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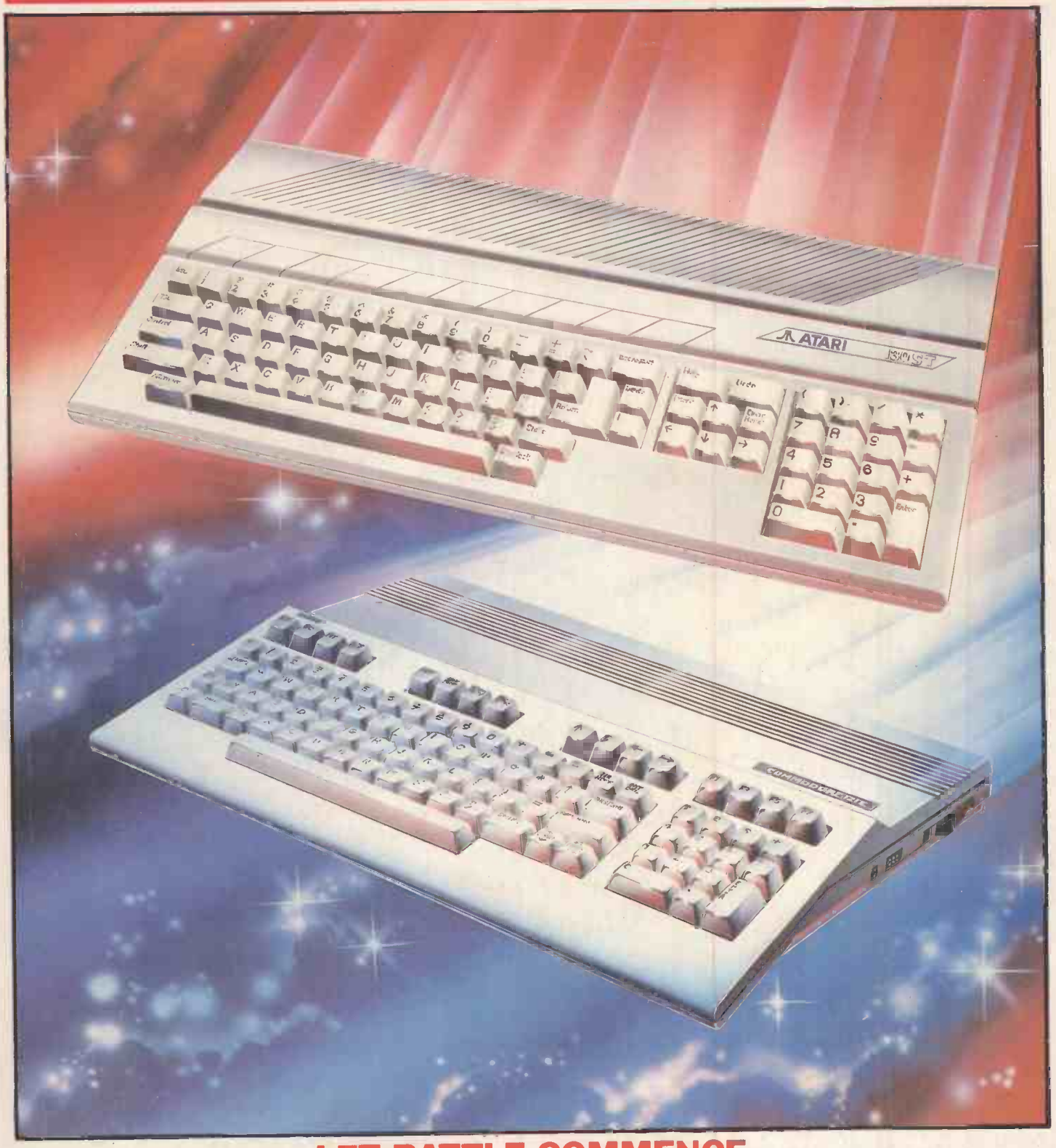

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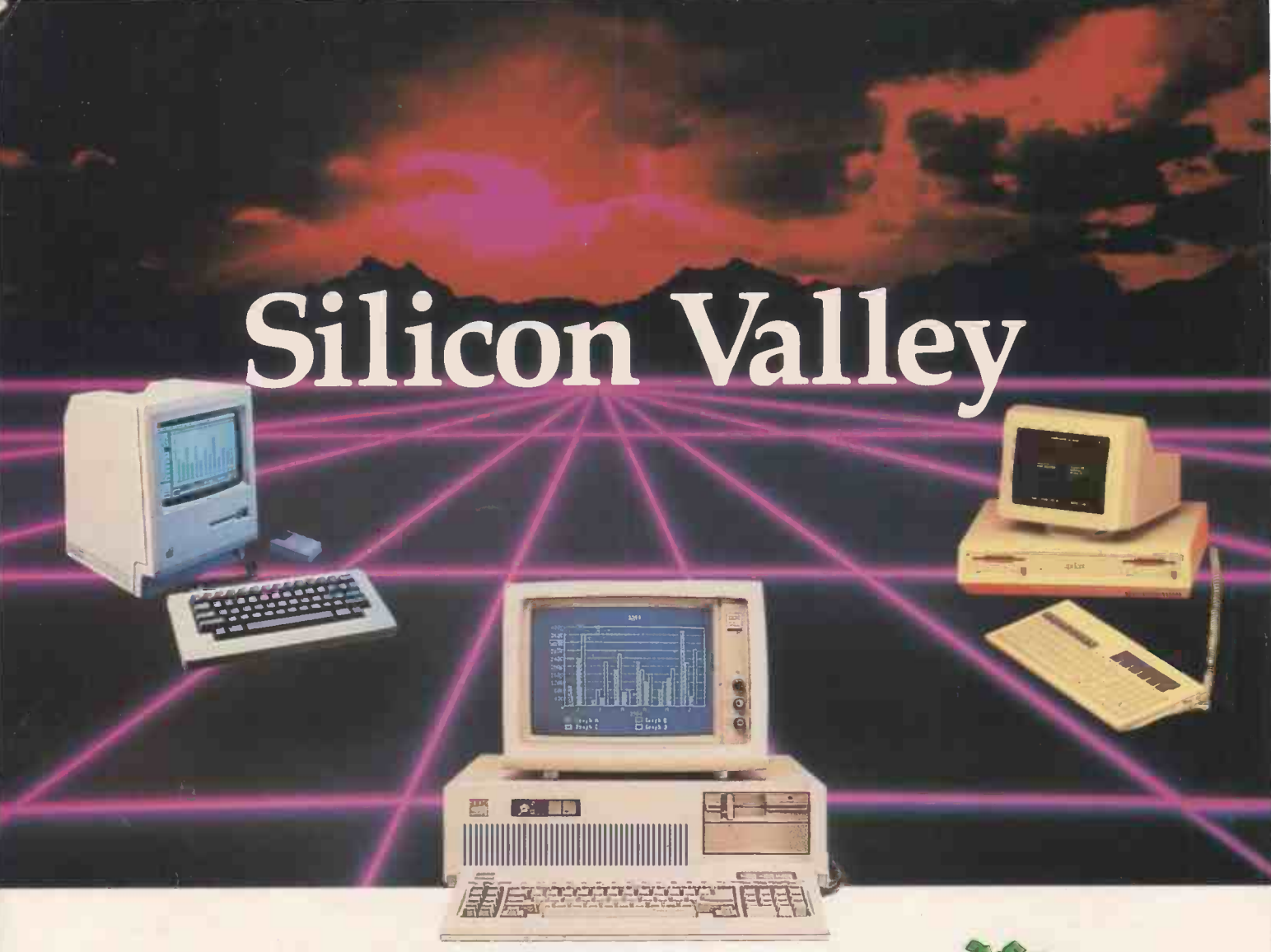

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CONTENTS

Vol 8 No 3 March 1985

Cover story begins page 120
Illustration by Barry Lepard

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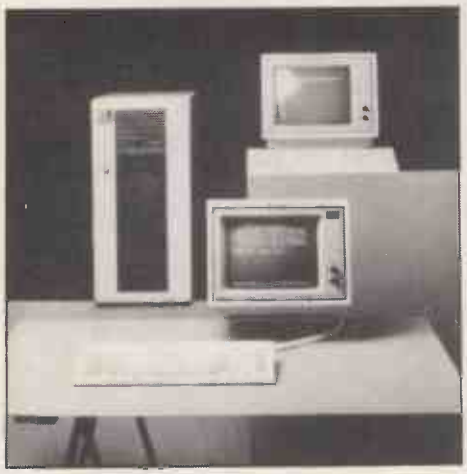

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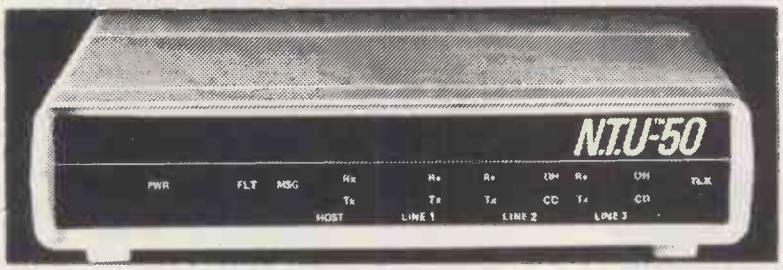

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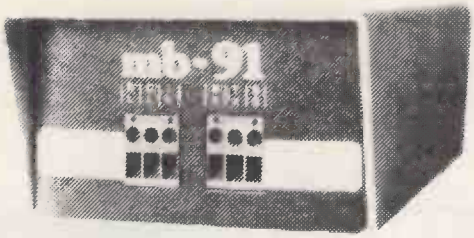

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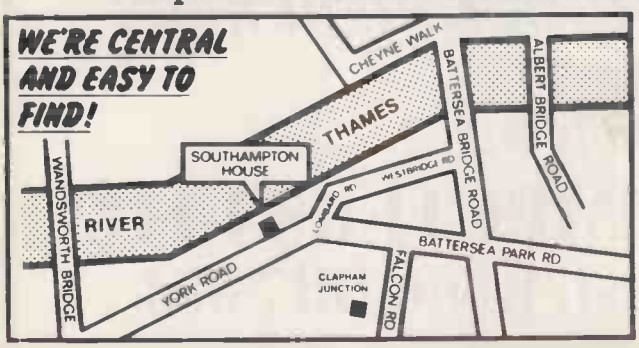

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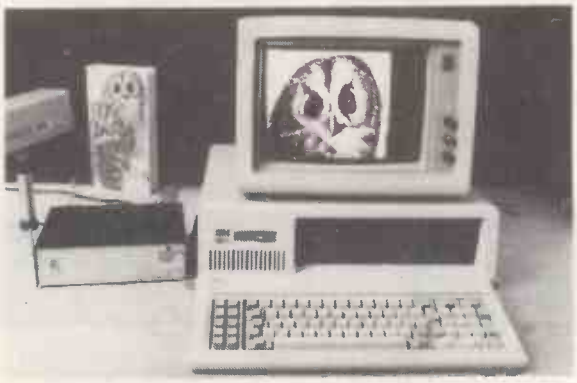

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Mono/Printer adap.	148
RGB Colour Mon	405
Colour adap.	159
Parallel adap.	71
64K RAM kit	59
10MB upgrade kit	820
DOS 2-1	48

APPLE

MAC 128K	1472
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IMAGE WRITER 15"	430
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APPLE //e	481
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Mouse //c	58

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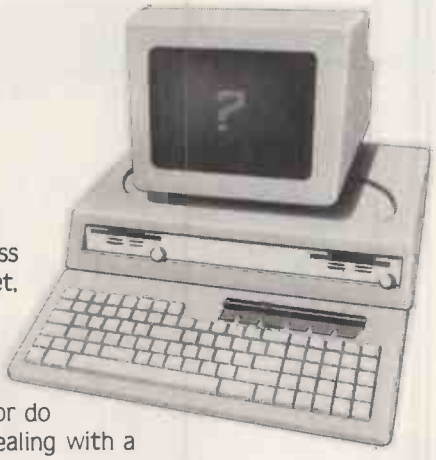

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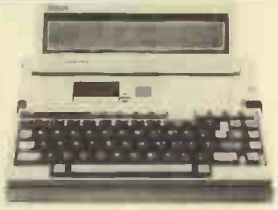

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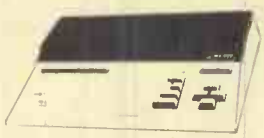

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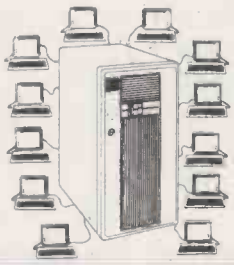

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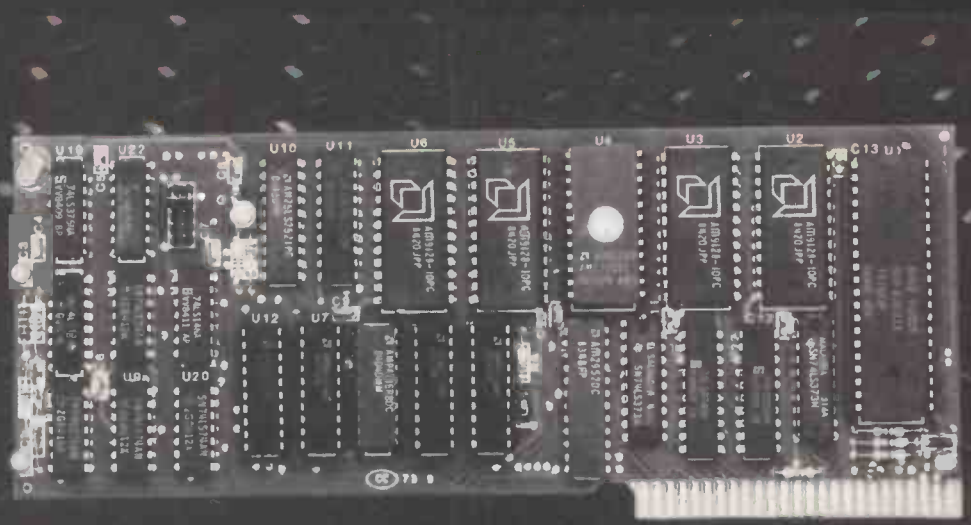

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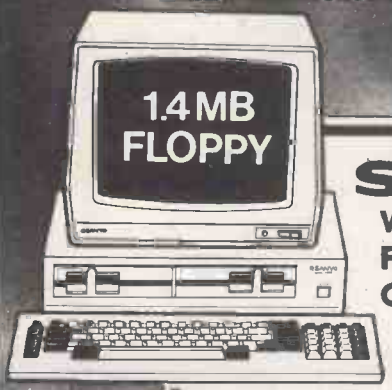

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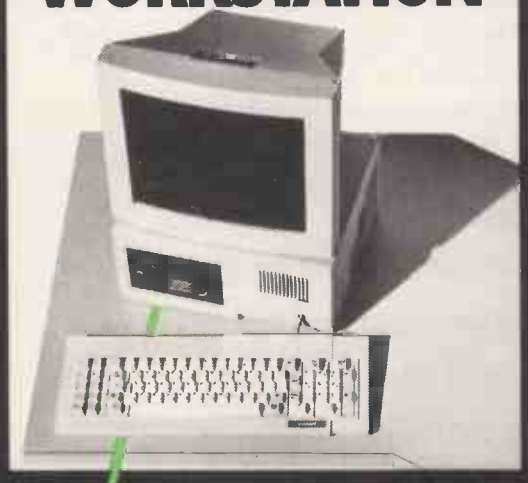

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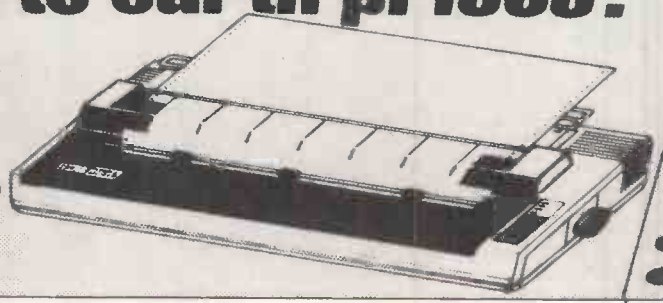

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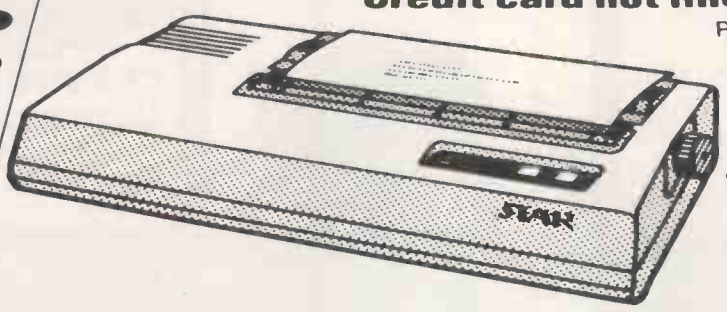

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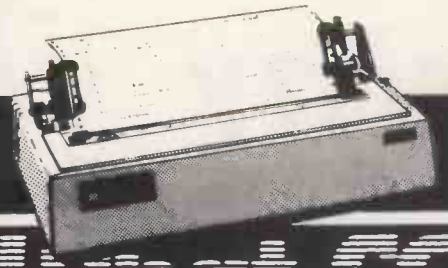

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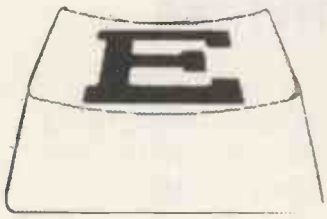

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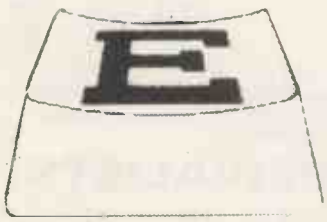

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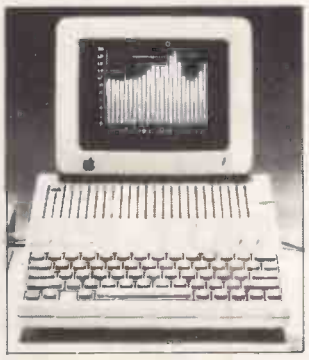

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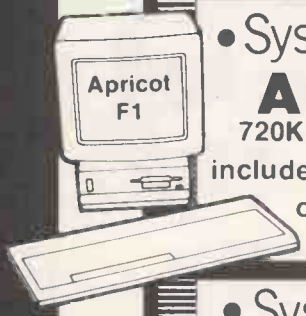

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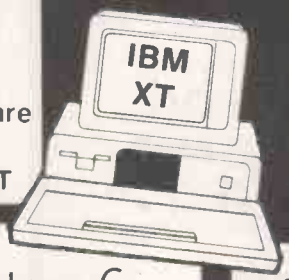

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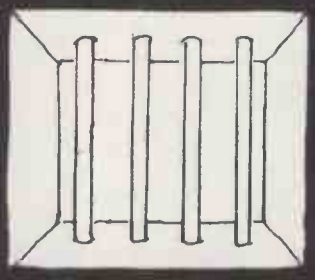

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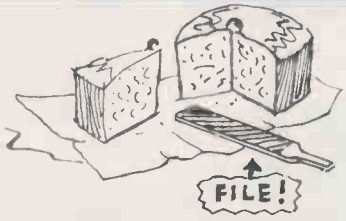

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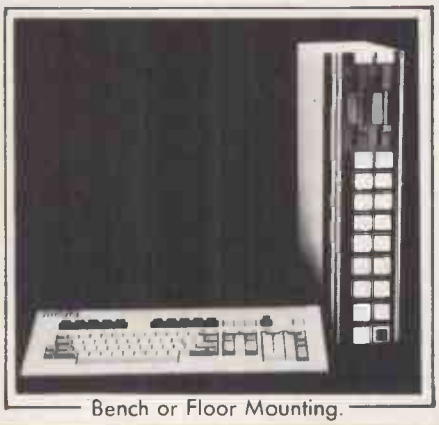

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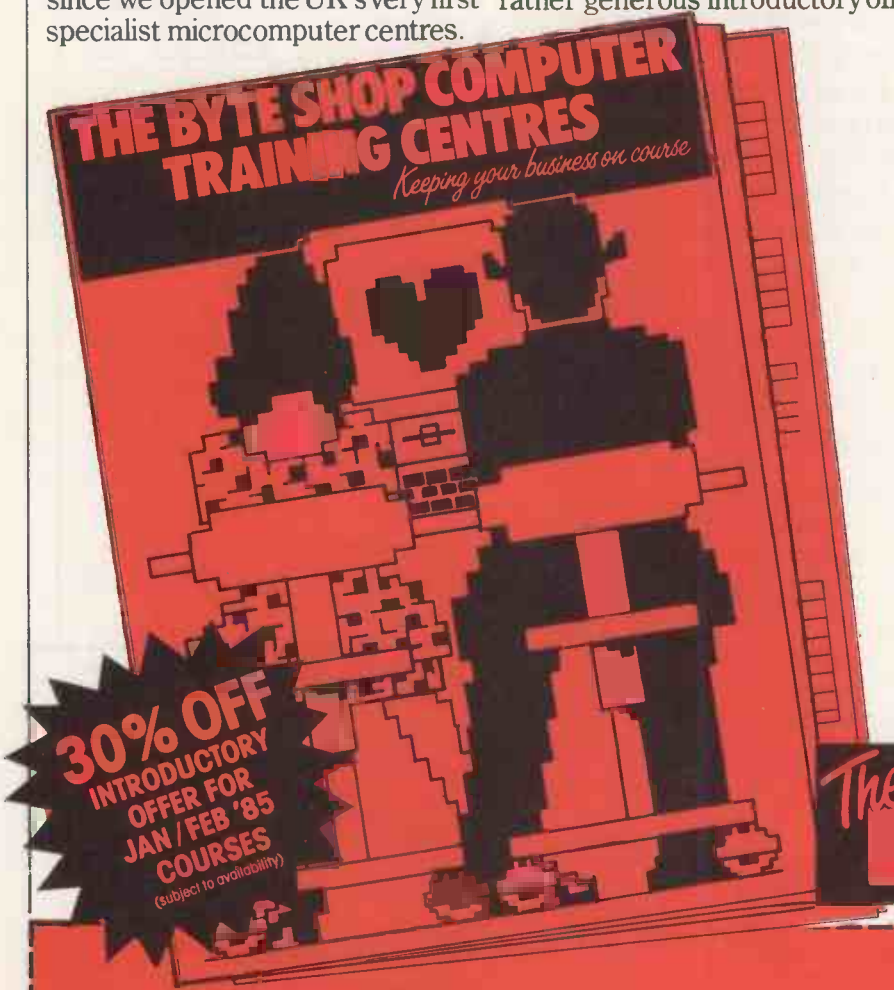

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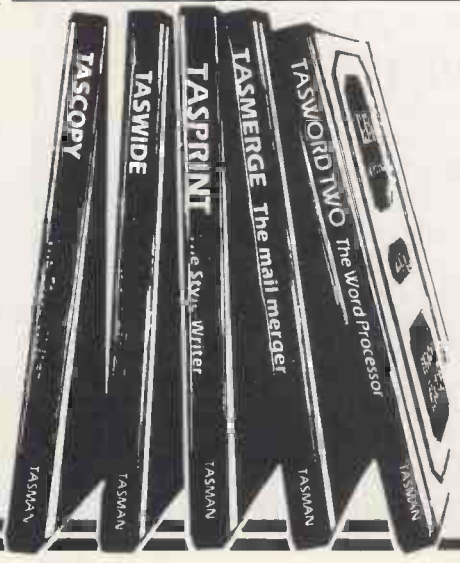

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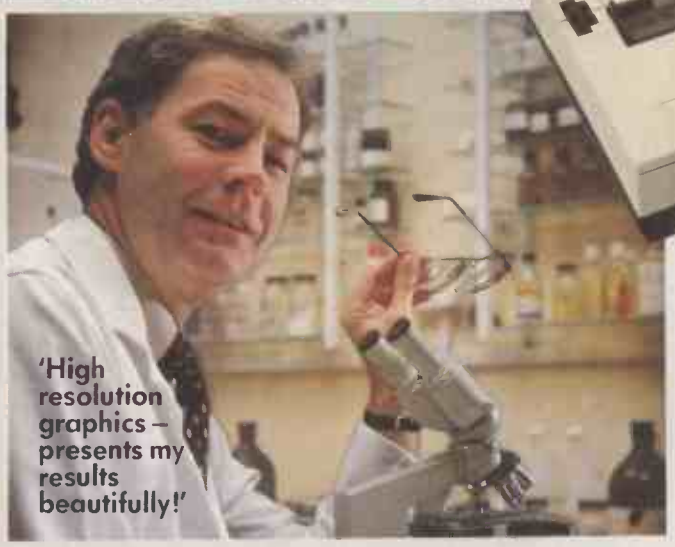

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PCW.3

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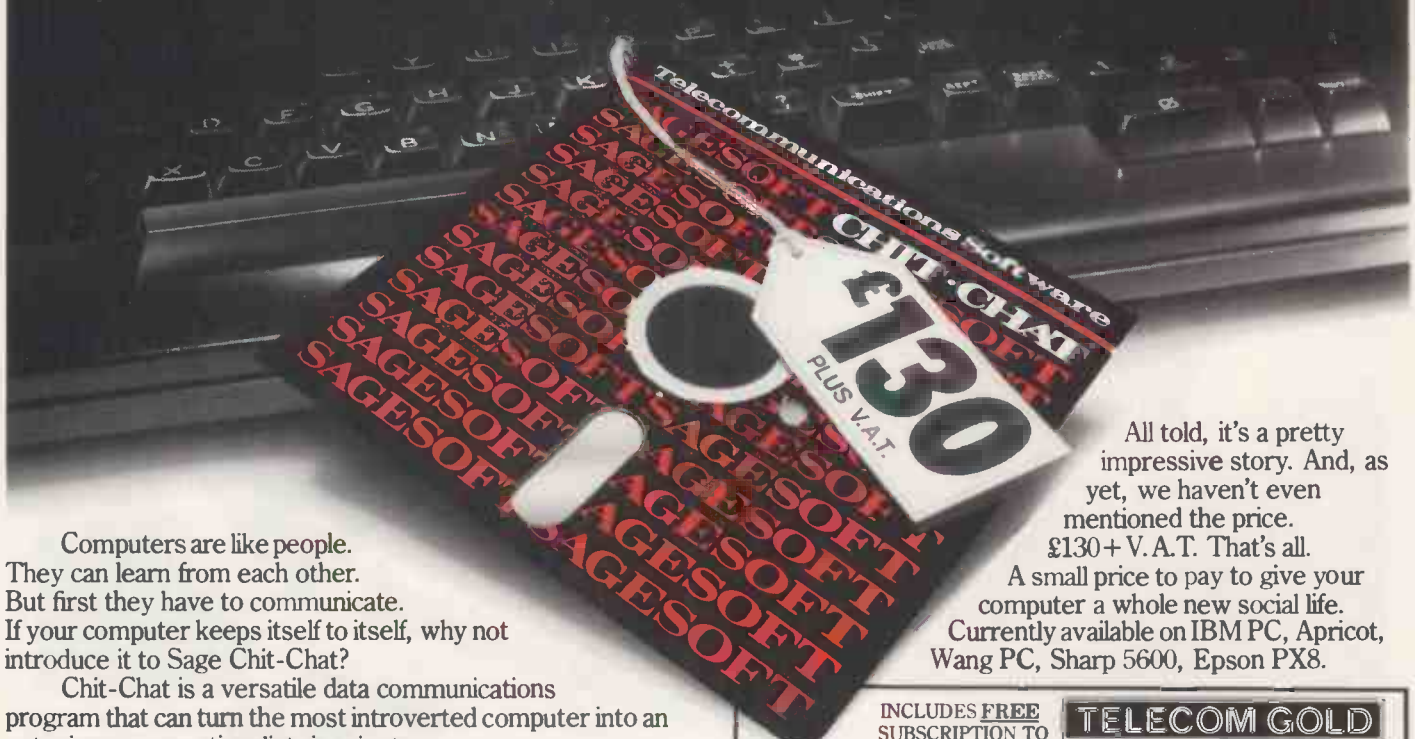

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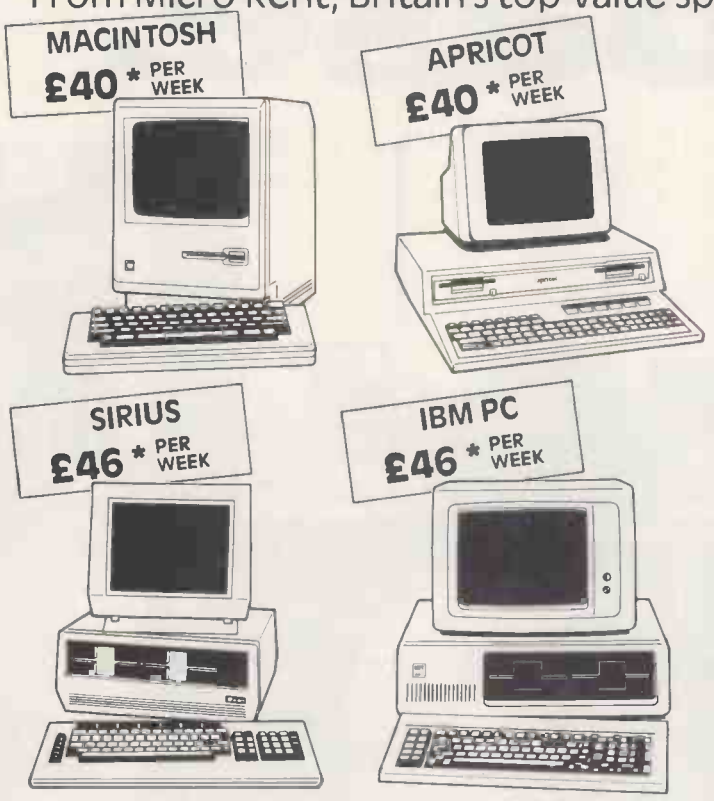

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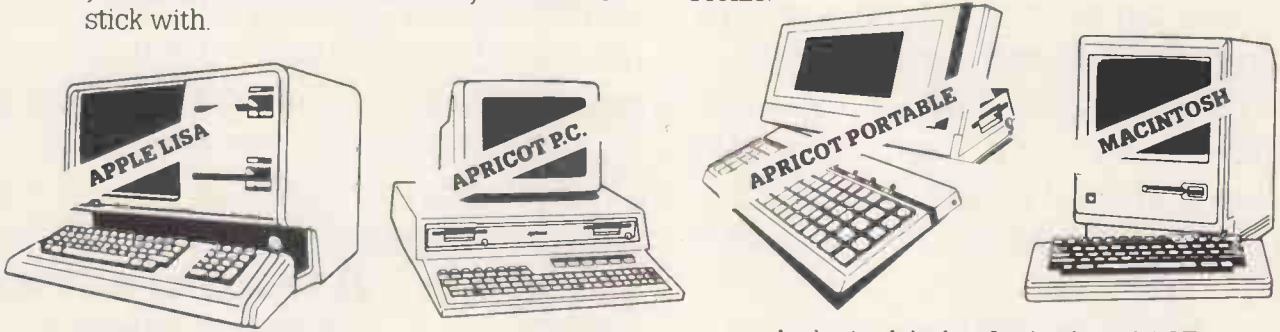

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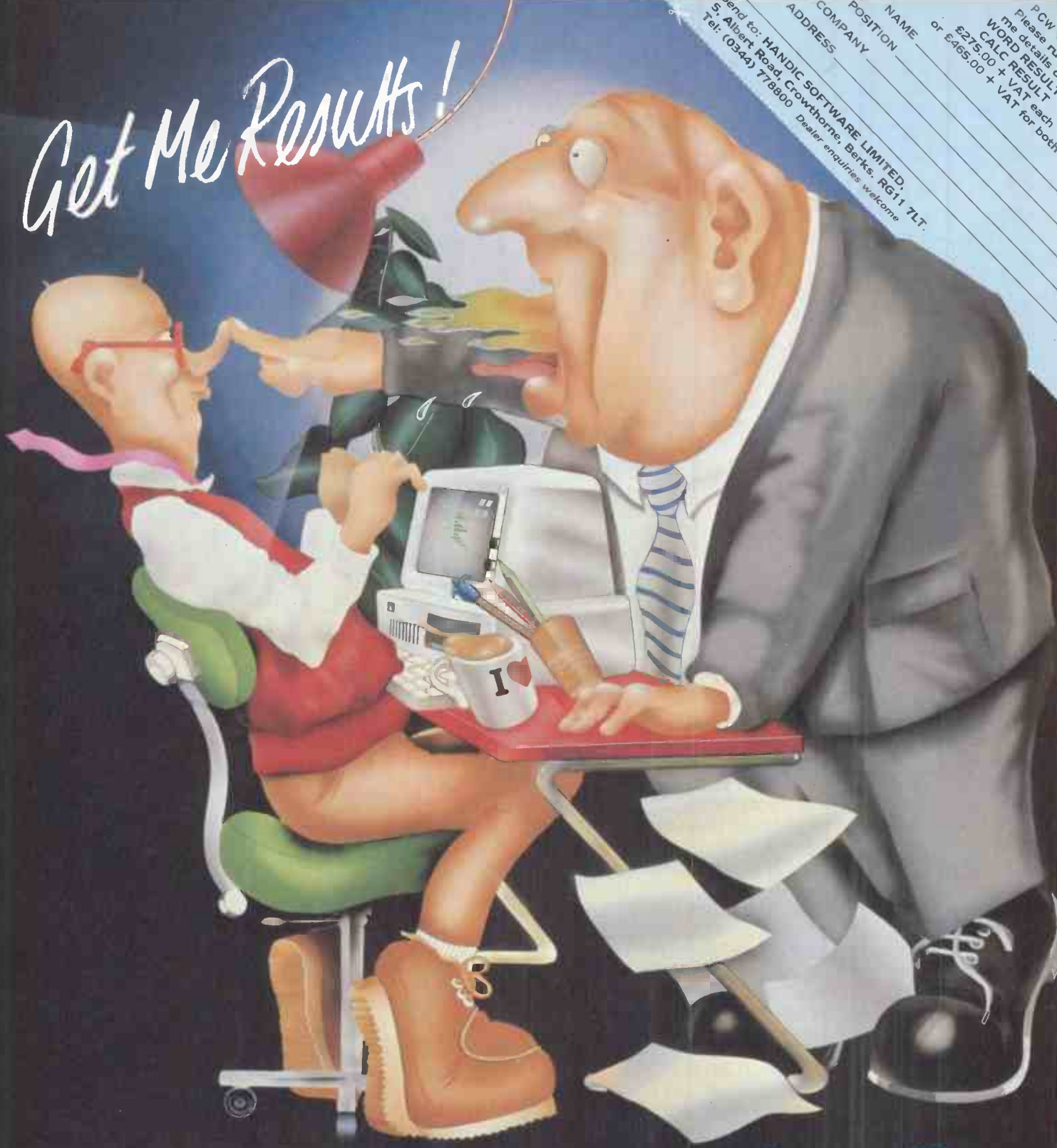

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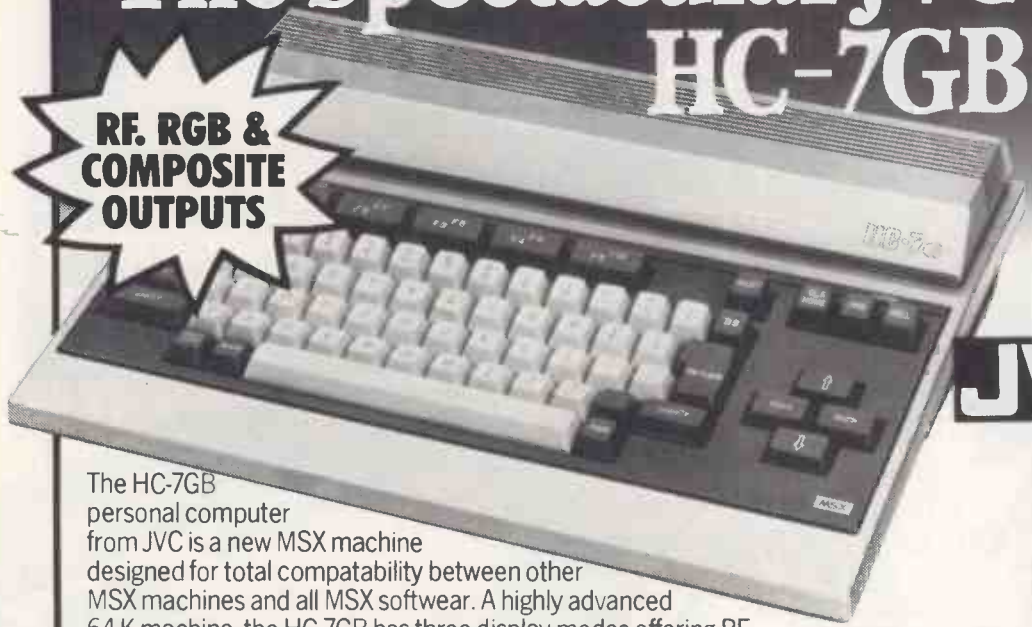

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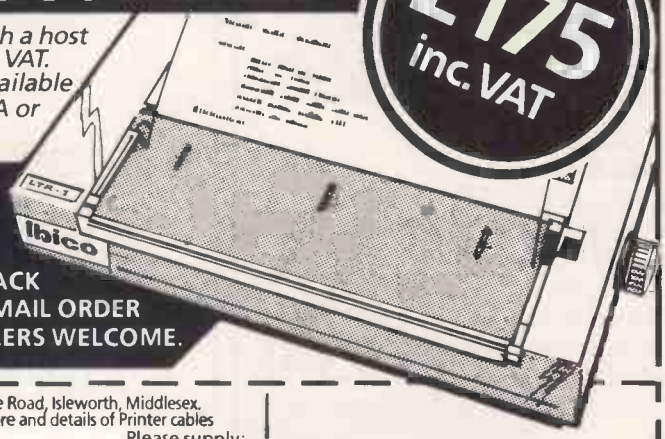

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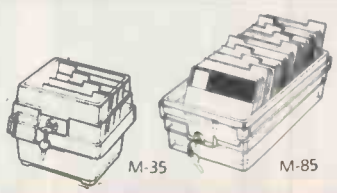
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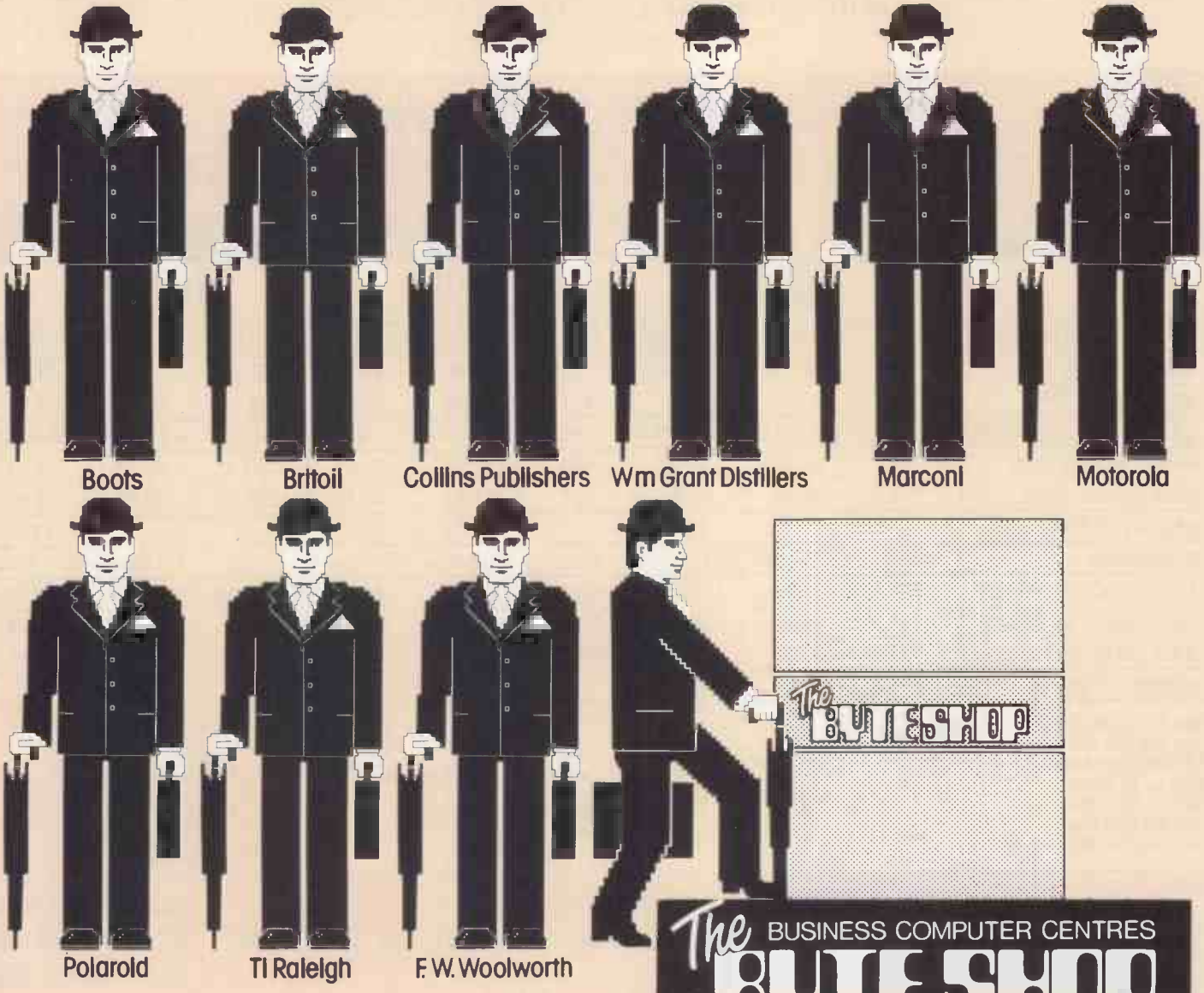

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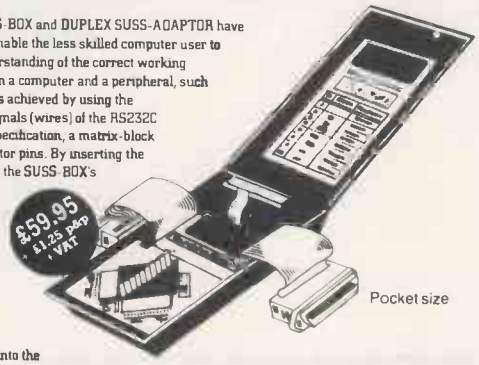

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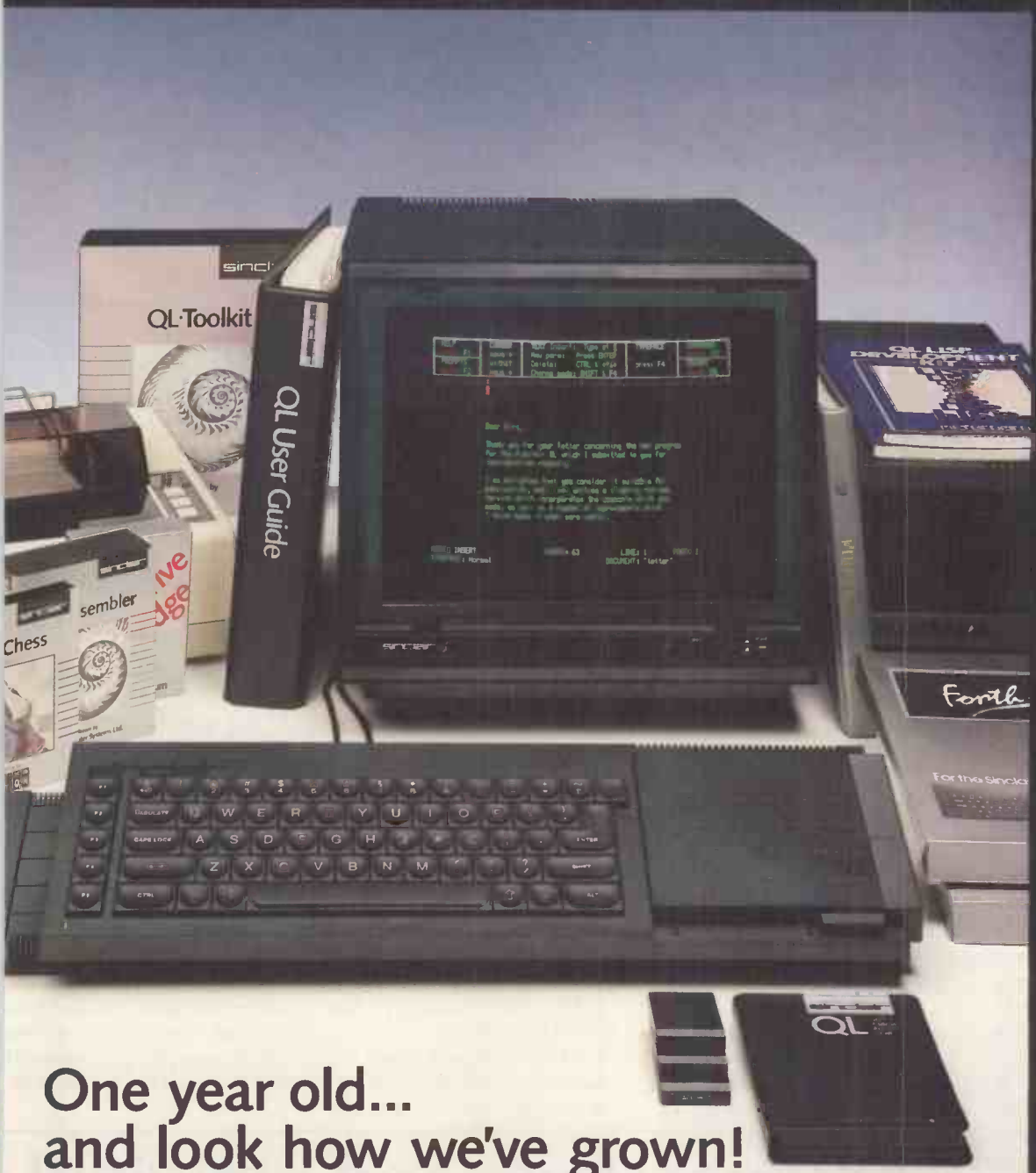
QL NEWS

News from the world of Sinclair QL computing.



