take a quick look at the Benchmark figures, you'll see that the Pinnacle is indeed very fast: it's easily the fastest micro PCW has ever Benchtested. Interestingly the previous champion was the Sage machine which is also imported by TDI.

The entry level machine is supplied with 256k of RAM, which is currently expandable to 1.5Mbytes. The review machine was supplied with 1Mbyte of RAM. The main board can only take 512k, the other 512k was accommodated on an expansion board piggy-backed under the RAM area on the main board. There wasn’t much space for air to circulate over the piggybacked board, but I didn’t suffer any overheating problems.

All the RAM on the review machine was made up of 64k x 1 chips. The review machine had no less than 144 of these little beasts arranged in 128k rows of 18 chips, giving parity on every byte — quite an impressive sight. When 256k RAM chips are more freely available, then the Pinnacle will use them. This will take the maximum RAM of the machine to 6Mbytes. The system also has 8k of ROM containing the bootstrap and various diagnostic routines.

The rest of the main PCB consists of the usual logic chips, disk controllers and I/O controllers. A large rechargeable battery is included in the board to supply power to the real time clock calendar chip.

A large ribbon cable runs from the main PCB to the RS232 board. Next to the ribbon connector on the main board are four Zilog 280 DART asynchronous communication controller chips; it’s these that drive the RS232 ports. The baud rate can be controlled either by software or by the first three of the bank A DIP switches. The system defaults to 19200 baud.

Unusually for a modern micro, many of the chips on the board are socketed. These include the 68000 chip, all the RAM, the ROM, the Z80 DART chips and some of the TTL chips. The review system also had some empty sockets; presumably these are for the various add-on boards.

The Pinnacle can be supplied with a combination of 800k floppy disk and 10-, 20- or 32Mbyte hard disk. The review machine was supplied with one floppy disk drive and a 21Mbyte hard disk. In use the hard disk worked well, but it was very noisy.

The floppy disk drive is worthy of mention. It echoes the Sage drive in that it has very fast access times. This is because unlike most other floppy drives, it doesn’t use any interleave or skew factors when data is stored on the disk. Instead the system lays consecutive blocks end to end over the surface of the disk. This saves the time which is usually lost while the head is waiting for the next block to come round.

The Pinnacle can be made to work with virtually any remote terminal. On the hardware side, it’s supplied with standard RS232 serial ports so there are no insurmountable problems there. On the software side, the system is supplied from the factory with a ‘Plain Vanilla’ terminal driver which is so basic, it should work with most terminals.

TDI recommends that you do something about the ‘Vanilla’ terminal driver as soon as you can, because although it will work, it will also be very slow. You can either install your own driver into the system, or you can use one of TDI’s pre-written drivers (if it has one for your terminal).

The review system was supplied with two thinly disguised American Wyse 50 terminals. These are TDI’s choice as the standard Pinnacle terminals, and are even supplied with stick-on TDI badges and a Pinnacle logo on the keyboard. It’s likely that many Pinnacle systems will be shipped with these terminals, so it’s worth looking at them in more depth.

I must admit that on the few occasions I’ve come across them, I’ve come to like these Wyse terminals. They are constructed on modern low profile lines, quite unlike the bulky, ugly DEC VT100 style which is more commonly associated with computer terminals.

The screen is large and can be tilted or swivelled in any direction on its base. Brightness can be controlled by a thumbwheel on the right-hand side of the display casing. The base unit houses two RS232 ports: one connects to the remote computer and the other is for a local printer.

The keyboard has no less than 101 keys of various shapes, sizes and colours; the typing angle can be increased with a flip-down bar.
The main qwerty typing area takes up most of the space. To its right is the numeric keypad which also plays host to four specialist editing keys. Sixteen function keys run along the top of the keyboard. The four cursor control keys are located in the qwerty area, but are distinguished by their bright yellow colour which adds a touch of decoration to an otherwise bland, grey keyboard.

The only unusual key on the keyboard is marked 'Setup'. This allows you to play around with the terminal settings, baud rate, parity, and so on.

Ifound the keyboard easy to use. The action is fairly springy, but the feel is good. I like the way that the 'F' and 'J' keys on the qwerty section, and the 'S' key in the numeric keypad, have small lumps moulded onto the keytops to make them easier to find when you’re touch typing.

Overall I like the Wyse terminal a great deal. My only criticism is that the RETURN key on the keyboard is rather small and can be hard to find.

System software

Like the Sage, the Pinnacle can be supplied with a wide range of system software. The standard operating system is the UCSD p-System; however, other operating systems are available, such as CP/M-68K and MBOS. The review system was supplied with the UCSD p-System and MBOS happily living together on the same hard disk. With the DIP switches in their normal positions, the system booted into the UCSD p-System. However, by altering the switch settings, it could be made to boot from the BOS section of the hard disk. In practice it's unlikely that many users will want to run multiple operating systems in this way, but it was useful for the Benchtest purposes.

In the normal run of things I would thing that the default operating systems will take the system with BOS, because there's a comparatively good range of multi-user business software now available under this system. I would expect educational establishments, software developers and the like to take the basic system as offered with the UCSD p-System. The problem for business users is that while there's a good deal of single-user p-System software around, I haven't come across that much multi-user p-System software yet.

There are some interesting features of the UCSD p-System on the Pinnacle. When you boot up the system it does a little hardware check, then the hard disk starts hammering and the system boots into the p-System. One of its first acts is to copy system files into the different users' RAM disks — each user can have his own RAM disk to speed up the system. Obviously you need a fair amount of RAM to be able to give each user a useful RAM disk, but it does make a fast system even faster.

After it has copied the files to the RAM disk, the hard disk does some more hammering and asks you to confirm that the date is right. The review system then went into a ‘user-friendly’ menu system, utility programs provided that allow you to edit and generally play around with menus, so with some practice it should be possible to create a menu for any occasion.

If you leave the nice, friendly world on the menus and descend into the dark, gungy world of the UCSD p-System, you find that things aren't that bad. I must admit that this was the first time I've used the UCSD p-System. I'm a confirmed CP/M-DOS user and have always thought that p-System was fine for education buffs, but not much use in the real world.

However, things aren't quite as easy as I've been making out (the directory function isn't available directly but as a sub-function from within the FILE command, for example), but I was happily wandering around the system within ten minutes. A total of 12 commands are available from the top level UCSD p-System command line: EDIT, RUN, FILE, CD/MOLE, LIJNK, ASSEMBLE, DBACKGROUND, HJALT, I/INITIALIZE, IUSER, RESTART and MJ/ONITOR. These are all self-descriptive, and the editor is of the full-screen variety.

The only function worth examining is the FILER. This provides some very sophisticated file manipulation and maintenance functions which are certainly not found on lesser CP/M-DOS-type systems. The menu for FILER has a total of 20 menu options, most of which are self-explanatory but some which are odd. The options are: Get, Slave, What, New, Ldir, Rlem, Chng, Ttrans, Ddate, Q/lit, Blad-biks, Elext/Dir, K/nch, M/ake, P/eref, V/ols, X/image, 2/Zero, O/n/off-line and Fil/swaplock. I imagine you're surprised to hear this, but FILER is powerful.

The next screen in the EASY setup menu is that which is worth taking a look at. It gives you the option of specifying how much RAM if you just want to experiment. The only problem with most of the screens in the Configure option is that knowledge of hex is required. The exception to this is the special EASY setup system where all numbers are expressed in decimal. Most users will not use the EASY setup option at all, so it doesn't matter if you leave them to do everything they want, and that there's no need for them to use the other utilities.

The first thing that the Elasy setup system allows you to do is to allocate a buffer length to each of the seven serial ports and to the printer port. This is easily done using the utility provided. Likewise, backing up the Winchester has been provided for with backup and restore utilities.

The more interesting utilities are provided under the heading of ‘Pinnacle Utilities’.

At the top level the options are: Configure, Format floppy, Boot transfer, Hard disk [backup, Restore, Format, Ship, Partitions, Transfer boot] and Quit. These are all self-explanatory; the only vaguely interesting option is Configure, which gives you the option of formatting the floppy disks, serial ports, users, the real time clock, buffers, partitions, and so on; in fact all the things that make the system tick. You can either write your changes to disk if you're confident that what you've done is right, or temporarily write them to RAM if you just want to test.

The only problem with this menu is that you can't get the directory is just look at the results of the Benchmark programs, see p185. All timings in seconds. For a full listing of the Benchmark programs, see p185.

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Time (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM1</td>
<td>0.35</td>
</tr>
<tr>
<td>BM2</td>
<td>0.45</td>
</tr>
<tr>
<td>BM3</td>
<td>0.90</td>
</tr>
<tr>
<td>BM4</td>
<td>1.30</td>
</tr>
<tr>
<td>BM5</td>
<td>1.34</td>
</tr>
<tr>
<td>BM6</td>
<td>3.36</td>
</tr>
<tr>
<td>BM7</td>
<td>4.24</td>
</tr>
<tr>
<td>BM8</td>
<td>4.25</td>
</tr>
<tr>
<td>Average</td>
<td>2.02</td>
</tr>
</tbody>
</table>
Adelphi Business Computers Ltd

Macintosh

- Competitive price
- Personal demonstration
- Full support service
- Personal delivery and training service throughout the UK

Adelephi Business Computers Ltd
25 Trinity Street,
Coventry CV1 1FJ
Tel: 0203 553944

Authorised dealer for Apple, ACT and Fortune

---

**3M authorized distributor**

---

### Special Offers

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Code</th>
<th>1-9 boxes</th>
<th>10+ boxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.25&quot; single sided disks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>double density 48 tpi</td>
<td>744</td>
<td>£14.79</td>
<td>£13.79</td>
</tr>
<tr>
<td>quad density 96 tpi</td>
<td>746</td>
<td>£22.69</td>
<td>£20.69</td>
</tr>
<tr>
<td>5.25&quot; double sided disks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>double density 48 tpi</td>
<td>745</td>
<td>£21.79</td>
<td>£19.79</td>
</tr>
<tr>
<td>quad density 96 tpi</td>
<td>747</td>
<td>£26.69</td>
<td>£24.69</td>
</tr>
<tr>
<td>p&amp;p per 10 disks</td>
<td></td>
<td>.70</td>
<td>free</td>
</tr>
</tbody>
</table>

### 8" Diskettes

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Code</th>
<th>1-9 boxes</th>
<th>10+ boxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>single sided single density</td>
<td>740-0</td>
<td>£22.69</td>
<td>£22.09</td>
</tr>
<tr>
<td>single sided double density</td>
<td>741</td>
<td>£29.69</td>
<td>£28.69</td>
</tr>
<tr>
<td>double sided double density</td>
<td>743-0</td>
<td>£34.09</td>
<td>£33.09</td>
</tr>
<tr>
<td>p&amp;p per 10 disks</td>
<td></td>
<td>.70</td>
<td>free</td>
</tr>
</tbody>
</table>

---

### TRANSELECT

**Microcomputer Services**

5 Cliffe Road,
Godalming,
Surrey

**Software**

- Superbase 64: £85.00
- Calc Result: £85.00
- Easyscript: £25
- Easyfile: £20

Please enclose Postal Order/Cheque (made payable to Transelect) with order to the above address.

---

### The 'Classic' Menu Generator

Eliminate all user contact with operating system commands. Use MENUGEN from Microsoft Technology to create menus to access all your regularly used programs.

MENUGEN is a utility which will create menus for any activity. A menu selection will run a program, call another menu, return to a previous menu, run a basic program, execute operating system commands, or exit to the operating system.

**Facilities Include**

- Up to 16 menu options per menu screen
- Up to 15 levels of nested menu
- Optional password protection on menu selections
- Optional logging of all selections taken

**MENUGEN**

MENUGEN is available for most micros with one of either the CPM or MS-DOS family of operating systems, including IBM PC and compatibles, Sirius, Apricot and many Z80 machines. MENUGEN costs £48 + VAT (£55.20) and is available from Microft Technology Limited, 45a Radnor Walk, London SW3 4BP.

To order, or for information, telephone 01-352 7876.

MENUGEN is a trademark of Microsoft Technology Limited and is a British product.
are copied from, boot volume, which serial port he can access, and so on. This provides the system with all the information it needs to install a new user or to modify an existing user. The rest of the easy setup allows you to play around with hard disk partitions and system volumes.

Back at the 'non-easy' setup utilities, there are a number of interesting options you can use if you know hex.

...to play around with hard disk partitions formation it needs to install a new user or to modify an existing user.

The sternal port option allows you to set the baud rate, data bits, stop bits, parity, and so on on each of the serial lines. This can override the settings made by the DIP switches on the back of the machine.

The multi-user p-System allocates the processor's time to each user by 'time slicing': each user gets a fraction of a second of processor time in rotation. Obviously the more people who are on the system, the slower it will be (but then the system is so fast it will still look good by comparison with other micros).

You can test the time slices to some extent by using the 'M'ulti misc configuration option: this allows you to set the time slice for each user. You can either set it short for smooth system response, or give one user more time if he has a special job.

The p-System is primarily famous for its Pascal; however, the review machine was also supplied with Basic so that I could run the PCW Basic Benchmarks. Unfortunately I didn't have time to run the Pascal Benchmarks, but if you look at the Basic set here you'll see that the system is our new speed champion, being over twice as fast as the Sage II. (A system with a floating point unit installed was running the Benchmarks even faster at Compec in November.)

'The Pinnacle ran the Benchmarks with astonishing speed... it's faster than an IBM PC...'

The Basic run on the Pinnacle was compiled with two-word reals, which is marginally faster than using four-word reals.

It's interesting to note that if you assume that the system does a straight time slice (which it does on processor bound jobs), then you could have all seven users running the Benchmarks at the same time and the system would still be faster than the IBM PC with one user! This doesn't prove much, but it's a nice thought.

Applications software

It was good to see that a great waI of applications software was supplied with the machine. Under BOS various business applications comprising ledger programs, word processors, and so on were supplied, and under UCSD p-System various games were provided in addition to the Word7 word processor, ProCalc spreadsheet and Aladin database.

Under the games section, TDI provided a program to solve the Towers of Hanoi (this is a puzzle loved by TDI — the company always sells games that are so fast they can solve the problem ridiculously quickly). For Towers freaks I timed the Pinnacle at 39 seconds.

Documentation

A veritable mountain of documentation was supplied with the Pinnacle. This ranged from third party manuals for the applications packages, TDI manuals for the system and even a copy of Mark Overgaard and Stan Stringfellows' Personal Computing with the UCSD p-System to make sure that even a newcomer to p-System like myself could use the system.

The most interesting manuals were the ones supplied by TDI. These are very professionally presented, and are bound and presented in exactly the same way as a paperback book.

The quality of the manuals varied. The two manuals I made the most use of were the Pinnacle User Manual and the Operating System Reference Manual — they were different in style. The operating system book was large and easy to understand, but the user manual was more technical and had forward and backward references which were distracting and confusing.

Prices

An entry-level system with 256k of RAM and a 10Mbyte hard disk will set you back £4995. The price increases by £1000 for the 21Mbyte hard disk and another £1000 for the 32Mbyte hard disk. The terminals cost £695 each.

Conclusion

I like this machine. It has a commendable lack of bulk but is the most powerful micro I have ever Benchtested. In a great many ways the Pinnacle reminds me of the Sage which, of course, is imported by TDI.

The Pinnacle ran the Benchmarks with astonishing speed — 'blindly fast' is right — and it's interesting to note that it's still faster than an IBM PC, even when all seven users are running the Benchmarks at the same time.

Of course not everyone wants sheer speed, and I don't see this as a mass market machine — it isn't competing with the IBM's and Apricots of this world. Instead TDI has chosen to market the machine where the competition isn't quite as strong and where the returns are higher.

This is a very nice, fast multi-user machine. As such the only competition I can think of is the Sage, and TDI has that machine too.
Pointing the way

Maurice Hawes presents some simple programs which reveal how different versions of Basic help a selection of micros to code floating point inputs.

Floating point notation is a way of representing numbers that enables them to be manipulated regardless of how big or small they are. As examples, 111.23 and 1112.3 would be stored as $1.1123 \times 10^2$ and $1.1123 \times 10^3$.

But life is never that simple in the micro world — many different coding patterns are used, and in many handbooks the code limits are not clearly stated and the precision available is not explained in detail. This article tries to fill the gaps in the literature, provide concrete information on a few popular machines as examples, and indicate the methods by which this information may be obtained for other machines.

**Floating point codes**

Any floating point number $N$ may be expressed in terms of a base number $B$, an exponent $A$, and a fraction $F$, according to the following model:

$$ N = \pm (B^A) \cdot (F) $$

where $A$ is a positive or negative integer, and $F$ is a fraction which must lie in the range $(0.5 \leq F < 1.0)$ if the values of $A$ and $F$ are to be unique.

Combining the factors of $B$, this may be rewritten:

$$ N = \pm (B^A) \cdot (B^F) $$

where $E = A + 1$.

Once $B$ has been chosen, the two values $E$ and $F$ as defined above uniquely govern the magnitude of $N$, and normally it's these two values which are stored in the computer, in some form, to define the magnitude of $N$. They are often referred to as the Characteristic of $N$ and the Mantissa of $N$ respectively; this is a little unfortunate, as the system is not a logarithmic one. The value of $E$ is one higher than the logarithmic characteristic of $N$ (which is $A$), and $F$ is a fractional multiplier rather than a fractional increment to the characteristic. In the following, $E$ will be referred to as the Exponent part of $N$, and $F$ as the Fraction part of $N$.

This concept of $F$ as a fractional multiplier is essential if the system is to be used for addition and subtraction. The addition or subtraction of two numbers begins by shifting factors of $B$ in the smaller number from its fraction part to its exponent part until the exponent parts of the two numbers are equal: this process is called "scaling". Once the exponent parts are equal, the two fractions may be legitimately added or subtracted to give the result. The process ends by rescaling this result as necessary until its fraction part comes within the prescribed limits.

The process of multiplying or dividing two numbers is easier: the two exponent parts are added or subtracted, and the two fraction parts are multiplied or divided. The result is then scaled as necessary. Scaling is an essential procedure in this system of number handling, and has no counterpart in a purely logarithmic system which cannot be used for addition or subtraction.

All these processes require that the computer be able to recognise and handle $E$ as a signed exponent, and $N$ as a signed number. The computer cannot store negative values as such, so the actual stored value of $E$ must be modified in some way to indicate whether the exponent is positive or negative. In addition, the complete code must contain an indication of the overall sign of $N$.

The exponent part $E$ is normally allocated one hexadecimal byte, then the standard method of coping with negative numbers is to offset $E$ by $80H$. This means that if $E = 1$ it will be stored as $81H$, and if $E = -1$ it will be stored as $7FH$. In such a case, the range of values of $E$ that can be handled by a machine is from $+127$ (stored as $FFH$) to $-127$ (stored as $01H$). (In many floating point — FP — packages which adopt this convention, those very small numbers which should be coded with an exponent byte of $00H$ are in fact coded as might be expected, but are subsequently treated as 0 by the machine.)

The precision with which the number $N$ can be coded is governed entirely by the number of significant bits in $F$. In a base two system all the bits in $F$ are always significant; for example, a three-byte fraction offers a precision of one part in $2^{24}$, and a seven-byte fraction offers a precision of one part in $2^{56}$. These two examples were chosen deliberately because the majority of small computers use an exponent base of 2 and one or both of these fraction lengths. Expressed in decimal notation, three bytes give an internal precision of seven significant figures ($s$), and seven bytes give an internal precision of $17sf$. These are the norms for 'single-precision' and 'double-precision' packages respectively. Other fraction lengths and bases are sometimes used and give different precisions, as will be seen below.

The input routine which accepts numbers from the keyboard, or from a program in decimal form, and converts them to FP code form, should be able to handle the maximum number of significant decimal digits that can be coded internally. The output routine, which takes stored numbers in FP code form and converts them to decimal form, will normally round off to at least one significant decimal digit less than is handled internally to allow for the small errors which occur during binary-
decimal conversion processes.

A coding system for floating-point numbers, which is constructed on the basis outlined above, will use one exponent byte and sufficient fraction bytes to achieve the decimal precision required. These bytes must be stored in a particular order on any one machine, but there is no settled convention between machines on this point and many patterns are found. As a starting point, we'll construct a hypothetical four-byte FP coding system to illustrate the principles outlined above in the simplest possible way. Various systems from a representative range of microcomputers, which all differ in something from the example model, will then be described one by one.

**Code patterns**

Here is a simple, hypothetical four-byte coding system. The exponent base is 2, and the code consists of one exponent byte, EE, and three fraction bytes — F1, F2 and F3 (F1 being the most significant of the three). They are stored in memory in that order (that is, EE F1 F2 F3) with EE set to 00, and the top bit of F1 is computed as 1 and used as the sign flag (1 = negative).

The largest negative number that can be handled is represented by the code set 01 00 00 00, and its positive equivalent by the set 00 00 00 00. The magnitude of this number, which is the same for any number of fraction bytes, will be labelled S and works out to:

\[
S = 2^{-127}(0.5) = 2^{-127}*2^{-256} = 2^{-383}
\]

The smallest negative number that can be handled is represented by the set 01 00 00 00, and its positive equivalent by the set 00 00 00 00. The magnitude of this number, which is the same for any number of fraction bytes, will be labelled S and works out to:

\[
S = 2^{-127}(0.5) = 2^{-127}*2^{-256} = 2^{-383}
\]

<table>
<thead>
<tr>
<th>N</th>
<th>+L!</th>
<th>+ (2^{127})*(1-256^-3)</th>
<th>codes as</th>
<th>EE F1 F2 F3</th>
</tr>
</thead>
<tbody>
<tr>
<td>N+6</td>
<td>+ (2^{3})*(0.75)</td>
<td>codes as</td>
<td>83 40 00 00</td>
<td></td>
</tr>
<tr>
<td>N+4</td>
<td>+ (2^{3})*(0.5)</td>
<td>codes as</td>
<td>83 40 00 00</td>
<td></td>
</tr>
<tr>
<td>N+pi</td>
<td>+ 3.141593</td>
<td>codes as</td>
<td>82 49 00 00</td>
<td></td>
</tr>
<tr>
<td>N+1</td>
<td>+ (2^{1})*(0.5)</td>
<td>codes as</td>
<td>81 00 00 00</td>
<td></td>
</tr>
<tr>
<td>N+0.25</td>
<td>+ (2^{-1})*(0.5)</td>
<td>codes as</td>
<td>7F 00 00 00</td>
<td></td>
</tr>
<tr>
<td>N+0.5</td>
<td>+ (2^{-127})*(0.5)</td>
<td>codes as</td>
<td>01 00 00 00</td>
<td></td>
</tr>
</tbody>
</table>

**Fig 1 Establishing the overall code pattern for positive numbers**

<table>
<thead>
<tr>
<th>N</th>
<th>-L!</th>
<th>-(2^{127})*(1-256^-3)</th>
<th>codes as</th>
<th>FF FF FF FF</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-6</td>
<td>-(2^{3})*(0.75)</td>
<td>codes as</td>
<td>83 00 00 00</td>
<td></td>
</tr>
<tr>
<td>N-4</td>
<td>-(2^{3})*(0.5)</td>
<td>codes as</td>
<td>83 00 00 00</td>
<td></td>
</tr>
<tr>
<td>N-3pi</td>
<td>-(2^{1})*(0.5)</td>
<td>codes as</td>
<td>81 00 00 00</td>
<td></td>
</tr>
<tr>
<td>N-1</td>
<td>-(2^{-1})*(0.5)</td>
<td>codes as</td>
<td>7F 00 00 00</td>
<td></td>
</tr>
<tr>
<td>N-0.25</td>
<td>-(2^{-127})*(0.5)</td>
<td>codes as</td>
<td>01 00 00 00</td>
<td></td>
</tr>
</tbody>
</table>

**Fig 2 Establishing the overall code pattern for negative numbers**

The largest negative number that can be handled is represented by the code set 01 00 00 00 and its positive equivalent by 00 00 00 00. The magnitude of this number, which is the same for any number of fraction bytes, will be labelled S and works out to:

\[
S = 2^{-127}(0.5) = 2^{-127}*2^{-256} = 2^{-383}
\]

The smallest negative number that can be handled is represented by the code set 01 00 00 00 and its positive equivalent by 00 00 00 00. The magnitude of this number, which is the same for any number of fraction bytes, will be labelled S and works out to:

\[
S = 2^{-127}(0.5) = 2^{-127}*2^{-256} = 2^{-383}
\]
For under £200 you can become your brother's keeper

In just a few days you could be using this amazing, new printer from Brother. It's small and neat but packed with more than its fair share of features.

**TRAVELS AT A STEADY FIFTY**
- In the speed stakes, the M-1009 is certainly no slouch, being fully capable of up to 50 characters per second.
- The M-1009 has bi-directional and logic seeking printing for normal characters and uni-directional printing for super script, sub script and graphics.

**PRINTS ON ANY PAPER**
- Being an impact printer, the M-1009 will print on virtually any paper, including letter headings, invoices and standard office stationery.
- It will even print two copies together with your original.

**A GREAT CHARACTER REFERENCE**
- No less than 96 ASCII plus international type and graphic characters are standard.

**BIG BROTHER RELIABILITY**
- Built to the same exacting standards as Brother's elite office printers, the Brother M-1009 already has faultless credentials for reliability.
- It's 9x9 dot matrix head, for example, has an astonishing 20 million character service life.

**SUITABLE FOR ANY MACHINE**
- With IBM Centronic and the Epson dual serial/centronic interfaces fitted as standard the M-1009 is suitable for any home or business computer.

**FULLY GUARANTEED 7 DAY DELIVERY**
- You can order in confidence, your Brother printer will arrive by courier within 7 days of your order complete with manual and full guarantee.

**£199.95 NO MORE TO PAY!**

Order your Brother M-1009 now! Access/Visa holders ring 01-482 1711 or fill in the coupon below, or write to: RELATIVE MARKETING, UNICOM HOUSE, 182 ROYAL COLLEGE STREET, LONDON NW1 9NN. (Personal callers welcome Monday-Friday 9-6, Sundays 10-1).

TO: RELATIVE MARKETING, UNICOM HOUSE, 182 ROYAL COLLEGE STREET, LONDON NW1 9NN.
Please send me by courier (qnty) Brother M-1009 printer(s) (qnty) Tractor Feed unit(s) at £17.25 (inc VAT). (qnty.) Printer Cables at £9.95 (inc VAT). State make and model I enclose a cheque for £ or debit my Access/Visa card no
Name __________________________ Signature __________________________
Address __________________________ Telephone __________________________
Postcode __________________________ PCW1
and 3.1 are used extensively on Sharp micros, and Version 4.1 has recently appeared on the Tatung Einstein. It is interesting to note that Tatung is proposing to offer a supplementary numerical code, the FP system, offering all the most common arithmetic routines with output to 15sf and automatic formatting to overcome the output limit of 6sf, which is a fairly severe handicap in financial programming.

BBC Basic uses an exponent base of two and the standard conventions for exponent offset and sign flag, but allocates four bytes to F and thereby achieves an internal precision of one part in 2^32 (better than 9sf). The code is laid out with exponent byte first, followed by the most significant byte of F. The large magnitude limit is slightly different from those previously encountered because there are four fraction bytes, and works out to:

\[ L = 2^{127} \times (1 - 2^{56} - 4) = 1.701411834 \times 10^{38} \]

The code pattern for positive numbers and zero is shown in Fig 4.

The equivalent negative numbers are coded by setting the top bit of F1. The last two examples in Fig 4 illustrate the fact that BBC Basic, unlike some packages previously mentioned, handles those numbers which code with an exponent byte of 00 and a valid value of F as non-zero numbers. The small magnitude limit is therefore \( S(0) = (2^{-127}) \times (0.5) \), and the code for the number 0 is five 00 bytes. Note that the input routine handles 10, and sometimes 11 significant decimal figures, and that by inputting to such precisions it's possible to produce the correct code patterns for the limiting numbers of the FP system on the BBC Micro. The designated output precision is 9sf.

Sharp Basic SP-5025 uses an exponent base of two but is otherwise quite unlike any of those mentioned above. It uses the top bit of the exponent byte as its sign bit (one = positive). The remaining seven bits of this byte are used to store the exponent, offset by +40H. The top bit of F1 is set if N<>0, and is set to 1 for all other numbers.

There are four fraction bytes, and the code is further complicated by its unusual storage order, which is:

\[ N = (2^E) \times F \text{ codes as } EE \text{ F4 F3 F2 F1} \]

where EE equals E+COH for positive numbers, or E+40H for negative numbers, and F1 is the most significant byte of F and has its top bit set if N<>0.

In this package, the large and small magnitude limits are quite different from those of other packages because of the reduced range available for E, and they work out to:

\[ L = 2^{256} - 4 = 9.22337203 \times 10^{38} \text{ (to 16sf)} \]

and \( S(0) = (2^{-127}) \times (0.5) \times 2^{38} \text{ (to 16sf)} \)

The overall FP code pattern for Sharp SP-5025 is shown in Fig 5.

The four-byte fraction gives an internal precision of one part in 2^23 (better than 9sf). The FP input routine in SP-5025 is unusual in that it will completely ignore any input beyond its designated limit of 9sf, and also because it doesn't allow the E notation. For these reasons, L and S could only be input in full (that is, with all necessary leading or trailing zeros) and to 9sf, and this produced the codes in Fig 5. (Attempts were made using the XXXX*10^nn format, but the notation proved slightly inaccurate as usual on small FP packages using base two.)

The designated output precision of Sharp SP-5025 is 8sf. Its magnitude range of 9.22337203+18 down to 2.71050544E-20 is adequate for general purposes, but can cause difficulties in some scientific calculations. As all Sharp machines run on RAM-based interpreters, other packages are available to help overcome this problem.

NewBrain Basic is the most unusual package of all those tested here. The numeric base for the exponent E is 16 but as the stored exponents change in steps of two, the effective base as far as the fraction F is concerned is 256. This means that none of the fraction bits may be used as a sign bit, since the limits of F in this case are (1/256 < F < 1.0). The sign bit (one = negative) is therefore placed in the otherwise redundant bottom bit of the exponent byte. Negative exponents are stored in 256 complement form to give a theoretical range for E from -256 down to -128 (stored as 80H). The exponent byte is followed by five fraction bytes, and zero is flagged by setting the top fraction byte F1 to 00. The theoretical magnitude limits are much wider than usual owing to the...
IN MICROSYSTEMS ONE NAME LEADS THE REST... VSI

**ZF-I51-22**
The "Total Business Solution"

PC desktop system with 8088 microprocessor, 128Kb RAM, 2 x 320/360Kb 5.25" half-height floppy drives, two serial ports, one parallel printer port, four open IBM-compatible card slots for expansion, detached keyboard, RGB and composite video output. With Zenith PC-DOS operating system enabling the use of all IBM PC software.

- Inc. Monochrome Monitor... £1,995
- Inc. Colour Monitor... £2,330

**ZW-I51-22**
As ZF-I51-22, but with 1 x 10MB 5.25" Winchester drive and 1 x 320/360Kb 5.25" half-height floppy drive. IBM expansion bus with three vacant slots.

- Inc. Monochrome Monitor... £3,695
- Inc. Colour Monitor... £4,030

**ZFA-161-22**
PC portable system with 9" diagonal amber display, 128Kb RAM, 2 x 320/360Kb 5.25" half-height floppy drives, two serial ports, one parallel printer port, four open IBM-compatible card slots for expansion, colour graphics standard, detached keyboard, RGB output. With Zenith PC-DOS operating system.

£2,150

**ZENITH MONITORS**
- **MONOCHROME**
  - Amber monitor 12" ZVM-122E £95
  - Green monitor 12" ZVM-123E £95
  - IBM access cable ZVM-121-I £3
  - Commodore access cable ZVM-121-2 £6
  - IBM compatible (TTL) 12" amber monitor, connector cable inc. ZVM-124E £128
  - Tilt base for all monitors ZVM-123-2 £8

- **COLOUR**
  - Colour monitor 13" ZVM-133E £395
  - Z-100 access cable ZVM-135-1 £16
  - IBM access cable ZVM-135-2 £16
  - Apple III access cable ZVM-133-3 £16

**ZENITH UPGRADE**
Z-205-1 64K RAM memory expansion chip set.

£99

**QX-10**
The Human Compatible Desktop Micro

£1,735

**QX-10 with CP/M Software Package**
Either PEACHTREE — Peachtext Word Processor, Spellproof Reader, Mailing List Manager, Peachcalc Spread Sheet, or MICROPRO — Wordstar, Mailmerge, Spellstar, MF Print, File Link. Both with printer and cables: plus

- Package with RX-80 printer... £1,999
- Package with RX-80 FT printer... £2,031
- Package with FX-80 printer... £2,126
- Package with FX-100 printer... £2,331

**EPSON**
**PX-8 FULLY PORTABLE MICRO**
£798

64Kb standard RAM, up to 32Kb ROM, up to 120Kb additional RAM, CMOS Z80 CPU, built-in data storage cassette, interfaces for printers, communications, disk drives, and barcode reader, automatic battery back-up for memory, automatic restart after power off, 80 x 8 character LCD display. With CP/M system, Microsoft BASIC and business software.

- PX-8EU 120K RAM expansion pack... £270
- PXB fitted with 120K pack... £998
- TF-20 Twin double-density disk drive for use with PX-8 or Epson HX-20... £498
- CX-21 Acoustic coupler for use with PX-8 or HX-20... £160
- Plus cables for PX-8

**SOFTWARE BUNDLES WITH ALL DUAL-PROCESSOR Z-100 SYSTEMS. CALL FOR DETAILS.**
Sharp double-precision disk Basic SP-6115 uses a base of 10 for the exponent and BCD coding for the eight bytes of the fraction F, each byte storing two decimal digits. The top bit of the exponent byte is used for the sign flag (one = negative), and the remaining seven bits of the exponent byte store the exponent offset by +40H. The bytes are stored in the order:

F1 F2 F3 F4 F5 F6 F7 F8 EE

The 'fraction' represented by F1-F8 is in fact a whole number, and the imaginary decimal point occurs to the right of F8. As F is not limited to the range (0.1 => F >1.0), there's more than one possible code set for any number with less than 16 significant digits. 0 is flagged by setting the exponent byte to 0. The primary code pattern for positive numbers and zero is shown in Fig 6. The equivalent negative numbers are coded by setting the top bit of EE. SP-6115 was used to check all the 16-figure numbers given in this text. In the course of performing these checks, a bug was found when calculating numbers small enough to force the machine to print out an answer in negative E format. The fault occurs when dividing, if the first significant figure of the numerator is smaller than the first significant figure of the denominator. Let N, the whole number, be the first 8C0 bits of F is a non-significant 0 and the negative exponent in the answer is printed out one less than it should be, even though the code stored is arithmetically correct. Thus, for example, 1/2E20) codes as 05 00 00 00 00 00 00 00 (right) and prints out as 5E-20 (right). The bug can be dealt with in Basic by asking the machine to print out the answer multiplied by one: 1/(2E20)*1 codes as 50 00 00 00 00 00 00 00 (right) and prints out as 5E-21 (right). The stored code for 1/2E20 in the first case is not the same as the stored code for 1/2E20 in the second case, although both are correct arithmetically speaking. This is an example of the possibility that a number may have more than one valid code set in this package. Since the fault does not occur when similar calculations give rise to answers printed out in full, which SP-6115 does on 1E+150, or when the answer is printed out in positive E format, it appears that the problem arises in the FP output routine when it's asked to read codes which have leading zeros in the fraction, and also implies printed output in negative E format. It's interesting to note the Basic trick of multiplying by one gets round this bug by scaling the code so that the leading 0 disappears.

An FP package cannot be used to calculate its own magnitude limits. For this reason SP-6115, with its precision of 16sf and its relatively wide magnitude range of 9.999999999999999E+78 down to 1E-48, was found to be extremely useful for calculating the theoretical limits of other packages; likewise those for the NewBrain, which were done by asking SP-6115 to calculate powers of 1.6 instead of 16, and therefore give the appropriate magnifying factor in powers of 10. As a check, 2^63 and 2^127 were calculated by hand, and SP-6115 was found to be accurate in both cases. For the record, the results are shown in Fig 9.

In general terms, the decimal precision of any FP package which uses an exponent base of 10 and a BCD coded fraction is defined for both input and output by the number of significant BCD digits in the fraction. In this particular package, certain arithmetical procedures may lead to results which code with leading zeros in the fraction and thereby lose a corresponding number of significant figures. Such procedures were carefully avoided throughout, and on the evidence of the above figures it seems reasonable to assume that all the 16sf limits calculated under SP-6115, and included in this article, are accurate.

A short Basic program will find the FP code pattern for your micro. The number to be input is defined as the first variable, and then the stored code for this variable is located, PEEKed out byte by byte, and printed onscreen. If your Basic includes the command VARPTR the program is very easy, as VARPTR will, on most machines, point to the lowest byte of the FP code for the specified numeric variable.

10 INPUT "Decimal number"; AA
20 PRINT:PRINT:GOTO 10
30 FOR L=0 TO 3:
40 PRINTN ;" ";
50 NEXT L
60 PRINT:PRINT:GOTO 10

This program is for four-byte code. The variable L in line 30 should be adjusted if necessary to suit your code.
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, both in monochrome and colour on a large range of computers.

COLOUR GRAPHICS CONTROLLER

DIGISOLVE offer you high resolution colour graphics too. Designed to plug into any computer with a bus host adaptor, The VGP64 gives you 512 x 512 pixels in 64 colours. With its own vector processor and 384K bytes of memory, your computer can become a sophisticated graphics system. 64 COLOURS or 8 if you insist, not many do! 4096 COLOURS now you can really paint a picture. 384K BYTES OF RAM or 768K Bytes with 4096 displayed simultaneously. 2 PICTURE BUFFERS give you help with animation. GREY SCALE OUTPUT. EXT VIDEO SYNC LOCK available for making video tapes. APPLE, SAGE, PET, IBM, S100, VME BUS, RS232, centronics, all have interfaces available to make use of our fast hardware. New ones are coming along all the time so give us a ring if your requirement is not listed.

8 COLOURS £899, 64 COLOURS £999
4096 COLOURS £2000 + P&P + VAT

The above prices are box units including power supply but excluding computer interface.

SOFTWARE PACKAGES: Painting and Slide generation, Business graphics, Architectural 3D design.

APPLE II

DIGISOLVE's Apple II High Resolution Vector Graphics Processor card quadruples the screen resolution and saves using up your Apple's memory. The enhanced Applesoft support disc supplied with our card provides powerful graphic functions and simplifies the conversion of existing software.

512 x 512 pixels resolution. FAST 1,500,000 pixels per second. MEMORY an extra 64K on the card. TEXT to 85 characters by 57 lines. CURSOR drawing features. SOFTWARE 18 new functions are added to Applesoft and extra utilities too, all with source listing. OUTPUT to a dot matrix printer or save images on a disc. PASCAL and TASC Compiles supported too.

£399.00 + P&P + VAT


VDU BOARD

DIGISOLVE offer you the cheapest way to make a scrolling VDU with our intelligent 80 x 24 VDU card. With over 80 control functions, the card works up to 19.2K baud. 80 x 24 DISPLAY optional 40 x 24 or 40 x 12.

TRUE DESCENDERS on properly formed characters in an 8 x 12 matrix.

BLOCK GRAPHICS

FULLY SCROLLING display

UP TO 19.2K BAUD via RS232 communications port.

KEYBOARD AND RS232 DATA INPUT

£180.00 (1 off) + P&P + VAT

COLOUR GRAPHICS TERMINAL

The new FRONTIER monochrome and colour high resolution graphics terminals are fully compatible with Tek 4014 terminals at an amazing price. The high line rate flicker free monitor and advanced electronics provide an exceptional graphic display terminal.

512 x 720 DISPLAY. 1K x 1K STORED PICTURE PAN, ZOOM & SCROLL to move the display about. LOCAL EDITING with macros and software definable character fonts.

PALLETTE OF 4096 COLOURS

FLICKER FREE DISPLAY due to high line rate monitor and advanced electronics working non-interlaced.

19" SCREEN OPTION AVAILABLE

PRICES FROM £1495.00 + P&P + VAT

CUSTOM DESIGNS

DIGISOLVE have staff dedicated to design consultancy and are helping many industrial users with custom design packages. Our experience in designing display equipment, character or graphic based, and microprocessor controllers may help you with your special projects. Please do not hesitate to contact us if you require further details.
If you're not sure how many bytes your machine uses for its FP code, a little trial and error with a known variable such as pi will soon establish this point. If your machine has HEX$ as well as VARPTR you can change lines 30-40 to give a printout in two-character hexadecimal instead of decimal:

30 FOR L = 0 TO 3: N$ = HEX$(PEEK(VARPTR(AA) + L)): IF LEN$(N$) = 1 THEN N$ = "0" + N$:

40 PRINT NS; " ";

If your machine does not have VARPTR things are a little more difficult, and it may help to know how the names of numeric variables are stored. The usual method with two-character names is to convert each letter to its ASCII hex code and store the results in two bytes immediately before the FP code. A one-character name will, in this case, still occupy two bytes, the second being set to 0H. In a multiple-precision package, the name bytes will be preceded by one extra byte denoting the length of the associated FP code. If your package allows long variable names, the name will occupy more than two bytes.

For example, in some of the versions of Microsoft Basic tested here, the name bytes are coded as follows before the first variable is called. PEEK addresses are denoted by the hex codes (for example, NEC PC-8800) and in Crystal Basic, the FP code input small limit is 9.40396E-39, although numbers down to 2.39374E-39 are still handled internally. Later versions of Microsoft Basic (Sirius, Apricot) will accept inputs down to 2.39374E-39. The Exponent QL-10 is strange here, as it exhibits one of these limits in single-precision and the other small limit in double-precision. The BBC Micro also has an exponent base of 2 and a full exponent byte, but codes down to 1.46937E-39 because any code set with a zero exponent byte is treated as a non-zero number.

The NewBrain has a much larger range, from 2.04856E+150 down to 1.00000E-128, because its exponent base is 16 instead of 2. The NewBrain should be able to handle an even wider range, from 5.23742E+151 down to 2.91342E-157.)

Sharp SP-5025, on the other hand, has a much smaller range, from 9.22337E+18 down to 2.71050E-20, because the top bit of its exponent byte is used as a sign flag. To compensate, Sharp has adopted a notion of negative FP code for each double-precision variable and specially defined FP code for each double-precision variable. The NewBrain should be able to handle an even wider range, from 5.23742E+151 down to 2.91342E-157.)

If your Basic has the function VARPTR, or if you know where the FP code for the first defined variable is stored, simple programs such as those given here will reveal how your machine codes FP inputs. Otherwise you could write a short provisional program variable such as Pi, and then finalise the program by trial and error. Once the program is running correctly, it will help you to learn a lot more about your FP coding system.

In the course of preparing this article, I examined a number of different methods of coding FP variables. The BBC package appears to handle FP codes very accurately within its own limits, and of all the packages tested offers the best compromise between range, precision and code length.

I suggest, however, that something like the BBC package, but with one extra fraction byte to give six bytes in all and output to 11sf is an even better compromise for small micros, and will avoid the code lengths and programming complications associated with double-precision options and specially defined variables.

PCW's Benchmark of the Sinclair QL (September 1984) revealed that Sir Clive has fitted his latest micro with an FP package having a magnitude range of E:615 and a precision of 8sf. My reaction was to wonder how many bytes it takes to store a QL variable: I think the answer may be five. Can you work out why? Five may be the wrong answer, but the logic is interesting.
Ever get the feeling that someone is watching you? Paranoia? Probably, but you can never be sure. If you use your micro and the public telephone lines to transmit important data to friends and colleagues, how can you be sure that no-one is eavesdropping on the line and stealing your data?

Up until now there has been very little micro users could do to protect their data. Mini and mainframe installations can afford expensive private lines and encryption hardware, but such facilities are beyond the means of the average micro user.

Now a small company called Datasoft in Ilminster, Somerset, has come up with a combined terminal and data encryption package called Datatalk. This allows you to code your data and transmit it to colleagues safe in the knowledge that even if someone is listening, he won't be able to understand a word of what you’re saying.

Datatalk runs on the IBM PC or compatibles and is supplied on one 5¼in distribution disk. It is available either with or without encryption. I tested the encryption version.

The code for the review system was contained in a file called DATACODE.EXE. This took up very nearly 100k, although the non-encryption version isn’t quite as big.

When “DATA-CODE” is typed, the system displays the copyright banner and the serial number. As my copy was a one-off version, the sign onscreen also displayed my name — it’s a great ego boost seeing your name in lights! The sign is displayed for a few seconds before the system goes into the top level menu.

Before we go any further it’s worth pointing out that Datatalk uses a hierarchy of menus to issue commands. Commands are selected by highlighting the word in the menu hitting RETURN. In practice, this is very much like the system used in Lotus 1-2-3. To move the cursor to the word you either type the first letter of the command, or use the cursor keys or the space bar to move the cursor to the desired command. ESCape will usually get you back to the previous level.

Datatalk also makes use of the IBM’s function keys. Hitting F1 at any time opens up a context-sensitive help window. The set-up of the other function keys varies according to where you are in the package, but F8, for example, will usually get you a disk directory.

It’s possible to assign strings of up to 40 characters to the function keys. Because the system uses the unshifted function keys for system commands, you can only assign strings to SHIFTed function keys. As well as assigning strings, you can also assign control or escape sequences to a function key. This makes it very easy to set up, say, log-on sequences.

You can save different sets of function key settings in disk files, so you can re-assign function keys simply by calling up a new file.

The top-level menu has six options — Setup, Editor, Transfer, Monitor, Data-Code and Terminal.

Selecting ‘Setup’ brings up a sub-menu which lets you play around with the baud rate, word length, stop bits and parity of the RS232 communications line. In addition to the normal baud rates, the evaluation copy of the software also allowed me to work at 1200/75 and 75/1200 baud. This is unusual because the RS232 controller on the IBM can’t strictly run at split baud rates in full duplex. Data can be lost if it attempts to send and receive data at the same time, so I wasn’t inclined to use it.

You can store a number of system and function key settings in disk files so that you can recall them easily if different remote systems need different settings.

‘Monitor’ allows you to set up the system to work with either IBM monochrome, colour or black & white composite monitors.

Unusually for a communications program, Datatalk is supplied with a built-in ‘Editor’. Once the editor has been selected from the main menu, the system opens up three windows. The top window shows a portion of the current text in the editor, the middle window is a menu and the bottom window shows the status of the editor.

The menu window gives you the option of loading or saving a disk file, entering the editor screen, or clearing the contents of the editor.

Whenever you are loading a file, you have the option of typing ‘DIR’ instead of the filename. This opens up a new window which displays a directory of the current disk; you can then happily scroll through the list of files until you highlight the required file. If you hit RETURN, the filename you selected will be written into the command lines.

An interesting feature of the review system was its use of illegal filenames. For example, you could happily create a disk file called ‘FRED’ and try to delete it later. However, if you went into DOS and tried to do anything with the file you would get a ‘File Not Found’ error. Far from getting annoyed with this ‘bug’, I found it useful because no-one else could read nor delete my files.

The editor screen is entered by selecting EDIT from the menu. The editing window displays 75 characters by 13 lines in reverse video (that is, white on black). This idea looks pretty, but because there is a great deal of white on the screen, I found that it flickered more than usual which was very distracting.

The editing facilities are extremely basic. Although the document window can only show 75 characters by 13 lines, the editor can actually hold up to 256 characters by 200 lines. Extended cursor control facilities are provided so
that you can use the editing screen as a window on the document as a whole. You can insert and delete characters and lines, but no block functions are available, so you can't do block deletes, for example.

All in all I found the editor adequate for knocking up messages for remote systems. Its great advantage is that you can enter it while you are still logged on to the remote system. I got into the habit of logging on, preparing replies locally, and then downloading them. This was much easier than fighting the strange line editors which Telecom Gold and TBBS provide.

'Terminal' mode provides all the features you would expect of a modern micro terminal emulation program. When it is selected, the top 23 lines of the screen display the input from the remote system and the 24th line is used to display status.

The two most useful keys when you are in terminal mode are F8 and Alt-F10. F8 calls up the main menu, so you can change the comm's settings, use the editor, and so on while remaining on the terminal. The remote system sends you data while you are doing something else, Datatalk buffers it up and displays it when you return to the terminal screen.

Alt-F10 finishes with terminal mode and returns you to the main menu. I was expecting the command for this to be ESCape, but as it is for most other things. However, some remote systems need ESCape, so you can't use this as a local command.

In addition to the basic terminal functions, Datatalk also has very comprehensive facilities for uploading and downloading disk files to and from remote systems.

At the lowest level, you can echo data to the printer or to a disk file for later processing. You can also easily send the contents of an ASCII disk file to a remote system.

Datatalk makes use of the XModem file transfer protocol. This very commonly used data checking protocol allows you to transfer binary .COM or .EXE files as well as normal ASCII files. I tried it with an ACT Apricot running Async and it worked well.

If you are transferring files between two machines which both use Datatalk packages, you could also use the Datatalk protocol. This has the advantage of allowing multiple files to be transferred using ambiguous filenames: for example, if you wished to transfer all .COM files, you could specify *.COM. I didn't test this because I only had access to one IBM PC during the review.

Encryption

As more and more people use the telephone lines to transmit important data, so the incentive increases for people to eavesdrop on the line and steal data. Encryption gets around this problem by encoding the data so that it doesn't make sense and is extremely difficult to decode. Unfortunately, it has previously only been applied in expensive mini and mainframe applications; nothing of my knowledge has been available for micros.

The people at Datasoft first developed Datatalk as a communications package for the medical profession. This application required a high degree of security to be built into the system to ensure that my knowledge could not read patients' records.

Understandably Datasoft isn't too keen to talk about how the encoding algorithms work except to say that they use a 'two keyshefting substitution' method. This works by generating an encryption table and then applying that and a user-defined key to the unencrypted data. The result, according to Datasoft, is a datafile that is unconditionally secure as long as the file isn't any longer than 10k.

Assuming that you are a new user of the system, the first thing to do is to take an encryption table, of which there are two different types: text and data. Text mode can only deal with ASCII characters — it doesn't handle control characters or binary files. Generally the only time you would use this kind of table would be when your communications system could only handle ASCII data. If your method isn't secure, it isn't as secure as a data mode table. Data mode tables can handle all kinds of data ranging from ASCII to binary .COM and .EXE files.

Both types of table are created in exactly the same way. First of all, you select 'Table' from the encryption sub-menu, then you select the 'Generate' option. The system then asks what type of data table you want to create, and goes on to ask for a 'Table Creation Key'. This can be anything up to a 40-character string and is used as the basis for the encryption table. After you have entered the key, the system thinks for a while (my Olivetti took just under a minute, but IBMcs can take up to three minutes).

While it is thinking, the system is actually using complex (and secret) algorithms to generate the encryption table. When it has done so, it asks for a filename and saves the table to disk. The disk files always take up 10241 bytes — no more, no less.

You can generate any number of different encryption tables; the only restriction being disk space and the fact that you can lose track of which tables you are using. You can add a new table into the system at any time.

In addition to the encryption table, you also need to have an 'encryption key' — another string of up to 40 characters. When you encrypt the file, the system combines the key, table and your file to produce the encrypted file. You can change the key at any time but, unlike the encryption tables, keys aren't stored on disk. You can only successfully decrypt a file if you use the same table and key which were used when it was encrypted, so it isn't a good idea to forget the key.

Encrypting and decrypting files is very straightforward. The first thing to do is to look at the status screen to ascertain that you have the correct encryption table and key installed in the system.

To encrypt the file, you simply select 'ENCRYPT'. The system asks which file you want to encrypt and then asks for a filename for the encrypted file. The encryption process is surprisingly fast: it encrypted a 20k WordStar WS.COM program file in 23 seconds. The encrypted files always end up the same length as the original, but the structure is totally incomprehensible.

Decrypting a file is just as straightforward as encrypting; the only problem is to make sure that you are using the right table and key. If you choose the wrong ones, the system won't tell you but the decrypted file will be gibberish. Encryption takes about the same amount of time as encryption.

Documentation

The documentation supplied with the review system was a professionally presented typeset 30-page booklet. The trouble was that although it looked nice, doing badly written. At a normal writing pace, Datasoft was well aware of these problems and was planning to rectify them. Fortunately, I found that the context-sensitive help screens were very useful, so by and large I didn't have to refer to the manual.

Conclusion

I liked Datatalk a great deal. As a communications/terminal package it is average, but with the addition of the encryption algorithms Datatalk goes a level above its competitors.

Most people agree that communications is becoming a major growth area in computing. It is also agreed that as the use of public telephone lines for micro communications grows, so does the likelihood of people eavesdropping on the line. Datasoft provides an effective method of protecting transmitted data. It would also be useful in a normal office environment where you might want to protect sensitive data or secret programs from prying eyes.

In use Datatalk had a couple of minor quibbles. The screen can get very cluttered and confusing when you have for example, five different windows open simultaneously, and there's also an overdose of inverse video flashing error messages. But overall these quibbles are outweighed by the sheer usefulness of the package.
Koala Pad

Martin Banks draws your attention to the Koala Pad, a touch-sensitive graphics unit for the Commodore 64 which allows aspiring computer artists to draw quality pictures easily.

Have you ever looked at someone else's computer-generated graphics and said to yourself: 'I wish I could do that...', and then given up on the idea because of the amount of program coding needed to achieve worthwhile results? I have. I've looked at some of the clever graphics around and thought it would be fun to try, if only it could be done more quickly and easily than the techniques currently presented.

The Koala Pad is an extremely simple device which enables graphics to be implemented with the utmost of ease, with virtually no tricks or skills to learn and with results that are interesting and entertaining, even for absolute beginners. The Pad has some weaknesses, but then it's not intended to be a professional 'hi-tech' device.

It is particularly aimed at the home and hobbyist market, and interfaces directly with the Commodore 64, the Atari range, the Apple II and the IBM PC in the US. As can be seen from the latter systems it has pretensions towards business use, although its capabilities might be found to be wanting if put to serious use. In the UK the Pad is marketed by Audiogenic, which is concentrating its efforts on the Commodore 64 market for now, and it's this machine which was used in the review.

Hardware

The Koala Pad is manufactured by Koala Technologies Corp of California. The hardware consists of a touch-sensitive pad which measures 3.5ins by 4ins. This sits in acase measuring 6.5ins by 8ins which incorporates two keys, both of which perform the same function. The case is designed to be held in one hand (either left or right) with the thumb over the adjacent key. The other hand is then free to work with the pad area, either with the stylus provided, a finger, or with any other reasonably pointed and hard object.