One year old... and look how we've grown!

When we launched the QL last year, we knew we were starting a revolution.

For the first time, the serious computer hobbyist could afford the same power and performance as the professional computer user.

A year later, and the QL is more than a unique computer, it's the heart of a unique system.

And the next 12 months promise even more for QL owners... new software options, extra storage devices, printers, monitors...

Read on, and see how far we've come, and how much further we're going!

Nº1

NIGEL SEARLE

Now it's the quantum leap for QL software and peripherals

Without doubt, the QL was the computer innovation of 1984. Launched to outstanding reviews, it soon gathered thousands of happy owners, and recognition from people like ICL, who have incorporated QL technology and its Microdrives into the new One Per Desk.

The quickest glance at the QL's specification shows what the fuss was all about... 128K RAM, 32-bit processor architecture, 200K built-in mass storage, bundled software, They're features that would normally cost you three or four times as much!

But that's only half the story, because the QL is now the heart of a computer system, with a growing library of software...

As you'll see from these pages, 1985 is the year of the quantum leap for software and peripherals. Already there are no less than five QL languages together with special programs for software developers, a world-beating chess game... and much more on the way!

On the hardware side, there's a special QL monitor to make the most of that high-resolution 512 x 256 pixel display. There are memory expansion boards, Winchester disk drives, printers, and low-cost Microdrive cartridges.

In fact, there's so much going on, we'll be running these regular Newsletters just to keep you in touch!

If you already own a QL, the next few pages will give you a taste of the exciting year ahead.

And if you don't . . . take a look at what you're missing. It should be all the persuasion you need!

Now read on...the quantum leap into serious computing starts here.

Nigel Searle

Nigel Searle, Managing Director, Sinclair Research Limited.

From sophisticated business packages to superb animated games... QL software makes the most of the computer's extraordinary specification.

New QL Software

Utilities, languages, games and business packages...with more on the way!

Two things are now certain about QL software. First, there's going to be plenty of it. And second, it's going to set completely new standards for microcomputers...

At the moment, there are well over 100 software programs in development. And the first software releases, shown here, demonstrate how exceptional the best QL software will be.

The QL already has five languages, superb programs for software developers, a top quality accounting package and in QL Chess it has its first game.

QLUB: 10,000 members and growing!

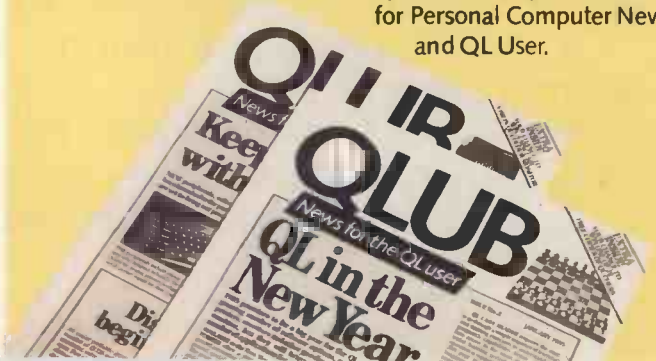
QLUB is the special Users Bureau for Sinclair QL owners. There are now well over 10,000 QLUB members, and membership is growing all the time.

For their annual subscription of £35, QLUB members are enjoying a whole range of information and advisory services, exclusive offers and special discounts.

One of the most important QLUB benefits is the special news magazine, appearing six times a year. The magazine provides a forum for QL owners to exchange views and keep in touch with all the latest developments.

Each issue is packed with updates on QL hardware and software, tips on applying the four QL Programs, and news of how other people are using the QL. QLUB members also receive a range of special discounts, with savings of at least 20% on selected software products.

Current special offers include:
QL Chess for £14.95
QL Toolkit for £19.95
QL Assembler for £31.95
QL Cash Trader for £54.95
Special subscription rates for Personal Computer News and QL User.



The multilingual Sinclair QL

BCPL – a forerunner of C, BCPL has been described as a systems programmer's delight. In the words of QL User, this compiler is a 'brilliant compromise between a high-level language and a low-level systems language'. Whilst not for beginners, this is an essential buy for anyone with a good knowledge of systems programming. Complete with manual.
Available from
Metacomco – £59.95.
Tel: 0272 428781.

LISP – already well-known for its artificial intelligence applications, LISP is a powerful and versatile language. This is a sophisticated implementation of LISP, by one of its leading exponents, Dr Arthur Norman. This package features full QL graphics, and a full manual is supplied.
Available from
Metacomco – £59.95.
Tel: 0272 428781.

Pascal – probably the most popular high-level language of all. Pascal is particularly well-suited to structured programming, sophisticated data manipulation and algorithmic problems. Pascal interpreter complete with 87-page manual.
Available from
Computer One – £39.95.
Tel: 0223 862616.

Forth – this 'new generation' language is proving both popular and easy to learn. The program provides a full implementation of the latest Forth 83 standard with graphics and sound extension.
Available from
Computer One – £29.95.
Tel: 0223 862616.

APL – the compact mathematics-based interpreted language designed for scientists and mathematicians.

APL keyword interpreter complete with manual.
Available from
MicroAPL – £99.95.
Tel: 01-622 0395.

Programmer's packs

QL Assembler – two programs operating in tandem. The first is a full-screen editor for creating and altering program files. The second, a Motorola-format compatible 68000 assembler which converts source files written in M68000 assembly language into machine code files which can run on the QL.

Both assembler and editor are written in machine code and can be multi-tasked with SuperBASIC, so you can switch between editor, assembler and SuperBASIC instantly.
Written by GST Computer Systems – £39.95.*

QL Toolkit – a programmer's toolkit with over 70 programs. and extensions to SuperBASIC. Most are linked to SuperBASIC initially and can then be used from commands or from within a program. Enhancements include printer spooling (print a file while running a SuperBASIC program); improved file access (with full random input/output command); job control (allows management of multi-tasking programs including the ability to display, alter priorities, and delete jobs from the QL); and SuperBASIC screen editor.
Written by Q Jump – £24.95.*

World-beating chess!

QL Chess – fresh from its victory at the World Microcomputer Chess Championship. This program sets a completely new standard for games software.

There's a high resolution display, animated 3-D graphics, and 28 levels of play from novice to champion. Features include an openings book of nearly 4000 moves, HINT and TAKEBACK functions that help you learn from your mistakes, and the option to play a human opponent or the computer.
Written by Psion – £19.95.*

Software at work

QL Touch 'n' Go – a unique approach to learning touch-typing skills. The program is designed to give you mastery of the standard QWERTY keyboard in just 24 hours. With practice, you should soon reach 40 words per minute, with over 95% accuracy.
Written by Harcourt – £24.95.*

QL Cash Trader – a unique computerised book-keeping system for small businesses. The program provides a complete course in the principles of accountancy, and goes on to become an essential aid in the day-to-day running of a business. Complete with comprehensive manual.
Written by Accountancy Software of Torquay – £69.95.*

This title is available from Sinclair Research on 0276 686100, and selected Sinclair stockists nationwide.

Psion trouble-shooting service

All QLUB members can obtain special assistance from Psion on using the QL Quill, Abacus, Archive and Easel programs supplied with the computer. Psion will normally answer any queries within 48 hours.

New QL Hardware
An industry is born

From the moment of its launch, the revolutionary QL attracted massive interest from all quarters.

In one area, the interest quickly turned to action, as high-tech hardware manufacturers realised the immense potential of the QL for vast expansion, for system development and for widespread networking. Already the list of peripherals for the QL is very exciting – and lengthening by the day!

Here, we've covered many of the latest, most important developments.

As more appear, be sure to keep in touch with QL News!

The dedicated Sinclair Vision QL monitor

Once you see the incredible graphics capabilities of the QL you may decide an ordinary TV just can't do them justice.

If that's the case, a high-resolution monitor is needed. (And if you're creating presentation-quality charts, for example, it's quite essential.)

The new Vision QL monitor is specially designed for the computer by Kaga Electronics, with full support from Sinclair Research.

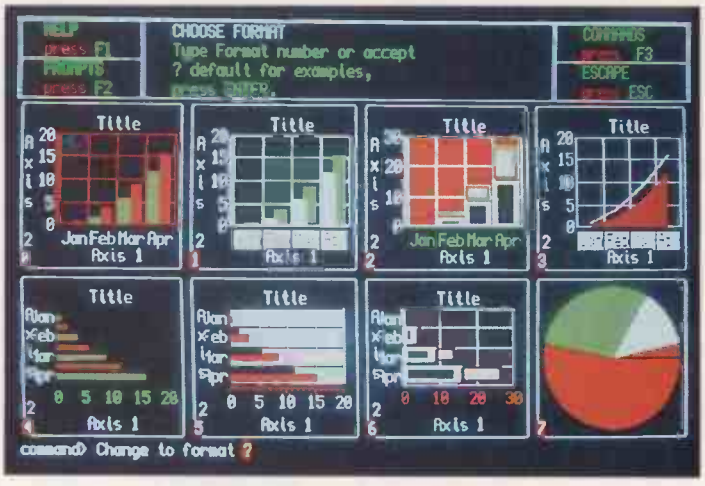
So it exploits the QL's maximum 512 x 256 pixel resolution to the full, with a pin-sharp 85 column display.

It's also specially styled to suit the QL – in looks, and in use. There's a 12" non-glare tube, and etched screen to diffuse reflections.

So the display is bright, sharp, *much* easier to look at . . . and invaluable for those late-night programming sessions!

And like the QL, the Vision monitor is designed with space in mind: it has a compact footprint of just 12½" by 15" – no more than a typical portable typewriter.

It's available from MBS Data Efficiency on 0442 60155 and selected Sinclair stockists.



Microdrive cartridges. Another Sinclair first!

Microdrive cartridges are the QL's own unique storage media. Each stores up to 100K of information, on a cartridge no bigger than a matchbox!

Access is within seconds. And in tests, Microdrive cartridges have made over 50,000 passes without loss of data.

Over 500,000 cartridges are now being used throughout Britain. And QL Microdrives themselves are standard equipment on the new ICL One Per Desk.

Sinclair Microdrive cartridges – up to 100K of programs and data on a medium so compact you can pop it into your pocket.

Powerful hard-disk system

For the QL business user, the new Firefly QL Winchester disk will boost the QL's power in one huge leap.

Designed by Quest, it uses CP/M and offers all the benefits of Winchester technology: fast access, reliability, compact size and quiet operation.

With 7.5 Mb storage, the Quest Firefly is ideal for large databases such as stock or customer lists. And at under £1,200, it represents exceptional value for money.

The Firefly will be available very shortly from Quest on 04215 66488.

Winchester hard disk drives supplement your QL's built-in mass storage.

Interface options

The QL comes complete with two built-in RS-232C interfaces.

In addition, interfaces for Centronics printers are widely available from manufacturers such as CST, Miracle Systems and Sigma Research . . . with prices from only £35.

And that's just the beginning. For attaching scientific and laboratory instruments to the QL, CST even offer an IEEE-488 interface, which can handle up to 16 connected devices simultaneously!

A Centronics interface slips discreetly into place.

Expansion boards for up to 4 times more memory!

Also from Quest, a simple and inexpensive way to expand the QL's RAM: with memory expansion boards.

These compact units connect to the standard QL expansion port, using the QL's internal power source or, for larger boards, an external power source.

The units range from 64K and 128K RAM boards to massively powerful 256K and 512K RAM boards, so there's something for every user.

Compact expansion boards.

Prices start at £117, and the 512K board is a very cost-effective investment at just £587.

With affordable memory like this, the QL is more than a match for any other micro under £2,000!

Where to find the QL.

The Sinclair QL is available at selected branches of Dixons, W H Smith, John Lewis Partnership, Currys, Greens in Debenhams and Ultimate, and larger branches of Boots, John Menzies and specialist computer stores nationwide.

The spec behind the spectacle

CPU – Central Processing Unit
Fast, powerful Motorola 68008 chip. A second processor, an Intel 8049, controls the keyboard, generates the sound, and acts as an RS-232C receiver.

RAM
128K. Now expandable to 640K.

ROM
48K.

Operating system
Qdos – revolutionary single-user, multi-tasking, windowing operating system.

Storage
Twin built-in QL Microdrives. Up to 100K storage each – transfer rate, up to 15K per second.

Keyboard
Full moving 65-key QWERTY, five function keys, four cursor keys.

Language
Sinclair structured SuperBASIC.

Application software
QL Quill – word processor
QL Abacus – spreadsheet
QL Easel – graphics
QL Archive – database
All four packages supplied with the QL.

Interfaces
Two serial RS-232C interfaces, Microdrive expansion port (up to 6 may be added), ROM cartridge port, local area network, 2 joystick ports, RGB monitor and TV output.

Text screen
Various modes – up to 85 columns by 25 rows on monitor. On TV, up to 60 columns.

Graphics resolution
512 x 256 pixels (four colour), 256 x 256 pixels (eight colour).

Sinclair Research Ltd
Camberley, Surrey, GU15 3BR
Tel: Camberley (0276) 686100.

sinclair

DISKING COLOURED DISKETTES

Part Numbers

5.25" Red Diskettes

R1/D	S/Sided D/Density 48 tpi
R2/D	D/Sided D/Density 48 tpi
R1/DD	S/Sided D/Density 96 tpi
R2/DD	D/Sided D/Density 96 tpi

5.25" Orange Diskettes

O1/D	S/Sided D/Density 48 tpi
O2/D	D/Sided D/Density 48 tpi
O1/DD	S/Sided D/Density 96 tpi
O2/DD	D/Sided D/Density 96 tpi

5.25" Yellow Diskettes

Y1/D	S/Sided D/Density 48 tpi
Y2/D	D/Sided D/Density 48 tpi
Y1/DD	S/Sided D/Density 96 tpi
Y2/DD	D/Sided D/Density 96 tpi

5.25" Green Diskettes

G1/D	S/Sided D/Density 48 tpi
G2/D	D/Sided D/Density 48 tpi
G1/DD	S/Sided D/Density 96 tpi
G2/DD	D/Sided D/Density 96 tpi

5.25" Pale Blue Diskettes

P1/D	S/Sided D/Density 48 tpi
P2/D	D/Sided D/Density 48 tpi
P1/DD	S/Sided D/Density 96 tpi
P2/DD	D/Sided D/Density 96 tpi

5.25" Blue Diskettes

B1/D	S/Sided D/Density 48 tpi
B2/D	D/Sided D/Density 48 tpi
B1/DD	S/Sided D/Density 96 tpi
B2/DD	D/Sided D/Density 96 tpi

General Prices EXC VAT

All Colours	1-9	10-19	20+
1/D	**12-90**	**11.90**	**10.90**
2/D	**18.90**	**17.90**	**16.90**
1/DD	**18.90**	**17.90**	**16.90**
2/DD	**21.90**	**20.90**	**19.90**

Prices & Quantities are per 5-PACK

Post Packing & Ins.

All Colours		EXC VAT
1-3	5-PACKS	**50p per pack**
4-9	5-PACKS	**30p per pack**
10+	5-PACKS	POST FREE

Quality Promise

Like All diskettes from DISKING, these Coloured Diskettes are individually certified, and are from a leading world manufacturer. We offer our usual no-quibble money-back warranty.

What you get

All Coloured diskettes are supplied in packs of five (5) of ONE colour. They come in a FREE plastic library box, and with colour coder pens. You will also be entitled to any other applicable promotions at the time of ordering.

Please state when ordering, the number of 5-PACKS you require, and the type number of the diskettes. For example, supposing you want five red diskettes for your IBM PC, and five green diskettes for your (double sided) ACT Sirius, you would order One pack of R2/D & one pack of G2/DD.

DISKING International, Liphook, Hampshire, GU30 7EJ. Telephone (0428) 722563

VISA Welcome

DISKING COLOURED DISKETTES

FOR PRICES SEE OPPOSITE

"I'll use the orange ones for my IBM, the blue ones for my Sirius, and the green ones for my Apple"

"No! We'll use the red ones for Masters, the pale blue for bought ledger and the yellow for word processing"

FREE Plastic Library Box with every 'One-Colour' 5-Pack.
Choose from six RED, ORANGE, YELLOW, GREEN, PALE BLUE or BLUE.
Or Treat yourself to six 5-Packs, one of each colour!

DISKING COLOURED DISKETTES

DISKING International, Liphook, Hampshire, GU30 7EJ. Telephone (0428) 722563

VISA Welcome

Attention the trade:- Our usual minimum orders will apply & library boxes will be charged extra

QUALITY NEVER LOOKED SO GOOD–

Now everyone with a BBC or IBM PC will want to get their paws on CUB's sleek new D series plastic cabinet – a triumph of ergonomics and up to the minute design. Within it is the CUB 653 MEDIUM RESOLUTION colour monitor – the perfect mate for computer users who wish to combine the advantages of brilliant, low cost colour graphics with 80 column processing software.

CUB 653's remarkable depth of colour is enhanced by minimal screen glare, thanks to a super high contrast CRT. Even in well lit environments the 653 (H) × 585 (V) resolution and 0.43mm dot pitch produces 80 column text which is pin-sharp and easy to read. Owners of SHARP, RML 480Z, APPLE Series, WANG and other leading computers needn't feel left out, because CUB 653's compatibility extends to these models and many more.

PICK ONE UP FOR JUST £299 inc. VAT

NEW LOW PRICE, NEW PLASTIC CABINET – THERE'S NEVER BEEN A BETTER TIME TO BUY.

Standard Resolution version also available in new cabinet. Both Standard and Medium resolution models produced in metal cabinets if required.

MICROVITEC 653 CUB COLOUR DISPLAYS

Microvitec PLC, Futures Way, Bolling Road, Bradford, BD4 7TU, West Yorkshire.
Tel: (0274) 390011 Telex: 517717

Available from High Street Computer Retailers and selected branches of W. H. Smith, Harrods, John Lewis Partnership, John Menzies with selected models available from larger branches of Boots.

1984

NEW

DataLife® by Verbatim®

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- **Superb New Packaging**
- **Same Incredible World beating Quality**

In stock NOW at **DISKING**

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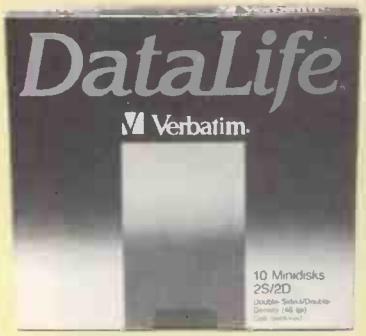
VISA Welcome

DISKING Means Business



The Biggest name in Disks!

5¼" Diskettes

Prices and quantities relate to Ten-Packs

PRICES EXC VAT	1-4	5-9	10+
MD 525-01 S/S 48 tpi	22.90	21.90	20.90
MD 550-01 D/S 48 tpi	29.90	28.90	27.90
MD 577-01 S/S 96 tpi	28.90	27.90	26.90
MD 557-01 D/S 96 tpi	36.90	35.90	34.90

Certified for single OR double density
48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation

8" Diskettes

Prices and quantities relate to Ten-Packs

PRICES EXC VAT	1-4	5-9	10+
FD 34-9000 S/S S/D	31.90	30.90	29.90
FD 34-8000 S/S D/D	31.90	30.90	29.90
DD 34-4001 D/S D/D	36.90	35.90	34.90

32 Hard Sector available at same price

3½" Microdisks

Prices and quantities relate to Ten-Packs

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MF 350 S/Sided 0.5Mb	42.90	41.90	40.90

Famous name — Low Prices

5¼" Diskettes

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PRICES EXC VAT	1-4	5-9	10+
MD 200-01 S/S 48 tpi	19.90	18.90	17.90
MD 250-01 D/S 48 tpi	23.90	22.90	21.90

48 tpi suitable for 35 or 40 track operation

8" Diskettes

Prices and quantities relate to Ten-Packs

PRICES EXC VAT	1-4	5-9	10+
FD 34-1500 S/S S/D	22.90	21.90	20.90
DD 34-1501 D/S D/D	29.90	28.90	27.90

32 Hard Sector available at same price

MEMOREX Memory Excellence

5¼" Diskettes

Prices and quantities relate to Ten-Packs

PRICES EXC VAT	1-4	5-9	10+
3481 S/S 48 tpi	22.90	21.90	20.90
3491 D/S tpi	29.90	28.90	27.90
3504 S/S 96 tpi	28.90	27.90	26.90
3501 D/S 96 tpi	36.90	35.90	34.90

Certified for single OR double density
48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation

5¼" Diskettes HIGH DENSITY

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PRICES EXC VAT	1-4	5-9	10+
5500 D/S 1.6 MByte	49.90	48.90	47.90

3½" Microdisks

Prices and quantities relate to Ten-Packs

PRICES EXC VAT	1-4	5-9	10+
6100 S/Sided 0.5Mb	42.90	41.90	40.90

Maxell — The Gold Standard

5¼" Diskettes

Prices and quantities relate to Ten-Packs

PRICES EXC VAT	1-4	5-9	10+
MD1-D S/S 48 tpi	23.90	22.90	21.90
MD2-D D/S 48 tpi	34.90	33.90	32.90
MD1-DD S/S 96 tpi	34.90	33.90	32.90
MD2-DD D/S 96 tpi	42.90	41.90	40.90

Certified for single OR double density
48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation

8" Diskettes

Prices and quantities relate to Ten-Packs

PRICES EXC VAT	1-4	5-9	10+
FD1-XD S/S D/Dens	32.90	31.90	30.90
FD2-XD D/S D/Dens	40.90	39.90	38.90

32 hard sector available at the same prices

3½" Microdisks

Prices and quantities relate to Ten-Packs

PRICES EXC VAT	1-4	5-9	10+
MF2-DD D/SIded 1.0Mb	59.90	58.90	57.90

3" Microdisks

Prices and quantities relate to Ten-Packs

PRICES EXC VAT	1-4	5-9	10+
CF2 Compact D/S Floppy	39.90	38.90	37.90

DISKETTE STORAGE

Choose the box you like, buy three and get the fourth one FREE

BUDGET RANGE

Budget Micro

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

Part No:	Description	Price exc VAT
BM	30 Microdisk capacity	6.90

If buying 3 to get one FREE, P&P @ 4 unit rate please

Budget 30

30 Minidisk capacity in smart beige brown with strong steel hinges, complete with five coloured dividers.

Part No:	Description	Price exc VAT
B30	30 Minidisk capacity	5.90

If buying 3 to get one FREE, P&P @ 4 unit rate please

Budget 50

50 Minidisk capacity in smart two tone brown, complete with four dividers and non scratch rubber feet.

Part No:	Description	Price exc VAT
B50	50 Minidisk capacity	8.90

If buying 3 to get one FREE, P&P @ 4 unit rate please

POPULAR RANGE

Disking Swing-Lid Lockable Box

60 Minidisk capacity, complete with keys, dividers tags and even built in carrying handles.

Part No:	Description	Price exc VAT
DSLB	60 Minidisk capacity	17.90

If buying 3 to get one FREE, P&P @ 4 unit rate please

Jumbo Swinger

A massive 120 minidisk capacity (with arms removed). Adjustable arms compensate for less diskettes, complete with keys and carrying handle.

Part No:	Description	Price exc VAT
JUMBO	100 Minidisk capacity	18.90

If buying 3 to get one FREE, P&P @ 4 unit rate please

Executive Micro 50

Fifty 3.5" microdisk capacity complete with removable lid, dividers, tabs, lock and 2 keys

Part No: EM50
Description 50 microdisk capacity
Price exc VAT 19.90
If buying 3 to get one FREE, P&P @ 4 unit rate please

Executive Mini 100

100 5.25" minidisk capacity complete with removable lid, dividers, tabs, lock and 2 keys.

Part No:	Description	Price exc VAT
EM100	100 minidisk capacity	22.90

If buying 3 to get one FREE, P&P @ 4 unit rate please

EXECUTIVE RANGE

The ultimate in quality, these beautiful Austrian made storage boxes in luxurious two tone deep 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.

DISKING INTERNATIONAL
FREEPOST
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UNITED KINGDOM

How to Contact DISKING:— By Telephone (0428) 722563
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SPECIAL CONFIGURATION

Dysan For The Discerning

5¼" Diskettes

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PRICES EXC VAT	1-4	5-9	10+
104/1D S/S 48 tpi	23.90	22.90	21.90
104/2D D/S 48 tpi	34.90	33.90	32.90
204/1D S/S 96 tpi	34.90	33.90	32.90
204/2D D/S 96 tpi	42.90	41.90	40.90

Certified for single OR double density
48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation

8" Diskettes

Prices and quantities relate to Ten-Packs

PRICES EXC VAT	1-4	5-9	10+
3740/1D S/S D/Dens	32.90	31.90	30.90
3740/2D D/S D/Dens	40.90	39.90	38.90

32 hard sector available at the same prices

COLOURED Diskettes

Supplied in *Five-Packs* of one colour
Prices and quantities relate to Five-Packs

5¼"

PRICES EXC VAT	1-9	10-19	20+
1D S/S 48 tpi	12.90	11.90	10.90
2D D/S 48 tpi	18.90	17.90	16.90
1DD S/S 96 tpi	18.90	17.90	16.90
2DD D/S 96 tpi	21.90	20.90	19.90

To order the colour your choice, just precede the type number with the appropriate letter, (R) RED, (O) ORANGE, (Y) YELLOW, (G) GREEN, (B) BLUE & (P) PALE BLUE. For the actual colours, please see our full colour advertisement back a couple of pages, or call and ask for our full colour brochure

FREE CLOCK

value £8.95

with EVERY 20 Diskettes ordered at these prices

When you buy twenty 5.25", 8" or 3.5" diskettes at these prices, from any of our manufacturers, you will receive completely FREE of charge, this superb calendar clock with a large easy to read 24mm LCD display. Buy forty diskettes and you will receive two clocks and so on.
Offer ends 30th April 1985

PLUS

FREE with every Ten-Pack of diskettes from DISKING, (or Five-Packs if coloured disks). The Superb SEE10 Library Box. Also available individually for £2.50 exc VAT, either for 5¼" Disks (SEE10), or 3½" Disks (SEE10-3). Now also available for 8" Disks (SEE10-8) at £3 exc VAT.

PLUS

FREE DISKING Colour Coders
A multicoloured pack of ten fibre tipped pens for colour coding your diskette labels. Available individually at 49p exc VAT

How To Order

Official Government Orders Welcome

We supply all Government bodies including Schools, Universities, colleges, Hospitals, the Utilities, Research Establishments, Armed Forces, the Ministries and Local Authorities world-wide. We will despatch within 4 (YES, FOUR) working hours from receipt of your official order number received either by post or telephone and all orders are handled in the strictest confidence and to the letter. All other customers, cheque with order please payable to DISKING. If you are a large establishment and cannot raise cheques 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.

Credit Card Orders

All orders left on the answering machine qualify for a FREE DISKING logobug to stick on your computer. You may call 365 days a year, 24 hours a day, and you may speak for as long as you like when you leave the following details:

1. Day-time telephone number
2. Cardholder name and address
3. Delivery (or invoice address) if different
4. Your Credit Card Number
5. What you want and how many
6. Normal or first class post

We welcome Access (Mastercharge), Barclaycard (VISA) and Diners Club International, and there is NO credit card surcharge. Alternatively you may write your credit card number on your order

Leave the REST to US!

Urgent Orders

If you are posting your order, leave out the word FREEPOST from our address, and use our normal post code GU30 7EJ and do not forget to stamp it First Class. If you are telephoning your order, please make it clear that you wish to pay for your goods to be sent to you by First Class Post

First Class Rates

Minidisks & Microdisks:	
First Ten-Pack	2.00
Second and subsequent Ten-Pack	1.50

Very Urgent Orders

If ordering by telephone, and by 3pm, you may request Datapost which delivers the next morning at 9am. Minimum cost is £10 for the first 5kg – please call

Desperate Orders

Just call and ask for Joan or Roger and we will do whatever we can to help you with your problem. If you are not too far we can probably organise a taxi or courier

Postage & Packing Rates

UK Shipping Rate Inc. ins. but exc VAT

5¼" DISKS OR MICRODISKS
1-2 packs each pack @ 95p
3-5 packs each pack @ 75p
6-9 packs each pack @ 60p
10+ packs POST FREE
ALL SEE 10 library boxes
ALL MEMOREX CLEANING KITS
1 off 60p each
2-7 off 40p each
8+ off POST FREE

DISKETTE STORAGE
Budget 30
1 off 1.00 each
2-7 off 70p each
8+ off POST FREE

8" DISKETTES
1-2 packs each pack @ 1.60
3-5 packs each pack @ 1.20
6-9 packs each pack @ 90p
10+ packs POST FREE

DISKING COLOUR CODERS
25p each — 5+
POST FREE

DISKMAILERS
£3.00 per 100

ALL OTHER STORAGE
1 off 2.00 each
2-7 off 1.30 each
8+ off POST FREE

DISKING DISKWRITERS
50-pack £1.00
1-4 off @ 40p each
5-9 off @ 30p each
10+ off @ 20p each

Bargain Corner Diskettes

5¼" Diskettes

Complete with a FREE SEE10 library box and Colour coders, these disks are certified and are from one of the manufacturers in this ad
Prices and quantities relate to Ten-Packs

EXC VAT No hub ring	1-4	5-9	10+
UL1D S/S 48 tpi	13.90	12.90	11.90
UL2D D/S 48 tpi	20.90	19.90	18.90
UL1DD S/S 96 tpi	20.90	19.90	18.90
UL2DD D/S 96 tpi	24.90	23.90	22.90

Suitable for single OR double density

EXC VAT With hub ring	1-4	5-9	10+
UL1DHR S/S 48 tpi	14.90	13.90	12.90
UL2DHR D/S 48 tpi	21.90	20.90	19.90
UL1DDHR S/S 96 tpi	21.90	20.90	19.90
UL2DDHR D/S 96 tpi	25.90	24.90	23.90

Suitable for single OR double density
48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation

Disking Supermailers

These diskette mailers come packed in 100s and are of a very clever copyright design. They will hold up to 4 diskettes complete with envelopes and are extremely robust

Part No.	Description	Price exc VAT
DSM	100 Supermailers	24.90

Trade Corner

***FREE* Aeroplane**

Our latest aeroplanes have sound, so you'll have no trouble waking up those sleepy software engineers, when you throw it at them. Just call and ask for our flier, and we'll send you our latest trade pack with prices, special offers and sample unlabelled diskette. We'll also enclose a DPC (Disking Priority Customer Card) application form telling you how to buy at our 10,000 prices yet order in 50s.

Memorex Cleaning Kits

The latest computer care range from Memorex represent fantastic value for money, and are available individually or with a discount if purchasing all three.

Part No:	Description	Price
MKEY	Case/keyboard cleaning kit	4.90
MTV	VDU screen cleaning kit	4.90
MDD	Disk drive head cleaning kit	8.90

Buy all three kits together, and we will reduce the total price from 18.70 to 14.90 SAVING 3.80 — A BARGAIN IF EVER WE SAW ONE!

Looking for better ways to move data?

Meet the new generation in local modems.

Moving data over short distances is now even easier with Gandalf's new alternatives to long distance modems. Now there is no need to buy more modem capabilities than you need. Gandalf's new local modems are optimised for local data transfer.

mLDS 122: The Cost Cutter
For local asynchronous transmissions, you'll love this miniature local modem. You just plug it directly into your Data Terminal Equipment and connect it to your BT EPS8 or privately owned line. Then sit back and enjoy the point-to-point data service over a 7Km/4 mile range at 50 to 9600bps. It's BT approved and affordable.

SmLDS 349: A Mini in Sync
Here's the synchronous counterpart to the mLDS 122. Same plug-in convenience for point-to-point data service over a 4.8Km/3 mile range at 19.2Kbps (9.6Km/12 mile at 2400bps). No need for V.24 cable or power point. It takes its power from your terminal device and is BT approved.

LDS 309A: New Standard in Local Modems
Our popular LDS 309 is now available in a new compact LSI version with auto-equalisation. LDS 309A handles synchronous and asynchronous data at speeds as high as 19.2Kbps and it's BT approved.

Telephone (0925) 818484 for details today.

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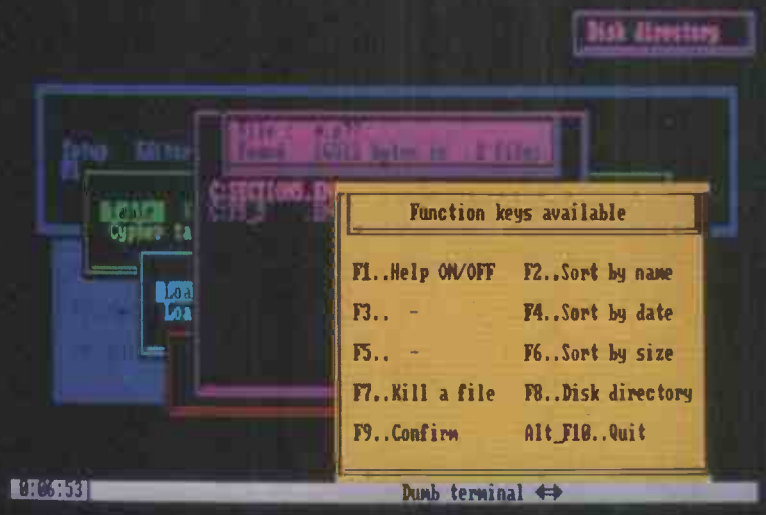

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- Terminal Emulations
- Two error checked file transfer protocols
- Split Baud rates
- On-line text editor
- Contextually sensitive help system
- Disk directory access
- User programmable function keys
- Overlaid windows for easy operation
- Datacode file encryption system

". . . Datatalk goes a level above its competitors"
(P.BRIGHT — PCW JAN 85)

"Quite simply, it is the answer for anyone who requires a secure communications package that combines ease of use, power and versatility"
(JOHN FORREST, THORN EMI CSD)

DATATALK costs £135.00 and DATATALK + DATACODE FILE ENCRYPTION is £225.00 Access **+ VAT**

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in
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BBC Model B (Free Recorder + Games)	£389
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Memotech 512 (Free rec)	£275
Memotech 500 (Free rec)	£199
Advance 86b	Call
Sinclair QL	Call
Sanyo 550	£640 + VAT
Sanyo 555	£799 + VAT
Einstein	POA
Amstrad	Call
Amstrad colour	Call

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JVC High	£249
Microvitec Medium (QL)	£275
Microvitec Medium (BBC)	£299
Ferguson MC101 (TV-Mon)	Call

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Shinwa CP80 CTI	£234
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Cosmos CP80	£214
Juki 6100	£388
Cannon 1080	Call
Brother HR15	£442
Star Gemini 10X	Call
National Panasonic	£335
Taxan	Call

DISK DRIVES
Opus, Pace, Cumana, modems various

BBC ACCESSORIES

6502 2nd Processor	£199
Z80 2nd Processor	£349
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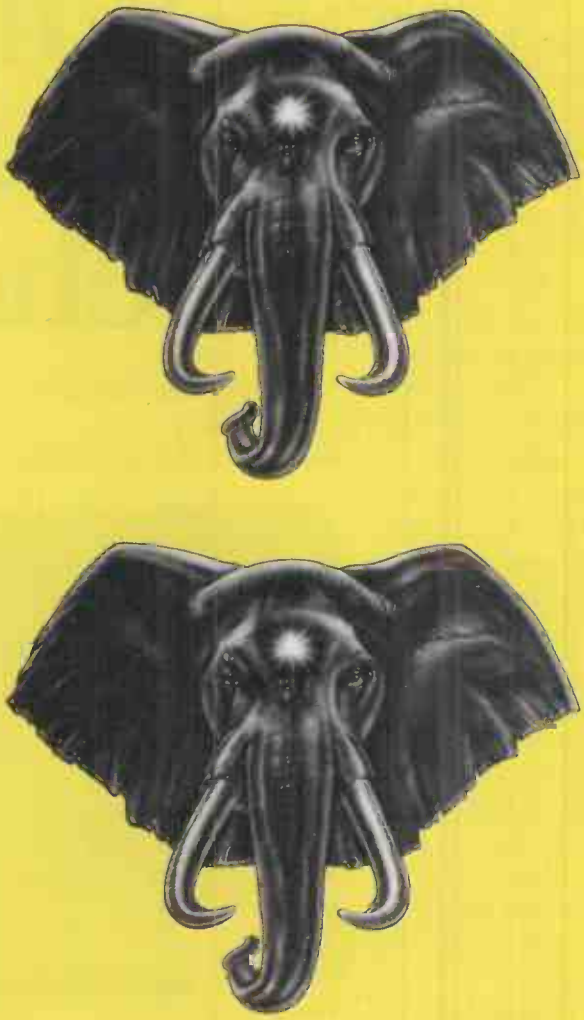

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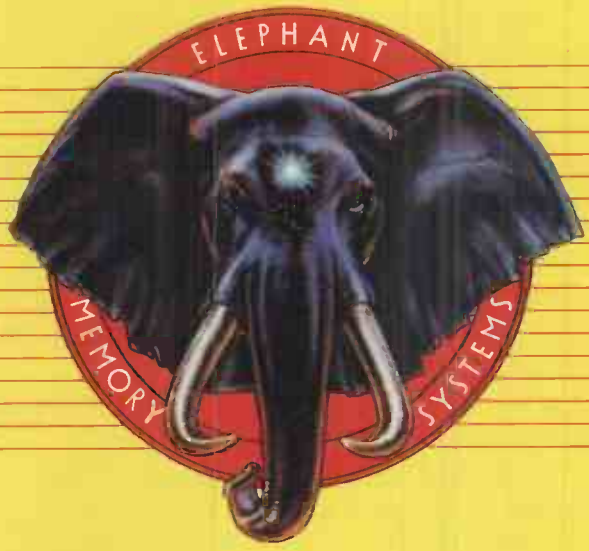

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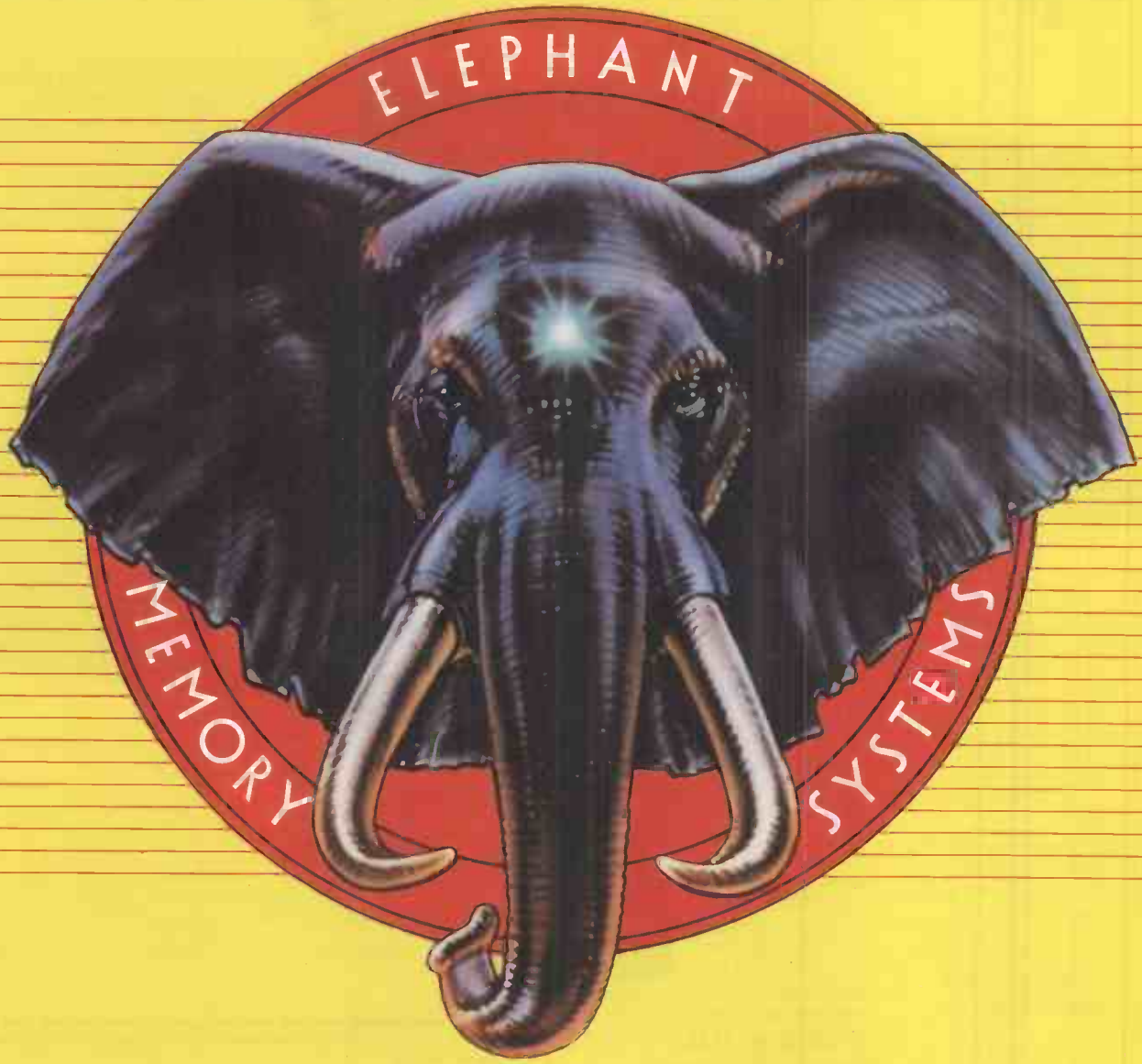

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If you're not sure about doing it yourself, don't worry. Simply return your 48K Spectrum to Sinclair and for £30 we'll upgrade it for you.

Whichever you decide on, you'll also receive the new 80-page User Guide and Companion Cassette.

The bigger, better Spectrum keyboard

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The official Spectrum Upgrade

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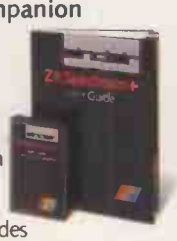
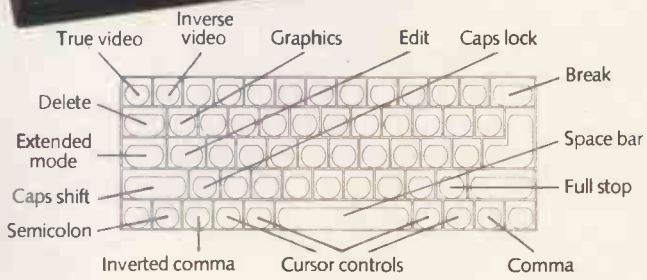
Included – the new Spectrum + User Guide and Companion Cassette



The new User Guide has over 80 pages of information, including a handy BASIC dictionary. The Companion Cassette provides an interactive tour of the new keyboard, and includes three entertaining arcade games.



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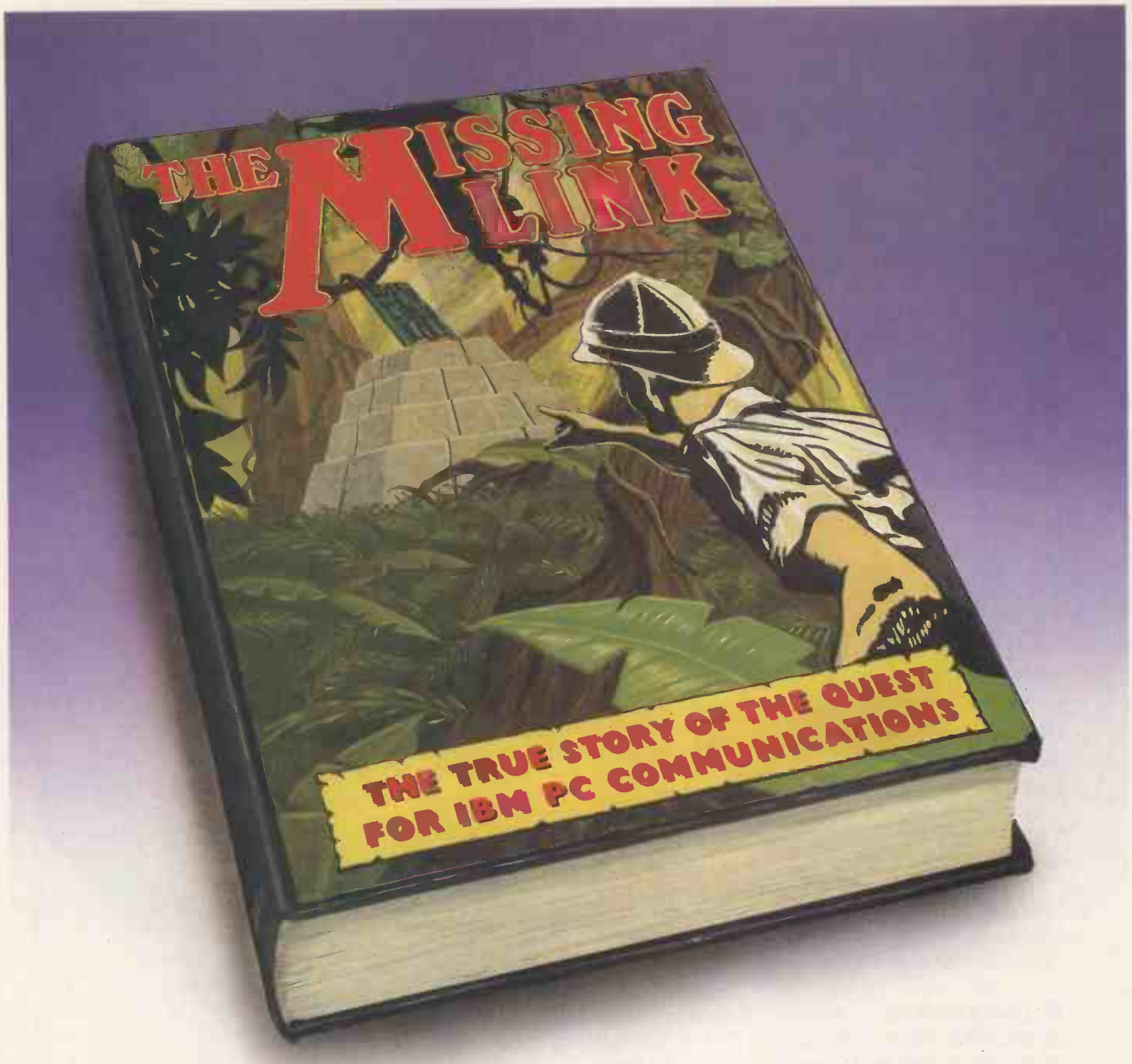

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20 start=HIMEM+1
30 !ASSEMBLE,start
40 'get start
50 'limit &FFFF
60 'ORG start
70 'CP 10:SCF:RET Z
80 'RST 1,&B7F2
90 'ORG &BD2B
100'JP start
110'END
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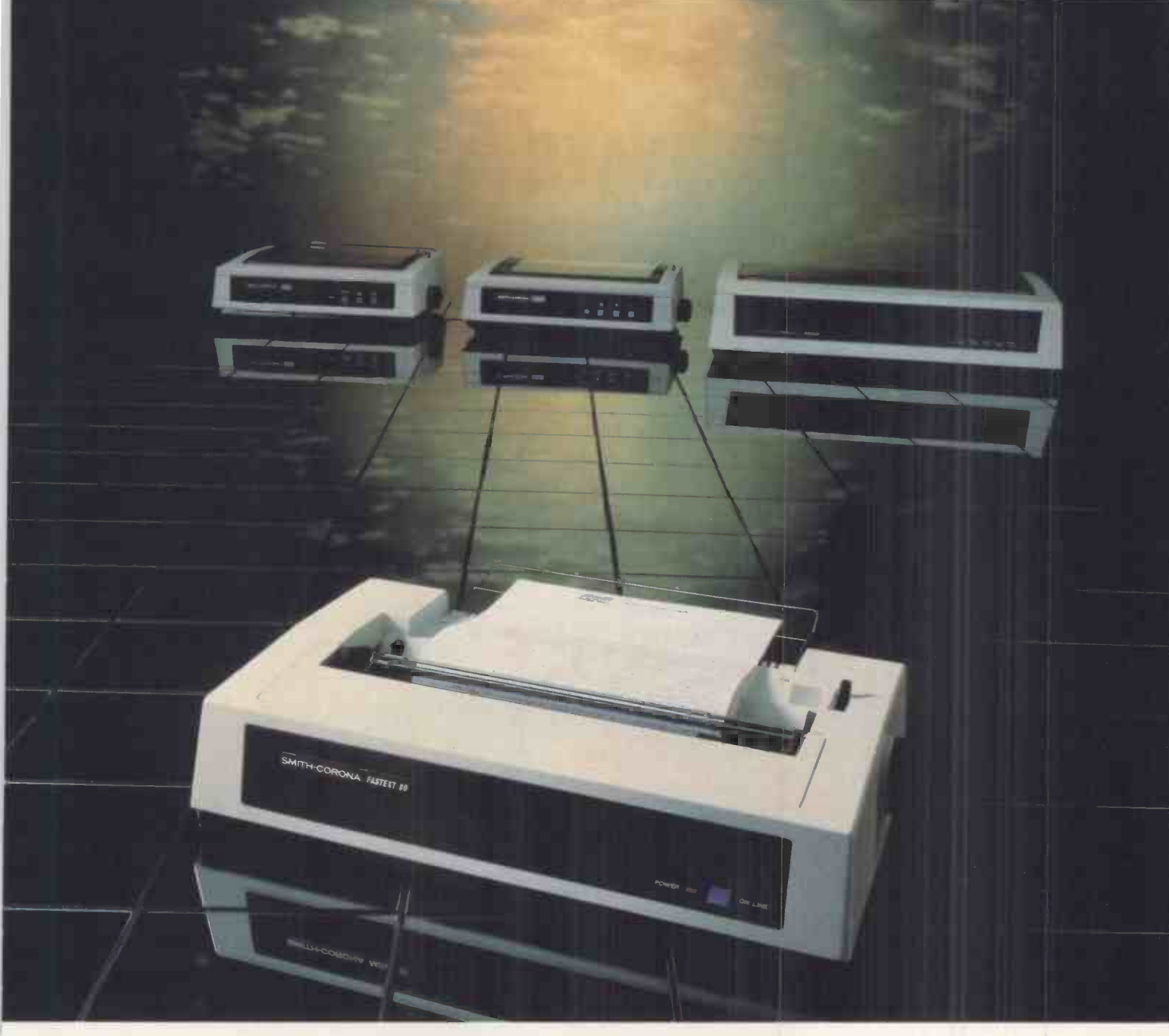

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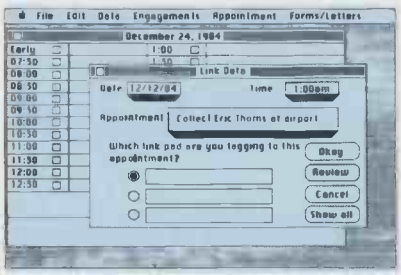

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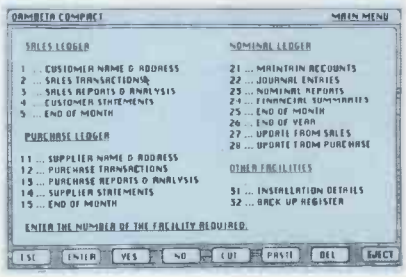

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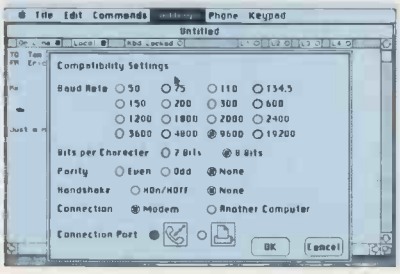

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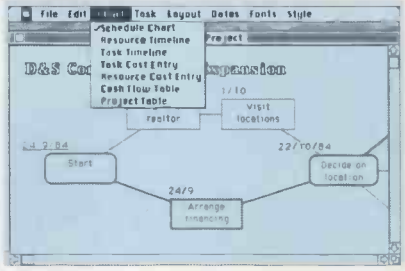

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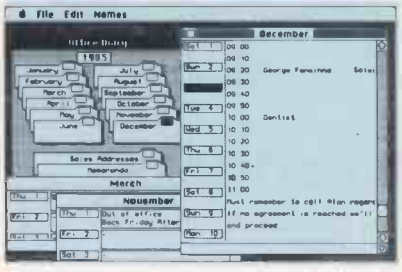

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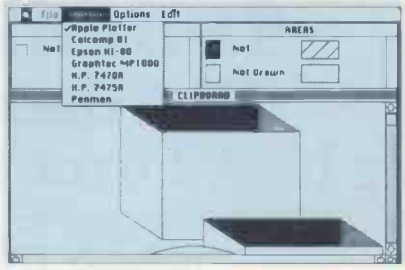

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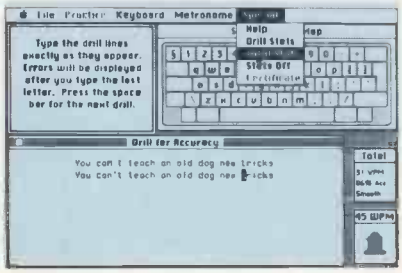

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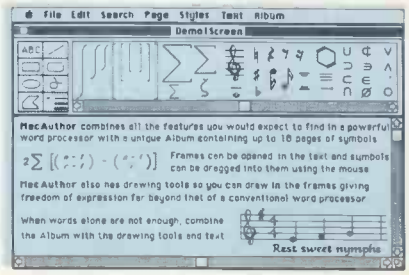

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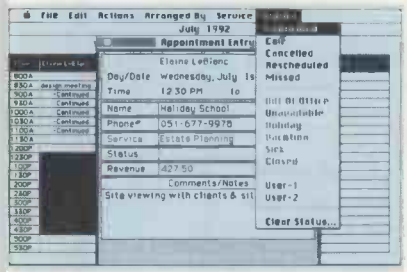

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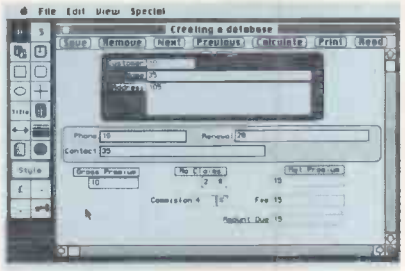

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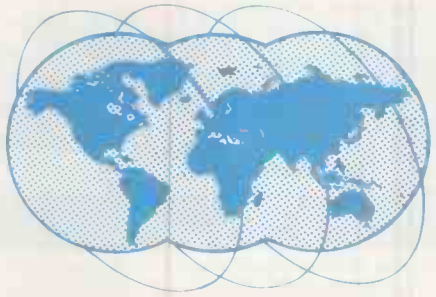

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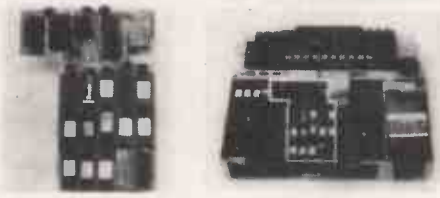

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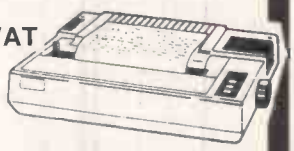

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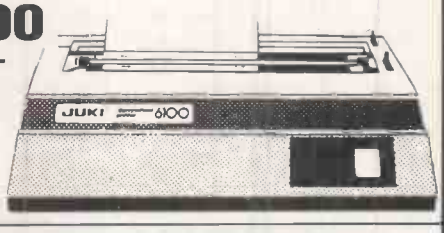

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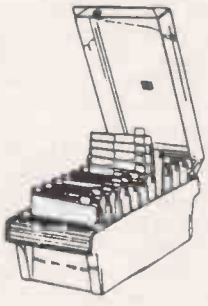

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NEWSPRINT

Where does IBM do its shopping? What do you know about Sir Clive Sinclair? Is the home market finished? Guy Kewney's been hot on the news trail.

Fooling yourself

You may not realise that IBM has to buy its equipment from IBM, like the rest of us. Worse, you may not have realised that IBM doesn't like it any more than the rest of us.

The non-appearance of IBM's PC/AT in Europe is due to a simple finance battle inside the corporation.

The computer itself is known to be difficult to build. The disks, for instance, are rather advanced and, therefore, highly unreliable. Some of the chips inside are rare, and still in short supply if you want them to work.

However, IBM has been counting the cost of its late launch of the PC in Europe, and angry words have been expressed by European executives to their American counterparts who couldn't release sufficient PCs to supply buyers over here. Even when they did, it will be remembered, there was a shortage of some kind.

So it was decreed that the AT would be supplied to Europe as well, at a certain price. And it would be sold, at another price, dangerously similar to the first.

European executives, having cast their eyes over the price list (not for divulging to us outsiders) have sent back memos, the broad gist of which is: Thanks very much and all that, but if you want big orders, the price will have to come down. We have to make a certain amount of profit on each million we spend, they said. And anyway, the things don't work. Get your fingers out.

I first reported on Texas Instruments' Pro-Lite in January, but details are available now of when — and for how much — the portable will sell for in the UK.

Obviously inspired by the occasion, the company sent out a selection of photographs, including the one above which also features a Microlite aircraft.

Prices of the portable, excluding the aircraft, start at £2995, and US imports will be available in March followed by UK versions in May.

It's a rich man's world

Thriving on editorial diversity is the motto of this particular story. My original intention was not to report on Sinclair's C5 vehicle: apart from commenting wryly that it's truly amazing, how many computer specialists have gone into print with their opinions on the thing?

The editor, however, disagreed. Hence the picture story which appears later in this column (and which, I hasten to add, was written by someone with more knowledge of cars than I have).

While the vehicle may be of interest because of the Sinclair connection, I have to add that Sinclair worship is a strange phenomenon. I think this fascination with the hobbies of a rich man is a symptom of the moribundity of our civilisation (I'm going to get into *Private Eye*'s Pseud's Corner if it kills me).

My argument runs something like this: if Sinclair takes his sponsorship of orchestras further and writes a symphonic opus, will the motoring specialists join in with the computer writers in producing criticism? And can we now expect the athletics magazines, who cover the marathon runs that Clive specialises in, to start reporting on the computer industry?

Sir Clive has many private interests. He is a poetry freak. He has tried his hand at publishing novels. He's a leading light in the IQ club, Mensa. He has political and social theories. And he has given evidence, on the one or two occasions when I've met him, of an interest in women, and in alcohol.

The editor permitting, none of these subjects will become the object of anything more than passing, humorous comment here.

Did you know, by the way, that the vehicle isn't even produced by the same company that makes the computers? Sinclair Vehicles Ltd is a separate entity from Sinclair Research. And the only possible interest to users of microcomputers is this: if the car business drains Sinclair's money away, then he may not have the cash to plough back into the next generation of micros.

Switched on

While everyone else is trying to buy cellular radio phones to prove their status (as travelling salesmen?) I've gone one better and installed my own PABX.

There are lots of private branch exchanges on the market these days, but the trouble with most of them is that they require special telephones, or a switchboard operator, or both.

The Small Systems model, the SS12, uses plain vanilla phones and, more important, uses only two wires.

The reason these two facts are important is that I have several computers in my office, and need to connect them to the phone system through modems.

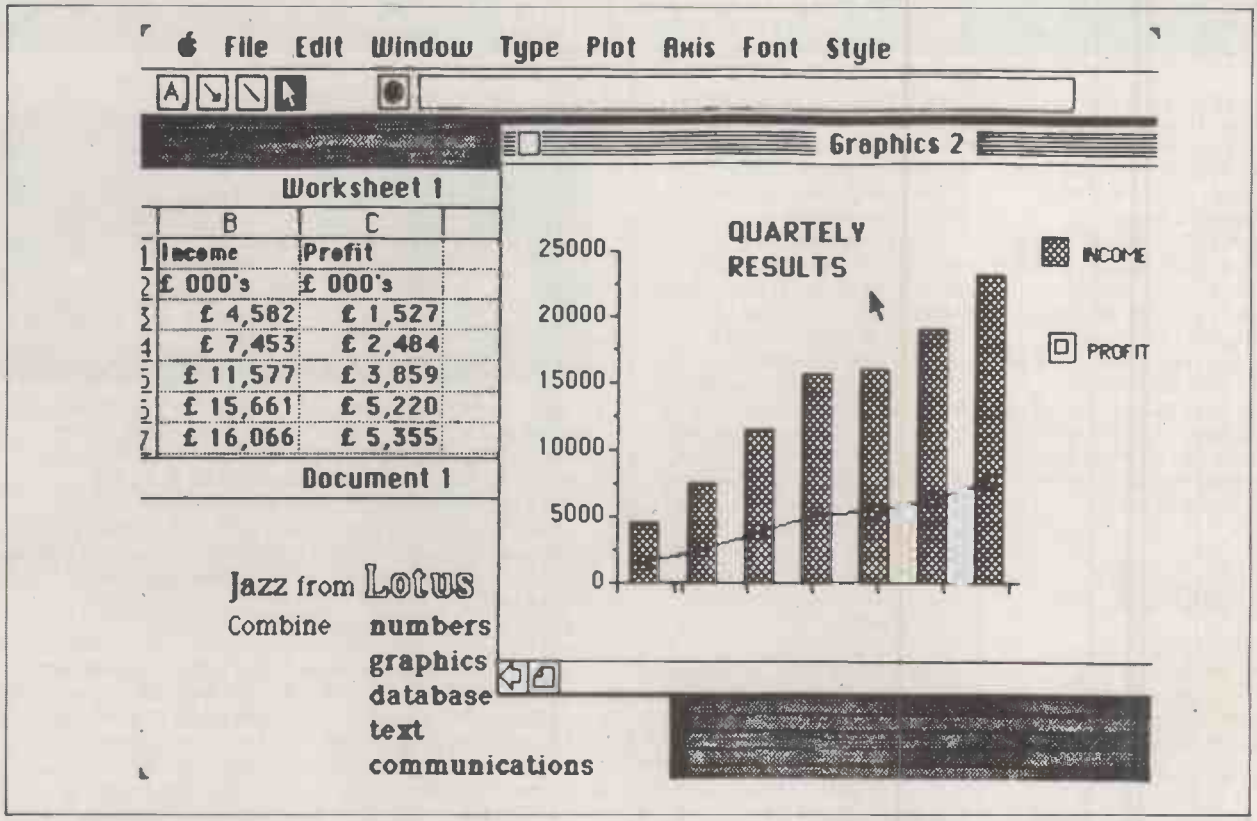
On all too many systems which try to offer inter-office switching without a switchboard console, they have to install extra wires to carry control signals. Alternatively they use special tones which a computer could accidentally duplicate. Either way, to attach computers to the phone system you need a new, special line.

The system comes, complete with wiring for twelve 'lines', at a package price of around what you'd pay for a two-disk CP/M system — approximately £1200. The central processor is an Intel 8085 and it controls all switching.

It sounds like a lot of money for very little hardware, but the problem of getting it cheaper falls into two rather tricky areas. One, of course, is the question of how many you can sell, and this is still not a mass market.

Systems like the SS12 may change all that, but not unless everyone can afford them. And as long as it takes two years from original design to approval, the sheer bank overdraft problems of designing a unit make the prospect of cheap ones rather remote.

The nice feature of the system is that you don't have to have hundreds of lines to



People will tell you that Jazz is the product which Lotus hopes will be as popular on Macintosh as 1-2-3 was (is) on the IBM PC. Lotus is right.

The company will also tell you that it's a version of Symphony, the follow-up IBM product, but for the Macintosh. There, it will be wrong.

The new product is superficially like Symphony in that it includes a proper database (1-2-3 had a rudimentary file searcher), a full-featured word processor (not just a pad scratcher) and also includes graphics and communications.

But where Symphony is a single database, with a series of different 'interfaces' to interpret the data in graphic, or spreadsheet, or text, or database mode, Jazz is actually five programs, integrated with automatic (but cancellable) matching.

In other words, a spreadsheet in both Symphony and Jazz can be arranged so that data displayed in graphic mode will automatically change if you change the spreadsheet.

But in Symphony, the change arises as soon as you ask for the display change in the graphics. In Jazz, the graphics program has its own file, and gets changed only when the changes are passed over from the spreadsheet. And it's possible to retain the old data, give it a new name, and file it.

The product will make a lot of difference to the Mac.

With Symphony, the change from 1-2-3 to the new product was not clear-cut enough for many commentators. All they saw was the complexity, and wondered aloud whether anybody would buy it. To the users, however, the additional database capabilities, plus the comms function, was enough to justify the switch.

With Mac, however, there isn't a 1-2-3 product to compare it with, and users of the computer will compare its five functions with separate spreadsheet, word processor, and so on.

To Mac users, no more need to be said.

Those of us who know (and love) the machine are still driven mad by the thoughtful, painstaking, nit-picking and endless way it refuses to be hurried while sorting out its disk drives. To switch from one application to another can take as little as half a minute, or as much as a minute and a half, if there are complex files to open and close.

The prospect of being able to switch from editing a letter, into sending an electronic mail version of that letter, into storing the reply in the database, into getting on with the spreadsheet work you stopped to write the letter in the first place — well, it's like magic.

Or at least, it will be if Jazz lives up to its promise.

The launch of Jazz in the UK in January was a pathetically low-key affair compared with the razzamatazz we saw in Las Vegas in November.

In Vegas, we were in an aircraft hangar because there wasn't anywhere else big enough to accommodate the cinema screen, the aeroplane (what was that there for?), the crowd of 300 important and self-important people, and the tables groaning under a load of glassware and crockery and floral arrangements. And the real live jazz combo (a big band) and jazz singer, of course.

In London, we were stuffed into a Park Lane Hotel room and made to watch the video of the jazz combo, and a Lotus executive did a demo of Jazz on a giant mockup of the Mackintosh, six feet tall. (In Vegas, there was a 12ft tall working model. Ah well.)

But we did have more impressive news here in London — the news that Apple is extending its Test Drive program to include Jazz.

The idea, according to Apple boss David Hancock, is that the test drive schemes will become more directly aimed at specific markets. And in April, the specific market will be the Jazz market, and people who borrow the machine overnight will get Jazz to play with.

One question which is being asked a lot is simply: Will it sell? And, more specifically, will it sell better than Symphony?

The Symphony problem is largely in the mind. There are those who think that Symphony requires a degree in computer science to understand. And there are those who mutter, darkly, that it has 'flopped'.

It's always possible that Lotus executives tell me fibs from time to time, but I haven't caught them at it yet, and they claim that, in Europe, Symphony sales are running level with 1-2-3 sales.

This means that IBM users are actually buying more copies of Symphony than of 1-2-3. The logic is simple: there are more lookalikes in Europe than in America, but Symphony is not yet available for most lookalikes. Lotus 1-2-3, however, is. So a large proportion of 1-2-3 sales are for the lookalikes, and very few of the Symphony sales will run on them.

As to whether Jazz will sell, I feel very happy sticking my neck out and saying 'Yes, very well indeed'.

use one. If you have two incoming Telecom lines, you can have 10 extensions. With three Telecom lines, you can have nine, and so on. But every extension has programmed dialling, alarm calls, intercom facilities, and put-you-through abilities.

Which means that, should you ring me up with a complaint about the collapse of your company (heaven forbid) as a result of some throwaway remark in this column, I can transfer you to the answering machine and get on with my work.

Unfinished business

Attentive readers of the *Sunday Times* will have noticed that newspaper reporting on the collapse of the home computer market. It is, it reports, over. But the home computer boom is far from being over. Indeed, it hasn't yet started.

The evidence of the collapse of the industry is simple — manufacturers who had a wonderful time at Christmas 1983/84 had a pretty poor time last Christmas. And the software business had a rotten year, especially on the games side.

However, the question of who had the rotten time last Christmas has some interesting answers.

Primarily, Acorn caught a cold, although the company says it sold twice as many machines this Christmas as last. Interestingly, Commodore didn't do as well as expected. And, despite all the predictions of doom, Sinclair did rather well.

Research Machines, whose Z80-based systems must be familiar to many of PCW's educational readers, has expanded into the world of 16-bit computing.

Based on Intel's 80186, its Nimbus range uses MS-DOS along with MS-NET networking, and an input/output system known as Piconet. MS-NET allows up to 64 'Nimbi' to share software and network facilities, while Piconet allows up to 30 peripherals to be driven by one I/O port.

As the Intel chip runs at 8MHz, the system is likely to be speedy. In fact, Research Machines has run the PCW Benchmarks and says the Nimbus beats all but the Sage from our January round-up.

The machine will be available in March, and an entry-level system, with a single 3½in, 720k capacity drive, costs £1395. For many educational customers the price is lower — £945. The twin drive version costs an extra £300. These prices exclude VAT and the cost of the monitor.

Hard disk versions and extras such as a mouse will also be available. At the time of writing few details of applications software were available, but PC Paint is a certainty and a wide range of business packages is promised.

More details on (0865) 249866.

It isn't altogether accurate of Servicon to say that its diskettes for the BBC Micro have 'broken the £130 barrier.' After all, the price of £129.95 doesn't include VAT. They have their own Crescent DFS, giving 400Kbytes per disk, and they are 3in drives.

The company has also launched a club for users of its equipment called the Inner Circle Club (!) costing £25 per year. You get five games per month on disk free (?) for the price.

Details on Cheltenham 583391.

However, the reasons for all this have nothing to do with the collapse of the market. Rather, they have to do with the neglect of the market by the manufacturers.

Clive Sinclair, uniquely in Britain, did launch a new machine with noticeably more features than his old one. The QL excited people and they bought it, even before it existed. Afterwards, fingers burned, they held back a bit — but by Christmas, all the chain store buyers were assuring me, the QL was selling again.

Commodore launched the Plus/4. It wasn't noticeably better than the 64, and it didn't run 64 software. It was sufficient to put some buyers off the 64 (out of date? they asked themselves) but not enough to swamp the market with its excitement.

Amstrad did pretty well, just launching a machine which brought the 'value for money' level into a different bracket.

To put it politely, the Amstrad is not very far removed from a souped-up Sinclair Spectrum with a proper operating system, a built-in tape player and a free monitor. But the free monitor was a new, even exciting, thing to get for £250 including the computer.

Acorn, complacently sure of its school sales, refused to change the BBC Micro or bring the price down. Yet it must be obvious to the most ignorant that the cost of building it had halved in the three years since it was first available, and that if it had been re-engineered it could be built for closer to a third of the price.

Now, the schools scheme has come to an end. Schools don't have money without such schemes — certainly not computer money. Many of them are short even of writing paper. And the result is that shops started dumping BBCs at discount prices. But the reason they started dumping them wasn't just a fear of not being able to sell them.

Around the beginning of December, rumours of the Issue 10 version of the BBC board began to circulate. It would, said 'informed sources', sell for £150-£170, and Acorn would stop supporting the old one.

Shopkeepers who weren't quite sure if this made sense still knew enough to move out of the firing line. If a new model is coming out, they reasoned, now is the time to get shot of the old, even at cost — or even at a loss.

So they did.

The fact of the matter, however, is that no-one, yet, sells a *home* micro.

What has flooded the market, to the point where potential buyers mostly already have it, is a programmer's exercise bike, usable for sophisticated games. For home use, it's a joke.

How can you manage your history notes on a system with only 100k of data? And if you log on to a remote database with history information, you can't compare it with your own notes to see if they relate because the comms program is separate from the text program.

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(Daisywheel Printer)

When the rumours first emerged about Hewlett-Packard releasing a Unix-based portable, a few eyebrows were raised. But it all turns out to have been true.

Dubbed the Integral Personal Computer, the 68000-based machine weighs 25lbs and includes a built-in Thinkjet printer and 3½in, 710k capacity disk drive.

The screen provides 31 lines of 80 characters on a 9in electroluminescent amber display. HP Windows is included and allows the multi-tasking system to display several applications simultaneously. Surprisingly though, it's a single-user system.

The operating system is Hewlett-Packard's UX, derived from Unix System III, as is Xenix which is due to be available on IBM's PC/AT this year.

Also included is Personal Applications Manager, which may help to appease Unix opponents as it allows you to access the machine without having to use standard Unix commands.

The £5450 Integral is aimed primarily at scientists and engineers, but standard business packages such as Multiplan and dBaseIII can be implemented. Availability is scheduled for March.

files?

Who is going to use his £400 micro to turn light switches on and off when that means he can't play Elite or Son of Blagger or Manic Miner?

When computer memory costs £200 for a half megabyte, why are people launching systems with 48Kbytes? Why, when there are chips that can control 16Mbytes, are people offering systems that get lost beyond 64Kbytes? When autodial modems could be built in for £50 extra, why are the computers not even fitted with sockets into which a modem can be plugged? When processors can run four levels of program protection, why are they not given proper multi-tasking operating systems? When display tubes can accept data at 10MHz, why are they sent data down a serial wire (which doesn't actually exist except in the mind of the designer) at 9600 baud?

The answer isn't simple. It has to do mainly with our general failure to understand that computers are fundamentally the most useful tools, after the invention of writing, known to civilisation. And also with our business expectation of a 'stable market' in an area where the technology is constantly causing earthquakes.

Selling a BBC Micro for £400 in 1985 is an act of simple dumb negligence. The fact that selling the BBC Micro is possible is a dead giveaway of the fact that its rivals have been equally negligent.

That machine was the most exciting design thought of when it was announced. It was still exciting when it became available, many months later. But only somebody who had never looked at a silicon chip could possibly imagine that, today, it is anything other than out of date. And so is the Apple II — but at least Apple has re-engineered it twice. So is the Spectrum, but at least Sir Clive has given it a better keyboard (sort of).

By the end of the year, the Macintosh will cost £1000, its Atari rival previewed in this issue will be available, and there will be one or two interesting machines like the Mind Set and Amiga, and others we haven't heard of yet because they are still secret.

If those machines show no sign of creating new markets, then I'll consider, seriously, the possibility that the home computer boom is over.

As of today, however, I'm still waiting for it to start.

Any offers?

Now that Coleco has killed off its Adam micro, we will never know whether it failed because the design didn't appeal to enough people, or because they never managed to build any that worked.

However, the company (now concentrating on cabbage patch dolls) does still have a computer product up its sleeve — a phone which runs Apple II software.

The plan is to sell this for £500, but the plan isn't Coleco's. That company hopes to find a sucker — sorry, buyer — to take over the design.

Sneaking suspicion

Tactless though it was of Timefame to allege foul play and unauthorised hacking of its Prestel pages, I'm stunned that Prestel could get away with the response it chose — to delete Timefame's pages altogether.

The fight blew up just before Christmas, when Timefame announced that hackers had been playing with its pages (which nobody need doubt) and worse, that these hackers had been given the necessary access codes by a 'mole' inside Prestel.

Who can say whether this is, or was, true? Certainly, Prestel couldn't prove it one way or another, and neither could Timefame. And eventually, Timefame withdrew the claim.

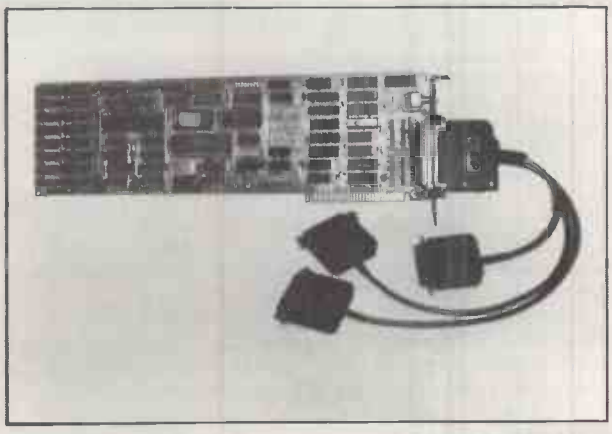
But the rest of us would find that withdrawal just a wee bit more convincing if Prestel hadn't put such extraordinary pressure on them.

If Prestel feels entitled to censor pages published by users of its service, it is going a lot further than it said it would when it announced the service. And it's going a lot further than the free press laws (such as they are) would allow it to do if it were a newspaper print works.

But to suspend the Timefame pages because of unflattering remarks is quite another thing.

I know that there are print unions which take similar action (and get away with it, sometimes) when their paper prints things about them which they regard as unfavourable.

But I'd be very surprised to learn that the people running Prestel are the type who



It wasn't all that exciting for the rest of us (who don't have Hewlett-Packard 150 micros) to learn that three of them could be connected by Protek's card to share a printer or plotter.

But the news that the card will now work with the IBM PC makes it rather more generally useful. And since the other two computers need only take the printer cable, they can be something else — as long as it has an IBM-style socket.

Details on (01) 245 6844

praise the print workers for that kind of high-handed action.

Apart from the arbitrary damage to Timefame's business, what about the subscribers? Aren't they entitled to the information — which, just possibly, might be important — that they want to look up?

And just suppose — just suppose, that's all — that Timefame was right, after all, and there was a mole, and Prestel was at fault?

It's irresistible

They are rather pleased with themselves at Digital Research, where the company reckons it's beaten IBM to the punch with a 'proper' operating system for the AT.

Concurrent DOS 286, launched together with Intel (which makes the 80286 super-chip inside the AT) does something that the AT's own operating systems, DOS 3.1 and Top View, can't do.

It extends the memory beyond a megabyte.

The 80286 operates in three modes. At startup, it behaves very like the original 8086 or 8088 inside the IBM PC. It addresses a megabyte, maximum, of internal memory, and it controls it in segments of no larger than 64Kbytes.

But it can be switched to 'protect' mode. In this mode, it can suddenly control 16Mbytes of memory (and the PC AT does have the necessary wires to plug all that memory in) — and can give different programs different 'privilege' levels.

The most privileged level, zero, is reserved for the operating system. It can decide which program runs in which part of the memory, and which bits of memory are not RAM any more, but ROM, or which bits can't even be read because they are secret. No other program can change these protected segmentations.

The result is that computers like the AT, the Acorn Business Computer, Rair, FTS, ICL's 286-based micros and others (still secret) can now run multi-task, multi-user programs, and the users of the AT who stick with Top View and DOS 3.1, can't.

When the software is available from Digital Research in April, it will actually run DOS 2.0 programs direct from the disks; at the moment, the company's latest version of Concurrent will read DOS 2.0 files, but not run programs.

Most IBM watchers now agree that Top View is more than just a 'cosmetic overlay' to DOS, and is a genuine multi-tasking operating system.

But it doesn't have the multi-user, networking abilities of Concurrent DOS, and, even stranger, all the evidence is that IBM doesn't propose to upgrade it to that level for several months — possibly, not until next year.

And strangest of all, it only gives the AT access to the 640Kbytes of memory that the PC has today. It doesn't use protected mode at all,

The only thing that is still far away on Digital Research's travel plan is the networking parts of DOS 3.1. The company says it hopes to incorporate that this year, but not at the release of Concurrent 286. But it will announce DR Net in a version to work with Concurrent 286 in April.

Working with the already-announced GEM, this new operating system could start the transformation of the AT into a super-Macintosh.

The segmentation and protection abilities of the 286 chip go some way beyond the powers of the 68000 chip as used inside the Macintosh, especially with the current Mac operating software.

However, there will be interesting announcements on that level in 1985 too. Concurrent DOS 68k is likely to be announced in the next few months, giving multi-tasking to many systems with the 68000. And a Mac version is one that Digital Research will find hard to resist.

Bridging the gap

Eagle has side-stepped the threat of Chapter XI bankruptcy in the States by rescheduling its debts.