Software

The software has been produced by Audio Light Inc of California. It takes the form of three packages — Koalapainter, Koalaprinter and the Instant Programmer's Guide. These are fairly self-explanatory, with the first intended for the production of graphics, the second provides hard copy output of the results of the first, and the third package is aimed at those hobbyists keen to interface the Pad to other programs.

Audiogenic has produced an Anglicised version of the Koalapainter package that incorporates a slightly different menu and minor modifications which allow 'circular' circles to be drawn; the American version produces slightly elliptical ones. The cassette tape forwarded by Audiogenic, and specifically checked out as OK, refused to load on the 64, so the test was conducted with the original American software shipped with the Pad. The company supplies in either audio cassette or floppy disk format, as required.

In use

Getting started with the Pad is straightforward with the 64, as its input signals mimic those of a standard joystick. The Pad is simply connected to port one of the computer, the cassette is loaded into the player, and you're ready to begin.

Enter LOAD “KPAINT” in response to the prompt; after the tape has been started there's about a minute to wait before the READY prompt appears again. Key in RUN and wait a further five or six minutes. The main menu then appears. This consists of a number of separate boxes, all containing a different command or function collected together in a rectangle. This constitutes the system's display area which is surrounded by a coloured border.

Now is the time to pick up the Pad and stylus, and twiddle with the television's volume control. This is necessary be-
cause, when the main menu is displayed, there is a continual and annoying mixture of buzz and white noise. The sound should not be turned off, however. Pressing the stylus onto the Pad will produce a buzzing sound from the television, which indicates that you can select from the main menu or change to the drawing in progress.

Move the stylus up the Pad and an arrow cursor appears on the screen's display area. Locate this in any of the boxes, press one of the two keys and the function or command in the selected box will become the current task.

Here's how it works in practice. The boxes contain such commands as DRAW, FRAME, CIRCLE, XCOLOUR (change colour), MIRROR, LINE, BOX, DISC, COPY, SWAP, LINES, RAYS, FILL, ZOOM, STORAGE, OOPS, BRUSHES, ERASE and, at the bottom of the display, a rectangular colour palette with 32 different colours or shades. To get started, move the cursor to one of the boxes by placing your stylus on the pad. Next, move the cursor down to the bottom of the Pad until the beeping is heard, when a key should be pressed again. This removes the main menu and leaves a blank display area inside the coloured border. Now move the cursor back up the screen into the display area; the arrow will appear accompanied by the selected command word, in this case DRAW.

Move the cursor to the point where you wish to start DRAWing, then press the key and it presses; now move the cursor around and draw your picture. To move the cursor without drawing, either take the stylus off the Pad and relocate it, or, more conveniently because you can see the movement, release the key until the cursor is in the right place. There are eight 'brushes' which can be selected for this purpose, and they have different effects. The narrow point for thin lines, broad brushes, and multiple brushes which allow you to draw several lines at once.

My major problem occurred when I placed the stylus on the Pad in a DRAW command as it was impossible to keep the cursor still. The amount of movement was small, no more than a Commodore sprite or two, but the effect was tremendous. It was impossible to produce a straight line in free-hand, and every movement was subject to considerable deviation from the straight and true.

Audiogenic says this is expected of the device, partly because it isn't intended for such 'professional' hand drawing capabilities, and partly because it has a reasonable set of automatic drawing commands which largely overcome the problem. One major reason for the problem, according to the company, is that the Pad is so small that the drawing area is tiny: therefore, the merest hint of a hand tremor is translated into a major movement on the screen.

The automatic graphics commands incorporated into the software fall into two main categories: the linear ones, and the solid ones. The former contains LINES, FRAME, CIRCLE and RAYS. With each of these the basic approach is the same. Select the command from the main menu, then press a key on the Pad. Having selected the function which illuminates its selection by blinking in the menu, and brush the cursor over the selection by placing the cursor over the selection and pressing a key on the Pad), return to the drawing display. Again, this is achieved by moving the stylus to the bottom of the Pad until the beeping is heard and a key can be pressed.

Locating the cursor at the start point and pressing the key will fix the end of a line, the centre of a circle, or the top left and corner of a rectangle. Move the cursor around until you have selected the position for the end of the line, diameter of the circle or bottom right-hand corner of the rectangle and press the key again. The arrow cursor will appear on the display as selected.

This is an extremely quick and easy way to create basic graphical shapes, and with imagination can be used quite effectively. It also overcomes the wobbly cursor problems.

The BOX and DISC commands are used in exactly the same way as FRAME and CIRCLE; the only difference being that once completed, the enclosed area is filled in with the background colour of the border. The same effect can be obtained on other enclosed areas you have drawn by using the FILL command; simply locate the cursor over the area, which can be quite small, and press a key. Be sure, however, that you haven't left any holes through which the colour can 'escape', otherwise everything will be painted the same colour. The only command that can be used for FILL is chosen by returning to the main menu and placing the cursor over the desired shade in the palette.

Of the other commands, XCOLOUR allows you to re-fill an area with another colour choice, MIRROR reproduces what you DRAW in one corner of the screen as mirror images in the other three corners, COPY provides a 'step and repeat' facility for copying all or part of a drawing to another location, and ZOOM allows you to select a portion of the drawing and expand it into a much-enlarged window.

The SWAP command allows you to move picture information from one window to the other. ERASE wipes out the whole picture you have created, while OOPS simply cancels the last drawing command. STORAGE is fairly self-explanatory, being the picture saving and retrieving routine. It was here that the only weakness in the documentation was found, in that the excellent explanation of STORAGE is not fully explained in the manual.

There is an addendum sheet that accompanies the Pad which corrects the error, but you must remember to refer to it (guess who didn't first time round?). When GETting a stored picture, you first have to go through the NAME routine, which allows you to name a picture file prior to SAVEing it in order to identify the file to be retrieved. The GET routine is then used exactly as described in the manual.

Documentation
The documentation supplied with the unit is clear and concise, and contributes well to easy operation.

Prices
The Koala Pad costs £79.95 including VAT and is only available for the Commodore 64 at present. It is marketed by Audiogenic, 39 Suttons Industrial Park, London Road, Reading, R66 1AZ. Tel: (0734) 164646.

Conclusion
The Koala Pad and its software is easy to use and quick to give results. The system is high on entertainment value, but also educational and 'artistic'. It has some drawbacks, most notably the wobbly cursor and the need for two-handed operation which could prove a problem, but at the price it's an excellent exploration of technology.

It also demonstrates how technology can be applied to business applications at a reasonable price. The Pad is a worthy competitor to a mouse and, although there wasn't sufficient time to fully evaluate the Instant Programmer's Guide package which allows you to write interfaces to other programs, it's a relatively easy task to accomplish.

Most of all, though, the Pad will appeal to all those budding computer artists who want to get on and draw the pictures but don't want to waste time forever programming sprites.
The new TDI Pinnacle — the fastest micro in the world.

Running at 12 MHz, the new TDI Pinnacle will take your breath away! It can execute a staggering 3 million instructions per second.

The compilers can handle 3,000 lines per minute. And with the capability of running a mountainous range of software, the TDI Pinnacle has real power, too. What's more it can service 7 users as fast as most personal computers service one. You could say the new TDI Pinnacle is the downhill racer of personal computers.

One thing's for sure, other micros are going to have an uphill struggle competing with it.

For more information about the new TDI Pinnacle contact TDI Limited, 29 Alma Vale Road, Clifton, Bristol BS8 2HL, telephone Bristol (0272) 742796, or clip the coupon.

Take my breath away! Send me your free colour brochure on the world's fastest MICRO.

NAME
POSITION
COMPANY
ADDRESS

TEL NO.

PLEASE TICK END USER DEALER
**UNBEATABLE OFFER**

During the next 28 days you may order any quantity of our discs at a special introductory price.

### INTRODUCTORY PRICES

<table>
<thead>
<tr>
<th>DISKETTES</th>
<th>1–9 Boxes</th>
<th>10+ Boxes</th>
<th>OFFER PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 1/4&quot; DISC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SINGLE SIDED</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Ex VAT</td>
<td>Inc VAT</td>
<td>Ex VAT</td>
</tr>
<tr>
<td>Double Density SS/DD</td>
<td>12.40</td>
<td>14.26</td>
<td>11.40</td>
</tr>
<tr>
<td>Quad Density SS/QD</td>
<td>17.40</td>
<td>20.01</td>
<td>16.40</td>
</tr>
<tr>
<td><strong>DOUBLE SIDED</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Ex VAT</td>
<td>Inc VAT</td>
<td>Ex VAT</td>
</tr>
<tr>
<td>Double Density DS/DD</td>
<td>16.40</td>
<td>18.86</td>
<td>15.40</td>
</tr>
<tr>
<td>Quad Density DS/QD</td>
<td>20.40</td>
<td>23.46</td>
<td>19.40</td>
</tr>
</tbody>
</table>

Post and packing 75p per box or Free for order of 10 or more

AIM Diskettes are packaged in boxes of 10. Each disc has a lifetime guarantee and comes complete with hub ring, sleeve, library labels and write-protect labels.

AIM is a well established company in the United States supplying discs to the American market.

Our reputation is such that we insist upon only the highest quality of disc.

Due to the large quantities involved, we are now able to offer these superb discs for the first time in the U.K. at a price which will dramatically reduce your operating costs.

### Agents:

We are rapidly expanding our agent network in the U.K. If you are already established in computer software, then you are invited to contact Mr Paul Burn, Advanced International Marketing (UK).

---

**Please send the following quantity of AIM DISKETTES**

<table>
<thead>
<tr>
<th>Description</th>
<th>Qty</th>
<th>Price (ex VAT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 SS/DD 48 TPI @ £8.80 per box</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 SS/DD 96 TPI @ £12.30 per box</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 DS/DD 48 TPI @ £11.40 per box</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 DS/DD 96 TPI @ £14.30 per box</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Total value exclusive of VAT | | |
| Total Postage and Packing | | |
| Sub-Total exclusive of VAT | | |
| VAT @ 15% | | |
| Total Value (Payable to A.I.M.) | | |

**ADVANCED INTERNATIONAL MARKETING (UK)**

74a Heath Road, Twickenham, TW1 4BW

Telephone: 01-891 3644 Telex: 946461

(USA) 111 West St John Street, San Jose, Cal. 95113. Tel: 0101-408 286 8013

Name .......................................................... Post code ..................................

Address ..........................................................

Please debit my Access card, number ....................................

Signature:..........................................................
Derwent Data Systems’ Retrieve II is a data management system available for systems such as the Apricot and the IBM PC. But Retrieve II has some unusual features, including the ability to tailor the entire system’s image to specific requirements. This flexibility has made it especially popular in Japan, where a version of Retrieve II is available in Kanji, the language of 4500 characters. For the average British user, one advantage of this flexibility is that you can rename Retrieve II commands: for example, the SORT AND PRINT command could be renamed SPRINT.

Retrieve II’s other unusual feature is its ability to accept voice input. This allows you, if you have the necessary hardware, to specify menu options, commands, and even file and field names by talking to your computer rather than pressing keys. The new Apricot Portable, for example, has voice recognition included in the basic system, and a version of Retrieve II is available for that model.

You must train the system to recognize your voice; having done so, the Retrieve II manual for the Apricot includes full instructions on how to set up your version of the package to work with your voice. There are limitations on vocabulary size, but these limits should suffice in the kind of straightforward application for which voice input might be appropriate.

What of the more prosaic features of the package? As is common with this type of software, these are a mixture of excellent, adequate and unhelpful. Retrieve II allows you to set up a display format for entering and editing records, and to make enquiries and produce reports based on these records. The enquiry processor is extremely flexible and powerful; the reporting facilities provide basic facilities simply, and powerful features in a more complex way. You can specify tasks by using menu options together with commands for producing reports, or you can use commands directly for all tasks. Any sequence of commands may be entered in a file and executed from there, either directly or via menus which Retrieve II helps you to set up. You can control the execution of stored commands, thus providing the basics of a programming facility. Retrieve II also gives unusually detailed and extensive support to dealers and large users who want to produce tailored systems based upon these facilities.

For those who want to try out the system before they buy, there’s a ‘sample’ version of the package which allows you to create up to 20 records; this comes with a simple, well-produced booklet explaining the basic features. Derwent estimates that a novice can use the sampler to set up and use a simple data file in 20 minutes, a claim it says is based on tests with genuine novices. The sampler is sold through dealers at a recommended price of £20, refundable if you purchase the full system, and this is a good way to try Retrieve II on your own computer.

**Constraints**

The main features and constraints of Retrieve II are shown in Fig 1. The date format is DD/MM/YY, and the ‘time’ data type saves a lot of tedious data handling in applications requiring time-based calculations.

The major limitation is the restriction to one keyed field for direct access. When editing, you can retrieve records directly by entering the unique key, or by setting a filter to select a set of records to be edited. The selection in this case involves reading the file sequentially, which could take a long time for a large file, especially on a floppy disk.

Direct access, while much faster, is limited to the single unique key field. For some applications, this might be a disadvantage: one shared by many packages in this part of the market, but one of which you should be aware.
File creation and indexing

The first step in creating a Retrieve II file is to define the name and type of each field in the record and, for text fields, the length of each field. The package uses a simple form-filling technique to obtain this information. Other attributes can also be defined at this stage: entry of a field value may be mandatory, conversion to upper case letters may be requested, and validation can be set up, including both pattern matches and range checks. In addition to values entered from the keyboard, fields may contain calculated values; these may depend on the values of other fields as well as constants.

At the same time, the display layout is defined: you enter the row and column position the field is to occupy when the record is displayed onscreen for data entry or amendment. This format may occupy more than one screen per record, but I find it easier to specify screen layout using a 'paint-a-screen' technique rather than by using column and row coordinates, especially when the program gives you so little help with the position of already-defined fields.

The first field in a Retrieve II record is a unique field which may, if you request it, be used to index the file, thus permitting fast direct access on this field. If you don't want to use this feature, or have no obvious unique field to use, you can ask Retrieve II to supply a unique value for this field as each record is entered.

Data input and updating

Retrieve II uses the same mechanism for entering records and for amending records retrieved directly. To retrieve an existing record, you enter the key field value and the record will be displayed for editing. To add a new record, just type in the value for the key field. If you decide at any stage of entry or amendment to change your mind about amending or creating this record, entering an asterisk in the first character position of a field will void this entry. An existing record will be left unchanged. This void character is used throughout Retrieve II to allow you to abandon tasks without penalty — a very helpful feature.

The process of entering and editing fields is rather less helpful: you enter each field in sequence, and are then asked whether any fields need changing. If you have corrections to make, you must enter the number of each incorrect field in turn and retype it — there's no facility for direct screen editing under cursor control.

To amend a set of records, you enter the enquiry processor and execute the CHANGE command. This allows you to specify criteria which must be met for controlling the display, and update records containing a mixture of confidential and public information.

Screen display

When displaying records for amendment, the format used is that specified in the data definition (called a dictionary by Retrieve II). A file may have several dictionaries, allowing you to have several different display formats. A dictionary must contain a reference to every field in the file. A field may, however, be described as 'hidden', so it's possible to set up different formats for controlling the display, and update records containing a mixture of confidential and public information.

For viewing record sets, two alternative formats are provided: you can view one record per line, with every field set out across the screen; or one field per line. The latter is the format used by Retrieve II if the record won't fit on a single screen line, but you can also request it if you prefer it. Such records can be selected using the criteria described under 'Selection & sorting', and sorted in order if that is required. Totals may be produced on numeric fields. Where several sort fields are used sub-totals can be produced, and the display may start on a new screen when a sorting field changes.

The fields chosen for display in these lists can be specified when the file is set up, or you can specify the fields to be shown when the display request is issued.

A sensible compromise is probably to define in the dictionary those fields which you most often want listed in a report, and to override this specification when necessary. A typical request for a list of all records using only a few fields might be:

LIST PERSONNEL SHOW NAME AGE SALARY

If the request is issued in this form, the list will be displayed one screen at a time.

Printed reports

Any sets of records retrieved through the enquiry processor may be printed or sent to a file as alternatives to screen display. If more powerful formatting facilities are required, you need to use Retrieve II's formatting program. This takes directives from a file of commands set up using the Retrieve II format command. This editor and formatter constitutes a powerful word processor, and the formatter includes some very unusual commands for a data management...
system report generator, such as the ability to generate an index, and to number figures and sections sequentially as they’re encountered in the file.

A particularly interesting feature is the ability to include paragraphs of text from document files in reports. The names of these paragraph files may themselves be field values from the database, so a very flexible system can be built up for applications such as personnel management. For example, the standard information about a member — name, salary, department, and so on — can be recorded in a Retrieve II data file, together with the names of paragraph files containing textual descriptions of job history and current performance. Reports can then bring together both the structured and textual information in a highly selective and well laid out report.

The flexibility of these formatting features is enhanced by the ability to include in a formatted report any sequence of commands which can be carried out by the enquiry processor. The report can thus include sorted lists of records, totals and sub-totals, with page-breaks when sub-total fields change, and so on.

It should now be obvious that the reporting features of Retrieve II are exceptionally powerful and flexible. The means of setting up reports is, however, not the easiest I have encountered. The commands to the formatter are reasonably straightforward, but if they are to be entered within Retrieve II you must use the system’s own editor. This is a buffered editor using indirect commands of the type familiar to generations of mainframe programmers, but not perhaps the easiest tool to master if your experience is confined to screen-based editing facilities of the WordStar kind.

You can use another editor but you must leave Retrieve II and return to test the command file you have created, a process which gets rather tedious until you become familiar with the package.

**Selection & sorting**

Selection, whether to decide which records to display for editing, for viewing in a list on the screen or printer, or for storing in a text file for subsequent word processing, is achieved by using modifiers to command words in the enquiry processor. Two types of criteria can be used: you can filter all records according to tests on the values of fields in file records; or you can continue extracting records until certain conditions are met (the two types of criteria can be used together). In either case, several tests are used, they may be combined with And or In any sequence, and brackets can be used to ensure that the result is satisfactory. A complex command to list a set of records showing the fields specified in the dictionary for reporting is shown in Fig 2 (the plus sign indicates that a command is continued on the next line).

Records which you need to report on to the display or printer may first be sorted into any desired order. Up to five sort fields can be specified, and you may ask for a new page or screen to be started as each sort value changes. If totals have been requested, sub-totals are printed when sort field values change. The SORT command not only carries out the sorting, but also activates the output requested. A command to produce the same output as the example in Fig 2, but sorted by department and giving totals of salaries for these records together with a sub-total within each department, is shown in Fig 3.

**Calculation**

Calculated fields may be set up when the record structure is defined. The usual arithmetic operators are used, and brackets are permitted. You can also show counts, averages and totals when displaying or printing groups of records.

**Multiple files**

Retrieve II does not allow the connection of several structured data files. It does, however, allow you to bring in several different text files when merging information into a report via the formatter. For an application with a mixture of structured and free-format textual information, this could prove to be an acceptable approach.

**Tailoring**

Any sequence of commands available in the enquiry processor may be stored in a file for subsequent execution, via...
either the RUN command or a menu set up using Retrieve II's facilities for creating tailored menus. When taken together with the facilities of the Retrieve II programming language, RBP, these facilities make it possible to provide a tailored system with a reasonable degree of flexibility. The commands for conditional execution are limited to a 'test and jump' pair, much like the Basic 'IF ... GOTO'. Parameters can be passed to an RBP program upon execution, allowing you to set up general purpose programs for a variety of specific tasks.

Other RBP commands allow you to interact with the person executing the program, and to interpret his response to prompts. You can also 'chain' out to the operating system to execute a sequence of system commands, so that you could, for example, set up a report and send the print image to a file, go to the system to set up a background print, and return to Retrieve II to do some more work on your data while the report is printed.

In addition to the facilities directly provided by RBP, considerable flexibility is also available through the extensive information provided on Retrieve II's internal construction. This, for example, allows the system developer to set up Help files at appropriate stages in a tailored system, and to modify the Help files which are supplied with Retrieve II.

Security & housekeeping

When setting up a file, you can specify a password which must be given before the file can be accessed at all, and another (which could, of course, be the same characters) to be given before amendment is allowed. This simple procedure should be sufficient protection in most applications against unauthorised access.

Commands are provided within Retrieve II to take security copies of complete files (if necessary partitioned over several floppy disks), to restore such files, and to copy records selected from individual files using the criteria described under 'Selection & sorting'. You can issue commands to delete files and to show the disk directory; you can also link out to the operating system to perform tasks there and return to Retrieve II.

Links with outside

Files in ASCII text format may be imported into Retrieve II provided they consist either of records which occur one per file line with fields separated by commas, or one file per file line. The system creates files in either format, so data files can be created for use with many word processors including WordStar's MailMerge. Since formatted reports may also be sent to a file, you can create text data files of a very wide variety of formats using Retrieve II's text formatter.

User image

One of Retrieve II's best features is the flexibility of its methods of issuing commands. In particular, it gives you the ability to use the menu approach if you're comfortable with the package and can rely entirely on commands. The command processor is very forgiving, allowing a variety of 'noise' words which are ignored, and also permitting you to rename commands to your own taste. For people who want to tailor systems for others, this flexibility tends to the ability to store command sequences, and to adapt the Help facilities easily and quickly.

I also liked the way the simple reporting facilities are provided; with practice, most users can get exactly the information they want with very little effort. The ability to void almost any operation with a single character is another good feature.

Documentation

The Retrieve II sampler has its own booklet to show you how to get started. This is typeset and nicely illustrated—a foretaste, I hope, of what the main documentation will look like.

Conclusion

Retrieve II is a powerful and flexible package for applications requiring varied reporting, either in terms of the different report elements or in the way they're laid out. It is particularly valuable for applications which need to store and calculate clock times, since, unlike most of its competitors, Retrieve II provides specific features to handle such data.

The package provides a reasonable range of functions for system developers, particularly with the amount of information which Derwent supplies to allow you to hook into the system. If you need to tailor the look of a package to particular requirements — not just foreign languages, but other specialised vocabularies—or if you need voice input, the special features make Retrieve II an interesting proposition. Try the excellent sampler before you buy, to get a feel for the package and what it can and cannot provide.

<table>
<thead>
<tr>
<th>Package</th>
<th>Cost (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condor 3</td>
<td>295</td>
</tr>
<tr>
<td>Conr 3</td>
<td>295</td>
</tr>
<tr>
<td>dBase II</td>
<td>375</td>
</tr>
<tr>
<td>dBase II</td>
<td>375</td>
</tr>
<tr>
<td>InfoStar</td>
<td>375</td>
</tr>
<tr>
<td>InfoStar</td>
<td>375</td>
</tr>
<tr>
<td>Pearl</td>
<td>190</td>
</tr>
<tr>
<td>Pearl</td>
<td>190</td>
</tr>
<tr>
<td>Rescue 3</td>
<td>295</td>
</tr>
<tr>
<td>Rescue 3</td>
<td>295</td>
</tr>
<tr>
<td>Retrieve II</td>
<td>375</td>
</tr>
<tr>
<td>Retrieve II</td>
<td>375</td>
</tr>
</tbody>
</table>

Fig 6 Comparison of similar data management packages
On your marks

See how they run: PCW presents its Benchmarks round-up.

Bumper to bumper they turn into the final straight, with only seconds between them. Which will be first across the line? Will the Sage II, primed with p-code, stay at the front for the second year running, or will the new model from the red firm of IBM steal victory? Read on...

Breathless readers should by now have realised that the time has come round again for the Great PCW Benchmarks Round-up. Ever since the magazine started back in February 1978, we've been testing machines with a set of Basic programs designed to measure the speed at which they execute certain important routines. For this issue we've compiled the results, taken the averages for each machine and listed them in order.

As we've sorted the results according to this average speed, we've had to ignore machines for which we haven't got a complete set of timings. This time we've also omitted some of the systems which are no longer being sold, but compensation figures are included for the Macintosh whose Basic wasn't available when the machine was Benchtested in March '84 (for more on Mac Basic see next month's issue).

To answer the opening question, the Sage II has held off all-comers to stay top of the list for the second year running. But last year's runner-up, Future Computers' FX-20, has slipped to seventh place, being replaced by the Crystal from Aston Technology. IBM's PC AT, with a late burst on Benchmark eight, comes in third, closely pursued by two PC clones, Olivetti's M24 and the MADI. The PC itself comes in lower, but is the highest placed machine reviewed in 1981 which is still on the list.

In case you're wondering, the B beside all these systems stands for business. Among the portables (Ps) Hewlett Packard is in front with its HP110, although the Jonos follows closely behind. Depending on how you define the home market (the Hs), either the Advance 86 or the BBC B leads that particular part of the field, hotly pursued by the Amstrad CPC 464. In fact, the BBC is the highest placed machine from 1982 when it came third.

Nineteen eighty-four saw the demise of the 8-bit micro in the PCW market. The rush towards IBM compatibility has meant that the majority of new business machines are 16-bit and faster than their 8-bit rivals. Only the Jonos matches the 16-bit machines by using a faster-than-usual Z80B processor. But homemicros still stick with 8-bit technology. The only major exception to this is the Sinclair QL which uses the Motorola 68008 8/16/32-bit central processor. However, despite having a theoretical processing advantage over its home rivals, SuperBasic as tested was very slow and the QL only managed 31st place behind machines like the Memotech and the BBC B.

The two fastest machines - the Sage II and the Crystal - both use the Motorola MC68000 processor and both run compiled versions of Basic. The combination of a fast processor and compiled code singles them out as being different from the rest. The IBM PC AT, using the faster, 286-based processor chip, made a brave attempt to beat them, but expect to see both the top machines defeated this year as more machines adopt the Intel 80286 or the very fast 12MHz versions of the Motorola MC68000.

Although the Apple II Macintosh uses the same Motorola MC68000 processor as the Sage II, it only came in at twelfth place. This is mainly because we used an early pre-release version of MacBasic which was very bad at maths. Hopefully, later versions will be able to add up faster.

Looking at the top twenty positions, 1984 was obviously a good year for speed, with 15 new machines listed. But before getting carried away with the idea of hurtling around the silicon at speed, a note of caution has to be struck. The figures may be interesting, but they don't make a good basis for deciding which machine to buy. At the very least you have to consider which Benchmarks are most appropriate to the kind of programs you want to run: for example, do your programs make heavy use of arithmetic operations or array access? And none of the Benchmarks calculates operations such as string handling, graphics or input/output, although we put forward some proposals for disk Benchmarks in our November issue.

What the Benchmarks do cover can be seen from the accompanying programs and times to allow timing with a stop-watch. BM1 tests an empty FOR RUN loop. The other Benchmarks, with the exception of BM8, proceed by adding extra functions to the basic routine: BMs 3 and 4 show the difference between using constants and variables in the same formula; BM5 adds a GOSUB routine, so you can see how GOSUBs slow you down; BM6 DIMensions an array; and BM7 writes data into that array. Finally, BM8 tests the machine's maths and trig functions.

One irregularity affecting BM8 should be mentioned. To save a Benchtester time, this Benchmark originally tested only 100 loops instead of 1000. Where necessary, these figures have been multiplied by 10 to give them the same weight as the others when calculating the averages. Since the beginning of 1983, however, Benchtesters have had to curb their patience until all the 1000 loops have been completed.

Much to the irritation of its opponents, Basic remains the most important microcomputer language. We already have tests for Pascal (see our December issue) and Forth, and we'd be interested in any proposals readers have for other languages. Given Basic's stranglehold on the market, though, it looks as though the Basic Benchmarks will continue to serve their (limited) purpose.
Benchmark programs

100 REM BENCHMARK 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT K
140 PRINT "E"
150 END

100 REM BENCHMARK 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
150 PRINT "E"
160 END

100 REM BENCHMARK 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K*K+K-K
150 IF K<1000 THEN 130
160 PRINT "E"
170 END

100 REM BENCHMARK 4
110 PRINT "S"
120 K=0

130 K=K+1
140 A=K/2*3+4-5
150 IF K<1000 THEN 130
160 PRINT "E"
170 END

100 REM BENCHMARK 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF K<1000 THEN 130
170 PRINT "E"
180 END
190 RETURN

100 REM BENCHMARK 6
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXT L
200 IF K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN

100 REM BENCHMARK 7
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXT L
200 IF K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN

100 REM BENCHMARK 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2
150 B=LOG(K)
160 C=SIN(K)
170 IF K<1000 THEN 130
180 PRINT "E"
190 END
THE FASTEXT 80
Dot Matrix Printer
from the New Force in Computer Printers

The Fastext 80 comes from an exciting new range of printers created to give speed, reliability and flexibility to the businessman at a price to suit the home user. Models in the range are compatible to all home computers, PCs and business micros. The Fastext 80 has a Centronics parallel interface – an RS232C serial interface is optional.

A machine of the highest quality, the six-pitch Fastext 80 performs at a speed of 80 cps with 80 column width (at 10 cpi). The host of features include a full line buffer, graphics capabilities, bi-directional text printing and logic-seeking. Friction feed is standard with a tractor feed available for continuous stationery.

Smith-Corona Data Products, Unit 23, Northfield Industrial Estate, Beresford Avenue, Wembley, Middlesex HA0 1XP. Telephone: 01-900 1222

Fill in the coupon and find out how you can make the most of your computer with a printer from Smith-Corona Data Products.

To: Smith-Corona Data Products, Unit 23, Northfield Industrial Estate, Beresford Avenue, Wembley, Middlesex HA0 1XP.

Please send me:
☐ A free copy of the full colour printer brochure.
☐ A list of local dealers.

Name
Company (if appropriate)
Address
Post code
Tel. No.
Make and model of computer used
HARDWARE
CAT

MacMise

Issue

MI

8112

113

BM

1I

8116

Iff7

les

Average

*ell

le -codeffebB3

.50

.70

1.30

1.10

2.10

5.10

6.40

18.00

4.47

8

Crystal

Jul84

.70

1.70

4.60

3.90

4.30

7.70

13.60

18.70

6.91

I

1811 AT

Dec84

.80

2.20

4.90

5.10

5.60

9.40

15.00

13.90

7.11

8

Olivetti 1124

Sep84

.80

2.50

5.20

5.20

5.70

10.00

15.30

16.60

7.66

8

MIDI

Sep84

.70

2.60

5.50

5.70

6.20

10.90

16.80

17.30

8.21

B

Xerox 16/8

Feb84

1.20

3.60

7.40

7.70

8.70

16.00

4.70

24.70

9.25

B

Future F1-20

Oct83

1.20

3.40

6.80

7.00

7.90

14.50

22.20

17.50

10.06

B

Cospudata Tulip Oct83

1.00

3.70

6.00

6.10

7.80

15.50

23.30

17.50

10.11

P

HP 110

Jul84

0.65

3.40

6.60

6.80

7.70

14.20

21.80

21.90

10.38

P

Jonos

Apr84

.80

2.50

6.70

6.70

7.20

12.70

20.10

34.40

11.39

HtB

Advance 86

Jul84

1.10

3.50

1.50

7.60

8.30

14.90

23.20

26.10

11.53

B

Apple Macintosh Mar84

.24

.65

6.00

6.40

1.10

8.60

15.90

52.30

12.15

B

lycoe Microfrase Jan84

1.50

4.10

8.10

8.40

9.70

18.00

27.60

21.50

12.36

B

HP 150

May84

1.40

4.30

8.70

7.50

10.30

28.10

26.70

13.18

P

Wren

Apr84

1.20

3.10

7.60

7.50

8.40

39.00

13.24

B

Commodore 715

Jan84

1.10

6.50

B

II Professional May83

1.00

4.20

9.30

9.10

10.50

29.50

31.40

14.28

B

NaveMate Bullet Feb84

1.20

3.70

7.80

8.40

13.70

20.40

32.60

27.10

14.4

H

Acorn BBC B

Jan82

1.00

3.10

8.20

8.10

9.10

13.90

21.40

51.00

14.55

H

Amstrad CPC -464 May84

1.09

3.28

9.16

9.61

10.20

19.03

30.18

34.20

14.59

B

ACT Sirius

Feb82

1.80

5.30

10.70

11.10

12.90

24.20

31.10

27.90

16.38

B

Shelton SigNet

Apr83

1.10

3.40

9.60

9.30

10.00

18.10

28.90

51.30

16.46

B

ACT Apricot

Oct 83

1.60

5.20

10.60

11.00

12.40

22.90

34.40

16.69

13

Sharp 82-808

Apr84

.60

4.50

8.50

11.50

13.00

19.00

3257:4500

50.00

16.83

B

Dimension 68000 Sep84

1.60

5.80

11.30

10.70

13.40

23.20

41.50

29.20

17.09

B

IBM PC

Nov81

1.50

5.20

12.10

12.60

13.60

23.50

37.40

35.00

17.61

13

LSI M4

Apr83

1.90

4.80

11.50

11.50

12.40

19.80

30.90

50.80

17.95

1

12.0015.30
14.2023.8013.84
12.307.20
140

15.30

22.10900

B

Torch IMBasicl

Jan83

1.50

4.20

10.60

10.40

11.60

21.10

33.00

55.00

18.43

H

Mesotech RS128

Oct84

1.90

5.30

11.70

11.40

13.30

22.60

40.80

43.70

18.84

B

Apricot Fl

Oct84

2.00

6.00

12.20

12.50

14.10

25.80

39.80

38.60

18.

H

Sinclair QL

Jun84

2.10

6.40

10.70

10.30

13.20

26.10

61.80

25.80

19.55

B

NEC AFC

Sep83

2.30

2.30

13.70

17.60

17.80

32.00

34.80

37.10

19.7

8

Osborne 01

Nov81

1.40

4.40

11.70

11.60

12.30

21.90

34.90

61.00

19.9

H

Acorn Electron

Oct83

1.10

4.00

11.10

11.80

12.40

18.70

28.70

72.50

20.04

H

Tatung Einstein Aug84

11.70

6.05

11.42

12.55

14.03

22.46

35.17

49.99

20.42

B

landy IRS -80 II Jun80

1.00

5.00

13.00

13.00

14.00

23.00

35.00

60.00

20.5

H

Sharp MI. -700

Feb84

.40

3.40

9.50

8.60

9.40

17.70

82.70

20.55

F

Osborne Encore

Aug84

1.90

6.60

14.20

14.60

15.80

28.30

42
34:70

00

47.80

21.65

H

IBM PC Junior

Mar84

1.90

6.40

11.20

15.00

16.50

29.30

46.60

47.40

21.79

B

Superbrain

Aug80

1.60

5.20

14.00

13.90

14.80

43.20

56.00

21.88

e

NCR Dec. Mate V Aug83

1.60

4.80

12.80

12.80

13.70

38.50

69.00

22.19

e

Apple 111

May82

1.70

1.20

13.50

14.50

24.68

F

Sharp PC -5000

May84

1.98

5.82

15.80

16.9055.40

75.00

52.20

25.03

ft

Epson Q1-10

Jul83

2.30

6.40

15.80

25.93

B

Xerox 820

Jan82

1.70

5.50

H

NemBrain

Jul82

2.00

B

Philips P2000

Dec81

H

Coasadore Vic20 Sep81

H/B

Apple

H

Ludt PIO/4 Oct14

F

Epson PX-8

H

Sharp 111

II

264:33:

16.00

27.00

19.10

33.00

15.80

16.50

31.90

52.90

65.80

15.50

15.10

16.20

28.90

46.10

80.00

26.13

5.80

19.20

17.50

19.20

32.00

48.80

70.00

26.81

1.90

5.90

15.80

15.10

16.70

29.80

41.20

85.00

27.25

1.40

8.30

15.50

17.10

18.30

27.20

19097..:(01

28.69

1.30

8.50

16.00

17.80

19.10

28.60

2.00

9.80

18.20

18.80

14.80

55.30

Jun84

3.00

8.00

19.50

189:7000

22.50

40.00

62.505110

Aug19

42.50

30.39

44.'4'..7800

101.10

12.14

Jun82

1.40

9.40

16.30

22.50

25.40

36.80

1:92.:

3323:11:

Sharp MI -5600

Nov84

1.50

7.20

19.80

20.20

21.60

32.80

53.80

115.20

34.01

H

CBM 8032

Sep80

1.70

10.00

18.40

20.30

21.90

32.40

51.00

119.00

34.34

H

Dragon 32

Aug82

1.60

10.20

19.70

21.60

23.30

50.00

129.00

36.21

H

Colour 6enie

Jun83

2.70

10.60

25.00

25.80

28.90

3447:800

73.10

104.30

39.78

H

Sony HB-75

Sep84

2.10

6.00

16.80

18.30

19.30

31.20

44.80

216.30

44.35

H

Oric Atsos

May84

1.90

15.50

25.50

27.10

33.30

44.00

67.20

140.10

44.4

H

Sp.Video SV-328 Mar84

2.30

5.10

18.10

20.00

20.90

32.80

45.10

235.70

47.59

P

&rid Compass

Jun84

8.50

11.90

25.10

22.50

21.80

H

Sinclair IX -81

Jun81

4.50

6.90

16.40

15.80

P

Epson HX-20

Dec82

2.10

15.30

33.10

32.80

35.30

59.10

100.60

133.30

H

11 Spectrum

Jun82

4.80

8.10

21.10

20.40

24.00

55.30

80.10

253.00

58.5

P

Candy Model 100 Aug83

3.50

9.50

26.50

29.50

31.50

43.00

64.00

321.00

66.06

H

Atari 400/800

Oct80

2.30

7.40

19.90

23.20

26.80

40.10

61.50

431.00

76.6

N

Texas 1199/44

Mar82

3.00

9.00

24.00

24.80

26.20

61.90

84.60

384.00

77.19

P

Casio P8-100

May83

8.00

39.00

82.00

80.00

105.00

160.00

220.00

341.00

121.4

P

Sharp PC1500

Jun82

15.00

70.00

121.00

122.00

118.00

293.00

383.00

510.00

211.5

B

801.

18.6051.18
125.10

51.11

158.3050

49.70

229.001,97

51.53

Cf13
P(AV1S7


Database dossier

Kathy Lang presents an up-to-date comparison of the database packages reviewed by PCW since the series began in March 1982.

Since this series reviewing data management systems began in March 1982, a total of 32 packages have been covered. In December 1983 and January 1984, we summarised all the packages which had been reviewed up to that point, where suppliers provided the information for this to be done. This article brings the story up to the end of October 1984, and covers articles published to January 1985, again on the basis of information provided by suppliers. Space restrictions have made it impossible to repeat the text comments made last year on new releases during 1983, but you should be able to tell from Fig 1 which packages had new releases during 1983 and for which you should therefore refer to the December 1983 article. This article brings all the tables up-to-date, and adds brief details about new versions of packages which were issued during 1984. Several suppliers have told me that they will have a major new release available by the time you read this or soon after, and this is duly noted in Fig 1.

Several packages underwent minor or major changes during 1984, or will do so soon. For example, Aspect had a new release due before the end of 1984 which will bring major performance enhancements, and some improvements to functions. The major change there will be the addition of a word processing facility, based on the ability to have text fields of virtually unlimited length.

Condor has been enhanced by major improvements to the COMPUTE features, processing of several COMPUTE statements in one pass. A default report format is available, and the documentation has been much improved. A menu-driven option is available for beginners who would prefer that approach; on the IBM PC colour is available. In addition, you can now get graphics and communications options integrated with Condor; these will be followed by spreadsheet and word processing options early in 1985, when I hope to do a new full review.

At the time of writing Data Master is proposing to add graphics and word processing options by the end of 1984, and at the same time the provision of a new manual. (Conditional processing is already available, contrary to my statement in the May review — my apologies for the error.) When these changes are made, the name of the package will revert to its American name of DatabaseEase, Sapphire will still be the sole importer, and will use the term DatabaseMaster to refer to DatabaseEase plus the ‘added value’ options it supplies, such as a consultancy/programming facility, as well as maintenance.

dBaseII now has a menu facility for novices, as well as a new set of manuals. These two changes should go a very long way to making this popular package much easier to use.

Delta has some new features includ-
ing conditional processing and a new manual, and a stablemate in the shape of Delta, which is effectively a version of Delta without transaction processing or tailored menus. A new release of Delta, plus some new associated packages, is due early in 1985, and I hope to review all these then.

Everyone now permits the use of colour on an IBM PC. A new full release will be available in 1985, providing significant performance enhancements as well as the ability to restructure the database without copying the data.

Omnis has been completely revised, and is now available in three versions, ranging from a simple, single-file version to one capable of handling up to 12 data files at once. Multi-user versions are available, and the package can be tailored to provide bespoke applications. New functions include flexible field formats, powerful computation, and very flexible searching. Again, I hope to do a detailed review of the new product in the immediate future.

Rescue 3 has been enhanced to allow use of several files together when entering and retrieving data, and a multi-user version is available. There are improvements to several retrieval

### Package Data types Fixed record structure Fixed record stored Amend record structure Link data files Number data files simult'ny Number sort fields Number keys Max length keys (ch/field) Subsidiary indexes updated

<table>
<thead>
<tr>
<th>Aspect</th>
<th>N, C, D, Ref</th>
<th>Y</th>
<th>Y</th>
<th>CO</th>
<th>N</th>
<th>NP</th>
<th>1</th>
<th>Y</th>
<th>12, Level</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta</td>
<td>N, C, D, L, M</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>CO</td>
<td>N</td>
<td>NP</td>
<td>1</td>
<td>3</td>
<td>N</td>
</tr>
<tr>
<td>BusFile</td>
<td>N, C, D, R, T</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>CO</td>
<td>N</td>
<td>NP</td>
<td>2</td>
<td>3</td>
<td>N</td>
</tr>
<tr>
<td>BusPost</td>
<td>F</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>CO</td>
<td>N</td>
<td>NP</td>
<td>1</td>
<td>3</td>
<td>F</td>
</tr>
<tr>
<td>CardBox</td>
<td>C, D, L</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>CO</td>
<td>N</td>
<td>NP</td>
<td>3</td>
<td>3</td>
<td>F</td>
</tr>
</tbody>
</table>
| Con
do | C, D, L | Y | Y | Y | CO | N | NP | 4 | 3 | F |
| DataMaster  | N, C, D, L, T, F, R | Y | Y | Y | CO | N | NP | 5 | 3 | F |
| dBaseII | N, C, D, L, Memo | Y | Y | Y | CO | N | NP | 6 | 3 | F |
| DBMSIII | N, C, D | Y | Y | Y | CO | N | NP | 7 | 3 | F |
| Delta  | N, C, D, R | Y | Y | Y | CO | N | NP | 8 | 3 | F |
| DMS+ | N, C, D, R | Y | Y | Y | CO | N | NP | 9 | 3 | F |
| Everyday | C, N, D, L, TS | Y | Y | Y | CO | N | NP | 10 | 3 | F |
| Files & Folders | N, C, D, L, T, S+ | Y | Y | Y | CO | N | NP | 11 | 3 | F |
| FMS80 | C, D, L, N, V | Y | Y | Y | CO | N | NP | 12 | 3 | F |
| Framework | C, N | Y | Y | Y | CO | N | NP | 13 | 3 | F |
| Friday | C, N, L | Y | Y | Y | CO | N | NP | 14 | 3 | F |
| IM | C, N | Y | Y | Y | CO | N | NP | 15 | 3 | F |
| InfoStar | C, N | Y | Y | Y | CO | N | NP | 16 | 3 | F |
| MicroPen | C | Y | Y | Y | CO | N | NP | 17 | 3 | F |
| Omni | N, C, D, L, S+ | Y | Y | Y | CO | N | NP | 18 | 3 | F |
| Optimum | N, C, D | Y | Y | Y | CO | N | NP | 19 | 3 | F |
| Pearl | N, C, D | Y | Y | Y | CO | N | NP | 20 | 3 | F |
| Personal Data Base | C, N, L | Y | Y | Y | CO | N | NP | 21 | 3 | F |
| Rescue 3 | N, C, D, R, etc | Y | Y | Y | CO | N | NP | 22 | 3 | F |
| Retrieve | C, N, D, L, S+ | Y | Y | Y | CO | N | NP | 23 | 3 | F |
| Search & Find | C | Y | Y | Y | CO | N | NP | 24 | 3 | F |
| Sensible Solution | C, N, D, Overlay | Y | Y | Y | CO | N | NP | 25 | 3 | F |
| SuperFile | C, N | Y | Y | Y | CO | N | NP | 26 | 3 | F |
| Symphony | C, N, D, T, M | Y | Y | Y | CO | N | NP | 27 | 3 | F |
| System Builder | C, N, D | Y | Y | Y | CO | N | NP | 28 | 3 | F |
| Tomorrow’s Office | C, N, D | Y | Y | Y | CO | N | NP | 29 | 3 | F |

Notes: General: UL=unlimited, NP=not possible, NS=not available. Data types: C=character, N=numeric (inc. decimal point), 1=integer, D=date(=MM/DD/YY format only), S=money format, V=varying length, L=Logical (Y or N), etc=extra formats, R=reference (table lookup). Amend record structure: CO=copy only, D=delete only, A=append only, G=change only, R=rewrite only. Link data files: B=batch processing, F=full, 1=own format only, M=masthead transaction, R=rewrite only, DY=directory used, SO=sorted only, RO=read only, PL=through programming language. Number of sort fields: @=total of files and indexes. *=possible but unnecessary within package, +=by index only — may effect ability to write out file in ASCII format in alternative order. Number of keys: *=record number, Max=number of keys: first field is limit. Subsidiary indexes updated: BA=batch process, UTD=kept up-to-date automatically. Tomorrow’s Office figures are: main package/with MultiFile upgrade.

**Fig 3 Features and constraints**
facilities, and batch updating is provided. There is also a new manual, much improved in many respects, including a reference summary, a tutorial introduction and a more understandable reference manual. (But the menu map seems, regrettably, to have been omitted.) This version of Rescue 3 is distributed by the suppliers, Grade One of Glossop (tel: (04574) 63819).

It is now possible to buy ready-fitted databases for use with Superfile; the first are the Times Top 1000 companies database, and certain areas of Census data. Southdata also now markets a ‘rulefinder’, which can search a Superfile database for data as are known as ‘hidden associations’.

When we reviewed Symphony and Framework, there were only pre-release versions of the manuals available. The pucka manuals for both are of excellent quality, and should make the packages as easy to use as is possible, given that they have such breadth of function.

Finally, System Builder has a complete new set of manuals, as well as some enhancements to the enquiry and report facilities, and full field editing.

Figs 1-6 are summaries of the ‘Features and Constraints’ information which appears in each review in this series. The supplier information from the summary box. Fig 7 summarises the Benchmarks, from which you will see that several different computer systems were used for testing during 1984. In Fig 8, you will find a comparison of timings of one package on three computer systems—Sirius with floppy disks, and IBM PC with floppy disks and with hard disk. This should give some way to help you in comparisons across systems. For detailed information about how the ‘synthetic’ data set used for these Benchmarks is constructed, see PCW January 1984.

Before I finish, I'd like to repeat the comments I made on copyright in the December 1983 round-up article. Most readers will know that material in PCW is protected by copyright, as is any published material in the UK which is a signatory to the Berne Convention. However, a few do not, so I'd like to take this opportunity of reminding all readers that material in this article is protected by copyright law. The article may not be copied or redistributed, in whole or in part, in any form without the written permission of the copyright holders. If you want to use the material, write to the PCW editor.

I would like to thank all the suppliers who provided me with help and with new information and versions of their products. I should like particularly to thank Ashton-Tate, in the person of Ian Turner, for making it possible for me to provide the cross-machine comparisons of the Benchmarks.

---

### Table 1: Features and Constraints

<table>
<thead>
<tr>
<th>Package</th>
<th>Store selection criteria</th>
<th>Combine criteria</th>
<th>Several tests/field</th>
<th>Wild codes</th>
<th>Browsing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspect</td>
<td>P</td>
<td>A, O, N</td>
<td>Y</td>
<td>SW</td>
<td>PK</td>
</tr>
<tr>
<td>Beta</td>
<td>N</td>
<td>A, O, N</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Busifile</td>
<td>P</td>
<td>A, O, N</td>
<td>Y</td>
<td>SW</td>
<td>PE</td>
</tr>
<tr>
<td>Busipost</td>
<td>N</td>
<td>A, O, N+T</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>CardBox</td>
<td>P</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Condor</td>
<td>P</td>
<td>A, O, *</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>DataMaster</td>
<td>P</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Dbaseil</td>
<td>P</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Dims++</td>
<td>P</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Ect MutableList</td>
<td>P</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Everyman</td>
<td>P</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Files &amp; Folders</td>
<td>N</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AK</td>
</tr>
<tr>
<td>FMS90</td>
<td>N</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AK</td>
</tr>
<tr>
<td>Framework</td>
<td>N</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AK</td>
</tr>
<tr>
<td>Friday</td>
<td>M</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AK</td>
</tr>
<tr>
<td>IM</td>
<td>N</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AK</td>
</tr>
<tr>
<td>InfoStar</td>
<td>M</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AK</td>
</tr>
<tr>
<td>MicroPen</td>
<td>P</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Optimum</td>
<td>P</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Pearl</td>
<td>N</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AK</td>
</tr>
<tr>
<td>Personal Data Base</td>
<td>N</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AK</td>
</tr>
<tr>
<td>Rescue 3</td>
<td>P</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Retrieve II</td>
<td>P</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Search &amp; Find</td>
<td>N</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Sensible Solution</td>
<td>P</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Superfile</td>
<td>P</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Symphony</td>
<td>M</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>System Builder</td>
<td>G</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
<tr>
<td>Tomorrow's Office</td>
<td>P+Q, OA</td>
<td>A, O</td>
<td>Y</td>
<td>SW</td>
<td>AF</td>
</tr>
</tbody>
</table>

Notes: Store selection criteria: N = not available, P = permitted but not mandatory, M = mandatory. Combination of selection criteria: A = AND (must pass all tests), OR = may pass any one test, N = Not (must pass test to state which packages which don't have this operator do not have a ‘not equal to’ comparator operator for single tests). P = may set permitted level, eq. 2 means at least two criteria must be satisfied. Condor: * = allows only one method of combination of any one of tests. DBMSII: += also allows Or within a single field. Omni: OR assumed where same field tested for equality more than once. More than one test allowed per field: * DBMSII allows several specified alternatives in one field. Wild codes: wild codes searching all fields, with SW = field must start with specified character(s); SW = field may contain specified characters. Browsing: File may be browsed in order as follows: PE = primary key for editing, any field for viewing; AE = any key for viewing or editing, AF = any field for viewing or editing.
Fig 6 Documentation and Help

Notes: User image types: M = menus, C = commands, LT = limited tailoring, FT = full tailoring, PL = interface to conventional programming language. Where condon/Condor, M, C, LT CardBox, Aspect

---

Package | User image | System Used | BM1 | BM2 | BM3 | BM4 | BM5 | BM6 | BM7 | BM8 | BM9 | BM10
---|---|---|---|---|---|---|---|---|---|---|---|---
Aspect | Sirf/S | Instr | 8 secs + | NA | 6 m 29 s | 8 secs + | NA | 28 m 10 s | 5 m 30 s | 6 m 55 s | M | D
Bet사 | Sirf/S | Instr | 2 secs/rec | 2 secs/rec | 2 secs/rec | 2 m 10 s | 1 m 30 s | NA | 11 m 40 s | NP | 2 m 40 s | 3 m 44 s | D
BuisFile | Lishit | Inst | 3 secs | Inst | 3 secs | 2 m 25 s | 2 secs/sec | NA | 37 m 30 s | NP | NP | NP | D
BusiPost | Instr | Inst | NP | 2 m 36 s | Inst | 2 m 10 s | 8 m 10 s | NP | NP | NP | NP | D
CardBox | Instr | Inst | 1 m 40 s + Inst | 8 + Inst | 2 m 10 s | 8 m 10 s | NP | NP | NP | NP | NP | D
Condor | Instr | Inst | 2 secs/sec | 2 secs/sec | 6 1/2 sec | 2 m 10 s | 1 m 30 s | NA | 56 m 55 s | NP | 1 m 45 s | 3 m 20 s | D
DataMaster | Instr | Inst | Inst | 1 m 40 s | Inst | 1 m 40 s | 1 m 50 s* | 4 7/10 m | 1 hr 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
DataMist | IBM PC/X | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
dBaseIII | IBM PC/X | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
DMS++ | Instr | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
Elasticman | Condor | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
Files & Folders | M, C, FT | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
FMS80 | M, C, FT | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
Framework | M, C, FT | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
Friday! | M, C | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
IM | M | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
InfoStar | C | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
MicroPen | M | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
Optimum | M, C, FT, PL | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
Personal Data Base | M | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
Rescue | M | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
Search & Find | M, C | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
Sensible Solution | M | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
Symphony | M, C, FT | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D
Tomorrow's Office | M, C, FT | Inst | 1 m 50 s | 2 m 30 s | 45 s | 1 hr 50 m | 1 hr 50 m | 42 m | 1 m 35 m 10 s | 2 hr 30 m 10 s | 2 hr 30 m 10 s | D

Notes: M = Menus, C = commands, LT = limited tailoring, FT = full tailoring, PL = interface to conventional programming language. Where condon/Condor, M, C, LT CardBox, Aspect

---

Fig 8 Comparison of dBasell Timings

Notes: *dBasell and Retrieve II - times are access to list of 20 records.* Condor - means + 10 seconds per search session (possibly including several search operations).
Whatever your tastes in music there are software packages that promise to meet them. However, you only have to listen to a section of computerised Bach, offered on each package reviewed here, to appreciate that promises can sometimes be hard to deliver. Jane Dorner names the tune.

MusiCalc

MusiCalc is the most versatile, and most expensive, of the three programs reviewed here. It sets its sights very high.

Whether you like rock, classical, country, jazz, pop, blues, new wave or other, this program is said to be for you!

It comes with a very clear and well-written owner's manual, which includes a quick start-up section — a snack to whet the appetite for the main course. It also sets down its basic concept so that even if you don't manage to explore the program's hidden depths, you have a clear idea of where you could take it next.

The package can be used in a variety of ways: to create sounds using 32 pre-programmed tunings and the same number of rhythm patterns, which can be merged in random or more considered ways; to write, edit and transpose songs, produce an endless variation of backing, and save them on disk; to learn about synthesizers and sequencers; and, finally, to generate sound effects.

I found composing on MusiCalc extremely cumbersome. I know conventional scoring isn’t fashionable, but memorising all the scoring procedures necessary in this program is an obstacle to creativity. It works on a grid pattern with two matrices, the 12 semitones of the scale on the vertical axis and the note number (sub-divided into its smallest value in any given piece) on the horizontal axis (Fig 1). Scoring is done by marking asterisks and diamonds in the correct places. The temptation to make visual patterns rather than musical ones is overwhelming.