The company's imitation IBM micros have never quite recovered from the blow of a lawsuit from IBM over the

The arrival of a Wabash Sony-style diskette is actually something of a breakthrough, because this one is really made by someone else. Most diskette material normally comes from one of three factories in the world, whatever the hype on the advertising box.

Wabash claims that this half-megabyte 3½in system uses a new surface technology. 'It is the first Wabash product,' says the company, 'to use the cobalt-enhanced oxide coating formulation for high density recording.'

Theoretically, this should mean that when disk drives are formatting diskettes to higher densities, these Wabash ones will cope with the new format programs.

Details from 1 Trinity Square, Chelmsford CM3 5JX.

You have never seen Clive Digby-Jones of Websters Software (a distributor) before, have you? But it's all right — he doesn't always snarl like this when entertaining ex-Transport Ministers.

The MP, David Howell, gave Websters a chance of some publicity by inspecting its new premises at Guildford (for where he is the sitting representative).

And what fascinating conversation took place then?

Digby-Jones, entertaining little imp that he is, took advantage of the occasion to quip: 'Websters has always taken a firm stand against piracy.'

Keeping them rolling in their seats, he chuckled: 'Organised illicit copying of computer software must be stopped. The loss of revenue for the software houses means there is a shortage of funds for research and development, and in the end, it's the consumer who loses out.'

I think he was trying to encourage Howell to vote in favour of the forthcoming Bill against software piracy. It's hard to be sure, because Howell's only recorded words were: 'I'm very impressed indeed, Websters is obviously in the frontier of computer technology,' and added: 'It is in the nature of things that you cannot prevent ordinary copying any more than you can stop book lending. But you can prevent the actual duplication and then re-sale of software under fraudulent labels.'

MORSE: THE TOP TEN SYSTEMS

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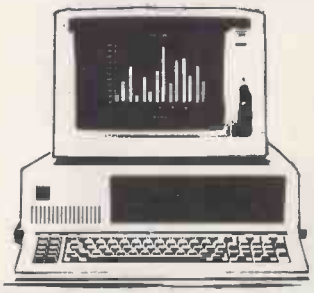

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close similarity of its internal software to IBM's own, and from a year ago, when it was the darling of American journalists, to today, is a big, big gap.

The plans for future money-making apparently centre on 'vertical markets' and overseas sales.

It's all in the game

At last, I have seen a computer downloading software from a video disk.

It's the new MSX design from JVC, linked into the VHD disk system and likely to hit the market later this year — much later.

The idea is that you can mix the picture from your computer with the picture from the disk player, and decide which film sequences to show under software control.

It looks like a first step, though.

The demonstration games shown at JVC's headquarters in London included the predictable car racing game, where the picture switches from one lane of a motorway to another as you twitch the joystick. The computer makes it more entertaining by dumping oil barrels into your path.

But the loading of software seems to have been designed by a contemplative monk.

Data for the computer is stored on the video disk — how, the executives weren't too sure. But it comes off the video disk at the blinding speed of around 2400 baud.

Ah, well, back to the drawing board. With something like four gigabytes of data possible on the disk, it would take around 5000 hours to read the whole disk at that rate. You can see that this is not a computer peripheral.

The interesting feature of the machine was not its data rate, however, but the games. Apart from the racing game, most of the demo games involved audience participation and an expert bookkeeper.

Executives told me that Japanese players love to sit round the screen, watching a fruit machine rolling. The audience watch the screen until the fruit is just about to settle, and then they have bets among themselves.

Alternatively, they watch a young man with a mischievous disposition walking through the changing rooms of a sauna/swimming pool, and noticing a shapely pair of legs under one of the shower doors. As he opens the door, the action freezes, and the computer makes random jumps — either to an angry young man, or to an embarrassed young lady — after everyone has placed their bets.

My favourite, by far, was the one showing three of those weird aliens from the Star Wars bar, all drinking in a Tokyo hotel. One gets up to visit the toilet, and stops between the two doors.

Which door will it go through — the Gents? Or the Ladies? Place your bets!

Roughly £100 below the nearest competitor, Prism's special monitor for the QL is priced at a penny short of £200, including VAT. I arranged to borrow one in order to test some QL software (yes, there is a program you can load other than chess) and it arrived promptly, and I'd tell you what it's like if only Sinclair could arrange delivery of the QL . . .

According to Prism, the screen is one of three designs — including Kaga's and the MicroVitec — which will display the full width of the 85-column width output of the QL. Ordinary colour monitors will cut it short.

Details on (01) 253 2277.

You are looking at an actual farad. A farad is the unit of storage of electrical charge, and most students of electronics, having discovered the surprising fact that two nearly-touching metal conductors can store a charge, are usually disappointed to find that most capacitances are measured, not in farads, but picofarads.

These are capable of storing thousands of times more power than most capacitors, and Panasonic, which makes them, reckons they can be used as an alternative to battery backup for memory.

You don't think so? You'd be surprised. 'Where a large number of charge/discharge cycles are required, the Gold Capacitors will operate reliably for over 20,000 cycles — compared with a thousand cycles for a nickel-cadmium battery.'

And you can get blocks of them of storing 5.5 volts up to 3.3 farads, which will keep a lot of memory going for quite a while.

Details on (0753) 73181.

Quick off the mark

Commodore has announced approved status for a Plus/4 business program — Company Pac 1*2*3 — saying that it's the first business product to get this approval.

Actually, it's the first product I've ever heard of for the Plus/4 at all.

Despite the name, it's not an imitation of Lotus Development's product for the IBM; it includes various ledger packages and management reporting routines, all on one disk.

Normally the thing costs £98.95, but the first 50 applicants were to receive a discount down to £50 by phoning (01) 900 0999. I wouldn't get too worked up about that — the release was sent to us in December, and just possibly someone else has already phoned.

Unix wasting time

If IBM continues to back MS-DOS as its primary operating system, and if that operating system is enhanced to gradually include a sophisticated degree of multi-tasking, 'then that'll be the end of Unix, at least as far as the PC world is concerned,' commented a pundit in Los Angeles recently.

The pundit is my old friend David Ferris, head of Ferrin, a company which trains corporate users of micros, and advises on selection of hardware and software. And I couldn't have put it better myself.

Ferris and his colleagues do

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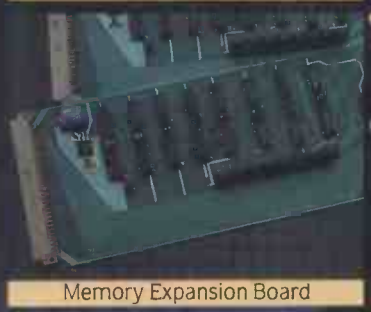
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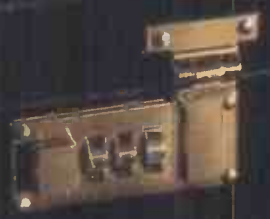

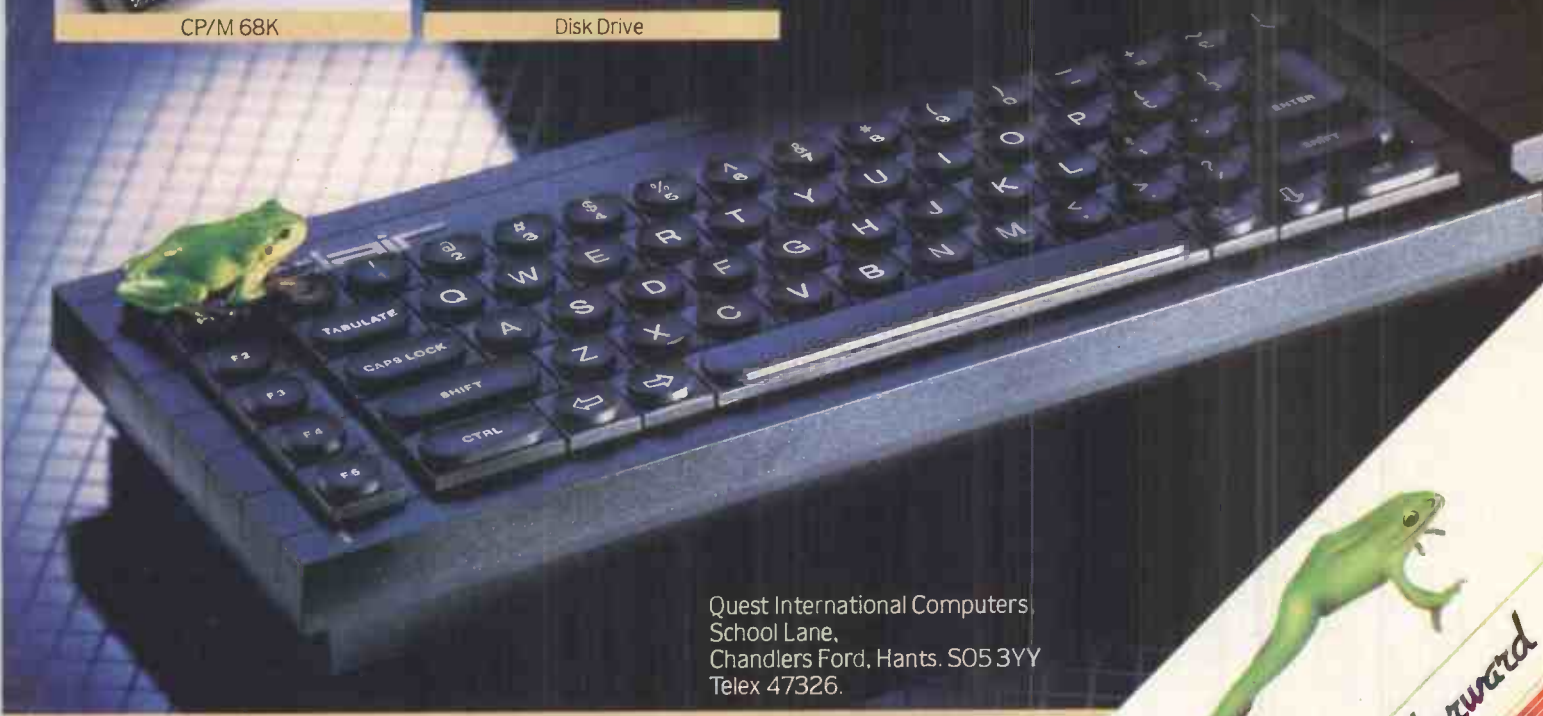

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The reasons single people join Dateline are often very varied, but come down to one thing — they are simply not meeting the sort of people they would like to meet.

'We are going to get on!'

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 swopped 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!

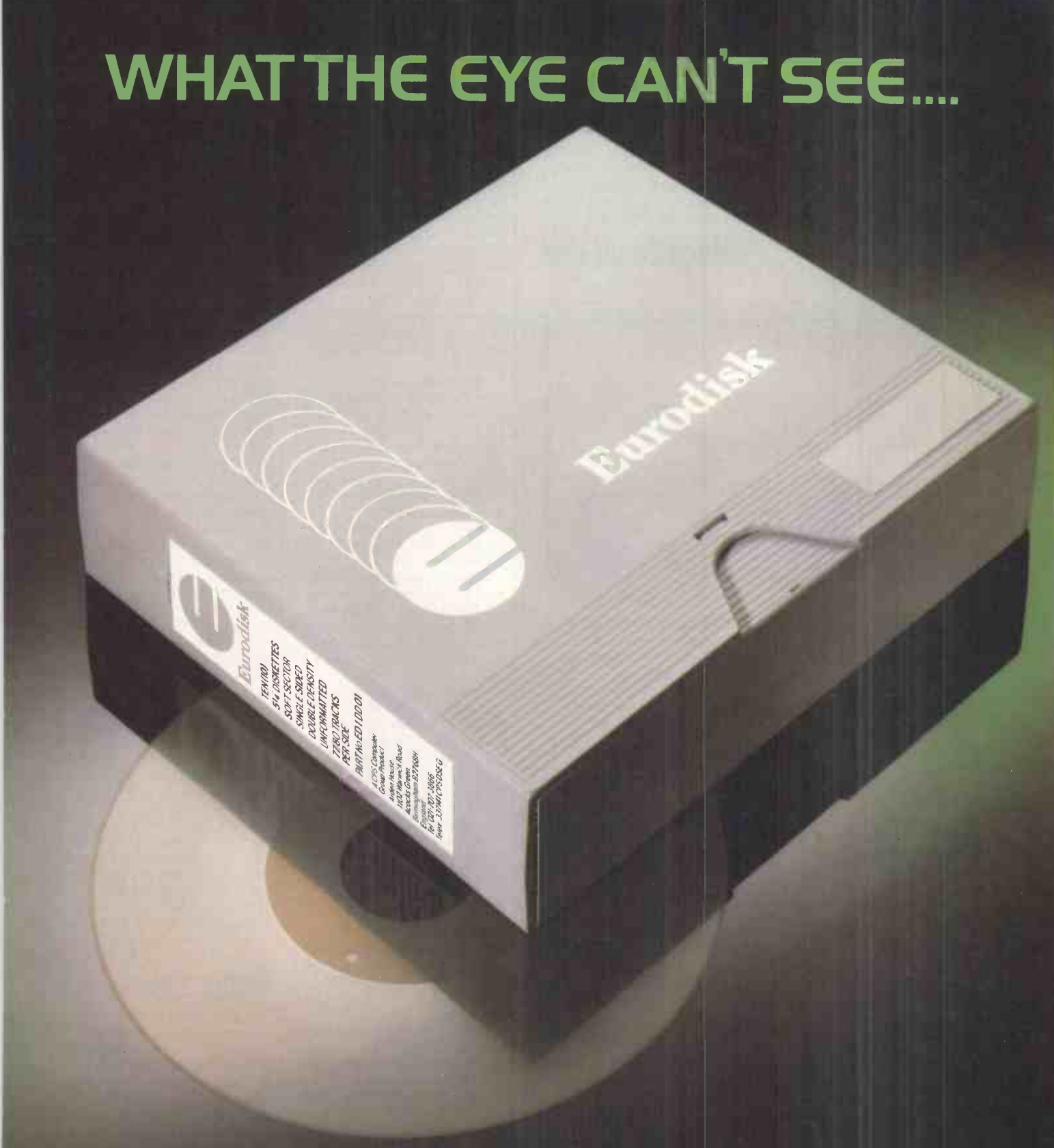
Within two or three weeks, Chris realised that she was falling in love with Tim and they were beginning to talk about the possibility of a future together. 'We went to London for a few days,' remembered Chris, 'and Tim said, 'Why don't we go to Hatton Garden and get a ring?!' So we did! It was a lovely day.'

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 out 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.

WHAT THE EYE CAN'T SEE....



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believe that there is a major requirement for 'a good, standard, multi-tasking operating system for personal computers,' but they don't think Unix is the one.

To cap it all, the firm is unimpressed by the Unix ability to put several users on one PC ('just a waste of time,' it said) and is warning corporate clients to steer clear of Unix for software reasons, too. 'The software for business use just isn't good enough,' said Ferris.

Educational link

It is unfortunately true that many schools have both the recommended educational micros — the Research Machines models, and the Acorn model — and that they are about as friendly as chalk and cheese.

A network which lets them link up has been developed by Richmead Micro of Reading, and it sounds like a sensible use of resources as opposed to an ideal solution, which might involve buying new resources.

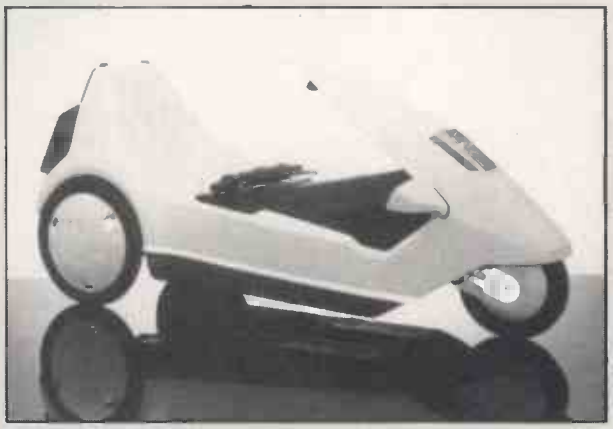
'Before the Beeb,' commented the company in its announcement, 'most secondary schools used the RML 380Z. But when the BBC Micro was launched, many switched over because the relative low cost allowed them to use several computers in a classroom where before they could afford only one.'

Most schools handed the disk-based 380Z over to the administration side. Then they found that a network of BBC Micros was possible, but they needed a big disk as a file server.

Richmead's solution: connect up to 16 BBC Micros together in Meadnet, and forget about Econet.

It costs £275 plus £20 for each BBC station, and is slower than having individual disks 'but faster than tapes,' according to teachers at one school where it is used.

Details of Richmead on (0734) 665771



Sir Clive Sinclair's C5 electric vehicle costs £399 and is delivered to your door in a cardboard box.

It is 5ft 9in long, 2ft 5in wide and only 2ft 7in high. The C5's body consists of two white polypropylene mouldings which are electrically melted together, forming a rust-proof shell for the Lotus-designed steel chassis.

The C5 is driven by a washing machine-derived motor, which is made by the Italian firm Polymotor which also makes motors for gyros and torpedoes. The motor drives only one of the three glass-reinforced nylon wheels, and through it the C5 can achieve a speed of 15mph. The motor is powered by a heavy-duty, deep discharge, lead acetate battery which gives the C5 a range of about 20 miles. The motor is activated by holding down a button on the control bar and cuts out as soon as the button is released. Should you run out of power then the C5's pedals will get you home. Once there, an overnight charge will restore the battery.

The driver sits in the seat and assumes a go-cart style posture, with his feet on the pedals and his hands resting on the control bar which runs under his legs.

At either end of the control bar are bike-style controls that activate the progressive brakes, which give a stopping distance of 20 feet at 15mph. Other controls, situated under the seat, turn on the front and rear lights, and the ignition key.

A Ferranti-designed ULA drives two LED displays. One tells the driver the amount of power that's left in the battery, and the other indicates how hard the motor is working.

The C5 is initially only available by mail order from Sinclair Vehicles, which is a separate company financed by the sale of 10 per cent of Sinclair Research.

The vehicle can be driven by anyone who's 14 or over — without a licence, helmet or road tax. Nor do you need any insurance, although the Prudential will insure you for between £20 and £50 (depending on your age).

Sinclair Vehicles also plans a range of add-ons, including booster pads so that smaller drivers can reach the pedals, wing mirrors and indicators, a horn, a 'high-vis' mast so that other road users can see you, and designer-styled waterproofs to keep you dry.

Sinclair watchers will notice a slight change in the order form. Under the usual '28 days for delivery' is a paragraph explaining that the company won't cash your cheques until delivery.

Although the C5 is only available by mail order, you can see one before you buy — it's displayed in 100 electricity showrooms throughout the country.

Rich pickings

Immediately after finishing this issue of Newsprint, I went to Apple's head office to be told about its new local area network.

Apple is making quite a fuss about this deal — air tickets to California wil cost them a bit — and the reason is simple: there is immense scepticism about it in the networking business.

Two areas worry the experts. Firstly, they say, the network is far too slow.

Harry Saal, network pioneer at Nestar, summed it up: 'It's the same speed as a thing we had working four years ago on Apple II systems, and it just isn't satisfactory. We'll leave this network to our rivals, 30Cm, and make do with the pickings from the IBM business.'

The speed is around 300 kilobits per second, where even the slower rivals start at four to ten times that data rate — and some run a great deal faster still.

Speed, however, isn't what worries my pundit friend David Ferris. He's taken the trouble to issue a condemnation of the apparent cost of the system — which Apple says will be £50 per micro.

'We have found that when you add up all the hidden expenses of building a network, the costs of the wires are trivial,' Ferris told me. 'We've installed more networks in the San Francisco area than anybody else, I'd say in the world, and really, the costs can be as high as fifty times greater than the cost of the micros, and the wires, and the software all together.'

However, it isn't all bad news: Ferrin as a company has suffered long enough from the software problem — no software works on most networks — to give high praise to Apple's approach to this.

Tactlessly issuing his release a week ahead of Apple's, Ferris commented: 'We give high marks in most areas, especially the announcements about collaboration with software vendors. It will take a long time before most people are able to use Apple Net, but by 1986, we think it will be a serious standard.'

I was particularly amused by the number of news media who took the meat of Ferrin's announcement, and reported the Apple network launch without Ferris's comments as if they'd dug it all out of the grapevine themselves . . .

Going down

The Spectrum has been dropped in the UK but the Spectrum Plus lives on, with its price cut to £129.95 from £179.95 (although you now have to pay for the software pack which used to be bundled in).

And you can upgrade your old Spectrum to Plus level for £30. Or indeed, thanks to Acorn, you can take it (or any other micro) to a BBC dealer and get £50 off the price of a Beeb.

Acorn also got in on the post-Christmas price-cutting with the Electron coming down £70 to £129.

END

Guy Kewney can be contacted on electronic mail. His numbers are Source TCK106, and Telecom Gold 81:JDS018.

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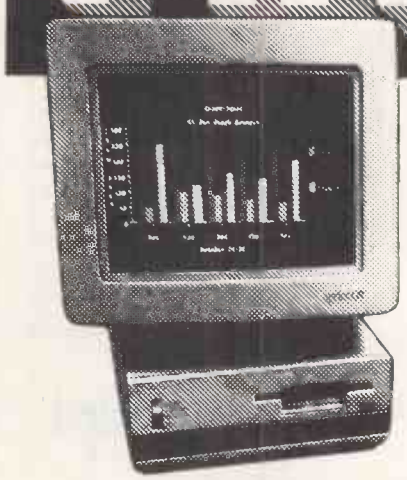

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YANKEE DOODLES

Our US reporter David Ahl has interesting news of a new operating system, HH-DOS, and subliminal software.

Portable operating system

Microsoft has developed a new operating system, HH-DOS (Hand-Held DOS), for notebook portable computers; it incorporates features of MS-DOS and various integrated software packages.

System calls and the file structure of HH-DOS are the same as MS-DOS, although by no means is it fully IBM PC compatible. Thus, data files and Basic programs can be up and downloaded from HH-DOS, but applications programs will undoubtedly require modification to run.

HH-DOS also integrates several applications software modules including the Microsoft Word word processor, Multiplan spreadsheet, Telecom (similar to the Tandy Model 100 version), File (a file manager), the Basic language, a calculator, calendar/scheduler, and modem dialer. These last three programs may be run from a window without disturbing the primary application in the machine.

The integration of software exists on both a file and functional level; you could pull all or a portion of a spreadsheet into the word processor. A File file can be moved into the spreadsheet, or a Basic program can be edited from either Basic or the full-screen word processor editor.

Data interchange between programs uses the Microsoft Word 'scrap' concept: that is, mark a word (or block), throw it into scrap, go to the other application and recover the scrap. If it's a big or important scrap, you can name it and automatically make it into a file.

The HH-DOS software of 200k bytes is etched onto two CMOS ROM chips which are currently being sold to manufacturers of notebook portables. An early customer was Zenith which has already shown a nifty new machine behind closed doors. However, I hear that Zenith would prefer to include WordStar in the machine rather than Microsoft Word, and, as a result, has delayed its introduction.

All in the mind

An entrepreneur in self-hypnosis and self-improvement audio tapes is now offering a computer program that seeks to tap the subconscious mind. 'We're changing the internal tapes inside your head,' proclaims Joel Amkraut of the California-based New Life Institute.

The program flashes messages for a fraction of a second on the computer screen while the user works on primary computer tasks. Over an eight hour day, a user would receive as many as 28,000 subtle copies of the message. He can put in his own message — to lose weight, stop smoking, avoid alcohol, overcome phobias, gain self-confidence, lessen stress, or address a variety of other ills.

Currently there is a great deal of debate as to whether such systems really work. Several university professors voice scepticism and feel that it's difficult to rapidly undo something that nature instilled in a slow and painful way.

Nevertheless, several companies have sprung up to market subliminal software. In addition to New Life, these include Greentree Publishers, Cabononics, and Futique, Inc. The latter firm was founded by Timothy Leary, the counterculture hero who championed psychedelic drugs in the 1960's.

Developers of these programs acknowledge the possibility for abuse. For example, an employer could use the program to instill company loyalty and fanaticism, or to send seductive suggestions to an unknowing typist to further sexual ambitions. One developer boasts of using his program to attract people to Christianity — which may or may not be the Christian thing to do.

Better integration needed

Since Lotus' Symphony and Ashton-Tate's Framework were announced, other vendors have been rushing into the integrated software market-place at a ferocious pace. According to one recently published study, the market for integrated packages will increase 20-fold in the next three years.

On the other hand, users who took part in a two-day seminar sponsored by MicroMentor, Inc, a computer training firm, registered dissatisfaction with existing integrated packages and eagerly await a new generation of stand-alone applications packages. Users felt that most integrated packages offer one strong application augmented by several weaker ones. Symphony was praised for its excellent spreadsheet, but users felt the word processor was lacking. In contrast, the word processor in Framework is very good, but the spreadsheet is weak.

Users also felt that software developers should create common user interfaces and file formats that would allow the use of stand-alone packages from different companies.

In addition, users criticised existing channels of distribution in which sales people push well-known 'safe' brands of software rather than investigating new products that may be superior. Users felt that they would be better served if they had more direct contact with software publishers, and expressed dissatisfaction with software packages that mainly reflect fancy technology rather than responding to users' needs.

Random bits

After failing to line up distribution with any major retail chains for its Decision Mate V or later IBM PC compatible computer, NCR is closing its US PC manufacturing factory and transferring production back to Germany . . . Citing delays in software development, Kaypro has cancelled an exclusive agreement with Mitsui to buy its IBM compatible notebook portable machine. Instead, the firm will go with a different design developed in-house . . . Warner Communications has written down the $240 million owed to it by Jack Tramiel for the purchase of Atari to $135 million. Still hoping to recover some of its money, Warner has purchased $10.1 million of receivables from Atari, loaned the company $8 million, and agreed to a further $4.5 million loan. That's good news for Jack . . . Sears, the nation's largest retailer, is teaming up with Apple to see if a high-end computer will sell in a department store. For the test, the Apple IIc will be sold at $984.99 side by side with the Commodore 64 and Atari 800XL, both priced at less than $200 . . . Hallmark, the greeting card and stationery giant, has acquired Information Technology Design Associates, a firm involved in designing software for children. ITDA's most successful product is Microzine, marketed by Scholastic . . . Faced with disappointing sales of its Professional Computer, Texas Instruments is shifting its retail focus to vertical markets such as engineers, architects and doctors. The company plans to train dealers in selling to these markets and to provide sales leads . . . Hewlett-Packard is expected to release a 32-bit transportable computer with the Unix operating system. The machine will be aimed at the technical and scientific community, and, at $5000, will be one of the least expensive Unix machines on the market . . . ICL's OPD has some company: over 20 firms are selling new machines that combine the functions of a computer and telephone at prices from $1000 to $6000. Analysts, investors and manufacturers predict the machines will become absolutely essential to anyone in business. One problem: they aren't selling. Of the machines, one consultant said: 'You might as well put a coffee pot on your personal computer.' END

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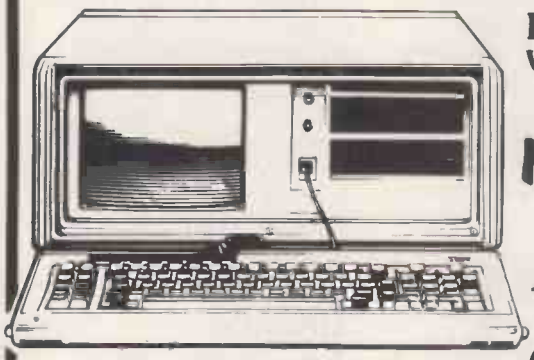

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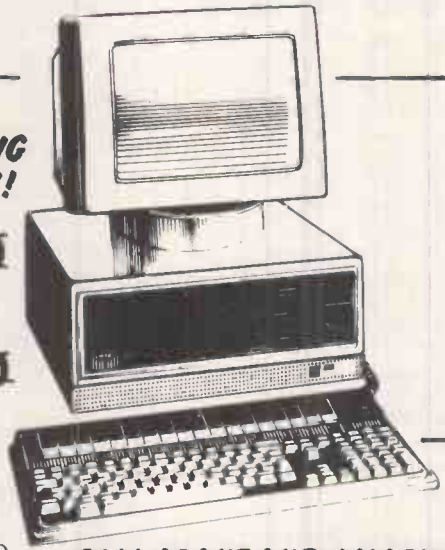

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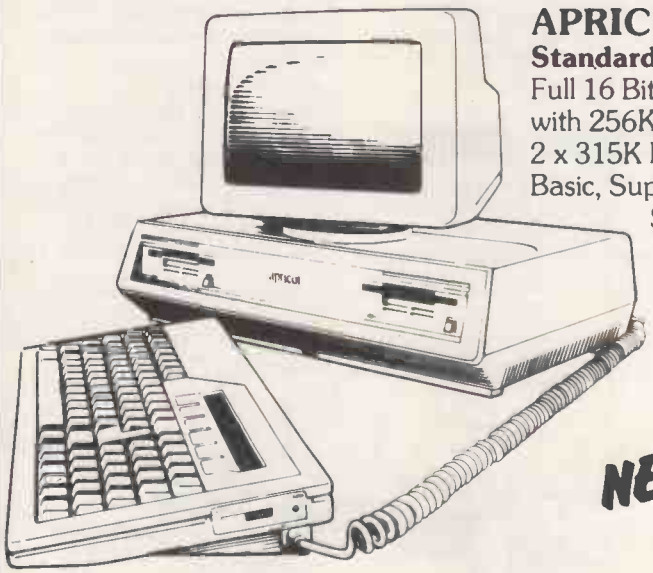

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ORIENT EXPRESS

Briefcase portables and a new computer price war dominate the Japanese scene — Shinichiro Kakizawa reports.

68000 portable

A Tokyo-based system house, Ampere, has developed a portable computer using a 68000 CPU, which will be marketed shortly. A unique feature of the new machine, called BIG-APL, is the built-in APL interpreter loaded from 128k ROM. The operating system is a unique multi-user, multi-task DOS called BIG-DOS. BIG-APL and BIG-DOS were both developed in the US for the 68000.

The machine features 54k CMOS RAM (max 512 k), an 80-character x 16-line bit map, LCD and weighs 4kg. Overseas marketing will be handled by a Hitachi subsidiary, Nissei.

Full-screen portable

Fujitsu has announced a 16-bit briefcase computer which weighs 2.7kg. Like the KT portable, it has a full 80-character x25-line LCD screen, and features an Intel 8086 CPU, and 464k RAM; it runs on Digital Research CP/M-86. The highlight of the machine is its graphic capability — the LCD screen can display 640 x 200 dots. Fujitsu hopes to set the price at around £1000, and the printer will come separately.

Price wars

The price war at the lower end of the home computer market is hotting up in Japan. This means low-cost MSX computers and micros for the home and games users.

This new price war was triggered by Casio, which began selling its MSX machine model PV-7 last October. The recommended list price is Yen 29800 (approximately £99), but in the space of a month the price has gone down to only £50 at some discount shops around the famous Akihabara electronics bazaar in Tokyo. Other prices have been forced to follow suit. Now the cheapest family computer in the Japanese market is the Nintondo colour game model which costs only £16 (the original list price was £70, only a few months ago).

Because of the recent cut-throat competition in the market, this downward price trend will probably continue for a while. Casio is also selling the PV-7 through Sinclair-type mail order, a new approach to selling computers in Japan.

Sony and other MSX suppliers feel threatened by this move. Casio has always played a major role in bringing affordable goods to the general public, and it looks as if the company is extending this virtue into the home computer market.

Low-cost digitiser

Oscon Electronics, a Tokyo-based company specialising in digitiser units, has made an extremely cheap digitiser available to MSX users. The new unit, Oscon MSX GP AD, is an electromagnetic induction digitiser. It costs £110, a quarter of the price of the many existing digitisers in the Japanese market. Until now digitisers, although extremely useful, have been highly priced compared with the mouse. One of the advantages of using an electromagnetic board is that you can rest your hand on the board without getting ?QZ!#£A on the screen!

The Oscon model can be switched into two other modes, pad mode and joystick mode.

Cheap graphics

A built-in image scanning unit for the Sharp PC5000 portable computer has been developed by Japan Softhouse, a Tokyo software company. The scanner head snaps easily onto the printer ribbon cassette of the Sharp PC4000 printer. Graphic images drawn on paper are fed into the printer, and the scanned, digitised data is transferred to the micro through its RS232C interface. The unit can transfer any image onto the computer including photographs, characters and hand-drawn pictures. The unit costs around £300, and is probably the cheapest way to input images to a computer. Japan Softhouse is developing the unit for other popular makes of printer.

New floppies

Hitachi-Maxwell has successfully developed a 5¼in floppy disk which can store as much as 19Mbytes. 1.0 to 1.6Mbytes is the standard for most micros at present, and the expensive hard disk has been the only way to store up to 10Mbytes.

Now this limit seems to have been removed. Hitachi-Maxwell coats the surface of the disk with a special combination of magnetised metal powder, and uses a particular type of metal reading head. The company has also developed a 5Mbyte 3.5in floppy disk.

Pioneer games

UK MSX users will be interested in the interactive video games from Pioneer, combining the MSX computer with the Laserdisk system. The result is a series of games played against a videodisk background. Early titles include space games Astron Belt and Strike Mission, and a wild west game, Bad Lands.

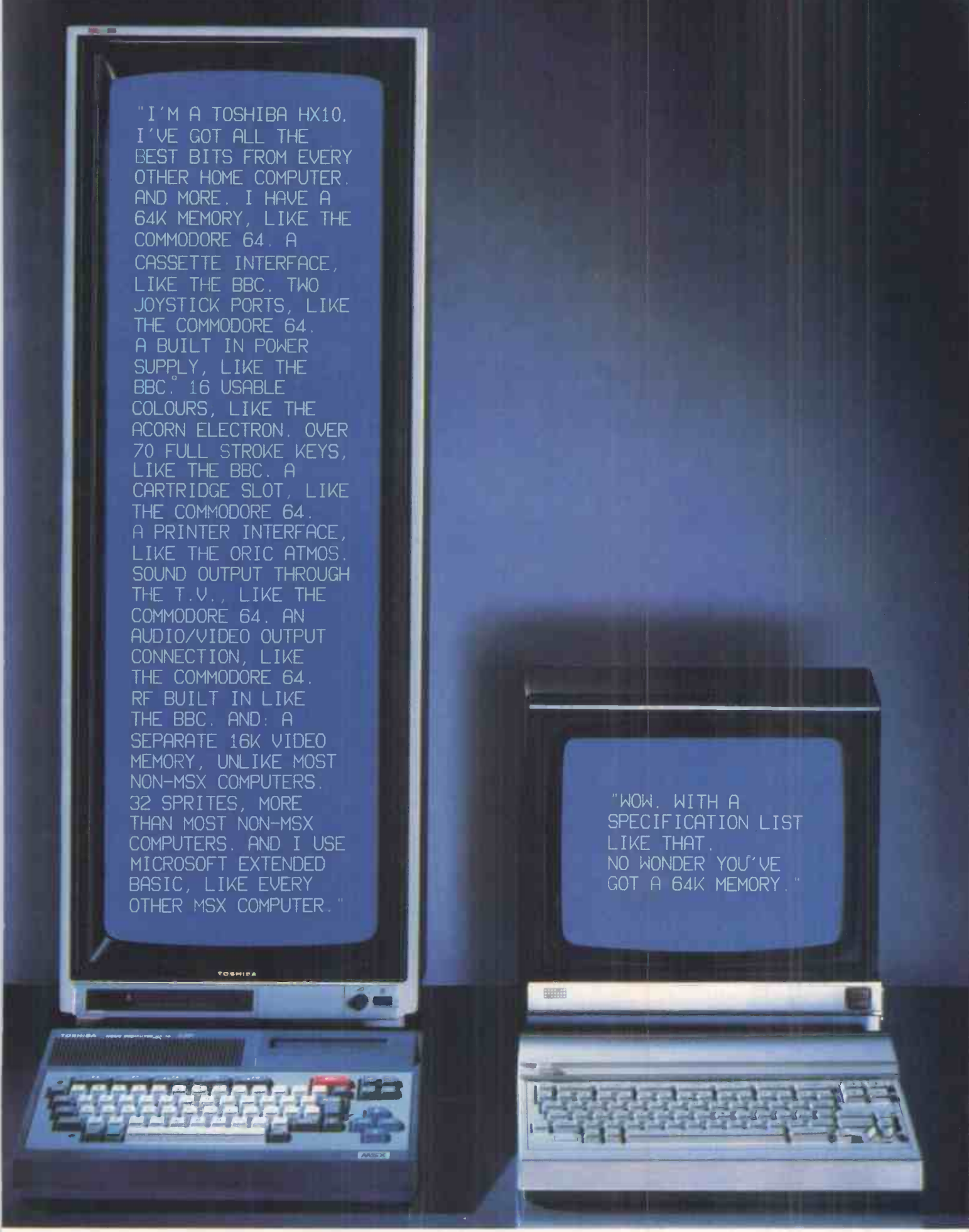
However, UK owners will have to wait as Pioneer has hit technical snags when converting the system from MTSC to the UK PAL TV format.

Toshiba American-style

Toshiba has prepared a Japanese response to American portable machines such as the Data General One and Texas Instruments' Pro-Lite.

Said to be fully compatible with IBM's PC, the T1100 is a briefcase-sized machine with a built-in 3½in disk drive. Unformatted capacity is one megabyte. The machine has an LCD screen with a 25-line by 80-column display, or it can be connected to a conventional display monitor.

RS232 and parallel printer interfaces are fitted, and a built-in modem is expected to be available as an option. The machine weighs less than 7lbs and has 256k of RAM. END



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.

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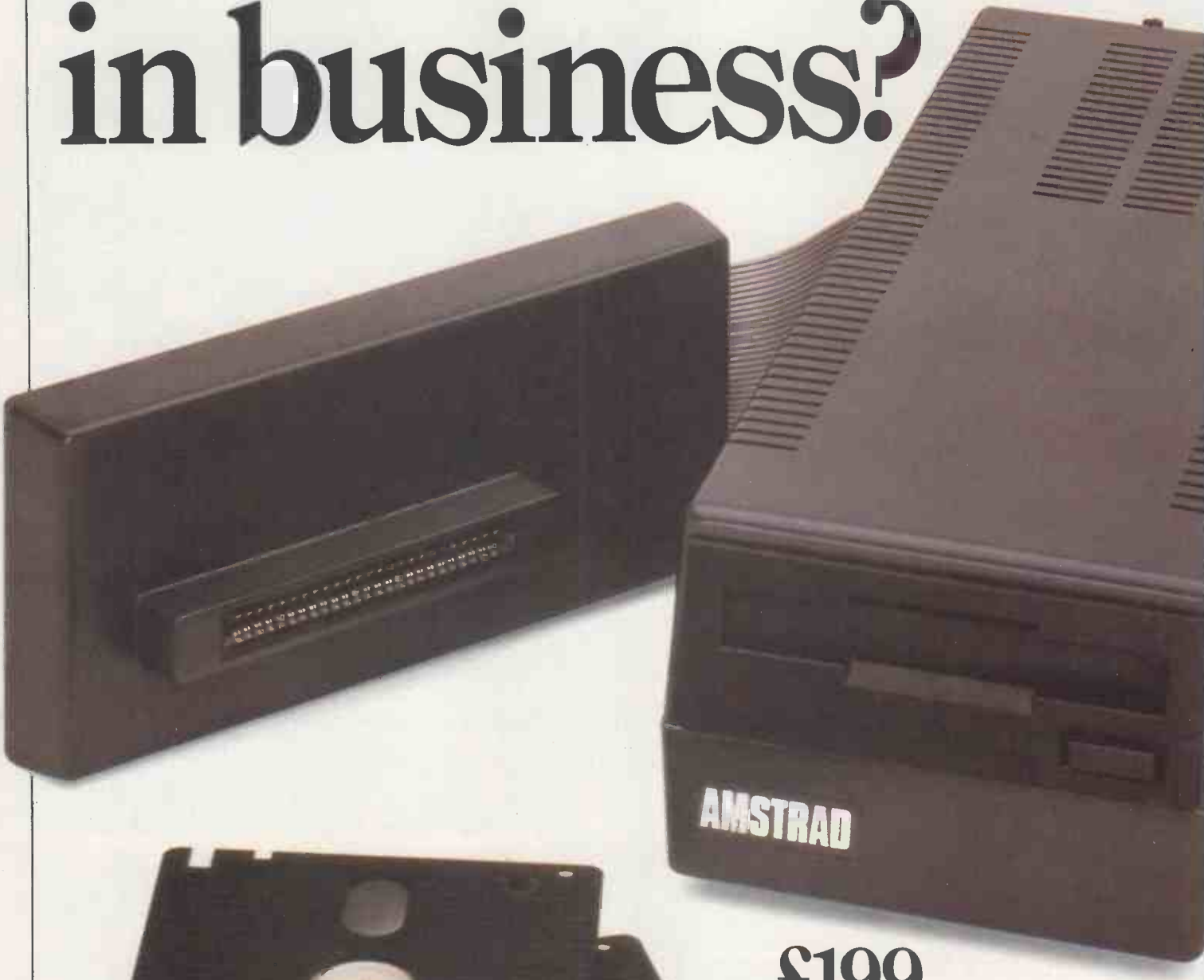

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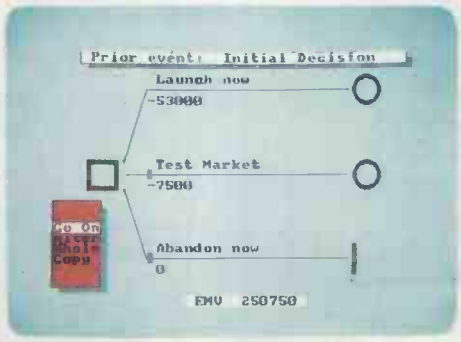

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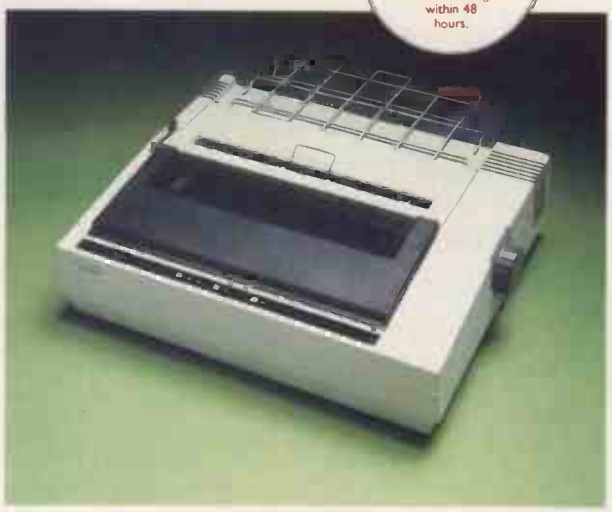

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LETTERS

This is the chance to air your views — send your letters to Communications, Personal Computer World, 62 Oxford Street, London W1A 1HG. Please be as brief as possible and add 'not for publication' if your letter is to be kept private.