But for those who find complex writing methods no obstacle — or if you follow the instructions in the tutorials — the creative phase of the exercise now begins in earnest, because you start to use the computer like a synthesizer.

That is, you control the shapes of the sound waves. You set your three voices to simulate, say, flute, drum and bass guitar. You then alter the volume and quality of sound attack, or set up instructions so that certain frequencies can be cut off to give unusual results, or alter the resonance of a voice from dull to bright, and the timbre can be changed in a variety of ways.

The procedures are complex, and require a great deal of patience and an excellent memory — rather like learning another language. However, the instructions are helpful and technical terms are explained, although the capacities of the sequencer are not given as much attention as the synthesizer.

The difference, briefly, is that a synthesizer is a device that makes sound electronically: a sequencer repeats patterns, altering them so that they mutate throughout the piece. One function a computer can easily perform is to reiterate the repeated phrases that occur in music of all kinds, but it was very difficult to discover how to do this in MusiCalc. Constant searching through the manual did eventually reveal the answer in a section entitled ‘Links’.

Was this program written for another computer and translated for the Commodore? If so, it would explain why so much care and effort has been taken over a program that demands a much better sound quality than the Commodore supplies. But that is not to say the sound is poor — it’s undoubtedly the best of the three.

Music Master

Music Master, another Commodore 64 program, offered the next best sound quality. At its most basic level, this package can be used as a musical toy to improve sounds or to superimpose a simple tune on top of a number of pre-selected basic rhythm patterns. All that’s necessary is to familiarise yourself with the letter names on the computer that correspond to the notes on a piano keyboard shown in the lower half of the screen. For example, ‘K’ corresponds to the note ‘C’, ‘L’ to ‘D’, ‘T’ to ‘E’, and so on. It’s a little awkward at first, but constant use removes any difficulties.

The Commodore’s three voice channels can be isolated or played in duo or trio. Each channel offers a choice between these sounds: electric piano, drum, clarinet, synthesizer, nasal, flute, violin, banjo and synthesizer bass. Any one of these voices can be used for the 34 pre-programmed rhythms, and the machine will obligingly play along as a robot accompanist to even the most hesitant, one-fingered melody line. You can have two patterns going at once but they won’t change key; they are just patterns, and not a rhythmic pulse.

So far, so good. It’s not unlike an advanced Casio machine, but the program gives opportunity for a much greater variation of synthetic sound. It can be used like a word processor to edit...
sounds, repeat sections and adjust tempo. Pieces can be written in three parts, recording one voice at a time, and then storing the result for later use or adjustment. There are a wide range of effect controls that will intrigue those well versed in the possibilities of polyphonic synthesizers; for example, synchronisation, ring modulation, gate filtering, and such special effects as vibrato, phasing and chorus. 'What these terms actually mean,' says the manual 'is unimportant, as a little experimentation will reveal the type of bell and gong effects that can be achieved.'

In fact, no synthesizer user would be satisfied with these sounds. A ring modulator, for example, should be very rich in harmonics and produce a haunting bell-like quality. This might be apparent if the system were wired up to a high-quality hi-fi set, or passed through a midi-interface to a superior audio-system. Fed through an ordinary TV set, the program only offers a taste of the possibilities of electronic music, even if you subsequently move on to something more aurally satisfying. There are many possibilities for producing polyphonic sounds which can be realised once you're familiar with the program.

The manual doesn't complement the program: it's confusingly arranged and not written in plain English. It's aimed at hobbyists at the lower end of the market, and a more helpful manual would be welcome, perhaps offering a familiar \textit{program's} capabilities. Tutorials would provide easy access to the price-and have the great advantage of being able to print out instant top copies of a piece in any major key is considerable.

But hold on, there's a snag. To conform to accepted music theory, your piece has to be in simple duple or triple time. The Spectrum can't cope with compound time, although it claims to be able to. Indeed, in its billing it offers everything up to 15/8 time, a signature that I've never come across although it may appear in abstruse modern music.

The difficulty arises in the computer's seeming inability to cope with a sense of the first beat of the bar. Similarly, it loses the subtleties of variation of emphasis within a bar. I wouldn't quarrel with this if it at least conformed to the correct rules of musical notation by implying the subdivisions in the bar, if not actually sounding them. But it won't, for example, join three quavers together for a correct 6/8, 9/8 or 12/8 rhythm, nor does it complete rests according to the rule book.

The manual does mention triplets, but testing didn't reveal what it thought these were. There's a device whereby a numeral 3 can be put on top of any note (crotchet, quaver, even semibreve) but I don't recognise this as a symbol in common use on a single note, nor could I fathom what, in the computer's terms of reference, it means.别人的 program is much more positive aspects of this program to the correct rules of musical notation. Mistakes can be easily corrected if noticed immediately, but if you want to edit a piece when you've heard the playback, it's necessary to master the art of remembering the number of the bar you wanted to alter and what was wrong with it.

Having completed a successful piece, it's possible to transpose it into another key, but you can't shift a whole piece up or down an octave, nor can you go from major to minor. This is a pity — both capacities are very useful. Presumably they're not offered because the semi-tones in major and minor keys come inbetween different degrees of the scale, and this program hasn't found a way of devising a conversion. In fact, the programmers and the manual writers have seen fit to ignore the existence of minor scales altogether. The transposition faculty is very useful and if you had a ZX printer, the benefit of being able to print out instant top copies of a piece in any major key is considerable.

The simplest of the three programs is Music Typewriter for the Spectrum. This package sets up a music stave onscreen with a choice of bass or treble clef, key signature, time signature, tempo and direction of note tails. An overlay to be placed over the computer keyboard simulates a piano keyboard, so that notes can be tapped and will simultaneously sound and appear as correct notation onscreen. It's possible to compose your own tunes or follow a score, but you have to decide on a note value before you tap it and the program follows the correct rules of music theory. Mistakes can be easily corrected if noticed immediately, but if you want to edit a piece when you've heard the playback, it's necessary to master the art of remembering the number of the bar you wanted to alter and what was wrong with it.

<table>
<thead>
<tr>
<th>Package</th>
<th>Machine</th>
<th>Format</th>
<th>Price</th>
<th>Supplier</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music Master</td>
<td>CBM 64</td>
<td>Tape</td>
<td>£17.95</td>
<td>Supersoft, Winchester</td>
<td>House, Canning Road, Wealdstone, Harrow, Middlesex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>version planned</td>
<td>£19.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MusiCalc</td>
<td>CBM 64</td>
<td>Disk</td>
<td>£49.99</td>
<td>Paradox Group, The Metropolitan, Enfield Road, London N1</td>
<td>Romantic Robot, 113</td>
</tr>
<tr>
<td>Music Typewriter</td>
<td>Spectrum</td>
<td>Tape</td>
<td>£9.95</td>
<td>Melrose Avenue, London</td>
<td>NW2</td>
</tr>
</tbody>
</table>

\textbf{Summary}

\begin{itemize}
  \item \textbf{Music Master}: CBM 64 Tape \\
  \textbf{MusiCalc}: CBM 64 Disk \\
  \textbf{Music Typewriter}: Spectrum Tape
\end{itemize}

\textbf{Package} | \textbf{Machine} | \textbf{Format} | \textbf{Price} | \textbf{Supplier} | \textbf{Supplier} |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Music Master</td>
<td>CBM 64</td>
<td>Tape</td>
<td>£17.95</td>
<td>Supersoft, Winchester</td>
<td>House, Canning Road,</td>
</tr>
<tr>
<td></td>
<td>(Amstrad Disk version planned)</td>
<td></td>
<td>£19.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MusiCalc</td>
<td>CBM 64</td>
<td>Disk</td>
<td>£49.99</td>
<td>Paradox Group,</td>
<td>The Metropolitan, Enfield Road, London</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N1</td>
<td>113</td>
</tr>
<tr>
<td>Music Typewriter</td>
<td>Spectrum</td>
<td>Tape</td>
<td>£9.95</td>
<td>Melrose Avenue,</td>
<td>London</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NW2</td>
<td></td>
</tr>
</tbody>
</table>
Ours prints exactly what it's told to as well.

Unlike the proprietors of PRAVDA, we're all for freedom of the press. On the other hand, we're certainly not in favour of freedom for the printer. We're as critical of documents that don't say exactly what they're supposed to as anyone at the Kremlin.

That's why we'd like you to take a look at the new Epson DX100 daisy wheel computer printer. It comes from Epson and will simply not tolerate smudgy, messy type. It is also fanatical about towing the computer line as it were.

That's because it has a 5K memory buffer built in. For those who may not know, a buffer does two things. First, it allows the DX100 to store more than a page of text while it's still printing. Setting your computer free to do other things.

Second, the buffer makes sure that the DX100 does exactly as it's told. A printer without a buffer can't keep up with the computer. So it has a tendency to defect. Leaving your documents with chunks missing, rather like that.

So get yourself £475 (+VAT) and you can have an Epson DX100 of your very own.

You will then be in possession of a printer that firmly subscribes to the belief that documents are always better read than dead.

Home computers and the DX100: Spectrum QL, BBC model B and Acorn Electron are all fully compatible.

Personal computers and the DX100: Epson FX-8, HX20 portables and QX10 desktop, IBM PC, Apricot, Apple and DEC Rainbow are all fully compatible.

THE EPSON DX100 DAISY WHEEL PRINTER £475 (+VAT).

Reveal all about the Epson DX100 and where I can get one, quick.

Name
Company
Address

To Epson (UK) Ltd., Derian House, 388 High Road, Wembley Middlesex HA9 6UH or phone Epson Freephone.
SPECTRUM ERROR ROUTINE

This routine, for either Spectrum, enables you to disable the BREAK key and provide various options for other errors. The routine must be activated initially, or, if continuing after a break for an error, with RAND USR onerror. This will replace the contents of the address on the stack pointed to by ERR SP with an address in this routine, so that it will be called whenever the Basic interpreter finds an error.

You can set any of five modes, by POKEing errmode.

Mode 1 - report normally.
Mode 2 - report normally.
Mode 3 - GOTO next line.
Mode 4 - GOTO 9990.
Mode 5 - clear program before reporting error.

Mode 3 is for anticipated errors.
Mode 4 is for unexpected errors. There's a choice of exiting or returning to the main menu.
Mode 5 enables you to load a Basic program and leave nothing to list after a loading error.

After an error, PEEK errnumb will return the error number, and the line and statement numbers where the error occurred will be in OLDPCC and OSPCC. The routine RASPs before reporting an error and is relocatable.

Rosemary Oakeshott

9000 REM error routine
9002 REM
9004 CLEAR PEEK 23730+256*PEEK 2
3731-135: REM lower ramtop
9006 LET onerror=PEEK 23730+256*PEEK 23731+1
9008 LET errmode=onerror+28: LET errnumb=onerror+27
9010 FOR i=onerror TO onerror+13
4: READ a: POKE i,a: NEXT i
9012 REM
9014 REM
9016 DATA 33,16,0,9,235,42,61,92,
,115,35,114,237,75,118,92,201
9018 DATA 58,58,92,60,40,110,205,
,198,31,24,2,0,1
9020 DATA 35,35,119,35,86,1,244,
,255,9,229,21,40,78,254,21,40,51,
,21,40,71
9022 DATA 42,69,92,34,110,92,35,
,21,40,6,33,9990-256*INT (9990/256),
,INT (9990/256),21,32,38
9024 DATA 254,4,40,51-0*14: REM 1*14 will clear program before reporting no room
9026 DATA 205,115,30,58,71,92,50,
,112,92,253,203,1,254,33,0,0,253,
,116,38,253,116,55,34,11,92,205,
176,22,253,112,0,195,125,27
9028 DATA 21,32,14,237,91,83,92,
,42,89,92,43,205,229,25,34,75,92
9030 DATA 22,0,253,94,254,33,144,
,26,205,181,3,225,195,3,19
9032 REM
9034 REM Activate Error Routine
9036 REM
9038 LET errdef=2: REM or what you will
9040 POKE errmode, errdef
9042 RANDOMIZE USR onerror
Example of mode 3.

-----------
0 REM to input b in range 1 to 10
50 POKE errmode, 3: REM on error goto next line
60 INPUT b:
IF b >=1 AND b <=10
THEN GO TO 80
70 BEEP .5,-8: GO TO 60: REM out of range, Stop in input, dividing by 0 or other error.
80 POKE errmode, errdef
90 REM

BBC MACHINE CODE REPLACEMENT

I'm sure that the following has happened to many users of Acornsoft Forth on the BBC or Electron.
You're developing an application and you attempt to TYPE a string; the screen clears and you seem to have inadvertently changed screen modes. This has the unfortunate side-effect of overwriting your buffer area and probably the top of the dictionary, which will cause a crash of the most fatal kind and you have to re-load the whole system.
The reason for this is that you've provided TYPE with an incorrect address or length count, resulting in a 'garbage' string containing VDU control codes being output: it's one of these codes which changed the mode.

I have written a screen containing a machine code definition which intercepts the standard EMIT routine by modifying the execution vector called EMIT. Now, any attempt to print "dangerous" control codes results in a circumflex followed by the corresponding ASCII character being output; code 22 will appear as "V. Line feed, carriage return and other cursor controls are unaffected.

SCR £ 623E H
0 (A Safe EMIT for A/S FORTH)
1 FORTH DEFINITIONS HEX
2 CREATE &EMIT
3 48 C, A9 C, 5E C, 20 C, EE C, FF C,
4 68 C, 18 C, 69 C, 40 C,
COMMODORE 64 MACHINE CODE AUTO-START

I am interested in running my own machine code programs on the Commodore 64, but I need some way to get them to auto-start when loading from tape. Using a Basic program to load them is one option, but since that uses extra memory space, it isn't very helpful.

Basic programs can be automatically started when loaded using SHIFT/RUN, so I decided to make my machine code program look like a Basic program and the result is shown here.

The number in single quotes is the start address (which can be as low as 2074, and as the example). A five-figure start address can be obtained by replacing the leading space with the extra digit.

To save the program on tape initially, start the program at SAVEIT the usual SAVE messages will appear (verification is also possible). Note that only memory from 2048 to 2074 is available, which is a call to the machine code routine at 2074. The main body of the program is executed and a return (via the RTS) is made to the line following the SYS statement, which returns to the Basic monitor.

When LISTed, the program appears as follows: 10 SYS 2074

Also, as with Basic, the machine code program can be re-run at any time by typing RUN.

With Turner

ATARI OUTPUT DEVICE

This subroutine allows you to change the Atari's standard output device (the standard output is where all system messages, PRINT statements, and so on appear, and normally this is the screen). With this subroutine, you can specify another device (usually a printer) and save yourself the bother of writing everything twice using PRINT &PRINT. The routine will work regardless of operating system, or even if you have superseded the normal device driver by adding a new device handler.

Simply type STDOUT$ = "Q" or STDOUT$ = "E" (depending on whether you want printer or screen output), then GOSUB 10000. Everything will be then sent to the chosen device.

10 DIM STDOUTS (2): REM DECLARE THE STRING FOR USE THROUGHOUT THE MAIN PROGRAM AND IN THE SUBROUTINE

Main program

10000 FOR DEVICE = 830 TO 794 STEP -3: IF PEEK (DEVICE + 1) + 256 * (DEVICE + 1) = 0: POP: GOTO 10020

10010 NEXT DEVICE: PRINT "NO SUCH DEVICE": RETURN

10020 POKE 838, PEEK (HANDLER + 1): POKE 839, PEEK (HANDLER + 2) + 256 * (DEVICE + 1): POKE 839, DEVICE + 2: POP: GOTO 10000

F M' Dwyer

QL JOYSTICK

QL users might want to use an Atari joystick with their machine but don't want to pay £5 for a special joystick lead. However, they may well have been sent a QL printer lead which, as most printers are of the centronics type, might well be useless to them. To put that lead to good use, why not turn it into a joystick lead?

Remove the plug at the printer end of the lead. Then, taking a 9-way D plug (these are available from most electronics shops — for example, Tandy) solder the lead to it as shown below:

End of the lead and snap off the plastic clips, tidying this up with a sharp knife. Place the plug in something that will hold it firmly, with the side with two grooves facing upwards. With the sharp knife, cut out two more grooves in the plug on the right-hand side as shown in Fig 1; make the grooves to the same dimensions as the existing ones.

When you have done this, insert the plug in CTRL socket one (if it doesn't fit, cut some more out of the grooves). Now enter and run Listing two and plug a joystick into your lead. Moving the joystick should produce the correct reading on screen, but if this is not so, re-check your connections.

Listing one is a simple procedure which will greatly improve the appearance of text by producing a slight shadow around it.

The procedure is called using the format SPRINT
"Text", x, y, DEPTH, DIRECTION. Where text could be a variable or text in quotes, x is the x coordinate on a scale of 0 to 511, y is the y coordinate on a scale of 0 to 255, DEPTH is the depth of the shadow (should be kept to 1 when using csize 0,0) and DIRECTION is the direction in which the shadow will be printed. The DIRECTION values are given below:

Ian Bowker

32000 DEFINE PROCEDURE
32010 SPRINT(A$,X,Y,DEPTH,DIRECTION)
32020 OVER 1
32030 FOR I=1 TO DEPTH
32040 IF DIRECTION=2 OR DIRECTION=3 OR DIRECTION=4 THEN X=X+1
32050 IF DIRECTION=6 OR DIRECTION=7 OR DIRECTION=8 THEN X=X-1
32060 IF DIRECTION=8 OR DIRECTION=1 OR DIRECTION=2 THEN Y=Y+1
32070 IF DIRECTION=6 OR DIRECTION=5 OR DIRECTION=4 THEN Y=Y-1
32080 IF X<0 THEN X=0
32090 IF Y<0 THEN Y=0
32100 IF X=511 THEN X=511
32110 IF Y=255 THEN Y=255
32120 CURSOR X,Y:PRINT A$
32130 NEXT I
32140 OVER 0
32150 END DEFINE SPRINT

Listing 1

100 MODE 4;PAPER 0;INK 7;CLS
110 CSIZE 3,1;UNDER 1;PRINT "JOYSTICK 1 TEST"
120 PROGRAM";UNDER 0
130 INK 4
140 IF KEYROW(1)=2 THEN AT 5,10:PRINT "LEFT"
145 IF KEYROW(1)=1 THEN AT 5,10:PRINT "RIGHT"
150 IF KEYROW(1)=4 THEN AT 5,10:PRINT "UP"
160 IF KEYROW(1)=128 THEN AT 5,10:PRINT "DOWN"
170 IF KEYROW(1)=64 THEN AT 5,10:PRINT "FIRE"
180 IF KEYROW(1)=0 THEN AT 5,10:PRINT "NONE"
190 AT 5,10:PRINT "":GOTO 130

Listing 2

ATARI FEATURES

Here are some useful features for any Atari machine.

A POKE 559,0 will turn off the screen display. Why should anyone want to do this? To make the program being executed perform 30 per cent faster. A POKE 559,34 restores the display to normal.

Another use for this technique is when the programmer wants an image to appear instantly without the user witnessing the image being drawn.

A PEEK into location 764 provides Atari Basic with a simple INKEYS function; the value returned is an internal code representing the last key pressed. The location can be reset by a POKE 764,255.

John R Owen

ENHANCING THE COLOUR GENIE

The Colour Genie has eight programmable function keys which prove to be very useful in making typing easier and quicker, but there is a catch: each key can only handle seven characters, and this is reduced to six using the automatic carriage return facility — that is, missing the final quote from the FKEY command as in the manual, results in some commands and data not fitting on a single key.

Fortunately, there is a way in which longer commands can be used with function keys — by using Basic tokens in the FKEY command, or by POKEing the token values into the memory containing the function key contents. The contents of function keys are stored in eight blocks of seven bytes starting at HEX4350. To cause an automatic carriage return, a maximum of six bytes should be used, the seventh byte being zero as should any of the six bytes not used.

Tokens for the Basic extension must each be preceded by a byte containing 255. This program enters function key 1 to contain CLS:LIST which would not normally fit on a single key.

10 FOR I=0 TO &H4356
19 FOR I=0 TO &H4356
20 READ A
21 POKE I,A
22 NEXT I
23 POKE I,A
24 NEXT I
25 DATA 132,58,180,0,0,0,0

Explanation of data

132 Token for CLS
58 ASCII colon
180 Token for LIST
0 Forces carriage return

Chris Warrington
VIC-20 RESET SWITCH

Have you ever tried an unusual POKE when typing in a program and found you've crashed the system? If you have and you own a VIC-20, then a 'reset switch' may be the answer to your problem.

You will need the following parts and a soldering iron:
1. A simple push switch MS No FH59P.
2. Some general solder MS No FR21X.
3. A 0.156in 2x12 way edge connector MS No BK74R.
4. Some extra flexible wire MS No XR69A.
5. A sticky label.

The reset switch will be connected to the VIC-20 user port (left of tape port looking from keyboard side).

Now perform the following operations:
1. Cut two lengths of wire, each approx 25cm long.
2. Look at the edge connector with (gold) pins facing you. Label the top of the connector 'UP' with your sticky label.
3. Solder one piece of wire to the first pin on the left in the top row.
4. Solder the other end to one pin on your push switch.
5. Solder the other piece of wire to the third pin on the left in the top row.
6. Solder the other end to the second pin on your push switch.

And there it is... a reset switch!

If you've correctly constructed your reset switch, you should now have a piece of hardware as shown in the diagram.

You should always try to insert the connector into your VIC correctly. However, it's unlikely that incorrect insertion would cause damage, as in this case reset would not work.

MJ Davies

APRICOT BASIC LOGOS

After you have created a logo using the LOGOEEDIT utility (see the Configurators Guide included with the Apricot), you may want to display the logo in one of your Basic programs.

This short program shows how a logo can be printed on the screen using Basic, and is written for clarity rather than efficiency.

Program
10 PRINT CHR$(14)
20 PRINT CHR$(27)+"F"
30 PRINT CHR$(27)+"E"
40 PRINT CHR$(27)+"Y"=";
50 FOR I=94 TO 114
60 PRINT CHR$(I);
70 NEXT
80 PRINT CHR$(27)+"Y+=";
90 FOR I=115 TO 125
100 PRINT CHR$(I);
110 NEXT
120 FOR I=32 TO 41
130 PRINT CHR$(I);
140 NEXT
150 PRINT CHR$(27)+"Y=";
160 FOR I=42 TO 62
170 PRINT CHR$(I);
180 NEXT
190 PRINTS CHR$(27)+"G"
200 PRINT CHR$(15)

The table below shows the 21 x 3 grid in which the logo is created using the LOGOEEDIT utility and the respective character codes for each square in the grid. This is useful if the logo does not consume the whole of the 21 x 3 grid.

<table>
<thead>
<tr>
<th>94</th>
<th>95</th>
<th>96</th>
<th>97</th>
<th>98</th>
<th>99</th>
<th>100</th>
<th>101</th>
<th>102</th>
<th>103</th>
<th>104</th>
<th>105</th>
<th>106</th>
<th>107</th>
<th>108</th>
<th>109</th>
<th>110</th>
<th>111</th>
<th>112</th>
<th>113</th>
<th>114</th>
</tr>
</thead>
<tbody>
<tr>
<td>115</td>
<td>116</td>
<td>117</td>
<td>118</td>
<td>119</td>
<td>120</td>
<td>121</td>
<td>122</td>
<td>123</td>
<td>124</td>
<td>125</td>
<td>32</td>
<td>33</td>
<td>34</td>
<td>35</td>
<td>36</td>
<td>37</td>
<td>38</td>
<td>39</td>
<td>40</td>
<td>41</td>
</tr>
<tr>
<td>42</td>
<td>43</td>
<td>44</td>
<td>45</td>
<td>46</td>
<td>47</td>
<td>48</td>
<td>49</td>
<td>50</td>
<td>51</td>
<td>52</td>
<td>53</td>
<td>54</td>
<td>55</td>
<td>56</td>
<td>57</td>
<td>58</td>
<td>59</td>
<td>60</td>
<td>61</td>
<td>62</td>
</tr>
</tbody>
</table>

Comments (not to be typed in)
Switches into second character set.
- Enters graphics mode.
- Clears screen.
- Positions cursor down 11, across 30.
  } Prints top line of logo.
  Positions cursor down 12, across 30.
  } Prints middle line of logo.
  Positions cursor down 13, across 30.
  } Prints bottom line of logo.
Leaves graphics mode.
Returns to default character set.

If no logo has been created using the LOGOEEDIT utility, the preset 'apricot' logo will be printed.

MD Dennis
Tony Hetherington tries to foil an evil doctor’s bid to destroy the world, applies for the job of Master of Lore and dips into literary culture as he re-lives the strange days of Macbeth. All this and more in this month’s best selection of games for the Commodore 64, Spectrum and Atari.

Nothing’s impossible . . .
Title: Impossible Mission
Computer: Commodore 64
Supplier: Epyx/CBS Software
Format: Disk
Price: £11.95

‘Another visitor... stay awhile... stay forever’. These are the game’s opening words that not only set the scene, but the atmosphere too. Epyx has created a coherent software voice which also manages to sound wicked.

The voice belongs to the evil Dr Elvin whose bunker you have just entered. He has threatened the world with nuclear annihilation and it’s your job to stop him. You are agent 4125 and, as you can guess, a few agents have been lost since 007: as you play the game you’ll see where they went.

You’ll also see why this is the definitive platform game.
Your character is joystick controlled, and jumps and somersaults through 32 rooms. Each room consists of platforms, lifts, numerous objects to be searched and some anti-social robots.

Should you get past the human-seeking robots and reach an object (which can be anything including the kitchen sink), then you may search it. This is done by pushing your joystick up and waiting until the bar that appears is diminished; the length of this bar represents the time needed to search the object. When your search is completed you are told what you have found. This is usually nothing, but occasionally you unearth a piece of the puzzle that you must unravel in order to crack Dr Elvin’s security and thereby foil his dastardly attempts to destroy the world.

Unfortunately the robots are a match for all but the best players as they cover your every move awaiting the chance to kill you, and their behaviour alters from one game to another. Routes through rooms aren’t easy to discover, so the game keeps its appeal.

UK software houses could learn a lot from Impossible Mission — in terms of quality it’s streets ahead. The character animation and the robots are impressive, but the sound is outstanding: as you run along the corridors it sounds like footsteps on a metal floor. The lifts make realistic noises as do the robots, but the most impressive is the voice.

‘Kill him, my robots!’ is a disturbing greeting as you enter a room, as is the ‘Aaaaaaah!’ when you plummet to your doom. Finally, should you fail in your mission, an evil laugh announces a report of your dismal performance.

Life in the fast lane
Title: Rally Speedway
Computer: Atari
Supplier: Adventure International
Format: Cartridge
Price: £28.95

It’s time to strap yourself in and head for the open road as you start this excellent rally car racing game. The game is played by one, or preferably two players who hurtle around a dry, wet or icy track that they devise themselves; the object being to complete a set number of laps in the shortest time.

Time is lost either by crashing, or by a time penalty which is imposed if you’re left so far behind that your car leaves the screen. A time penalty will cost you five seconds and a crash 10 seconds — plenty of time to rebuild a mangled car, I don’t think!

The object of the game is to stay on the track for more than a few seconds.
The author obviously realised that this might be a problem so you can race 'only in a computer' rather than 'in real life', which means that you can happily drive through the bushes, houses and pools that surround the course. Once you have mastered the training you're ready for the real thing—a tussle between two equally skilled players and a no-holds-barred race. A timely ramming will either send your opponent crashing into a house, or at least push him off the track onto the grass which will slow him down, perhaps enough to earn him a time penalty. Pitstop, which was reviewed last month, had rather average racing but excellent pitstop locations, whereas Rally Speedway features great racing but nothing else. A mixture of the two would be a winner.

Tinker, tailor, micro, spy
Title: Spy vs Spy
Computer: Commodore 64
Supplier: Beyond/First Star
Format: Cassette
Price: £9.95
Two famous adversaries from Mad magazine come to life in this classic game of skulduggery, as you try to out-fox your enemy in an attempt to steal papers from an embassy.

Within a set time limit, you must escape through a hidden door carrying a top secret briefcase which contains passport, money, key and, of course, the secret plans. These are all hidden throughout the embassy in cupboards and behind paintings, and must be found. Unfortunately you can only carry one object at a time, except if things are put in the briefcase.

This is only a minor problem when compared to the lengths to which your opponent will go to steal your ill-gotten gains. These range from bashing you with a club to more subtle traps involving bombs, large springs and buckets of water. Traps can be laid above doors or in the hiding places. Both spies contribute to this mindless violence which makes the embassy a very dangerous place, particularly since spies have been known to be blown up by their own bombs.

There are ways to avoid most of the traps: for example, an umbrella found in a coat rack will protect you from electrocuting water, but it's too late to remember this is you've already been fitted with a pair of wings and a halo. When this happens, your opponent pauses for a chuckle before continuing with his task.

A demised spy soon returns after losing vital seconds, but well-timed revenge will turn the tables.

The spy who collects all the items isn't always the winner — a mugging could enable your enemy to steal the bag of goodies and make a run for his waiting plane. The winner is then rated on his performance and given an accolade ranging from 'knee high spy' up to 'good guy spy'.

You can compete against either a human or computer opponent in a variety of embassies: these can incorporate just six rooms, or be one building split into two levels complete with holes hidden under carpets.

The screen graphics greatly enhance this game. Each spy has his own display of the room he is in which is transferred to a single display when they enter the same room. To the right of the displays are the trapulators, which are used to select the traps (with a joystick) or a map of the embassy.

The game has a soundtrack that will be whistled by the players long after the last bomb has exploded.

Is this a game I see before me?
Title: Macbeth
Computer: Commodore 64
Supplier: Creative Sparks
Format: Two cassettes
Price: £14.95
Shakespeare's Macbeth is a powerful play and instils such feelings into actors that few will name it, simply referring to it as 'the Scottish play'. One actor was even killed in one of the supposedly cursed battle scenes. You can now play the adventure game.

There are four parts to the game, each an adventure in its own right. In the first you play Macbeth: all you have to do is slay Scotland's greatest adversaries, then discover and decode an 11th century runic script.

Macbeth features a delightful mix of text and graphics. Although the graphics are of the standard adventure game quality, many are animated and all are changed by your actions: for example, if you open a closed trap-door, when you look again the graphics screen is redrawn with the trap-door open. Similarly, objects taken and dropped by you appear or disappear from the picture. This feature is a great bonus, but to date has only been available on a few disk adventures.

After a quick change of clothes and sex, you're ready to take the part of Lady Macbeth as she attempts to murder the King. You must accomplish this and remain undetected within an hour.

In the third part you're an assistant of the witches, and you must collect ten of the ingredients with which they'll bind Macbeth to his destiny. The balance of
force of the siege. The package includes not only a text
booklet which sheds light on the despicable deeds of those days.
Should you wish to delve deeper into the characters, you can use the

Paytron, which is now available for the
Commodore 64. There the similarity ends.
You are a Psi warrior whose mission is to destroy the strongest of the Psi
creatures, the Source, which lurks in an
ancient silo.
Unfortunately it lives 80 levels down
and before you reach it you'll have to do
battle with the Psi, Ids and Pupae. The
Psi are bred from the mental energy of
human minds and the Ids from man's
animal instinct. The Pupae are dis-
embodied human entities which are yet
to turn into Psi or Ids.
They don't attack you physically but
drain your Psi and Id energy; this
should be avoided, since you use your
Id energy as fuel with your Psi energy
to control it.
You can also use Psi energy to
teleport and levitate yourself, as well as
to make yourself temporarily invisible.

The players take the parts of the four
main characters who all have their own
special power, or bargaining point.
Grasper is a landowner who offers
protection; the exact nature of this
grace (this is essential — the
Prince won't see anyone who hasn't
been absolved from their wrong-
doing); Porcus is a merchant who
lends much-needed money; but it's
Fernando the tipstaff who'll have the
most fun — he can send people to trial.
You are ably supported by some
computer-controlled characters which
include Gamp, a 'buy-or-sell-no-
questions-asked' stall holder, and a
motley collection of spies and hench-
men who are for hire.

You are a Psi warrior whose mission
is to destroy the strongest of the Psi
creatures, the Source, which lurks in an
ancient silo.
Unfortunately it lives 80 levels down
and before you reach it you'll have to do
battle with the Psi, Ids and Pupae. The
Psi are bred from the mental energy of
human minds and the Ids from man's
animal instinct. The Pupae are dis-
embodied human entities which are yet
to turn into Psi or Ids.
They don't attack you physically but
drain your Psi and Id energy; this
should be avoided, since you use your
Id energy as fuel with your Psi energy
to control it.
You can also use Psi energy to
teleport and levitate yourself, as well as
to make yourself temporarily invisible.

The Prince is a four-player adventure
game in which you compete to become
the Master of Lore to the Prince. The
Master is the second most powerful
person in the land, a position obviously
worth fighting for as well as being
worth lying, bribing, begging, stealing,
dealing and blackmailing for. These are
the 'talents' that the successful player
must have.

The next player does the same, and
so on until the game is won. The winner
is the first to present tokens of succes-
sion to the Prince; the exact nature of
these tokens is left for you to discover.

This is an adventure game in which
four people are competing but only one
can win. Therefore a word of warning:
don't spend too long at the keyboard.
While you're deciding your moves and
planning your strategy, your oppo-
ents are plotting against you.
01-222-5981
PERSONAL COMPUTER SUPPLIES LTD

TECHNICAL SUPPORT +
DEMONSTRATION FACILITIES FROM
THE NICEST PC SHOP AROUND

Our wide range and low prices include:

<table>
<thead>
<tr>
<th>Software</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wordstar</td>
<td>£195</td>
</tr>
<tr>
<td>Wordstar Pro</td>
<td>£295</td>
</tr>
<tr>
<td>Symphony</td>
<td>£435</td>
</tr>
<tr>
<td>Wordstar 2000</td>
<td>£375</td>
</tr>
<tr>
<td>Multimate</td>
<td>£259</td>
</tr>
<tr>
<td>DBase II</td>
<td>£295</td>
</tr>
<tr>
<td>DBase III</td>
<td>£450</td>
</tr>
<tr>
<td>Oz</td>
<td>£275</td>
</tr>
<tr>
<td>Open Access</td>
<td>£375</td>
</tr>
<tr>
<td>Supercalc 3</td>
<td>£175</td>
</tr>
<tr>
<td>DBase II</td>
<td>£375</td>
</tr>
<tr>
<td>Brainstorm</td>
<td>£250</td>
</tr>
<tr>
<td>Tabs integrated accounts — price on application</td>
<td></td>
</tr>
<tr>
<td>Minerva integrated accounts — price on application</td>
<td></td>
</tr>
<tr>
<td>Ram cards: 128k £215, Dysan Discs DS/DD £22.00 Box. SS/DD £17.00 Box. SS/SD from £10.00 Box. Listing paper £4.00 per 1000. dBase II Applications from £50.00</td>
<td></td>
</tr>
</tbody>
</table>

IBM APRICOT OLIVETTI
OCTOPUS

Personal callers welcome.
Mon-Fri 8-6pm
Sat-Sun by appointment
American Express.

HARDWARE, SOFTWARE, PRINTERS, BOOKS,
COMPUTER STATIONERY, DISCS, ACCESSORIES.
Trainspotting with
RS232

Title: RS-232 Made Easy: connecting computers, printers, terminals and modems
Author: Martin D Seyer
Publisher: Prentice-Hall Inc
Price: £19.20

Not, on the face of it, an engrossing topic for a book. You can, after all, adequately describe RS232 in a sentence. RS232 is jargon for a serial interface: you bung the plug into the socket, thus connecting your computer to a modem, for example, or a typical daisywheel printer.

Provided you don't confuse a serial interface with a parallel one (the so-called centronics standard), which is usual for hooking up dot-matrix printers, I shouldn't have thought there was too much else to talk about. People don't as a rule queue up to buy books describing, say, coaxial jacks, or for that matter the life and times of a 13amp three-pin plug. What's so special about RS232?

Mr Seyer does his utmost to convince us that unravelling which-wires-do-what within RS232 is the key to grasping the theory of serial input/output in general, and communications technique in particular. It's a spirited attempt, but a good two-thirds of this book nevertheless consists of dreary appendices, painstakingly listing the pin configuration of umpteen devices, or copying out the Electronic Industries Association's laborious definition of standards.
The remaining third of the book is mostly about trains. It's an American railroad, mind you, so you'll need to know your boxcar from a caboose to grasp the various analogies with shunting data. In time, you do get briefed on setting up for modern transmissions — duplexes, parity, baud rates, and so on — but you start to nod off, too.

It would make life simpler to get dealers to supply the right cables along with any RS232 connected devices you might buy and to have fun using add-ons instead of messing about stripping down their connections. RS-232 Made Easy forgets that its subject doesn't need to be so difficult in the first place.

Computer dating

Title: How To Buy Software: The Master Guide To Picking The Right Program
Author: Alfred Glossbrenner
Publisher: Papercraft
Price: £9.95

A door-stopper of a paperback, this, and numbingly prolix in the way that all-American, catch-all handbooks by people who write as well as Alfred Glossbrenner often are. It's Mr Glossbrenner's ninth, making me wonder if he ever sleeps. I like to picture him hacking through the night in a stetson, a fat stogie clenched between his gold-filled teeth, a can of Budweiser at his side.

The book points out, only a hundred or so computer manufacturers and far fewer major ones, yet there are something like 40,000 separate software packages 'and they're multiplying like coat-hangers in a darkened closet.' Gosh darn it, for a moment there I feared Glossbrenner might be about to fling his name for a holy sheet.

In the event he majors on software types like the 'big four' accounting routines (general ledger, accounts receivable, accounts payable and payroll), spreadsheets, databases, communication, word processing, business graphics, educational software and games. They each get a chapter (25 in all) while other chapters crash-course through operating systems, programming languages and hardware configurations. Glossbrenner's gee-whiz exuberance never lets up for a moment.

Peppering his text are hundreds of 'SoftTips' — sometimes handy shortcuts through intractable procedures, sometimes blindingly obvious little homilies along the lines of don't buy what you don't understand, sometimes sidetracks into well-laid land.

There is, it has to be said, a lot of useful information in this book (all of it, except a short appendix, directed at an American audience), but it also needs to be said that the relentless Mr Glossbrenner goes on and on and on.

Let's leave him with one of his typical SoftTips, which will give you the flavour: 'You can think of CompuServe's CB section as a gigantic, ongoing telephone conference call. The difference is that instead of speaking your comments, you type them in and read those made by others who are online. At least two couples who met on the system later got married — on the system. The minister was in one state, the parents and the happy couple were in several other states, and the wedding guests were scattered all over America. When it was all over, all the guests threw rice — by hitting the hyphen keys on their computers.' Gee.

'Mike's too short'

Title: Basic ROM User Guide for the BBC Microcomputer and Acorn Electron
Author: Mark Plumbley
Publisher: Adder (Cambridge)
Price: not known

Those electronic svots who are almost freakishly fascinated with the innermost techical structures of BBC Basic or 6502 machine code are going to love this book. Those who aren't, aren't.

Mark Plumbley is, in short, an enthusiast: eager to sit up until the small hours with a pot of strong coffee and his disassembler, getting to intimate grips with BBC Basic, not as a language, but as a system.

In theory, this leads to better programming technique, and you won't catch Plumbley's apprentices using GOSUB when they can call PROC or FN. In practice, what it leads to is bags under the eyes — but fanatical fiddlers don't mind that when they're having such fun.

This isn't a book you read in the ordinary sense, it's one you labour through line by line, mental spanners in hand — a kind of theoretical workshop manual for those who can't rest until they've taken the technical structures to bits, until they've split the Acorn.

As such it's matchless, meticulous and mind-bendingly thorough. Whether or not you might consider that life's too short, I leave entirely to you.

Art for art's sake

Title: Computer Art and Graphics
Author: Axel Brück
Publisher: Element (Paul Petzold)
Price: £14.95

Some risk again here of going boss-eyed from tap-tapping lengthy listings, but working up to fancy graphics sounds like more fun than crunching ROM. In any case, we're told, it's still the idea at all to key in the provided (Basic) programs and stand back to gasp. You're supposed to have in your artistic imagination some exquisite design, then to use the book's examples of method and problem-solving to persuade your micro — any micro — to create your highly personal electronic canvas. The snag is that your results may prove a bit of a let-down against the wonderfully infectious surrealist colour plates which Herr Brück includes to demonstrate his gift.

The unfortunate fact is that without sophisticated (and expensive) gizmology, such as very high resolution monitors, decent CAD software and fancy plotters, achieving computer graphics which can decently be called art is a terrible sweat.

Brück assumes that you can at least run to a plotter (he has a handy friend who knocks them up for him) and asserts that the rest doesn't really matter if you're patient with his methods. He's pretty sniffy about the crude standards of average arcade-style games; his game is to plot a piece of artwork you might want to pin to the wall. And in time you do get there, by way of simple shapes, more sinuously complex ones, clipping routines, multidimensional techniques and controlled perspective.

It's hard work, made harder by the frequent need to tinker with Herr Brück's listings to match your particular Basic (his is Apple), but this is an interesting and unusual book, assemblage of artwork you admits to knowing nothing about electronics, but who has an infectious enthusiasm and can show remarkable finishes.

Misery and mystery can be yours...

Title: Commodore 64 Data Files
Author: David Miller
Publisher: Prentice-Hall
Price: £8.95

The purpose of this book, says the author, is to take some of the misery and mystery out of learning to use the Commodore 64's file structure. The pity of it is, of course, that the misery and mystery are there in the first place. My rather jaundiced view of the Commodore 64 is, I'm afraid, that it's an ageing machine. On the whole I'd rather not age with it, struggling to understand its quirky ways.

Most of this book consists of lengthy listings which, mercifully, can be ordered from California on disk. Some are fed for drill and practice, others provide a mailing list, a home inventory, a magazine catalogue or a simple medical records file. If you choose to enter them from the book, note the author's ridiculous warning that they were printed out on a letter-quality machine which couldn't differentiate between number 1 and lower-case letter l, had slashless zero and no means of doing a proper up-arrow character.

Manipulating Commodore 64 files and creating your own programs are yours to discover with this book, says the blurb.

All yours, say I.
Happy-go-lucky C

Les Hampson introduces the features of C, and explains how the language's versatility enables it to adapt to ever changing requirements.

Which high-level language do you think is used to produce many of the spreadsheets, databases, word processing applications and the integrated products now appearing? Which language has Digital Research (of CP/M fame) adopted for system development? Not Fortran nor Pascal, and certainly not Basic, but C.

Why is C so popular with professional software writers? The answer is: because it is versatile, puts few constraints on what can be done, produces fast and compact programs, and allows software to be readily transferred between systems. Although C was conceived for 'systems programming' (which means writing things like operating systems), specifically developing the Unix operating system, it has proved useful for general applications.

C works well in many applications, and versions are available for almost all machines with disk drives. Some of the 8-bit versions are subsets of the language (for example, without floating point operations) but are still very useful; almost all 16-bit implementations provide the complete language. You probably don't want to write your own CP/M, a compiler, or an alternative to Multiplan, at least not yet, but if you want an efficient, general purpose language, or need the flexibility of assembler without the headaches, then C has a lot to offer.

The name itself reflects that C is not a verbose language, so let's jump straight in with a sample to show that it can be fairly easily understood. Fig 1 compares a simple loop in C and in Basic; a lot can be learnt from this example. C does not use line numbers and the program can be laid out as required, although everything on one line would be going a bit far. The types and names of variables have to be declared before use, unlike Basic which provides a variable when a new name appears (or even a mistype). The braces { } enclose groups of statements and each of these is terminated by a semicolon.

The general approach will be familiar to anyone who uses Pascal, especially when you realise that the braces correspond to BEGIN and END. Although you can use expressions like x = x + 1, C has special operators such as '++' to increment and '+=' to add to a variable because these can be more efficient.

What the example does not show are the advantages of using C: for such a trivial program there aren't any, and Basic has the advantage of being easy to get started in and can be run immediately. But larger programs are better written in the structured way encouraged by C with full control over variables, rather than huge monolithic blocks of Basic with control jumping all over the place. A large, well written, C program, such as a text editor which might be 2000 lines, can be readily understood once you become familiar with the constructions used; on the other hand, a badly written C program can be very cryptic and difficult to unravel.

In Basic

10 for i=1 to 20 step 2
20 x=x+1
30 next i
40 print "finished ";x
50 end

In C

int x,i;
for(i=1;i<=20;i+=2)
x++;
printf("finished ",x)

Fig 1 A simple loop in Basic and in C

Version 1

/*
since i is always true (ie non zero) the loop will continue until explicitly broken */
while(1)
{
    c=getc(myfile);       /*get a character from file*/
    if(c==EOF) break;     /*exit loop at end of file*/
    if(c==0) numnull=numnull+1; /*increment if c is zero*/
}

Version 2

while((c=getc(myfile))!=EOF)
    if(c==0) numnull++;

Fig 2 Two loops showing different constructions

main --->---- fopen --->---- if error --->---- puts
          --->---- gotc ---->---- if EOF ---->---- fclose
                      |                      | | | |
                      |                      | | | | encrypt ---->---- rand
                      |                      | | | putc

Fig 3 Structure for file encryption program

break continue
char short int long float double
extern unsigned static auto register
while for do if else goto return
switch case default
union struct
sizeof typedef

Fig 4 Keywords in C with specific meanings
Before getting down to details let’s look at another example. The first part of Fig 2 is another loop which gets characters from a file and counts the number of zeros. The loop is exited when the end of file is reached. The ‘=’ symbol tests equality, whereas ‘=’ is used for assignment. In practice the second version, which does exactly the same job, would be preferred because it can be translated by a compiler into more efficient machine code. Although such concise constructions are common in C, they take some getting used to.

Using C
In general, C has to be compiled — there’s no instant gratification as with an interpreter. A suitable package will include compiler, linker, function library and a text editor of some kind. Although such concise constructions are common in C, they take some getting used to.

Functions
Functions are the building blocks of a C program. A function is a series of instructions called by name to carry out operations such as read from a file, clear a display screen or manipulate numbers. These will, of course, have been written in C. Many versions also have utilities for maintaining function libraries. A few have a symbolic debugger, which allows you to run programs step-by-step while displaying the source code and to check the values in variables. A few C interpreters have been written but are not widely used.

The language is defined in an excellent reference text (C Programming Language by Kernighan and Ritchie, Prentice Hall, 1978). No extensions to the standard are required or generally available, thus eliminating the problem of confusing variants found with other languages.

Functions
Functions are the building blocks of a C program. A function is a series of instructions called by name to carry out operations such as read from a file, clear a display screen or manipulate numbers. These will, of course, have been written in C. Many versions also have utilities for maintaining function libraries. A few have a symbolic debugger, which allows you to run programs step-by-step while displaying the source code and to check the values in variables. A few C interpreters have been written but are not widely used.

The language is defined in an excellent reference text (C Programming Language by Kernighan and Ritchie, Prentice Hall, 1978). No extensions to the standard are required or generally available, thus eliminating the problem of confusing variants found with other languages.

Developing a program
C is a powerful and flexible language which can produce well-structured programs. Complex constructions can be elegantly expressed and data structures designed to suit the application. However, as in all things, there is a price to pay: the programmer is assumed to be right and few checks are made, which means that some errors can be truly spectacular. This ‘Teach Yourself’ series should lead you around common pitfalls, and as you write increasingly complex programs you will begin to appreciate the virtues of C and its brevity.

Large programs in C are best developed using a ‘top down’ approach — that is, dividing the overall objective
into logical sections and then into sub-tasks. Eventually a level is reached where the tasks can be conveniently constructed as C functions. It is also necessary to consider how information will be passed between the functions, and how data is best handled. Some planning effort before starting to write the program avoids the torture of sorting out tangled, unnecessarily complex and badly structured code.

C will not produce a fast-running program from poor ideas. The algorithms used are crucial in determining efficiency, as in any language. For example, if you were writing a spelling checker, then the methods used to sort words into order, check against the dictionary and use memory for disk buffering would have a major effect on the time your program took to run.

Suppose we want a program to encrypt the data in a file so that it cannot be used by others. Fig 3 shows the functions which might be used.

The function ‘main’ first calls ‘fopen’ to access the file to be converted and to get a character from the file, and passes it to ‘encrypt’. This in turn needs to call ‘rand’ to produce random numbers needed for encryption, and finally ‘putc’ writes out the converted character to disk. When ‘getc’ finds the end of the file, the loop is exited; ‘fclose’ is called to close the files and the program ends.

**Contents of a source file**

What makes up a C source file (a program as written)? Lines can be of arbitrary length and use the full range of printable characters. There are few constraints on the layout of the program, which can be arranged as required for clarity. The examples in this series will align braces and make extensive use of indenting.

A source file consists of preprocessor directives, comments, global data declarations, and functions containing local data declarations and executable statements. These are built up from: identifiers—e.g., my file name; keywords—e.g., while; constants—e.g., 0; character strings—e.g., "this is a message"; operators—e.g., +; separators—e.g., ;

Spaces, tabs, new lines and comments are ignored except that they separate adjacent identifiers, and so on. Variables and functions are identified by suitable names, which preferably suggest their purpose. These must begin with a letter or underline and can contain digits. Identifiers can be of any length but only a limited number of characters will be significant (usually eight). The names of identifiers must not be certain C keywords which have special meanings (see Fig 4).

The name and type of a data item must be declared before use, so that memory can be reserved; the correct operations used to manipulate it. For example, to declare a character, an integer and a floating point quantity the following statements could be used:

```c
char c;
int i;
float f;
```

Data items can be made global (available from any function) by being declared outside functions, or local to a particular function by being declared inside. This is very useful because any data which is ‘private’ to a function can be made local; there is no conflict with names in other functions and the memory used can be released on leaving the function. Data is best communicated between functions using parameters and a returned value, rather than with global data.

The body of a function consists of statements to be executed and from keywords, function calls and expressions formed from operators and their operands. Each statement is terminated by a semicolon and is usually put on a separate line. Braces can be used to combine single statements into a block which is treated as a unit.

Comments of one or more lines are enclosed by the symbols ‘/*’ and ‘*/’. C statements can be terse, so comments should be generously used.

A source file can also contain preprocessor directives which are simply instructions to the compiler. The directives begin with the ‘#’ symbol; they do not end with a semicolon since they are not C statements, and are dealt with before any translation takes place. The basic use is illustrated by:

```c
#define MAXCOLS 80
```

This will cause all occurrences of MAXCOLS to be replaced by the numerical constant 80. This is preferable to scattering obscure numbers through a source file and makes changes easier. The replacement symbol does not have to be a number; it can equally well be, say, a function call or character string. It is also possible to define symbols with arguments in the form of 'macro' definitions.

**Function libraries**

A program does not have to be contained in one source file. Larger
Is the Information Revolution Passing You By?

If you use an Apple, IBM, BBC or ACT micro then you could be missing out on the information revolution of the decade. Today there are literally hundreds of databases worldwide, which can be accessed by a microcomputer fitted with a Nightingale modem and using appropriate software. These databases include Prestel, Micronet, Homelink, Telecom Gold, various 'Bulletin Boards' and massive American Databases such as 'DIALOG' and 'The Source'.

Micros can also be used to send telex messages.

A world of information is available to you now when you install the Nightingale modem from Pace. There are hundreds of thousands of 'pages' of data available on Prestel, free computer software on Micronet, homebanking facilities available with Homelink, Company facts, Educational information, magazine and news articles available with Knowledge Index and the ability to communicate with other micro users direct, or via 'bulletin boards'.

The Nightingale modem is only £136.85 inc. VAT. If you do not already have suitable communications software Pace can supply this complete with a manual and full installation instructions.

NIGHTINGALE - The Modem

By far the most versatile modem available, at the price, for either home or business use, Nightingale will enable your micro computer to send and receive data utilising an ordinary P.O. Telephone Line. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) alongside 300/300 baud full duplex for communication between computers.

The state-of-the-art modem chip technology employed in Nightingale requires minimum support circuitry resulting in low power consumption, low cost, high quality and extreme reliability. It also features a simple self test facility for easy installation.

Nightingale complies with the vigorous specifications laid down by British Telecom and is fully BABT approved.

"INFORMATION SHEETS AVAILABLE ON REQUEST"

To Pace Ltd., 92 New Cross Street, Bradford BD5 8BS
Please supply:
- modems at £136.85 inc. VAT & carriage
- modems & software pack for BBC micro at £159, inc. VAT & carriage
- modems & software pack for Apple IIe at £279 inc. VAT & carriage
- modems & software pack for IBM PC* at £269 inc. VAT & carriage
- modems & software pack for ACT at £269 inc. VAT & carriage

Name __________________________________________
Address _______________________________________
Cheque enclosed £ ___________ or please debit my Access ___________
Barclaycard ___________ (Please tick)

If you require further information on the above communications products for other computer systems, please write enclosing a stamped addressed envelope.

* Assumes IBM micro fitted with RS 232 interface. Please allow up to 28 days delivery.
The last thing we expected was to be first so soon.

When you start a company you find it pays to specialise. At Parrot we specialise in firsts.

The first and only totally integrated diskette manufacturing facility in the UK, combining the best of British and American technological resources.

The first company to specialise in diskettes and computer tape only.

The first company to build quality control into every job in the plant—not leave it to just one department.

The first company to supply its entire range of diskettes in a unique indestructable, highly practical ten-disk file.

The first company to offer you this much service and reliability for such an unexpectedly competitive price.

And to be honest even we were surprised by our rapid success. But when you weigh up all the benefits it's really not so surprising after all.

Who's a clever boy, then?
programs, especially, are likely to consist of several files which are separately compiled and finally linked together along with required library functions to give something which runs.

Where do all the functions required in a program come from? It may come as a surprise to discover that C provides no built-in access to display, keyboard, printer nor disk files. Nor does it provide basic operations such as adding one string of characters to the end of another or taking the sine of an angle. The language can be used to do all these things (given some way of interfacing with the operating system), but suitable functions have to be devised.

This sounds distressing, but fortunately the user is not required to write such functions because they will be provided in a library with the compiler; a program simply calls them. However, the library functions are not an intrinsic part of C. Most implementations try to follow the functions provided with Unix, but as they are not part of the language, this is in the hands of the software author. We will be looking at the software author's library. This is the 'toolbox' approach which leads to a specialised library to suit particular interests.

The program in Fig 5 fleshes out the skeleton encryption program to illustrate C. It should be possible to understand how the program works and the way in which functions are used, even if some of the details are not yet clear.

<table>
<thead>
<tr>
<th>Company/Address</th>
<th>Machine/Operating System</th>
<th>Package</th>
<th>Price (includes VAT and UK p&amp;p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hisoft 180 High Street North, Dunstable, Beds</td>
<td>Spectrum</td>
<td>Hisoft C</td>
<td>£22.50 (normal price £25)</td>
</tr>
<tr>
<td>System Science 6-7 West Smithfield London EC1</td>
<td>CP/M-80</td>
<td>Software Toolworks C80, Mathpak and C Programming Language by Kernighan and Ritchie DeSmet C and C Programming Language Aztec C86 Compiler and C Programming Language Aztec C Compiler and C Programming Language</td>
<td>£90 (normal price £119.15)</td>
</tr>
<tr>
<td></td>
<td>CP/M-80, MS-DOS</td>
<td></td>
<td>£155 (normal price £185.40)</td>
</tr>
<tr>
<td></td>
<td>Apple DOS 3.0 or Prodos</td>
<td></td>
<td>£180 (normal price £216.25)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>£158.75 (normal price £176)</td>
</tr>
<tr>
<td></td>
<td>CP/M-86, versions 1 and 2 of MS-DOS and PC-DOS</td>
<td>DeSmet C without debugger</td>
<td>£130 (normal price £158.75)</td>
</tr>
<tr>
<td></td>
<td>CP/M-80 5¼in soft-sector or 8in disk</td>
<td>DeSmet C with debugger</td>
<td>£181.75 (normal price £216.25)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BDSC</td>
<td>£118.50 (normal price £125)</td>
</tr>
<tr>
<td>MMG Consultants 19 St Andrews Road Great Malvern, Worcs</td>
<td>CP/M</td>
<td>Small-C-80</td>
<td>£75 (normal price £100)</td>
</tr>
</tbody>
</table>
**6502 SUPER SET**

Andrew Civil of Coventry took a brief look at the dozens of unspecified 6502 instructions (PCW, January 1984) and has found that $9F$ is more complex than was thought. Instead of storing A AND X to an absolute address indexed by X, it stores A AND X AND N to an absolute address indexed by Y. N is calculated as one more than the high order byte of the destination address - not much use unless you want to store a number to page $FEO0$.

**GRAPHIC DOTS**

DOT-A from John Penfold of Harpenden, and DOT-B and DOT-C, both from Barrie Frost of Basildon (all in Datasheet 1) are just a few of the innumerable ways of writing two bits of graphics information to a target byte. For the benefit of new readers, SubSet issued a challenge in November 1983 for an 'elegant solution' to the problem of placing this information. The first set of solutions, in 6502 and Z80 code, were printed in April 1984. Just to make Z80 programmers try harder, the faster 6502 solution took only 43 clock cycles - at the cost of a 20-byte look-up table.

**DATASHEET 1**

<table>
<thead>
<tr>
<th>DOT-A</th>
<th>DOT-B</th>
<th>DOT-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOB</td>
<td>ACTION</td>
<td>HARDWARE</td>
</tr>
<tr>
<td>To replace the existing 2 bits of graphics information in a target byte by new information formed from an input 2-bit value.</td>
<td>Move new dot information to correct bit positions. Construct mask in correct bit positions. Replace old dot information.</td>
<td>1 byte of RAM containing graphics information.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CPU</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1:6001</td>
</tr>
<tr>
<td>INPUT</td>
<td>OUTPUT</td>
<td>SOFTWARE</td>
</tr>
<tr>
<td>8-bit pointer address target byte.</td>
<td>Target graphics byte contains new information. Some input and other registers change.</td>
<td>None.</td>
</tr>
<tr>
<td>8-bit register holds dot information (0 to 3).</td>
<td>Base dot information in bit 0 (msb) and bit 0 (lsb).</td>
<td>None.</td>
</tr>
<tr>
<td>8-bit register holds new information in bit 1 (msb) and bit 0 (lsb).</td>
<td>Target byte formats 1 and 2: 1 2 3 4 5 6 7 8.</td>
<td>None.</td>
</tr>
<tr>
<td>DOT-A</td>
<td>DOT-B</td>
<td>DOT-C</td>
</tr>
<tr>
<td>8-dot</td>
<td>6-dot</td>
<td>8-dot</td>
</tr>
<tr>
<td>Target dot no. Info.</td>
<td>Target dot no. Info.</td>
<td>Target byte formats 1 and 2: 1 2 3 4 5 6 7 8.</td>
</tr>
<tr>
<td>DOT-A</td>
<td>DOT-B</td>
<td>DOT-C</td>
</tr>
<tr>
<td>8-bit</td>
<td>6-bit</td>
<td>8-bit</td>
</tr>
<tr>
<td>Target byte formats 3 and 4: 1 2 3 4 5 6 7 8.</td>
<td>Target dot no.</td>
<td>Target byte formats 1 and 2: 1 2 3 4 5 6 7 8.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inputs: 1 2 3 4 5 6 7 8.</td>
</tr>
<tr>
<td>DOT-B</td>
<td>DOT-C</td>
<td>DOT-D</td>
</tr>
<tr>
<td>DOT-B</td>
<td>DOT-C</td>
<td>DOT-D</td>
</tr>
<tr>
<td>Inputs: 9 10 11 12 13 14.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DOT-C</td>
<td>DOT-D</td>
<td>DOT-E</td>
</tr>
<tr>
<td>OR C</td>
<td>INFO</td>
<td>MOVES</td>
</tr>
<tr>
<td>(HL)</td>
<td>C, A</td>
<td>MOVES?</td>
</tr>
<tr>
<td>DOT-C</td>
<td>DOT-D</td>
<td>DOT-E</td>
</tr>
<tr>
<td>RET</td>
<td>RET</td>
<td>RET</td>
</tr>
<tr>
<td>INFO</td>
<td>ERR</td>
<td>CODE</td>
</tr>
<tr>
<td>Target graphics byte contains new information. Some input and other registers changes.</td>
<td>INFO and dot numbers exceed $03H$.</td>
<td>Instructions and dot numbers exceed $03H$.</td>
</tr>
<tr>
<td>MEM USE</td>
<td>MEM USE</td>
<td>MEM USE</td>
</tr>
<tr>
<td>DOT-A: A $8001$</td>
<td>DOT-B: A $8001$</td>
<td>DOT-C: A $8001$</td>
</tr>
<tr>
<td>DOT-D: A $8001$</td>
<td>DOT-D: A $8001$</td>
<td>DOT-D: A $8001$</td>
</tr>
<tr>
<td>STACK USE</td>
<td>STACK USE</td>
<td>STACK USE</td>
</tr>
<tr>
<td>None.</td>
<td>None.</td>
<td>None.</td>
</tr>
<tr>
<td>RAM USE</td>
<td>RAM USE</td>
<td>RAM USE</td>
</tr>
<tr>
<td>None.</td>
<td>None.</td>
<td>None.</td>
</tr>
<tr>
<td>CYCLES</td>
<td>CYCLES</td>
<td>CYCLES</td>
</tr>
<tr>
<td>A and B: 24, A and B: 22, A and B: 10.</td>
<td>A and B: 24, A and B: 22, A and B: 10.</td>
<td>A and B: 24, A and B: 22, A and B: 10.</td>
</tr>
<tr>
<td>D0</td>
<td>D1</td>
<td>D2</td>
</tr>
<tr>
<td>Target number: 5</td>
<td>Target number: 5</td>
<td>Target number: 5</td>
</tr>
<tr>
<td>D0</td>
<td>D1</td>
<td>D2</td>
</tr>
<tr>
<td>25 23 21 19 17 15 13 11 9 7 5 3</td>
<td>142 140 138 136 134 132 130 128 126 124 122 120</td>
<td>139 137 135 133 131 129 127 125 123 121 119 117</td>
</tr>
<tr>
<td>D0</td>
<td>D1</td>
<td>D2</td>
</tr>
<tr>
<td>D0</td>
<td>D1</td>
<td>D2</td>
</tr>
<tr>
<td>25 23 21 19 17 15 13 11 9 7 5 3</td>
<td>142 140 138 136 134 132 130 128 126 124 122 120</td>
<td>139 137 135 133 131 129 127 125 123 121 119 117</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6809 ASCII TO 16-BIT

DECCON (Datasheet 2) from Martin Chadwick of Charbury, Oxford, is an improvement to DECBIN (PCW, October 1983). DECBIN used the 6809’s MUL instruction to separately multiply the high and low order bytes of the partial result by ten. DECCON achieves greater speed and knocks off 21 bytes by using the tried and tested method of binary shifting and addition.

Another time and byte saving trick is to subtract the ASCII digits high nibble value ($30) before testing to see if the character is a digit. Only one test is then needed to identify non-digit characters.

6809 16-BIT TO DECIMAL

BCDCON (Datasheet 3) from FR Elahi of Collingwood College, Durham, is part of a utilities program that he’s writing for the Dragon. It isn’t quite the inverse of DECCON as the result of the conversion is unpacked binary coded decimal (BCD), with each digit occupying the low nibble (bits 3 to 0) of a result location and the high nibble bits cleared to zeros. To convert unpacked BCD to ASCII decimal just OR, EOR or add $30 to each result byte.

I’m surprised that BCDCON should not be relocatable. The 6809 can load the index registers with base addresses by using an offset from the program counter. 280 users will find a routine utilising the power of ten look-up table for binary to decimal conversion on page 241 of William Barden’s ‘The Z-80 Microcomputer’, published by Howard Samas.

**DATASHEET 2**

---

Summary:

- **RES** URE
- **RAM USE**
- **LENGTH**
- **CYCLES**
- **CLASS 2**

---

**DECCON**

**ASCII to Decimal Routine**

- **Description:** Converts ASCII to BCD.

**Input:**
- ASCII decimal number

**Output:**
- BCD result

**Errors:**
- None.

**Notes:**
- The unpacked BCD equivalent is contained in memory at TABADR+10 (high order digit) to TABADR+14. The unpacked BCD result, must be contiguous but not necessarily located with the routine.

**Example:**

```
DECCON: ;ASCII to BCD conversion routine
    ;...routine body...
```

---

**DATASHEET 3**

---

Summary:

- **RES** URE
- **RAM USE**
- **LENGTH**
- **CLASS 2**

---

**BCDCON**

**Decimal to ASCII Routine**

- **Description:** Converts decimal to ASCII.

**Input:**
- Decimal number

**Output:**
- ASCII result

**Errors:**
- None.

**Notes:**
- The result will be left-justified in memory.

**Example:**

```
BCDCON: ;Decimal to ASCII conversion routine
    ;...routine body...
```

---

**SUBSET BOOKS**

Some of the best routines from over four years of SubSet are now available in book form. Published by Century Communications, the titles are Assembler Routines for the 6502 and Assembler Routines for the Z80.

---

**SUBSET INDEX**

---

Unsure which issue that useful Datasheet appeared in? Here’s a handy 1983/4 Sub Set index to help you find it.

<table>
<thead>
<tr>
<th>Basic, embedded assembler (BBC)</th>
<th>6-9</th>
<th>BBC Microcomputer, pages uses</th>
<th>7-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-LSTFMT, BASIC/6502(D)</td>
<td>7-9</td>
<td>BBC Microcomputer</td>
<td>6-17,9-12</td>
</tr>
</tbody>
</table>

---

PCW213
SUBSET INDEX

Bits, splitting 7-4
Case structure 6-4,7
   =CASEOF: 6502(D) 6-4,7
   =CASCADE: Z80(D) 7-6
   =CASTXT: 6502(D) 6-7,10
   =KYSCH: Z80(D) 7-6
Code, dump formatter =FRMTZ: Z80 6-3
Code, modifying =XYMOD: 6502(D) 6-4
Code, relocation =RELOC: Z80(D) 6-11
Common areas(MACRO-80) 6-8,12,7-2
   =BCNV: 6502 6-2
   =base 2-36 to ASCII base 2-36 6-2
   =base 2-36 to 32-bit 6-1
   =ANYNO: Z80(D) 6-1
   =XBIN: 6502(D) 7-11
   =-decimal to 16-bit =DECBIN: 6502(D) 6-10
Conversions, binary source 6-8,11
   =4-bit to ASCII hexadecimal =code: 6809 7-7
   =8-bit to ASCII hexadecimal =BHEX: 6809(D) 7-7
   =16-bit to ASCII hexadecimal =DHES: 6809(D) 7-7
   =16-bit to ASCII decimal =PRAY: 6502(D) 6-5
   =PRX: 6809(D) 7-1
   =32-bit to ASCII base 2-36 =BINX: 6502(D) 6-2
   =n-bit ASCII decimal =LNGID: 8080/8085/Z80(D) 7-5
Conversions, date/days 6-4,12
   =day/month/year to days =CVDATES: 6502(D) 6-4,12
   =days to day/month/year =CVDATE: Z80(D) 6-4,12
CP/M (Osborne 1) entry =ENTRY: Z80 6-3
Cube root extraction, method 6-68
Cube root extraction, routines 7-11
   =16-bit (unsigned) =CURT1: Z80(D) 6-7
   =32-bit (unsigned) =CURT2: Z80(D) 6-7
Data, 12-bit, compression 6-6
   =SOSH: Z80(D) 7-6
   =SQSH: 6502(D) 7-10
Data, 12-bit, expansion 6-6
   =EXPD: 280(D) 6-6
   =EXPX: 6502(D) 7-10
Data sheet, standard 6-5,7-9
Delay, switchable =SLOWUP: Z80(D) 6-10
Discret, Class I definition 7-9
Division, challenge(68000) 7-11
Division, 32-bit (signed) =SDIVU: Z80 6-3
Documentation, revised 7-9
Escapes codes 6-9
Error detection and correction 6-7
   =E ACL6: 6502(D) 6-1
   =ECALS: 6809(D) 7-12
   =EFIX6: 6502(D) 6-1
   =EFIX9: 6502(D) 7-12
Errors, documentation section 7-12
Exidy Sorcerer 7-12
Flags, Entire (6809) 7-8
Flags, error 6-1
Flags, temporary storage 6-3
Flags, testing =LONGBR: 6502(D) 6-2
Flags, unspecified 8085 6-2,6
Graphics, colour change =INKPAP: Z80(D) 7-9
Graphics, elegant solution challenge 6-11
Graphics, elegant solutions =DOT: 25/34/5/6502 7-3
   =DOTT: 8/9/8: Z80 7-4
Graphics, pixel inversion =SGREV: Z80(D) 7-9
Index, May 1980 to December 1982 6-2
Instructions, byte-length determination 6-3
   =LENGTH: Z80(D) 7-9
Instructions, discussed =LDIR: Z80 7-8,12
   =LDIR: Z80 7-12
   =MULS: 68000 7-12
   =MULU: 68000 7-12
   =RDL: 80 7-6
   =RRD: Z80 7-6
   =RST: Z80 7-6
   =RTI: 6809 7-8
   =SWAP: 68000 7-11
Instructions, unspecified 6-11
Instructions, unspecified 8085 6-2,6,7,11
Instructions, unspecified 6052 6-7,11
Key search =KYSCH: Z80(D) 7-6
Key testing 7-10
LIB-80 7-2
LIST-80 6-12,7-2
Listing, formatted =LSTFTMT: BASIC/6502(D) 7-9,12
MACRO-80 6-12,7-2
Matrix transposition, during transfer =MATRAN: Z80(D) 6-6
   =MATRAN: 6809(D) 6-9
Matrix transposition, own-space =TRANS: 6502(D) 6-11
   =OSMTRN: Z80(D) 7-1
Memory, block fill =QUKFL: Z80(D) 7-8,12
   =CLEAR: Z80 7-12
Memory, block rotation =RRL: 6502(D) 6-9,7-2
   =ROLR: Z80(D) 7-2
   =BLKEXG: 6809(D) 7-2
Memory, block transfer =BLKMY: 6502(D) 6-7
   =IBT2: 6502(D) 7-2
   =IBT6: 6502(D) 7-8
   =IBT8: 6809(D) 7-8
Menu display/select =MENU: Z80(D) 7-10
   =MULTIPLIC: 68000 series 7-12
   =MULTIPL: 6809(D) 6-8
   =MULU: 6809(D) 6-8
   =M6800series, Datasheet notation 7-11
Option select =MENU: Z80(D) 7-10
   =OSWRCH (BBC) 7-9
Page zero, as program memory =RINXY 6502 6-8
   =XYMOD2: 6502 6-8
   =INDXY 6502(D) 7-6
Page zero, as RAM, Datasheet notation 7-9
   =PRAMASKING 6-1
Program Counter, anticipation =NEWPC: Z80(D) 6-5
Program relative, addressing 6-5
   =FOWAD: Z80/8080/8085(D) 6-2,6
Program relative, branches (16-bit offset) =LONGBR: 6502(D) 6-2
Random number generation 7-11
   =RND16B: 6502(D) 7-11
   =RND32: Z80(D) 6-2
   =RANDOM: Z80(D) 7-3
   =RAND16: 6809(D) 7-5
   =RNDWAS: 68000/08/10(D) 7-11
   =RNIDLW: 68000/08/10(D) 7-11
Recursion 6-9,7-7
Register indirect addressing =XYMOD: 6502(D) 6-4
   =RINXY: 6502 6-8
   =XYMOD2: 6502 6-8
   =INDEXT: Z80(D) 7-6
   =INDEXT: 6502(D) 7-6
Relocatable code (standards) 7-3
   =RESORT: 6502(D) 7-8
Robust, Class 1 definition 7-9
Screen, clear =CLEAR: Z80 7-12
Screen, invert =SGREV: Z80(D) 7-9
Search, associative key =KYSCH: Z80(D) 7-6
Single stepping 6-5
Sort, string bubble =ALSORT: 6502(D) 7-3
Square root extraction, method 6-68
Square root extraction, routines 6-6
   =16-bit (signed), =SOR15: 6809(D) 6-1
   =SOR16: 6502(D) 6-3
   =16-bit (unsigned) =SOR16: 6502(D) 6-1
   =32-bit (signed) =DSRTZ: Z80(D) 6-1
Stack, exchanges, Z80 instructions 6-6
Stack, exchanges, routines =EXSPBC: Z80 6-11
   =EXSX: 6502 6-11
   =EXGSX: 6809 6-11
Stack, user =PSHL: 6502(D) 6-12
   =PPL: 6502(D) 6-12
Stack Pointer, as general register =COMPAR: Z80(D) 6-10
   =MATCH: 6502(D) 6-10
Strings, reversing 7-6
Strings, transfer =MSTR: Z80(D) 6-8,10
System specificity 7-9
Text, escape expansion =MAKMSG: Z80(D) 6-9,7-7
   =MAKMSG: 6809(D) 7-7
Text, token expansion =TOK: 6809(D) 6-6
Text, program embedded =TEXT: 6502(D) 6-8
   =TEXTS: 6809(D) 7-7
   =TEXTQ: 6809(D) 7-7
TRS-80 7-9,10
VIA (Versatile Interface Adaptor) 7-11
Video Genie 7-9
Zero suppression 6-5
ZX SPECTRUM 7-9,12

END
To get the most out of your IBM PC, you need a professional letter-quality printer. Not just somebody's converted typewriter. Why compromise your computer investment with a makeshift add-on? Especially when Queme's SPRINT 11 PLUS — one of the world's best, most flexible printers — is available. It plugs right into your PC, turns out letter perfect print and works beautifully with your IBM PC business software, including sophisticated word processing packages. So don't be fooled by low-price, low-performance printers.

And don't spend more than you need to. Choose the dependable, premium-quality SPRINT 11 PLUS from Queme. It's the best printer you can buy for your IBM PC. And the best buy in printers.

The SPRINT 11 PLUS is available in 40, 55 and 90 c.p.s. versions, with a range of plug-in interfaces for most popular computer systems.

The range of Queme peripherals includes also — VDU's, Disk Drives, Paper Handling Devices and Supplies.
Using an isolated personal computer in the modern office is rather like using a megaphone to telephone.

The multitude of tasks and diversity of communications call for a radical new approach.

Logica Networked Office Automation Systems.
Logica Networked Systems are revolutionising working procedures by enabling users to pool resources.

Groups can now work together from consistent data, sharing information and expensive hardware.

Logica offers two comprehensive systems which can be tailored to the needs of all companies.

The Kennet Business Computer and the Polynet Office System.

The Kennet Computer is a powerful multi-function workstation with advanced hardware architecture and a diversity of software.

For the first time, the Kennet range allows personal computer users to reap all the benefits of local area networking.

The Polynet Office System, based on Logica's own high speed local area network, is a total system including all the hardware and software for text processing, data processing and communications.

Its sophisticated network management service also facilitates the sharing of extensive resources such as file storage and printing.

The benefit of both systems is that neither is confined to specialised groups such as Accounts or the typing pool.

See us at WHICH COMPUTER, Stand 3503
Both can be used effectively by casual users as well as professionals. You can start with a single Kennet Computer or cluster using one processor to drive several screens.

Or a Polynet Office System designed as a stand-alone advanced word processor.

And since both systems use local area networks, you have a smooth upgrade path for flexibility and growth in line with your needs.

What's more, there is no need to buy different equipment for different jobs (personal computers, word processors, terminals etc.).

Logica is Britain's leading independent software consultancy and products company.

With subsidiaries in eight countries, we know all about networks.

To talk shop, dial our 'user friendly' hotline on 01 637 7761 or fill in the coupon and send to our office automation team at 84 Newman Street, London W1A 4SE.

---

15-18 January, NEC, Birmingham.
Catch 64

I have read that interpreted Basic programs on the IBM PC are limited to a total size of 64k for the program and data. What's a cost of buying, say, a 128k machine if a program has to fit into 64k? Do dBaseII or dBaseIII have similar limitations? I'm trying to decide on a language to develop programs for business use.

JS Norris, Fulwood, Sheffield

You're quite right. Both MBasic and dBaseII allow a maximum of 64k for programs and data, if you're going to use the same languages, there's not much point in buying extra memory.

The 64k limit exists because both MBasic and dBaseII are translations of programs for smaller (CP/M) micro systems which only support 64k. The changes necessary to make use of the extra RAM are quite major, partly because of the way the programs are designed and partly because of the way the IBM PC handles extra memory. It works with 64k 'segments', and special 'machine instructions' are needed to switch from one segment to the next.

The extra RAM will come in useful if you purchase a word processor or other package written specially for the IBM machine. New programs (such as Lotus 1-2-3 and Symphony) make use of all the free memory. Most language compilers allow you to use up to 64k areas — one for data, and one for the program.

Remember that this 64k limitation only applies to the information in the computer's memory at any instant. It's possible to 'overlap' programs and data from the disk drives, and swap them back and forth so that their total size can be much greater than 64k.

Small Logo or Lisp?

Are there any Logo or Lisp packages available for the VIC 20? If so, where, and how much do they cost?

Grant McFarlane, Clydebank, Scotland

The VIC 20's small memory means that languages for the machine are rare. Even if you've got a 16k expander you still haven't really got enough memory to run Lisp, which is a notoriously greedy language. If you upgrade to the Commodore 64 you can obtain a good implementation of Logo from the manufacturers at a price of £34.95, but this is only available on disk.

Commodore could give no definite information about a Lisp interpreter for the 64, although I suspect that there may be one under development. Once again, you'll probably need a disk drive to run it.

Microsoft has implemented a package called Multisp on a wide range of micros with the 286 processor, and Lisp is also available from the manufacturers of the QL (Sinclair) and BBC Micro (Acorn).

Musical micros

I'm thinking of buying a BBC Model B, mainly to get the hang of computers. Is it possible to fit this machine with a music synthesizer to make a computer synthesizer? What software or add-ons are necessary for it to work? Can any synthesizer be used, or does it need a special adapter or socket?

BS Greener, Jarrow, Tyne and Wear

A year ago there were very few micros which could meet your specification — now there are many, following the publication of a new standard called MIDI (Musical Instrument Digital Interface). MIDI is a standard which allows computers, sequencers and synthesizers to communicate down a simple two-wire cable.

Almost all new synthesizers are built with a MIDI socket as standard, although it doesn't appear on older models. A lead or interface is needed to connect computer and synthesizer together.

The MIDI interface is available from a number of firms for the Commodore 64, Spectrum and BBC Micro at a cost of £50 with software. The interface itself is quite simple: in fact, two resistors are all that are needed if you have a Spectrum and Interface 1, so the quality and versatility of the software should guide your choice.

Most popular micros have built-in 'synthesizers' capable of playing three-part music, but the range of sounds available is limited and they all sound distinctly like 'computer music'.

A Nottingham firm, LVL, supplies add-ons, three octave keyboards for the BBC Micro and Commodore 64, that use the built-in sounds. The Spectrum is probably the weakest in sound facilities, and the Commodore 64 the strongest.

You should also consider the new range of MSX micros, some of which come from major synthesizer manufacturers like Yamaha. The standard sound facilities of MSX are average, but versatile add-on keyboards and synthesizers are being launched which could be ideal. Check out the Yamaha CX5 computer with the SFG01 synthesizer add-on; this has the advantage over MIDI that computer and synthesizer were designed together. MIDI will also be available for MSX computers soon.

Not recommended

In the May issue of PCW there was an article called 'Monitoring progress', which explains how to turn Pye or Philips TV's into composite video monitors. This is something I'd like to do but, unfortunately, I have a Decca set. Could you please explain how it can be done on my TV (if at all)?

Kieran Smyth, Prestwich, Manchester

In principle it's possible to convert most modern TV sets into monitors using the approach outlined in the article, but in practice it can be a very hazardous business. I can't give specific instructions for a Decca TV since the alteration needed varies between models. It's certainly possible to convert most portable TV sets into video monitors, but you run the risk of injuring yourself or your computer unless you're very careful, so don't do it.

PCW cannot accept no responsibility for the consequences if you do decide to dissort your TV.

Legal adventures

My son and a friend are currently developing adventure programs and wish to market the software on a commercial basis. I would be most grateful for any advice you can offer, especially on the legal aspect of marketing.

As the authors are only 15 years of age, I'm particularly concerned as I feel that I may be held legally responsible for the actions of my son.

They propose to market the tapes by advertising in the computer press under a 'house name', and I feel that this may be illegal unless a proper company is set up.

A Freeman, Stonehaven, Scotland

Your best bet is to talk over the plan with a bank manager, or contact the Small Firms Advisory Service. It can be reached via the 'freephone', and it doesn't charge for the first few consultations.

You'll legally responsible for your son's actions until he reaches the age of 16, and for some of them until he's 18. To a great extent it will be your business rather than his, although it's worth discussing this in detail with a financial adviser. Remember that your tax affairs will also be affected.

Make sure that you're not distributing any copyright material as part of your programs — some software houses sell programming tools such as 'dungeon generators' or language compilers, and then insist that they're paid for or credited if the tools are used in commercial software. It isn't clear whether or not this is legal, but in general you should play safe and ask permission before putting any part of someone's program on your tape.
You're allowed to use a trading name as long as the name of the real owner of the business appears on your letterhead, and chequeheads. Your chequebook might read: A Freeman t/a Underage Software or something similar; the abbreviation t/a stands for 'trading as'. Once you have opened an account of this kind, you pay in cheques made out to the trading name alone. If you take someone's trading name you can be forced to stop, or even pay compensation, so it's worth spending a few pounds at your local Chamber of Commerce having a 'search' performed to make sure that no-one has piped you to the post. If you're undertaking a business you can add a place name, and become: Underage Software (Stonehaven).

If you're prepared to spend a hundred pounds you can set up or buy a limited company — otherwise you're personally liable for all trading debts. The cheapest way to become 'limited' is to buy an existing, non-trading firm 'off the shelf'. You don't get any choice of name, hence the odd-sounding names of a few micro parent companies, but it does mean that you're only liable for company debts up to a certain 'limited' amount. You can still use other names under the 'limited' umbrella, but you must print the main one (and its number) on all your advertisements and notepaper. Limited companies also bring extra responsibilities, like you should take professional advice before buying one.

Plugging the generation gap

I have a BBC Model B and I'm wondering if it's possible to use an Apple printer, monitor and disk drives on it. If not, is there an interface available to do it? Martin Singleton, Bromley, Kent

The BBC Micro has a wide range of interfaces, which makes things fairly straightforward but you'll need to do some electrical experimentation — the exact amount required will depend on the models of disk, printer, and so on which you've already got.

Disconnect the power supply to both machines before you start wiring things up. If the video monitor is monochrome, it should be compatible with the composite video output of the BBC machine — you'll just need a connecting cable to tie the two sockets together.

Most Apple printers use either the centronics or RS232 interface. On a BBC Micro the RS232 does the job of an RS232. If there are 10 or more wires between the printer and the Apple it's almost certainly a centronics printer, and should be connected to the socket under the BBC keyboard. An IDC connecter is needed at the Beeb end, and an Amphenol plug at the Apple end (the standard lead, available from most computer shops). If there are less than 10 wires then a standard DIN socket under the BBC should be connected to the five-pin DIN socket at the back of the Apple. There are two different ways of wiring up an RS232, depending upon whether the printer or computer is 'boss' — the BBC Micro uses a reversible plug so that you can try both ways without tearing the plug to bits. The disk drives are the trickiest parts to wire up, since they involve the most wires and the fastest transfer of data. If in doubt, don't try.

Both computers use cables based on the Shugart 400 interface, and they both supply power to the drives from the computer. The Apple uses a combination cable to carry power and data, whereas the BBC Micro conveys the two separately.

The next step is to find a lead to connect the devices. The cable goes from the underside of the Beeb to an edge connector on the inside of the disk drive. If a standard cable won't fit exactly, you're well advised to seek professional help.

Now assume that your eventual system will be quite unwieldy — you'll need to swap a lot of cables around each time you want to use the other disk drive. In view of the hassle and potential for accidental damage, it might be a good idea to save up for separate peripherals for each machine.

VIC 20 jumps!

I have recently advanced into the world of machine code on my VIC 20, but I don't fully understand the counting of byte numbers when using jumps. Can you help? Paul McLeod, South Shields, Tyne and Wear

This seems to be the all-time favourite question among learn your program — 6500, 6809 or 280? All these machines use a technique called 'relative jumping' or 'branching', which is very useful but can be a little difficult to understand.

Most branch instructions consist of two bytes. The first tells the computer that a branch may be needed — perhaps only under certain circumstances: for example, if you don't want the program to jump to the next instruction if the least result was zero, or overwhelmed. The second byte tells the computer where to go if the circumstances are right — whether to go back or forward, in the program, and if you want to jump far forward or go back. If the conditions are not right, the program just carries on with the instruction immediately after the branch instruction.

The topic is confusing because of the way that the next instruction is specified — using something called a 'two's complement relative offset'.

A 'relative offset' is just a distance, in bytes, from one instruction to another. If one instruction is at location 100 and the other is at 87, the relative offset is 13 bytes.

The 'two's complement' part just means that the destination can be either side of the start — earlier or later in memory; it's easy enough to represent a jump three bytes ahead — the relative offset is three, so that such a jump skips over three bytes. The code would be:

```
<branch byte>
<offset 3>
```

Jump back 128 bytes (to 126 bytes before the start) we use an offset of 256–128, which is 128. This seems odd at first, but like most computer madness (K = K + 1?) it soon becomes second nature. Let's say we wanted to write a program to do absolutely nothing. Unless we use a hardware approach (like turning the machine off), we can use a branch that jumps straight back where it came from. Since the branch itself is two bytes long, we need an offset of minus two bytes. This gets stored as 256–2, or 254, so that the bytes:

```
<jump byte>
<254>
```

will leave the computer twiddling its thumbs forever. Note for clever programmers: what happens when the jump byte is 255? This corresponds to an offset of minus one, so that the computer jumps back into the middle of the jump instruction! Normally this is a disaster, but if you're programming a Z80 processor it has an interesting consequence. If byte 255, in the middle of the jump, represents an instruction called RST 56 — a one-byte instruction which tells the computer to make an immediate jump to location 56. Consequently, if the conditions are right for the jump, the computer goes directly to location 56 even if it's thousands of bytes away. So what you've got, quite by accident, is a conditional jump to location 56, all in two bytes! This isn't often useful, but it's interesting.
Up, up and away!

Networking is fun and easy when you know how, but newcomers need fear no more. Peter Tootill's refresher course will get you up and 'online' in no time.

Although the world of microcommunications has grown rapidly during the last 12 months, a lot of people are just beginning to explore it for the first time. In order to help newcomers or those who may be thinking of adding a modem to their system, here is some helpful advice on how to get your micro online.

Let's start with a little background information on microcommunications and also establish the hardware and software necessary to enable you to use your system with bulletin boards (BBS), Prestel and networks.

There are already large numbers of people using BBS for a variety of purposes: one of the most popular being the exchange of messages with other users. The other online systems, such as Prestel, provide you with a database of useful information.

In order to connect your micro to a telephone line, you will need an adapter. This is usually called a modem, and there are several types available. Prices start at around £60 and go up to around £500. A simple, single standard modem (that is, one that can be used for bulletin boards or viewdata — for example, Prestel — but not generally for both) will cost between £60 and £100. A more versatile one which will allow you to use bulletin boards and viewdata systems will probably cost between £150 and £200. Note that some BBS will accept 1200/75 viewdata type callers (see below) and although you can use Prestel at 300 bit/sec (without the graphics), you normally require a different type of modem for each family of system. As with anything you only get what you pay for. However, with many micros the modem is all the hardware you'll need; it simply plugs into the RS232 serial port on the computer. If your computer doesn't have a serial port, then you'll need to buy an interface to use a modem. These are readily available for most of the popular micros and some are listed in the table.

The software you require for your micro is called 'terminal software'. This simply means that your micro acts like a terminal attached to a micro at the other end of the telephone line. There are various sorts of terminal software and you will undoubtedly come across such terms as 'dumb' and 'smart' (this subject was covered last month), but dumb terminal software is all that you'll need for your first venture into using a modem. Most computers with a built-in RS232 interface will include a sample program in the manual. Alternatively, one will probably be provided with the interface if you have to buy it separately.

Failing this, user groups are good places to try for simple and sometimes for more sophisticated software. There are, for example, some very comprehensive public domain programs available for TRS-80 and CP/M systems from the respective users groups. PCW will also be publishing short dumb terminal routines for some of the more popular systems in Program File, so if you have one, please send it in to the programs editor. More sophisticated programs will also be considered if they are in Basic, or can be entered with a simple Basic loader and data statements.

<table>
<thead>
<tr>
<th>System</th>
<th>Phone Number</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comet</td>
<td></td>
<td>Message handling business system giving subscribers facilities for leaving and retrieving messages; more details on (0527) 28515</td>
</tr>
<tr>
<td>Distel</td>
<td>(01) 679 1888</td>
<td>300/300 baud rate; 24 hours daily; run by Display Electronics (new and surplus electronic and computer equipment, components, and so on); information about stock lines, credit card sales, and some message facilities; free service</td>
</tr>
<tr>
<td>Maptel</td>
<td>(0702) 552941</td>
<td>300/300 baud rate; 24 hours daily; run by Maplin (electronic components and microcomputers); information on stock levels, credit card sales to existing customers; free service</td>
</tr>
<tr>
<td>Micronet</td>
<td></td>
<td>Baud rates as for Prestel; subscriber system within the Prestel database specifically aimed at micro users; more details on (01) 937 2699</td>
</tr>
<tr>
<td>Prestel</td>
<td></td>
<td>1200/75 baud service at local call rates for a large percentage of potential users, 300 baud service on London telephone number only at present; subscriber database made up of individual pages provided by many different organisations (not by Prestel itself); details: dial 100 and ask for Freefone Prestel sales</td>
</tr>
<tr>
<td>Telecom Gold</td>
<td></td>
<td>Business subscriber system; more details on (01) 403 6777</td>
</tr>
</tbody>
</table>
One feature that is now becoming more common are BBS which provide a 1200/75 bits/sec (V23) service, either exclusively, or in addition to the normal 300 bits/sec (V21) service.

Using a remote system that talks to you at 1200 bits/sec certainly speeds things up, but one point is that even though a system may run at 1200/75 bits/sec (which is the same standard as Prestel), it doesn’t mean that it will work problem-free with a Prestel terminal. This is because Prestel transmits a screenful of information and then pauses, waiting for the caller to press a key to select an item from the menu. Most BBS don’t do this—they just keep transmitting — and you may find that when the screen is full a Prestel terminal will not scroll; the output simply starts again at the top of the screen and overwrites what is already there. But it is worth trying one or two to see how your system reacts as some Prestel terminals do scroll normally. Some BBS do attempt to support Prestel standard terminals and even to transmit graphics characters and coloured text. Systems which can be used with a V23 modem are indicated in the table, and if they provide Prestel compatibility a separate note is added. Some dual speed systems do have teething problems, so bear with the sysop and keep trying if you can’t get one to work at first.

Next month I’ll be looking at online systems and some of the associated problems and pitfalls.

### UK free networks

<table>
<thead>
<tr>
<th>Bulletin Board</th>
<th>Phone Number</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BABBS-Bath</td>
<td>(0225) 23276</td>
<td>300/300 baud rate; 9pm-8am weekdays, 9am-noon weekends; Atari-based system</td>
</tr>
<tr>
<td>BABBS-Felixstowe</td>
<td>(0394) 276306</td>
<td>300/300 baud rate; 24 hours daily; Apple users’ group</td>
</tr>
<tr>
<td>BABBS TWO-Basildon</td>
<td>(0268) 778956</td>
<td>300/300 baud rate; 24 hours daily; Apple users’ group with special area for queries to Apple UK</td>
</tr>
<tr>
<td>Basug</td>
<td>(0742) 667983</td>
<td>300/300 baud rate; 24 hours daily</td>
</tr>
<tr>
<td>Bettisfield</td>
<td>(094875) 378</td>
<td>300/300 baud rate; 3pm-9am daily; remote CP/M system</td>
</tr>
<tr>
<td>Blandford Board</td>
<td>(0258) 54494</td>
<td>300/300 baud rate; 24 hours daily</td>
</tr>
<tr>
<td>CABB</td>
<td>(011) 631 3076</td>
<td>300/300 baud rate; 24 hours daily</td>
</tr>
<tr>
<td>CBBS SW</td>
<td>(0392) 53116</td>
<td>300/300 baud rate; 24 hours daily</td>
</tr>
<tr>
<td>CBBS Woking</td>
<td>(0626) 890014</td>
<td>1200/75 and 300/300 baud rates; 24 hours daily; jokes, jobs, reviews, news</td>
</tr>
<tr>
<td>CNOL Lancaster</td>
<td>(0524) 60399</td>
<td>300/300 baud rate; 24 hours daily</td>
</tr>
<tr>
<td>Computers Incorporated Newcastle</td>
<td>(0207) 543555</td>
<td>300/300 baud rate; 24 hours daily; Clinical Notes Online service, mainly for medical users; works in conjunction with a database on the Datastar network</td>
</tr>
<tr>
<td>Forum 80 Hull</td>
<td>(0482) 859169</td>
<td>300/300 baud rate, 5-11.30pm weekdays, noon-11.30pm weekends; Bell 103 standard, midnight-8am daily; international electronic mail, library for up/downloading</td>
</tr>
<tr>
<td>Forum 80 SPA</td>
<td>(0926) 39871</td>
<td>300/300 baudrate; 11pm-midnight daily; TRS-80 and Genie users’ group</td>
</tr>
<tr>
<td>Forum 80 Wembley</td>
<td>(01) 902 2546</td>
<td>300/300 baud rate; 7-10pm weekdays, midday-10pm weekends; electronic mail, library for downloading; ring and ask for Forum 80</td>
</tr>
<tr>
<td>Hamnet Hull</td>
<td>(0482) 497150</td>
<td>300/300 baud rate; 6pm-8am daily</td>
</tr>
<tr>
<td>Liverpool Mailbox</td>
<td>(051) 4288924</td>
<td>300/300 baud rate; 24 hours daily; electronic mail, program downloading, TRS-80 information; messages for PCW can be left on the board and will normally be read by us within 24 hours</td>
</tr>
<tr>
<td>Mailbox-80 Stourport</td>
<td>(0384) 635336</td>
<td>300/300 baud rate; 6pm-8am daily</td>
</tr>
<tr>
<td>Manchester Open Bulletin Board</td>
<td>(061) 7368449</td>
<td>300/300 baud rate; 24 hours daily; Micro User magazine, mainly for BBC users</td>
</tr>
<tr>
<td>MBBS-Mitcham</td>
<td>(01) 640 2617</td>
<td>300/300 baud rate; 24 hours daily</td>
</tr>
<tr>
<td>MG-Net CBBS London</td>
<td>(01) 399 2136</td>
<td>300/300 baud rate; 24 hours daily; Micro User magazines, mainly for BBC users</td>
</tr>
<tr>
<td>Microweb Manchester</td>
<td>(061) 4564157</td>
<td>300/300 baud rate; 24 hours daily</td>
</tr>
<tr>
<td>NBBBS-North Birmingham</td>
<td>(0827) 288810</td>
<td>300/300 baud rate; 24 hours daily; weekend except 7pm-9pm, weekends except 10am-10pm</td>
</tr>
<tr>
<td>OBBS Manchester</td>
<td>(061) 4271596</td>
<td>300/300 baud rate; 24 hours daily</td>
</tr>
<tr>
<td>PIP-Sheffield</td>
<td>(0742) 667983</td>
<td>300/300 baud rate; 8pm-2am daily; ring-back system (dial the number, let phone ring once, and then ring back); messages, downloading</td>
</tr>
<tr>
<td>Southern BBS</td>
<td>(0243) 511077</td>
<td>300/300 baud rate; 24 hours daily; remote CP/M system</td>
</tr>
<tr>
<td>Stoke ITEC</td>
<td>(0782) 265078</td>
<td>300/300 baud rate; 9am-7am daily</td>
</tr>
<tr>
<td>TBBS London</td>
<td>(01) 348 9400</td>
<td>300/300 and 1200/75 baud rates (including Prestel compatibility); 24 hours daily; temporary number for the TBBS Nottingham system</td>
</tr>
<tr>
<td>TBBs London Metro</td>
<td>(01) 348 7840</td>
<td>300/300 baud rate; 24 hours daily; remote CP/M system</td>
</tr>
<tr>
<td>WABBS-Worthing</td>
<td>(0903) 42013</td>
<td>300/300 baud rate; 24 hours daily; ring-back system (dial the number, let phone ring once, and then ring back); Atari-based</td>
</tr>
</tbody>
</table>
The notion of a congruent number has been familiar to some mathematicians for at least a thousand years. The defining algorithm leading to the construction of such numbers is easily illustrated by a simple example:

(i) Take three squares, \(a^2, b^2, c^2\), which have a common difference, \(D\) (we say that they are in arithmetic progression): for example, \(D=24=2^2 \times 6\).

(ii) Take the common difference, \(D\), and write it in the form \(N^2\), where \(N\) is square-free: for example, \(a^2=1^2=1\), \(b^2=5^2=25\), \(c^2=2339148435306225006961\), \(N=10195\), \(a=1\), \(b=5\), \(c=2339148435306225006961\) (or \(e=+1\)).

(iii) \(N\) is then a congruent number (i.e., \(N\) is a square) if there are \(a, b, c\) as in (i) such that \(a^2+b^2=c^2\)

So, we have the four equations

\[
4a^2p^2 = n_0^2q^2, \quad 4b^2p^2 = n_0^2q^2, \quad 4c^2p^2 = n_0^2q^2, \quad n_0^2 = n_0^2.
\]

To obtain some non-congruent numbers take a square free \(N\), factorise it, allocate its factors in all possible ways to \(n_1, n_2, n_3, n_4\), testing each allocation for the restrictions. If all ways fail, then \(N\) is non-congruent.

Submissions should include program listings, hardware description, run times and output. These will be judged for accuracy, originality and efficiency (not necessarily in that order) and a prize will be awarded to the 'best' entry received by 1 April 1985.

Please address entries to Mike Mudge, 'Square Acre', Stourbridge Road, Penn, near Wolverhampton, Staffs WV4 5NF. Tel: (0902) 892141. Tree-like structures, August 1984

Dr D Fisher supplied a one-line statement of the problem:

\[
\frac{(1 - \cos nx)}{2} = \left(1 - \frac{\pi}{2}\right)^2
\]

as a special case of a 'chaotic iteration', \(x\) a rational number. No attempt was made to use any graphics to display tree-like structures; this topic will be returned to in a later problem.

This month's worthy prizewinner is Fred Salt of 'The Paddock', Flanders Road, Llanwit Major, South Glamorgan CF6 9RL. The work was carried out in Apple Pascal on a U200 (Apple compatible) computer with 48K RAM and a 16k language card; the results were displayed using an Epson MX80 FT III printer. A suitable prize will be sent to 'The Paddock'. Further enquiries relating to this work should be directed to Fred Salt or myself.

Please note that submissions can only be returned if a suitable stamped addressed envelope is provided.

Expanded reviews of previous problems together with subject to the approval of the contributor, copies of detailed programs from the prizewinning entry may also be requested.

END
forces White to correct his last move by
20 Rd3-d4
Ra8-d8 followed by ...Nd6-c4 oppos-
have tried 16 ..
hope is to seek exchanges, so he should
makes pointless moves. Black's only
plan to deal with this new threat and
16
13 Rd1xd3
12 0-0-0
(dangerously behind in development.)
bishop, but not here. Black now falls
10 Bc1-d2
9 Bf1-d3
8 Qd4-f4
7 Nb1-c3
6 e5xd6 e.p
5 Qd1xd4
3 d2-d4
2 Ng1-f3
White's position is so good that he


White: RMoss. Black: Super Constella-
tion. Notes by Grandmaster Dr John
Nunn.

The Novag Super Constellation took
part in last year's Championships held
at Brighton. It played in the Major Open,
a reserve tournament just below the
Championship itself, and acquitted
itself well against some good club
players. The following game from this
event illustrates the strengths and
weaknesses of computer play.

1 e2-e4
e7-e5
2 Ng1-f3
Ng8-f6
3 d2-d4
e5xd4
4 e4-e5
Nf6-e4
5 Qd1xd4
36 Nf5-d6?
35 g4 -g5
34 Rd1xd7
33 Rd7-d6
32 Nh6-f5+
31 Nf5xh6+
30 Nd4-f5
29 Rg4-g7+ Kf7-e8 31 Nc5-e6+ forking king
and rook.)
28 Rd4xf4
27 Nc5-d7
26 Rh1-d1
25 Kc1xb2
24 Rd1xd7
23 Ne4-c5
22 Qg3xf4
21 Nc3-e4
20 Rd3-d4
19 h2-h4
18 Qf6-g3
17 Nc3-e4
16 Bc7-e3

(Black cannot avoid losing a pawn.)
22 Qg3xf4
gxf4
23 Ne4-c5
c4-c3
(23...Be6xd4 loses material after 24
Rh1-g1 f7-f6 25 Nc5-e6+ forking king
and rook.)
24 Rd4xf4
cxd4+?
25 Kc1xb2
Be6-c8
(Not only is black a pawn down, but
his pieces lie scattered helplessly along
the back rank.)
26 Rh1-d1
b7-b6
27 Nc5-d7
Bc8xd7
28 Rd1xd7
h7-h6
29 Nf3-d4
Kg7-g8
30 Nd4-f5
Ne8-f6
31 Nf5xh6+
Kg7-g6
32 Nh6-f5+
Kh7-h7
33 Rd7-d6
Rh6-h6+
34 Rd6-h6+
Kh7-g8
(White's position is so good that he
can afford to make several mistakes and
still win, but this move is the first sign of
hesitation. Professional players are
well aware that won games should be
wrapped up as speedily and efficiently
as possible, since every extra move
increases the chance of a blunder. This
applies especially when playing the
bishop to e3. Unfortunately
sometimes it is worth spending two
moves to exchange a knight for a
bishop, but not here. Black now falls
dangerously behind in development.)
12 0-0-0
Ne5xd3+
13 Rd1xd3
Bc8-e6
14 Be3-d4
t-0
15 Bd4xg7
Kg8xg7
16 g2-g4!
(An excellent move, starting a powerful
kingside attack based on the adv-
cence of the two flank pawns.)
16 ...Nd6-e8
(If 15...Nc6xe5? 16 exf6! Nd8xf8 17 fxe6+ Ng7xe6
18 fxe6 Ng8xe6 19 Rd2xg7+ Kh8xg7
20 Qf3-g4 Kg7-g6 21 Qh5h5+ Kf7-g6
22 Rd1xd7+) 16

(Black's only

(White's threats of f7-f8=Q+ and Rf4-
h4 mate cannot be met.)
51 Rf3-g3
Rf8-c8+
52 Kc5-d4?
(Just when White could have brought
the game to a speedy end, he makes a
really serious mistake. 52 Kc5-b5 Ra2-
b2+ 53 Kb5-a4 Rb2-b4+ 54 Ka4-a3
escapes from the rook checks, when
White's threats of f7-f8=Q+ and Rf4-
h4 mate cannot be met.)

(White emerges with an extra pawn,
but it is of no significance and the Super
Constellation forces a draw.)
55 Kg3-g2
a5-a4
56 f7-f8=Q+
Rf8xf8
57 Kb6xd4
Kf7-f5
58 Kd5-c4
Kh8-f6
59 Kg2-a2
Kh6-f6
60 Khb2-c2
Kg7-f5
61 Khc3-d3
Rg8-f8
62 Kdb2-c2
Ra8-a1+
63 Kec1-d2
Ra1-b1
64 Kd2-c2
Rb1-f1
65 Kc2-d2
Rb1-f1
66 Rhxf2+ X
(White offered a draw, but it was
refused.)

(White's position is so good that he
can afford to make several mistakes and
still win, but this move is the first sign of
hesitation. Professional players are
well aware that won games should be
wrapped up as speedily and efficiently
as possible, since every extra move
increases the chance of a blunder. This
applies especially when playing the
bishop to e3. Unfortunately
sometimes it is worth spending two
moves to exchange a knight for a
bishop, but not here. Black now falls
dangerously behind in development.)
12 0-0-0
Ne5xd3+
13 Rd1xd3
Bc8-e6
14 Be3-d4
t-0
15 Bd4xg7
Kg8xg7
16 g2-g4!
(An excellent move, starting a powerful
kingside attack based on the adv-
cence of the two flank pawns.)
16 ...Nd6-e8
(If 15...Nc6xe5? 16 exf6! Nd8xf8 17 fxe6+ Ng7xe6
18 fxe6 Ng8xe6 19 Rd2xg7+ Kh8xg7
20 Qf3-g4 Kg7-g6 21 Qh5h5+ Kf7-g6
22 Rd1xd7+) 16

(Black's only

(White's threats of f7-f8=Q+ and Rf4-
h4 mate cannot be met.)
51 Rf3-g3
Rf8-c8+
52 Kc5-d4?
(Just when White could have brought
the game to a speedy end, he makes a
really serious mistake. 52 Kc5-b5 Ra2-
b2+ 53 Kb5-a4 Rb2-b4+ 54 Ka4-a3
escapes from the rook checks, when
White's threats of f7-f8=Q+ and Rf4-
h4 mate cannot be met.)

(White emerges with an extra pawn,
but it is of no significance and the Super
Constellation forces a draw.)
55 Kg3-g2
a5-a4
56 f7-f8=Q+
Rf8xf8
57 Kb6xd4
Kf7-f5
58 Kd5-c4
Kh8-f6
59 Kg2-a2
Kh6-f6
60 Khb2-c2
Kg7-f5
61 Khc3-d3
Rg8-f8
62 Kdb2-c2
Ra8-a1+
63 Kec1-d2
Ra1-b1
64 Kd2-c2
Rb1-f1
65 Kc2-d2
Rb1-f1
66 Rhxf2+ X
(White offered a draw, but it was
refused.)

(White's position is so good that he
can afford to make several mistakes and
still win, but this move is the first sign of
hesitation. Professional players are
well aware that won games should be
wrapped up as speedily and efficiently
as possible, since every extra move
increases the chance of a blunder. This
applies especially when playing the
bishop to e3. Unfortunately
sometimes it is worth spending two
moves to exchange a knight for a
bishop, but not here. Black now falls
dangerously behind in development.)
12 0-0-0
Ne5xd3+
13 Rd1xd3
Bc8-e6
14 Be3-d4
t-0
15 Bd4xg7
Kg8xg7
16 g2-g4!
(An excellent move, starting a powerful
kingside attack based on the adv-
cence of the two flank pawns.)
16 ...Nd6-e8
(If 15...Nc6xe5? 16 exf6! Nd8xf8 17 fxe6+ Ng7xe6
18 fxe6 Ng8xe6 19 Rd2xg7+ Kh8xg7
20 Qf3-g4 Kg7-g6 21 Qh5h5+ Kf7-g6
22 Rd1xd7+) 16

(Black's only

(White's threats of f7-f8=Q+ and Rf4-
h4 mate cannot be met.)
51 Rf3-g3
Rf8-c8+
52 Kc5-d4?
(Just when White could have brought
the game to a speedy end, he makes a
really serious mistake. 52 Kc5-b5 Ra2-
b2+ 53 Kb5-a4 Rb2-b4+ 54 Ka4-a3
escapes from the rook checks, when
White's threats of f7-f8=Q+ and Rf4-
h4 mate cannot be met.)

(White emerges with an extra pawn,
but it is of no significance and the Super
Constellation forces a draw.)
55 Kg3-g2
a5-a4
56 f7-f8=Q+
Rf8xf8
57 Kb6xd4
Kf7-f5
58 Kd5-c4
Kh8-f6
59 Kg2-a2
Kh6-f6
60 Khb2-c2
Kg7-f5
61 Khc3-d3
Rg8-f8
62 Kdb2-c2
Ra8-a1+
63 Kec1-d2
Ra1-b1
64 Kd2-c2
Rb1-f1
65 Kc2-d2
Rb1-f1
66 Rhxf2+ X
(White offered a draw, but it was
refused.)
Subscribe today, and take PCW for a 'Test Drive'. See how it handles, revel in the sleek design, the exclusive benchtests, the blinding editorial, the hot tips, the humour, the top writers—You won't be able to put it down!! If after three months you don't wish to continue your subscription we will refund your payment in full. So, get into gear and 'Test Drive' PCW today.
Rupert Steele keeps you up-to-date on computer clubs.

If you have a new computer you may be finding it rather difficult to use, particularly if you're a first-time user. The quality of documentation accompanying computers has improved over the past few years, but much of it is still not of a high quality; this is where computer clubs come in.

There are three main types of computer club. These are: machine users' clubs; local computer clubs; and Computer Towns. The first group is likely to be the best for gaining detailed technical information and 'fixes' for your micro. They usually operate through a newsletter, for which you pay an annual subscription of around £10. Some users' groups are no longer clubs but have, in effect, become specialist publishers. For some of the best-selling magazines, this market has been monopolised by commercial magazines aimed specifically at users of a particular micro.