Benchmarks

As a regular reader of *PCW* I have been waiting to see a Benchtest of the business world's true pace-setter — the Wang PC. After your review of the IBM AT I ran the Benchmarks on the Wang PC, and with crude timing methods obtained the following results:

BM 1	0.8	BM 5	5.0
BM 2	1.9	BM 6	9.0
BM 3	4.0	BM 7	13.0
BM 4	4.0	BM 8	15.0

Average 6.59

This performance would put the Wang into second place in your Benchtest roundup without the help of a maths co-processor or compiled Basic! As these two options are available, the Sage II may prove a pretender to the throne.

K W Beales, Kings Langley, Herts.

Ancient bugs

Bugs are older than you think. The *O.E.D. Supplement* quotes: 'Mr. Edison, I was informed, had been up the two previous nights discovering *a bug* in his phonograph — an expression for solving a difficulty, and implying that some imaginary insect has secreted itself inside and is causing all the trouble', from the *Pall Mall Gazette*, 1889.

Dr F Marriott, Enstone, Oxon

Micro musts

Not all the features needed in the real world of personal computer systems' users are among those you see on the usual micro charts. There are still some things I miss. For example:

A minimal start-up time — when I started with my WP program, it was taking three minutes to load from cassette. With a succession of upgrades I finally cut that down to seven seconds;

Minimal desk imprint — this includes the possibility of moving the keyboard off the desk space altogether when not in use, and there's no spaghetti junction of wires;

Maximum user-friendliness — this begins with the keyboard and the screen. It includes a placing of the cursor keys to suit touch-typing, unless cursor movement can be catered for better with voiced commands. Some fancy systems, with cursor keys placed on a far corner of the keyboard, are hopeless in this respect;

Internal power back-up — this goes with portability, or at least with not being wholly dependent on mains power in one place. Apricot-style segmentation, if only combined with battery power, might be the best solution;

Printer quality with versatility — what is needed is a better way than I have yet seen of combining letter-quality mode with draft speed and print variety. Perhaps we need a combination of 24-wire head printers with personal typesetter programs;

Program access to printer capacity — programs (I am thinking especially of word processing programs) should be able to access anything any printer can do: for example, if print commands in ASCII code are provided for. Ideally it should be effective both for screen display and for printout, so that you can see what you'll get.

Parig Digan, Navan, Ireland

Not quite right

I have been reading your journal for quite some time and generally find it quite factual. One exception, however, is David Ahl's comments in the December 1984 issue. Under the heading, 'Eat your words' he states: 'In 1950, a study by Univac indicated that five computers would meet the total worldwide demand for the foreseeable future.'

In 1949, one year before his 'study', there were actually six Univac I's already on order, three for the government and three for industry, with additional contracts being actively pursued. When Remington-Rand purchased the Eckert-Mauchly Computer Corporation in February 1950, the production plan called for an initial run of 10 or 20 systems. At no time did anyone ever think that the total demand was as ridiculously low as five. The only problem was one of deciding how much of a production commitment to make in advance of firm orders.

It is true that some studies were later carried out, but none of them ever indicated a number as low as that quoted by Mr. Ahl.

James Weiner, Brussels, Belgium

Spectrum compiler

I was interested in the article on the Acornsoft ISO Pascal compiler in your December 1984 issue, and in particular, the Benchmark programs. I thought Z80-based machine owners might be interested in the following timings for the Hisoft Pascal compiler, running on a ZX Spectrum (all times are in seconds):

Magnifier	0.9
For loop	6.9
While loop	7.9
Repeat loop	7.7
Literal assign	7.4
Memory access	7.7
Real arithmetic	20.7
Real algebra	21.2
Vector	16.8
Equalif	10.7
Unequal if	10.5
No parameters	6.3
Value	7.0
Reference	7.0
Maths	88.6

I think the timings speak for themselves, and show the significant difference between true and p-Code compilers. Indeed, it is quite educational to be able to disassemble the output code and compare it with the source.

The compiler circumvents the problem of lack of memory very well — allowing compilation of source direct from cassette or microdrive, and permitting programs generating up to about 21k of compiled code to be run.

The editor is line based, and very easy to get used to. Source entry is easy (the Spectrum keyboard is used as a normal typewriter but without all the keywords.) The only component lacking at present is the ability to handle files, although hopefully this will come soon (not an unreasonable hope, as the Hisoft C compiler handles files on cassette and microdrive).

P Smith, Blackburn, Lancs

Memotech users' club

I was interested to read in the ACC news section of *PCW*, January about a club for Memotech owners. I have been a member of Genpat, the Memotech users' club, since the beginning of September. The club offers members discounts of 10-15 per cent on hardware and software, a 16 hours per day answering service and produces a monthly magazine, *Memopad*, which puts to shame the news sheet produced by the Memotech owners' club. On top of this, Genpat has set up its own software label, Syntax Software, and in less than a month it has released 11 titles at very competitive prices.

The fee is £16 per annum which seems expensive, but since joining the club I have saved over £60 on a printer, word processor, Pascal ROM and other pieces of software. In the near future the club will also be producing a speech synthesiser, graphics tablet, light pen and a bulletin board. An exclusive deal with Memotech has allowed the club to offer members a 250k disk drive and RS232 interface for £249 rather than £285.

Genpat can be contacted at 3 Bulcock St, Burnley BB10 1UH.

Tim Rothwell, Bolton, Lancs.

Fallen peach

The remark by Peachtree's manager, quoted by Guy Kewney (*PCW* January) that manufacturers were not pushing Peachtree products, is both ironical and infuriating to anyone struggling to use its software.

Following the recommendations by Epson and my dealer (Transam Ltd), I bought PeachText for use on

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LETTERS

my QX-10. PeachText (previously Magic Wand) certainly rates, in my estimation, as an excellent word processor. But it has some exasperating bugs, the most important being related to page numbering, and starting and stopping at given pages or records. Such functions are vital if you write or translate books where a chapter may run to more than 250k, or if you wish to incorporate data files into specific documents. The catch is that the problems are not immediately apparent, especially as some involve the interaction of two or more commands.

For more than a year I have been trying to get satisfaction from Epson and Peachtree. An 'improved' version (2.0) was promised to replace the original version 2.01, but although this has a few enhancements in other areas, the print functions are even more defective. For example; it refuses to print any document where page numbering starts at a number other than 1. I am now informed that the errors will not be corrected, there being no further support from Peachtree. Certainly there will not be a version to run under CP/M3.

It is quite obvious that Peachtree, probably because of its rush to develop games and educational software for the US market, has utterly failed to support what may well be its best product. Epson's specific software recommendations also prove to be valueless. The only moral appears to be that even with well-established software and apparently reputable companies, you can never be certain of receiving proper support.

Storm Dunlop, East Wittering, Sussex

Do it in one!

I was very disappointed with the publication in January's issue of the long winded way to put a logo on the Apricot screen: A twenty line program which can be done in one:

```
10 PRINT CHR$(27)+"i*="
```

This will put the logo in exactly the same position.

John Lyth, Keston, Kent

Disk alternatives

Compared to their ever-increasing performance, computer prices are falling continuously. As for disk drives, price cuts are not and will never be as spectacular.

A low-priced home micro costs around £190. The disk drive which goes with it is more like £230. So for the non-professional user, a disk drive is rather expensive for what it basically does — storing and retrieving data — in comparison with the multitude of basic functions of the cheaper micro (keyboard, video control, music, programming).

A disk drive also has secondary functions: the organisation of the data (copy, delete, merge, directory); these functions make the drive so expensive. An answer would be to have a computer capable of carrying out these secondary functions.

I envisage a micro with 512k RAM, 64k ROM and a fast tape or streamer as a mass storage device. Loading and saving would only be possible in sequential blocks of a fixed length — 192k RAM. This would make the tape operations very simple: a computer controlled start at the beginning and a stop at the end of the block. Without making the streamer too expensive, it still must be possible to load or save a block in less than 15 seconds.

Organising the data before saving would also be very easy: it is only a matter of changing the data locations in the memory. Random accessing would no longer be a time consuming operation. With 512k RAM as memory, it is possible to have two big blocks in the computer for merging and copying of files. Moreover, the DOS could be replaced by a simple and short menu-driven program.

It should be possible to build and sell a micro of this type with a fast tape for less than £230. Besides, the potential computer power is much higher than the 64k RAM machines currently available.

Corman Eddy, Antwerp, Belgium

Brother bother

Last October I bought a Brother HR25 printer and single sheet feeder from Office International of Euston Road, London NW1, at a price which my computer supplier could not match.

Within a day or so of delivery I ran into problems. After contacting Office International by phone I was referred to Brother in Manchester, but still the problems remained. I phoned and wrote and phoned again but with no joy — the printer still gave problems on documents of 40 characters wide while on my other printer, an Epson they printed perfectly. After six weeks of constant problems I asked Office International to take the printer back.

In desperation to get one particular document printed, I contacted Tailored Business Systems who supplied the Apricot to see if it could help. What a change in attitude — not only did the company immediately offer to print the document for me, it also said it would find the cause of the problem. One of the directors, Denis Sutch, checked out the system and found that the problem was partially due to the Diablo protocol that the Brother is fitted with, and partially due to the program being asked to do too many things at once. Having found the problem, the document was printed successfully.

Service is the key to good dealer/customer relations, and my congratulations go to Tailored Business Systems for the quality of service offered.

The problems that arose over page length were largely caused by the instructions, which invite the user to select the page length using a series of DIP switches on the rear of the printer. However, what the instructions do not tell you is that although a sheet of A4 measures 11⅔ inches, the switches should be set to the word processing length of 11 inches. The ambiguity should be cleared up by Brother to halt the confusion.

Mike Jones, London NW3

Z80 fast timing

Following your compilation of Benchmark timings presented in *PCW* January, you may be interested in the following Benchmarks run on the Acorn Z80 Second Processor using BBC(Z80) and Mallard-80 Basics.

	BBC (Z80)	MALLARD-80
BM1	0.5	0.4
BM2	2.1	1.5
BM3	7.0	4.3
BM4	7.7	4.5
BM5	8.2	4.8
BM6	11.7	8.3
BM7	16.7	13.5
BM8	21.3	16.2
Average	9.4	6.7

It is interesting to note that the combination of the Z80 Second Processor and the run-only Mallard-80 Basic surpasses in speed all the machines listed in your compilation, with the sole exception of the Sage II.

D Gay, Barnsley

END

BLUDNERS

September's 'Spectrum Function Keys' article (page 178) and October's 'One Step at a Time' (page 132) were less a bludner and more a calamity. September's hex loader program was incorrect — use October's instead and incorporate the following corrections:

```
71 PRINT INVERSE 1:"ADDRESS";AT
   0,10;"CONTENTS";AT 0,20;"INPUT";INVERSE 0
80 LET L=4:LET b=add:GOSUB 1000
90 LET L=2:LET b=PEEK add:LET x=0:GOSUB 1000
105 LET a$=""
220 PRINT AT y,x;a$;" "
240 GOTO 50
1080 FOR i=LEN a$+1 TO 1 STEP-1
```

There were also errors in October's hex dump. The corrections to this are as follows:

EACE ED 2A . . . Should read EACF ED 2A . . .

EBA7 C3 6E EC
EBE5 21 F2 ED 7E F5 23 7E 2A
EDOA E5 . . .
EE6B EC D1 C1 78 C5 D5 CD FA

And we got Software Arts' American phone number wrong in January's Newsprint story on Spotlight (reviewed in this issue). The company can be contacted in the UK at 43 Buttermarket, Ipswich, Suffolk. The phone number is (0473) 221551.

END

BANKS' STATEMENT

Eastern rising

All is not quiet on the Japanese front — MSX is stirring. Martin Banks takes cover and observes.

Ever since 1980 there has been a whole boat-load of pundits around, confidently predicting the imminent arrival of the Japanese on the personal computing scene. 'Watch out', the pundits all cried, 'the Japanese are coming and they are going to wipe everyone else off the face of the earth.'

The logic behind this suggestion was quite sound, based on the idea that personal computers, of the home/game-playing variety especially, were high-volume, low-value devices of a domestic nature. This made them the ideal product family for the Japanese to adopt.

That, at least, was the theory. In practice, it didn't work out that way. The Japanese focused most of their attention on the Apple-equivalent market and above, looking to break into the lucrative small business machine area. This required not only good hardware, which they often managed to produce, but good software too. This they failed to come up with. Their operating systems were poor, for one reason or another. It was said, for example, that the OS for the Sharp 3201 machine was truly excellent except for one thing — it was dreadfully slow. It was a full 'belt and braces' system that never got it wrong, it just took forever to do it.

The Japanese missed out on the small business market, which went first to Commodore, Tandy and Apple, and subsequently to IBM *et al*, and missed the boat on the home computer boom, which went to the likes of Sinclair and Commodore.

Now the Japanese are having a concerted pitch at the home market again with the MSX machines jointly developed by Microsoft and a whole bunch of Japanese companies. These have generally been well received by reviewers, who have been impressed with the machines but less impressed with the price, considering what you get — essentially an old-fashioned 8-bit machine that the likes of Sinclair has left far behind.

The MSX family does have one thing going for it already, and has some interesting possibilities for the future. Its present advantage is standardisation. There are a whole range of machines coming from different manufacturers that can all use the same software, up to a point. This means that the software authors get a large potential market and become interested in writing for it, which in turn means that the users get programs to play with, plus a choice of machines.

Another advantage of the MSX family is its lineage, which comes from roots buried deep in the dear old CP/M operating system. This means that an MSX system, coupled to a disk drive or two, can become a CP/M machine. Not terribly startling, but the home market is starting to drift upwards in terms of capabilities. People now want to do more than just play 'nuke-the-world' games, and that means two things: bigger systems and better software. It also means that the software has to be available, and that's where CP/M comes in: there's a lot of good, low(ish)-cost applications software waiting to be picked up.

This leads the current MSX machines into a number of alternative routes for the future, stretching from home applications through to real business.

At the home end, it's certain that you will see the machines being applied more and more in association with other systems and equipment. One reason for this is that Japanese manufacturers are now working hard to get the production costs of an MSX machine down to the absolute minimum. The latest versions are said to consist of just seven circuits, which means it will be cheaper to make and smaller to integrate into other things. Yamaha has already pointed the way with its new computer/organ and there will be plenty of other combination products of this type in the future, especially in the area of interactive video.

Most of these applications will be ideal for the 8-bit Z80 processor used in MSX for several years to come, and the standardisation of the technology and software will make it increasingly easy for manufacturers to 'bury' such a computer in their products. But the MSX family is unlikely to stop there.

An important aspect of the standard is its file structure when working with disk drives. These are directly compatible with the existing Microsoft industry standard for 16-bit personal computers, the MS-DOS operating system. Although it won't run an MS-DOS program, MSX will read data files written under MS-DOS and *vice versa*.

This compatibility is important for the future of the standard, for Microsoft and the Japanese companies have designs upon a certain market-place. That market-place is the one that will be effectively vacated by IBM as it moves its Personal Computer family upwards technologically, and in performance.

Microsoft founder, Bill Gates, talks quite openly about MSX growing into a 16-bit system at some time. There is little doubt that, from the hardware point of view, it could be done already. The standard is already part way to being MS-DOS, and MS-DOS runs on the 8088/8086 family of processors. An MSX machine based on one of these would not be difficult to engineer.

What is important, therefore, is the market timing. IBM is the key here, for this year will see it move its products inexorably upwards. There is already the PC/AT, which is based on the Intel 80286 chip, and there are strong hints of a replacement for the PC itself in the near future. This could well be based on the 286 chip's close relative, the 80186 processor. Although the company is also expected to introduce a lap-held machine this year, which will probably be based around the new low-power CMOS versions of the 8088 chip, such moves would leave a chink of light in the original PC market which would mark the first openings of a window of opportunity for the MSX range.

As the IBM PC family gets more powerful (though still compatible) it will leave a hole at the bottom of the market. This will be at a time when a new breed of users, the small professional individual and the more advanced domestic user, will want the power and performance of the PC without the expense. For performance it is, of course, important to read the words 'working applications software', and that is just what the MS-DOS environment will offer — a wealth of proven applications software. With its existing compatibility and the upward move towards 16-bit processing, this type of machine can be expected. END

Illustration by Martin Handford

Star wars

Peter Bright presents a resumé of the new offerings from Commodore and Atari which were on show (or hidden from view) at the CES in Las Vegas, and which will vie for your attention this year.

Computer shows present an ideal opportunity to get advance information and hands-on experience of the machines which manufacturers would otherwise try to keep under wraps. Escaping from the January freeze in the UK, I went to the Consumer Electronics Show in Las Vegas, and spent four days fighting off the other visitors who also wanted to be first to use the new machines.

It was the Commodore and Atari stands which had the most to offer. The competition between these two companies has always been intense, but it was heightened last year when ex-Commodore boss Jack Tramiel took over the reins at Atari. Now both companies have new machines on their books which will bring them into even closer combat, and which will also challenge Sinclair's QL.

Commodore's C128 and Atari's ST micros are similar in one important respect — both are attempts at 'cross-over' machines between the home and business markets.

But while Atari's other new offerings, a range of 8-bit machines based on the 800XL, are aimed more squarely at the home market, Commodore's new products are emphatically upmarket and represent an interesting change of pace for the company.

Commodore

On the Commodore stand were a battery-powered LCD display notebook micro, the much-rumoured C128, and an IBM-compatible business machine.

The Portable Computer

The first thing you notice about the Portable Computer is that it looks good! It comes in a compact off-white 2.1 × 10.5 × 11.7in package with a hard cover which hinges back to allow the LCD display to flip up. This all smacks of careful design. Could this be the same Commodore who gave us the downright ugly 64?

The main processor inside the Portable Computer is a 65C102; this is an enhanced CMOS version of the old 6502 processor with a few extra commands built in. It's similar to (but not exactly the same as) the 65C02 used in the Apple IIc. The processor is clocked at a fairly measly 1MHz.

As standard the Portable Computer is supplied with 32k of CMOS RAM, and 96k of CMOS ROM which holds the applications programs. The machine also has a spare ROM slot under the top cover which can take extra ROM-based software.

All the electronics are based on CMOS designs, so you should be able to get about 15 hours use out of the four AA batteries which the machine uses.

One of the good things about the Portable Computer is that it's loaded down with I/O facilities. It has a built-in 300 baud direct connect modem, but unlike most other American machines, this modem can work on British CCITT standards as well as American Bell standards. This means that we should be able to use it in this country as soon as its released, as long as Commodore can get it approved. However, at the moment Commodore UK is being very cagey about launch plans.

'The competition between these two companies has always been intense, but it was heightened last year when ex-Commodore boss Jack Tramiel took over at Atari.'

As well as the direct connect output, the Portable Computer has provision for acoustic cups so that you can use it with a telephone handset if you don't have access to a jack plug. You can also plug a special handset into the Portable Computer so that your line can be used as a normal telephone without the machine being unplugged.

Other I/O facilities include a Commodore serial port so that you can use any Commodore 64-compatible peripherals such as the disk drive or printer, an RS232 serial port, a Centronics parallel printer port and a bar code reader. Considering that Commodore is infamous for never using standard interfaces, this is a very impressive list.

The machine display is an 80-column by 16-line liquid crystal display (LCD); this is Commodore's own make and it's good. The usual problem with large LCDs like this is that they are difficult to read, but I found the Commodore's LCD excellent in this respect. Even in poor indoor lighting it was easy to read, and it shows what can be done with large LCDs if you try.

When it's released, the Portable Computer will come with a word processor, file manager, spreadsheet, address book, scheduler, calculator, memo pad, terminal emulator, Basic and a machine code monitor built into the ROM.

Only the word processor, spreadsheet and terminal emulator were available on the machine I looked at. All the applications make heavy use of the eight programmable function keys and use the last line of the display to label them. One of the most interesting things about the unfinished applications programs was their speed — considering that the machine only uses a 1MHz 6502, they really were quite fast.

Interestingly, the memo pad and the calculator are available at any time just by hitting a function key from within an application. This means that if you have an idea while you are in an application, you can call up the memo pad and write it down.

At the time of going to press Commodore wouldn't give any specific indication of what the Portable Computer will cost.

The C128

There have been strong rumours about the C128 for quite some time. Most have been proved accurate, although again Commodore UK is keeping quiet about the machine.

Like the Portable Computer, the C128 looks quite attractive. Although it is packaged in a low-profile casing, it's still a large box and takes up more table space than you would expect for a home machine.

The main feature of the C128 is that it's actually three different microprocessors (6510, 8502 and Z80) in one box. This allows it to operate in three different modes: C64 emulation, native C128 and CP/M. The machine can sense if you have plugged in a C64 cartridge or if you have a CP/M boot disk in the drive, and switches itself to the correct mode

The Atari ST and the Commodore 128 — battling for personal computer power

automatically. You can also switch modes under software control.

Commodore claims that the C128 is 100 per cent compatible with C64 hardware and software when it's in C64 emulation mode. One of the engineers on the stand said that he had quite a problem persuading a well designed machine like the C128 to behave like a C64. I can believe it.

In C64 emulation mode, the C128 uses the 6510 CPU running at 1.02 MHz, a 6581 sound chip, 64k of RAM and 16k of ROM. Just like the C64 you get a 320 × 200-pixel display with 16 colours and eight sprites, and you can even plug C64 cartridges into the machine. Commodore says it has tried all the C64 cartridges it can find, and they all work.

In its native C128 mode the machine uses a 8502 processor, 6581 sound chip, 128k of RAM and 64k of ROM. The RAM can be expanded up to 512k but 128k is the maximum system RAM: the rest is used as a RAM disk.

The display operates in one of two modes — high-resolution 640 × 200 or medium-resolution 320 × 200. In the latter mode you can have 16 colours and eight sprites which can be accessed via a new super-friendly (for Commodore) Basic version 7.0.

Native C128 mode also allows you to make use of the high data transfer rates on Commodore's new 1571 disk drive. Although you can use this drive in C64 mode, it only operates at the C64's (slow) speed.

The CP/M mode uses the built-in Z80 microprocessor. It represents part of a new trend within Commodore towards more standardised systems.

In this mode the C128 is turned into a fairly standard 8-bit CP/M machine. It uses CP/M Plus which allows it to access the C128's 128k of RAM. You can take the RAM up to 512k as long as you use the extra as a RAM disk.

CP/M mode operates in either 40- or 80-column screen widths and can display up to 16 colours onscreen. It makes use of the new 1571 disk drive which can read Kaypro and Osborne CP/M-80 disks.

Commodore demonstrated the C128 running the Perfect suite (Perfect Filer, Perfect Calc and Perfect Writer) in CP/M mode, and says it will run the most popular CP/M-80 applications software.

As far as I/O is concerned, the C128 is fairly standard Commodore–user port, cassette port, serial port, two game ports and a cartridge port. Its main claim to fame is that it offers composite video, RGB and TV video outputs, so it shouldn't be difficult to hook up a monitor.

The keyboard on the C128 is interesting because it hints at the multiple modes of the machine. At first sight it looks like a standard full-function keyboard with its separate numeric keypad, programmable function keys and main typing area. However, a closer look reveals two sets of cursor movement keys, one along the top and another at the bottom of the typing area. This makes sure that the keyboard, as well as the electronics, is compatible with the C64.

Although the C128 seems to function well enough in its different modes, it's difficult to imagine many people wanting the ability to run C64 programs *and* CP/M programs. It remains to be seen how many software houses will write for the machine's native C128 mode.

IBM compatible

Also at the CES was Commodore's IBM PC-compatible business machine. However, unlike the other two machines, this one was hidden away in a private room on the stand to keep it from general view.

Not long ago, the idea of Commodore selling a PC compatible would have been unthinkable. Commodore prides itself on being different from the rest and being able to survive on its own technology, but the failure of recent Commodore business machines has apparently forced a rethink.

Commodore hasn't given in completely, however. This machine will only be sold in Europe and will not be available in the US. It was also on display at the *Which Computer?* Show and is expected to be available in the spring at a price of under £2000.

Peripherals

In addition to the new machines, Commodore was also showing a range of new and revamped peripherals. The most interesting of these is its new 1571 disk drive.

The main advantage of the 1571 is that it transfers its data much faster. Unfortunately you only get this extra speed if you use it with a C128.

Essentially the 1571 works in three modes: C64, C128 and CP/M. If you use it with a C64 it works at the same old slow 300cps; if you use it with a C128 the speed goes up to 1500cps. With a C128 running CP/M, the speed goes up to 3500cps. This is fine if you have a C128, but if you use it with a Commodore 64 you're no better off.

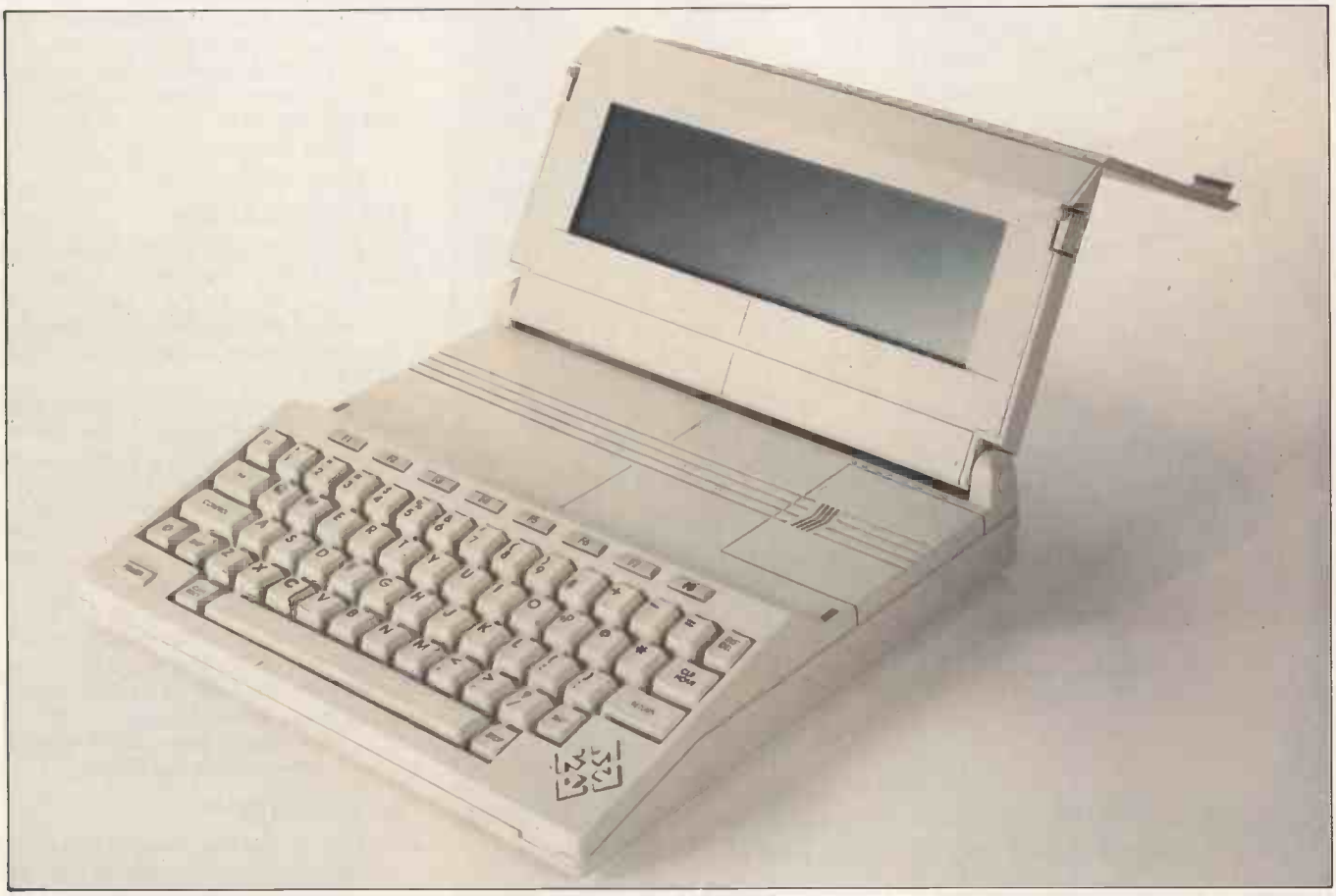
Commodore was also showing a compact Sony 3½in microfloppy unit, but it would say nothing about pricing and availability.

Atari

Ever since its early days of heady success, Atari has been in the doldrums. Until recently Atari was owned by the American entertainments giant Warner Brothers, but during this time it did little but lose money. Warner Brothers decided to sell.

Now enter the portly figure of Jack Tramiel fresh from Commodore. Tramiel and his clan have the reputation of being hard men and their arrival at Atari was accompanied by howls of despair from some quarters within the company, but it's significant that a large number of staff left Commodore and followed their leader to Atari.

There's no doubt that Tramiel's



The Commodore Portable Computer — it's loaded down with I/O facilities, including a direct connect modem

arrival has transformed Atari: a wide-ranging programme of new product development under the banner 'Power without the price' was begun; the projected new range of machines and peripherals stretches from 8-bit machines right up to a full-blown 32-bit business machine. The one trait that all the machines share is an extremely competitive (some would say suicidal) pricing policy.

Atari chose the January CES to show the first stage of its new products and peripherals. First are four new 8-bit models based on the popular 800XL home micro, and second are two new 16-bit machines based on the powerful Motorola 68000 processor.

65XE/65XEM/65XEP/130XE

The four new models in the '65' range are all broadly the same in that they are based on the successful but long in the tooth 800XL home computer. Atari claims that all the 65 series machines are compatible with the 400/800 series software and peripherals, including the 1050 disk drive.

The base model of the 65 series is the 65XE; this is based around a 6502C central processor linked to 64k of RAM. As you would expect from an Atari home machine its strong features are graphics and sound, both of which are controlled by custom-designed control chips. Programming is achieved via Atari Basic.

The graphics capabilities of the 65XE include a 320 × 192-resolution display, 11 graphics modes and a palete of 256 colours. In addition there are five text modes and the traditional Atari 'Missile' sprite graphics. As far as sound is concerned, the 65XE features four programmable voices.

Externally the 65XE is very different from the old 800XL machine. The casing is the same off-white/grey that seems to be the Atari trademark. It features a full travel keyboard with the traditional 800 series function keys moved along the top of the main typing area. The result is pleasing and is vaguely reminiscent of the Commodore Plus 4. The only disadvantage of the new design is that the cartridge slot has been relegated from the top to the back of the machine where it's far more prone to knocks.

The other machines in the 65 range are similar to the 65XE but offer specialised advantages. The 65XEM offers far more comprehensive sound capabilities than the 65XE. Instead of having four basic voices, the 65XEM offers eight voices and 64 harmonics, and high-quality sound is achieved through a sampling rate in excess of 30KHz.

The 65XEP is a portable version of the 65XE. In addition to the basic electronics of the 65XE, the 65XEP also includes a built-in 5in monochrome monitor and built-in 3½in Sony micro-floppy disk drive. This is all contained in a large portable box.

The final model in the 65 range is the confusingly-named 130XE. Despite its '130' tag, it has the same electronics as the 65XE with the addition of an extra 64k of RAM to bring the total RAM count up to 128k.

Pricing for the 65 range hasn't been fixed yet. All Atari will say is that the new models will start at less than the 800XL costs at the moment, which is £129 at the time of writing.

130ST/520ST

The 130ST and the 520ST are the first of Atari's new generation of powerful personal computers. They are both basically the same machine — the only difference between them is that the 130ST is supplied with 128k of RAM whereas the 520ST comes with 512k.

The styling of the new machines is very similar to that of the 65 series machines — very neat integrated lines in the same off-white/grey colour scheme. The keyboard is a full-function, full-travel unit with separate typing area, cursor control block and numeric keypad. The unit also incorporates 10 function keys integrated into the top of the casing.

The main processor in the ST range is the Motorola 68000 16/32-bit processor; this is the same processor that is used in some of the fastest personal computers on the market today. It's also similar to the processor used in the Sinclair QL, the only difference being that the QL uses a cut-down version while the ST uses the full-blown 68000.

Both machines come with 192k of ROM holding the operating system (this can be expanded to 320k by plugging in extra ROM packs), and both machines also come with Basic and Logo built in.

Portable Computer peripherals, including an ultra-fast disk drive

As standard the ST range comes with composite video, and RGB and TV video outputs. The display is fully bit-mapped into a 32k chunk of RAM and operates in three modes: 320 × 200 with 16 colours, 640 × 200 with four colours or 640 × 400 in monochrome. The machines have a palette of 512 different colours.

Music is provided by three separate internal voices and a Midi synthesiser interface. The inclusion of this interface allows you to use the ST machines to control a wide range of popular synthesisers. This is the only personal computer I know of that comes with a Midi interface as standard.

Mass storage can be provided by the optional floppy disk drive or the hard disk, and the machines are provided with a floppy disk controller, hard disk interface and direct memory access facilities as standard.

In addition to the disk interfaces, the machines also come with an RS232 serial port, a Centronics parallel printer port and two joystick ports as standard. One of the joystick ports is configured to work with the mouse which is supplied with the system.

One of the most interesting features of the ST range is that it is supplied with Digital Research's Graphics Environment Manager (GEM) as standard. In this implementation, Digital Research has extended GEM to include the unfortunately-named operating system TOS (said to stand for Tramiel Operating System!).

I took a close look at GEM last month, but for the uninitiated it's a super-friendly Macintosh-like environment which makes full use of mice, ikons and pull-down menus to make the system as simple to use as possible.

The basic idea is that the screen looks like a desktop with papers on top of it. The screen has a menu bar running along the top with various options, and has ikons running down the side representing the disk drives. Using the mouse which is supplied with the ST machines, you can move the cursor arrow to select ikons or to invoke a pull-down menu from the menu bar.

Although GEM will run on a wide range of machines, the ST machines are the first personal computers I've come across which have it as standard. During my short time with the machines it certainly did make them much easier to use than traditional operating systems.

Although UK prices hadn't been fixed at the Show, preliminary US prices had been set at $299 for the 130ST and $499 for the 520ST. This represents extremely good value for money. Early indications are that Atari is aiming to sell the machine in the UK from May onwards, at prices starting from about £300.

Peripherals

Along with the new machines, Atari was showing new peripherals. It has introduced a colour coding system so that you can find out which peripherals are suitable for your machine. To complement the new high-power ST machines, printers, monitors and disk drives were on show.

There are two disk drives available for the ST machines. The first is a 500k Sony 3½in microfloppy unit; this attaches to the fast disk interface on the ST machines. Two versions of the disk drive were on display: one was a free-standing unit and the other was incorporated into the housing of a high-resolution monitor.

Conclusion

Although they may seem different on paper, the Commodore C128 and the new 16-bit Atari ST machines are similar in some important respects.

Both machines offer facilities which are a combination of home and business micro. Look at the C128: if it's a home machine, why give it CP/M? Or if it's a business machine, why give it C64 capability?

The same holds true for the ST machines. The processor, Digital Research operating system and RAM all cry out 'business machine'. If this is the case, why give it Logo and a Midi synthesiser interface?

These machines are following the lead of the Sinclair QL in that the companies realise that the home games market can't hold up forever. So they're trying to shift some of their eggs out of the games micro basket without actually going all the way with out-and-out business machines.

Whether this strategy will work or not is open to doubt, and obviously a final opinion will have to wait until we can Benchtest the machines thoroughly. However, it has to be said that Atari are in an especially vulnerable position if they try to sell the ST to business. Selling business machines in quantity requires different distribution channels from home machines. And the fact that Atari is trading on price means that there will be precious little money left for the dealers and distributors.

Software could also be a problem for the ST. Atari says that all the major software houses are writing for the machine. I'll believe it when I see it. END

The Atari 130ST — a powerful personal computer

SCREENTEST

Entrepreneur

Launching a new business can be risky and costly. Peter Bright looks at Entrepreneur, which is designed to test the viability of any new project. It can help you decide if your business will make it in 1985.

'Now you can do something useful with your home micro.' The number of times I've seen these words and then had my hopes dashed as I look at yet another appalling piece of 'serious' home computer software.

But now it looks as if you may at last be able to do something useful with a home machine. Brentwood-based Triptych Software has released a range of good-looking packages for home machines. Although the Triptych programs run on a range of different home machines, I received them in their most recent versions, running on an Amstrad with the new disk drive unit attached.

Four Triptych packages were supplied with the Amstrad: Entrepreneur, Project Planner, Decision Maker and Star Watcher. I'll concentrate on Entrepreneur here.

Entrepreneur

Entrepreneur is best described as a small business modelling tool. Suppose you have an idea for a small business and you want to work out if it could be viable. Using Entrepreneur you can feed in projected sales and costs, and the program will produce cash flow projections, a profit and loss account, balance sheet, and so on. It also provides the information you need to assess the project.

As with the other Triptych packages, Entrepreneur has three main parts: the main program, the tutorial, and the manual. On the Amstrad the tutorial was on side A of the disk and the application program on side B.

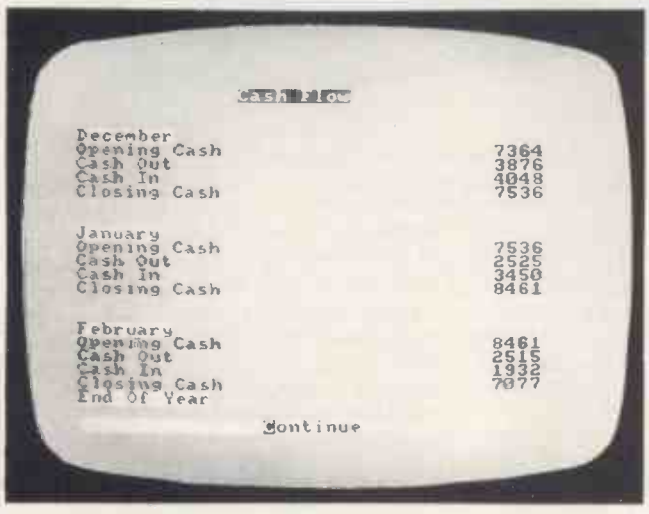
Tutorial and manual

Both the onscreen tutorial program and the manual are designed so that you must use them both. This curbs the temptation to rush from screen to screen and only read the manual when problems occur, which is a bad way of learning as you could miss important information in the manual.

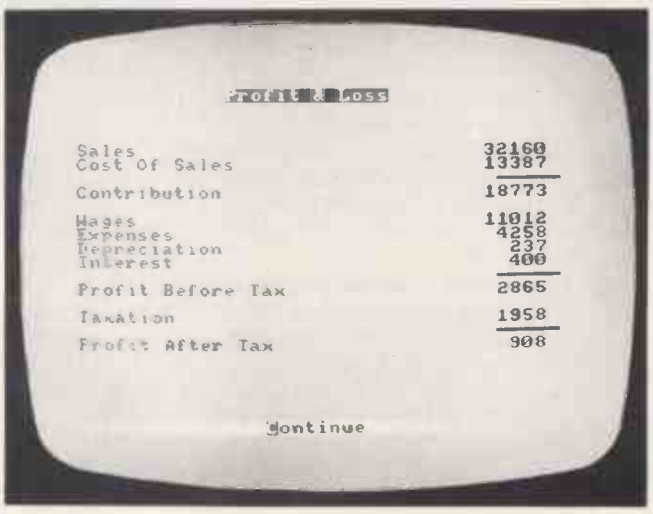
The Entrepreneur tutorial prevents you doing this by forcing you to use the manual. If you load up the tutorial and try to run through it, you soon come across a message like: 'Please refer to chapter X for instructions on how to proceed.' The only way you can persuade the tutorial program to go any further is to enter the correct code into the machine. The only way to find the code is to read the manual! Clever.

Reading the manual is a very rewarding experience. It begins with lots of good advice on how to analyse whether or not a business will work. It shows you how to produce a business plan and forces you to think about the many difficult aspects of the venture. The last part of the planning section is headed 'Have you been honest?', and finishes in ringing tones with 'Remember; the harder you plan, the luckier you get!'.

The rest of the manual is designed to be used in conjunction with the computer: for example, the manual makes a



Cash flow screen



Profit and loss screen

point and explains it, then the computer demonstrates the figures on the screen.

The computerised tutorial is divided into six sections: 'Using Numbers', 'The Balance Sheet', 'Making a Profit', 'Having Enough Cash', 'Value Added Tax' and 'Balance Sheet Display'. These sections introduce the basic principles of accounting assuming no knowledge of accounting practice.

Using Numbers introduces the idea of double-entry accounting and uses the balance sheet as an example. Indeed the balance sheet is used as the basis for the examples for most of the tutorial.

'Both the onscreen tutorial program and the manual are designed so that you must use them both. This curbs the temptation to . . . only read the manual when problems occur . . .'

The Balance Sheet introduces fixed assets, equity, stock, debtors, creditors, cash, profits and term loans. These are all explained using the example of Joe the lobster seller who wanders through the tutorial carrying out progressively more complex transactions.

Making a Profit is one of the most important sections of the tutorial. It introduces expenses, depreciation of assets, and finally introduces the profit and loss account. It also shows how to calculate overheads and contributions, and how to work out a break-even analysis.