If, however, you're looking for something that will teach you more about 'computing' rather than the machine's details, then you should consider joining a local computer club. Some of these are machine-specific (for example, the BBC Micro, the Commodore 64 or the Spectrum) which may be helpful, although there are also benefits in a club that covers all micros. Here, you'll find a wide variety of computer hobbyists, from the most dedicated to the absolute beginners. At a local computer club, you'll meet people who'll be able to explain difficult concepts in computing, and popular meeting places are pubs, church halls or educational establishments.

The idea behind Computer Towns is to get everyone interested in computing. The organisers bring along a number of computer systems which are laid out in a room for the public to use. There's no membership system as such: users just turn up and the organisers try to keep order. This kind of meeting is recommended for those who don't already have their own computers, as it gives a chance to find out about computing before parting with the cash.

The Association of Computer Clubs (ACC) is the national body that represents all three types of computer club. It has been running in its present form for a year, and has well over 100 clubs which are affiliated to the ACC with voting rights at the ruling council (which consists of representatives of all the affiliated clubs). The ACC is non-profit-making and strictly for amateur clubs. It provides a number of services, including insurance schemes for public liability and equipment damage risks, the ClubSpot 810 area on Prestel, various publicity schemes and general advice.

The ACC also provides a starter pack for people considering setting up their own computer club, as well as a service to put people in touch with their local club or the user group appropriate to their machine. For this purpose we run a database containing details of all the computer clubs we are aware of. Your club should be on it — contact me and make sure. If you have any ideas about what else the ACC should be doing, or if you want full details of how the Association can help you or your club, write to me.

Club news

Good news for Memotech MTX users! A new Memotech user group produces a monthly magazine containing programs, reviews, queries and competitions. The annual subscription is £7 and for details you should send an SAE to Memotech Owners Club, 23 Denmead Road, Harrow, South Hampt on SO2 5GS.

Two Scottish clubs have contacted me. One is the Perth and District Amateur Computer Society, whose secretary is Mr John Sanderson, of 4 Maple Place, Perth PH1 1RT. Why not drop him a line? The other is the Pennyburn Computer Users Club. It has around 40 members, and meets on Monday evenings for programming and Tuesday evenings for games. Both meetings are 6.30pm to 9.30pm at the local community centre in Cranberry Moss. The secretary is James Brown, who lives at 12 Newark Square, Pennyburn, Kilwinning, Ayrshire KA13 6NA.

Moving south to Staffordshire, the find Richard Underhill, of 19 Lodge Hill, Tutbury, Burton-on-Trent, Staffs DE13 9HF, who writes to tell me of the EBITZ user club. This club produces a newsletter every two months and aims to cover the Burton-Derby area. Contact Richard on 0283/814008. David Butler (age 13) of 48 Priory Lands, Stretton, Burton-on-Trent, Staffs DE13 0HJ, writes to tell me that he runs a VIC-20 Junior User Club in the Burton-on-Trent area. Why not drop him a line to find out how it's going?

And there's always the Thame Computer Club. This group meets on the first and third Friday of each month at the Tamworth Voluntary Activities Centre, Ludgate Street (off Hospital Street), Tamworth. Membership (which is at the committee's discretion, so don't spit on the floor) comes in a variety of packages (including 'family'), with the basic rate being £5 per annum. The club caters for all levels of expertise including beginners, professional programmers and hardware hackers, and runs...
various starter courses as well as the occasional equipment demonstration and visit to shows. Members can obtain some discounts via the club; very reasonably, a very cheap (25p) temporary membership is available so that you can try it out. There’s a small additional charge per meeting. For details, write to Bob Overton, 67 Quince, Amington, Tamworth, Staffordshire, or ring the chairman, Tony Beckett on Tamworth 53473 (evenings).

Moving to Derbyshire, a few more clubs can be found. I had a note recently from George Reyner, the treasurer of the Derby Micro Society. Why not write to him at 36 Underhill Close, Sunnyhill, Derby, DE3 7RH for more details? Meanwhile, those of you in the area with a fertiliser interest may want to know more about the Fison Computer Club. It’s only open at present to Fisons employees and their immediate family, but if you’re in that line, write to John Carter at 112 Boulton Lane, Alvaston, Derby DE2 0FE.

Finally, there’s the Chesterfield Micro Users’ Group. The secretary is Mr A Croft, and his address is 37 Lawrie Park Crescent, Chesterfield, Derbyshire, Chesterfield, Derby S40 2TG.

For more information on any aspect of the ACC, write to me: Rupert Steele, 17 Lawrie Park Crescent, London SE26 6Hr or tel: (01) 370 0601.

TRANSACTION FILE

Your chance to buy, sell or swap equipment

● SHARP MZ-26k, 48k integral monitor cassette. With CP/M card (without disc drive), 65+ programs including Donkey Kong, Defender, Scramble. Excellent condition. Ideal Christmas present. Any reasonable offers. Tel: (0482) 845881

● EPSON RX80FT. With 5148 RS232C serial interface (six months old), £300. Also, NewBrain A with all leads, PSU, handbooks, technical manual, assembler and hexes. £150. Tel: 0275-4807 gt Manchester.

● BBC model B. Unused, brand new, with cassette recorder, five games including Elite, and Fort language. Fully guaranteed, £350 ono. Tel: 01-642 6553.

● TWO disk drives, not used much, 5½40 track SSSD. Cased and PSU. Tel: 0296-25467 (Aylesbury).

● OLYMPUS 800, 8mm portable television, control portable television, compatible cassette, various manuals, leads, software including BrainWriter, Chess, home accounts etc, dustcover, built-in mini Cassette deck. £110. Christchurch, Dorset. Tel: 0425 72441.

● VIDEODrive. Brand new, £650. Tel: 01-740 6313 eves.

● TANGERINE V-48k micro computer. Processor, memory, with sheet and tractor feeds. Excellent condition, dustcover, built in CP/M, compatible cassette, various programs, including Donkey Kong, Defender, Scramble, etc. £350 ono. Tel: Borough Green 23491.

● APPLE II+ 48k. Disc drive, Sony colour TV Monitor, colour card, 768k memory card, integer card, joystick, ACE, manuals and software £650 ono. Also LCSI Apple (full) logo with manuals £80 ono. Tel: (01) 857 1980.

● CONTROL data type CRS56. Hard disk drive 60MB capacity, fully maintained and recently serviced £325. Also Apple II + look alike £300 ono. Ken. Tel: 066689 307

● TRS-80 Model III. 48k, twin disk drives, Newdos, Ldos, Scripstr, £500. Tel: 0206-256257 (Aylesbury).

● NEWBRAIN AD. Remote control portable television, compatible cassette, various manuals, leads, software including BrainWriter, Chess, home accounts etc, dustcover, built-in mini Cassette deck. £110. Christchurch, Dorset. Tel: 0425 72441.

● VIDEODrive. Brand new, £650. Tel: 01-740 6313 eves.

● TANGERINE V-48k micro computer. Processor, memory, with sheet and tractor feeds. Excellent condition, dustcover, built in CP/M, compatible cassette, various programs, including Donkey Kong, Defender, Scramble, etc. £350 ono. Tel: Borough Green 23491.

● APPLE II+ 48k. Disc drive, Sony colour TV Monitor, colour card, 768k memory card, integer card, joystick, ACE, manuals and software £650 ono. Also LCSI Apple (full) logo with manuals £80 ono. Tel: (01) 857 1980.

● CONTROL data type CRS56. Hard disk drive 60MB capacity, fully maintained and recently serviced £325. Also Apple II + look alike £300 ono. Ken. Tel: 066689 307

● TRS-80 Model III. 48k, twin disk drives, Newdos, Ldos, Scripstr, £500. Tel: 0206-256257 (Aylesbury).

● NEWBRAIN AD. Remote control portable television, compatible cassette, various manuals, leads, software including BrainWriter, Chess, home accounts etc, dustcover, built-in mini Cassette deck. £110. Christchurch, Dorset. Tel: 0425 72441.

● VIDEODrive. Brand new, £650. Tel: 01-740 6313 eves.

● TANGERINE V-48k micro computer. Processor, memory, with sheet and tractor feeds. Excellent condition, dustcover, built in CP/M, compatible cassette, various programs, including Donkey Kong, Defender, Scramble, etc. £350 ono. Tel: Borough Green 23491.

● APPLE II+ 48k. Disc drive, Sony colour TV Monitor, colour card, 768k memory card, integer card, joystick, ACE, manuals and software £650 ono. Also LCSI Apple (full) logo with manuals £80 ono. Tel: (01) 857 1980.

● CONTROL data type CRS56. Hard disk drive 60MB capacity, fully maintained and recently serviced £325. Also Apple II + look alike £300 ono. Ken. Tel: 066689 307

● TRS-80 Model III. 48k, twin disk drives, Newdos, Ldos, Scripstr, £500. Tel: 0206-256257 (Aylesbury).

● NEWBRAIN AD. Remote control portable television, compatible cassette, various manuals, leads, software including BrainWriter, Chess, home accounts etc, dustcover, built-in mini Cassette deck. £110. Christchurch, Dorset. Tel: 0425 72441.

● VIDEODrive. Brand new, £650. Tel: 01-740 6313 eves.

● TANGERINE V-48k micro computer. Processor, memory, with sheet and tractor feeds. Excellent condition, dustcover, built in CP/M, compatible cassette, various programs, including Donkey Kong, Defender, Scramble, etc. £350 ono. Tel: Borough Green 23491.

● APPLE II+ 48k. Disc drive, Sony colour TV Monitor, colour card, 768k memory card, integer card, joystick, ACE, manuals and software £650 ono. Also LCSI Apple (full) logo with manuals £80 ono. Tel: (01) 857 1980.

● CONTROL data type CRS56. Hard disk drive 60MB capacity, fully maintained and recently serviced £325. Also Apple II + look alike £300 ono. Ken. Tel: 066689 307

● TRS-80 Model III. 48k, twin disk drives, Newdos, Ldos, Scripstr, £500. Tel: 0206-256257 (Aylesbury).

● NEWBRAIN AD. Remote control portable television, compatible cassette, various manuals, leads, software including BrainWriter, Chess, home accounts etc, dustcover, built-in mini Cassette deck. £110. Christchurch, Dorset. Tel: 0425 72441.
TRANSACTION FILE

- Apple Europlus 64k. Twin disks, lowercase chip, 12in green screen monitor, parallel printer card and lead, carrying case. UCSD Pascal, all manuals £500 the lot. Tel: Leicester 544543, after 6pm.
- Teletype ASR 33. 110 baud with paper tape punch and reader in working order. £80 ono. Tel: Trevor on Rickmansworth 775399 after 8pm.
- Apple IIE. 80 column text 80 column language card. Mint condition, in original package with manual etc. Sale due to upgrading. Best offer over £25 accepted. Tel: Northampton (0604) 888355.
- Commodore 8032. Commodore 8050 disc drives, Microline 783A printer, interface etc. Complete with all leads, Compsoft, DMS, Diamond Microline 783A. With high resolution colour monitor and dual disk drive and expansion unit. WordStar, dBessel and games included. £600. Tel: (London) 01-226 43606, after 6pm.
- Commodore 64 disk drive, cassette recorder, joystick, Simons Basic. Books and games. All for £480. Write to: De. Scott, 48 Rowfant Road, Balham SW17 4AP. No callers please.
- High speed printer DRE 8230. Bi-dir dot matrix, serial and parallel interface, print width max 220 characters £480 ono. Tel: 0935 872308.
- Sharp MZ-80K. 48k RAM, integral monitor and tape, several programs, and relevant literature, £150 or sensible offer. Tel: Swansons (0792) 852392 eve.
- Sharp MZ 80A. 48k personal computer, built-in monitor and data recorder. Mint condition. Includes over £200 of software. Unwanted present for sell only £250 ono. Tel: Yin-Man, 01-733 2166 ext 77 room 40.
- Hewlett Packard HP78A, HP9201M dual disk drive. All manuals, cables, etc. As new condition, £350. Eversley (0734) 738638 eve, or Brocknel (0344) 424986 ext 6101 day.
- Epson HX-20 portable. 16k with micro-cassette drive. One year old, excellent condition. Carrying case, manuals and some software, £210 ono. Tel: Farnborough 02520 548766 (evra).
- Tandy model 100. Portable, 24k memory, as new condition, boxed, £850. Osborne double density, with over 40 programs including 8bessel, language compilers, utilities, many business applications. £865. Tel: 01-543 6835.
- Nascom 2. 64k RAM, programmable graphics, 8-b ADC, 8-b DAC,noise generator, joystick, cassette. Basic, Forth, Pascal with documentation. NAS-SYS 3 (£76 ono. Also 80 column data card available. Tel: Simon on (0617) 363311 ext 2967, daytimes, or (0612) 255879 evenings.
- Sanyo MBC-1000. Plus second DDSO drive, 48k. CP/M some software including WordStar. Used only once £700 ono. Also BBC B+ with 16k disk drive. Any offers. Tel: 0691-659201.
- HP1IC with card reader. Three memory modules, manuals. £80. Tel: Lester Gilbert (0691977) 2921.
- PET 2016. With cassette, tapes, manuals, programs. Good condition. £175 ono. Tel: Royston (0763) 440498 after 6pm and weekends.
- Epson HX-20 portable. As new complete with manuals, case, charger, paper and cassettes £299 ono. Tel: 061-440 8088, Alan, or 0257 48241 Mike.

Writing for PCW

We’re offering readers a chance to contribute to the magazine.

We’re offering readers a chance to get rich (well, at least richer) and to influence what’s published in the magazine — by writing for it. We welcome all approaches, from would-be writers, including those who have never appeared in print before. It’s often users with practical experience who have the most interesting things to say, so don’t worry if your prose is less than perfect, we can take care of the polishing.

If you have an idea for a feature write, with a brief synopsis, outlining the proposed structure and content. If your article is already written, then send it in for consideration. Remember to put your name and address on both the covering letter and the manuscript — along with a daytime phone number if possible. Manuver should be typed or printed out (dot matrix output is fine), in double-line spacing with ample margins top and bottom and on each side.

Any accompanying program listings should be supplied on disk or cassette, ideally with relevant documentation.

We’ll try to return all submissions sent in with a suitable sae, but make sure you keep a copy of everything you submit as well.

Bear in mind that it’s worth taking a look at the Back Issues advertisement to see what sort of things we have already published — after all there’s no point reinventing the wheel. And please be sure to tell us if you’ve contacted another magazine (perish the thought): it would be very awkward if the same article appeared elsewhere. Frankly, we’re more likely to accept something which has been offered exclusively to us.

Finally, we do pay for published work — the rate is £65 per 1000 words, and payment usually follows about four-six weeks after publication.
BRITAIN'S BEST S/W PRICES?

<table>
<thead>
<tr>
<th>Software</th>
<th>Discount Price</th>
<th>Discount Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wordstar</td>
<td>190</td>
<td>345</td>
</tr>
<tr>
<td>Superbrain</td>
<td>190</td>
<td>345</td>
</tr>
<tr>
<td>Lotus 1-2-3</td>
<td>265</td>
<td>440</td>
</tr>
<tr>
<td>SuperCalc II</td>
<td>210</td>
<td>365</td>
</tr>
<tr>
<td>Spellbinder</td>
<td>240</td>
<td>395</td>
</tr>
<tr>
<td>Framework</td>
<td>325</td>
<td>540</td>
</tr>
</tbody>
</table>

* Wordstar professional — now only £29!
* We will endeavour to better any other advertised price in this issue, please call.
* Please call for anything not listed above.
* All goods will normally be delivered within two working days.
* Please state micro type, operating system and disc format when ordering.
* Please enclose cheque with order where possible including £4 p&p + 15% VAT.
* We supply government, local authorities etc . . . on receipt of official orders.
* All prices subject to change at any time.

MICROSTAR SOFTWARE
106 LONDON ROAD
LEICESTER LE2 0QS
Telephone: (0533) 544601

TOUCH-TYPE
FOR THE 48K Sinclair Spectrum

DO YOU WANT TO DO SOMETHING USEFUL ON YOUR SPECTRUM?

Do you want to be typing expert? Do you have a computer program that can boost your Spectrum into the world of "The Office of the Future"?

Learn to do secretarial work on any DATABASE without using the Spectrum as the teaching machine. Learn to do secretarial work on any DATABASE without using the Spectrum as the teaching machine.

Full touch typing (no eyes down to the keyboard).
Cardinal designed course progress through key learning to secret practice at each stage.
Full touch typing (no eyes down to the keyboard).
Cardinal designed course progresses through key learning to secret practice at each stage.
Full touch typing (no eyes down to the keyboard).
Cardinal designed course progresses through key learning to secret practice at each stage.
Full touch typing (no eyes down to the keyboard).
Cardinal designed course progresses through key learning to secret practice at each stage.
Full touch typing (no eyes down to the keyboard).
Cardinal designed course progresses through key learning to secret practice at each stage.
Full touch typing (no eyes down to the keyboard).
Cardinal designed course progresses through key learning to secret practice at each stage.
Full touch typing (no eyes down to the keyboard).
Cardinal designed course progresses through key learning to secret practice at each stage.
Full touch typing (no eyes down to the keyboard).
Cardinal designed course progresses through key learning to secret practice at each stage.
Full touch typing (no eyes down to the keyboard).
Cardinal designed course progresses through key learning to secret practice at each stage.

£8.95 inc p&p and VAT.

TOUCH-TYPE TOUCH-TYPE TOUCH-TYPE TOUCH-TYPE TOUCH-TYPE TOUCH-TYPE TOUCH-TYPE TOUCH-TYPE TOUCH-TYPE

Software and Magazine

Micro Arts is a forum organisation for people working in microtechnology and the arts. The magazine covers micro art, music, general debate and other more speculative areas. The Software label will build up a catalogue of new artist's work (work for any micro is welcomed). Art software includes anything that falls outside existing straightjackets eg graphics, literany, interactive etc.

Computer art — what to do with your Micro Free magazine with all software.

SOFTWARE: Spectrum 48 or 16.
MAT: "Abstract Originals" — Advanced graphics artefact — menu controlled — £3.00.
MAC: "Various Unusual Events" — 6 tantalising provocations — menued — £2.50.

BBC Model B.
MA3 Vol 1 by Martin Rootes — 5 graphics programs.

MAGAZINE 1: "Language" — an introduction to computer art. 2."Sex" (pocket book format) technology and sex etc. 99p per issue.

Please contact
MICRO ARTS (P) PO Box 587
London SW4 9PH
Tel: 01-720 4456

PROGRAM FILE

PCW is interested in programs written in any of the major programming languages for all home and small business micros. When submitting programs please include a cassette or disk version of your program, brief but comprehensive documentation, and a listing on plain white paper — typed if you have no printer. (Commodore 64 owners should use the Brackets program printed in the June issue to make control codes understandable.)

Please ensure that the software itself, the documentation and the listing are all marked with your name, address, program title, machine (along with any minimum requirements) and — if possible — a daytime phone number.

All programs should be fully debugged and your own original, unpublished work.

We prefer to receive programs which adhere to the following criteria:

1 Maximum 80-column width; and
2 Emphasised typeface.

We’ll do our best to return any submissions that are sent in with the appropriate postage and packing, but please keep a copy of everything yourself.

Programs are paid for at the rate of £50 per page of published listing, plus a £50 bonus for the Program of the Month. Send your contributions to Nick Walker, PCW Programs, 62 Oxford St, London W1A 2HG.

Home computer owners often complain of a 'boring lull' about three weeks after purchasing a micro: they've typed in small Basic programs and played ad infinitum the few games they could afford after buying the machine. Typing in listings from a magazine can help fill this void as it provides a source of cheap software as well as a means of increasing Basic knowledge by modifying the typed-in software — alteration of a large program can give you the necessary skills to start your own major project.

Considering that the vast majority of computer sales are at Christmas, a lot of people will be feeling at loose end. This month's selection of programs is designed to keep you busy.

Program of the Month is a space adventure/strategy game of epic proportions for up to 28 players. On the arcadeside there is Falcon Attack for the Commodore 64 and Meteor Attack for the Atari. From the board game side there is a truly excellent draughts program for the BBC.

Other programs this month are MTX Old command, a TRS-80 machine code parser for inclusion in adventure games, a Commodore 64 screendump and a training program to help you overcome the annoying cursor key layout on the BBC Micro.

Games
Scientific/mathematical
Business
ToolkitUtilities
Educational/Computer
Aided Learning

Space Wars
by Andrew Poulter

Space Wars is a space adventure game for two to 28 players. It's more a
strategy game than an adventure game, with a number of objectives. The most obvious scenario is for each side (Rebel, Federation or Neutral) to battle it out against each other until one side is victorious.

Another alternative is to designate one ship as a leader within a fleet: when it is destroyed that side has lost.

The game is divided into a number of phases as described below:

**Equipment:** this occurs only once at the beginning of the game. In this phase you equip your ship with items such as lasers, computers, scanners, and so on. Each item is described in detail along with its cost. Try to construct a balanced fleet of attacking and communicating vessels.

After equipping each ship the game beta begins, with a number of objectives. The most obvious scenario is for each side to battle via the computer. No player should attempt planet landing.

(3) **Manoeuvre:** direction is referred to via the computer. No player should attempt another entering his/her move.

(4) **Manoeuvre:** direction is referred to as 'DV' and can take four value 1 to move up, 2 to move right, 3 to move down and 4 to move left relative to your ship's position.

The galaxy is 32 by 32 sectors which are as follows.

- Information: any ship that has been recently hit will flash during this stage.

- Examine message received.
- Transfer credits.
- Communicate with other ships.
- Attempt planet landing.

(e) **Use directional scanners.**
(f) ** Attempt self-destruct.**

Most of this is fairly obvious; communication with other players is limited to 64 characters and can only take place via the computer. No player should watch another entering his/her move. (3) Fire: this is straightforward, but, remember, although you can use lasers as often as you want, you only have a limited supply of photon torpedoes.

**Formats:**

- IEEE-488 or Centronics parallel, or
- V24/RS232c serial, or any conversion combination.

**BufferSize:**

- From 2k to 1 megabyte RAM.

**Computers:**

- IBM PC, Hewlett-Packard, DEC, Apple, Sirius/Victor, Televideo, SuperBrain, Commodore, BBC, Tandy, Sharp, Osborne, NEC, Data-General, etc.

**Applications:**

- Input buffering (data collection, telecommunications, etc.)
- Output buffering (accounts/payroll printing, plotting, graphics dumps, assembly listings, word processing, telecommunications, etc).

**Support:**

- We are the leading specialist distributor of UK-designed buffered interfaces, with a range of products second to none in scope, price and reliability.

**A-Line Computer Systems**

**MICRO BUFFER DISTRIBUTORS**

1 Church Farm Lane, Willoughby Waterleys, Leicestershire, LE8 3UD.

PCW 229
**MICROMART**

**STOCKISTS OF**

(All including VAT, carriage extra)

- **Sinclair ZX Printer**
- **Sinclair ZX81**

---

**THE DATABASE THAT'S DESIGNED FOR CALLING FROM BASIC; TRANSPARENT, FAST AND FLEXIBLE; A-B-TREE INDEX TOOL THAT ADAPTS WITH YOUR NEEDS.**

**CARD INDEX DEMO IN BASIC TO GET YOU STARTED.**

+ **ORDER MAINTENANCE UTILITIES COMPLETE AT £90 (+ VAT)**

From: CAIRN Associates LTD, THORNHILL, STIRLING FK3 3PL, Tel: (0786) 65697

For fact sheet from CAIRN Associates LTD, THORNHILL.

---

**SCREEN-SCENE**

**SERVICE SINCLAIR**

To manufacturers specifications

Computer Repair Charges

Sinclair Spectrum £20

Sinclair ZX81 £14

Sinclair ZX Printer

(All including VAT and return carriage) £19

Quick turn-round + 3 months warranty

**STOCKISTS OF**

NEW! SEIKOSHA PRINTERS

GP 50 complete with Speedmark Interface £99.95

GP 500a Centronics interface £179.95

GP 700 Colour printer, Centronics interface £199.95

(All including VAT, carriage extra) £349.95

S/N + Accessories on display in our shop for Sinclair, BBC, Amstrad etc

---

**WANTED**

**COMPUTER SYSTEMS**

APPLE

SIRIUS

SUPERBRAIN

TELEVIDEO

IBM PC

OSBORNE

APRICOT

HARDWARE ACCESSORIES

FLOPPY DRIVES

WINCHESTERS

PRINTERS

NON-WORKING HOME COMPUTERS

Fair cash prices paid working or not.

Tel: 061-941 5732 (day) 062-587 8595 (night)

---

**FILING FIASCOS?**

**BASIC PROGRAMS THAT NEED DATAFILES NEED MULTIKEY**

---

**PROGRAM FILE**

---

**WANTED**

**COMPUTER SYSTEMS**

APPLE

SIRIUS

SUPERBRAIN

TELEVIDEO

IBM PC

OSBORNE

APRICOT

HARDWARE ACCESSORIES

FLOPPY DRIVES

WINCHESTERS

PRINTERS

NON-WORKING HOME COMPUTERS

Fair cash prices paid working or not.

Tel: 061-941 5732 (day) 062-587 8595 (night)
MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROMART

MICROPCW
**BBC Draughts**
by R K Reading

Strategy games using Basic normally display requiring skill and expertise, as a result in either a nice graphics screen or a boring display. This version of draughts for the BBC demands little game skill or a boring screen. The version of draughts for the BBC combines the best of both worlds: the

---

**WARF BOOT SOFTWARE SALE**

**BBC Model**

- ZX (480 x 20 tracks disk)

**CRP-80**

- Tape-based (tape and equivalent and very fast)
- Micro-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
- ESP/Expert (Expert Systems via Text Animation)
- MicroPAC from J2 Information
- ESP/Prolog -1 (artificial intelligence language)
- Micro -Prolog from LPA
- HULK II (knowledge engineering package)
- Micro -Prolog from LPA
- HULK II (intelligent decision support)
- EMOS/Prolog from Expert Systems (International)
- PCW233
- MS-DOS/PC-DOS/CP/M-86
- Turbo Pascal (and equivalent and very fast)
- Moby-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
- ESP/Expert (Expert Systems via Text Animation)
- MicroPAC from J2 Information
- ESP/Prolog -1 (artificial intelligence language)
- Micro -Prolog from LPA
- HULK II (knowledge engineering package)
- Micro -Prolog from LPA
- HULK II (intelligent decision support)
- EMOS/Prolog from Expert Systems (International)
- PCW233
- MS-DOS/PC-DOS/CP/M-86
- Turbo Pascal (and equivalent and very fast)
- Moby-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
- ESP/Expert (Expert Systems via Text Animation)
- MicroPAC from J2 Information
- ESP/Prolog -1 (artificial intelligence language)
- Micro -Prolog from LPA
- HULK II (knowledge engineering package)
- Micro -Prolog from LPA
- HULK II (intelligent decision support)
- EMOS/Prolog from Expert Systems (International)
- PCW233
- MS-DOS/PC-DOS/CP/M-86
- Turbo Pascal (and equivalent and very fast)
- Moby-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
- ESP/Expert (Expert Systems via Text Animation)
- MicroPAC from J2 Information
- ESP/Prolog -1 (artificial intelligence language)
- Micro -Prolog from LPA
- HULK II (knowledge engineering package)
- Micro -Prolog from LPA
- HULK II (intelligent decision support)
- EMOS/Prolog from Expert Systems (International)
- PCW233
- MS-DOS/PC-DOS/CP/M-86
- Turbo Pascal (and equivalent and very fast)
- Moby-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
- ESP/Expert (Expert Systems via Text Animation)
- MicroPAC from J2 Information
- ESP/Prolog -1 (artificial intelligence language)
- Micro -Prolog from LPA
- HULK II (knowledge engineering package)
- Micro -Prolog from LPA
- HULK II (intelligent decision support)
- EMOS/Prolog from Expert Systems (International)
- PCW233
- MS-DOS/PC-DOS/CP/M-86
- Turbo Pascal (and equivalent and very fast)
- Moby-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
- ESP/Expert (Expert Systems via Text Animation)
- MicroPAC from J2 Information
- ESP/Prolog -1 (artificial intelligence language)
- Micro -Prolog from LPA
- HULK II (knowledge engineering package)
- Micro -Prolog from LPA
- HULK II (intelligent decision support)
- EMOS/Prolog from Expert Systems (International)
- PCW233
- MS-DOS/PC-DOS/CP/M-86
- Turbo Pascal (and equivalent and very fast)
- Moby-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
- ESP/Expert (Expert Systems via Text Animation)
- MicroPAC from J2 Information
- ESP/Prolog -1 (artificial intelligence language)
- Micro -Prolog from LPA
- HULK II (knowledge engineering package)
- Micro -Prolog from LPA
- HULK II (intelligent decision support)
- EMOS/Prolog from Expert Systems (International)
- PCW233
- MS-DOS/PC-DOS/CP/M-86
- Turbo Pascal (and equivalent and very fast)
- Moby-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
- ESP/Expert (Expert Systems via Text Animation)
- MicroPAC from J2 Information
- ESP/Prolog -1 (artificial intelligence language)
- Micro -Prolog from LPA
- HULK II (knowledge engineering package)
- Micro -Prolog from LPA
- HULK II (intelligent decision support)
- EMOS/Prolog from Expert Systems (International)
- PCW233
- MS-DOS/PC-DOS/CP/M-86
- Turbo Pascal (and equivalent and very fast)
- Moby-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
- ESP/Expert (Expert Systems via Text Animation)
- MicroPAC from J2 Information
- ESP/Prolog -1 (artificial intelligence language)
- Micro -Prolog from LPA
- HULK II (knowledge engineering package)
- Micro -Prolog from LPA
- HULK II (intelligent decision support)
- EMOS/Prolog from Expert Systems (International)
- PCW233
- MS-DOS/PC-DOS/CP/M-86
- Turbo Pascal (and equivalent and very fast)
- Moby-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
- ESP/Expert (Expert Systems via Text Animation)
- MicroPAC from J2 Information
- ESP/Prolog -1 (artificial intelligence language)
- Micro -Prolog from LPA
- HULK II (knowledge engineering package)
- Micro -Prolog from LPA
- HULK II (intelligent decision support)
- EMOS/Prolog from Expert Systems (International)
- PCW233
- MS-DOS/PC-DOS/CP/M-86
- Turbo Pascal (and equivalent and very fast)
- Moby-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
- ESP/Expert (Expert Systems via Text Animation)
- MicroPAC from J2 Information
- ESP/Prolog -1 (artificial intelligence language)
- Micro -Prolog from LPA
- HULK II (knowledge engineering package)
- Micro -Prolog from LPA
- HULK II (intelligent decision support)
- EMOS/Prolog from Expert Systems (International)
- PCW233
- MS-DOS/PC-DOS/CP/M-86
- Turbo Pascal (and equivalent and very fast)
- Moby-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
- ESP/Expert (Expert Systems via Text Animation)
- MicroPAC from J2 Information
- ESP/Prolog -1 (artificial intelligence language)
- Micro -Prolog from LPA
- HULK II (knowledge engineering package)
- Micro -Prolog from LPA
- HULK II (intelligent decision support)
- EMOS/Prolog from Expert Systems (International)
- PCW233
- MS-DOS/PC-DOS/CP/M-86
- Turbo Pascal (and equivalent and very fast)
- Moby-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
- ESP/Expert (Expert Systems via Text Animation)
- MicroPAC from J2 Information
- ESP/Prolog -1 (artificial intelligence language)
- Micro -Prolog from LPA
- HULK II (knowledge engineering package)
- Micro -Prolog from LPA
- HULK II (intelligent decision support)
- EMOS/Prolog from Expert Systems (International)
- PCW233
- MS-DOS/PC-DOS/CP/M-86
- Turbo Pascal (and equivalent and very fast)
- Moby-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
- ESP/Expert (Expert Systems via Text Animation)
- MicroPAC from J2 Information
- ESP/Prolog -1 (artificial intelligence language)
- Micro -Prolog from LPA
- HULK II (knowledge engineering package)
- Micro -Prolog from LPA
- HULK II (intelligent decision support)
- EMOS/Prolog from Expert Systems (International)
- PCW233
- MS-DOS/PC-DOS/CP/M-86
- Turbo Pascal (and equivalent and very fast)
- Moby-Pass from LMI
- ESP/Advisor (Expert Systems via Text Animation)
**FOR TH = TOTAL CONTROL**

**QL FORTH — AVAILABLE NOW**

FORTH 83 from Laboratory Microsystems — the professional FORTHs complete with full-screen editor, macro-assembler, multi-tasking, turn-key compiler, decompiler, binary overlays, file maintenance and system utilities, example programs, and extensive documentation. These FORTHs are available for Z80, 8086/88, and 68000 processors. State disc format with order. A special integrated version is available for IBM PCs and 100% compatibles. CPM-86 E190+VAT. CPM-86, MS/PC/DOS E120+VAT.

Cross-compilers — transport FORTH to different processors, generate ROMmable code, as used to write QL Forth. The complete microprocessor development system — from £225. Choose targets from — 6502, 65110, 8080, 8085/86, 8080, 8080, 8080/88, 68000, 28000, 28000, 28000, 28000. Plug directly into user port, ready for immediate use.

The program is in two parts: type in listing one and save it as a file called ‘D1’, then type in listing two and save it as a file called ‘D2’. When D1 is run it will automatically load D2. The second listing is a very tight squeeze in 32k, so it is absolutely essential that the program is typed in as printed with no extra spaces and that the line number increases by 1. Instructions are included in the program as long as you are familiar with the rules of draughts. Good luck: it plays a mean game.
NO GIMMICKS!
NO WAFFLE!
SIMPLY THE BEST PRICE!

MICROMART

236 PC %V

EDUCATIONAL, COMMODORE, VIC 20, DEC RAINBOW, IBM, 1CL, EPSON,

For popular demand we are able to supply business,

For -..wsinus1

Send any other ad to us and we’ll beat the price.

(softwaresent post free by recorded delivery)

Barclaycard number for immediate despatch (software

All prices plus VAT in UK. Phone your Access or

These products.

GSX £219

£219

TK SOLVER £353

d BASE 3/FRAMEWORK £349
d BASE 2

SUPERCALC 2/3

WORDSTAR PROFESSIONAL PACK VER. 3.3

£299

VER. 3.40

The latest version!

Please send SAE for full list

University, Demo disks and literature are available for many of

and Public Authority orders welcome.

All prices plus VAT in UK. Phone your Access or

Send any other ad to us and we’ll beat the price.

Tel: 01-977 3498

New open 6 days a week!

Answering machine after business hours.

Offers subject to availability.

Telephone first to reserve.

Telex No. 885463 (Photo G)
To use this program you'll need to have created an adventure party from Brimstone Part 1 published in November and solved Brimstone Part 2 published in December. After the dangers of Brimstone Trilogy we'll be publishing a detailed description of how to create your own dungeons. As stated in Part 1 the characters closely follow AD&D format, so your computer-generated characters can of course be used in a standard human-modulated game of Dungeons and Dragons.

To the spoils of your previous adventures replenishment of lanterns and rations weapon bonuses accrued, and the calculated, party, new experience and hit points are shared among the survivors in your party.

SUCCESSFULLY MADE YOUR WAY BACK TO THE ENTRANCE. END

OUT OF THE DUNGEON

FEELING MUCH RECOVERED 'the tarnished sword'

IN LIEU OF OTHER TREASURE

OOPh1t11 P. Gallagher 1984

Brimstone Part Three
by Paul Gallagher

To use this program you'll need to have created an adventure party from Brimstone Part 1 published in November and solved Brimstone Part 2 published in December. After the dangers of Brimstone Trilogy we'll be publishing a detailed description of how to create your own dungeons. As stated in Part 1 the characters closely follow AD&D format, so your computer-generated characters can of course be used in a standard human-modulated game of Dungeons and Dragons.
MICROMART

238PCW

£1,750

COMPACT DISK

£957

SANYO MBC 555 Twin 160k disks inc green

APRICOT XI 5mb plus 315k floppy

APRICOT PC TWIN FLOPPY (Single -sided) inc SIRIUS SX (10mb hard disk)

SIRIUS TWIN FLOPPY (Single -sided)...

Barclay -Access orders accepted by telephone

Please add VAT all 15% to prices.

SPEECH RECOGNITION

SPECTRUM

RGB in. PAL UHF out not for 201 COLOUR MODULATOR giving 9 music channels & 48 I/O lines polyphonic Synthesiser, Add keyboard to make a ,,ve performance Full instructions, software included. Railway etc etc Works with or without 16K RAM Input Output lines provide control and monitor Play 3 -pan music, sound effects, drums etc ZX81 /SPECTRUM BUILT TESTED S. GUARANTEED Instructions COMPUTER amplifier.

(exclusive to WM Stuart Systems)- solid tone programmable pitch for more natural intonation speech - hence unlimited vocabulary.

EXCLUSIVE’ (Please state) SYSTEMS

acr

SPEECH RECOGNITION

SPECTRUM

RGB in. PAL UHF out not for 201 COLOUR MODULATOR giving 9 music channels & 48 I/O lines polyphonic Synthesiser, Add keyboard to make a ,,ve performance Full instructions, software included. Railway etc etc Works with or without 16K RAM Input Output lines provide control and monitor Play 3 -pan music, sound effects, drums etc ZX81 /SPECTRUM BUILT TESTED S. GUARANTEED Instructions COMPUTER amplifier.

(exclusive to WM Stuart Systems)- solid tone programmable pitch for more natural intonation speech - hence unlimited vocabulary.

EXCLUSIVE’ (Please state) SYSTEMS

acr

SPEECH RECOGNITION

SPECTRUM

RGB in. PAL UHF out not for 201 COLOUR MODULATOR giving 9 music channels & 48 I/O lines polyphonic Synthesiser, Add keyboard to make a ,,ve performance Full instructions, software included. Railway etc etc Works with or without 16K RAM Input Output lines provide control and monitor Play 3 -pan music, sound effects, drums etc ZX81 /SPECTRUM BUILT TESTED S. GUARANTEED Instructions COMPUTER amplifier.

(exclusive to WM Stuart Systems)- solid tone programmable pitch for more natural intonation speech - hence unlimited vocabulary.
CIRKIR

29 Beeches Road, Chelmsford, Essex CM1 2 RX
VAT No. 407 0905 74

Low cost Software for your PC
SIDEKICK
No matter what software you're running, hit the button and a sidekick window pops up, a daily, it output a phone directory, a calculator or an ASCII table. All at once... or one at a time, whenever and wherever you want. No matter what software you're running. Includes 250 page manual and FREE spreadsheet program written in Turbo Pascal.

** TURBO PASCAL V2.0 **
IBM-PC or true compatibles £54.95 anywhere on the screen you like. Another keystroke, and you're ready to go.

No matter what software you're running, hit the button and a sidekick window pops up, a daily, it output a phone directory, a calculator or an ASCII table. All at once... or one at a time, whenever and wherever you want. No matter what software you're running. Includes 250 page manual and FREE spreadsheet program written in Turbo Pascal.

** TURBO PASCAL V2.0 **
IBM-PC or true compatibles £54.95 anywhere on the screen you like. Another keystroke, and you're ready to go.

29 Beeches Road, Chelmsford, Essex CM1 2 RX
VAT No. 407 0905 74

14 GOODWOOD CLOSE, MORDEN, SURREY SM2 5AW

Back up support and HP forms

51/4" 10 MB VERSION £1295 + VAT

Consol products!

3½/5½ WINCHESTERS FOR GEMINI/NASCOM AND SUPERBRAIN COMPUTERS

514" 10 MB VERSION £1295 + VAT

(Other capacities/size's available)

Tel: (0245) 57575

for further details. Securicor delivery.

Back up support and HP forms available.

Low cost Software for your PC
SIDEKICK
No matter what software you're running, hit the button and a sidekick window pops up, a daily, it output a phone directory, a calculator or an ASCII table. All at once... or one at a time, whenever and wherever you want. No matter what software you're running. Includes 250 page manual and FREE spreadsheet program written in Turbo Pascal.

** TURBO PASCAL V2.0 **
IBM-PC or true compatibles £54.95 anywhere on the screen you like. Another keystroke, and you're ready to go.

No matter what software you're running, hit the button and a sidekick window pops up, a daily, it output a phone directory, a calculator or an ASCII table. All at once... or one at a time, whenever and wherever you want. No matter what software you're running. Includes 250 page manual and FREE spreadsheet program written in Turbo Pascal.

** TURBO PASCAL V2.0 **
IBM-PC or true compatibles £54.95 anywhere on the screen you like. Another keystroke, and you're ready to go.

29 Beeches Road, Chelmsford, Essex CM1 2 RX
VAT No. 407 0905 74

14 GOODWOOD CLOSE, MORDEN, SURREY SM2 5AW

Back up support and HP forms

51/4" 10 MB VERSION £1295 + VAT

Consol products!

3½/5½ WINCHESTERS FOR GEMINI/NASCOM AND SUPERBRAIN COMPUTERS

514" 10 MB VERSION £1295 + VAT

(Other capacities/size's available)

Tel: (0245) 57575

for further details. Securicor delivery.

Back up support and HP forms available.

Low cost Software for your PC
SIDEKICK
No matter what software you're running, hit the button and a sidekick window pops up, a daily, it output a phone directory, a calculator or an ASCII table. All at once... or one at a time, whenever and wherever you want. No matter what software you're running. Includes 250 page manual and FREE spreadsheet program written in Turbo Pascal.

** TURBO PASCAL V2.0 **
IBM-PC or true compatibles £54.95 anywhere on the screen you like. Another keystroke, and you're ready to go.

No matter what software you're running, hit the button and a sidekick window pops up, a daily, it output a phone directory, a calculator or an ASCII table. All at once... or one at a time, whenever and wherever you want. No matter what software you're running. Includes 250 page manual and FREE spreadsheet program written in Turbo Pascal.

** TURBO PASCAL V2.0 **
IBM-PC or true compatibles £54.95 anywhere on the screen you like. Another keystroke, and you're ready to go.

29 Beeches Road, Chelmsford, Essex CM1 2 RX
VAT No. 407 0905 74

14 GOODWOOD CLOSE, MORDEN, SURREY SM2 5AW

Back up support and HP forms

51/4" 10 MB VERSION £1295 + VAT

Consol products!

3½/5½ WINCHESTERS FOR GEMINI/NASCOM AND SUPERBRAIN COMPUTERS

514" 10 MB VERSION £1295 + VAT

(Other capacities/size's available)

Tel: (0245) 57575

for further details. Securicor delivery.

Back up support and HP forms available.
Meteor Attack by Nick Pearce

Occasionally I enjoy a good, traditional game. The joystick controls the direction of the zap-'em game and I find there's no better machine than an Atari for games of this type. The game has all the usual features of arcade games — high scores, multi-player and game over shots. Little is needed in the way of instructions — just protect the cities from the missiles and take out the enemy's cities.

The joystick controls the direction of the zap-'em game and I find there's no better machine than an Atari for games of this type. The game has all the usual features of arcade games — high scores, multi-player and game over shots. Little is needed in the way of instructions — just protect the cities from the missiles and take out the enemy's cities.
**BRAIN SURGEONS**

Anita Electronic Services (London) Ltd. are specialists in the repair and service of the Superbrain and associated peripherals.

We offer a fast on-site nationwide service or alternative repairs can be carried out at our workshops should you wish to bring your machine in to us.

Maintenance contracts are available at very competitive prices.

We also specialise in the repair of Commodore, Apple, IBM Apricot, Osborne and Sinus.

Trade enquiries welcome

For further information telephone or write to:

Mr. D. Wilkinson
Anita House,
15 Redanwell Close,
London EC1R 4AD
Tel: 01-253 2444

---

**COMPUTERS**

| Spectrum 48K | £120.00 |
| Commodore | £161.00 |
| Alpha Com 32 Electron | £52.00 |

Apple Computers available

---

**PRINTERS**

- **IBM**
  - 110-240V £85.00
  - 220-240V £95.00

---

**MONITORS 14" COLOUR**

Nicotea E17S TV Monitor £120

---

**ACCESSORIES**

- **RIBBON**
  - 1264 £10.00

---

**EDUCATION orders supplied**

**Trade enquiries welcome**

Add 80 pence Post & Packing for small items and £6 for large items.

---

**PET CONVERSIONS AND UPGRADES**

**Anita House, 15 Redanwell Close, London EC1R 4AD**

---

**Trade enquiries welcome**

---

**SPECIAL PRICE**

- **1006** single without power supply £99.95

---

**PRINT LINK 64** £29.00

---

**PET CONVERSIONS AND UPGRADES**

---

**ADD 15% VAT TO TOTAL**
TRSA-80 Adventure

by Alan Kirk

Possibly the only redeeming feature of the outdated TRS-80 is the quality of its Basic: in particular the writing of text adventures is suited to this machine — typically a 48k adventure on the Spectrum would occupy, say, 32k on a TRS-80 and run much faster. This machine code utility will further im-
prove the quality of any adventures written on a TRS-80 or Video Genie.

The program decodes sentences of the usual vernacular format with the first three letters of each word being significant. To use the program in your own adventure you must use the code from 10 to 120 and the data from 140 to 490. You can use different line numbering, but 'LN' in line 30 must contain the line number of the first data statement.

To initialise the adventure decoder you need lines 600 to 690 with the strings VB$ and NO$ initialised to lists of three-character words. The decoder can then be used by inserting 'GET V,N' at the point in your program where you require sentence input. Any two variables can be used, but they must be defined as integers. The two numbers returned represent the position of the verb and noun on their own, so they can be tested for actions.

The length of the word table is limited to #249 characters which corresponds to 83 words. If any one of the returned values is 255, then the word is not in one of the tables.

The common one-letter commands are pre-programmed into the routine and will respond as follows:

<table>
<thead>
<tr>
<th>Command</th>
<th>Exected</th>
<th>Verb</th>
<th>Num</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>1</td>
<td>(Down)</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>1</td>
<td>(East)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>1</td>
<td>(North)</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>1</td>
<td>(South)</td>
<td></td>
</tr>
<tr>
<td>U</td>
<td>1</td>
<td>(Up)</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>1</td>
<td>(West)</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>1</td>
<td>(Left)</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>1</td>
<td>(Right)</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>10</td>
<td>(Help)</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>9</td>
<td>(Inventory)</td>
<td></td>
</tr>
</tbody>
</table>

INTERFACE PROBLEMS?

SOLUTION 1: SERIAL — CENTRONICS CONVERTER £59.95

For owners of computers with RS232 outputs who wish to save money on rented software required to connect serially to computer, needs no external power.

SOLUTION 2: SERIAL — 4-WAY SERIAL £59.95

For owners of computers with RS232 outputs who wish to use two to four different devices without swopping leads. Needs NO POWER. Supplied with any mix of sockets and leads.

SOLUTION 3: CENTRONICS — 2-WAY CENTRONICS £59.95

For computer owners who wish to drive more than one printer. Requires no power, includes both printer leads.

SOLUTION 4: SERIAL — 2-WAY CENTRONICS £84.95

For owners of computers with RS232 outputs who wish to connect two (or more) printers and save money on leads and effort on swopping leads, as they are included. Add £25 for additional ways. Especially suitable for EPSON, OKI, PERKINELMER, SARIN, SIMON, SPECTRUM INTERFACE BR, APPLE IIetc. Please enquire about our range of software for the Novenas.

All the above prices include VAT, post and packing in EUROPE. For computer owners who wish to drive more than one printer. Requires no power, includes both printer leads.

CENTRONICS — 2-WAY CENTRONICS £59.95

Supplied with any mix of sockets and leads.

SERIAL — 4-WAY SERIAL £59.95

For owners of computers with RS232 outputs who wish to talk to four different devices without swopping leads. Needs NO POWER.

For computer owners who wish to drive more than one printer. Add £25 for additional ways. Reverse also possible for computer owners who wish to drive more than one printer.

Program File

**Adventure Decoder For GENIE/TRS-80**

By Alan Kirk

Version 1.2

**DATA**

140 DATA 221,42,128,65,33,53,125,34,126,65, 894
150 DATA 33,4,125,34,177,64,8,8,8,8,8, 437
160 DATA 8,8,8,8,8,8,8,8,8,8, 281
170 DATA 8,8,17,37,125,285,181,254,229,229, 988
180 DATA 32,101,175,18,17,13,125,35,205,181, 932
190 DATA 125,254,28,4,254,8,32,8,229, 1088
200 DATA 175,18,33,37,125,285,13,36,237,83, 964
210 DATA 49,125,33,43,125,205,13,38,237,83, 951
220 DATA 51,125,33,5,125,6,16,285,217,5, 708
230 DATA 56,246,120,254,1,202,245,127,17,21, 1207
240 DATA 252,229,285,212,125,42,49,125,113,35, 1307
250 DATA 175,119,17,98,253,225,6,12,35,12, 1866
260 DATA 254,32,48,21,16,248,42,49,125,62, 889
270 DATA 255,119,35,54,8,42,51,125,119,195, 995
280 DATA 174,125,225,221,233,35,205,212,125,42, 1597
290 DATA 51,125,113,25,175,119,225,126,281,35, 1205
300 DATA 126,254,32,48,258,254,65,285,163,125, 1559
310 DATA 254,9,242,163,125,16,35,19,126,254, 1327
320 DATA 44,200,254,8,200,254,29,200,19,24, 1252
330 DATA 241,14,8,6,5,12,229,213,26,198, 934
340 DATA 32,0,19,35,5,32,247,290,225,281, 1013
350 DATA 32,0,19,225,283,127,32,5,19,19,24, 882
360 DATA 228,175,29,281,126,6,1,254,48,48, 1178
370 DATA 48,4,254,69,48,43,254,78,48, 834
380 DATA 38,4,254,83,48,33,254,85,48, 835
390 DATA 28,4,254,87,48,23,4,254,78,48, 818
400 DATA 18,4,254,82,48,13,254,73,48, 782
410 DATA 24,4,254,72,48,26,195,147,125,42, 929
420 DATA 51,125,62,1,119,35,175,119,42,51, 778
430 DATA 125,112,25,175,124,52,62,10, 1178
440 DATA 24,238,42,49,125,62,11,24,231,4, 810
450 DATA 254,73,48,24,254,72,48,26,197, 982
460 DATA 198,125,42,92,125,62,1,119,35,175, 946
470 DATA 119,42,94,125,112,195,217,125,42,92, 1163
I am assured by MTX500 and 512 programmers that one of the major dangers of programming an MTX is accidental erase of a program. There are three software resets (PRINT USR (O), RST O and NEW), as well as hardware resets and misplaced POKEs all resulting in a lost program and re-initialised system variables. This utility provides a much needed OLD command to restore lost programs from one of the above-mentioned causes.

The program should be loaded and run before programming begins. The program places itself at the top of RAM, lowers RAMTOP and deletes its own listing, and is therefore transparent both to user and system. You can now type or load in a program. When you are ready to start debugging type (PRINT(USR(49010). If, for any reason, typing (PRINT(USR(49069)) while debugging will restore it.

To run on an MTX500 two minor changes are necessary:

1. Change LD HL, 8069 to LD HL, 4069 in line 0.
2. Change the two occurrences of LD in line 0.

To run on an MTX500 two minor changes are necessary:

1. Change LD HL, 8069 to LD HL, 4069 in line 0.
2. Change the two occurrences of LD in line 0.

and so on.

---

**MTX OLD**

by P Walker

---

**PROGRAM FILE**

---

**MICROMART**

---

**COMMODORE 2001-3000**

4000-8000

We have the world’s largest selection of software for the PET/CBM range. We supply to schools, universities, large and small companies, government departments, and of course home users. We also manufacture add-on boards and plug-in chips that can make your computer more powerful – the most popular add-ons are our high resolution graphics boards which give your PET better resolution than an Apple!

**IF YOU OWN OR USE A PET/CBM COMPUTER WRITE OR PHONE FOR A FREE CATALOGUE.**

By the way, we also offer software for the Commodore 64.

**SUPERSOFT**

Winchester House, Canning Road, Wealdstone, Harrow, Middlesex, HA3 7SJ

Telephone: 01-881 1166

**BLANK CASSETTES**

Guaranteed top quality computer/audio cassettes at great budget prices.

*Packed in boxes of 10 with labels, inlay cards and library case.*

**BASE FLOPPY DISKS**

Prices of boxes of 10

**MICRO FLEXI DISKS**

Price per unit

**MODULA-2 & ADA**

We offer Europe’s largest selection of Modula-2 and Ada subset compilers for microcomputers.

**MODULA-2 COMPILERS**

Modula Corp (MS-C64, Apple) £ 90

JRT (CP/M-40) £ 95

Vollition (various) from £ 265

Logitech (MS-C64, CP/M-64) £ 380

**ADA (subset) COMPILERS**

Augusta (CP/M-80) £ 80

Supersoft (CP/M-80) £ 155

Janzar (CP/M-680, MS-C64) from £ 265

Telesoft (IBM PC-XT) £ 2000

**Blanks**

Prices include delivery, but not VAT.

For more information call us.

4 Priors Meadow, Ashburton, Devon TQ13 7DF

TEL. (0364) 53499

**GREAT MATER**

---

**PCW 245**

---

---
**BEST PRICES**

Including FREE packing & postage

<table>
<thead>
<tr>
<th>Example</th>
<th>RRP</th>
<th>OUR PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lotus 1-2-3</td>
<td>375.00</td>
<td>295.00</td>
</tr>
<tr>
<td>dBase II</td>
<td>365.00</td>
<td>245.00</td>
</tr>
<tr>
<td>Symphony</td>
<td>550.00</td>
<td>405.00</td>
</tr>
<tr>
<td>WordStar</td>
<td>265.00</td>
<td>165.00</td>
</tr>
<tr>
<td>Open Access</td>
<td>460.00</td>
<td>315.00</td>
</tr>
<tr>
<td>Multi-Mate</td>
<td>346.00</td>
<td>230.00</td>
</tr>
<tr>
<td>Filwork</td>
<td>460.00</td>
<td>320.00</td>
</tr>
<tr>
<td>Friday</td>
<td>580.00</td>
<td>340.00</td>
</tr>
<tr>
<td>Cardbox</td>
<td>105.00</td>
<td>120.00</td>
</tr>
<tr>
<td>Other Software</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apricot Micros</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Complete, specially designed, easy to use. micro system for the small business, with:

- Aldcot twin disc PC, letter quality printer, Business manager, accounting, word processing and financial planning software, manuals; and disk, papers, ribbons and other accessories.

**ONLY £2295 or £12.50 per week**

When ordering, please add 15% VAT to cheque.

Software

- 3M Floppy Diskettes
- Second hand Micros purchased

**AC COMPUTERS LTD.**

4A HEARSALL LANE, COVENTRY
Telephone: (0203) 78003

---

**Commodore 64 Screendump**

by Matthew Burt

Screendump allows the printing of high resolution of user-defined character screens on the Commodore MPS-801 printer. If a normal text screen is dumped, the standard '64 character set will be used instead of the MPS-801 set. There are two stages:

1. Load and run to locate the routine in memory anywhere above 800 hex. There is a default option to put the routine above the Basic text and protect it.
2. Call the specified address either from Basic or a machine code monitor.

The MPS-801 must be device four and contain paper that can accommodate 54 characters across.

Screendump leaves the printer in graphics mode, so ASCII character 15 must be sent before normal use.

Any screen that uses sprite graphics will be printed but the sprites will be invisible. The results with screens that use raster interrupts are, at best, highly unpredictable.

Lines 1000-1800 contain the data of the machine code routine in decimal. Lines 2040-2100 actually transfer the DATA into memory using a dummy OPEN in line 2060. Pay particular attention when typing lines 2000-2100. Any error here will not be detected in the same way as the DATA lines.

To prove the program works there are some example printouts of graphics dumps done with the utility. On running, the prompt will be displayed. Type an address (such as C000 or C800 or 9000) or press RETURN for the top of memory option.

If all is well, the message CALL WITH SYS xxxx will be displayed. Use this SYS to dump the screen to the MPS-801. Monitor users may wish to locate the code under the Basic ROM.
**BEST UK SOFTWARE PRICES?**

Buy from TriSoft Ltd., the specialist software company formed by microcomputer consultants.
- Over 400 leading software packages (inc. Apple)
- Independent advice in making your choice
- Professional staff + network of consultants
- Most formats. All programs latest versions.

**SAGE ACCOUNTS £259**

The new updated version (1.5) featuring many enhancements at only £259 (reduced from £375). Please telephone or write for details of all other Sage Accounting products and our Sage training programmes.

**SELECTED PRICES**

<table>
<thead>
<tr>
<th>Product</th>
<th>List Price</th>
<th>Our Price 1</th>
<th>Our Price 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wordstar Prof</td>
<td>399</td>
<td>275</td>
<td>275</td>
</tr>
<tr>
<td>Symphonic</td>
<td>550</td>
<td>325</td>
<td>325</td>
</tr>
<tr>
<td>Objector</td>
<td>395</td>
<td>235</td>
<td>235</td>
</tr>
<tr>
<td>SuperCalc 3</td>
<td>295</td>
<td>199</td>
<td>199</td>
</tr>
<tr>
<td>Little RED</td>
<td>135</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Open Access</td>
<td>450</td>
<td>325</td>
<td>325</td>
</tr>
<tr>
<td>DMS Data 2</td>
<td>395</td>
<td>255</td>
<td>255</td>
</tr>
<tr>
<td>Wordcraft</td>
<td>425</td>
<td>285</td>
<td>285</td>
</tr>
<tr>
<td>SuperCalc</td>
<td>195</td>
<td>145</td>
<td>145</td>
</tr>
<tr>
<td>Framework</td>
<td>450</td>
<td>325</td>
<td>325</td>
</tr>
<tr>
<td>Symphony</td>
<td>550</td>
<td>325</td>
<td>325</td>
</tr>
<tr>
<td>SAGE ACCOUNTS</td>
<td>259</td>
<td>259</td>
<td>259</td>
</tr>
<tr>
<td>BASE II</td>
<td>239</td>
<td>239</td>
<td>239</td>
</tr>
<tr>
<td>MS Word</td>
<td>300</td>
<td>239</td>
<td>239</td>
</tr>
<tr>
<td>Framework</td>
<td>495</td>
<td>325</td>
<td>325</td>
</tr>
<tr>
<td>MS Word</td>
<td>300</td>
<td>239</td>
<td>239</td>
</tr>
<tr>
<td>Framework</td>
<td>495</td>
<td>325</td>
<td>325</td>
</tr>
</tbody>
</table>

**SPECIAL OFFER**

- D BASE II £239
- D BASE II £239

**INTERESTED IN ACCOUNTANCY SOFTWARE?**

Having reviewed many of the accounting s/w packages currently available, we are now able to offer first class advice on the best accounting s/w for your business. One of the accounting systems which we supply and support is PEGASUS.

We have Midlands and London based staff who are fully trained in the application and use of Pegasus software.

**LOTUS 1 2 3 £279**

Also available at our new lower price for SIRIUS and APRICOT.

**OPEN HOUSE TUITION FOR NOVICES AND OTHERS**

Choose your time — day or evening. Learn at your own pace.

- BASIC programming £60
- BUSINESS Packages £70
- Word-Processing introduction £25

**Renaissance**

BY LOUIS K SAVAIN

COPYRIGHT 1982 UMI INC
QL 3D-Histogram Generator

by Stewart Kessel

Although the QL is supplied with an excellent business graphics program, Easel, there's no facility within the be relatively easy to modify for such features as automatic scaling or height sorting of data. The program should work on all QL's two years' data and plot them in 3D in both TV and monitor mode. perspective against a grid.

With the use of SuperBasic the program is well structured, so it should be relatively easy to modify for such features as automatic scaling or height sorting of data. The program should work on all QL's two years' data and plot them in 3D in both TV and monitor mode.
MICROMART

MICROspirit, OAS LIMITED

THE BUDGET EXTENDER FOR ALL COMPUTER SOFTWARE

AT LEAST 20% OFF* ALL SOFTWARE

FOR APPLE * IBM * BBC * COMMODORE * APRIcot * ATARI * SPECTRUM

WE SUPPLY SOFTWARE FOR
BUSINESS & WORD PROCESSING & GAMES & EDUCATION SYSTEMS & UTILITIES & GRAPHICS
WE SPECIALIZE IN MAIL ORDER

TELEPHONE NOW 01-
FOR OUR PRICES AND FREE CATALOGUE FREE 1985 DIARY WITH EVERY PURCHASE

MICRO SOFTWARE LIMITED
164 CARMAN HIGH STREET
LONDON NW2
TEL. 01-387 0325

REALISE YOUR FULL POTENTIAL

LIFE-LINE
SELF ANALYSIS CAREER COUNSELLOR
FOR ANY SPECTRUM COMPUTER
(Commodore and BBC compatible)

Understand yourself and others using this brilliant new program
LIFE-LINE will reveal:
YOUR TRUE CHARACTER
THE CHARACTER YOU TRY TO PROJECT
YOUR SELF-IMAGE

LIFE-LINE can help you:
CHOSE THE RIGHT CAREER
ACHIEVE MORE
ACCEPTED COUNTER

LIFE-LINE is designed for use in the home, school or college - anywhere that people matter.

Price £14.95 inclusive of VAT and Postage.

All enquiries SAE please

Mr. Ell
Barclay Access orders accepted by telephone
WILLIAM Ourley Down House Cholderton
STUART Nr. Salisbury
Wiltshire SP4 TDZ

CRASS 80

Z80 CROSS ASSEMBLER
SPECTRUM MACHINE CODE
FROM THE ACT APRICOT

* Write Source Text with a professional Word Processor then assemble to MS DOS disk file or direct to target System
* Only £95 + VAT Delivered

From: STEVE BETTS SOFTWARE
42 WALLACE DRIVE
EATOMERAY
BEDS. LU6 2DF

* OTHER HOST AND TARGET SYSTEMS UNDER DEVELOPMENT ENQUIRE FOR DETAILS

310 key
320 GO TO 320
330 DEFINE PROCEDURE firstrow
340 pos=880:barno=1
350 FOR ypos=300 TO 80 STEP -20
360 IF h11,barno) < h12,barno)
361 height=h11,barno):shade=1
362 ELSE
363 height=h12,barno):shade=2
364 END IF
370 if ypos, ypos, ypos, shade
380 pos=xpos+50
400 barno=barno+1
410 END FOR ypos
420 END DEFINE firstrow
430 DEFINE PROCEDURE secondrow
440 ypos=918:barno=1
450 FOR ypos=380 TO 60 STEP -20
460 IF h11,barno) < h12,barno)
461 height=h11,barno):shade=1
462 ELSE
463 height=h12,barno):shade=2
464 END IF
480 bar height*6,xpos,ypos,shade
490 xpos=xpos-50
500 barno=barno+1
510 END FOR ypos
520 END DEFINE secondrow
530 DEFINE PROCEDURE grid:CLS:INK 7:FILL 0
540 FOR ygrid=100 TO 700 STEP 60
550 LINE 300,ygrid TO 900,ygrid+245
560 END FOR ygrid
570 inc=0
580 FOR xgrid=300 TO 900 STEP 50
590 LINE xgrid,100+inc TO xgrid,700+inc
600 inc=inc+20
610 END FOR xgrid
620 END DEFINE grid
630 DEFINE PROCEDURE bar(h,x,y,shade)
640 REMark front
650 INK shade:FILL 1
660 LINE x,y TO (x+50),(y+20) TO (x+50),(y+20+h) TO x,(y+20+h) TO x,y
670 FILL 0
680 REMark top
690 INK 3:FILL 1
700 LINE x,(y+h) TO (x+50),(y+20+h) TO (x+20),(y+40+h) TO (x-30),
(y+20+h) TO x,(y+h)
710 FILL 0
720 REMark side
730 INK shade:FILL 1
740 LINE x,y TO (x-30),(y+20) TO (x-30),(y+20+h) TO x,(y+h) TO x,y
750 FILL 0
760 REMark line up side
770 INK 0:LINE x+1,y+3 TO x+1,(y+h-3)
780 END DEFINE bar
790 DEFINE PROCEDURE init
800 DIM h12,12)
810 DIM month(12)
820 DIM year$(12,9)
830 RESTORE 850
840 FOR n=1 TO 12:READ month(n):END FOR n
850 DATA "J","F","M","A","M","J","J","A","S","O","N","D"
860 RESTORE 880
870 FOR n=1 TO 12:READ syear$(n):END FOR n
880 DATA "January","February","March","April","May","June","July","August","September","October","November","December"
890 END DEFine init
900 DEFine PROCedure key
910 bar 50,1150,300,1
920 bar 50,1150,100,2
930 CSIZE #1,1,1:INK 6
940 AT 6,21:PRINT"Key"
950 CSIZE #1,2,0
960 AT 22,28:PRINT histol$
970 AT 17,28:PRINT histo2$
980 AT 21,18:PRINT "month":INK 7
990 AT 0,(32-LEN(title$))/2:INK 7:CSIZE 3,0:PRINT title$:CSIZE 2,0
1000 END DEFine
1010 DEFine PROCedure getdata
1020 INK 7:CSIZE 3,0:AT 1,3:PRINT"3D'HISTOGRAM GENERATOR":CSIZE 0,0
1030 REPeat loop
1040 AT 3,3:PRINT"Title of graph (max 20 characters) ?";FILL;:("",36)
1050 AT 3,45: INPUT title$
1060 IF LEN(title$) (=20 THEN EXIT loop
1070 END REPeat loop
1080 REPeat loop
1090 AT 5,3:PRINT"Title of histogram 1 (max 5 characters) ?";FILLU" ',10)
1100 AT 5,45: INPUT histol$
1110 IF LEN(histol$)=5 THEN EXIT loop
1120 END REPeat loop
1130 REPeat loop
1140 AT 7,3:PRINT"Title of histogram 2 (max 5 characters) ?";FILLI" ',10)
1150 AT 7,45: INPUT histo2$
1160 IF LEN(histo2$)=5 THEN EXIT loop
1170 END REPeat loop
1180 CSIZE 2,0:INK 0
1190 AT Ilfrow,56:PRINT FILL$(" ",5):AT Ilfrow,56:INPUT h(1,table)
1200 IF h(1,table) <=0 AND h(1,table) >=0 THEN EXIT loop
1210 REPeat loop
1220 AT Ilfrow,10:PRINT syear$(13-table)
1230 REPeat loop
1240 AT Ilrrow,38:PRINT FILLI(" ",5):AT Ilrrow,38:INPUT h(1,table)
1250 IF h(1,table) <=0 AND h(1,table) >=0 THEN EXIT loop
1260 END REPeat loop
1270 REPeat loop
1280 AT Ilrrow,56:PRINT FILLI(" ",5):AT Ilrrow,56:INPUT h(2,table)
1290 IF h(2,table) <=0 AND h(2,table) >=0 THEN EXIT loop
1300 END REPeat loop
1310 row=row+1
1320 END FOR table
1330 END END DEFine getdata
1340 DEFine PROCedure drawscale
1350 INK 7
1360 REMark 0 to 100
1370 FOR scalespos=100 TO 700 STEP 60
1380 CURSOR 170,scalespos,0,0
1390 PRINT (scalespos-100)/6
1400 END FOR scalespos
1410 labely=50:duxy=1
1420 FOR labelx=-400 TO 950 STEP 50
1430 CURSOR labelx,labely,0,0
1440 PRINT "month(labelx)
1450 labelx=labelx+20:duxy=duxy+1
1460 END FOR labelx
1470 END END DEFine drawscale

MICRO COMPUTER
EXHIBITION
BROMLEY CIVIC CENTRE
SAT JAN 12th 1985
10.00am-17.00pm
BR Train to Bromley North or Bromley South
HOME, HOBBY & BUSINESS
Amstrad/BBC/Commodore/Spectrum/ 
Vemtech/Oric/New Brain
Software, Hardware and Add-Ons plus "The Business End"
BM/ACT/RAM and BUSINESS SOFTWARE
Enquiries East/West 01-250 5298
THE NEW BRAIN FILES
ALL YOU EVER WANTED TO KNOW
ABOUT THE NEWBRAIN 32k and Wx
Out January 14th from VITAGRAPH £9.95
VITAGRAPH LTD
26 COLLAGE ROAD
BROMLEY BR1 3PE
OPEN END STREAM-
The information exchange for New Brain Users
3 Mags + public domain software £10 to:
24 COLLAGE ROAD
BROMLEY BR1 3PE
Tel: South 01-290 5299
North 061-434 1810 (Eves)

COULD YOU
TEACH
BASIC?
If you can write your own programs in BASIC and can
talk to people then YOU CAN TEACH with the PROTOS
System ©.
The PROTOS System contains all the information you
need: Organisers Manual, Tutors manual, full lecture
notes, handouts, visual aid guide, how to advertise
and a FREE back-up service by phone.
The PROTOS System costs are covered by just 3
students at home . . . but is designed for up to 40.
For more details and application form write NOW to:
Dept. PCW, The Computer Group,
Oaklea, Goldhanger Road,
Maldon, Essex CM9 7QU,
or ring 0621-58091 NOW.

NAG
FOR THE
ACT
SIRIUS
The PC50 Library is a subset of the
internationally renowned NAG library and
offers a powerful set of programming tools for
the Fortran user on the Sirius. Can you afford
to be without
THE NAG FORTRAN PC50 LIBRARY
For full details write to—
HARRISON-WARD
associates Ltd.
62 LYNTON ROAD, RAYNERS LANE, HARROW, MIDDLESEX HA2 9NN
* APRICOT VERSION NOW AVAILABLE *
Hounslow Computer Interfaces

We specialise in computer cables made up to your requirements at the lowest prices anywhere.

- TEAC 100k disc drive: £100.00
- Wabash SS/SD 100k discs: £13.00
- Epson FX80: £105.00
- Epson FX80 F/F: £200.00
- Epson FX110: £240.00
- Also Sekosh, TEC. Buffers from 2k to 512k. A selection of ribbons for most printers.
- Epson FX80: £23.60 Shimma GP80: £3.60
- SCMTP-1: £22.00 Sekosh GP80: £3.60
- Paper per 2000 sheets: £12.86
- Plotters, Monitors, Modems. C12 cassettes and Dust covers for most printers & computer.

Send NOW FOR OUR FULL DETAILED PRICE-LISTS

Delivery within 30 miles of London FREE! All prices shown are exclusive of VAT

Send SAE for free catalogue or Tel: 01-723 0562 (10am-7pm)

SCREENWRITER II £51.50
HOME WORD £29.50
B.C. QUEST FOR FIRES £25.75
FLIGHT SIMULATOR II £25.75
OILS WELL £25.75
BRISTLES £8.95 £10.95
BOULDER £8.95 £10.95
DEADLINE N/A

LOWEST PRICES IN UK?

MICROSOFT
Spectrum-48k (free six pack software) £374.95
Commodore +4 £414.95
Commodore +3 £319.95
BBC B/minus cassette players/software £369.95
BBC B+ £369.95
SINCGAR L £139.00

FOR YOUR MICRO
Zx Microdrive £47.95
Zx Interface £47.95
Zx Microdrive interface (4 ports) £97.00
Zx Interface £56.95
Microdrive Cartridge £4.75
Specially treated 16k/32k £6.95
Programmable joystick interface £22.95
Commodore C17 Cassette clips £24.00
Commodore C70 Cassette clips £19.00
Commodore 1511 Drive £199.95
Commodore 1510 Monitor £199.95

eighson 32 printer £74.95

CASIO
PX70 £122.95
PX70-2 £122.95
FX750P £175.95
FX750P £175.95
PR 410L £17.95
PB 110 £17.95

CASIO KEYBOARDS
MT 46 £79.95
MT 64 £79.95
MT 200 £111.95
MT 80 £121.95

Complete range of Casio calculators, watches and keyboards at Discount Prices.

K.K. STATIONERS

187 Edgware Road, Marble Arch, W2 1ET
Tel: 01-723 1436

Send Cheques, P.O. to Zoomsoft, 40 Huntsworth Mews, London NW1 6DB.

EBORSOF

81 Hull Road, York Y01 3JS
Tel: 0904-411873 (24 hour ansa)

SHARP

Starting machine code on the Sharp a new book by G. P. Ridley for all MZ20K, MZ26A, MZ700 owners. wishing to expand their knowledge of machine code, £5.95 from Sharp dealers or direct inc p&p from:

G. M. SERVICES (PCW)
D. C. BRENNAN ENG.,
14 North Western Avenue, Watford, Herts.

For your copy of our MZ700 software catalogue

From GAMES to BUSINESS and EDUCATIONAL OVER 180 TITLES plus Peripherals and Accessories.

Send P.O. for 50p (refundable on first order to the above address)

BASIC COMPILER

For the BBC Micro

Now supports around 90 key words

Turns Basic programs into really fast machine code. It is very easy to use and comes complete with full instructions. Suitable for the Model B or Model A with 32K

CASSETTE £17.95
DISK £19.95

Enquire at your local computer store or order direct (Post FREE) from:—

A.C.K. DATA
PCW Dept
21 Salcombe Drive
Redhill
Nottingham NG5 8JF
Tel: (0602) 262498
Dealer enquiries welcome

WANTED PERSONAL COMPUTERS

IBM, TANDY, EPSON, etc

all models bought for cash

MORGAN CAMERA COMPANY

160 Tottenham Court Road, London W1.
Tel: 01-388 2562
It took an apple for Isaac Newton to discover gravity so why not use your Apple to discover MEMDOS the unique Application Development Tool.

Why are there more than 10,000 Apple users of MEMDOS in France today?
When MEMSOFT won the Golden Apple Award, for best system software, Apple users realised that at last they had discovered the way to program their powerful application software easily!
For only £15 you can discover the amazing power of MEMDOS through MEMDOS JUNIOR with its incredible MULTI-KEY INDEX FILING (ISAM), dynamic Screen Management and powerful Macro instruction sets which reduce program coding by up to 90%. Use MEMDOS JUNIOR and we are sure that you will progress to full system MEMDOS, as over 10,000 others have done.

MEMSOFT LTD, WEST LODGE, WEST DRIVE, LURCH, BERKSHIRE RG 10 0SG

WIN A SUPER HOLIDAY TO GREECE
SEND FOR DETAILS

MEMDOS JUNIOR costs £15. The full MEMDOS disk system costs £99 (only £84 if you buy MEMDOS JUNIOR).
Here is a guide to PCW back issues. Hardware reviews/Benchtests are indexed by manufacturer, software by product name.

## HARDWARE

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>PRODUCT</th>
<th>ISSUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acorn</td>
<td>Speech System</td>
<td>January 1984</td>
</tr>
<tr>
<td>Acorn</td>
<td>Electron</td>
<td>October 1983</td>
</tr>
<tr>
<td>Acorn</td>
<td>BBC Micro</td>
<td>April 1984</td>
</tr>
<tr>
<td>Acorn</td>
<td>Teletext</td>
<td>October 1983</td>
</tr>
<tr>
<td>Acorn</td>
<td>Apricot</td>
<td>April 1984</td>
</tr>
<tr>
<td>Acorn</td>
<td>Sirius</td>
<td>March 1984</td>
</tr>
<tr>
<td>ACT</td>
<td>Adman Speech</td>
<td>February 1982</td>
</tr>
<tr>
<td>ACT</td>
<td>Synthesiser</td>
<td>January 1984</td>
</tr>
<tr>
<td>AGF</td>
<td>Programmable Joystick</td>
<td>December 1983</td>
</tr>
<tr>
<td>AMS</td>
<td>Disc Drive</td>
<td>January 1984</td>
</tr>
<tr>
<td>Apple</td>
<td>Lisa</td>
<td>July 1983</td>
</tr>
<tr>
<td>Apple</td>
<td>Ill</td>
<td>May 1982</td>
</tr>
<tr>
<td>Apple</td>
<td>Macintosh</td>
<td>March 1984</td>
</tr>
<tr>
<td>British Micro</td>
<td>Mimi 801</td>
<td>July 1982</td>
</tr>
<tr>
<td>British Micro</td>
<td>EP44</td>
<td>April 1984</td>
</tr>
<tr>
<td>CWP</td>
<td>Cortex</td>
<td>December 1983</td>
</tr>
<tr>
<td>Computers</td>
<td>Lynx</td>
<td>March 1984</td>
</tr>
<tr>
<td>Canon</td>
<td>AS-100</td>
<td>December 1983</td>
</tr>
<tr>
<td>Canon</td>
<td>CX-1</td>
<td>November 1982</td>
</tr>
<tr>
<td>Canon</td>
<td>X-07</td>
<td>November 1982</td>
</tr>
<tr>
<td>Casio</td>
<td>PB-100</td>
<td>March 1984</td>
</tr>
<tr>
<td>Casio</td>
<td>fx-9900g</td>
<td>May 1983</td>
</tr>
<tr>
<td>Casio</td>
<td>602P</td>
<td>February 1983</td>
</tr>
<tr>
<td>Casio</td>
<td>FP-10Printer</td>
<td>May 1982</td>
</tr>
<tr>
<td>Coleco</td>
<td>Adam</td>
<td>April 1982</td>
</tr>
<tr>
<td>Commodore</td>
<td>71B</td>
<td>April 1984</td>
</tr>
<tr>
<td>Commodore</td>
<td>64</td>
<td>January 1984</td>
</tr>
<tr>
<td>Computdata</td>
<td>Tulpisystem</td>
<td>March 1983</td>
</tr>
<tr>
<td>Conchess</td>
<td>MonarchAmbassador/</td>
<td>January 1984</td>
</tr>
<tr>
<td>Corvus</td>
<td>Microspeech Unit</td>
<td>March 1983</td>
</tr>
<tr>
<td>Currah</td>
<td>Escouter</td>
<td>January 1984</td>
</tr>
<tr>
<td>Dacom Systems</td>
<td>Buzzbox</td>
<td>September 1983</td>
</tr>
<tr>
<td>DCP/Microdevelopments</td>
<td>SpeechPack</td>
<td>April 1983</td>
</tr>
<tr>
<td>Digihurst</td>
<td>Microsight1</td>
<td>October 1983</td>
</tr>
<tr>
<td>Digital Equipment</td>
<td>Rainbow100</td>
<td>November 1982</td>
</tr>
<tr>
<td>Dragon Data Ltd</td>
<td>Dragon32</td>
<td>August 1982</td>
</tr>
<tr>
<td>Eca International</td>
<td>ColourGenie</td>
<td>June 1983</td>
</tr>
<tr>
<td>Electrolab</td>
<td>FX System</td>
<td>November 1983</td>
</tr>
<tr>
<td>Epson</td>
<td>My Talking Computer</td>
<td>November 1983</td>
</tr>
<tr>
<td>Epson</td>
<td>OX10</td>
<td>July 1983</td>
</tr>
<tr>
<td>Epson</td>
<td>UX-20</td>
<td>December 1982</td>
</tr>
<tr>
<td>Epson</td>
<td>FX-80</td>
<td>July 1983</td>
</tr>
<tr>
<td>Ferrori</td>
<td>FX-8</td>
<td>June 1984</td>
</tr>
<tr>
<td>Fidelity</td>
<td>ArgusPPC</td>
<td>November 1983</td>
</tr>
<tr>
<td>Fortune</td>
<td>Prestige</td>
<td>February 1983</td>
</tr>
<tr>
<td>Future</td>
<td>Fortune32:16</td>
<td>October 1983</td>
</tr>
<tr>
<td>GCE</td>
<td>FX20</td>
<td>February 1983</td>
</tr>
<tr>
<td>GCS</td>
<td>GavilanMC</td>
<td>June 1984</td>
</tr>
<tr>
<td>Gemini</td>
<td>Vactrex System</td>
<td>February 1984</td>
</tr>
<tr>
<td>GRID</td>
<td>Ferret</td>
<td>June 1984</td>
</tr>
<tr>
<td>Gulfstream</td>
<td>Multiboard</td>
<td>February 1982</td>
</tr>
<tr>
<td></td>
<td>Compass</td>
<td>June 1984</td>
</tr>
<tr>
<td></td>
<td>Hyperion</td>
<td>October 1993</td>
</tr>
<tr>
<td>Hewlett-Packard</td>
<td>HP-75C</td>
<td>November 1982</td>
</tr>
<tr>
<td>Hewlett-Packard</td>
<td>15C and 16C</td>
<td>September 1982</td>
</tr>
<tr>
<td>Hewlett-Packard</td>
<td>HP-125</td>
<td>October 1982</td>
</tr>
<tr>
<td>Hewlett-Packard</td>
<td>HP-IL</td>
<td>April 1982</td>
</tr>
<tr>
<td>High Tech Electronics</td>
<td>Sid 1 Colour Board</td>
<td>March 1982</td>
</tr>
<tr>
<td>Hitachi</td>
<td>MB16001</td>
<td>April 1982</td>
</tr>
<tr>
<td>Hitachi</td>
<td>Peach</td>
<td>June 1983</td>
</tr>
<tr>
<td>IBM</td>
<td>9000Instrumentation</td>
<td>May 1982</td>
</tr>
<tr>
<td>IBM</td>
<td>Computer</td>
<td>March 1983</td>
</tr>
<tr>
<td>Ikon</td>
<td>PC Junior</td>
<td>January 1984</td>
</tr>
<tr>
<td>IO Research Ltd</td>
<td>Hobit</td>
<td>December 1982</td>
</tr>
<tr>
<td>JLM</td>
<td>Pluto</td>
<td>January 1984</td>
</tr>
<tr>
<td>LSI</td>
<td>M-Four</td>
<td>April 1983</td>
</tr>
<tr>
<td>Mannesmann Tally</td>
<td>Mat</td>
<td>August 1983</td>
</tr>
<tr>
<td>Mattel</td>
<td>Aquarius</td>
<td>November 1983</td>
</tr>
<tr>
<td>Micorwriter Ltd</td>
<td>Phant6m</td>
<td>September 1982</td>
</tr>
<tr>
<td>Milton Bradley</td>
<td>Monro8820</td>
<td>July 1983</td>
</tr>
<tr>
<td>Monro8820</td>
<td>Monro8820</td>
<td>April 1982</td>
</tr>
<tr>
<td>Motorola</td>
<td>Micro-ProfessorII</td>
<td>December 1982</td>
</tr>
<tr>
<td>Multitech</td>
<td>September 1983</td>
<td></td>
</tr>
<tr>
<td>NCR</td>
<td>DecisionMate V</td>
<td>March 1983</td>
</tr>
<tr>
<td>NEC</td>
<td>PC-8201A</td>
<td>October 1983</td>
</tr>
<tr>
<td>NEC</td>
<td>G007GraphicsModule</td>
<td>September 1983</td>
</tr>
<tr>
<td>Novag</td>
<td>Constellation</td>
<td>October 1983</td>
</tr>
<tr>
<td>Olivetti</td>
<td>M20</td>
<td>September 1982</td>
</tr>
<tr>
<td>Orct Products</td>
<td>Orcl</td>
<td>April 1983</td>
</tr>
<tr>
<td>Osborne</td>
<td>Executive</td>
<td>July 1983</td>
</tr>
<tr>
<td>Positron</td>
<td>9000</td>
<td>October 1983</td>
</tr>
<tr>
<td>Robocorn Ltd</td>
<td>BitStik</td>
<td>November 1982</td>
</tr>
<tr>
<td>SAGE</td>
<td>II</td>
<td>February 1983</td>
</tr>
<tr>
<td>Scully</td>
<td>Chess Champion Mark5</td>
<td>January 1983</td>
</tr>
<tr>
<td>Semi-Tech</td>
<td>Pled Piper</td>
<td>September 1983</td>
</tr>
<tr>
<td>Sharp</td>
<td>MZ-700</td>
<td>February 1984</td>
</tr>
<tr>
<td>Sharp</td>
<td>MZ-1251</td>
<td>February 1983</td>
</tr>
<tr>
<td>Sharp</td>
<td>MZ-1500</td>
<td>June 1982</td>
</tr>
<tr>
<td>Sharp</td>
<td>MZ-80A</td>
<td>June 1982</td>
</tr>
<tr>
<td>Sharp</td>
<td>MZ-80A</td>
<td>April 1984</td>
</tr>
<tr>
<td>Sharp</td>
<td>Z80A</td>
<td>April 1983</td>
</tr>
<tr>
<td>Shellton-Instruments</td>
<td>SigNet</td>
<td>October 1983</td>
</tr>
<tr>
<td>Sinclair</td>
<td>Microdot</td>
<td>June 1982</td>
</tr>
<tr>
<td>Sinclair</td>
<td>ZX Spectrum</td>
<td>January 1982</td>
</tr>
<tr>
<td>Sinclair</td>
<td>Z881 Printer</td>
<td>December 1983</td>
</tr>
<tr>
<td>SMT</td>
<td>Goupil-3</td>
<td>August 1983</td>
</tr>
<tr>
<td>Sord</td>
<td>M5</td>
<td>August 1982</td>
</tr>
<tr>
<td>Sord</td>
<td>ExalightExpert</td>
<td>March 1984</td>
</tr>
<tr>
<td>Spectravideo</td>
<td>SV-318 and SV-328</td>
<td></td>
</tr>
<tr>
<td>Tandata</td>
<td>Homedock</td>
<td>April 1984</td>
</tr>
</tbody>
</table>
SOFTWARE

<table>
<thead>
<tr>
<th>PROGRAM</th>
<th>ISSUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2-3</td>
<td>April 1984</td>
</tr>
<tr>
<td>1-2-3</td>
<td>November 1983</td>
</tr>
<tr>
<td>1982 Database Roundup</td>
<td>December 1982</td>
</tr>
<tr>
<td>1983 Database Roundup</td>
<td>December 1983</td>
</tr>
<tr>
<td>1983 Spreadsheet Roundup</td>
<td>December 1983</td>
</tr>
<tr>
<td>Accountancy Programs</td>
<td>June 1983</td>
</tr>
<tr>
<td>(General)</td>
<td>September 1982</td>
</tr>
<tr>
<td>Aquila</td>
<td>January 1984</td>
</tr>
<tr>
<td>Benchmarks Explained</td>
<td>August 1983</td>
</tr>
<tr>
<td>(Reference Article)</td>
<td>February 1984</td>
</tr>
<tr>
<td>Beta</td>
<td>January 1984</td>
</tr>
<tr>
<td>Brainstorm</td>
<td>February 1983</td>
</tr>
<tr>
<td>Busfile</td>
<td>August 1982</td>
</tr>
<tr>
<td>Buspost</td>
<td>December 1982</td>
</tr>
<tr>
<td>Cardbox</td>
<td>November 1982</td>
</tr>
<tr>
<td>Color Scriptman</td>
<td>March 1982</td>
</tr>
<tr>
<td>Condor Database</td>
<td>August 1983</td>
</tr>
<tr>
<td>Databases (Choosing One)</td>
<td>March 1983</td>
</tr>
<tr>
<td>Dataplan</td>
<td>October 1983</td>
</tr>
<tr>
<td>Dataprom</td>
<td>December 1983</td>
</tr>
<tr>
<td>DBM325</td>
<td>March 1982</td>
</tr>
<tr>
<td>Delta</td>
<td>June 1984</td>
</tr>
<tr>
<td>Design</td>
<td>September 1982</td>
</tr>
<tr>
<td>DMS</td>
<td>December 1983</td>
</tr>
<tr>
<td>Dragon Disks</td>
<td>June 1984</td>
</tr>
<tr>
<td>E40</td>
<td>July 1983</td>
</tr>
<tr>
<td>Ecalc</td>
<td>February 1984</td>
</tr>
<tr>
<td>Expert-Ease</td>
<td>June 1984</td>
</tr>
<tr>
<td>Falc</td>
<td>January 1984</td>
</tr>
<tr>
<td>Financial Director</td>
<td>June 1983</td>
</tr>
<tr>
<td>FM580</td>
<td>April 1982</td>
</tr>
<tr>
<td>Frequent</td>
<td>February 1982</td>
</tr>
<tr>
<td>Homework</td>
<td>November 1982</td>
</tr>
<tr>
<td>HP41-C-Text Editor</td>
<td>February 1984</td>
</tr>
<tr>
<td>Home Accounts/Finance Manager</td>
<td>January 1984</td>
</tr>
</tbody>
</table>

PERSONAL COMPUTER WORLD SPECIALS: 1984 MICROCOMPUTER BENCHTEST SPECIAL: (£2.40 inc p&p) — 20 leading micros reviewed by the PCW team. Desktop Computing (£2.25 inc p&p) — comprehensive guide to using micros in your business. Binders (£3.95 each inc p&p) — keep your copies in order with these strong, attractive yellow binders.

ANYONE ISSUE £1.50; ALL ADDITIONAL ISSUES £1.00 EACH. BENCHTEST SPECIAL £2.40. 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/PO PAYABLE TO COMPUTING PUBLICATIONS LTD.
we know computers

Cambridge Computer Store
1 & 4 Emmanuel Street, Cambridge

Business &
Professional
Tel 0223 65335 4

Home &
Educational
4

Cambridge Computer Store
1 & 4 Emmanuel Street, Cambridge

Business &
Professional
Tel 0223 65335 4

Home &
Educational
4

Cambridge Computer Store
1 & 4 Emmanuel Street, Cambridge

IBM
Apple
Digital
Tandy
HP
Kaypro
Epson
Sanyo
BBC
Sinclair
Electron

FIRST for
EPSON

and
OKI MICROLINE

PRINTERS

EPSON

SHEER ELEGANCE
RX 80
100 CPS 80 Col
RX 80 F/T
100 CPS 80 Col
RX 100 F/T
100 CPS 136 Col
FX 80
160 CPS 80 Col
FX 100
160 CPS 136 Col
M92P
160CPS 80 Col
M92S
160CPS 80 Col
M83A
120CPS 136 Col
M84P
200CPS 136 Col
M84S
200CPS 136 Col
M93P
160CPS 136 Col
M93S
160CPS 136 Col

OEM

Price

List
Price

£

£

449

379

539

459

489

419

799

679

899

769

585

499

£

569

449

M82A
120CPS 80 Col

SHEER MAGIC

299

259

BARGAINS

SHEER VALUE

SHINWA CTICP80

JUKI Daisywheel

SEIKOSHA GP100A

OLIVETTI

JP101 Ink Jet

DAISYSTEP

List

Price

£

299

449

459

215

199

199

199

159

288

249

OEM

Price

£

199

349

199

199

159

249

PRICING

OEM Prices are exclusive of carriage and VAT and are current at time of printing.
CARRIAGE ONLY £5 ON ALL ITEMS

ALWAYS CALL FOR OUR BEST PRICES ON OTHER LEADING PRODUCTS

By phone, quoting your ACCESS or BARCLAYCARD number or by sending a cheque for the OEM price stated, plus carriage and VAT. Please allow 7 days for cheque clearance. 30 days credit for Official Orders from PLC's and Public Authorities, subject to 5% Credit Charge.

OEM Computer Sales
9-11 Regent Street
Rugby
Warwickshire CV21 2PE

TELEPHONE HOTLINE
(0788) 70522/3/4
There's only one way to be sure!

When data is important it needs to be stored in a reliable place and they don't come any more reliable than Datasafe.

A full range of quality 5¼" and 8" floppy diskettes supplied in boxes and packs of 1, 2 or 3. Manufactured and tested to exacting standards ensuring 100% error-free operation and utmost reliability. Already used on most micros including Apple, IBM, Compaq, ICL PC, BBC Micro, Rank Xerox etc.

As with all products from Samleco, prices are in sterling with guaranteed price stability. We don't expect you to believe everything we say but if you test our product and fail to agree with our quality expectations we'll give you a free pack. Can we say fairer than that?

Samleco International Ltd, SCS House, 9 Fairacres Ind. Est., Dedworth Road, Windsor, Berks SL4 4LE, England. Tel: Windsor (07535) 54717 (2 lines). Telex: 838791

TM Datasafe is the trade mark of Samleco International Ltd.
FOR COMMUNICATIONS INSIGHT

For those of you who wish to use, at low cost, VIEWDATA, TELEX, ELECTRONIC MAIL, or even use your micro as a Viewdata/Telex terminal.

AT LAST, CYTEL is a unique company dealing with the many applications of Viewdata and training support.

Use Our Experience.
We Can Help!

Talk to Greg, Malcolm or Ben at Cytel.

OXFORD PASCAL

WHAT DO I GET?
With the cassette version of OXFORD PASCAL you get:
- A powerful text editor for preparing PASCAL programs
- A resident compiler giving 14k of user RAM
- A powerful set of colour graphics and sound extensions to standard PASCAL

With the disk version of OXFORD PASCAL you get:
- All the above, PLUS
- A full disk to disk compiler exploiting the entire memory of the 64 for PASCAL programs.

HOW MUCH DOES OXFORD PASCAL COST?
Cassette version (resident compiler only) £19.95
Full disk compiler (1541, 4040, 8050, 8250 drives) £49.95
Prices are exclusive of VAT. There is also a small charge for post and packing.
WANTED. British made portable bus. micro, incl. Fin. Plan, Exec. Desk Top, w.p. & filing software. Must have BT aprvd. on-board modem and auto-dial for direct connect to Prestel, Micronet 800, and other Viewdata systems. Built-in screen, RS232 and printer interfaces, twin disk drives and 64K bytes of memory req'd. Should be no more than £11000.00

FOR SALE. The new Wren Executive System. No other small computer offers you more... so why settle for less?

Distributed by: Wren Computers Ltd. Telephone: 01-253 2277

Carry the company in your hand not on your shoulders

The Wren is designed by Transam Computers Limited. Perfect Software® is a trademark of Perfect Software Inc. Micronet 800 is the trading style of Telemap Limited and British Telecom. Executive Desktop is the copyright of Quanta Systems and Software Limited. Prestel is the trademark of British Telecom. All prices exclude VAT.

For full details of the Wren Executive System complete this coupon and send it to:
Prism Microproducts Limited, 18-29 Mora Street, City Road, London, EC1V 8BT Telephone: 01-253 2277

Name
Company
Address
Telephone
EPSON PX-8
PERSONAL PORTABLE COMPUTER

PERSONAL COMPUTER POWER – WHEN AND WHERE YOU WANT IT

- Total compatibility with the wide range of Epson products.
- Total support from Transam with both software & technical expertise.
- Big 80*8 LCD virtual screen with full graphics.
- 64K User Ram expandable to 184K Ram disk area.
- Built in microcassette drive for mass storage.
- CP/M operating system and Basic in ROM – wide range of compatible software.
- Wordstar, Micro Calc, Scheduler, & Cardbox Plus supplied as standard in plug-in ROMs, Terminal & Comms software also included.
- Dual NiCd batteries for non-stop computing, (AC charger supplied).
- Three microprocessors for speed & power, inc. industry std. Z80.
- RS232 and serial communication ports.

Epson PX-8 64K Computer with all SW detailed above. £798.00 + VAT
Epson PX-8 64K Computer as above, with 120K RAM Pack. £998.00 + VAT
Epson TF-20 dual 5” drive unit (mains, inc IF cable) £525.00 + VAT

* RAM Pack available June/July
To reserve your machine telephone our sales hot-line on 01-404 4554 immediately.
Additional Software available from Transam, either on disk or cassette. Please specify which version is required when ordering.

- Lisp80 (SW Toolworks) £60.00 + VAT
- TCL Pascal Compiler £60.00 + VAT
- C-80 (SW Toolworks) £60.00 + VAT
- Nevada Fortran £70.00 + VAT
- Indexer £100.00 + VAT
- Superfile/Superforms £195.00 + VAT
- BSTM Communications £135.00 + VAT
- Blast (PX8 TO IBMPC COMS) £195.00 + VAT
- HX20 DevPack (XASM68) £150.00 + VAT
- Big 80*8 LCD visual screen with full graphics.

DEALER PRICES AVAILABLE ON SOFTWARE.

MICROSYSTEMS LIMITED
59/61 Theobalds Road,
LONDON WC1X 8SF
Tel: 01-404 4554
Are all important factors when it comes to choosing the right people to look after your personal computer system especially in the event of a breakdown.

We at CSL recognise the importance of these factors and regard maintenance as a vital part of any computer back-up service.

With our team of fully trained engineers we specialise in maintaining microcomputers and their associated peripherals.

Our maintenance contracts offer a fully comprehensive cover and guarantee a fast and efficient service:

- **5 STAR SERVICE**
  - A RESPONSE TO ALL CALLS WITHIN 24 HOURS
  - REPLACEMENT PARTS
  - ALL LABOUR AND TRAVELLING COSTS
  - ON-SITE REPAIRS
  - 2 PREVENTATIVE MAINTENANCE VISITS

**MANY PEOPLE PROMISE THIS WE GUARANTEE IT!**

FOR A FREE ESTIMATE PHONE US NOW!

01-883 1186

CSL SYSTEMS SERVICE LTD
51 COLNEY HATCH LANE, MUSWELL HILL, LONDON N10 1LJ
At £1,000* the Wren is the desk-top that's not desk-bound.

The Wren Executive System: British made and backed by the distribution expertise of Prism Business Systems. No other small computer packs in so much for such a price. Simply add up its strengths and you'll see just what we mean:

- Full range of Perfect business software including financial planning, word processing and sophisticated filing systems.
- Executive Desk Top System - includes electronic diary, notepad, calculator, timer clock and random access card index.
- British Telecom approved on-board autodial modem and communications software for direct access to Prestel, Micronet 800, and other private viewdata systems.
- Built-in 7 amber screen. Twin disk drive. 64K bytes of memory.
- Built-in interfaces include RS232, Winchester disk drive and external colour monitor.
- 3 months free subscription to Micronet 800 and Prestel.
- Fully portable.
- No other small computer offers your customers more... so why settle for less.

Carry the company in your hand not on your shoulders.

New from Xebec —

The 9710H Slimline Disk Subsystem

The 9710H disk subsystem — slimline in form factor, but filled with system features:

- 10 Megabyte formatted capacity using half high 5¼-inch Winchester disk unit.
- Universal SASI interface for system connection to wide range of popular microcomputers.
- Available selection of Xebec host adaptor cards to allow easy add on to existing microsystems.
- Automatic data error detection and correction to give high data integrity.
- Small ‘footprint’ to minimise work space required.
- No fan convection cooling for low acoustic noise — ideal for office environment.

- Professional I/O connectors with provision for easy daisy chaining of additional box on SASI bus.
- Includes widely used and industry proven Xebec controller technology.

Good looks combined with good features make the 9710H a very attractive box.

The Xebec ‘Xero D’ signature that appears on this page is the quality mark of the company. It identifies zero defect quality as the goal on every program and product within Xebec. This commitment to quality and a major continuing investment in both product and manufacturing technology are earning Xebec its position as a major supplier of advanced technology product for microcomputer systems.

Xebec Systems Ltd.,
1st Floor, Cockayne House,
Crockhamwell Road,
Reading RG5 3JH
Tel: (0734) 693511
Telex: 849443

Belgium — Tel: 32-02-7629 494, Telex: 65054. Italy — Tel: 39-6-350201, Telex: 620114.
We have the solutions ... now what's your problem?

At CISS we understand the business systems you're running, and we can tell you how best to develop them, enhance them, and get more out of them. Because we make it our business to understand business systems, their problems, and how to solve them using the changing technology available today.

CISS can recommend hardware and software solutions; provide remote access to mainframe information processing; integrate telecommunications; and train staff to best-exploit your investment. From a micro to a fully-distributed system.

We'll undertake every aspect of systems review; support you on a daily basis; and monitor your systems in the longer term – so changes won't come as surprises.

Whatever your system, and whatever your problem, we'll help you find a cost-effective solution that works.

CISS – the complete computer service.

SYSTEMS CONSULTANCY
SOFTWARE SOLUTIONS
HARDWARE SELECTION
TRAINING AND EDUCATION
INSTALLATION AND SUPPORT
INFORMATION PROCESSING
SPECIALIST SERVICES

Contact: CISS, 311 Ballards Lane, Finchley, London N12 8LY. Telephone: 01-446 6841.
How to teach your Micro
a thing or two

Thousands of home computer owners have yet to discover their microcomputer’s potential to help with many of the problems and decisions that come up every day in the home or office.

Perhaps you have always promised yourself that you would teach yourself programming, but have been put off by manuals which seem to assume a lifetime spent studying computer science and mathematics. Maybe you have looked at other computer books, but have yet to find one which is free of unnecessary jargon or where the program examples bear some relevance to real life and not space invaders.

Relax, your search is over. The ‘Learn BASIC’ tutorials from Logic 3 are the latest development of a teaching method pioneered by Professor Andrew Colin and perfected by testing on 3 generations of students at Strathclyde University. The ‘Strathclyde Method’ has been translated into 8 languages and used by over 300,000 microcomputer users.

‘Learn BASIC’ is a jargon free, step by step course in computer programming, which explains everything clearly in English, not computer talk. In a matter of hours you will be writing your first programs.

‘Learn BASIC’ is designed for people who want to keep abreast of the computer age, for people who realise that understanding computers is a key to future success at work, at school, and as a parent.

Get ‘Learn BASIC’ and teach your micro how to be useful! (Available from major branches of W.H. Smiths, Boots, Laskys, Greens, John Menzies and better computer shops nationwide.)
You should see what he's just seen.

Micronet 800.
Stretching the mind of your micro far beyond its limits.

Micro evolution continues with this unique communications, information and software system. Set on our mainframes nationwide.

Includes 30,000 pages and access to Prestel* with its full range of services.
A tremendous Communications section that networks you to thousands of other members across the country.
Send and receive electronic messages and graphics at a touch of a button.

And there's the Chatline service, Swapshop and Teleshopping.
Check with daily updates on the very latest computer news.
Micronet also has its own huge facts data base.
And a choice of up-to-the-minute software to download absolutely free.

For only £13 a quarter and just a local telephone call whenever you want to connect up (that's only 22p per half hour at cheap rates) you could be part of Micronet.
The only accessory you need is a Modem.
A small price to pay to join the other visionaries on this exciting new system.

Fill in the coupon for more details and send to Micronet 800, Durrant House, 8 Herbal Hill, London EC1R 5EJ.
But be warned, Micronet 800's features are almost limitless and constantly updating. So maybe you'd be better to call in at Laskys, John Lewis, main Boots or your local Micronet 800 Action Station.
To feast your eyes on all the amazing things it can do.

Fro: MICRONET 800, Durrant House, 8 Herbal Hill, London EC1R 5EJ. Telephone 01-278 3143.
Please send me the full facts about Micronet 800.

Name
Make/Model of Micro
Address
Telephone

For 97% of telephone users.
Prestel is a trademark of British Telecommunications.
The Unicorn Modem

- Auto Dial
- Auto Redial
- Auto Answer
- Auto Baud Rate Scan
- Full Duplex (300 baud)
- Half Duplex
- Bulletin Board Facility
- Number Memory Store
- European and U.S.A. Standards
- Complete with Power Supply Leads and Manual at a Breakthrough Price of £49.95 EX VAT AND P & P.

We've taken the best components from the best suppliers and combined them to produce a modem with everything you could want. Modern manufacturing and quality control techniques have brought a breakthrough in price. Our philosophy is to pass those savings on to you and to recover our R & D costs across increased sales. We've made the modem easy to understand and use, you don't need to know anything about baud rates or bits, simply plug in and talk to the world.

Features of the Unicorn Modem include:

Auto Answer
Unicorn automatically answers, then uploads or downloads data into your micro and printer just like a telex.

Auto Baud Rate Scan
When receiving, the modem scans the incoming data and selects the correct baud rate to receive.

Full and half duplex
One (full duplex) or two-way (half duplex) simultaneous transmission.

Full U.K. European and U.S.A. standards
V21 and 23, CCITT. Fully compatible with Termi, Communicator and other existing software.

BAUD RATES
300/300 1200/1200 1200/75 75/1200

Easy to Use
Complete with all leads, power supply, operating and reference manuals. Just plug in, no soldering required. Fits all RS232/423 interfaces. (State machine).

Technical Enquiries: Ring Barry Krite on 01 482 1711
Dealer Enquiries: Ring Mark Simon on 01 930 1612
Orders on Access/Visa: 01 482 1711

Unicorn Limited, A joint Rushworth Dales - D.B. Enterprises Company 20 Orange Street, London WC2H 7ED.

To: Unicorn Limited, 20 Orange Street, London WC2H 7ED. Please send me:

(Qnty) Unicorn Modems at £60. Includes VAT and P & P (State Machine)
(Qnty) Unicorn ROM's at £24. Includes VAT and P & P
(Qnty) Unicorn disks at £4.95 includes VAT and P & P State 40. or 80 track.

I enclose cheque to the value of £
Or debit my Access/Visa card no.

Signature: Name:
Address: Postcode:

PROHIBITED from direct or indirect connection to any telecommunication system run by British telecommunications. Action may be taken against anyone so connecting this apparatus.
**HARD DISK DRIVES**

Fully refurbished DIABLO/DRE series 30 2.5 Mbyte disk drive £270/
DIABLO/DRE series 60 5 Mbyte disk drive £450/
DIABLO/DRE series 120 10 Mbyte disk drive £750/
DIABLO/DRE 44X400A 5.5" vented hot-plug drive £370 wonders for 100's of stock items and one off bargains.
ON LINE NOW - 300 bond full data CCITT 144.8kbps, new.
01-677 1888

EX STORE INTEGRATED CIRCUITS OVER 100,000 ITEMS INCLUDING:

- 74 series
- 555 timer
- 556 timer
- 557 timer
- 74HC series
- 74ACT series
- 74ALS series
- 74AS series
- 74AS-PC series
- 74ALC series
- 74AS-PC series
- 74LVC series

Prices range from £5 to £30 per 1000.

01-679 4414

**DIYSTEL**

The ORIGINAL FREE OF CHARGE data up to data base
3000's of stock items and one off bargains.
ON LINE NOW - 300 bond full data CCITT 144.8kbps, new.
01-677 1888

**STILL IN STOCK**

FP1500 Heavy Duty 25 cps daisy wheel RS232 interface, directory printers.
Brand New ONLY £9.95.

CALL FOR MORE DETAILS

**COOLING FANS**

Keep your hot parts COOL and RELIABLE with these high quality, miniature fans. Useable in various sizes from miniatures to large sized versions. Available in various voltages, current requirements and rotation speeds. Also available with shrouded blades to give extra protection. BRAND NEW condition with cable for BBC micros.

Additionally, for all future expansion requirements, we have a range of miniatures and a special 240 volt fan, suitable for all major computer company, comprising of brushless very quiet running 240 v operation. BRAND NEW £6.95

**FINGER GUARD.** £9.95.

**DUAL 5" DISK DRIVES**

Current, quality, professional product of a major computer company, comprising of miniatures with Brushless cooling fan complete with finger guards. £9.95.

High quality, miniature fans, a very quiet running 240 operation. NEVER used. £9.95.

BLUETOOTH - full kit of 4 miniature fans with fans in a brushless direct drive. £19.95.

Current, quality, professional product of a major computer company, comprising of miniatures with Brushless cooling fan complete with finger guards. £9.95.

MUFFIN-CEANTUR standard 4", 4" 1/4", 5 1/4" and 3" 3/8" for BBC micros. £4.95, £6.95, £14.95 and £19.95 respectively for BBC NEW 240v at 3 x 5 amp, 2 x 5 amp. £9.95

Current, quality, professional product of a major computer company, comprising of miniatures with Brushless cooling fan complete with finger guards. £9.95.

MUFFIN-CEANTUR standard 4", 4" 1/4", 5 1/4" and 3" 3/8" for BBC micros. £4.95, £6.95, £14.95 and £19.95 respectively for BBC NEW 240v at 3 x 5 amp, 2 x 5 amp. £9.95

**DUAL 5" DISK DRIVES**

Current, quality, professional product of a major computer company, comprising of miniatures with Brushless cooling fan complete with finger guards. £9.95.

High quality, miniature fans, a very quiet running 240 operation. NEVER used. £9.95.

**COMPUTER 'CAF'**

All in one quality computer cabs, designed to be fitted with a Commodore 128 or 64, can be built to order, to suit your needs. High quality, professionally designed, compact, attractively styled, grey ABS plastic. £89.95.

**HIGH COMPRESSION INTERNAL PROPER SATIONAL SPACES**

High compression space for proper and complete spaces. £1.95

**DUAL 5" DISK DRIVES**

Current, quality, professional product of a major computer company, comprising of miniatures with Brushless cooling fan complete with finger guards. £9.95.

**FINGER GUARD.** £9.95.

**DUAL 5" DISK DRIVES**

Current, quality, professional product of a major computer company, comprising of miniatures with Brushless cooling fan complete with finger guards. £9.95.

High quality, miniature fans, a very quiet running 240 operation. NEVER used. £9.95.

**COMPUTER 'CAF'**

All in one quality computer cabs, designed to be fitted with a Commodore 128 or 64, can be built to order, to suit your needs. High quality, professionally designed, compact, attractively styled, grey ABS plastic. £89.95.

**FINGER GUARD.** £9.95.

**DUAL 5" DISK DRIVES**

Current, quality, professional product of a major computer company, comprising of miniatures with Brushless cooling fan complete with finger guards. £9.95.