Having Enough Cash gives worked examples of cash flow and shows you how to calculate your working capital needs.

Value Added Tax shows how VAT works and explains corporation and income tax.

Finally, Balance Sheet Display allows you to enter your own figures into the balance sheet.

I found the combination of the computer tutorial and the manual very impressive. I particularly liked the manual, which is full of information. The planning section at the beginning was very good, and the appendix on sources of assistance for the small business was a nice touch.

The manual includes a book list for those who want to read more on small business planning. One book they recommend which I must read is called *The Genghis Khan Guide To Business*. If the book is as good as the name, it must be worth looking at.

Applications program

There are actually two versions of the Entrepreneur applications program: Single Product and Multiple Product. As its name suggests, the Single Product program assumes that your business is selling one product; its advantage is that it can deal with more data about the product. Multiple Product allows up to 10 different products to be included in the business.

Before you can do anything useful with Entrepreneur, you have to gather a wide range of information to feed into the program.

If you think about it, this is the first stage of the business analysis. Without performing a single calculation, Entrepreneur forces you to think hard about the costs and revenues of your projected business in order to formulate the first stages of the business plan.

It is obvious that the figures you get out of Entrepreneur will only be as good as those you feed in. If you just pull costs out of thin air then the projections will be meaningless, so some thought is required at this stage.

To help you gather the information Entrepreneur needs, the manual explains what the figures mean and provides figures for an example company to show how the package works. The manual also includes pre-printed data entry forms which you can photocopy and fill in so that you have all the necessary data to hand when you run Entrepreneur.

In use

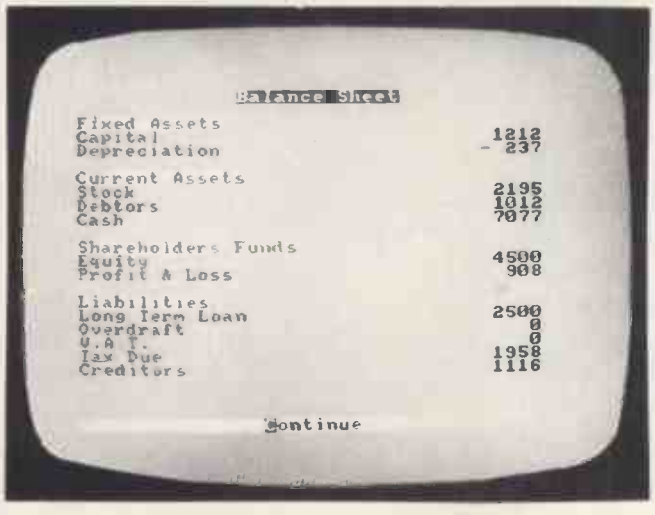
Entrepreneur displays data entry screens with the question on the left-hand side of the screen and a space for the answer on the right. A two-line window at the bottom of the screen gives handy hints on what the right answer should look like.

When you have finished with a screen you can hit ESCape. This will give you the option of continuing to the next screen, or calling up the full-screen editor and altering data on the current screen.

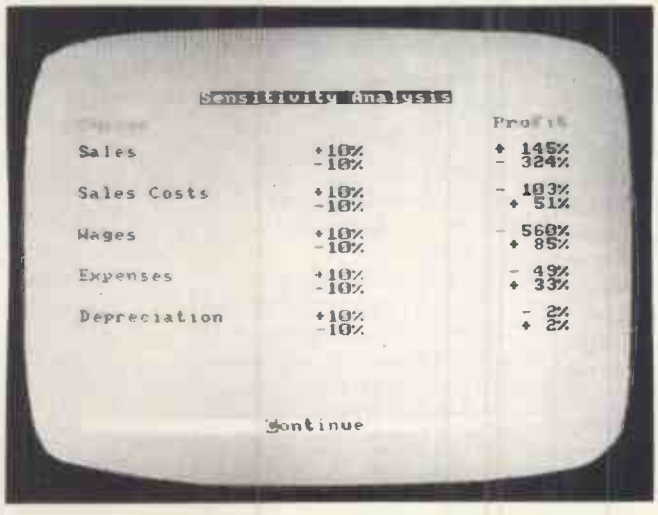
'I've seen so many so-called business packages on home machines that aren't worth the tape they're recorded on. Entrepreneur is refreshingly different.'

The first thing the package needs to know is what your company is to be called and what type of business it is. The program can handle the three main types of business — sole trader, partnership and a limited company. It requires information about any fixed assets (land, buildings, and so on) that you'll buy, how much they'll cost and when you'll pay for them.

This led to my first problem. I couldn't make the program believe that I paid for my fixed assets by a single cheque rather than multiple payments. It turns out that the package used to have a 'single payment' option, but that later versions had this option incorporated under an 'irregular payments' heading. Once I was told this everything was straightforward, but perhaps the



Balance sheet screen



Sensitivity analysis screen

SCREENTEST

manual could be made clearer.

You then move onto expenses: for example, rent, heating, lighting, as well as entering how much these will cost. You also have to state whether each item will be paid for by cash or credit, whether VAT is payable, how frequently you will be invoiced and when the first invoice will come in.

The next cost you have to calculate is how many staff you will take on and at what salary; it was here that I came across my second problem. Occasionally the Amstrad got tired of running Entrepreneur and decided that life would be much more exciting if it did a spot of garbage collection. The first time this happened I was convinced that the program had crashed — I was in the middle of inputing data when it locked up. I was just about to reset the machine when the Amstrad finished cleaning itself up and was ready for action.

There was no way of predicting when this would happen and it locked up for 20 to 30 seconds. Once I found out what was happening I didn't worry too much, but it was very annoying. According to Triptych this doesn't happen when Entrepreneur is running on any other home micro — it's just one of the funny quirks about the Amstrad.

The next section allows you to enter projected costs and sales for your product. If you are doing single-product analysis, you can enter costs for the raw materials that go to make up your product. If you are doing multi-product analysis, you just enter the direct costs as a percentage of the selling price. After this you can enter your projected sales figures for your product(s) on a month-by-month basis.

Analysis

When you have entered the projected sales figures, the program has enough data to start producing figures.

If you are doing single-product analysis, the first thing that the system works out is projected year end stock levels for all the raw materials. Ideally you should keep stock levels as low as possible to avoid tying up working capital but without running out. If you will run out of stock during the year, the program will tell you and allow a revision.

The screen then shows a break-even analysis for your business and displays projected sales, so you can see if you will reach your targets.

This display is a good example of one of the things I don't like about Entrepreneur. Throughout the package, figures are displayed on screen without any heading to tell you what they mean. For example, on this screen, the top few figures represent pounds sterling while the rest relate to product units. It isn't always obvious which is which.

Next, Entrepreneur generates a preliminary monthly cash flow projection. The cash flow display shows the consolidated figures for each month and for the year end, showing the opening balance, cash out, cash in and the closing balance. I was worried when I found that the last month of the year invariably didn't balance; according to Triptych this is because of year end tax payments. The preliminary cash flow analysis will give you some idea of how much finance you will need to run your business.

The finance plan is the last piece of information that Entrepreneur needs to be able to generate the projected year end accounts of your company.

The first of these is the profit and loss account. This lists all income and expenditure and then works out the projected profit (or loss). The system will also work out a projected year end balance sheet.

One of the most interesting reports that Entrepreneur can generate is the sensitivity anaylsis screen. This shows how a +/− 10% change in sales, sales costs, wages, expenses and depreciation would affect profits.

This can generate some extremely interesting figures. For example, in my 'Bright Enterprises' model a 10% increase in wages would lead to a staggering 1314% fall in profits. No pay rise this year, folks! The final analysis screen displays different ratios. The first two are debtors' and creditors' turnover rates in days. The final figure is profit as a percentage of assets.

You can easily spend an evening just playing around with the figures and projections, and generally tinkering with the system. Once you have looked at the initial figures you can use the menu to go backwards and forwards, altering the input, and then re-run the analysis to see if any improvement has been made.

My only criticism in this area is that it can be time-consuming to go back, alter one figure, and then have to wait until the Amstrad has churned through all the figures again. Although with the figures can be fun, it can also be quite dangerous. It's very tempting to up the sales figures by 10% because you know it will pull up your profit. The problem is that if your original sales figures were honest, you would be introducing a distortion into the model.

Conclusion

I was very impressed with Entrepreneur. I've seen so many so-called business packages on home machines that aren't worth the tape they're recorded on — Entrepreneur is refreshingly different. The back-of-an-envelope planning brigade have no excuse now. Entrepreneur is available on low-cost home micros (including the Sinclair QL) at prices starting at £15, and it does a good job.

What makes Entrepreneur so good is not so much the program, but the manual. Where most manuals would limit themselves to telling you how to use the package, the Entrepreneur manual goes further and, above all, it forces you to think hard about your business.

END

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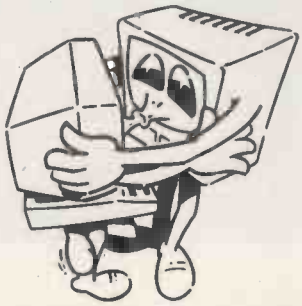

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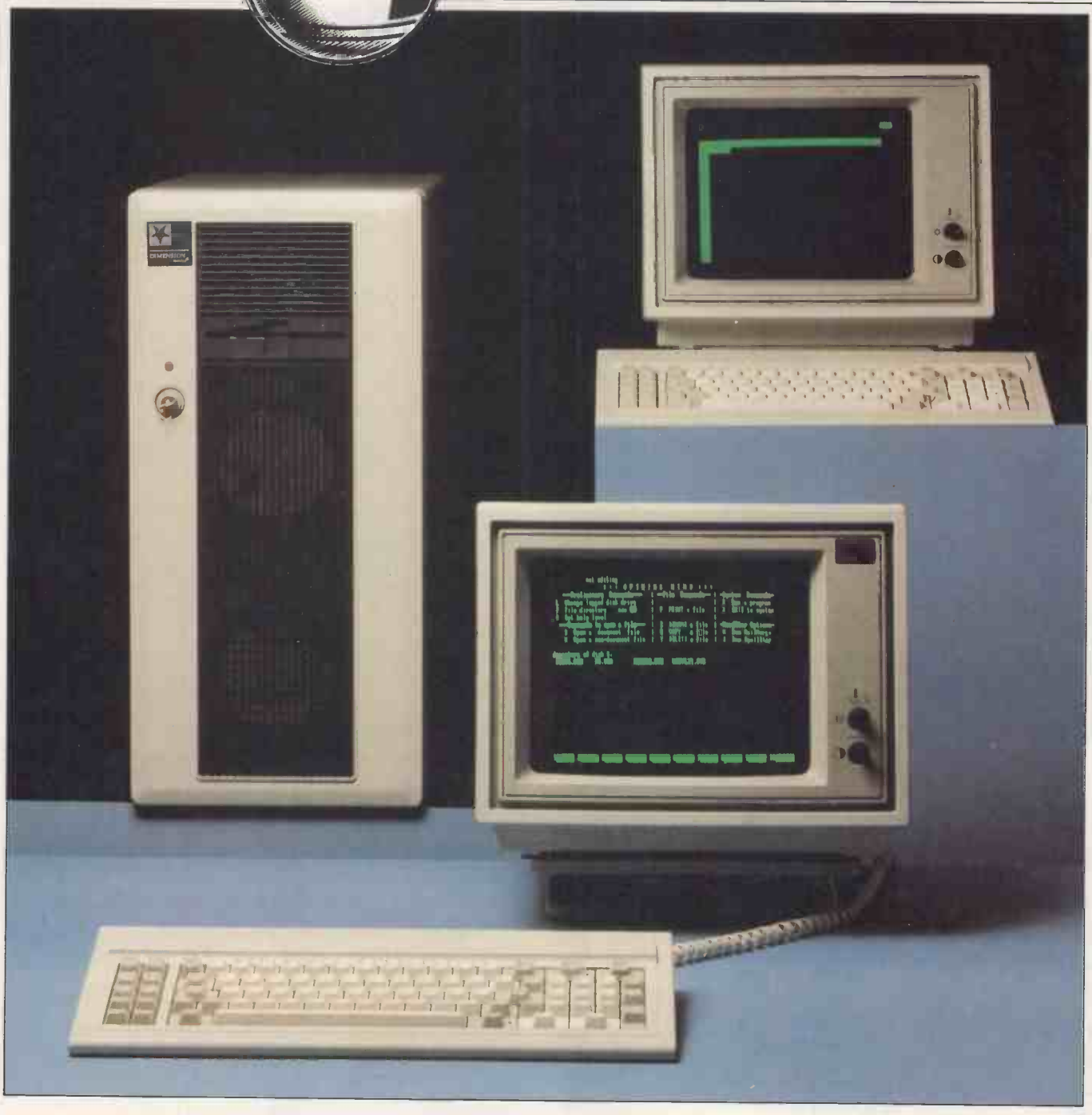


North Star Dimension

The North Star Dimension couples a multi-user, IBM-compatible environment with the capability of running familiar applications programs. Considering its other marked advantages, how will it fare in the same market as the IBM PC/AT? Martin Banks finds out.

There is a growing body of opinion that suggests that small multi-user systems, capable of handling a small number of users, will find an important niche in the market. Such systems will service the needs of small to medium sized companies that want, say, two or three people doing accounting work, two or three writing reports, and a couple working on budgeting and similar spreadsheet activities.

For these users, the traditional options have been to go for a small minicomputer-based multi-user system — and risk bankruptcy trying to pay for it — or to opt for a collection of standalone machines and perhaps networking them.

The new Dimension from North Star Computers cuts this dilemma down to a manageable size by providing a multi-user (or, more accurately, a condensed network) IBM-compatible system that is price-competitive with a collection of standalone machines, and which offers some considerable advantages.

Hardware

To the dedicated desktop user, the first impression of the Dimension is its size. The machine comes as a large box which is designed to stand all by itself on the floor. The user workstations, on the other hand, are small and neat affairs which look good on a desk. Between the two elements of the system are strung thick, 25ft-long connector cables. At some 60lbs in weight, the one thing the Dimension isn't is portable — it's only transportable by the strongest — but this is not a great drawback.

The system is intended for those users who have a reasonably clear idea of what they want and who feel they can go some way to realising their ambitions.

The machine is this big because of the way it is constructed and operated. With the Dimension, North Star has brought together into the central module of the system a collection of IBM PC clones. Each system user (there can be up to 13 in total but 12 is considered the normal maximum) has his own personal computer within the module.

The standard monochrome/green monitor has brightness and contrast controls

The key element of the machine is the special internal IBM-compatible bus motherboard; this is controlled by an Intel 80186 16-bit processor running at a respectable 6MHz. This processor drives the one or two hard disk drives the system can mount, the IBM-compatible 360k 5¼in floppy drive and the optional tape cartridge system. It has its own 256k of cache memory which it uses for such tasks as program loading and print spooling.

Expansion boards are available for the central module cache memory, taking it up to 512k bytes, while there are two options available for the workstation boards, adding either 128k or 384k to the standard 128k bytes with which it is equipped. To gain entry to the module, or to add either these boards or a new user, the machine must be laid on its side and the three screws holding the cover in place removed. This is not something which should be attempted on a regular basis: it involves a DOS routine to lock in place the flying heads of the hard disk being used and the total system should be closed down. The workstation boards slide into place and are located by screws. Expansion memory boards mount over their respective boards on pillars.

The Dimension keyboard is manufactured by the same company that made the IBM PC keyboard

The central module comes with a single 15Mbyte hard disk, plus a single floppy drive. Its cabinet is in the classically unobtrusive light fawn colour which most computers are now clothed in, but with a black grille running down the front. A rather noisy cooling fan sits behind this grille.

The workstation cables are connected to the back of the module where the connectors from each user board are exposed as they are added to the system. The user board slots are numbered, so it's the convention to add new boards in number sequence.

From this structure it can be seen why this multi-user system is also defined as a network: in practice each user has his own machine attached to the motherboard rather than all the users accessing a single processor system. The end result, however, is fairly academic until larger numbers of users are attached. Then it's likely that the Dimension's construction will allow it to run faster than a more conventional multi-user approach.

The central module is equipped with two serial ports, one an RS232 and one programmable, and one Centronics-compatible parallel port. It can work with any and all of the peripheral devices available for the PC family and its many clones, and is turned on and off by a key switch mounted on the front panel.

The workstations come in four parts. The keyboard is a standard 84-key device which incorporates all the things one would expect of an IBM-compatible unit manufactured by the same company that produced the PC keyboard. It has a good feel and a similar tilt mechanism to the PC on the bottom to bring the back of the unit higher. This is also used to lower the front end of the keyboard so that it complies with West German VDE standards, which specify the height of the front edge of the keyboard from the desk.

The screen is a standard monochrome/green, and the display unit has an on/off and brightness control plus a contrast control. North Star states that a colour unit is expected later this year, but the current 12in monochrome unit is fully capable of running the same level of graphics-based applications as the IBM PC family. Resolutions available are 640x200 and 640x400 pixels.

Both the keyboard and the display plug into the third element of the workstation, the connector cable; this comes equipped with a small connector box into which the two units are plugged. Its most important function, however, is to house a parallel port which allows a local printer to be connected. Using this, an individual user can obtain printouts without having to go into the central print spool or to where the central printer may be located. This port can also be used with a mouse or modem if required.

The 256k central module

The heart of the system

Also on the workstation is the processor board which sits inside the central module. It uses an 8088-2 processor with a minimum of 128k. This -2 version of the processor runs at a respectable 7MHz clock speed, which contributes significantly to the speed of the system.

The overall feel of the workstation is fine, apart from the lengthy screen decay time. The keyboard feels solid, and has a good action. The screen is easily legible in a variety of lighting conditions, from direct sunlight to pitch-dark-and-small-table-lamp. The display measures approximately 12ins square, while the keyboard is around 14 x 6ins. With no system box, the desktop footprint is small. In the test system I had two terminals standing easily side by side on a desk measuring 3ft 6in by 2ft, which gives some idea of their size. As with most systems, the keyboard is connected by a 6ft-long coiled cable so it can be 'lap-mounted' when required.

System software

Two levels of system software are supplied with the Dimension. There is the operating system itself, which controls both the central module machine and the individual workstation processors, and the system management software through which a designated individual, the system manager, takes care of the system's housekeeping and performs such tasks as adding new users.

The operating system is North Star DOS which, in the test machine, was version 1.1.0. This is not as intimidating and 'different' as it sounds: it's essentially a version of Microsoft's MS-DOS. The main differences are the inclusion of some additional commands specifically geared to the requirements of the Dimension machine, and the way it is operated.

The main advantage of using MS-DOS as the basis of the machine is obvious, however. As with the main thrust of the hardware design, the key element is to maintain as much compatibility with the IBM PC as possible. This means that the Dimension will run the majority of applications programs available for the PC family, including Lotus 1-2-3, WordStar, dBaseII, and so on. Not all these will run as true multi-user applications — this will depend on whether they include or can be modified to include 3Com semaphores in the coding, but in many cases this will not be too much of a hardship. Neither will the system run any PC applications which are protected in any way, for example, Prolok.

Typical of the commands which have been added to MS-DOS in this North Star implementation are those that relate to its multi-user orientation and its hard disk basis of working. In everyday use, the average individual user is going to need access to the diskette only rarely, unlike with a standalone machine. All applications programs in common use will be held on the hard disk. Gaining access to the diskette drive is, therefore, a specific task on the Dimension and the DOS provides a couple of ways of achieving this. The first is the command REQUEST, which assigns the diskette drive to the logged-on user making the request. All other users are then barred from it. RELEASE is the command that lets the drive go again. These two are used primarily when a new applications program is to be loaded onto the hard disk by the system manager.

If an application is to be run direct from diskette, DISKBOOT is used which automatically turns that user's workstation into what is, effectively, a single disk drive PC.

The system software covers a wide range of systems management tasks which are required to be performed by the system manager. This position will be an appointment from among the users, usually of an individual of suitable status within the user organisation and with sufficient experience to effectively carry out the duties. This should not be taken to mean that a high level of technical competence is required of the system manager, but the tasks are such that some comprehensive experience of using a computer, preferably an IBM PC or clone, will be a useful skill.

The system manager's job involves ensuring that the system runs efficiently, and that the users have sufficient resources for their needs and applications. A major portion of this task is involved with partitioning the available disk space so that every user has what he requires.

The hard disk can be divided up into a maximum of 64 different partitions, each of a minimum 360k capacity. Partition numbers 0 and 63 on the disk are reserved for system software, utilities and electronic mail facilities, and cannot be touched by any user or the system manager. If a second hard disk is installed, its first partition, numbered 64, will also be reserved for these duties.

It is the system manager's task to define the profile of each user, including his own. Each profile will contain details of the partition(s) available to each user name, and the size of each partition. This will be governed by the demands of a specific application, with a user who's doing long textual reports under WordStar requiring more space than someone doing small financial models on a spreadsheet that rarely need to be saved.

Only the system manager can perform such tasks as deleting or adding applications on the pubic partition and changing the profiles of users on the system; this also includes being able to add or delete users. These facilities are available in what the DOS refers to as 'manager' mode. To make use of them, the system manager signs on to the system and keys in MANAGER ON to get into manager mode. A key facility available to the manager in this mode is system maintenance, which is called up keying MAINT. This provides the common tasks required of the manager of creating or changing a partition, adding, editing or deleting a user, and adding, editing or deleting a printer. They are called by the function keys, with the tenth key used to exit the maintenance system.

The task of adding a new user, for example, is quite simple and can be done in just a few minutes. The necessity of having a system manager with at least some computing experience will be high-lighted where disk partitioning work is undertaken. At least a general understanding of the concepts of disk storage and the potential capacity requirements of applications programs is a good thing to have when deciding the required size and type.

The one disadvantage of the Dimension system here is that it has to be effectively closed down to all users if any systems management task is to be performed. Unlike many local area network systems, it isn't possible to perform a task such as adding a new user while the machine is being used by other operators. For any systems management task it's necessary to banish all other users for the duration, which may not always be the most popular thing the manager does.

As the machine has to be laid on its side to gain access, there is a possiblity of damage to the hard disk as the flying heads move around. To prevent this, North Star has built in a command to the DOS called DISKLOCK. As its name implies, it locks the head away from the disk. Once instigated the system module is turned off, and the head remains locked until it is freed by power on.

Applications software

Apart from DOS and the system management software, the Dimension does not have any software bundled with the machine but it will run the majority of IBM-compatible/MS-DOS applications. Loading a new application is a straightforward affair performed by the manager. The diskette drive is requested, the application disk is loaded in and the normal application and/or MS-DOS copying conventions are observed to get the application onto the public partition on drive C of the hard disk.

Once the central module is switched on, each user's workstation board is potentially 'live' and ready to run. The user turns on the workstation and sees the sign-on and password entry routines; this will lead into the standard MS-DOS prompt which in this case is the default drive, letter 'C'. Now the user calls up an applications program.

It's here that the power of the machine becomes apparent, especially if two or more terminals are close together. The Dimension uses a specially written algorithm for searching the hard disk which ensures the minimum number of passes over the disk by the read/write head.

Data from the disk is first read into the cache memory under the control of the 80186 processor, and then fed out to the respective workstations that have requested the data. The algorithm allows the head to collect all requested data as it is passing on the disk, rather than complete one full read task then go back and start another. The respective tasks are assembled in the cache memory.

The practical result of this is speed — even in single-user mode it's fast and can load Lotus 1-2-3 in about one second. WordStar takes around 5.5 seconds (including an intermediate RTRN keystroke on the test machine). There was, however, no discernible loss of loading speed when it was asked to load both onto different workstations simultaneously; both were in and ready to run in 5.5 seconds. The same speed was achieved when simultaneously loading dBasell and WordStar. Saving a long document file in WordStar can take noticeable amounts of time on some machines, but is completed rapidly on the Dimension.

Dimension applications programs fall into two basic categories — multi-user and single-user. The type of multi-user program that the Dimension can operate with are those that have, or can be modified to accommodate, the 3Com semaphores. These allow several people to be active within one file at any time while stopping them working on a single record simultaneously.

North Star currently has accounting packages from Sky and Omicron available with the 3Com semaphores, ready for full multi-user applications. The Dataflex database system is also available, with Delta and Datamanager expected soon.

But there are many applications for which the company feels that full multi-user capabilities are not essential and where a single-user application package will suffice. This doesn't mean that there is no means of sharing the data between users, and the solution selected will depend to a large extent on the application. For example, the shared data in a word processing application is often going to be of the standard paragraph type, and these can be held in the public partition as read-only files which can be pulled out as required. The finished document can then be saved to a personal partition.

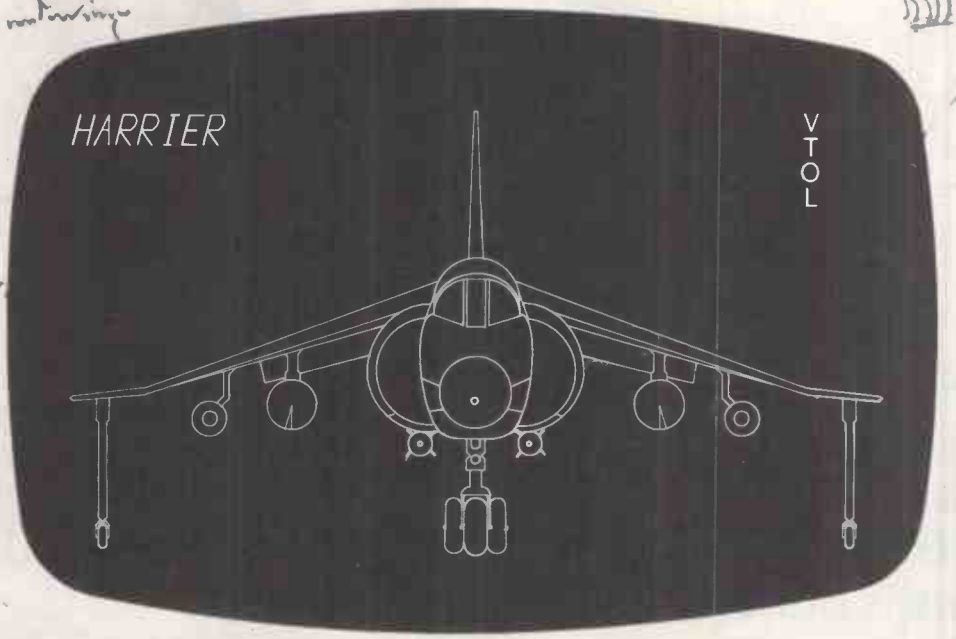
Where there is a need to allow other users access to an individual's files, this can be achieved in one of three different ways. Firstly, the system manager incorporates all personal partitions in

Benchmarks

BM 1	0.8
BM 2	3.1
BM 3	6.6
MB 4	6.8
BM 5	7.4
BM 6	13.1
BM 7	20.2
BM 8	21.6

All timings in seconds. For a full listing of the Benchmark programs, see page 185, January issue.

Drawing and words...



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their own manager's partition. It is then possible for the manager, when signed on as such, to copy the file from one user's partition to another and then sign off again.

The second approach depends on the creation of a shared partition between the users needing to swap files. This shared partition will also be assigned a different user name that is used as a sign-on when copying from one user to the other.

The third technique is to simply REQUEST the diskette drive, copy the file to the diskette, and then RELEASE the drive. The recipient then repeats the process and copies from the diskette to a personal partition.

It would be unfair to the machine to describe its facilities and applications without mentioning its electronic mail capability.

It's possible to send mail to any user from any terminal by keying in MAIL in response to the prompt. This sends the machine into a routine which displays a neat screen format in which the user can write and address messages, or read the messages that have been received. If there is mail for a user who is not logged on, the message 'You have mail waiting' will appear under the prompt when he signs on next time. It's a neat and simple electronic mail system entirely controlled by the function keys and adds a rounding touch to the overall package.

Documentation

There are four manuals in the complete documentation set for the Dimension, although most users will probably only see one. This is the *User's Guide*, which is a simple, step-by-step guide to the workstation and shows how the facilities which an individual user has access to can be utilised. It is essentially of the 'how to sign on and call up an application program' type and does its job very well.

The second and third manuals are more serious, and more comprehensive; both are intended for the system manager. One is the *DOS Manual*, which is largely the same as the Microsoft equivalent but with coverage of the extensions. The other is the *System Manual*, which sets out all the facilities available to the system manager for creating profiles, partitions and general system maintenance. The fourth manual is the *Technical Manual* and is unlikely to appear outside the dealer's door.

All are well written and are presented in hard-bound ring binders; this allows updates to the manuals to be incorporated as they occur. The one drawback of not having bundled software is that users can end up with different styles and sizes of documentation for their system: it would be nice if some coherence could be brought to bear here.

Prices

The pricing of the Dimension has been set quite competitively by North Star, given the market-place at which it is aiming the machine. The minimum configuration available, and incidentally the configuration which was supplied for this review, consists of a central module with 256k of memory and a 15Mbyte hard disk, plus two workstations with 128k bytes each. This package, which includes the North Star DOS, costs £5875.

Although this is more expensive than the average desktop standalone machine by a reasonable margin, it is in fact competitive with two IBM PC/XTs (North Star claims you get at least the equivalent performance of two XTs). Additional workstations which come complete with keyboard, display, 25ft connector cable and processor board cost £1395 each.

The 256k RAM expansion board for the central module costs £690, while the two available for workstations, the 128k and 384k boards, are £385 and £845 respectively.

As a guide to its competitiveness, North Star claims that an average installation of five workstations and a central module will cost 40 per cent less than four IBM PCs and a PC/XT networked together.

Conclusion

The success or failure of the Dimension will, in the end analysis, have little to do with the machine itself. Instead it will be the way and speed with which users in small to medium sized companies take up the idea of a small, competitively priced multi-user machine, and, more importantly, it will depend on IBM.

The arrival of the PC/AT as a potential multi-user engine shows that IBM is aware of the potential of such a market-place and to exploit it, the company will have to maintain some degree of compatiblity with the vast base of applications software which already exists. This means that the Dimension is in the right position to reap some of the rewards.

It is a soundly engineered machine that is fast, efficient and tolerably viceless — certainly viceless when not trying to perform tasks like running protected programs that the machine is not designed to run.

If it suffers from any major drawback, it's the temporary lack of available multi-user software with good record locking — this will hinder its market penetration.

END

Technical specifications

Central Module	
Processor:	6MHz 80186
RAM:	256k
Mass storage:	15 or 30Mbyte hard disk, 360k 5¼in floppy disk
Size:	20 × 12 × 24in
Weight:	60lbs
I/O:	One × RS232, one programmable serial, one Centronics parallel
DOS:	North Star DOS version 1.1.0
Workstation	
Processor:	7MHz 8088-2
RAM:	128k
Keyboard:	84-key, IBM-compatible layout

In perspective

The whole area of small multi-user machines is just beginning to open up, so the Dimension comes at an interesting time. There seem to be two schools of thought about how to approach the demands of the small to medium, five to 50-employee companies. One is the supermicro which normally runs a Unix-alike operating system and costs around £10,000 for a start-up system; the new alternative is a machine like the Dimension.

Its key advantage is the choice of MS-DOS as the basis of its operating system, which gives it a wide range of available applications software that most users will be familiar with. These will, however, mainly be single-user applications that could frustrate some users.

The market is one that IBM has recognised with the launch of the PC/AT, so there should be pickings enough for North Star. This will be so as long as it is not superseded by any developments which may occur on the IBM operating systems front over the coming year.

For anyone looking for a multi-user machine that can run up to 12 workstations using familar applications programs, the Dimension is certainly one to consider seriously.

Sharp PC-1350 vs Casio FX-820P

What is the ideal niche for a pocket computer — as an on-site boon to field executives, as an introduction to computing, or is it just an impressive calculator? Nick Walker looks at the Sharp PC-1350 and the Casio FX-820P, two diminutive contenders in the lap-held/portable revolution.

With the growing interest in lap-held computers, it seems that an often-forgotten corner of the computer market is that of pocket computers. This is a shame as these machines probably offer a great amount of computing power within the smallest amount of space, providing you can accept the diminutive keyboard and display.

Unlike lap-helds, which are scaled-down versions of business machines, pocket computers are much older and grew out of the programmable calculator market. Originally the battle for the title of programmable calculator king was between Texas Instruments (TI), Hewlett-Packard (HP) and Casio. Then in 1979 Sharp launched the PC-1211, the first hand-held with Basic, and since then it's been Sharp versus Casio with HP and TI staying in the scientific/programmable calculator field. Both Sharp and Casio have continued to develop in this field and it's two of the latest machines from these companies that are reviewed here — the Sharp PC-1350 and the Casio FX-820P. Notable predecessors were the FX-702P, Casio's answer to the PC-1211, and the PC-1500 from Sharp with its comprehensive Basic, graphics and a remarkable printer/plotter.

Sharp PC-1350

Hardware

The PC-1350 pocket computer is enclosed in the now traditional brushed aluminium ABS case. The machine is considerably smaller than the PC-1500A and more in line with the dimensions of the original PC-1211 — very slim and suitable for, say, an inside jacket pocket. The small size is due to Sharp reverting back to the button-sized lithium battery as a power source. These give approximately 250 hours of life to the machine, and an alternative power source is available.

On the back of the machine is a removable aluminium panel, under which is the edge connector for insertion of the optional 8k and 16k RAM cards. Also under this panel is a small sliding door to the battery compartment.

'. . . it's surprising what applications software is available for pocket machines, and . . . most of it will be converted to the PC-1350. Typically there is scheduling, tiny databases, sales analysis and other packages . . .'

Pocket computers are not designed to be looked at internally, and I was soon frightened off by the vast number of tiny screws and delicate construction. However, within these tightly packed PCBs I am assured there is an 8-bit processor of Sharp's own design, a 40k ROM, 5k RAM and all the other necessaries that make a computer. All the chips are CMOS, allowing memory to be retained even when the machine is switched off.

The keyboard consists of a non-staggered qwerty layout of calculator keys, very similar to the PC-1211, with a larger numeric keypad and control keys to the right. The alphabetic keys are just about fingertip size and it's all too easy to hit up to three keys simultaneously; probably the simplest way round this is to use the blunt end of a pen instead.

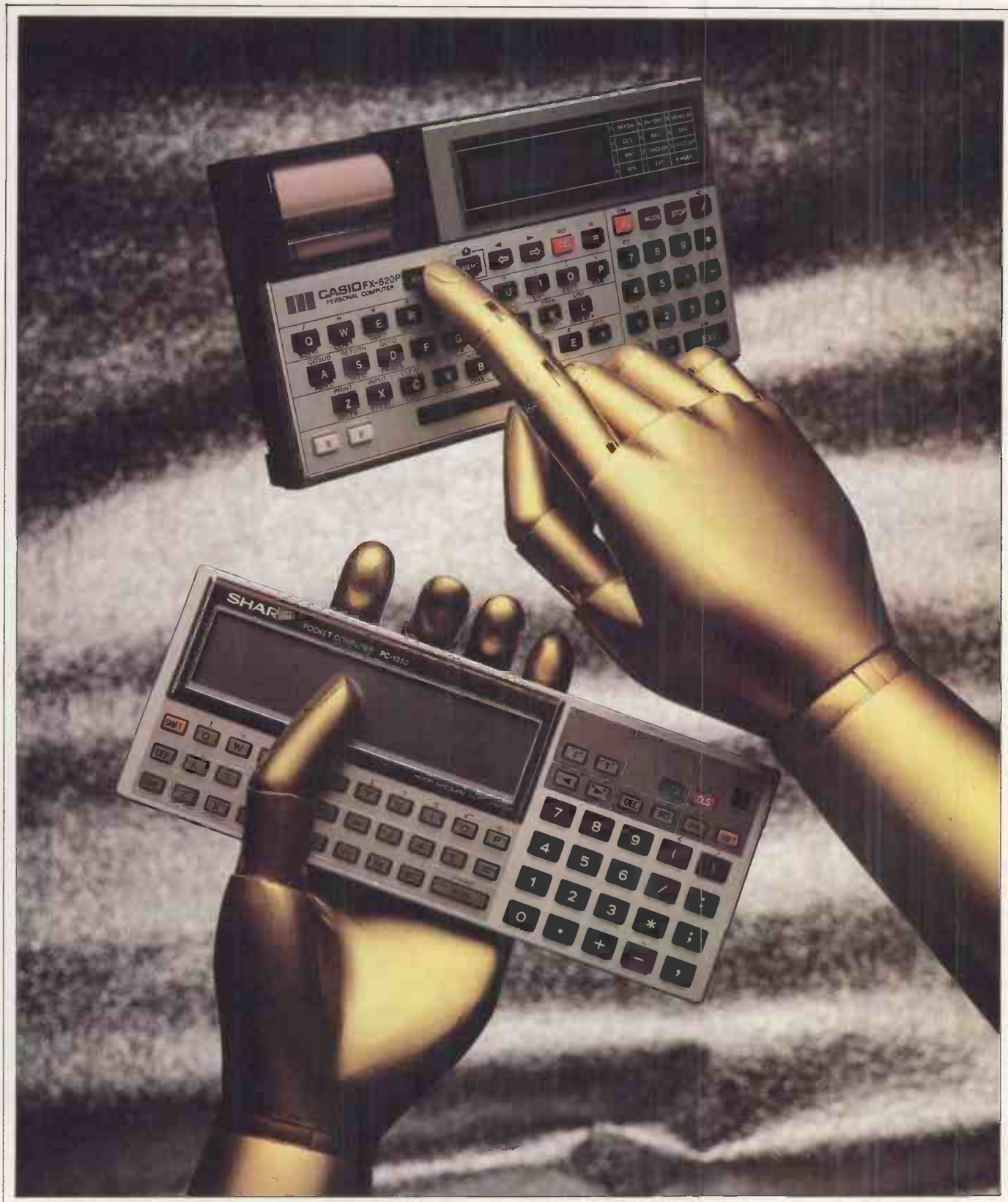
The nicest feature of this machine and the reason that the keyboard is so small is the LCD display. Rather than the usual one-line arrangement, this is a four-line by 24-character display, or 32 by 150 pixels if used graphically. Left of the main display but still within it are annunciators for programming mode, lower-case and definable mode.

Other notable hardware features include a contrast thumb wheel (at last). A well documented serial I/O port, which includes configurable baud rate and parity is on the right-hand side — quite remarkable for a pocket machine.

Software

Most pocket computers, as a result of their calculator origins, can be used as a calculator. The PC-1350 is no exception: it acts as a very powerful scientific calculator, especially as variables can be used within manual calculations. Calculation is performed to 10 figures with a dynamic range of 10. A wide range of scientific functions are provided, although these are perhaps a little more cumbersome than their calculator equivalents as they have to be spelled out. The machine breaks no records in terms of speed, and is probably on a par with the slowest of the home machines.

The PC-1350 has three modes of operation: run, program and reserve



mode. Run and program are toggled by the mode key in the upper right-hand corner of the machine; run mode allows program execution and the use of the machine as a calculator; and program mode is for program entry and editing. Reserve mode is entered by typing SHIFT MODE and allows the bottom two rows of qwerty keys to have a string associated with them. These can then be recalled in both program and run mode, and are useful for commonly used Basic commands and functions.

The bottom two rows of qwerty keys can also be used in conjunction with a DEF key to run a program, or section of program, whose Basic line is labelled with the corresponding letter. The editor can be described as a full-screen editor even though the screen is only four lines long with four-way movement scrolling when necessary, and insertion and deletion control by four cursor keys.

The Basic interpreter is held within an extremely large (for a pocket machine) 40k of ROM, and is Microsoft based with extra commands for graphics, the I/O port, and so on, which adds up to around 120 commands. Unlike some of the previous pocket machines there are no noticeable omissions in the Basic: string handling, one or two dimensional arrays and data statements are all there in their standard Basic form. Variable names can be of any length with the first two characters significant.

The PRINT command stops execution of a program so that the information is not scrolled off the screen, and there's a PAUSE command which enables display for a programmable length of time. Debugging is facilitated by the commands TRON and TROFF, which display line numbers and allow

The Sharp PC-1350 in use; the Casio FX-820P sitting on its disk interface

single stepping.

Cassette file-handling instructions are included for use with the cassette interface and a suitable recorder. As well as program saving and loading, there are the necessary INPUT# and PRINT# for data files. The serial I/O port can also be accessed from Basic with such commands as OPEN, CLOSE and CONSOLE, which is a sure sign that Sharp intends the machine to be used on site and brought back to base to communicate with a larger machine.

The area where the Sharp really shines out from the competition is in the graphics commands which drive the 32 by 150-pixel screen. Text and numerical data can be displayed anywhere onscreen so that a number of running totals can be displayed at once and figures can be labelled. In addition, the display can drive on a pixel basis with point setting and line drawing commands. Small histograms and line graphs can be drawn with this facility, and it's also used in games.

Overall I was very impressed with the Basic although a little surprised that it took 40k of ROM to implement it. The only thing I can find to complain about is the absence of a real-time clock, something which is useful on portable machines that are used for appointment keeping and is found on the PC-1500. The absence of a block delete and renumber routines is also a disappointment.

After some searching it's surprising what applications software is available for pocket machines, and I suspect that most of it will be converted to the PC-1350. Typically, there is scheduling, tiny databases, sales analysis and other packages for people who need computing power outside the office.

Documentation

It seems that for Sharp the writing of quality documentation is an uphill battle. The earliest attempts at providing a tutorial for the MZ-80K and the

badly translated PC-1211 manual undoubtedly prove this. But happily, by staying mainly as a reference manual, the PC-1350's 269-page instruction manual is quite comprehensible. By far the worst chapter is the one that tries to teach Basic programming; I recommend that this is replaced by a standard Basic programming book.

Interestingly, with the PC-1500 there were three commands — PEEK, POKE and CALL — that were undocumented. On the PC-1350 these commands are once again available, and are mentioned in the manual for a self-test routine but are not explained anywhere else.

I don't know what Sharp has against people looking around the memory of its machines — perhaps the fact that we might find out exactly why it took 40k of ROM to program the Basic.