High quality, miniature fans, a very quiet running 240 operation. NEVER used. £9.95.

**COMPUTER 'CAF'**

All in one quality computer cabs, designed to be fitted with a Commodore 128 or 64, can be built to order, to suit your needs. High quality, professionally designed, compact, attractively styled, grey ABS plastic. £89.95.

**FINGER GUARD.** £9.95.

**DUAL 5" DISK DRIVES**

Current, quality, professional product of a major computer company, comprising of miniatures with Brushless cooling fan complete with finger guards. £9.95.

High quality, miniature fans, a very quiet running 240 operation. NEVER used. £9.95.

**COMPUTER 'CAF'**

All in one quality computer cabs, designed to be fitted with a Commodore 128 or 64, can be built to order, to suit your needs. High quality, professionally designed, compact, attractively styled, grey ABS plastic. £89.95.

**FINGER GUARD.** £9.95.

**DUAL 5" DISK DRIVES**

Current, quality, professional product of a major computer company, comprising of miniatures with Brushless cooling fan complete with finger guards. £9.95.

High quality, miniature fans, a very quiet running 240 operation. NEVER used. £9.95.

**COMPUTER 'CAF'**

All in one quality computer cabs, designed to be fitted with a Commodore 128 or 64, can be built to order, to suit your needs. High quality, professionally designed, compact, attractively styled, grey ABS plastic. £89.95.

**FINGER GUARD.** £9.95.

**DUAL 5" DISK DRIVES**

Current, quality, professional product of a major computer company, comprising of miniatures with Brushless cooling fan complete with finger guards. £9.95.

High quality, miniature fans, a very quiet running 240 operation. NEVER used. £9.95.

**COMPUTER 'CAF'**

All in one quality computer cabs, designed to be fitted with a Commodore 128 or 64, can be built to order, to suit your needs. High quality, professionally designed, compact, attractively styled, grey ABS plastic. £89.95.

**FINGER GUARD.** £9.95.

**DUAL 5" DISK DRIVES**

Current, quality, professional product of a major computer company, comprising of miniatures with Brushless cooling fan complete with finger guards. £9.95.

High quality, miniature fans, a very quiet running 240 operation. NEVER used. £9.95.
At a TABS Business Centre you'll get free advice, the best hardware and software, expert training and a professional installation service – all in one place.
Herbie Briggs has just destroyed the myth that all floppy discs are created equal.

They seem equal. Until you look at the seams.
That's where equality ends.
Most companies seal their discs with a spot here, a spot there. Leaving most of each seam not sealed at all.
Sooner or later, the seams might do what comes naturally: they bulge. Warp. Pucker. Open up.
Pens, pencils, fingernails—even a four-year-old's, like Herbie—can catch and snag in those wide open spaces.
That's sloppy. And dangerous. Because if you put a sloppy floppy into your disc drive, it can jam your drive. Ruin your drive head. Lose your data.
So much for their seams. Ours are different.

THE SLOPPY FLOPPY:
Scaled with a spot here, a spot there. Leaving unsealed seams everywhere.

Memorex uses a process we developed, called Solid-Seam Bonding.
Solid-Seam Bonding seals shut every inch of every seam of every Memorex floppy disc. Tight as a drum. That makes the Memorex floppy stiffer. Stronger. And your data safer.
To resist bulging, warping, puckering, or opening up.

MEMOREX SOLID-SEAM BONDING:
Every inch of every seam is sealed shut. Tight as a drum.

To resist all the things that can jam your drive, ruin your drive head, or lose your data.
Which proves that a Memorex floppy disc isn't equal to all the others. It's better. Solid-Seam Bonding is just one example of the extra care that goes into every Memorex floppy disc. Be it 8" 5¼" or the new 3½". Extra care that lets us guarantee every Memorex disc to be 100% error-free.
The next time you're buying a floppy disc—or a few hundred of them—just remember this:
It's always better to be safe than sloppy.
For more information on the full line of Memorex quality computer media products, including computer tape, call Memorex U.K. Ltd., 96-104 Church Street, Staines, Middlesex.
Tel: 0784 51488

Your Data. When it matters, make it Memorex.
EasySales Pro™
picks your best prospects instantly.

The more accurately you pick your best sales prospects, the more time you save. Your sales force spends more time selling, less time figuring out who to sell to.

EasySales Pro is a personal computer program that can dramatically increase the efficiency of your sales efforts. In one easy-to-learn program, EasySales Pro sets up sales call priorities by ranking the importance of your prospects. It shows you how much time should be spent with them, and how often to call.

Just tell EasySales Pro about your customers and prospects. The program guides you to better sales decisions.

EasySales Pro is designed to be adaptable to a wide variety of sales management systems, so you can easily customize it to your product line. And EasySales Pro can generate timely reports on territory activity, as well as in-depth records of prospects. This makes it a snap to update your sales and prospect information.

Pick your best prospects...before your competitors do. Pick up EasySales Pro at any Sorcim/IUS dealer.

Special offer:
Free demo diskette

☐ Please send me a Free Demo Diskette® so I can preview the features and effectiveness of EasySales Pro™

Name _____________________________
Address ___________________________
_________ ___________ __________
Tel: ______________________________

Post this coupon to:
Sorcim/IUS, 10 Station Road, Watford,
Herts WD1 1EG. Tel: (0923) 46255.

Diskette is designed for use with IBM-PC® or fully compatible hardware systems.
IBM-PC is a registered trademark of International Business Machines Corporation.

10 MEGABYTES PC
JUST £1,995
APRICOT F1
WITH
INTERNAL
10Mb HARD DISK
INCLUSIVE OF SOFTWARE
VALUED AT £1,000
VARIOUS MONITOR OPTIONS
(EXTRA)

C+E MICROTRONICS
3 WALDERSLADE CENTRE
WALDERSLADE ROAD
CHATHAM, KENT
ME5 9LR
Tel: 0634 63036
01-301 4141

THE VIKINGS ARE COMING!!!
SWESCOT are proud to announce that we
will soon be releasing several top quality
programmes on the international market,
made by some of Sweden’s most proficient
programmers.
And best of all.......... PRICES FROM £1.99
Du som bor i Skandinavien och söker bra
program till din hemdator.

KONTAKTA OSS!!!
Vi har det mesta som finns i denna tidning
till samma låga priser som gäller i England.
Dessutom får vi in alla nyheter samtidigt
som de släpps i England.
OBS!!! Vid katalogbeställning v.g. medsänd 5:- Skr
i frimärken för portot.

SWESCOT
Box 213
121 02 Johanneshov, SWEDEN
08/39 27 00 — 08/81 18 01
We are looking for established companies that would be interested in
marketing Swedish software
DEALER INQUIRIES WELCOME

MEGADEALS
Trade-in your
weeny ½K Hoity-Toity 3000
for the latest
30 Mega Thingy Quality Leap.
We also buy Computers &
Peripherals for CASH
(If you can’t put up
with its superior
comments having spent
24 hours playing ‘The Hobbit’
and getting .002%)
We’ll even take your
sooper-dooper
computer gear
in part exchange for
weird but wonderful
Hi-Fi rigs, Walkpersons etc
from our
Lo/Mid/Hi-Fi store
or against Niknok, Conan,
Printax, Oilmouse cameras
and 30,000mm lenses
from our two
photographic emporiums.
### Offer the UK's lowest prices on computer systems

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>APRICOT TWIN 315K and monitor</td>
<td>£1,350</td>
</tr>
<tr>
<td>APRICOT TWIN 720K and monitor</td>
<td>£1,500</td>
</tr>
<tr>
<td>APRICOT XI 15MB and monitor</td>
<td>£2,000</td>
</tr>
<tr>
<td>APRICOT XI 10MB and monitor</td>
<td>£2,150</td>
</tr>
<tr>
<td>SIRIUS TWIN 600K</td>
<td>£1,650</td>
</tr>
<tr>
<td>SIRIUS TWIN 1200K</td>
<td>£2,150</td>
</tr>
<tr>
<td>SIRIUS SX 10MB</td>
<td>£2,900</td>
</tr>
<tr>
<td>EPSON RX80 F/T</td>
<td>£210</td>
</tr>
<tr>
<td>EPSON FX80</td>
<td>£310</td>
</tr>
<tr>
<td>EPSON RX100</td>
<td>£330</td>
</tr>
<tr>
<td>EPSON FX100</td>
<td>£400</td>
</tr>
<tr>
<td>EPSON DX100</td>
<td>£340</td>
</tr>
<tr>
<td>WORDSTAR</td>
<td>£190</td>
</tr>
<tr>
<td>LOTUS1-2-3</td>
<td>£250</td>
</tr>
<tr>
<td>DMS DELTA</td>
<td>£375</td>
</tr>
<tr>
<td>D-BASE II</td>
<td>£225</td>
</tr>
<tr>
<td>PEGASUS</td>
<td>£175</td>
</tr>
</tbody>
</table>

All products carry 12 months full guarantee, with HOTLINE phone support. Prices excluding only of VAT and delivery. We **GUARANTEE** the lowest prices full stop!

**COMPANY SERVICES INCLUDE:**

- CUSTOMISED DATABASE SYSTEMS, MAINTENANCE CONTRACTS, INSTALLATION CONTRACTS, NETWORK SYSTEMS, MULTI-USER SYSTEMS.

**FINANCING:**

- CASH, LEASE-RENTAL, LEASE-PURCHASE, SHORT-TERM RENTAL, HIRE-PURCHASE, PERSONAL LOANS, INSTANT CREDIT (subject to status).

* Provide a currently advertised lower price within 7 days of purchase and difference will be refunded.

---

**I.S.C. LIMITED**

**GRAPHIC HOUSE, 88 WAVENEY ROAD**

**ST IVES, CAMBS PE17 4SW**

**TEL: 0480 300533**

---

This modular communications package gives your QL more versatility and potential than probably any other add-on.

Using expansion connectors, the units stack on top of each other to provide a universal communications facility for VT100 emulation, telex, electronic mail, home banking and teleshopping, user-to-user communication, rapid data and word processor transfer between sites, downloadable software and access to the international PSS network and databases such as Prestel and Micronet 800.

The modules can be purchased individually, starting with the Q CON for interfacing, micro-based I/O control, and midrodrive software support for itself and subsequent modules. It accepts any modem, including of course the Q MOD V23 modem. Q CALL provides unattended auto-dial and answering.
But before you leap at the likely cost of all this, just take a look at the price details in the order coupon. Because in the same way that the QL gives you so much for so little, the cost of communicating now takes a downward jump of order coupon. Because in the same way that the QL gives you so much for so little, the cost of communicating now takes a downward jump of order coupon. Because in the same way that the QL gives you so much for so little, the cost of communicating now takes a downward jump of order coupon. Because in the same way that the QL gives you so much for so little, the cost of communicating now takes a downward jump of order coupon.

Test drive the Macintosh in your own office or home for 24 hours free

From now until the end of the year you can see just how useful the Macintosh could be to your business by testing it yourself in your own environment. It will help you to prepare letters and reports, run the company accounts, produce charts and presentation slides. It is easy to use, it can be set up in minutes, learnt in hours and will last for years. Call in anytime to arrange the details for your free test drive and also find out about the Apple Credit Card which gives you up to £1,500 of instant credit (subject to status and acceptance).

Apple Macintosh 128kb with monitor, built in disk drive, keyboard and mouse.

£1695 inc. MACPAINT and MACWRITE software.

Apple Macintosh 512kb now available £2495.

We've moved to a bigger and better new store! Extensive business software now available. Prices exclude VAT.

Open Mon-Sat 9.30am-6.30pm

The Business Computer Store
231 Baker Street, London NW1. Telephone: 01-935 5262

Q MOD

V23 modem. Direct telephone line connection, 1200/75 baud full duplex operation for Prestel and other database access, 1200/1200 baud half duplex operation for user to user communication.

Q CALL

Auto dial/answer unit for attended or unattended operation.

Q CON

Asynchronous multi-speed interface, single chip micro based with software on microdrive cartridge. Operates at 9600, 4800, 2400, 1200, 300 and 75 baud. Independent Tx and Rx rates. 25-way D-type, SER 2, power and expansion connectors. Provides VT100 emulation and software support for Q MOD and Q CALL. Can be used with any modem.

Tick Quantity Module Price* Value

£79.95

£79.95

£49.95

£49.95

£49.95

£49.95

£49.95

Total order value

Signed

Please send me more information.

Name

Address

Tel

O.E. Ltd, North Point, Gilwilly Industrial Estate, Penrith, Cumbria CA11 9BN. Tel: 0768 66748 Telex: 64157

*Inc. VAT and P&P. Please allow 28 days for delivery. Please delete as appropriate.
DESIRABLE DAISYWHEELS

PRINTER/TYPWRITERS FROM PMS DEVELOPMENTS
Discover the benefits of letter quality printing.

These modern, stylish, feature-packed Daisywheel printer/typewriters offer the versatility of both serial and parallel communication, enabling connection to most modern micro's. Many optional extras available.

<table>
<thead>
<tr>
<th>Features</th>
<th>Hermes 15</th>
<th>Remstar 201</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial RS-232 (300 and 1200 baud)</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Parallel Centronics</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>13.3 Characters per second</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Powered automatic paper loading</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>10, 12, or 15 cpi switch selectable</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>13.5 platen (11.5 prin')</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Switch selectable line pitch</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Lift off correction ribbon</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>45 character correction buffer</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Variable print intensity</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Express—cantage return</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>relocate—after correction</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Index—paper advance</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Reverse Index</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Half space</td>
<td>✗</td>
<td>✗</td>
</tr>
</tbody>
</table>

Dealer enquiries welcome.

PMS Developments
22 Tarsmill Court Rotherwas Hereford HR2 6JZ
Tel: Hereford (0432) 265768

for Business Systems in LONDON, SURREY KENT and SUSSEX

Vega Computers Ltd
01-680 4484

WARNING: YOU HAVE DIRTY MAINS

The surges, spikes, noise and transients on the mains are a form of pollution which degrades the performance of HiFi systems and causes computers to malfunction. Protect your computer and restore the full performance of your HiFi system by fitting a Clamp 1 to the mains lead instead of an ordinary mains plug.

Clamp 1 — Computer Grade is fitted to your computer and each peripheral, in place of the conventional 13A plug.

£5.95 each

Clamp 2 — Super. A faster acting device for more effective spike suppression
£19.95 each

Clamp 3 — Lightning strike protector. This is not fitted to any equipment, but is plugged into the mains at a vacant socket somewhere on the same ring. Protects your HiFi system, television, home computer etc. from lightning strike.

£11.50 each

From your dealer or direct (including VAT and P&P) from:

Russ Andrews Turntable Accessories
Edge Bank House, Skelsmergh, Kendal, Cumbria LA8 9AS
Tel: Selside (053 963) 247
Consider our software from a professional point of view.

If you ever have to bring work home from the office you can now tackle it professionally thanks to Practicorp’s range of advanced programs for the Commodore 64.

PRACTICALC 64.
Working on budgets, sales forecasts or cash flow at home has never been easier. With the Practicalc 64 spreadsheet and your Commodore 64 you have a totally professional system. It has 2000 cells, more than 20 mathematical functions, the ability to insert or delete rows and columns, sort information alphanumerically and seek specific information. And you won’t need a cash flow projection to see if you can afford it at only £44.50 (disc) or £39.95 (tape).

PRACTIFILE 64.
If you need access to files, client or patient information, names and addresses then Practifile 64 is your instant answer.
Practifile is able to handle 5800 record entries, sort them, file them, retrieve them. It can calculate within individual files and prepare your own style of reports. And what’s more its easy menu-driven program makes it child’s play to operate. Only £44.50 for the disc version.

INVENTORY 64.
For keeping track of stock, Inventory 64 is just the job. It’ll tell you how much stock you have, where it is located, how much it’s worth, what you should re-order, and from whom. With a capacity of 650 items, Inventory 64 is ideal for the average small business, and excellent value at only £29.95 (disc).

Practicorp’s software is available at all good computer stores, including selected branches of Boots, W.H. Smith and Menzies. Clip the coupon for details of your nearest stockist.

Please send me details of your Commodore 64 programs.

Name: ____________________________
Address: ____________________________

Goddard Road, Whitehouse Industrial Estate, Ipswich IP1 5NP
Telephone: 0473 462721
Here’s your chance to contribute to the most important event of the microcomputing calendar – The British Microcomputing Awards 1985. Recognised as the Oscars of the industry, the awards are organised by VNU – publisher of Micro Decision, Personal Computer News, Personal Computer World, Commodore and Sinclair Answers, Personal Computer Games and What Micro? – The Sunday Times and Thames Television’s ‘Database’, which will televise the event.
The BMA 1985 is looking for technological excellence and value for money. Who do you think deserves to win these highest of accolades? Fill in the nomination form and let us know. Your nominations will be carefully considered by a team of experts from this magazine who will then forward a shortlist to two independent panels of judges. The winners of the eleven categories will be announced at the Awards Ceremony next June and they will each receive the unique BMA trophy. The ceremony will also make a series of special commendations for computer projects of social importance. There will be a major presentation to Concerned Micros in Education and Training (COMET), the charity established by the BMA 1984, to aid disabled young people. Complete the nomination form opposite and you could join the top names of the industry at the prestigious Awards Ceremony in London next June.

The judges will be looking for a number of important qualities in all the products nominated. These include value for money, ease of use, flexibility and innovation. Colour, sound and speed, as well as software support will be other key considerations in judging the hardware, and use of the machine in the software categories. The judges will also be looking at the consumer support service offered. There are however, certain specific requirements:

1. **Business Microcomputer & Business Microcomputer of the Year.** The machine must cost less than MRP £5000 including operating systems, CPU, keyboard, disks and monitor. It must be disk based, come with at least a 90-day guarantee and have a wide range of business software.

2. **Business Software & Business Software of the Year.** Software should be disk based with a MRP of less than £1000 per package or module.

3. **Home Microcomputer & Home Microcomputer of the Year.** The machine must not cost more than MRP £500.

4. **Home Software & Home Software of the Year.** Software must not cost more than MRP £50.

**RULES**

1. Categories 1-5. Manufacturers may nominate their own products which need not have been made in Britain but all products must have been available for purchase from retail outlets in the UK by January 31st 1985.

2. Categories 6-9. Manufacturers may nominate their own products which need not have been made in Britain, but all products must have been available for purchase from retail outlets in the UK between 1st November 1983 and January 31st 1985.

3. Employees of VNU Business Publications BV, The Organisers, The Sponsors or any individuals associated with the British Microcomputer Awards are not eligible to place a nomination with the exception of the six VNU title judging panels which may each nominate up to six entries.

4. The decision of the judges is final and no correspondence will be entered into.

5. All nominations must be received by noon February 15th 1985.

Enter your nomination for each category and explain, in not more than 30 words, the reasons for your choice, using another sheet of paper if necessary. You should consider carefully the guidelines given for each category.

**Category 1:** Business Microcomputer

**Category 2:** Business Software

**Category 3:** Home Microcomputer

**Category 4:** Home Software

**Category 5:** Educational Software

**Category 6:** Game of the Year

**Category 7:** Peripheral of the Year

**Category 8:** (i) Home Software of the Year

(ii) Business Software of the Year

**Category 9:** (i) Home Microcomputer of the Year

(ii) Business Microcomputer of the Year

**Name**

**Address**

**Tel No.**

Send your nominations to:
VNU Business Publications BV,
British Microcomputing Awards,
Freepost 38, London W1E 6QZ

Nomination forms must reach the Awards Office by noon, Friday 15th February 1985. Nominations cannot be accepted after this date.
MUCH MORE ON YOUR SIXTY-FOUR

Print your heart out using EPSON printers and GÖRLITZ interfaces – over 10,000 sold in West Germany. Definitively THE BEST connection between VIC-64 and EPSON printers is our VIC-EPSON-INTERFACE:

Plugs right into any EPSON (board 8422) * 2K Buffer (8K option) * Z80 processor * lots of additional control functions * brings you the original CBM character set with all graphics in up to 40 sizes * including double height and double width printing of CBM characters * precise HARDCOPY from SIMON’s BASIC * BUS connector doubled like 1541 * DIL-switch for device address * printer remains unchanged * Interface can be switched off if Centronics port is used * No. 8423 for external use with EPSON-compatible printers like STAR etc. * Prices include DIN cable (im) and manual.

VIC-EPSON Interface type 8422 (board) ....................... £ 78.50
VIC-Centronics-Interface type 8423 (external) ............... £ 79.50

prices do not include VAT. This is just one GÖRLITZ product. We are looking for dealers in UK. Our Phone: (01049)-261-27500. Mailbox for letters, queries and orders starting October: (01049)-261-2044.

GÖRLITZ COMPUTERBAU • P.O.BOX 852 • D-5400 KOBLENZ, WEST GERMANY
PAGES OF POSSIBILITIES FOR YOUR DRAGON 32, AMSTRAD AND ATARI

DRAGON 32
SIXTY PROGRAMS FOR THE DRAGON 32
Another in this popular series, providing 60 assorted games programs for only £5.95
INSTANT ARCADE GAMES FOR THE DRAGON 32
Shows newcomers to computing how to write creative games programs without having to learn BASIC

AMSTRAD
SIXTY PROGRAMS FOR THE AMSTRAD CPC 464
£5.95
NEW
60 assorted programs for the price of a single cassette. Lists space games, war games, word games, utility and educational programs for this brand new computer system.

ATARI
SIXTY PROGRAMS FOR THE ATARI 400/600XL/800
£5.95
A broad range of 60 programs for only £5.95. Includes space games, war games, word games, utility and educational programs.

Good value paperbacks from the PAN/PCN Computer Library available at your local computer book stockist NOW!

THE MODULAR SOLUTION TO YOUR R&D AND OEM PROBLEMS!!

★ Z80A Based MODULAR computer system ★ 8” × 8” Plug in PCB’s
★ CP/M 2.2 ★ Floppy/Winchesters ★ CP/M Plus
★ RS-232, RS-485, Parallel I/O ★ MP/M
★ Silicon disk ★ Real time clock
★ Mixed drives/formats with CP/M Plus
★ Full BIOS source code supplied for user customisation
★ Compatible with many different suppliers circuit card including NASCOM etc
★ Full software support including languages, applications etc
★ Many hardware configurations available
★ PCB’s and components are available separately for OEM’s
★ Some boards available as KITS for the home user

BUY PACKAGED SYSTEMS OR JUST PCB’S TO BUILD “YOUR OWN” IDEAL COMPUTER

MAP 80Systems Ltd
Unit 2, Stoneylands Rd., Egham, Surrey TW20 9QR
Tel: EGHAM (0784) 37674

Pan Books Ltd., Cavaye Place, London SW10 9PG Registered in England Registration No 398591.
**DISCS (Prices per Box of 10—Minimum order 1 Box)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>DYSAN 5.1/4&quot;</td>
<td>SS/DD 48 tpi 16.60</td>
</tr>
<tr>
<td></td>
<td>DS/DD 48 tpi 24.50</td>
</tr>
<tr>
<td>XIDEX 5.1/4&quot;</td>
<td>SS/DD 48 tpi 17.20</td>
</tr>
<tr>
<td></td>
<td>DS/DD 48 tpi 22.90</td>
</tr>
<tr>
<td>SONY 3.1/2&quot;</td>
<td>SS/DD 35.50</td>
</tr>
<tr>
<td></td>
<td>DS/DD 44.50</td>
</tr>
<tr>
<td></td>
<td>SS/DD 33.50</td>
</tr>
</tbody>
</table>

**RIBBONS (Prices per Ribbon)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epson MX 80</td>
<td>2.58</td>
</tr>
<tr>
<td>Epson MX 100</td>
<td>4.50</td>
</tr>
<tr>
<td>Diablo HT2</td>
<td>1.63</td>
</tr>
<tr>
<td>Ricoh 1500</td>
<td>1.72</td>
</tr>
<tr>
<td>OLDB</td>
<td>1.05</td>
</tr>
<tr>
<td>New</td>
<td>2.39</td>
</tr>
<tr>
<td>Brother HR1</td>
<td>0.99</td>
</tr>
<tr>
<td>Brother HR15</td>
<td>1.99</td>
</tr>
<tr>
<td>Qume 3/5</td>
<td>1.50</td>
</tr>
<tr>
<td>Olivetti ET/S</td>
<td>1.69</td>
</tr>
<tr>
<td>Olympia (ES 100)</td>
<td>1.89</td>
</tr>
<tr>
<td>Canon (AP Series)</td>
<td>1.99</td>
</tr>
</tbody>
</table>

**LIBRARY CASES**

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1/4&quot;</td>
<td>1.65</td>
</tr>
<tr>
<td>50 Disc Size</td>
<td>8.50</td>
</tr>
</tbody>
</table>

Post + Packing - per 10 discs — 1.50 x per Ribbon order — 1.50

Prices EXCLUDE VAT — add 15% to order excluding Post + Packing

Please send Remittance with order to:

Kerrisdale Computer Suppliers Ltd.
P.O. Box 27
Wetherby
LS22 5LB

---

**SCARBOURNE LTD**

180 SHIRLAND ROAD, LONDON W9
Tel: 01-289 0901

**STOCKHOLMED}
Could this be the biggest selling disc since White Christmas?
Come and see what makes Lotus Symphony such a success story.
When we show you how it can control an entire business on one disc you really will think it's Christmas.

INTRODUCTORY AND ADVANCED TRAINING COURSES IN LOTUS PRODUCTS FROM A MAJOR DISTRIBUTOR OF THE LEADING BRANDS OF BOTH SOFTWARE AND HARDWARE.

For details of our comprehensive range of training courses — beginners and advanced — telephone our EDUCATION CENTRE on 021-643 4743.

Specialist Computer Centres Ltd.
London  Birmingham  Liverpool

THE "YES" COMPANY

DISCOUNTS  Yes ☑ APRICOT  Yes ☑
TRAINING  Yes ☑ SIRIUS  Yes ☑
AFTER SALES  Yes ☑ EPSON  Yes ☑
SOFTWARE  Yes ☑ SANYO  Yes ☑
PERIPHERALS  Yes ☑ EINSTEIN  Yes ☑

17 WEST BAR, BANBURY
OXON. (0295) 65023

Microdrive/Cartridge Utilities
A complete suite of new routines
LOAD, CATALOG, ERASE cartridge files, by menu choices from master, autorun routine.
Intelligent FORMAT routine formats batches of cartridges for optimum storage space.
Print Filespace or CATALOG or Duplicate Master Routine on batches of cartridges.
Also — Expert Microdrive Troubleshooter!

THE ONLY UTILITY OF ITS KIND
Now with fully updated Microdrive routines to MERGE with Masterfile and Tasword Two, and give optimum professional performance.

MEMO and ACTION (scheduler) formats for MASTERFILE are free with cartridge version

INCREDIBLE VALUE from MONITOR Ltd.
Cartridge £12.95, Cassette £6.95, incl. VAT and P&P within U.K. or P&P within Europe.

P.O. Box 442, London NW7 2JF. 01-959-1787.

THE "YES" COMPANY

DISCOUNTS  Yes ☑ APRICOT  Yes ☑
TRAINING  Yes ☑ SIRIUS  Yes ☑
AFTER SALES  Yes ☑ EPSON  Yes ☑
SOFTWARE  Yes ☑ SANYO  Yes ☑
PERIPHERALS  Yes ☑ EINSTEIN  Yes ☑

17 WEST BAR, BANBURY
OXON. (0295) 65023

THE "YES" COMPANY

DISCOUNTS  Yes ☑ APRICOT  Yes ☑
TRAINING  Yes ☑ SIRIUS  Yes ☑
AFTER SALES  Yes ☑ EPSON  Yes ☑
SOFTWARE  Yes ☑ SANYO  Yes ☑
PERIPHERALS  Yes ☑ EINSTEIN  Yes ☑

17 WEST BAR, BANBURY
OXON. (0295) 65023

THE "YES" COMPANY

DISCOUNTS  Yes ☑ APRICOT  Yes ☑
TRAINING  Yes ☑ SIRIUS  Yes ☑
AFTER SALES  Yes ☑ EPSON  Yes ☑
SOFTWARE  Yes ☑ SANYO  Yes ☑
PERIPHERALS  Yes ☑ EINSTEIN  Yes ☑

17 WEST BAR, BANBURY
OXON. (0295) 65023

THE "YES" COMPANY

DISCOUNTS  Yes ☑ APRICOT  Yes ☑
TRAINING  Yes ☑ SIRIUS  Yes ☑
AFTER SALES  Yes ☑ EPSON  Yes ☑
SOFTWARE  Yes ☑ SANYO  Yes ☑
PERIPHERALS  Yes ☑ EINSTEIN  Yes ☑

17 WEST BAR, BANBURY
OXON. (0295) 65023

THE "YES" COMPANY

DISCOUNTS  Yes ☑ APRICOT  Yes ☑
TRAINING  Yes ☑ SIRIUS  Yes ☑
AFTER SALES  Yes ☑ EPSON  Yes ☑
SOFTWARE  Yes ☑ SANYO  Yes ☑
PERIPHERALS  Yes ☑ EINSTEIN  Yes ☑

17 WEST BAR, BANBURY
OXON. (0295) 65023
**BBC**

Model B ........................................... £346
Model B x Disk 1/F ................................ £407
Double Density 1/F ................................ £106
Teletext Receiver ................................. £222
280 2nd Processor ................................. £347
6502 2nd Processor ................................. £173
Video Digitiser ................................... £222

**Sinclair**

Sinclair Plus ................................... £156
Sinclair QL ........................................ £348
Low Profile Keyboard ............................ £43
DKtronics K/B .................................... £39
BBC Joystick ...................................... £8
Dual J/S ........................................... £17

Plus 4 ........................................... £260
Starter Pack ....................................... £121
Plus 16 ........................................... £121

**Toshiba**

Z80 2nd Processor ............................... £347
DKtronics K/B .................................... £39
MX ................................................ £39

**Epson**

LQ1500 ........................................... £399
RX100 F/T ......................................... £149

**Philips**

Nordmende 14" TV/MON ........................... £217

**Teac Drives**

55A S/S 40 Track ................................ £104
200K Single ...................................... £208
55E S/S 80 Track ................................ £134
200K Dual ......................................... £276
55F D/S 80 Track ................................ £153
800K Dual ......................................... £304
Optional PSU ...................................... £26
3" Disk Drive (200K) .............................. £115
Cable & Formatting Disk ........................... £15

**Teletext Receiver**

£222

**Matrix**

Juki 6100 ........................................ £225

**Novex 14" Monitor**

£187

**Amstrad CPC Z64**

£190

**Philips**

£13

**Novex 14" Monitor**

£187

**Tatungs Einstein**

Fast processor and full graphics
16 colours and 32 sprites
500K drive (option another 500K)
Superb sound
Full I/O capacity

£430

2nd 500K 3" drive ................................. £130

**AMSTRAD CPC Z64**

With green monitor ............................. £213
With colour monitor ......................... £308
3" drive ........................................ £173

**Export Orders from Abroad Most Welcome**

Please Supply:

<table>
<thead>
<tr>
<th>CHQ/PO No.</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>£</td>
</tr>
</tbody>
</table>

Free Delivery in UK

**Mail Order**

Name: ........................................ Sig:
Address: ......................................

Goods in stock will be dispatched within 24 hrs.

**Microworld**

Computer and Video Centre Ltd.

12 York Place
Brighton
SUSSEX BN1 4GU

10 The Boulevard
Crawley
SUSSEX RH10 1XX

*Computers* *Software* *Printers* *Peripherals* *Miscellaneous*

Free Postage/Carrige Any Item in UK

**Prices Subject to Change Without Notice**
FREE POSTER OFFER
INTERCEPTOR MICRO’S
Lindon House, The Green, Tadley, Hants, England
TEL: (07356) 71145/3711 TELEX: 849101

COMMODORE 64

BENEFITS ON JOINING INTERCEPTOR SOFTWARE CLUB

1. Up to date information on new releases.
2. Free posters & other promotional aids.
3. Special club member discount.
4. Help club for Interceptor adventure players.
5. Special offers on blank data cassettes

FREE MEMBERSHIP

When you join Interceptor Micro’s new software club you will receive free posters. We will also keep you up to date on all our new releases, and include a list of special offers on some of our latest games. Available only to members.

NAME ____________________________
ADDRESS ____________________________

DON’T DELAY! POST TODAY
Interceptor Software Lindon House, The Green, Tadley, Hants, England
We start carrying your workload the very first day.

**EasyWriter II™ System**

EasyWriter II System is word processing that's easy to learn and easy to use. Memos, reports, correspondence, even statistical documents are letter perfect from day one. If you can type, you can use it to lighten your workload.

EasyWriter II System gives you everything you need. It has an 88,000 word spell checker and convenient mail-merge for reports and form letters. They're built right in, not sold separately. And unlike some other programs you may see, what you look at on the screen is exactly what is printed.

So no matter what your office word processing needs, EasyWriter II System can make the days more productive, by carrying the load right from the start.

Special offer:
Free demo diskette

☐ Please send me a Free Demo Diskette* so I can preview the features and effectiveness of EasyWriter II™ System

Name _________________________
Address ______________________

Tel: _________________________

Post this coupon to:
Sorcim/IUS, 10 Station Road, Watford, Herts WD1 1EG. Tel: (0923) 46255.

*Diskette is designed for use with IBM-PC® or fully compatible hardware systems. IBM-PC is a registered trademark of International Business Machines Corporation.
### JANUARY SALE

15% Discount for payment with order

<table>
<thead>
<tr>
<th>Printer</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP 80/81</td>
<td>£196.00</td>
</tr>
<tr>
<td>DP 100</td>
<td>£263.00</td>
</tr>
<tr>
<td>DWP 1120</td>
<td>£299.00</td>
</tr>
</tbody>
</table>

PLUS VAT

**Credit Facilities Available If Needed**

Send now to:

**SOUTH COAST CASH REGISTERS LTD**

FREEPOST, BLANDFORD, DORSET  Tel: 0258 56700

Please allow 14 days delivery

---

**TYKES!**

It’s all in Headingley at

**FLEXIWORDS**

The Super Computer Shop

We stock HARDWARE

Computers, disk drives, printers, monitors, disks, tapes, paper, accessories.

and SOFTWARE

Utilities, adventures, education, business, games, books.

FROM

Acorn, Amstrad, Psion, Microwriter, Sinclair.

FOR

Access, Amex, Barclaycard, Diners, Cheques, even pound coins.

You're welcome to come in and browse, and remember, you're better off at a proper computershop.

**FLEXIWORDS COMPUTERSHOP**

18 Otley Road, Leeds LS6 2AD  
Tel: (0532) 758474

---

**REMEMBER**
TOOL BOX '84 is a very helpful tool which is made for you, the serious computer user.

TOOL BOX '84 is specially designed for electronical functions such as:
- making your own joysticks, paddles, lightpens etc.
- making ganging instruments for light, wind, heat and resistance.
- making electronic alarm systems.
- making your own robotsystem.
- developing your skills in computers and electronics.

TOOL BOX '84 is needed in schools, work or for your hobby.
TOOL BOX '84 is delivered with a informative user's guide with lots of program listings.
TOOL BOX '84 is a necessity for the beginner.
TOOL BOX '84 adds a quite new dimension to your computer-life!

Send for our free TOOL BOX '84 Information.

Norbit Elektronikk
DATA SOFTWARE
P.O. BOX 228, N-7701 STEINKJER
NORWAY
TEL: (NORWAY) (01047) 7765440, 7765310

Shipping and handling £2.50 per order.

I own the computer and Please send copies of the TOOL BOX '84 £36.25 p.p. and/or free TOOL BOX '84 Information.

Name
Address
City/State/Zip
Chargecardno

□ MC # or □ Visa #
Exp.Date
Signature

TOOL BOX '84 is a trademark of Norbit Elektronikk.
UNBEATABLE DEALS ON
SHARP & MSX
FROM SCOTLANDS
SOLE AXIS DEALER

Sony MSX Micro .................................. £260
Sanyo MSX Micro .................................. £260
Toshiba MSX Micro ................................. £242
Sony 3.5in. Floppy Disk ......................... £304
Toshiba Plotter-Printer ........................... £217
Toshiba 105cps Printer ........................... £304
£70 of software with every MSX
Sharp MZ-700, built-in cassette recorder + 10 great games ........... £129
Sharp MZ-700, built-in cassette, 4 Languages: Basic, Pascal, Forth machine code + 50 programs ........... £169
Sharp 4 Col Plotter-Printer ......................... £110

Dear Microfans,
We have used MSX since its release in Japan last year. You will have read the articles in MSX USER about us going to Japan to meet the inventor of MSX and see the MSX manufacturers. We are acknowledged as experts in Japanese computers by TOSHIBA, SANYO, MITSUBISHI, AND SHARP who all buy KNIGHTS programs. We are also enthusiasts and will always help you — no other firm can match us for service or value for money.

We have special deals on Sharp — where else can you get a fast, reliable, 76K colour computer with a proper keyboard for £129. We have now released a FORTRAN compiler tape for the MZ700 series — the cost is £25 and that includes 10 FORTRAN programs. FORTRAN commands include Colour, Box, Fill, Sound, Joy etc.

Ring or write and we will rush you full details of our unbeatable deals. If you are really desperate ring us with your Access or Visa number as we can usually deliver anywhere in the U.K. within 24 hours. We have sold thousands of Japanese products Worldwide in the last 10 years and have never charged for a single repair. We guarantee to beat any competitors price on the spot. For personal service ring and ask for Graham or Neil.

happy computing, Graham Knight and Neil Hunter

PS: U.K. customers add 15% VAT. EXPORT only add £10 for freight
PPS: Write for our massive SHARP and MSX SOFTWARE list.

KNIGHTS TV & COMPUTERS
108 ROSEMOUNT PLACE, ABERDEEN
TEL: 0224 630526 TELEX 739169 "KNIGHTS"
Computer books with pages of possibilities for your micro.

The Pan/Personal Computer News Computer Library is available through all good bookshops including major branches of WH Smith
REMEmber

ELEPHAnT

MEMoRY

SYSTeMS

REMEMBER

ELEPHANT NEVER FORGETS

Get the best from your computer with ELEPHANT disks. Certified 100% error-free and problem-free, and with quality maintained for at least 12 million passes, ELEPHANT disks are guaranteed to meet or exceed every industry standard and are compatible with virtually every computer on the market.

Look for the ELEPHANT sign at your local Dealers — or in case of difficulty, phone or write direct to Dennison Manufacturing Co. Ltd.

Dennison Manufacturing Co. Ltd.
Colonial Way, Watford, Herts WD2 4JY, Tel: Watford (0923) 41244, Telex: 963321
France: Soroclass, 5, Rue Montgolfier - 93115, Roncy-Sous-Bouis, Tel: 16 (1) 856-73-70
Germany: Marcom Computerzubehör GmbH, Podbielskistr. 321, 3000 Hannover 1, Telex: 923818
Other Countries: Dennison International Company, 4906 Erkrath 1, Matthias-Claudius-Straße 9, Telex: 858 6600
WIN!

A fabulous holiday for you and 3 friends in sunny Florida
Including: Kennedy Space Centre, Disney World & Florida Keys

Slowly plus

£2,500 Spending Money
The 10 runner up each get a £100 Voucher
to spend in any Spectrum store - anywhere in the UK.

Pick up an entry form from your local Spectrum now—
no purchase required!

MICRO UPDATE
Spectrum's own magazine for home and
small business computers
Have you seen our MICRO UPDATE
magazine yet! It's Spectrum's own
computer guide, published
by the experts for YOU.
It's packed with illustrations and
descriptions of just about everything
you're likely to need in home micro
hardware, add-ons and accessories. Plus there's information on current
software, and hints and tips from
experts about home computing.
Call in to your local Spectrum dealer
and get YOUR copy - it's great!

New Products

Commodore C16/Plus 4 Joystick Converter £3.75
BBC Emulator for CBM 64 £13.95
Timex Spectrum Keyboard £14.95
Omega Data Recorder £24.95
Commodore 1531 Data Recorder £44.99
Entrepo Quick Data Drive for CBM 64 £79.95
Koala Pad for CBM 64 £79.95
Datafax Dsk Interface £79.95
Psion Organiser £99.95
Rotronics Wafadrive £129.95
ZX Spectrum Plus £179.95
Goldsatr MSX £239.99
Canon V20 MSX £279.95
Sanyo MPC 100 MSX £299.95
Commodore Plus 4 £299.99

There's up to £1,000 worth of Instant Credit
available on a Spectrum Chargecard. See your
local SPECTRUM dealer for written details (UK
mainland only) Typical APR -29.8%

Latest News
for up to date news, information & offers
from SPECTRUM - see PRESTEL page
600181 for details
Yes—the exciting new world of MSX computing is now here, with the superb new Goldstar MSX micro! And just look at the rave reviews it’s received from the press.

MSX micros are made to a standard specification—but some things do vary and that’s where the Goldstar comes out on top. It’s powerful—a full 64K of user RAM, 32K of ROM AND a 16K video RAM. Its sixteen vivid colours and eight octaves of sound make it a great games player’s micro, and there’s a powerful Z-80A processor to take on a world of home or office tasks.

But it’s the price tag that’s really special—just £239.99, a lot less than most of the others. Take a look at the superb Goldstar MSX at your Spectrum dealer NOW!

- General purpose MSX micro
- Powerful 64K user RAM
- 32K ROM, 16K video RAM
- Hi-resolution colour graphics
- Full typewriter keyboard and cursor controls

SPECTRUM APPOINTED DEALER
BOB CLEAVER, Spectrum Group PLC, Hunting Gate, Hitchin, Herts. SG4 0TJ; Tel (0462) 37171

More from Spectrum...
Sensational ZX Spectrum offer

Including

FREE! Software pack
- Computer Scrabble
- Computer Chess
- Chequered Flag Game
- Horace goes skiing game
- Make-a-Chip

Worth £56.70

ZX Spectrum 48K

SPECTRUM PRICE £129.95

Timex Spectrum Keyboard

Push-button keyboard for the ZX Spectrum makes programming and game playing much easier. Full travel keys are designed to last for 3 million operations, and it can be fitted in minutes.

SPECTRUM PRICE £14.95

Datafax Disk Interface

For ZX Spectrum

SPECTRUM PRICE £79.95

Sinclair Expansion Pack

Increase the power of your Sinclair 16K Spectrum dramatically—with this neat expansion pack. Boosts the RAM capacity to a powerful 48K to run the top games software.

SPECTRUM PRICE £99.95

The very latest

ZX Spectrum+

Here's the brand new Spectrum micro. The 'Plus' boasts a new, professional typewriter-action keyboard, plus all the Spectrum's top selling features like powerful 48K RAM, 8 colours, 10-octave sound and full compatibility. AND you get a super 80-page User Guide PLUS SIX FREE SOFTWARE PACKAGES - unbeatable value-for-money!

SPECTRUM PRICE £179.95

Rotronics Wafadrive

At last a versatile, flexible twin data drive for the ZX Spectrum! The Wafadrive features twin 128K drives that take the compact wafers (choose from 16K, 64K or 128K sizes) - The dual drive means professional-style ease of use, with easy copying of files or whole wafers. There are no cables to connect - and there's RS232 PLUS Centronics ports to take a host of extra peripherals. For super reliability, the tape has been designed for extra long life and a top data integrity. And it's incredible value-for-money!

Plus FREE Softeks Special Writer an excellent word processor program

SPECTRUM PRICE £129.95

Up to £1000 Instant Credit

- There's up to £1,000 worth of Instant Credit available on a Spectrum Chargecard. See your local SPECTRUM dealer for written details (UK mainland only). Typical APR -29.8%
Commodore 16
Package offer

Including
Commodore 1531 Cassette Recorder

Introducing the new Commodore 16 - the advanced micro that's designed with the beginner in mind. This brand new micro features a powerful 16K RAM, a full professional keyboard, superb graphics with 121 colours, plus terrific built-in sounds. In its 32K ROM is a new BASIC 3.5 with over 75 commands including graphics plotting and editing. There's a unique HELP key that highlights errors when you're learning to program. It's a tremendous new micro and the Spectrum package includes a Commodore Model 1531 Cassette Data Recorder too. See it at your local Spectrum dealer now!

SPECTRUM PRICE
£139.99

SPECTRUM PRICE
£299.99

Commodore MPS801 Printer
Plus FREE!
Easy Script and Future Finance

Commodore 16/Plus 4 Joystick Converter

NOW you can use Britain's best-selling QUICKSHOT II JOYSTICK with your Commodore 16 or Plus 4!

SPECTRUM PRICE
£230

SPECTRUM PRICE
£3.75

Koala Touch Pad for CBM64

Lets you control your computer without using keyboard commands, by simply moving your finger across the touch-sensitive surface.

SPECTRUM PRICE
£79.95

SPECTRUM PRICE
£4.95

Plus 4 Data Recorder Adapter

Allows you to use the Shado Commodore compatible recorder with the plus 4

SPECTRUM PRICE
£249.95

Spectrum Computer Centres have no connection whatsoever with the Z80 Spectrum Computer manufactured by Sinclair Research Ltd.

More from Spectrum...

Spectrum Computer Centres have no connection whatsoever with the Z80 Spectrum Computer manufactured by Sinclair Research Ltd.
PSION Organiser

An easy to use personal computer that fits in the palm of your hand and slips in your pocket

Includes FREE 8K Datapak - Utility pack
Built-in database stores information such as names & addresses, diary appointments, price lists and timetables
Automatic cross referencing of records when using the 'Find' command
Permanent slide storage of information in thumb sized datapaks which slot discreetly into unique 'Solid state drives'
Range of comprehensive software packs solve finance, maths & science problems
Create your own programs using P.O.P.L. - The easy to learn 'Psion Organiser programming language'
Communication pack links the Psion Organiser to a wide range of printers and other computers.

£99.95

PSION ACCESSORIES
16K Data Pack £19.95
8K Data pack £12.95
Finance Program £29.95
Maths Program £29.95
Science Program £29.95
Formatter £44.95

Spectrum Scoop Purchase

Seikosha GP500A Dot Matrix Printer INCLUDING FREE! 2000 sheets of Tractor Feed Paper

£159.95

- Printing speed 20cps
- Full Graphics capability
- In the graphic mode, a column of graphic data can be repeated as many times as you want with a single command.
- Double width character output under software control.
- Print position addressable by character or dot. (positioning control).
- 8 European country character sets.
- Graphic, character, and double width character modes can be intermixed on a single line.
- Automatic Printing. When the text exceeds the maximum line length no data is lost due to overflow.
- Self-test printing is available.
- Centronics parallel interface.
- Paper width is adjustable up to 10 inches.
- There's up to £1,000 worth of Instant Credit available on a Spectrum Chargecard. See your local SPECTRUM dealer for written details (UK mainland only). Typical APR 29.8%
Superb value and Service in
Personal Computers
from selected Spectrum Stores Nationwide

Apricot
F1E/F1 System

These stylish new personal computers are among the best of the new generation of business micros. Powerful and versatile, the F-1 features a standard 256K OF RAM (expandable to 768K), with a 16-bit 8086 CPU running MS-DOS and Concurrent CP/M. That's backed up by a built-in 3½" floppy disk drive providing 720K on double-sided disks (you can add another floppy or Winchester drive later). The economical F1E has a 128K RAM and a single-sided 360K disk drive -with the same 92-key professional infra-red keyboard on the F1. And don't forget - when you buy from Spectrum you get the assurance of our trained, expert staff to help and advise you!

Excluding VAT. Monitor extra.

On-site service contract worth £175
Spectrum give you peace of mind with your new computer! There's a twelve month on-site service contract, worth £175, ABSOLUTELY FREE when you buy either a Sanyo 550/555 computer or an Apricot F1E/F1.

Plus Free Business Software.

Both the Sanyo and Apricot computers come complete with a superb pack of comprehensive business software worth hundreds of pounds. The packs contain virtually everything you're likely to need to get the very best from your computer -from Day one!

SEE YOUR NEAREST SPECTRUM PERSONAL COMPUTER STOCKIST FOR DETAILS OF BOTH OFFERS

Sanyo
550/555

Among the very best value in personal computers is the excellent Sanyo 550/555 Series. They feature high performance, 16-bit CPU that runs on MS/DOS, with a RAM that's expandable up to 256K bytes. The 550 has one 512K byte 5½" floppy disk drive while the 555 has dual drives for professional flexibility. There's a choice of superb hi-resolution Colour or B&W Monitors too (not included). Both come with a comprehensive package of business software, and a very special free maintenance offer. - Take a look at these superb micros at Spectrum NOW!

- Take a look at these superb micros at Spectrum NOW!

Sanyo 550
Monitor extra
SPECTRUM PRICE £749
Excluding VAT.

Sanyo 555
Monitor extra
SPECTRUM PRICE £999
Excluding VAT.

More from Spectrum...

Or prospective dealers. If you'd like to know more about becoming a SPECTRUM APPOINTED DEALER, please write to: BOB CLEAVER, Spectrum Group PLC, Hunting Gate, Hitchin, Herts. SG4 0TJ, Tel (0462) 37171

Spectrum Computer Centres have no connection whatsoever with the ZX Spectrum Computer manufactured by Sinclair Research Ltd.
Incredible value for money

**AVT Monitors**
DM-216G or DM-216/0

- Available in Green or Orange
- Glare or Non-Glare screens
- For office micros, or Personal Computers

**Price**
£99.95

---

**Brother HR-5 Printer**

A great printer at a top-value price from Spectrum. Here's what you get:
- Letter-quality daisy-wheel printing
- Between 13 and 18cps
- Bi-directional printing
- Tractor-fed paper or single sheets
- Super low price!

**Price**
£159.95

---

**Brother EP-44**

'Transforming Office Machines', runs Brother's slogan - with these super-compact battery powered type-writers, it's easy to see why!
- Top quality thermal head
- 4K of text memorise (3 A4 pages)
- Centering if required
- 15-digit LCD display for pre-print corrections
- Line-by-line edit facility

**Price**
£249.95

---

**Music Maker for Commodore 64**

A superb new music system for the Commodore 64 micro, with everything that's needed for high quality music making. The package price includes Software (on either Disk or Cassette), a 24-key piano-style keyboard which fits over the computer keyboard, and a songbook containing 28 popular songs. Music Maker is versatile, but simple to use. It suits both beginners and experienced musicians. There are 8 voices to simulate instruments (including piano, guitar and synthesiser); all the sound parameters can be varied, to create any sound within the 64's capabilities. Different menu-selected modes include one which creates rhythms, from waltzes to disco, and pre-programmed bass patterns that you can create around the tune. The Music Maker is an incredible addition to the Commodore 64 superb music for everyone!

**Price**
£29.95

---

**AVT Printer Bargains**

**80cps Printer**
- 288 ASCII characters
- 640 dots/line p/sec
- Centronics Parallel
- Opt. RS232C Serial
- Sprocket & Friction feed
- Semi-graphic
- Normal & italic fonts

**Price**
£199.95

---

**100cps Printer**
- Letter Quality dot matrix
- RS/132 cols
- Serial & Parallel
- Tractor & Friction feed
- Graphics

**Price**
£249.95

---

There's up to £1,000 worth of Instant Credit available on a Spectrum Chargecard. See your local SPECTRUM dealer for written details. (UK mainland only) Typical APR - 29.8%

---

Latest News

for up to date news, information & offers from SPECTRUM - see PRESTFL page 600181 for details
MASSIVE SAVINGS ON THESE TOP SELLING MICROS

Atari 800XL

Plus!
Atari 1010 Data Recorder
Plus!
Basic Tutor

SAVE £39.97

This powerful and versatile home computer packs the punch of a full 64K of user RAM memory, to make the most of exciting games and educational software. Among its up-to-date features are a high quality full-stroke keyboard, three-and-a-half octaves of sound synthesis and a superb dscreen display capability that includes 11 Graphic Display modes and a palette of 256 colours—128 of which can be displayed together at any one time. Ask your local Spectrum dealer to show you the amazing Atari today!

BBC Model B
With Speech Synthesiser fitted

SAVE

Sensational Price

£55

Total Normal Price £254

SENSATIONAL PRICE

£399

The BBC MODEL B probably the most flexible personal microcomputer available today. Using powerful BBC BASIC, the BBC B is widely accepted as providing the educational standard for computer learning.

The Model B features a variety interface ports allowing easy connection of both standard peripherals (like disk drives and printers) and second processors or other devices to give you access to Teletext or Prestel services.

Acorn Electron
Plus 5 Software Cassettes

SAVE

Sensational Price

£55

Total Normal Price £254

SENSATIONAL PRICE

£199

The Electron gives high quality graphics output to either colour TV or monitor. Sound can be generated through the internal loudspeaker.

The Electron comes complete with a free introductory cassette, containing 19 free programmes & two manuals—the User Guide and ‘Start Programming With The Electron’.

Computer Dealers

Or prospective dealers. If you’d like to know more about becoming a SPECTRUM APPOINTED DEALER, please write to: BOB CLEAVER, Spectrum Group P.L.C., Hunting Gate, Hitchin, Herts. SG4 0TJ; Tel (0462) 37171

More from Spectrum...
Micro Dealers UK's Top 50
Britain's No.1 Software Chart

Program | Supplier | Machine | Price
--- | --- | --- | ---
Underworld | Ultimate | Spectrum | £9.95
Tri No No | Digital | CBM 64 | £14.95
Eureka | Domestic | Spectrum | £9.95
Fort Apocalypse | Spectrum Software | CBM 64 | £9.95
Dark Star | Spectrum Software | CBM 64 | £9.95
Bombardier | Spectrum Software | CBM 64 | £9.95
Knight Lore | Ultimate | Spectrum | £9.95
Bookworms | Spectrum Software | CBM 64 | £9.95
Backpackers Guide | Spectrum Software | CBM 64 | £9.95

Also suitable for other micros.

Compatible Data Recorder
The excellently packaged Omega Compucorder is an affordable alternative to ordinary cassette recorders. All your software is saved on the data cassette, and is ready to be loaded into your micro. The unit is compatible with most home systems and connects easily, offering reliable and consistent performance. When you need to copy a program to another cassette, this superb unit enables you to process your project on your Commodore at home. All you do is type programs in BBC BASIC and the Emulator allows your Commodore 64 to 'imitate' the BBC.

Price

Spectrum £13.95
Quickshot II Joystick £11.95

Omega Compucorder
- Battery/Mains Operation
- Built-in condenser microphone
- Automatic level control
- 3-digit Tape Counter
- DIN Socket

GREAT VALUE AT ONLY £24.95

BBC Emulator
This superb unit enables you to process your BBC projects on your Commodore 64 at home. All you do is type programs in BBC BASIC and the Emulator allows your Commodore 64 to 'imitate' the BBC.

Price

Spectrum £13.95

Quickshot II Joystick
Helicopter-style grip with the fire button on top. Features suction feet for stability and Auto Fire mode. Compatible with most micros.

Price

Spectrum £11.95

Super Value Shado Add-Ons

Shado BBC Compatible Data Recorder
Also suitable for other micros

Price

Spectrum £32.50

Commodore 64 Compatible Data Recorder

Price

Spectrum £34.97

Shado Joysticks for the BBC

Price

Spectrum £16.95 per pair

Blank Data Cassettes

Price

C12 Standard Data Cassette £7.95
C12 Reel to Reel £12.95

Latest News
for up to date news, information & offers from SPECTRUM - see PRESTEL page 600181 for details

Up to £1000 Instant Credit
- There's up to £1,000 worth of Instant Credit available on a Spectrum Charge Card. See your local SPECTRUM dealer for written details (UK mainland only) Typical APR -29.8%
Spectrum owners! Now you can upgrade your machine to take full advantage of the sheer speed and convenience of floppy disk operating.

Greater storage! Faster access! More operating flexibility!

Disk drives were specifically designed for use with computers so programs and data can be stored and accessed quickly and safely. Also a disk drive uses random access to get programs and data from any part of the disk. The speed? Only a few seconds!

Upgrade now with this low-cost Beta disk interface from Technology Research that uses only 128 bytes of Spectrum memory and gives you instant operating compatibility with any disk drive that the BBC micro uses!

Each interface comes complete with a 5¼" disk with utility programs already loaded. From the word go you can transfer the contents of one disk to another or make copies of individual programs or data to any other disk. There will be no problems with your upgrade to DISK operation as the LOAD and SAVE commands work equally well with cassette or micro-drive.

Take advantage of this offer and get the compact yet powerful Beta Disk Drive as well, made by TEC (as supplied by Cumana), and be up and running on disk in minutes!

The Beta disk interface; the Beta disk drive. Only from Technology Research. The sooner you order, the sooner you'll be enjoying all the benefits of full disk control!

Features

- EPROM disk operating system for ease of operation
- Available in Single Density and Double Density
- Uses only 128 bytes of Spectrum memory
- Compatible with 40 or 80 tracks, single or double-sided disk drives
- Works equally well on 5¼", 3½" or 3" disks, with upgradability built-in from 100K to 2.6 Mbyte
- Supports up to four disk drives
- BASIC program merge facility
- Duplicate Spectrum connector included
- Uses Spectrum key words
- Random access of data for fast operation
- It costs less per byte of storage to switch from tape to disk

Technology Research Ltd.
Unit 18 Central Trading Estate
Staines, Middlesex TW18 4XE
Tel: Staines (0784) 63547
Tlx: 896691 TLXIR G

CUT OUT THIS COUPON AND SEND WITH CHEQUE OR POSTAL ORDER TO THE ADDRESS ABOVE

PLEASE SEND ME:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE DENSITY BETA INTERFACE</td>
<td></td>
<td>£97.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DOUBLE DENSITY BETA INTERFACE</td>
<td></td>
<td>£109.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SS51 BETA DRIVE*</td>
<td></td>
<td>£152.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*40 track single sided, including power supply
Prices for other disk drives available on request

Name

Address

Postcode

TOTAL

£

NEW BETA INTERFACE PLUS
BETA DRIVE!
The complete package from £249.75!
Crestmatt challenge you
to find a better deal.

Apricot F1 £1259 INC VAT
256k business system
1x720k double-sided d/d
FREE Shinwa CP80 printer
FREE printer cable
SuperWriter w/processor
SuperCalc spreadsheet
SuperPlanner
GSX graphics utility
FREE Shinwa CP80 printer
FREE printer cable
FREE 4 extra microdrives
FREE 4 extra microdrives
FREE 10 blank d/s discs
FREE box of paper

Sinclair QL £682 INC VAT
128k business pack
4 software packages
12" colour monitor (PRISM)
FREE Brother HR5 printer
printer cable
FREE box of paper

QL pack £549 INC VAT
128k business pack
4 software packages
Brother HR5 printer
FREE printer cable
FREE 4 extra microdrives
FREE 4 extra microdrives
FREE 10 blank discs
FREE box of paper

Crestmatt packages may be reconfigured to
suit individual business
needs. We provide demonstration,
support and training
with on-site maintenance
contracts available.

Printers: dot matrix
call for latest prices
(all prices include VAT)
£189 Shinwa CP80 80cps
Shinwa CP80 100cps (p)2k
Epson RX80FT 100cps
Epson FX80 160cps
Ensign 165cps 72corresp
Kaga Texan 160cps 27nlq
Canon PW1080 160cps 27nlq
Brother EP44

Brother HR5 30cps
SmithCorona 0200 160cps
daisywheel
Juki 6100 20cps
Juki 6300 40cps
£239 DaisyStep 2000 18cps
Brother HR5 13cps
Brother HR25 25cps
Brother HR35 35cps
£239 SmithCorona L1000

Crestmatt Limited
67a York Street (BakerSt ε)
London W1H 1PO
01.402 1254/5
01.723 4699

authorized dealers for
Apricot, ITT, Sanyo
offers strictly one month
prices subject to change
without notice; goods
subject to availability.
DAYSTAR COMPUTERS LTD

ULTIMATE SERVICE

DP Managers — One Shop Supplier/Service/Advice
Mail Order — Discount Prices/Vast Product Range
New Users — Low Cost Entry/Systems Analysis
Dealers — Monitor/Printer Distributor
OEM — Manf. S100 8086 MS DOS Computer

We Specialise in Service — Example Prices

NETWORKING — IDE•NET for IBM PC
ONCE ONLY SOFTWARE £299
NETWORK BOARD PER M/C £450

SPECIAL SANYO MBC 555
128K MEMORY WITH FREE SOFTWARE £880

SPECIAL BRAID TELEX MANAGER
COST SAVER ON IBM PC £1,750

SPECIAL EPSON LQ 1500
DUAL MODE, QUALITY PRINTER £850

Ring or Write for Full Price List

DAYSTAR COMPUTERS LTD
UNIT 4 and 5, NEW ROAD
NEWHAVEN, SUSSEX BN9 0EU
PLEASE TEL: 0273 514874

SOLVE THOSE DESKTOP BLUES . . . FOR ONLY £29.99
INCLUDING CARRIAGE & V.A.T.

with the CEMOC PRINTOUT FEEDER/STACKER

Send your cheque today
(made payable to CEMOC Ltd.)
or telephone your Barclaycard order
through for immediate despatch

(Please state whether for 80 or 130 column printer)

CEMOC COMPUTERS
I Samuel Whites Estate
Medina Road
Cowes, Isle of Wight, PO31 7LP

TEL: (0983) 290584

MIDSHIRES COMPUTER GROUP
66, 68, 78 NANTWICH ROAD, CREWE, CHESHIRE
MIDSHIRES MAILORDER (0270) 211086

COMPUTERS, MONITORS, DISK-DRIVES, PRINTERS, DESKS, RIBBONS
A SELECTION OF OUR SUPER LOW PRICES. FOR A LIMITED PERIOD ONLY.

<table>
<thead>
<tr>
<th>Goods</th>
<th>Midshires Price</th>
<th>RRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epson RX100</td>
<td>395.00</td>
<td>450</td>
</tr>
<tr>
<td>Shimwa CP 80</td>
<td>174.58</td>
<td>199</td>
</tr>
<tr>
<td>Ritten Blue</td>
<td>244.89</td>
<td>279</td>
</tr>
<tr>
<td>Cannon 1156</td>
<td>350.34</td>
<td>399</td>
</tr>
<tr>
<td>OKI 84p</td>
<td>690.13</td>
<td>799</td>
</tr>
<tr>
<td>OKI 2350</td>
<td>1640.38</td>
<td>1815</td>
</tr>
<tr>
<td>Seikosha 100x</td>
<td>144.42</td>
<td>174</td>
</tr>
<tr>
<td>Seikosha 250x</td>
<td>195.05</td>
<td>235</td>
</tr>
<tr>
<td>Brother HR5</td>
<td>138.31</td>
<td>157</td>
</tr>
<tr>
<td>Brother EPN4</td>
<td>198.35</td>
<td>245</td>
</tr>
<tr>
<td>Mannesman 80</td>
<td>251.80</td>
<td>263</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Goods</th>
<th>Midshires Price</th>
<th>RRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epson RX80</td>
<td>262.46</td>
<td>299</td>
</tr>
<tr>
<td>Rittenman</td>
<td>219.11</td>
<td>249</td>
</tr>
<tr>
<td>Cannon 1080</td>
<td>230.04</td>
<td>269</td>
</tr>
<tr>
<td>OKI 83a</td>
<td>420.54</td>
<td>469</td>
</tr>
<tr>
<td>OKI 84s</td>
<td>775.67</td>
<td>899</td>
</tr>
<tr>
<td>OKI 2410</td>
<td>1745.63</td>
<td>1935</td>
</tr>
<tr>
<td>Epson FX80</td>
<td>384.00</td>
<td>438</td>
</tr>
<tr>
<td>Epson RX80</td>
<td>218.67</td>
<td>249</td>
</tr>
<tr>
<td>D/W Brother HR15</td>
<td>138.00</td>
<td>144</td>
</tr>
<tr>
<td>NEC 2000</td>
<td>186.30</td>
<td>217</td>
</tr>
<tr>
<td>Dynem WR12</td>
<td>241.37</td>
<td>275</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Goods</th>
<th>Midshires Price</th>
<th>RRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensign</td>
<td>262.46</td>
<td>299</td>
</tr>
<tr>
<td>Rittenman</td>
<td>219.11</td>
<td>249</td>
</tr>
<tr>
<td>Cannon 1080</td>
<td>230.04</td>
<td>269</td>
</tr>
<tr>
<td>OKI 83a</td>
<td>420.54</td>
<td>469</td>
</tr>
<tr>
<td>OKI 84s</td>
<td>775.67</td>
<td>899</td>
</tr>
<tr>
<td>OKI 2410</td>
<td>1745.63</td>
<td>1935</td>
</tr>
<tr>
<td>Epson FX80</td>
<td>384.00</td>
<td>438</td>
</tr>
<tr>
<td>Epson RX80</td>
<td>218.67</td>
<td>249</td>
</tr>
<tr>
<td>D/W Brother HR15</td>
<td>138.00</td>
<td>144</td>
</tr>
<tr>
<td>NEC 2000</td>
<td>186.30</td>
<td>217</td>
</tr>
<tr>
<td>Dynem WR12</td>
<td>241.37</td>
<td>275</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Goods</th>
<th>Midshires Price</th>
<th>RRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensign</td>
<td>262.46</td>
<td>299</td>
</tr>
<tr>
<td>Rittenman</td>
<td>219.11</td>
<td>249</td>
</tr>
<tr>
<td>Cannon 1080</td>
<td>230.04</td>
<td>269</td>
</tr>
<tr>
<td>OKI 83a</td>
<td>420.54</td>
<td>469</td>
</tr>
<tr>
<td>OKI 84s</td>
<td>775.67</td>
<td>899</td>
</tr>
<tr>
<td>OKI 2410</td>
<td>1745.63</td>
<td>1935</td>
</tr>
<tr>
<td>Epson FX80</td>
<td>384.00</td>
<td>438</td>
</tr>
<tr>
<td>Epson RX80</td>
<td>218.67</td>
<td>249</td>
</tr>
<tr>
<td>D/W Brother HR15</td>
<td>138.00</td>
<td>144</td>
</tr>
<tr>
<td>NEC 2000</td>
<td>186.30</td>
<td>217</td>
</tr>
<tr>
<td>Dynem WR12</td>
<td>241.37</td>
<td>275</td>
</tr>
</tbody>
</table>

MIDSHIRES reserve the right to change prices at any time.

Orders £101 to £500 add £5.95, over £500 add £9.95 p&p

MIDSHIRES reserve the right to change prices at any time.

To MIDSHIRES COMPUTER GROUP, 68 NANTWICH ROAD, CREWE,
CHESHIRE CW2 5AL
Please supply:

I enclose my cheque for £ including VAT & p&p.
or charge my Access/Barclaycard No.

Name
Address
Signature

PCW L 85

Computers & Peripherals
at prices you can afford
(all goods guaranteed by manufacturers)
The printer you’ll judge others by!

Daisywriter 2000
The world's most intelligent letter-quality printer.

The Computer Optimised Printer Interface and Emulation System* (COPIES) has all the powers and features needed to make the Daisywriter 2000 the most reliable and cost-effective letter-quality printer you can buy.

Computer compatibility is easily accomplished through the Daisywriter 2000's all purpose interface.

And its impressive built-in memory buffer of 48 Kbytes, together with its special firmware allows high throughput and reprinting of documents stored in the memory buffer without using your computer.

The Daisywriter 2000. The printer for all systems.
No other printer can give you so much for so little*.

Sole U.K. Distributor:
Multi-Media Peripherals,
Russell House, 117/19 Oxford Road,
Reading, Berks. RG1 7HU
Tel: (0734) 500661

Multi-Media Peripherals is a member of the Europa Systems Group of Companies.
Patent applied for. **MRRP £1,295

*Price includes VAT. **MRRP £1,125.
Is this new Ferguson TX a new mini-computer or is there more to it? Let's read through the features:

The Ferguson TX MC01 has separate RGB, Composite Video and Aerial inputs: a choice of connections for computers, video games and video recorders. These provide the shortest (and best) routes for computer and video signals to reach the tube.

The loop aerial shows that the MC01 is also a portable colour TV. And there's automatic electronic switching between functions.
A glance at the screen of our new MCO1 will tell you how far it is from being just a monitor. Or just a 14" portable colour TV. One advantage of our double act is worth repeating, if only because it’s another Ferguson first:

Electronic switching lets you change functions automatically from monitor to video recorder to TV.

You can plug in any combination, leave them permanently connected; and wave goodbye to spaghetti junction round the back.

Convenience is matched by performance. Computer graphics and picture quality are far better through our RGB and Composite Video inputs than through the aerial socket of an ordinary TV.

Computer audio output sounds better through the speaker of the MCO1. (And if the beeps are too loud, you can turn down the volume)

The full potential of the MCO1 will be revealed by your Ferguson Dealer; as will the optional Battery Converter which makes it totally portable; and the matching computer-dedicated cassette recorder 3T31.

If total dedication is what you’re after, he’ll tell you about our outstanding new 12” monochrome monitor MM02, which is particularly suited to text applications.

But if you need a monitor for a home computer, it makes sense to get one that’s also a colour TV. Especially when it only costs around £229.

And if you want a portable colour TV, why not get one that’s also a monitor? In the Ferguson Monitor Colour TV, you get the state of two arts in one.
After 83 years we’ve reached the end of the tape.

It’s almost unbelievable that we still use punched paper tape to transmit important and imperative messages around the world. But it doesn’t take a great leap of the imagination to realise that by hooking up a normal microcomputer to the British Telecom telex jack, we can have all the advantages of today’s microchip technology.

No longer will you have to wait to receive or transmit while you’re typing out another telex message.

You can alter the words directly on the VDU, and send the same telex to ten different destinations by pressing just one button.

Automatic dialling, redialling and storage of numbers, enable your operator to get on with other jobs, and the noise level is just a whisper.

Storage on a floppy disc can be optionally selected, but if the disc is full (and it can take up to 20 telexes), all telexes are printed, thus reliability is assured.

When it’s 9 o'clock in the morning in Dallas, your telex can go out when they’re in the office and you can store incoming messages till you get in.

An inbuilt clock tells you how long each transmission has taken, and can then be attributed to any department.

The KAI Telex Processor is fast, and has a prodigious memory, with extended form capability for variable information that can be added to customised forms such as invoices.

The KAI Telex Processor is British Telecom approved, and with an Apple II or IIe you immediately have a quality microcomputer and a telex at your disposal.

KAI Telex Processor
Telex us on 261514

Fill in the coupon and send to
KAI Limited, 203a Belsize Road, London NW6, Tel. 01-625 5126

Please ring me for a demonstration

Please send me further information

Name

Position

Company

Address

Tel No

Ref. No
All the above are Econet II compatible and utilise DFS compatible software. A choice of configurations as follows:

- Comprehensive manual which contains many program examples. 
- PASCAL – T code. Full Editor and disk support are included, together with a PASCAL - T software syntax to Pascal.
- Hardware: LUCIDATA PASCAL.
- FLEX FORTH includes Editor and Assembler together with over 100K of utilities and example programs.
- Powerful machine-code monitor with disk utilities on 8k Eprom.
- LOGO - FORTH is an 8k Eprom for the Acorn Electron, complete with comprehensive documentation.

Powerful LOGO-FORTH is integral.

Software

**PASCAL-T**

Pascal-T is a 16k Eprom program capable of compiling source PASCAL into a compact and very fast threaded-interpretative code. Full Editor and disk support are included, together with a comprehensive manual which contains many program examples.

**FORTRAN**

A choice of configurations as follows:

- 8k Eprom + Disk containing assembler and program examples.
- 16k Eprom containing assembler and utilities.
- Disk-based FORTRAN for the BBC 6502 2nd Processor.
- All the above are Econet II compatible and utilise DFS compatible files to hold FORTRAN supplied. Supplied with 200+ page manual.
- Electronic FORTRAN is available for the Acorn Electron, complete with comprehensive manual.

**FORTH**

A 16k Eprom program introducing this very powerful but friendly turtle-graphics language. Users also have access to the support manual.

- M/UTS is a powerful machine-code monitor with disk utilities on 8k Eprom.

**Business Software**

A suite of three programs as follows:

- Sales Ledger
- Purchase Ledger
- Invoice: B. Stock Accounting

All include comprehensive documentation.

**Software for the CMS 6809 2nd processor**

- FLEX with Assembler and Editor.
- PL9 Compiler — very advanced native-code compiler, similar in syntax to Pascal.
- "C" Compiler. Price £179.00

**Hardware**

- BSECURE Security cabinet for the BBC Microcomputer. All steel construction, colour matched to BBC Machine.
- Short: Depth: 17" Height: 13"

**Printers**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOTT Matrix</td>
<td>£230</td>
</tr>
<tr>
<td>DOTT Matrix</td>
<td>£215</td>
</tr>
<tr>
<td>DOTT Matrix</td>
<td>£195</td>
</tr>
<tr>
<td>DOTT Matrix</td>
<td>£175</td>
</tr>
</tbody>
</table>

**MONITOR**

- Power Microscope
- Monitor: 11" XGA 2003
- Monitor: 14" XGA 2004
- Monitor: 17" CGA 2005
- Monitor: 19" CGA 2006
- Monitor: 21" CGA 2007

**Distributors for ACORN, MICROVITEC and CUMANA**

Distributors for ACORN, MICROVITEC and CUMANA and also dealers for many other leading manufacturers — please enquire for comprehensive product list.

**TRADE Enquiries are always welcome**

**Prices not including VAT**

**HCCS Associates**

533 Durham Road, Low Fell

Gateshead, Tyne & Wear

NE9 SEY

Tel: (0522) 821924

Retail sales also at:

HCCS Microcomputers

122 Darwin Street

Blackburn, Lancs

Tel: (0254) 872214

**Call us LAST with your best quotes.**

**APRICOT/SIRIUS/IBM**

- A80 OUTDOOR FRONT, Front: 50 x 50
- A80 OUTDOOR FRONT, Front: 50 x 100

**SANAYO**

- 200 Series 100W With Laser: 1000 x 1000
- 200 Series 200W With Laser: 1000 x 2000

**COLOMBIA**

- Colombia 50W With Laser: 1000 x 1000
- Colombia 200W With Laser: 1000 x 2000

**MACINTOSH**

- Macintosh: 1 Megabyte for Pico...

**OLIVetti**

- OLIVetti: 1100-2200
- OLIVetti: 1100-2200

**COMPAD**

- COMPAD: 1100-2200
- COMPAD: 1100-2200

**TELEVISED**

- TELEVISED: 1100-2200
- TELEVISED: 1100-2200

**EPSON**


**KYAPRO**

- KYAPRO: 1100-2200
- KYAPRO: 1100-2200

**NEC**

- NEC: 1100-2200
- NEC: 1100-2200

**HEWLETT PACKARD**

- HEWLETT PACKARD: 1100-2200
- HEWLETT PACKARD: 1100-2200

**ZENITH**

- ZENITH: 1100-2200
- ZENITH: 1100-2200

**MULTI USER COMPUTERS**

- MULTI USER COMPUTERS: 1100-2200

**Hobby Microcomputers**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZAGGLOXID QUAD</td>
<td>£230</td>
</tr>
<tr>
<td>ZAGGLOXID QUAD</td>
<td>£215</td>
</tr>
<tr>
<td>ZAGGLOXID QUAD</td>
<td>£195</td>
</tr>
<tr>
<td>ZAGGLOXID QUAD</td>
<td>£175</td>
</tr>
</tbody>
</table>

**Printers**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOTT MATRIX</td>
<td>£300</td>
</tr>
<tr>
<td>DOTT MATRIX</td>
<td>£275</td>
</tr>
<tr>
<td>DOTT MATRIX</td>
<td>£250</td>
</tr>
<tr>
<td>DOTT MATRIX</td>
<td>£225</td>
</tr>
</tbody>
</table>

**Dot Matrix**

- Dot Matrix: 100k
- Dot Matrix: 120k

**PL9 Compiler**

- PL9 Compiler: 120k
- PL9 Compiler: 120k

**C COMPLIER**

- C COMPLIER: 120k
- C COMPLIER: 120k

**LUCIDATA PASCAL**

- LUCIDATA PASCAL: 120k
- LUCIDATA PASCAL: 120k

**Hardware**

- BSECURE Security cabinet for the BBC Microcomputer.
- All steel construction, colour matched to BBC Machine.
- Short: Depth: 17" Height: 13"

**Printers**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOTT MATRIX</td>
<td>£230</td>
</tr>
<tr>
<td>DOTT MATRIX</td>
<td>£215</td>
</tr>
<tr>
<td>DOTT MATRIX</td>
<td>£195</td>
</tr>
<tr>
<td>DOTT MATRIX</td>
<td>£175</td>
</tr>
</tbody>
</table>

**Monochrome**

- Monochrome: 11" XGA 2003
- Monochrome: 11" XGA 2004

**Colour**

- Colour: 11" XGA 2003
- Colour: 11" XGA 2004

**COMPUTER ENTERPRISES INTERNATIONAL LTD**

01-543 8666

01-542 4850

TLX: 8813271

S SHOWROOM (OPEN Mon-Sat 10 to 5)

85-90 CHALKS LOCKS ROAD, WIMBLEDON, LONDON SW19 1EX


PRICES & SPECIFICATIONS SUBJECT TO CHANGE: NO VAT: NO POSTAGE:

**SOFTWARE**

- SOFTWARE: 1100-2200
- SOFTWARE: 1100-2200

**COMMUNICATION HARDWARE**

- COMMUNICATION HARDWARE: 1100-2200
- COMMUNICATION HARDWARE: 1100-2200

**ADD-ONS**

- ADD-ONS: 1100-2200
- ADD-ONS: 1100-2200

**Daizy Wheel Printers**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOTT MATRIX</td>
<td>£230</td>
</tr>
<tr>
<td>DOTT MATRIX</td>
<td>£215</td>
</tr>
<tr>
<td>DOTT MATRIX</td>
<td>£195</td>
</tr>
<tr>
<td>DOTT MATRIX</td>
<td>£175</td>
</tr>
</tbody>
</table>

**MONITOR**

- Monitor: 11" XGA 2003
- Monitor: 11" XGA 2004

**CONSUMABLES**

- Consumables: 11" XGA 2003
- Consumables: 11" XGA 2004

**Prices not including VAT**

**Prices not including VAT**

**Prices not including VAT**

**Prices not including VAT**

**Prices not including VAT**
Getting the right computer

At the Byte Shops we've helped countless companies of all sizes improve their efficiency by the introduction of microcomputers. Generally these are required to perform routine business tasks—but, however similar the application, we invariably find that no two customers have exactly the same requirements. When you come to the Byte Shop, you'll find that we are far more interested in finding out what jobs you require the computer to do both now and in the future. We then tailor a complete system including not only the hardware but the software, and the peripherals to meet your individual needs. We believe this is the only sensible way to sell computers. On this spread you'll find a number of "Typical Ready To Run" systems. However we won't sell one to you—unless you force us—without asking a few questions first.

WHERE TO FIND US:
NOTTINGHAM

With their team of all talents, it's perhaps surprising that Brian Clough has not popped into Byte Shop, Nottingham to discuss a solution to Forest's goal scoring problems.

Manager David Slater's method of relaxation (?!?) is to renovate houses. Engineer Clive Davison is into amateur TV and can even transmit his own pictures. The Sales Executives haven't been left behind and Steve Mayes is writing a book about a Nottingham architect, Alan Smith plays hockey and both David liffe and Simon Gunn are keen photographers.

If you're not interested in these subjects it's a relief to know that they can all talk enthusiastically and knowledgeably about all facets of microcomputers.

NOTTINGHAM—SPECIAL OFFER
IBM Portable was 2254.00
Symphony was 550.00
Available together at the special package price of only £2600.00.

THE BYTE SHOP. THE FIRST TURN TO FOR MI

COMPAQ

STANDARD & PLUS

Following phenomenal success in America, you can now find the portable, fully IBM PC compatible, Compaq micros at your local Byte Shop. Spec, for the Standard model includes, 256kb RAM, twin 360kb floppy disk drives, high resolution screen and tough carry case...

Plus models as above but with

single 360kb floppy and 3.5 hard disk drives.

All prices EX. VAT

£2195.00

£3945.00

COMART COMMUNICATOR

Comart Communicator multi-user systems have expandability built in and are the most cost-effective way of sharing computer power amongst your staff. You can start with 2 'Communicator' systems to suit your current requirements—up to 15 people can share—and simply add new terminals as you grow. A considerable saving over buying a complete new computer each time.

COMMUNICATOR MULTI-USER MULTI-PROCESSING SYSTEMS

£1800 per user

Communicator CP520MP including: 5 display terminals, cables & controller memory £9095.00

£2119 per user

Communicator CP525SM with M-905 operating system, including 5 display terminals, dot matrix printer and cables £10995.00

NEW COMMUNICATOR CP2000 SERIES

Featuring the new 'powerhouse' Intel 286/287 processors, the three models in the CP2000 series have at least double the speed and processing capacity of most conventional multi-user systems. The big performance and excellent value of the CP2000, means that it can comfortably support up to 12 users for as little as £3995.

Importantly, the CP2000 series runs two industry-standard operating systems, CP/M and the latest version of the concurrent CP/90, allowing you to switch from up to four programmes simultaneously without clearing the screen.
IBM/PC

CROCOMPUTERS.

The IBM PCX's versatility means that it's equally at home in a small business or as a stand-alone desktop top in a large corporate company linked to a mainframe.

IBM PC: dual 300M disk drives, 64Kb RAM, UK keyboard and screen; 1988.00

IBM PC XT: dual 300M disk drives, 128Kb RAM, DOS 2.1, UK keyboard and screen; 2499.00

IBM PC XT, 1 x 320K floppy disk, 1 x 10Mb hard disk, 128Kb RAM; 1988.00

IBM PC; dual 320K floppy disk; 64Kb RAM; DOS 2.0; UK keyboard and screen; 3432.00

From 1988.00 ex. VAT

IBM PORTABLE PC

Offers the features of IBM PC computing in a self-contained portable package weighing only 330b (13 kg). Specification includes 256Kb RAM expandable to 512Kb, dual floppy disk drives, 9" amber screen and smart system carrying bag...2254.00

Typical IBM Business Systems

Word Processing

IBM Multimate, letter quality printer...313.00

IBM PC; colour monitor; Symphony; 399.00

IBM PC XT; dBase II; dot matrix printer 349.00

IBM PC XT; dBase II; dot matrix printer, QWERTY keyboard with 10' coiled cable, separate numeric key pad for easier and error-free data entry 349.00

Application System

IBM PC, 128Kb RAM; DOS 2.1; UK keyboard alone desk top in a large corporate 3135.00

system linking to a mainframe. 3432.00

IBM PC; dual 320K floppy disk drives; 64Kb RAM; DOS 2.1; UK keyboard and screen 269.00

IBM PC; dual 320K floppy disk drives; 128Kb RAM, DOS 2.1, UK keyboard and screen 399.00

IBM PC; dual 320K floppy disk drives; 128Kb RAM; DOS 2.1; UK keyboard and screen 2499.00

IBM PC XT; dBase II; dot matrix printer 399.00

System Spotlight

IBM PC AT

If you are doubtful whether a standard PC will have the processing speed or memory to keep up with your future development, then the AT is the obvious choice. The AT's 'formidable' spec. includes 256Kb standard RAM (512Kb enhanced version), 2Mb hard disk (20Mb enhanced), new DOS 3.0 operating system expandability, monitor and newly enhanced keyboard with '10' coiled cable, separate numeric key pad for easier and error-free data entry 3374.00

Enhanced from 4703.00

Lotus 1-2-3 - Remarkable spreadsheet, easy to use, function key driven word processing, integrated spreadsheet, communications, database and colour graphics package for the IBM PC 375.00

dBASE II - Powerful database management and applications generator with optional graphics and development tools 365.00

Symphony - Complementary follow-up to 1-2-3 from Lotus including word processing, integrated spreadsheet, communications, database and colour graphics. 550.00

SuperCalc 2 - Sophisticated, easy to use financial spreadsheet for in depth analysis, modelling and forecasting 195.00

FrameWork - Integrated package featuring word processing, spreadsheet, graphics, data management 495.00

Friday - Personal file management package for the novice with quick custom reporting 795.00

dBASE III - Powerful database management tool for data entry, database and file maintenance 945.00

Communications Plus - Simple to use selective data retrieval tool with optional tailor made report writer 330.00

Level II Cobol - Mainframe level III compiler, well suited for new applications development: tools and utilities available 965.00

GraphStat - Up and coming statistics and colour graphics package for the IBM PC 195.00

CBASIC - Widely used commercial programming language for business applications development, interpreter also available 125.00

Delta - Comprehensive and sophisticated database, graphing and word processing package for the IBM PC 495.00

BSTAM - Communications package for sending and receiving CPM files over telephone lines 495.00

Presentation Master - Provides all the tools to turn your PC into a graphicsoriented slide projection unit 1495.00

Pascal MTR - Comprehensive integrated language for developing production quality software...269.00

CP/M 86.462.00

microserve

An integral part of the Byte Shops, Microserve provides a complete range of serving and maintenance plans nationwide for computers such as the IBM PC and Communications Plus peripherals from Epson, Anadex, Qume, Wyley and Vollenkamp. "Microserve" - our speedy nationwide on site maintenance and repair contract for a 'once only' annual fee. "Microswop" - component exchange service. "Micromend" - workshop repair and upgrade service. 'Microcall' - on site maintenance and repair charged on a time and materials basis, 'Microfran' - runs product training courses for your own service engineers. Call into your local Byt shop for further details. 0480 215005 for a Microserve Information Pack.

ST NAMERICA MICROCOMPUTERS.

Top 20 SELLING SOFTWARE

Lotus 1-2-3 - Remarkable spreadsheet and information management package incorporating colour graphics for the IBM PC 375.00

dBASE II - Powerful database management and applications generator with optional graphics and development tools...365.00

Symphony - Complementary follow-up to 1-2-3 from Lotus including word processing, integrated spreadsheet, communications, database and colour graphics. 550.00

SuperCalc 2 - Sophisticated, easy to use financial spreadsheet for in depth analysis, modelling and forecasting...195.00

Framework - Integrated package featuring word processing, spreadsheet, graphics, data management...495.00

Friday - Personal file management package for the novice with quick custom reporting...795.00

dBASE III - Powerful database management tool for data entry, database and file maintenance...945.00

Communications Plus - Simple to use selective data retrieval tool with optional tailor made report writer...330.00

Level II Cobol - Mainframe level III compiler, well suited for new applications development: tools and utilities available...965.00

GraphStat - Up and coming statistics and colour graphics package for the IBM PC...195.00

CBASIC - Widely used commercial programming language for business applications development, interpreter also available...125.00

Delta - Comprehensive and sophisticated database, graphing and word processing package for the IBM PC...495.00

BSTAM - Communications package for sending and receiving CPM files over telephone lines...495.00

Presentation Master - Provides all the tools to turn your PC into a graphicsoriented slide projection unit...1495.00

Pascal MTR - Comprehensive integrated language for developing production quality software...269.00

CP/M 86.462.00

PC XT ADD-ON'S & ADD-IN'S

Alloy PC AT

PC XT - Backup - cartridge tape unit for backing up, storing, retrieving data from hard disk...1750.00

Microvitec 1446 - 14" colour monitor...495.00

Expansion Unit 1 - 10 Mb hard disk unit for PC XT...1381.00

Tallgrass Datassert - 5.4" hard disk mass storage unit with 12, 20 or 35 Mb capacity plus integral streamer cartridge backup from 2.820.00

Heracles Graphics Card - allows high resolution bit mapped graphics on monochrome display...395.00

Orchid PC Net Starter Kit - local area network allowing file and disk sharing plus optional electronic mail...1000.00

PC Net Cards - To link additional terminals to network...460.00

Quadram Cards - full range available inc. memory expansion & colour graphics from 194.00

IBM colour monitor plus adapter card...468.00

IBM printer incl. cable...469.00

Epson FX80 printer incl. cable...478.00

Brother Letter Quality Printer...445.00

ALL PRICES EX. VAT

At a glance Computer Checklist

<table>
<thead>
<tr>
<th>IBM AT</th>
<th>IBM PC</th>
<th>Compat</th>
<th>Compaq</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Volume purchase prices available on request

Barclaycard Visa and Access taken in payment

Account, leasing and HP facilities available

Prices valid for cover date life of this magazine (January).

LONDON

173-175 Drummond Street NW1. Tel: 01-387 0506 Manager Russell Jacques

BIRMINGHAM

94-96 Hurst Street. Tel: 021-622 3165 Manager Jim Atfield

GLASGOW

266 St. Vincent Street. Tel: 041-221 8202 Manager Gordon Coventry

MANCHESTER

11-12 Gateway House, Piccadilly Station Approach. Tel: 061-236 4737 Manager Robin Pimlot

NOTTINGHAM

92a Upper Parliament Street. Tel: 0602 470576 Manager David Slater

SOUTHAMPTON

23 Cumberland Place. Tel: 0703 334711 Manager Russ Wilmott

BRISTOL

Tel: 0272 290651 Manager John Page

BYTE SHOP HEAD OFFICE

Grove House, Great North Road, Little Paxton, Cambs. PE19 4EL. Tel: 0480 218812 Managing Director Peter King

KJ A Kode International plc Company
Totally dedicated to writing very fast, video games, BASIC Lightning is a
is a fully structured extension to the
Commodore BASIC which adds a
stringing 200 reserved words. It
allows up to five tasks to run
concurrently (one in foreground and
four in background). Most of the
commands are dedicated to games
writing and the sound and graphics
commands are unparalleled.

Procedures and PASCAL like structured
programming commands are also a
feature of BASIC Lightning.

As well as being Commodore's own 8
hardware sprites. BASIC Lightning has
its own software sprites. Up to 255 can
be defined with user selectable
dimensions. There can even be several
screens wide. They can be scrolled,
spun, mirrored, enlarged or inverted
with phenomenal speed and
smoothness.

A Sprite Generator Program
(written in BASIC Lightning) is also
supplied and can be used to design,
edit and store all your sprites for use in
your main program.

White Lightning is a complete
games writing package comprising a
high level, Forth based, multi-tasking
game writing language, the extended
BASIC (BASIC LIGHTNING) and a
powerful sprite Generator Program.

Programs can even be written in a
combination of Forth and Commodore
BASIC and the final program, which will
run independently of White Lightning,
can be marketed with no restrictions
whatsoever.

The Basic Lightning port of the
package can be used to experiment
quickly and safely before the Forth
program is developed.

The speed of White Lightning has
to be seen to be believed and a full
demo is included. As with Basic
Lightning, hardware sprites are
supported, together with 255 software
sprites which can be scrolled, spun,
reflected, enlarged or inverted.

MULTI-TASKING Without doubt
the most powerful feature of the
tracking series of languages is the
multi-tasking facility. This allows two
programs to be run concurrently and
makes these smooth in readable
scrols etc. effortless.

The BASIC Lightning Sprite
Generator Program is also included in
the package.

Commodore 64 Machine Lightning
is probably the most advanced games
writing utility available on any micro. It
contains in 4 parts:

MACRO ASSEMBLER/
MONITOR/DISASSEMBLER This is
probably the most comprehensive
machine code development system
available for the Commodore 64 with
features too numerous to mention.

BASIC LIGHTNING This
multi-tasking BASIC is also
provided to facilitate experimentation
in preparation for later assembly.

SPRITE GENERATOR Used to
develop all the graphics for the final
program. The Sprite Generator has
numerous functions including enlargement,
rotation and reflection.

OBJECT LIBRARY This is Machine
Lightning's most powerful feature.
10k of re-entrant code with more than 130
documented entry points. These are
the routines that provide all the
super-fast graphics routines in White
and Basic Lightning. They contain
virtually every routine you'll ever need
to write on an Arcade Game and
multi-tasking in Machine Lightning is
covered in the comprehensive
accompanying manual.

NAME
ADDRESS
TELEPHONE

Please send me the following Lightning System Pack(s)
Basic Lightning (tape) (4.5) £19.95
disk) £21.95
White Lightning (tape) (29.95
disk) £39.95
Machine Lightning (tape) £29.95
disk) £39.95

I enclose my cheque/PO for (£)

Available from
and all good software suppliers.
Introducing Byte Shop Training Centres

Pretty soon there will be only one kind of business.

The business whose staff fully understands its computer systems.

Those businesses who fail in this respect will, simply, not be in business.

That is why—as an urgent priority—The Byte Shop is providing computer training from our Business Centres in London, Bristol, Glasgow and Birmingham. And they’re the best—in keeping with our tradition ever since we opened the UK’s very first specialist microcomputer centres.

There are course sequences to suit, whether you just want to understand the basics or are a DP professional looking to expand your knowledge.

And since our courses are approved by the Manpower Services Commission, your company may well qualify for a grant. Incidentally, our courses are also taking part in the Royal Society of Arts scheme to provide qualifying students with certificates in Computer Literacy and Information Technology.

Send off the coupon for our brochure containing full course details and booking forms. Do it now and help yourself to our rather generous introductory offer.

*Courses will also be available shortly in Southampton, Nottingham and Manchester.
ARE YOU USING A SLEDGEHAMMER?

Your word processing system is very powerful. But how easily can it type out one address, or a short memo? Can untrained temporary staff use it at all?

Would you like to have a truly simple text editor as well?

The Nutcracker Suite can:
- Type text line by line as it is entered.
- Save in format usable by other word processors.
- Give full on screen editing and versatile printing options.

Formats: IBM PC DOS Or Apricot MS DOS

At £49.45 (including VAT) the Nutcracker Suite gives you back a typewriter for all the simple work in your office. Ask your dealer for a demo ... or send a cheque to:

Lutterworth Software
6 Cromwell Close
Walcote
Lutterworth
Leicestershire
LE17 4JJ
Tel: 04555 4259

We Solve All Your Data Processing Problems!

How to prevent equipment damage and data loss from voltage spike?
Tired of waiting aside monitor for incoming data? Any trouble connecting incompatible cable between two equipments? We are manufacturer of a wide range computer supplies and accessories. Contact us today for all details.

DATA-MASTER, INC.
P.O. BOX 55-249 TAIPEI, TAIWAN R.O.C.
Tel: (02) 542-0888 (5 Lines)
Telex: 19826 ELMACH
Fax: (02) 994-4240
Small Systems Engineering have for a long time been innovators in the field of microcomputer technology and enhancement products. Now we introduce innovation to the area of networking mass storage systems for micros.

The Sunol range of high performance Winchester disk drives, giving 8, 16, 25, 40, 65 or 92 Mbytes of usable storage capacity.

ORE WORK...IN HALF THE TIME

Sunol’s data recording system, ‘Run Length Limited’ coding, improves data density by up to 60% and media transfer speed by up to 50% over conventional MFM recording techniques.

Sunol hard disk systems allow shared use, with the ability to mix and match various computers and operating systems on the same drive – sharing resources, sharing data and sharing costs. Two RS232 ports may be added to the drive to function as printer or communication servers for the whole system.

Small Systems have developed many innovative enhancements to the Sunol range, including interfaces for Sirius, Apricot, Commodore and IBM PC, and an interface controller for the Apple Macintosh, the first independent design using Apple’s RS422-based AppleBus networking protocol. Sunol drives are now compatible with over two dozen different micros. Seven different operating systems may be used on one drive at the same time.

For more information, phone Sue Allwood or Simon McCarthy on 01-538 2211, or just fill in the coupon below.
RUNS ON MORE MACHINES THAN ANY OTHER BUSINESS GRAPHICS PACKAGE INCLUDING:
- IBM, Apricot (whole range), Sirius, DEC Rainbow,
- Honeywell, LSI Octopus, DMS Hi-Net, Cifer 2887, ICLPC,
- Epson DX-10, Ferranti.
- NCR DMS, NEC-APC, XEROX 920 II, Olivetti M24,
- Torc. Please phone to check whether DATAPLOT PLUS has been configured for any computer not mentioned.

Interfaces to:
- Supercalc, Calcstar, Multiplan,
- D Base II, D Base III, DMS Delta,
- Lotus 1-2-3, etc.

Outputs on following plotters:
- HP 7475, 7470, Calcomp 84,
- Epson HI-80, Roland, Piny 3,
- Sweet P, Gould, Colorwriter etc.

Distributed by:
- ACT (Pulsar) Ltd, Software Ltd,
- Tamsys, Tradesoft, MPI,
- WHS Distributors,
- Soft Option (UK) Ltd, Xian Ltd.

This software package has been officially recognized by ACT for use with Apricot & Sirius personal Computers.

DATAPLOT PLUS

BUSINESS GRAPHICS SOFTWARE
- SIMPLE YET SOPHISTICATED-

Dataplot Plus now gives you the range and versatility of graphics presentation previously only available on specialist systems, for a fraction of the cost.

Using simple single key commands Dataplot Plus takes only seconds to draw perfect graphs.

Dataplot Plus converts tabulated data from your spreadsheet or database package into instantly readable form with full control given the type, scaling, colour and style of the graph.

Dataplot Plus is the business graphics package that lets you spend less time at your computer — not more.
<table>
<thead>
<tr>
<th>A</th>
<th>ACT</th>
<th>112/113, 120/121, 125</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anglia Computer Centre</td>
<td>317</td>
<td></td>
</tr>
<tr>
<td>ATA Systems</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Atron</td>
<td>33, 40/41, 48/49, 74/75</td>
<td></td>
</tr>
<tr>
<td>Ascent Computers</td>
<td>277</td>
<td></td>
</tr>
<tr>
<td>Ascomp UK Ltd</td>
<td>284</td>
<td></td>
</tr>
<tr>
<td>Addmark</td>
<td>76/77</td>
<td></td>
</tr>
<tr>
<td>Admark Publishing</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>Adelphe Business Computers</td>
<td>164</td>
<td></td>
</tr>
<tr>
<td>Air Disketts</td>
<td>179</td>
<td></td>
</tr>
<tr>
<td>American Dynamics</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Amstrad Consumer Electronics</td>
<td>128/129</td>
<td></td>
</tr>
<tr>
<td>Ashfield Business Computers Ltd</td>
<td>156</td>
<td></td>
</tr>
<tr>
<td>Atari</td>
<td>1001</td>
<td></td>
</tr>
</tbody>
</table>

**B**

| Bankury Computer Centre | 285 |
| Barcanic Systems | 17 |
| Bolic | 43 |
| British Micro Awards | 280/281 |
| Brook Street Bureau | 14 |
| Business User Systems | 58 |
| The Byrnesops | 312/355 |

**C**

| C & E Microtronics | 275 |
| C2E2 | 264 |
| CJE Microcomputers | 44 |
| CRL | 261 |
| Cambridge Computer Store | 256 |
| Canterbury Computers | 13 |
| Canon Software | 111 |
| Cencom Computer's | 306 |
| Chota Graphics | 79 |
| Comart | 16 |
| Compishop | 54 |
| Compsoft | 199 |
| Computer Enterprises | 311 |
| Computer Hardware and Maintenance | 141 |
| Crestan Ltd | 43, 305 |
| Cumara | 114 |
| Cydis | 258 |

**D**

| Data Master | 316 |
| Data Profile | 35 |
| Datafax | 60 |
| Datamath | 57 |
| Datastore | 21 |
| Datatone | 21 |
| DataTel | 68 |
| Dateline | 99 |
| Davinci Computer Store | 38 |
| Daynet | 306 |
| Dennisson Kybe | 289, 291, 293 |
| Digiwave | 85/172 |
| DIGIC | 61 |
| Digital World | 1 |
| Disktecno | 67/69 |
| Disking | 80/81 |
| Display Electronics | 270 |
| Duxian Ltd | 251 |
| Dusit | 9 |

**E**

| ECC Publications | 87 |

**F**

| FSSP Distribution | 13 |
| Electroconsult | 83 |
| Electrosport | 52 |
| Fasonic | 61 |
| F & J. International | 209 |
| Fabruary | 131 |
| Factor Associates | 133 |

**G**

| GCI Tutoring | 82 |
| Glorit Computerbau | 282 |
| Guildford Computer Centre | 25 |

**H**

| Hugo Products Ltd | 91 |
| Handle software | 197 |
| Harrisence (UK) Ltd | 103 |
| HCCS | 311 |

**J**

| J. B. International | 100 |
| J & K | 310 |
| KGB Micros | 237 |
| Kellereeds | 4 |
| Knighthouse Computer Services Ltd | 69 |
| Knights TV & Computers | 291 |

**K**

| KAI | 76/79 |
| KGB Micros | 60 |
| Keller's | 269 |
| Kellereeds | 269 |
| Kingsley Enterprises | 269 |

**M**

| MAM Executive Computer Services | 27 |
| Maintenance Tally | 23 |
| Map 80 Systems | 283 |
| Mayfair Micros | 78, 82 |
| Memorex | 272/273 |
| Memsoft | 253 |
| Merchandise Marketing | 55 |
| Micro-Computer Consultancy | 17 |
| Micro-Computer Services | 96 |

**Q**

| Quicksil | 21 |
| Q旅游度假 | 21 |
| Quicksil | 21 |

**T**

| TIC | 232 |
| TIC | 232 |

**U**

| U-Microcomputers | 46 |
| Ultron | 269 |

**V**

| V | 82 |
| V | 82 |

**W**

| W | 37 |
| W | 37 |

**X**

| X | 278 |
| X | 278 |

**MICROMART ADVERTISERS INDEX**

| A | 233 |
| B | 237 |
| C | 240 |
| D | 242 |
| E | 251 |
| F | 251 |
| G | 230 |
| H | 251 |
| I | 228 |
| J | 228 |
| K | 252 |
| L | 250 |
| M | 251 |
| N | 262 |
| O | 290 |
| P | 277/277 |
| Q | 21 |
| R | 216 |
| S | 34 |
| T | 260 |
| U | 104 |
| V | 37 |
| W | 248 |
| X | 244 |

**ADVERTISERS INDEX**

| 34 |
| 59 |
| 59 |
| 262 |
| 170 |
| 280 |
| 22 |
| 32 |
| 32 |
| 262 |
| 191 |
| 35 |
| 32 |
| 280 |
| 289 |
| 306 |
| 30 |
| 262 |
| 240 |
| 231 |
| 242 |
| 249 |
| 242 |
| 252 |
| 232 |
| 244 |
| 244 |
Apart from breaking into joy because the tape has finally loaded, what else might have excited the young user in the centre of this photograph? And no, we don't know why the other young lady had to put on her leotard before tackling the Spectrum.

Send your suggestions, on the back of a postcard, to Chip Chat, PCW, 62 Oxford Street, London W1. Don't forget to give your name and address so we know where to send the £10 should you win. The closing date is 31 January.

The BBC sure gets around:

last November we reported the Homelink Interactive Building Society has
Taking stock: Nottingham of 'contemporary Barbies was announced - a display convention where the game another feature at the Barbie
stereotyping will doubtless even change Barbie's her in over 1000
five different stores, dress can take Barbie shopping in home computer, children 'Through the magic of the computer' - strange that. many people do not know why the other young lady had to put on her
leotard before tackling the Spectrum. Apart from breaking into joy because the tape has finally loaded, what else might have excited the young user in the centre of this photograph? And no, we don't know why the other young lady had to put on her leotard before tackling the Spectrum.

Send your suggestions, on the back of a postcard, to Chip Chat, PCW, 62 Oxford Street, London W1. Don't forget to give your name and address so we know where to send the £10 should you win. The closing date is 31 January.

The BBC sure gets around:

last November we reported the Homelink Interactive Building Society has
Taking stock: Nottingham of 'contemporary Barbies was announced - a display convention where the game another feature at the Barbie convention where the game was announced — a display of 'contemporary Barbies groomed for the fast-paced business world.'

Taking stock: Nottingham Building Society has announced the winners of the Homelink Interactive Game competition we ran last summer. Making money through investment proved to be a rewarding theme for P L Wallinger of Winchester who took first prize, closely followed by Edinburgh's K Campbell and Grimbsy's W K Turner.

Inscrutable: readers may recall a letter from NEC in our last issue which denied a price-cutting possibility raised in a previous news story. That letter was published about the time a price cut was announced. We understand that this particular deal will no longer be on offer by the time you read this, then again ...

Basic knows no borders: Xitan doubtless deserves credit for translating XBbasic into Welsh (LOAD is LOAD is
RELOAD is RELOAD and so on). The Southampton-based company would deserve even more credit if it hadn't said that one reason Welsh was chosen was 'to get the product checked out by people in the same country.'

Rave from the grave: Livewire Software has revived the only game which PCW's editor ever truly mastered — Space Invaders. What next from this forward-looking firm — Pong 957 Uncordinated readers striving for success on faster games should look at a product called Slomo which will slow everything down so that you can at last rack up a high score.

SOS: Douglas Nunn has sent Chip Chat a plea: 'I returned to my computer one day to find the following anonymous message left for me via my newly acquired teletext system. I can see it's not a program of any sort, not even in Forth, but I can't make head nor tail of it. My last hope is to send a copy to both Personal Computer World and the Polish Embassy to find out if either can tell me its significance and the whereabouts of the mysterious sender. I have added my own numbers for reference.'

We can't help (nor, we suspect, can the Polish Embassy) — but we've every faith that one of our readers can. In case faith is not enough, Hewlett Packard has agreed to offer a prize of its 12C calculator to whoever can come to Douglas's aid.

Send your suggestions to reach us by 31 January — the address is as for the competition.

Chip Chat...

...Across 8 Validate 9 Edible 10 Author 11 Glossary 12 Blip 13 Validate 9 Edible 10 Author 11 Glossary 12 Blip 13

ACROSS

Down
1 Bumf 2 Digits 3 Pacman 4 User port 5 Diskette 6 Validate 7 Edible 8 Author 9 Manual 10 Light pen 11 Warranty 12 Blip 13
Affordable and reliable printers from **Micro P**
give you more CPS for your money

Even in today's high tech world, for most of us, the written word is still the least expensive means of sending and receiving information. If you own a microcomputer the chances are that sooner or later you are probably going to need a printer.

**Micro P** — **CPP40**
A low cost 4 colour 40/80 column printer/plotter capable of printing text or graphics on plain paper. The CCP40 is an ideal companion for small and portable micro's, as it is fitted with rechargeable batteries — perfect for beginners.

**Micro P** — **SHINWA CPA80**
With 100 cps quality printing, the CPA80 probably gives more cps/£ than any other printer available today. The CPA80 is packed with features you would normally find on a more expensive printer. With an optional RS232 version available (even for the QL) this Epson compatible printer will hook up to almost any micro. See them at your local dealer today!

**Micro P** — **MP165**
Looking for a matrix printer as well as a daisywheel? Well, the MP165 combines all the attributes of these two technologies to give a matrix printer capable of printing at up to 165 cps, as well as providing crisp Near Letter Quality (NLQ) print at 75 cps. Features include a 2k buffer as well as both friction and tractor feed, as standard. Ideally suited to most popular micro's, the MP165 is now available in a new RS232 QL compatible version.

---

**Micro Peripherals ltd**
‘The Power Behind the Printed Word’
INTEC UNIT 3, HASSOCKS WOOD, WADE ROAD, BASINGSTOKE, HANTS, ENGLAND, RG24 1NE.
Telephone: BASINGSTOKE (0256) 473232 (32 lines).
Telex: 888669 MICROP G Facsimile: 0256 461570

*Full 12 months warranty on all products. QL is a registered Trade Mark of Sinclair Research.*
Personal Computers Ltd, the U.K.'s first personal computer dealer has done it again! First in the U.K. with Apple Computers — first in the U.K. with Lotus 1:2:3 software — and now another first, the brand-new Macintosh Centre open in the heart of the City of London.

Macintosh is the new computer sensation from Apple, designed on the simple premise that a computer is a lot more use if its easy to use. Computers have little value if they require thirty manuals to figure out and a doctorate in mathematics to operate. Ideally, working with a computer should be like talking to a very bright friend who is eager to help get your work accomplished — and that's Macintosh.

With Macintosh you can write, analyse, organise, create and illustrate, often at the touch of a finger, by moving a 'mouse' on your desk to move a pointer on the screen. It can also help you prepare letters, reports, produce charts and presentation slides, store and retrieve information. And much more.

This doesn't just mean your work will be faster and more accurate — it will also be better. And remember the less time you spend shuffling papers — the more time you have available to exercise your creativity.

Macintosh takes over your deskwork, but not your desk. In fact it takes up an area as small as a standard sheet of paper.

Macintosh has a wide range of software available, and new packages are being added all the time. In addition to Mac's own software which includes MacPaint, MacWrite, MacDraw and MacProject, there's world-famous packages from Microsoft — like Multiplan, Chart, Word and File, and the best-selling Filevision — you'll find them all at the new Macintosh Centre.

Macintosh — recently voted best value personal computer by 'Which Computer' magazine, source: 'Which Computer' survey August 1984 who called it "an unbeatable buy".

Let us put a mouse in your hand, and show you the capabilities of this exciting new computer. Call in at the new Macintosh Centre, 218 Bishopsgate, London EC2M 4JS or for further information call the Mac Hotlines on 01-377 1200 today!