RAM cards are available for both the Sharp and Casio machines

Casio FX-820P

Hardware

The Casio FX-820P is a larger machine than the Sharp PC-1350, and is once again covered by a brushed aluminium ABS case. It is powered by two lithium batteries which keep the machine alive and kicking for approximately 140 hours. The batteries are replaced by removing the back panel; this requires the removal of two tiny Philips srews for which you really need a suitable jeweller's screwdriver.

The reason for the extra bulk is the inclusion of a built-in printer to the left of the machine, and the NiCad batteries to drive it. The printer uses special electrothermal paper of tally roll size, and produces a good quality print after it's printed the first four lines or so. A charger unit is supplied with the computer for recharging the NiCads, and when fully charged they should work for well over 3000 lines of printing.

Although the increased bulk is a result of the inclusion of a printer, by far the worse casualty is the LCD display. This is a tiny one-line, 12-character affair to the right of the printer and can only be described as just about workable.

On the front of the machine is an opening for the insertion of either 2k or 4k RAM cards (one 2k card is supplied with the machine). These cards contain a tiny battery that maintains memory contents even when the card is removed. As a result, Casio eagerly pursued the idea that they could be used in a similar manner to floppy disks, with frequently used data and programs stored on a number of RAM cards. This is very nice, but at £20 a time for only 2k of storage it's rather expensive.

The Casio's keyboard is a staggered qwerty arrangement of calculator keys with a proportioned space bar. There is sufficient room for most fingertips, and it all works very effectively as well as making the machine look neat. To the right of the keyboard is a numeric keypad, and the top row of keys spanning both keypad and qwerty pad are control keys.

To the left of the machine is a thumb wheel for adjusting the contrast, and to the back is the edge connector for connection to the optional cassette interface. There's also an all-reset switch on the back which is activated by a pen nib: this clears all data and program memory, and restarts the machine. The FX-820P is slightly faster than the Sharp PC-1350, but once again won't set any records for speed of operation.

Casio is as shy as Sharp about people getting into its machines, but if you did manage to hack your way in there you would find a custom 8-bit processor, no RAM (it's all on the plug-in card) and an undisclosed amount of ROM.

Software

The FX-820P operates in three modes — run, program and Data Bank entry — each of which is accessed by pressing the MODE key followed by a numeral. Other combinations of MODE and numerals change the angular mode

Technical specifications FX-820P

Processor:	Custom CMOS design
RAM:	2k with included RC2 RAM card, 4k with optional RC4 RAM card
ROM:	Amount not stated but incorporates OS, Basic and Data Bank
Mass storage:	Cassette tape with cassette interface, battery-backed interchangeable RAM cards
Keyboard:	56 calculator keys in staggered qwerty arrangement
Size:	172 × 96 × 34mm
Weight:	0.4lbs
I/O:	Cassette port for cassette interface
Peripherals:	Cassette interface, 2k RAM card and 4k RAM card

Technical specifications Sharp PC-1350

Processor:	8-bit custom CMOS chip
RAM:	5k, additional 8k and 16k cards available
Mass storage:	Tape using cassette interface, battery-backed interchangeable RAM cards
Keyboard:	62 calculator keys in unstaggered qwerty arrangement, plus numeric keypad
Size:	182 × 72 × 17mm
Weight:	0.42lbs
I/O:	Custom serial I/O, optional RS232 step up/down
Peripherals:	CE126P printer cassette interface, CE152 cassette recorder, 8k and 16k RAM cards, RS232 step up/down transformer

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and setting of the debugging options. Casio has followed in the footsteps of the Sinclair Spectrum by assigning as many as five different functions to one key. Various combinations of shift, function and extended mode are needed to access these, but as with Sinclair a colour scheme eases your way around.

From run mode the machine can be used as a scientific calculator; the one-keystroke entry of functions works very well here alongside the use of variables in immediate calculations. A fine array of functions exist, making the machine an excellent proposition for anyone who would normally consider a top-end programmable scientific calculator.

Also from run mode it's possible to run any one of the 10 programs that can be in memory simultaneously.

Program mode is for insertion of a Basic program. As stated, up to 10 separate programs can exist in memory at the same time, all taking from a central pool of memory. While entering a program, a second, small four-digit display is shown above the main one indicating the amount of program steps remaining.

Like the Sharp, the Basic is very comprehensive by pocket computer standards but no real features shine out as particularly interesting.

An optional cassette interface allows programs and data to be stored on tape, and also the data file-handling capabilities. A trace option is available which displays line numbers and facilitates single stepping — much needed as the error messages consist of a grand total of eight.

The third mode, data entry, is used in conjuction with a feature known as the Data Bank. This is a kind of mini-database on which a primitive number of search criteria can be applied. Each item of data is entered in data entry mode and the separate fields within a record are separated by a comma. It's then possible to do a sequential search through the data, or search via a specified string through any field. Used alone this would allow you to store, say, a number of telephone numbers and perform an intelligent search on either name or number.

'Both the Sharp and the Casio have features in their favour, but overall I'd plump for the Sharp with its 40k Basic and graphic display. However, if a hard copy of calculations is important then the Casio is the neatest . . .'

The real power of this feature is revealed when it is used in conjuction with a Basic program. The Data Bank can be accessed as a random access file allowing complex search criteria to be constructed from the program.

There seems to be less commercial software available for the Casio than for the Sharp; what does exist once again consists of scheduling programs, databases, and so on. The absence of the PEEK, POKE and CALL commands means that it isn't possible to write programs with a machine code content or directly access the ROM — two things necessary to produce good quality commercial software.

Documentation

Two books are included with the Casio FX-820P: a 200-page *Owner's Reference Manual* and a 94-page *Database Reference Manual*. These are generally well written but do show signs of translation, the most amusing being that the manual constantly refers to the machine as the 'mainframe'. In particular, the phrases that try to make the manual friendly suffer in translation. For example: 'However, unless you activate the computer function you cannot use it.'

Prices

The Sharp PC-1350 retails for £129 with 5k of RAM built in. Additional RAM cards cost £69.95 for an 8k RAM card, and £114.95 for a 16k RAM card. The printer/cassette interface costs £59.95 and the matching audio cassette recorder £39.95, but any cassette recorder with the right sockets will do.

The Casio FX-820P is the top of a range which all feature the Data Bank and are priced as follows: £89.95 for the FX-820P; £49.95 for the FX-720P (same as the FX-820 but without printer); and £49.95 and £39.95 for the lesser PB-410 and PB-110 respectively. Peripherals are £22.95 for the cassette interface, £29.95 for the character printer, £19.95 for the 2k RAM card and £29.95 for the 4k RAM card.

Conclusion

Pocket computers are still a viable proposition for engineers, field service personnel and anyone who needs computing power but is not too concerned about full keyboards and screens. The other market that both Casio and Sharp obviously consider important is as an introduction to computers. Both machines fill that roll very well and would probably still be useful after you'd been introduced, unlike a cheap home machine. What's more, they look rather more impressive than does a Sinclair ZX81 or Spectrum.

Both the Sharp and the Casio have features in their favour, but overall I'd plump for the Sharp with its 40k Basic and graphic display. However, if a hard copy of calculations is important then the Casio is the neatest portable method of doing this. END

Benchmarks Casio FX-820P

BM1	10.8
BM2	48.9
BM3	106.8
BM4	95.5
BM5	126.1
BM6	200.6
BM7	251.7
Ave	120.0

All timings in seconds. For a full listing of the Benchmark programs, see page 185, January issue.

Benchmarks Sharp PC-1350

BM1	7.3
BM2	47.7
BM3	110.1
BM4	113.3
BM5	127.6
BM6	180.2
BM7	294.3
Ave	125.8

All timings in seconds. For a full listing of the Benchmark programs, see page 185, January issue.

In perspective

If you decide that a pocket computer is what you want, the market is unfortunately very limited and consists purely of Sharp and Casio models. Both the Sharp PC-1350 and the Casio FX-820P are top-of-the-range machines, with the lesser models being progressively cheaper as features are stripped off them. If complex calculations are your only requirement it may be worth looking at a programmable calculator such as the Hewlett-Packard 41C or Texas Instruments 60, both highly scientific but not progammable in Basic.

If you're considering a pocket machine as an introduction to computers, then it's worth looking at the home computers available. In terms of computing power there's no doubt that you could purchase more for the same price with a home computer, but you would lose the portability. If nothing else, a pocket computer must be the most impressive way of adding the shopping bill on the weekly dash around Sainsbury's.

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SUITABLE FOR ANY MACHINE

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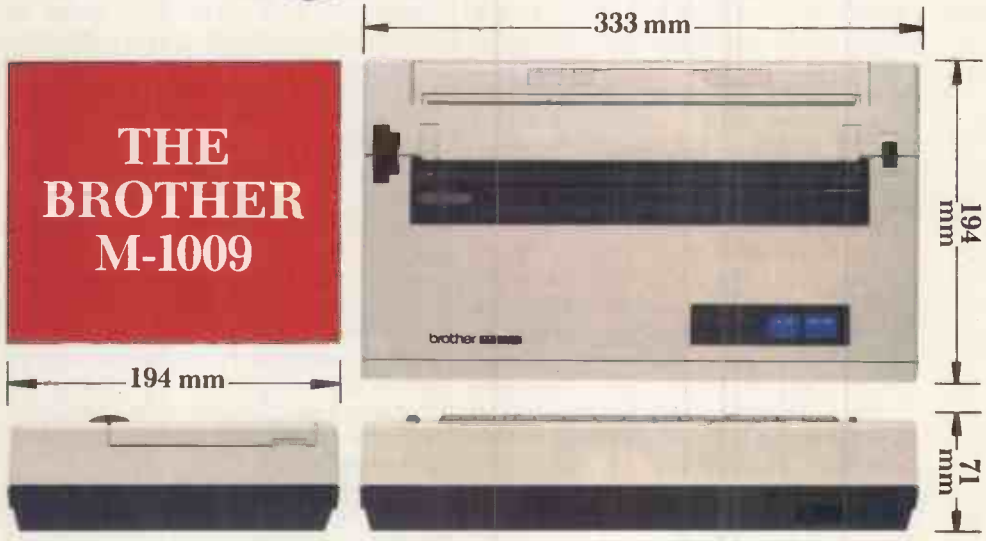

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RGB monitors

Gareth Jefferson looks at the pitfalls that await the unwary when hooking up a computer to a display unit, and considers three new televisions-cum-monitors.

The vast majority of computers worldwide are used with ordinary domestic television receivers that serve as the computer's video display. However, the domestic compromises that arise when someone wants to use the computer while the rest of the family wants to watch *Coronation Street* or *The A Team* is only part of the problem. There are technical compromises too. Ordinary televisions are designed to give an acceptable standard of reproduction of ordinary broadcast television signals. The eye is a fairly forgiving organ when it comes to moving pictures, but more critical when it comes to computer text. TV broadcast standards and TV receiver capabilities are a compromise between cost and picture quality, with cost coming out the winner, and most sets are simply not capable of adequately displaying 80 characters on a line.

Computers, on the other hand, make severe demands of their display units. The signal bandwidth required to display 80 characters across the width of a screen is more than ordinary televisions can manage, so home computer designers and users are forced to compromise: either display 40 columns (characters) on an ordinary television, or use a more expensive high-bandwidth, high-resolution colour monitor.

But a third alternative is emerging: colour television receivers equipped with wider bandwidth circuitry and signal interfaces able to take video signals directly from computers. These 'direct' inputs are either composite video inputs or RGB inputs; using them avoids having to RF (radio frequency) modulate the computer's output signal to make it emulate an aerial input, and excludes unnecessary degradation of the signal.

TV receivers and broadcast standards The signal emerging from a monochrome television camera consists of an analogue video signal (corresponding to the intensity of the illumination of the picture tube as it is scanned), and horizontal and vertical synchronisation pulses. These sync pulses allow the receiving equipment to know when the end of each horizontal line and each picture field have been reached.

Colour cameras are essentially three monochrome cameras in one, with a separate video output for each of the primary colours — red, green and blue — plus horizontal and vertical sync signals for a total of five signals. These are usually called R, G, B, H-sync and V-sync. The standard signal level for video is one volt peak-to-peak.

Composite video For broadcast purposes, these five separate signals are usually combined into a single video signal called composite video. Although the five original signals are mixed, receiving equipment can separate them using moderately straightforward circuitry. The sync pulses are easily separated from the composite signal using simple time-constant circuits. Composite video signals have the advantage that only a single coaxial cable is needed to connect video

The Hitachi, Ferguson and Fidelity sets can act as televisions (note the portable TV aerials) . . .

equipment, and all the sorting into luminance, chrominance and sync signals can be left to the last unit in the chain — the receiver.

RF signals Although composite video signals involve relatively high frequencies, they are not suitable for radio transmission as such. For this purpose they must first be RF (radio frequency) modulated for transmission at VHF (very high frequency) or, more commonly, UHF (ultra high frequency). So, it's an RF modulated composite video signal that is picked up by a TV aerial and fed into the aerial socket at the back of the colour television receiver.

Since the most common type of input signal in the domestic environment is from an ordinary aerial, most domestic sets are equipped with only a single RF (aerial) input socket. A tuner inside the TV set selects only the required signal (each channel is broadcast on a different frequency), and this RF modulated signal is then demodulated to get back to the equivalent of an ordinary composite signal.

TVs with video inputs The advent of the VCR (video cassette recorder) and, to a lesser extent, the video disc player, has changed the picture slightly. Since there's no need for radio transmission between the video recorder under the television and the TV set itself, most VCRs and video disc players provide two outputs: an RF modulated output and a composite or 'video' output.

Computer outputs Computers that are capable of generating colour outputs invariably do so by generating three separate colour signals (red, green and blue) as well as horizontal and vertical sync. There are three ways of getting this stream of colour data from the computer to a suitable monitor. One is to leave the R, G, B and sync signals as they are and send them individually to the monitor. This involves minimal degradation to the signal, but requires the use of a monitor able to accept these separate signals.

The second approach is to combine the R, G, B and sync signals into a single composite signal, and here a monitor or television receiver able to accept a composite input is necessary. As mentioned, many ordinary TV sets are now able to do this. Signal degradation is greater than when the signals are left separate, but not as great as when RF modulation is involved.

The third approach is first to combine the separate signals internally, then to RF modulate them so that they emulate a broadcast television signal and feed them directly into the aerial socket of the TV set. All ordinary televisions have this type of input. This method involves the greatest loss of quality, and the screen resolution is generally limited to displaying only 40 characters across the screen or the equivalent in computer graphics.

RGB televisions A few years ago Sony perceived a niche in the consumer video entertainment market for a 'unit audio' approach to domestic television, and produced the Profeel line of TV monitors with RGB inputs and separate TV tuners. Sony was quickly followed by a number of other manufacturers who also offer a unit video approach. The most basic unit is nothing more than a colour CRT (cathode ray tube) with the internal circuitry needed to process separate RGB and sync signals. Other sets offer RGB input and built-in TV tuners to enable broadcasts to be received off-air.

RGB: TTL and analogue If you have a computer with an RGB output, you have the choice of either a dedicated computer colour monitor such as the Microvitec Cub, or a television set with an RGB interface such as the three models reviewed in this article. Whether or not this apparent choice is real depends on the type of RGB output your computer provides.

The reason for this unfortunate source of confusion stems from the fundamental difference between computer-generated video and 'television' or picture quality video. A colour television receiver, as well as colour computer monitors, provides a large number of phosphor triplets consisting of a triad of phosphor dots, each of which produces either red, green or blue light when irradiated with an electron beam from the electron gun(s) of the CRT. 'Real' pictures have varying degrees of brightness at any given point, as well as colour content. To get the full effect of an ordinary colour picture on a colour set, this involves allowing each of the dots in every phosphor triplet to give out varying amounts of light, from no output to full output. An ordinary colour video signal does this by having two components: luminance (brightness) and chrominance (colour value).

Computers work in binary states of on or off. Computer interfaces use TTL (transistor-transistor logic) chips that produce outputs of (approximately) five volts or zero volts. This binary option means that any of the red, green or blue dots can be fully on or fully off. This limits the choice of displayable colours to eight: red (red only), green (green only), blue (blue only), yellow (red + green), magenta (red + blue), cyan (green + blue), white (red + green + blue) or black (nothing). No other colours are displayable.

There are two ways round this problem: either the red, green and blue signals can be made to vary between fully off and fully on; or a separate intensity signal can be supplied. When the R, G and B signals are at TTL levels, there is no question of varying the signal strength because TTL signals are either on or off — there are no intermediate states.

. . . . or they can act as monitors by bypassing TV demodulation

Broadcast standard colour monitors with RGB inputs have traditionally taken a different approach. They have what is known as analogue RGB inputs. An analogue input is, by definition, infinitely variable between its minimal and maximal values. Video signals are traditionally 1V peak-to-peak, so an analogue RGB signal will vary in intensity between 0V (fully off) to 1V (fully on) and anywhere inbetween. TV monitors for unit video systems, such as the Sony Profeel and the models reviewed here, therefore have RGB inputs that accept analogue signals of between zero and one volts.

Now consider the situation that applies if the R, G and B signals are either on or off, with no intermediate states. The possible signal states and resulting colours are summarised in Fig 1. Only eight colours are possible; this may be fine for computer text and bar graphs, but is unacceptable for television pictures. It's also unacceptable for the home computers that are able to produce 16 or more colours.

Signal			Resulting colour
R	G	B	
0	0	0	Black
0	0	1	Blue
0	1	0	Green
0	1	1	Cyan
1	0	0	Red
1	0	1	Magenta
1	1	0	Yellow
1	1	1	White

Fig 1 Signal states and resulting colours

Sync, logic and other complications We now have to consider the sync signal(s) and the 'logic' of the signals. The so-called RGB outputs provided on many computers sometimes combine the H and V syncs into a single compound sync, signal; sometimes they are left on separate pins; occasionally both compound sync and separate sync signals are provided.

RGB monitors with TTL inputs generally have separate H and V sync inputs, while RGB analogue monitors usually have compound sync inputs. The sync signal does not need to be analogue since sync pulses are logically either on or off. Monitors with TTL inputs, therefore, invariably also have TTL sync inputs, while analogue monitors sometimes use TTL on the sync input (and 1V peak-to-peak analogue inputs for the R, G and B signals) and sometimes one-volt inputs for the signal too!

Combination inputs It's not surprising that manufacturers try to cater for as wide a range of inputs as possible. A little bit of cheating in the input circuitry allows most sets to accept RGB inputs at either analogue (1V peak-to-peak) or TTL levels (0V-5V). Remember, however, that if your computer produces a true

TTL RGB output, only eight colours will be displayable. Some computers use TTL-type voltages, but with a full voltage swing to allow more colours to be displayed. The models looked at here can cope with any voltage likely to be encountered, from half a volt peak up to five volts.

Screen resolution A composite or RGB input to a domestic colour television will result in a cleaner signal getting through, but don't think that means you can display 80 columns where only 40 could be shown previously. Unless you have a monitor with more phosphor dots on the screen (and more perforations in the tube's shadow mask) all you'll get is 40 cleaner characters.

Any attempt to diplay 80 columns will still result in blurred, unreadable characters.

The machines

The Ferguson MC01, the Fidelity CTM1400 and the Hitachi CPT-1444 sets have much in common: all cost under £230, can receive TV signals off-air and accept RGB inputs. The Ferguson and Fidelity sets can also accept composite video inputs.

The Fidelity CTM1400

The TV/monitor version of this set retails for £229, but a monitor only version (with no internal TV tuner) is available for £199. It has the nearest thing there is to a standard connector, the so-called SCART or Euro-connector. This is a 21-pin connector feeding into 75-ohm analogue inputs. Signals catered for include composite video in and out, stereo sound in and out, RGB analogue at 0.7V peak-to-peak, combined sync and fast blanking.

A wide range of ready-made leads is available for all the popular micros. Resistors in series with TTL outputs from computers drop the signal (by forming a potential divider with the 75-ohm input impedance) and allow the interface to be used with no significant loss of quality.

The only problems likely to be encountered using this model would be with computers producing separate H and V sync signals since there's only a compound sync input. The IBM PC, which produces TTL-level RGB and uses a separate intensity line for a fuller colour range, has to use the composite input for sync purposes and only eight colours can be displayed. All in all it's a very versatile set, although the manual TV tuning was fiddly.

The Ferguson MC01

This model retails for £229 and is provided with separate RGB and composite DIN-style sockets — seven pins and five pins respectively. Neither of these is standard, but the interface is versatile and should work with virtually any machine. Only a BBC lead was available at the time of the review, but this worked with a clear improvement in the quality of the display on switching from RF to RGB. Two sync inputs are available for machines that produce separate sync outputs, but the sync signals must be negative-going (which is normal anyway).

Combined sync is sorted out internally and simply needs to be plugged into one of the sync inputs.

The Hitachi CPT-1444

This is the cheapest of the models under review, retailing at £210. But, unlike the other two models, it has an RF and RGB input only; there is no provision for a composite video input. Only two types of lead are available — a BBC lead with appropriate plugs at both ends, and a general purpose lead with a DIN-style plug at the Hitachi end and nothing at the computer end. Soldering a suitable connector for your computer will be your responsibility. Adjusting the contrast control allows the input sensitivity to be adjusted for either analogue or TTL input levels. The sync input is for combined sync, and the signal must be negative-going.

Conclusion

Television sets with RGB or composite video inputs do give a worthwhile improvement in quality when used with a computer. Particularly noticeable is the freedom from the irritating drifting dot effect, so common when RF inputs are used. They are not, however, really suitable for 80-column displays. They may have the internal bandwidth to handle 80 characters, but do not have the screen resolution owing to the limitations of the shadow masks on domestic receivers.

If you're in the market for a new colour television and would like some improvement in the computer display, then the few pounds extra these sets cost is well worth considering. This is particularly true if you have a video recorder or disc player with a video output: the lack of a composite input in the Hitachi would then rule it out. The extra £19 spent on either of the other two models gives considerable extra versatility.

In any event, it's a wise precaution to try out your computer with whatever monitor or television you are contemplating. END

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Down to Basics

John Locke gets to grips with business programming in Basic. Despite its reputation, it can produce fast running and efficient programs with just a touch of 'style'.

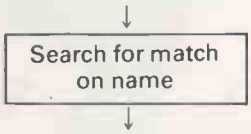
Basic doesn't have a wonderful reputation in the programming world, but it does have the advantage of being available on most micros in one form or another; and it *is* capable of producing fast-running and efficient programs. I have known interpretative Basic programs that ran as fast as a compiled COBOL equivalent from the user point of view.

Programming style

One of the surest ways of achieving fast-running programs is to develop an individual programming style — that is, either a personal or a 'house' style. Style implies standardisation. Once you have found a good way of performing a particular program function, stick to it until you have a very good reason for changing it. This also applies to the general structure of the program. Writing the code for this function will then become second nature to you, the bugs will have disappeared long since from that section and it can be typed in almost without thinking. Build up a library of generally useful subroutines and try to give them the same and easily remembered start line number in each application. In this way, the address of the subroutines will be remembered and can be referred to in the program almost without thinking. By implication, the subroutines must be developed to have general application. Other aspects of style will appear in the structure of the program and will be described later.

There is a difference between the structure of programs in general and the structure of a particular application. The structure of a particular application arises from an analysis of the requirements. This must be done thoroughly at the start. Making changes to a 'finished' program because an important requirement was forgotten is time-consuming and may even ruin the efficient structure of the program. That is not to say that the customer's requirements will not change (with bespoke programming they assuredly will), but it is your job to anticipate the changes that might be required at a later stage and allow for their insertion when building the original application structure.

After the analysis of the requirements, construct a flow-chart of a program to meet these. Take as an example an accounts suite consisting of sales, purchase nominal ledgers together with stock control, sales analysis, ordering, invoicing, and so on; this will occupy between 20 and 25 pages of code. Without a flow-chart it is easy to lose track of where you are. Not only that, but flow-charts should be an essential part of the software documentation. As you code the program in accordance with the flow-chart, add to the block on the diagram the line number that commences the function of the block. This makes the task of tracing through the program much easier later on.



Conventional flow-chart symbols will not always cope with Basic options: ON — GOTO is an example. A multiple exit block rather than a whole row of decision blocks illustrates this (see Fig 1).

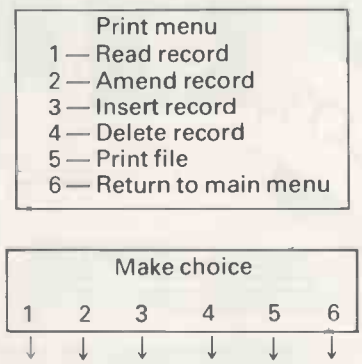


Fig 1 Multiple exit block

Analysis

The first step, obviously, is to analyse your program's requirements before constructing a flow-chart to meet them. While constructing the flow-chart, I find it useful to design all the menus for the program (assuming that menus are to be used) because these will determine the major modules of the program and the sections of the flow-chart. Don't be afraid to redraw the flow-charts several times before you are satisfied with them. In this way all the redundant sections can be eliminated, the common subroutines highlighted and the many alternatives of achieving the desired results explored.

Strategic decisions which will affect the whole program should be made when the menus are being designed, and reviewed when the flow-chart has been completed. These decisions will include such things as: whether numeric values are single or double precision; whether values are to be held in core in a large array, or as a random file in permanent storage; whether or not the program is to be machine specific; whether each transaction is to be incorporated in the file to which it refers, or in a separate audit file, and so on.

Applying these to an accounting package example, the totals of each nominal account can be turned into a profit/loss report very quickly if these are held in a core array. The difficulty is that even a modest number of accounts — for example, 36 — together with the fact that each could have totals for cash-in-hand, cash-at-bank, VAT (cash), credit, and VAT (credit) for each of twelve months, will occupy 36×12×5 items. With double-precision values at 8 bytes each, the array will occupy 17k.

If you are using a machine with MBasic (Microsoft Basic) operating under CP/M, then you won't get much change out of 30k for these. In a 64k memory you therefore have 34k for program and variables. I suggest that if a hard disk is available, then use random access files rather than an array. (They are roughly equivalent in that they both allow rapid selection of one set of items.)

Double precision is likely to be a must for monetary values — otherwise, with single-precision, one will be limited to a little over £30,000.00 before the pence disappear; or to £3,000.00 if rational roundings of the pence is to be retained. While double-precision variables may be individually defined throughout the program, this is tedious and the £ sign can easily be forgotten when coding. It is suggested that all variables capable of being grouped in the program should be. For example, all double-precision variables should start with B so that they may be defined with DEFDBL in a group. No reserved words in MBasic begin with B. In addition, J,Q,X,Y,Z are

useful to preface variables that are to be grouped without clashing with reserved words and for defining as single, double-precision or integers in groups. K and H can be used with care.

Memory space limitations will almost certainly force the chaining of the main program modules. Chaining is an advantage anyway, at least with MBasic where all or a choice of variables can be transferred and a start line specified (chaining in BBC Basic is much less flexible). Chaining modules reinforces the structure of the application program and, if properly done, enables each module to be tested separately.

It is essential to have a correctly designed foundation module onto which the other modules overlay. This foundation module has some similarities to the environment division in COBOL but it should go further than that. The foundation module should contain:

(a) A housekeeping section to fulfil such tasks as general definition of variables and dimensioning.

(b) The definition of all the string variables and numeric constants (if any) that will be used throughout the suite of modules. For example, A$=STRING$(20, "*") as a useful heading underline, and perhaps AL$= A$+A$+A$+A$ to give an across-the-screen division.

All string variable arrays that will be frequently used should also be set up at this time. They are either written into the code, or loaded into the array from a file. Account headings would be an example of these, such as: H$(1)="Rent":H$(2)="Rates".

(c) The definition of all screen control characters. For example, MBasic doesn't include a clear screen command because this and other screen controls, such as half brilliance, field protection and cursor control are specific to the particular terminal in use. A program feeding an ICL K9 terminal would require CL$=CHR$(27)+CHR$(42) as a clear screen command.

(d) The definition of all printer control characteristics. Commonly used controls will be: top-of-form, £ sign, print size, underlining.

(e) The definition of common messages: for example, BAD$='Incorrect entry, please try again'. This is also set up with the screen control for flash or reverse characters as desired or determined by your style.

(f) A table of the *common* variables (those to be transferred from one module to another) if the ALL option of CHAIN is not used.

(g) The program suite heading and main menu together with choice selection.

(h) A chaining table.

(i) Commonly used subroutines.

(j) All file handling subroutines.

The layout of the foundation module is shown in Fig 2.

Housekeeping & variable definition (a to f)
Program suite heading & main menu (g)
A chaining table (h)
Subroutines (i & j)

Fig 2 Foundation module layout

Examining an accounting program in detail should help to clarify the following.

The housekeeping is done by line 10:

```
10CLEAR:DIM H$(120), ST1$(10), ST2$(10), SD1$(12), F$(14)IT$(14), DAT$(14), T$(10), TR$(10): DEFDBL B: DEFINT J
```

H$() is the array to hold the nominal account headings. ST1$() and ST2$() are the fields in two stock files, one holding stock item data and the other holding stock sales data. SD1$() is the array of stock descriptors.

Next come the string variables:

```
15 A$=STRING$(20,"*"): AL$=A$+A$+A$+A$
20 SD1$(0)="Ref": SD1$(1)="Qty": SD1$(2)="Unit": SD1$(3)="Item": SD1$(4)="Size" . . .
```

The definition of the 12 descriptors in the foundation module will save a lot of space in the overlay modules. For example, to show the first 11 stock details after having selected the stock number and read this record:

```
FOR X=0 TO 10:PRINT SD1$(X); TAB(20)ST1$(X):NEXT X
```

is sufficient.

The screen control characters are defined in line 25:

```
25 CL$=CHR$(27)+CHR$(42): BT$= CHR$(27)+CHR$(73):
DEL$=CHR$(27)+CHR$(82)
```

These are a few of the screen control codes: clear screen, back tab and delete line. How these are set up depends on one of the strategic decisions — whether the program suite is to be general-purpose or specific. Give the control codes meaningful but short names like TOF$ for top-of-the-form or CL$ for clear screen. You will be using them extensively throughout the program and you won't have to keep referring to your list of variables (which you are of course, keeping as coding proceeds) because this is time-consuming. There is no need to waste memory space and typing-in time by continual use of long variable names: reserve these for when they are essential.

Grouping variables by common starting letters is another way of increasing their intelligibility.

Line 30 defines the printer control characteristics:

```
30 TOF$=CHR$(12): COM$=CHR$(15): UON$=CHR$(27)+CHR$(45)+CHR$(1): UOFF$=CHR$(27)+CHR$(45)+CHR$(0)
```

These are printer control codes for top-of-the-form, compressed print and underline on and off.

Line 40 is a sample common message:

```
40 TAIL$='Please pay this invoice before the 20th of next month.'
```

The table of common variables comes in line 80:

```
80 COMMON CL$,DEL$,A$,AL$.TAIL$, and so on.
```

If memory space permits, it is very much simpler to use the ALL option in the CHAIN command.

Next comes the title and main menu section:

```
100 PRINT CL$;SL$:PRINT SPC (23) 'Company Accounting and Stock Control':PRINT AL$: PRINT SPC(27) 'Copyright J. D. I. Locke 1984': PRINT
```

This is the title; SL$ clears an independent status line 25. This will later be used to show the title of the module in use. It is easy to forget which ledger is in use if you are taking a telephone call or a coffee break, especially as the menus can be similar in different sections of the program. The status line is particularly useful for this purpose as it is a non-scrolling line not affected by screen clear and is provided on many terminals. A routine follows the title to display company details and to call for input of the date which will be used throughout the operating session. The latter routine bristles with control codes and validation checks in order to simplify operator input and minimise operator error.

```
105 TEXT$(1)='1–Purchase Ledger': TEXT$(2)='2–Sales Ledger': TEXT$(3)='3–Nominal Ledger': TEXT$(4)='4–Stock Control': TEXT$(5)='5–End session'
110 FOR X=1 TO 5: PRINT TAB(30) TEXT$(X):NEXT X:PRINT:PRINT:KL=1:KH=5: GOSUB 520
```

This illustrates one simple method of getting a neat screen layout while minimising the possibility of typing errors in the coding. To obtain the main menu at any time only requires the contents of line 110. KL and KH are controls for the limit of numeric input at the line 520 subroutine. This in its simplest form could be:

```
520 REM**MENU SELECTION**
525 INPUT'Input the number required',K
530 IF INT(K)<>K OR K<KL OR K>KH THEN PRINT BAD$: GOTO 525
535 RETURN
```

The basic interpreter will catch the input of a letter rather than a number. The next program line in this section will print the selected choice in the status line by extracting MID$(TEXT $(K),3,LEN(TEXT$(K))) and combining it with the necessary control code.

Lines 130-170 are the chaining table. The same line of code will contain ON K GOTO 130,140,150,160,170 where:

```
130 CHAIN MERGE "PURCH", 1000,DELETE 1000-9999
140 CHAIN MERGE "SALES", 1000,DELETE 1000-9999
150 CHAIN MERGE "NOM",
```

```
1000,DELETE 1000-9999
160 CHAIN MERGE "STOCK",
  1000,DELETE 1000-9999
170 CLOSE:SYSTEM
```

Note the use of a common starting line and a common deletion range. This type of standardisation speeds the coding by making these references easy to remember. The last line, 9999, is a dummy line well past the end of program coding and is used to contain a REM of the module name. Always refer to this before saving the latest version otherwise you will find yourself overwriting another module on disk.

It can happen — just too easily. The end session is very simple in this case, merely a precautionary file closing before returning to the operating system. It is worthwhile considering back-up of all the data files at this stage. Try to make this operation as automatic as possible so that there is no excuse to skip this chore. You will often find that the operating system can help considerably here. Consider the use of a SUBMIT file to link the program with backup. (It will simplify matters if the suffix .DAT is given to all the data files that need regular backup.)

File-handling

The final section covers file-handling. Generally, the files will be random access, so subroutines will be required to open the file and dimension the fields, to read a record, to write a record and to find a vacant hole in the file for a new record. To give examples of these, the supplier's account file will be used. Twenty records per month have been allocated to each of 150 suppliers, giving 3000 records. At the end of each month, or when all the allocated records have been filled, a statement is printed out and the account cleared to a single brought forward balance. SAC% is used as the record number and is calculated from the supplier reference number, SUP%. The file is called SUPPACC.DAT.

```
250 REM**OPEN SUPPACC**
255 OPEN "R",£3, "SUPPACC.DAT":
  FIELD£3,3 AS F$(0),9 AS F$(1),8 AS
  F$(2),8 AS F$(3),8 AS F$(4),8 AS
  F$(5),8 AS F$(6),8 AS F$(7),8 AS
  F$(8):RETURN
260 REM**READ SUPPACC**
265 GOSUB 250:GET£3,SAC%: CLOSE
  £3: FOR X=0 TO 8: SAC$(X)= F$(X):
  NEXT X: RETURN
270 REM**WRITE SUPPACC**
275 GOSUB 250: FOR X=0 TO 8: LSET
  F$(X)=SAC$(X): NEXT X: PUT£3,
  SAC%: CLOSE£3: RETURN
280 REM**FIND VACANT SUPPACC**
285 SAC%=SUP%*20 -19: GOSUB
  250: GET£3,SAC%: WHILE SAC%
  <SUP%*20 AND VAL (F$(0))=>1:
  SAC%=SAC%+1: GET£3, SAC%:
  WEND: LSET F$(0)= MKI$(SAC%):
  FOR X=1 TO 8:LSET F$(X)="": NEXT
  X: PUT £3,SAC%:CLOSE£3:RETURN
```

It should be noted that the first field contains the record number when it's occupied, otherwise it is blank. The subroutine at 280 may seem longer than is necessary as the section which writes back the record number only into the vacant record. This is a precaution to be taken in a multi-user system to reserve the vacant record as soon as it is found while the user, or another part of the program, determines its contents. Without this, you could find two users both trying to grab the same record.

This is not the only precaution that has to be taken — other users should be locked out of that file or that record while it is being written to. The use of a single open statement is invaluable during program development, since only a single statement has to be altered should any changes to the file structure be required. The use of common file-handling subroutines does make the adaptation of the program to multi-user simple. All that is required is a jump, at the beginning of the write routines, to a test subroutine to check whether that file is in use and whether that record is in use at the moment. A jump back to the file-sharing routine is made just after the file has been closed to reset the indicators and to release the file again.

In its very simplest terms, with the files only being open for as long as required (as illustrated here) it's possible for a small multi-user system to set a single key when any file is open for writing to inhibit all other access to the files during this time. Even with three users, the resulting delay is negligible. The delay to re-read this key to see if it has been cleared after an unsuccessful attempt need only be of the order FOR X=1 TO 500:NEXT X. Although it is common practice to open all the files necessary at the beginning of the program and then to close them all at the end of a session, I prefer to close most of the files as soon as reading or writing has taken place and accept the slight loss of speed.

Multiple record search

An exception to the above principle is the multiple record search, an example of which is at subroutine 280; here the file is opened at the start of the search and closed at the end. The speed penalty is small and it does save the loss of all the data files when the system crashes.

As another example of multiple record search, assume that there is a file called SUPPLIER.DAT, £5, containing such details as name, address, telephone number, and so on of 150 suppliers (record 151 is a dummy). The record number is given by SUP% and the file is opened by subroutine 310. To search for a particular supplier's name (contained in field F$(2) one could use:

```
1100 TB=0: INPUT"Name";NA$:
  GOSUB 2070: IF TB=1 THEN PRINT
  "Another try?": GOSUB 500: ON K1
  GOTO 1100,1000,1000
2070 GOSUB 310: SUP%=1: GET
  £5,SUP%: WHILE SUP%<151 AND
  NOT INSTR(F$(2),NA$): SUP%
  =SUP%+1: GET£5,SUP%: WEND
2080 CLOSE£5: IF SUP%>150 THEN
  PRINT"Name not found": TB=1:
  RETURN
```

Note that as the 'while' condition depends on the contents of a field, the file must be read outside as well as inside the loop. The subroutine at 500 is a standard yes/no routine returning K1=1 for yes, K1=2 for no and K1=3 for error. Each module starts at line 1000 with a menu display. The return must not be to a clear screen command, otherwise the message will not be displayed.

Although the above implies that all the files should be random access, sequential files are useful for reading data into an array: for example, the account headings, if they were set up in a separate program.

```
50 OPEN "I",£1, "STARDATA.DAT"
55 FOR X=0 TO 5: INPUT£1,CO$(X):
  NEXT X: INPUT£1,MI$: FOR X=0 TO
  120: INPUT£1,H$(X): NEXT X:
  CLOSE£1
```

In this example, CO$(X) includes the company name and address, MI$ the first month in the financial year, and H$(X) the account headings as described before.

As mentioned, one strategic decision which must be made before program design commences is whether the program is to be machine specific or general. If the latter, then a customising module has to be written. One approach is simply to list the machine specific control characteristics required and then let other users insert the codes to match them.

Research

The other approach is for you to carry out the necessary research into the most popular terminals and printers, and to find out what control codes they will support. You then set up a multiple choice for the user to select the terminal/printer that is being used. The program transfers these specific control codes into a file which can be read by the foundation module to match the variable names that have been given to the control codes in the program. The complete set-up program need not be complex and can be covered by a page or so of code.

It is assumed, of course, that all the machines have a common operating system and carry a common Basic variant, hence the use of MBasic for the examples. I'm not a purist when it comes to the use of GOTOs. A pragmatic approach is important and good use should be made of all the tools to hand.

END

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PHILIPS Business Systems

Spreading the word

Messaging facilities play an important part in the concept of portability. Menno Aartsen takes the weight off his arms to examine exactly what constitutes a portable machine, and looks at the electronic mail systems portables can talk to.

The gap is widening between portables which try to emulate desktop machines and those which aim for true portability. The recent introduction of the Apricot Portable is a perfect example: it's a powerful MS-DOS machine, containing everything the computer user needs. A mini-floppy and a full-size screen make it completely independent, anything from Lotus 1-2-3 to an accounting package will happily run on it, and it can be moved from work location to work location quite easily. Yet it's not a true 'portable' computer, a term better reserved for lap held machines. The Tandy Model 100, in particular, has done much for true portability, although some people still think of it as a toy.

A journalist's toy, I should add — journalists were the first true users of the little 100, which enables stories to be written on the spot, on the train and on the plane, and then transmitted to base either direct or via an electronic mail system such as Telecom Gold. Many more professions have discovered the possibilities of these electronic notepads and found that they are quite powerful in their own right. A Tandy 100 with 23k RAM will yield around 29k of user memory, with Basic, a simple text editor and a communications program in ROM. The Epson PX-8, on the other hand, is even more powerful and sports CP/M (with utilities), WordStar, Portable Calc and a scheduler. It has 24k of user memory (which runs out very quickly once WordStar starts creating backup files), supplemented by 29k on microcassette.

But where Tandy has attempted to create a portable with optimum usability, Epson has tried to emulate a desktop computer. The Tandy 100 is the more useful machine, despite the Epson's 80-column by 8-line display where the 100 only offers 40 columns.

Pocket micros

We'd all like a powerful micro in our pockets, but every extra carries weight. As a journalist I've carried both machines for days on end, covering exhibitions or attending conferences, and started to notice the weight very soon — after all, one usually carries more than just the micro. With acoustic coupler, the usual paperwork, keys and other gubbins, a case can easily weigh in at 10 to 15lbs, which is a lot to carry around all day. In this respect every ounce counts, which is where the Tandy (just over 3lbs) wins easily.

Although Epson has produced a very nice little machine, I can't see the need for PIP and CONFIG in a lap held. Epson does produce a battery-driven floppy, but with four software packages on ROM, built-in microcassette and RS232, I don't really need additional storage space. Once you progress to large files and other software it's surely better to buy a 'full' portable, considering the fact that a PX-8 with two floppy drives, diskettes, coupler, cables, spare batteries and charger can hardly be called 'lap held'.

But it all depends on what you expect to do with a portable, of course. Where the Apricot will happily give you an office computer in any location with a convenient AC socket, the true lap held allows the user to access electronic mail systems and remote databases, or even the office computer. The US company Dialcom, now owned by ITT, started the craze with a viewdata system which could be dialled from within the US, and which would accept text output of, what were then, communicating typewriters, or teletypes. You could leave a message for someone else, receive your own and browse through information pages.

Illustration by Eddi Gornall

Today, the US alone has dozens of these ASCII databases — no graphics, no colour, the simple standard keyboard character set and lots of info. They vary from CompuServe in Columbus, Ohio, where one finds mostly computer enthusiasts, via The Source in McLean, Virginia, where thousands of teenagers make each other's acquaintance, to Dow Jones News/Retrieval, where stockbrokers can find the latest quotes and read *The Wall Street Journal*.

There are very few 'true' message systems in the States. The latest arrival on the scene is MCI Mail in Washington DC, which offers a gateway to Dow Jones but only provides a mailing service itself. It will allow the user to send surface mail, however, from ordinary two-day post to a four-hour courier delivery in any major popula-

tion centre in the US and Canada.

Which brings us home to Telecom Gold, a British system based on ITT Dialcom software and primarily intended for messaging. Telecom Gold does not run a database, but subscribers do have the facility to make their own available. Gateway facilities are under development, and Roderick Manhattan Associates will shortly start trials, through Telecom Gold, with Manhattan Linq, a European surface mail service with the same possibilities as MCI offers in the States.

The major advantage of a service like Telecom Gold is its link-up with the international packet switching network. From the user's terminal, every ITT Dialcom user in the world can be mailed, and the system can be accessed from any location with a Tymnet node.

Electronic mail

The Tandy 100 is a clever machine: it was designed for use with these electronic mail systems although you can happily use it as a word processor. Tandy's portable version of Scripsit takes only 4k (as compared with Epson's Wordstar, 33k) and has all the basic processor functions. On the road, however, where you're unlikely to be lugging a printer, its own text editor does handsomely. Provided you have an electronic mailbox, you simply dump the contents of your memory (for safekeeping) and continue working. Since all its internal data is, or can be, converted into ASCII code, anything from your diary to utility software can be transmitted via electronic mail and retrieved the same way.

It's unfortunate that neither Tandy nor Epson have found it necessary to provide built-in modems with their portables. Officially they say BABT approval is a problem, but I suspect that preparing a modem card for a small market would make the machines too expensive. Every European PTT has its own standards, and these standards are different in every country; only the USA is a big enough market to warrant the development cost. The American version of the 100 thus comes with built-in Bell modem and software for auto-dialling, automatic log-on and automatic data retrieval. All you have to do to read and download your mail or stock market quote is program it, plug it into the telephone socket, press one button and hey presto! — it goes away and does it.

But Britain can't have it, and that's final. Even ACT doesn't bundle terminal software or a modem for its portable; it's all optional, meaning extra pounds and pence. And even if you do get your coupler, modem and terminal emulator, you're not always home free. European buyers of Epson's PX-8 soon noticed that when they started using dial-up services, the terminal program either 'throws' you or simply doesn't work. Why? Epson isn't saying, but I suspect the software contains a modified American terminal package. This was originally intended to work with a

bolt-under Bell modem with its own port, while we in Europe have to make do with the RS232C port as the connection.

Epson-to-Epson works well, but then that is not dependent on correct tones or voltages which differ in the American and European telephone network. Epson users who have experienced these difficulties might like to know that *PCW* offers a (free) solution (see box).

'The major advantage of . . . . Telecom Gold is its link-up with the international packet switching network. From the user's terminal, every ITT Dialcom user in the world can be mailed, and the system can be accessed from every location . . .'

The use of portables and dial-up services is really tied to professions — private use is simply too expensive. The Epson is a splendid little machine if you happen to have another CP/M computer, so file and software transfer become useful. The PX-8 is specifically configured to talk to Epson's own HX-10 desktop micro, but it wouldn't talk to my Rank Xerox 820-II although the latter would work as a terminal on the Epson. Other than that, you really need the memory expansion pack and/or floppies, both of which make the thing highly unwieldly. The Tandy 100, made by Kyocera which also supplies Olivetti and NEC, does have a limited memory (for some reason the 24k plug-in RAM isn't sold here) but will work as an intelligent terminal and has nice, big readable letters with true descenders, which is useful if you're writing on a train at night. It's virtually impossible to crash and will take a fall or a bucket of water without complaint (yes, both happened to me).

Don't go for a portable unless you really want a portable, and if you do, use it with a mail system. And don't get on electronic mail unless you've got someone to talk to, and if you do, be prepared to pay for it. Telecom Gold is supposed to charge 10.5p per minute during working hours, but if you add the cost of the telephone, you pay between 13 and 15p. Once you're outside of London and have to use PSS the situation gets even worse: a five minute datacall can add another 12p exclusive of VAT. With foreign (American) databases, apart from the dollar exchange rate, the cost of PSS is horrendous: six minutes on The Source cost £1.05 just for the transatlantic connection. Because of the timeshift, you normally end up in either PSS's prime time or in that of The Source, so beware.

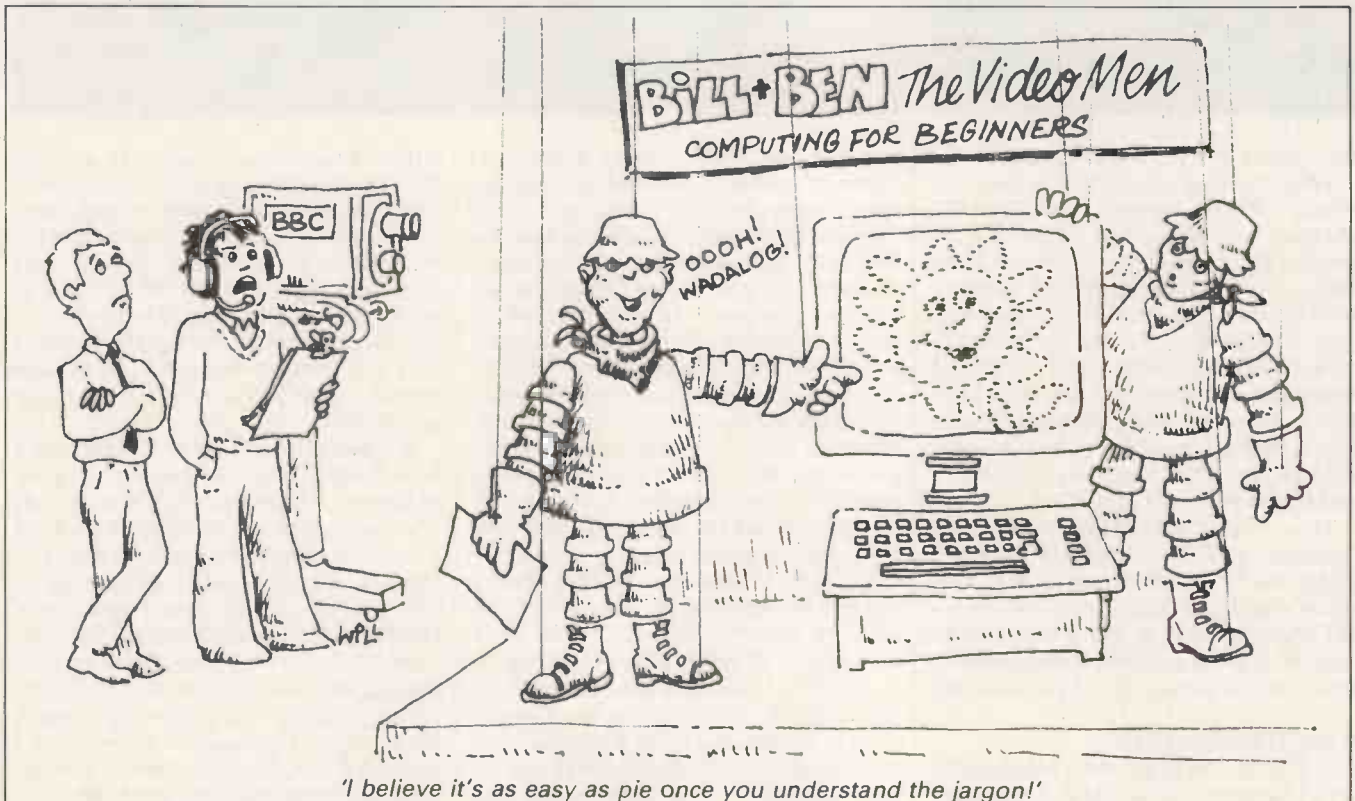
Conclusion

Portable computing is good fun, and useful for some, but has a long way to go. You can't make a keyboard smaller and a larger screen does away with portability, so lap-helds will always be a compromise. Not until a portable with a large internal memory and a real fold-under screen is introduced will we really be able to carry our office around with us.

The Data General One is a step in the right direction, but we'll have to wait for cheaper technology and make do in the meantime.

'The use of portables and dial-up services is really tied to professions — private use is simply too expensive. The Epson is a splendid little machine if you happen to have another CP/M computer, so file and software transfer become useful.'

PCW readers who own or use an Epson PX-8 may have run into the terminal problems mentioned in this article. Gerrit Slot, who runs the Dutch Epson Users' Club bulletin board, has written a terminal program which is in the public domain, and Epson UK has offered to copy it onto your empty microcassette. If you send it to *PCW*, along with a suitable sae, it will be returned with a copy of the program. Written in C, it contains an Xmodem option and will take up 11k of RAM.



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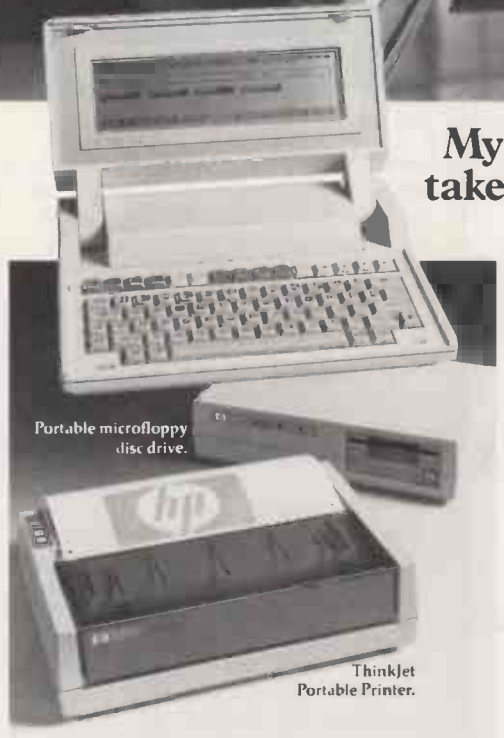

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Perfect power

The Perfect suite of programs is familiar as the bundled software with a selection of machines. John Vogler presents various procedures that he's implemented with the package on an upgraded BBC Micro.

Perfect software (in an improved version 2) is shortly to be marketed in the UK by Thorn EMI Software, initially for the IBM PC, with releases for the Apple and Apricot following close behind. The company is already known to CP/M users: for example, the estimated 12,000 users of the Torch and Torch upgrades of the BBC Micro. Recently, a number of other popular and low-cost business micros have been bundling Perfect software with the initial computer purchase: for example, WH Smith's bargain the Ferranti Advance, and the Prism Wren.

As more and more small businesses discover that home micros with single processors are not sufficiently powerful for their needs, it is likely that an enormous number of people will be cutting their teeth on Perfect software. Hence this article written by a business user (small-business computing consultant, and management consultant) for business users.

Perfect software (version 1) comes from the States. As bundled in this country it comprises: Perfect Writer word processor, which includes the spelling checker Perfect Speller; Perfect Filer database; and Perfect Calc spreadsheet.

These procedures are for a BBC fitted with a Torch ZEP100 Z80 processor and any dual disk drive. This is the *least* powerful hardware that will run them. Users of the Torch business machine will find only minimal changes are needed from descriptions given here. If they refer to the keyboard diagrams in the Programmers' Guide, they will find that the left-hand pad keys bear a number whose final digit is the same as the function key number given in this article (f0, f1, and so on). Those with more sophisticated systems will no doubt build on these ideas.

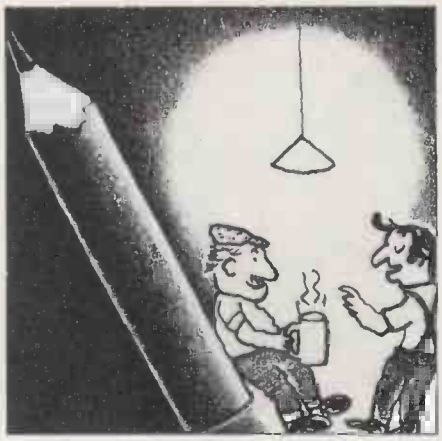


Illustration by Chris Winn

```
B 2
VDU 12
;                    Loading Perfect Writer
;                PLEASE WAIT until menu appears.
;          ...To edit file B:$1.MSS press 'E' followed by red key f0
;          ..To format file B:$1.MSS press 'F' followed by red key f0
;          ...To print file B:$1.FIN press 'P' followed by red key f1
;                   Red key f2 has been primed with '$2'
;              NOTE All the above red keys need SHIFT + CONTROL
*FX3,6
F 7
*FX11,20
*FX12,8
*FX4,2
*FX226,193,0
*FX228,1
*KEY 0 B:$1.MSS|M
*KEY 1 B:$1.FIN|M
*KEY 2 $2
*KEY 3 |XO
*KEY 4 |F@ ITEMIZE[]|B
*KEY 5 |F@ ENUMERATE[]|B
*KEY 6 |F@ SUBHEADING[]|B
*KEY 7 |F|B
*KEY 8 |F|B
*KEY 9 |D|[F]|B
*FX219,138
*KEY 10 |[F|D-|[F
*KEY 11 |{|H
*KEY 12 |[5|[B
*KEY 13 |[5|[F
*KEY 14 |[>
*KEY 15 |[<
*FX5,2
*FX8,4
*FX138,0,13
*FX138,0,77
*FX138,0,69
*FX138,0,78
*FX138,0,85
*FX138,0,13
*FX3

NOTE: There should be no space after the @ command: the space
      has been inserted to disable the command when printing!
```

Fig 1 Command file W.SUB to load Perfect Writer

Perfect Writer

I work in three separate phases: text input, performed at high speed with accuracy secondary, either by myself or by a secretary or typist; editing, to produce a word perfect manuscript with all necessary formatting commands in place; and finally, format and print.

With text input only slight improvements are possible, of which the most important is a slickloading sequence. I do not have a winchester disk, so text files go onto different floppies according to the client. Originally these were listed on paper in the drawer beneath the computer. Now I find it's quicker to type D RETURN, which loads command file D.SUB (a display of which disk contains what) that ends with the system prompt onscreen ready for the next stage. For this I use a writer's command file, W.SUB, which resides on each of my Writer/Filer program disks (always placed in top drive 'A') (Fig 1). The user enters:

W <filename> <keyword> RETURN

The file name needs neither the drive prefix 'B:', nor the file name extension .MSS; both are added automatically by argument substitution, using the rules for preparing command files. The keyword is any single phrase which may be frequently repeated during the text, but a shortcoming is that only

upper case words can be used. It's very handy for evironment commands or for writing 'Perfect' innumerable times!

Planning ahead, you would need to do the above immediately you sit down to the machine, then, while the disk drives are whirring, you can organise dictaphone, earphones, text being copied, flask of coffee and all the other essentials. By the time attention returns to the screen the disks are silent, ready for a single-letter selection from the menu (such as 'E' to Edit) followed by function key (a red, user-definable key at the top of the keyboard) f0.

An alternative sequence T.SUB is for typists only. It is even quicker to load, requiring only two keystrokes plus the file name, but occupies f8 with an EXEC command that prevents its use for other things.

W.SUB speeds up the auto-repeat and shortens the delay; each user and secretary must tune these to suit their touch. I like a rather fast auto-repeat so that I can zoom the cursor around the screen when editing, but need a longer auto-delay. When writing, I make frequent use of three or four environment commands, particularly: ITEMISE, ENUMERATE and SUB-HEADING. These are programmed into function keys with the vital final bracket (to terminate the environment) in position, but with the cursor pulled back to its correct position *before* the final bracket.

Editing provides the major gains. To the ordinary user it may seem to place too much importance on tiny time-savings and speed gains. However, to the professional user editing thousands of words a day, be it book, report, news article or broadcasting script, these represent huge increases in productivity and a detailed, complex system is justified. In discussing it I'll refer to command keys, by which I mean the use of a key to perform some task (for example, delete the next word) rather than type a character. Perfect software gives some keys (in different combinations with others) as many as three or four different tasks.

One of Perfect's shortcomings is that you cannot function key definitions while in the program: all have to be pre-defined. W.SUB, therefore, contains an elaborate key definition sequence. Unshifted function keys have been defined by Torch. The handbook omits to mention that the COPY key alone performs the sequence ESCAPE CONTROL W — the CONTINUE SAVING command which is used for gathering isolated fragments of text and indicated by the appearance of a '+' at the right-hand end of the echo line. Use of this makes text gathering much slicker. After gathering text, or just deleting, it may be necessary to discontinue the gathering (denoted by the disappearance of the +). This can be done by either CONTROL G or the DELETE key.

Controlled function keys (depressed while CONTROL is held down) have also been defined by Torch. Because this has been done for the Torch business machine, it appears rather illogical on the BBC keyboard. They can be redefined using *FX227, but I disagree. Any definition the user imposes is eradicated when the Perfect program is loaded. Again the handbook does not mention that the left arrow cursor key plus CONTROL deletes the word in front of it to the right, which is utterly illogical but quicker than ESCAPE — F.

Using *FX4,2 enables the five grey (ARROW and COPY) keys to be defined, in addition to the 10 red. However, SHIFT and SHIFT + CONTROL function keys cannot be freely defined simultaneously. Define one group (using *FX226,1 or *FX228,1) and the other can only be set in a combination dictated by the list (Appendix C, *Changing the Command Keys*) in the handbook. This appendix has been included for use with a program named WRTBIND.COM, which can be used to alter the command function of any key but which is unfortunately not available. Without it, the user's best hope is to select whichever block of 15 sequential code numbers gives the most useful set of key definitions. My preference is for codes 193 to 208 inclusive. The BREAK key, which is also function key f10, cannot be used in practice but its place can be taken by the TAB key by use of the code *FX219,138.

These codes (imposed by

*FX226,193) form a coherent set of editing controls which, if the SHIFT LOCK is on, can be used single-handed to move the cursor one word, sentence or paragraph in either direction, change to upper or lower case, delete the next word or sentence, or mark the current paragraph for deletion or moving. There is also a command, ignored in the handbook, to indent successive lines by any amount. It requires a VERBATIM environment but is far more flexible than the INDENT environment command, which will only indent by a fixed half-inch.

Perfect Writer's range of commands for moving rapidly through a text, when editing, is already wider than almost any other word processor. You can move by letter, by word, by line, by sentence, by paragraph, by screen or by the whole text. However, some of these are achieved with clumsy 'one-two' commands, such as ESCAPE followed by a key, or by a CONTOLled key; or CONTROL-X followed by a key, or by a CONTROLled key. The arrangements described aim at least to reduce these to simultaneous keystrokes. The benefit becomes most evident when repeating the task; for example, moving the cursor three words forward, which can now be done with one finger static on SHIFT while the other taps £5 three times or holds it down momentarily.

This leaves the user to fully define all the function keys with SHIFT + CONTROL, and each user will have his or her own favourites. For many the most important need will be the command to delete a word backwards. This is an essential facility for rapid editing, yet even its laborious one-two form, ESCAPE CONTROL-H, is not mentioned in the handbook. To have it ready to hand, I put it on f11, the COPY key. Still in search of rapid cursor movement, I have defined the left and right arrow keys to move five words either way. The up and down arrow keys find the extreme start and finish of the text, replacing the clumsy ESCAPE SHIFT < and >.

Other SHIFT + CONTROL definitions include f0 and f1, and f2 which contains the key phrase described above. Because I do a great deal of split-screen editing, f4 is used to flip from one window to the other. f4 to f6 contain the environment commands mentioned above, while f7 and f8 automatically insert bold-face and underline commands. f7 sets up the BOLD command for use while inputting text (the command is typed *before* the word), with the final bracket of the environment 'fence' moving ahead of the text. If the word has already been typed, a rapid two-part operation is used. Pressing f7 places the command, complete with closing fence, before the word and f9 then moves the closing fence, one word at a time, through as many as are to be emboldened. Similarly with underlining. Finally, the TAB key (acting as f10) is used to hyphenate any pair of words.

Alternatively Torch advises that customers buying the MCP Plus-100 upgrade pack will get a utility program, Softkey, which, run on its own will display the function key settings, and run with a filename will create the relevant key definition statements.

Perfect Speller automatically counts the words, but is not accessible during editing. However, f8 not only lists the buffers in current memory but also tabulates their length in characters. The trick therefore is to count the words in a typical piece of text using Perfect Speller, then divide this by the number of characters to find your average word length. There will be surprisingly little variation between different texts, so the character count, divided by this figure, will give a rapid and surprisingly accurate word count.

Perfect Writer has an extensive and imaginative range of commands for document design. They are invoked by instructions that use full key words, such as DESCRIPTION. As well as by defining function keys, this can be avoided by creating standard document headers. For example, HEAD4AR where 4 stands for A4 and AR for article. The header not only defines the page margins: it prepares the environments for the article heading, sub-heading and page headings, and gives the option of turning off page numbers.

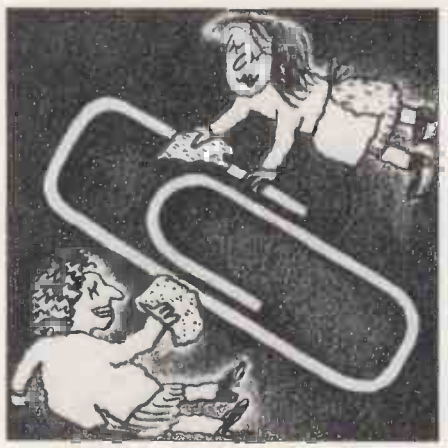
For letters (but only to correspondents who are not included on the database) there is L4E4W.M and L5E5W.M (Fig 3) for A4 or A5 paper and envelope. These are loaded using L.SUB, which automatically loads the heading and has slightly different key definitions. Once the address has been typed for the letterhead, pressing f0 automatically copies it onto the envelope which is printed immediately following the letter.

W.SUB speeds up loading and reloading the text file on which you are working. Typing drive letter, colon, file name, extension and RETURN every time is irritating. W.SUB avoids it elegantly: provided the file name is included as the argument when loading, the whole sequence is contained in f0 thereafter while, to initiate printing, f1 contains the name of the formatted file (with the extension .FIN).

To preview the exact page layout before printing, the handbook instructs that it should be formatted with the console or screen as output, configured identically to the printer. However, viewing a formatted text as it scrolls rapidly past is difficult.

There are helpful error messages generated by the formatting program but they are limited, particularly in respect of one irritating problem. This is the disastrous consequence of omitting the final fence of an environment command, namely that the entire remainder of the document is itemised or enumerated. Whereas most single-character errors can be altered even after printing, this one must be corrected before.

For this I use CON.SUB (Fig 2) which imposes paged mode instead of scrolling so that text can be examined meticulously. Secondly, it defines keys f8 and f9 to search for the left and right square brackets I use as the fences for environment commands. Thirdly, like W.SUB, it speeds up loading and reloading.



Perfect Filer

The Filer database is the weakest

```
B 2
VDU 12
VDU 21

*FX226,1
KEY 0 PW B:$1.MSS¦M
KEY 1 VDU 14¦MPF -c B:$1.MSS¦M
KEY 5 VDU 15¦M
KEY 8 ¦S[¦[
KEY 9 ¦S]¦[
VDU6
;               To display formatted file: press f1
;                To show next screen, press SHIFT
;              For continuous scrolling press ESCAPE
;             To restore scrolling afterwards press f5

;             To load file on PERFECT WRITER: press f0
; To search for missing environment brackets, press f8, f9 alternately.
```

Fig 2 Command file CON.SUB for viewing formatted text

element of the Perfect suite. One defect is that it only permits one data file to be open at a time and allows only one database file on a whole double-sided data disk. The handbook urges creation of two separate correspondence data files, one for organisations and one for individuals. My correspondents are such a mixture of organisations and individuals that I ignored Filer's templates and merged the two as a single, multi-purpose record.

One difficulty with Filer that can be overcome is the small size of the cursor. This can be changed by VDU 23,0,10,64 which produces a large, flashing cursor. For smaller cursor size, select other values (between 64 and 71) for the final argument.

Another shortcoming is the absence of a browse facility. I have failed to overcome this and shall be indebted to any reader who can help.

I have learned one or two lessons about designing database records. I incorporated a switch — a status field that switches any individual member into or out of a given subset — using yet another command file, S.SUB, which defines user keys to switch members on or off. To economise on keystrokes when defining lists, form letters, and so on, my fields use only a two-character field tag, such as sn. This undoubtedly saves time, but does not provide meaningful subsection headings.

In the light of this experience perhaps full-word tag names, such as 'surname', are justified. Include two or three spare fields so that the standard database can be used for special functions. Spare fields should be alphanumeric.

Perhaps the most important lesson when designing a Filer correspondence database concerns addresses. To analyse correspondents by their location, I designated three fields for ADDRESS, the fourth for CITY, COUNTY or STATE, the fifth for POSTCODE, the sixth for COUNTRY and the seventh for world REGION. This was a mistake which cannot be altered by MOVE, only by changing each member individually.

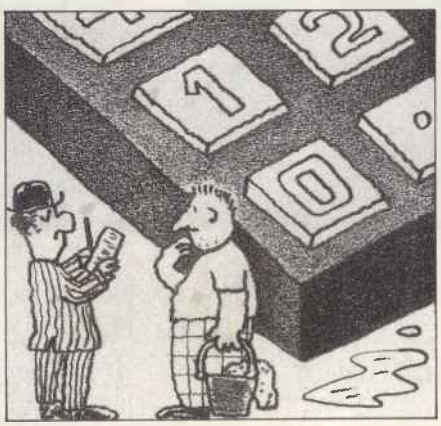
My database is mainly used for correspondence, so I avoid shuffling program disks in and out of the top drive by holding both Writer (plus its entourage of command files and headers) and Filer on a single program disk, generously protected and backed up. This has been achieved by scouring away all surplus programs. Correspondence that plucks names, addresses, products, prices and other comments off the database is initiated by a completely different command file, M.SUB. Editing facilities on function keys have been replaced with sequences that pick their way through Filer's menu choices. It is loaded by M letter-format ID of-correspondent. The ID is Filer's recommended four-digit member identity tag.

Letter formats are of two types: form letters, whose text will be written using Writer but whose variables and printing are controlled by Filer, are distinguished by a final F in the file name and use Filer's special formatting commands; and individual letters, for which standard headers are fed into Filer to gather date, name, address and salutations, then printed to file. The file B:L.MSS is automatically erased as the first task when M.SUB is run, then recreated for the new batch of letters and loaded automatically into Writer for insertion of text and any editing of the information that came from the database.

```
          This is for A4 letters that do not use the database.
                  L5E5W.M for A5 letters is similar.
@ MESSAGE'INSERT INTERWASTE A4 LETTERHEAD - Top of paper to top of rollers'
@ PAGEFOOTING()
@ STYLE(paperwidth 8 inches)
@ STYLE(paperlength 11 inches)
@ STYLE(topmargin 0 lines)@ COMMENT"So second sheet is full to top!"
@ STYLE(headerspacing 0 lines)
@ STYLE(bottommargin 3 lines)
@ STYLE(leftmargin 5 chars)
@ BLANKSPACE(6 lines)@ COMMENT"Space for letterhead"
@ BEGIN(VERBATIM)@ COMMENT"Address starts next line"

@ COMMENT"To address envelope, now press RED KEY f3 + SH + CTRL"
@ COMMENT"Next line: write the date"

Dear      @ COMMENT"Delete for personal friends"

@ CENTER(@ ux[])
@ END(VERBATIM)@ COMMENT"Text starts on next row"

@ BEGIN(VERBATIM)

Yours sincerely

J A Vogler
@ END(VERBATIM)
@ NEWPAGE
@ MESSAGE[Insert A4 envelope - Top of envelope to top of rollers]
       FIRST CLASS @ COMMENT"Delete for second class or airmail"
       @ BLANKSPACE(3 lines)
@ BEGIN(address)@ COMMENT"Address starts on next line"

@ END(address)
@ NEWPAGE
NOTE: There should be no space after the @ sign: the space has
      been inserted to disable the command while printing this Figure!
```

Fig 3 Perfect Writer letter header L4E4W.M

Solitary envelopes for bills or parcel labels are addressed using E.SUB. This takes, on average, 43 seconds to address an envelope from a cold start; a second envelope takes only 10 seconds more. For a single envelope the computer is thus much slower than addressing by hand, the only way to improve this would be to buy a Winchester disk drive. Finally, such a plethora of command files and headers needs its own index, both on paper and on yet another quick-to-load command file, Q.SUB.



Perfect Calc

I loaded Perfect Calc with S.SUB, which switches on the printer and defines the function keys with a number of commonly used processes or part processes. The normal and CONTROLled keys are already defined by Torch. Once again, each user will find certain functions are either inconvenient or commonly used and define his own. To demonstrate the scope, my SHIFTed keys are: f0 starts the first task after loading; to alter the width of the current column; ready for the new number. f1 moves to the top of the sheet and f2 to the bottom. f3 splits the screen, horizontally, at the centre line; saves failed commands due to an unsuitably placed cursor. f4 prepares for creation of a sum formula. f5 converts all numerical entries to integers. f6 draws a continuous line across the screen, and indexes the cursor one column to the right. Holding this key down thus draws a line across the spreadsheet, regardless of column widths. f7 does the same with a line of asterisks. f9 puts the current cell into edit mode, with the cursor positioned at the right-hand end of the text. Arrow keys all jump the cursor five lines or columns. The COPY key switches from one window to another. Users of the Torch business machine may have already discovered that despite the handbook's statement to the contrary, the left-hand keypad and EXACT SPACE key have already been configured for Perfect Calc.

The PCCONFIG.COM program that redefines all Perfect Calc keys is provided, so it is unnecessary to use SHIFTed and CONTROLled function keys. However, to change them sacrifices the enormous benefit of Calc and Writer using identical codes: for example, to save the current file, CONTROL-X CONTROL-S or F5 on both. This elegant simplicity evaporates if Calc keys change when Writer's cannot. **END**

It is an interesting paradox in business, that those who achieve the greatest success, appear to do so with the least amount of work.

This illusion of relaxed inactivity is considerably heightened by the Wang PC.

Like its human counterpart, the Wang works faster than its rivals. Put another way, that's twice as fast as an IBM PC.*

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There's no referring back to manuals, all instructions appear on the screen. And should there be a moment's uncertainty,

Invariably, the man with most on his mind has least on his desk.

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It takes all sorts...

If you think that every important aspect of programming arises somewhere in the context of sorting and searching, then you're in full agreement with master programmer Donald Knuth. Mike Liardet looks at Sorting and Searching, *the third volume of his book,* The Art of Computing Programming.

```
10000 REM INITIALIZE
10010 INPUT"NUMBER OF RECORDS TO SORT";N
10015 IF N<0 OR INT(N)<>N THEN PRINT CHR$(7):GOTO 10010
10020 INPUT"RANGE OF KEYS 1 TO..(OR 0 = IN ORDER, -1 = REVERSE ORDER)";MI
10025 IF MI<-1 OR MI>1E+08 OR INT(MI)<>MI THEN PRINT CHR$(7):GOTO 10020
10030 GOSUB 30000
10040 PRINT"SORT METHOD..."
10045 PRINT"  0. STOP"
10050 PRINT"  1. INSERTION SORT"
10060 PRINT"  2. SHELL'S SORT"
10070 PRINT"  3. QUICKSORT"
10080 PRINT"  4. DISTRIBUTION COUNTING"
10100 INPUT"ENTER 0 TO 4";CH
10105 IF CH<0 OR CH>4 OR INT(CH)<>CH THEN PRINT CHR$(7):GOTO 10100
10107 IF CH=0 THEN STOP
10110 ON CH GOSUB 20000,21000,22000,23000
10115 PRINT CHR$(7);CHR$(7);CHR$(7);
10120 GOSUB 31000
10130 RUN
20000 REM INSERTION SORTING - N ITEMS IN K() AND R$()
20010 FOR J=2 TO N
20020 K=K(J):R$=R$(J)
20030 FOR I=J-1 TO 1 STEP -1
20040 IF K>=K(I) THEN 20080
20050 K(I+1)=K(I):R$(I+1)=R$(I)
20060 NEXT I
20070 I=0
20080 K(I+1)=K:R$(I+1)=R$
20090 NEXT J
20100 RETURN
21000 REM SHELL'S SORT
21010 DIM H(15)
21020 H(1)=1
21030 FOR I=2 TO 15
21040 H(I)=3*H(I-1)+1:IF H(I)>=N THEN 21070
21050 NEXT I
21060 PRINT"N>7174453 ERROR":STOP
21070 T=I-2:IF T<1 THEN T=1
21080 FOR S=T TO 1 STEP -1
21090 H=H(S)
21100 FOR J=H+1 TO N
21110 K=K(J):R$=R$(J)
21120 FOR I=J-H TO 1 STEP -H
21130 IF K>=K(I) THEN 21170
21140 K(I+H)=K(I):R$(I+H)=R$(I)
21150 NEXT I
21160 REM ASSUMES I IS DEFINED ON COMPLETION OF FOR-LOOP
21170 K(I+H)=K:R$(I+H)=R$
21180 NEXT J
21190 NEXT S
21200 RETURN
22000 REM QUICKSORT WITH INSERTION SORTS FOR M OR LESS ITEMS
22010 DIM LSTACK(20),RSTACK(20)
22015 INPUT "M VALUE (EG 9):";M
22020 IF N<=M THEN 22150
22030 TOP=0:LFT=1:RGHT=N:K(0)=-1E+10:K(N+1)=1E+10:REM !!!GOTO 22040
22031 LFT=0:RGHT=N+1
22032 SWAP K(INT((LFT+RGHT)/2)),K(LFT+1):SWAP R$(INT((LFT+RGHT)/2)),R$(LFT+1)
22034 IF K(LFT)>K(LFT+1)THEN SWAP K(LFT),K(LFT+1):SWAP R$(LFT),R$(LFT+1)
22036 IF K(LFT+1)>K(RGHT)THEN SWAP K(LFT+1),K(RGHT):SWAP R$(LFT+1),R$(RGHT)
22038 IF K(LFT)>K(LFT+1)THEN SWAP K(LFT),K(LFT+1):SWAP R$(LFT),R$(LFT+1)
22039 LFT=LFT+1:RGHT=RGHT-1
22040 K=K(LFT):R$=R$(LFT)
```

Fig 1 Sorting program

Sorting is the process of arranging things in ascending or descending order. Knuth points out that the layman's use of 'sorting' means something slightly different, and computer sorting could more correctly be called 'ordering', or 'sequencing'. In some senses sorting is related to the other topic in the volume, searching. This is because searching becomes a great deal easier once the items are sorted; imagine looking for a word in an unsorted dictionary.

Knuth divides sorting into two categories, internal and external. Internal sorting is used when all the data can be accommodated in high-speed internal memory, or RAM. External sorting is used when some, or most, of the data lies in external memory such as disks or tape, which are a great deal slower to access. This difference in access speed necessitates different approaches to the two types of sorting.

A prerequisite for external sorting is an ability to do internal sorting. However, as external sorting strategies are influenced by the hardware available and are generally more complex, I'll stick to internal sorting.

For internal sorting, Knuth presents well over two dozen different algorithms. It's not easy to pick a 'best' one, since different algorithims are better in different situations. It is, however, fairly easy to identify the worst one, called 'bubble sort'. For some perverse reason bubble sorting has enormous popularity with programmers, possibly because it's easy to remember when Knuth's volume is not to hand. I'll present some of the more highly recommended routines.

A program that will enable you to test four of Knuth's sorting algorithms in a variety of different circumstances is listed in Fig 1. In all cases the data, or rather 'keys' to be sorted, are integer values in the array K(). For each key in K(), there is an associated record in the array R$(). For most sorting applications, it is not merely sufficient to sort the keys, but also the associated records: a telephone directory with the names sorted but the numbers in the

Fig 1 continued

```
22050 I=LFT:J=RGHT+1
22060 I=I+1:IF K(I)<K THEN 22060
22070 J=J-1:IF K<K(J) THEN 22070
22080 IF J>I THEN SWAP K(I),K(J):SWAP R$(I),R$(J):GOTO 22060
22090 SWAP K(LFT),K(J):SWAP R$(LFT),R$(J)
22100 IF RGHT-J>=J-LFT AND J-LFT>M THEN TOP=TOP+1:LSTACK(TOP)=J+1:RSTACK(TOP)=RGHT:RGHT=J-1:GOTO 22040
22110 IF J-LFT>RGHT-J AND RGHT-J>M THEN TOP=TOP+1:LSTACK(TOP)=LFT:RSTACK(TOP)=J-1:LFT=J+1:GOTO 22040
22120 IF RGHT-J>M AND M>=J-LFT THEN LFT=J+1:GOTO 22040
22130 IF J-LFT>M AND M>=RGHT-J THEN RGHT=J-1:GOTO 22040
22140 IF TOP>0 THEN LFT=LSTACK(TOP):RGHT=RSTACK(TOP):TOP=TOP-1:GOTO 22040
22150 IF M>1 THEN GOSUB 20000
22160 RETURN
23000 REM DISTRIBUTION COUNTING
23010 IF HI>1000 THEN PRINT CHR$(7);"KEY RANGE > 1000!!":RUN
23020 U=1:V=HI
23030 DIM COUNT(V-U)
23040 FOR I=0 TO V-U:COUNT(I)=0:NEXT I
23050 FOR J=1 TO N:COUNT(K(J)-U)=COUNT(K(J)-U)+1:NEXT J
23060 FOR I=1 TO V-U:COUNT(I)=COUNT(I)+COUNT(I-1):NEXT I
23065 R=N
23070 IF R=0 THEN RETURN
23080 IF COUNT(K(R)-U)<R THEN R=R-1:GOTO 23070
23090 IF COUNT(K(R)-U)=R THEN COUNT(K(R)-U)=COUNT(K(R)-U)-1:R=R-1:GOTO 23070
23100 R$=R$(R):K=K(R):J=COUNT(K(R)-U):COUNT(K(R)-U)=COUNT(K(R)-U)-1
23110 S$=R$(J):S=K(J):L=COUNT(K(J)-U):COUNT(K(J)-U)=L-1:R$(J)=R$:K(J)=K:R$=S$:K=S:J=L:IF J<>R THEN 23110
23120 R$(J)=R$:K(J)=K:R=R-1:GOTO 23070
30000 REM SET UP K() AND R$() WITH N VALUES DETERMINED BY HI
30010 DIM K(N+1),R$(N)
30020 FOR I=1 TO N
30030 IF HI>0 THEN K(I)=INT(RND(1)*HI+1)
30040 IF HI=0 THEN K(I)=I
30050 IF HI=-1 THEN K(I)=N-I+1
30060 R$(I)=STR$(K(I))
30070 NEXT I
30080 IF HI<=0 THEN HI=N
30090 RETURN
31000 REM CHECK K() IS SORTED AND R$() IS IN STEP WITH IT
31010 FOR I=1 TO N
31020 PRINT I,K(I)
31030 IF K(I)<>VAL(R$(I)) THEN PRINT"^^RECORD ERROR^^"
31040 IF I=1 THEN 31060
31050 IF K(I)<K(I-1) THEN PRINT"^^ORDER ERROR^^"
31060 NEXT I
31070 RETURN
```

original order would be quite useless! In some actual applications the keys may be an integral part of the record or they may be textual, and so on. Once you understand the algorithms it is relatively easy to tailor them to fit the specific sorting problem.

The program is structured as shown in Fig 2.

Line 10000 — Initialisation and menu control
Line 20000 — Insertion sorting routine
Line 21000 — Shell's sorting routine
Line 22000 — Quicksort routine
Line 23000 — Distribution counting routine
Line 30000 — Routine to initialise data to be sorted
Line 31000 — Routine to print and check sorted data

Fig 2 Sorting program structure

The simplest sorting algorithm is called 'insertion sorting'. Imagine a situation where the list of keys is partitioned in two, with a sequence of keys in order up to a given point, and thereafter out of order. For example:

2 3 5 6 4 8 9 7 1

By scanning the values to the left of the marked key, we can gradually move these values one place right until we arrive at the right place to insert the marked key. This increases the size of the sorted partition by one. The above example would become:

2 3 4 5 6 8 9 7 1

By repeatedly applying this method, the sorted partition grows until all the keys are sorted. To get it started, only the first key is deemed to be sorted since any single value must be 'sorted', no matter what it is. Initially all keys, bar the first, are in the unsorted partition. In the Basic routine (Fig 1, line 20000) the variable J marks the boundary between the two partitions, and K is used to hold the key to be inserted — it cannot be left *in situ*, as it would be overwritten by the shuffling up to accommodate it.

Shell sorting was devised by Donald L Shell in 1959. In some sorting algorithms, the keys are only moved short distances at a time; this can be highly inefficient if the keys have to move a long way. Shell's method 'encourages' the keys to move in long jumps initially, and it then works out the details later by successfully shorter jumps, or 'increments'. If the increments are successively 4, 2 and 1, the following nine keys would be sorted as follows:

```
5 7 9 4 3 1 2 6 8
  *   *   *
```

4-sort. .

```
3 1 2 4 5 7 9 6 8
  *   *   *   *   *
```

2-sort. .

```
2 1 3 4 5 6 8 7 9
* * * * * * * * *
```

1-sort. .

```
1 2 3 4 5 6 7 8 9
```

In effect the 4-sort does an insertion sort on four independent sequences of keys, where in each sequence the keys are four apart. The first of these sequences (marked with asterisks) comprises the keys 5, 3 and 8. The second comprises the keys 7 and 1, and so on. Note that all four of these sequences are correctly sorted following the 4-sort. The 2-sort does the same thing for just two sequences, with keys two apart. Finally, the 1-sort sorts a single sequence of adjacent keys and gets everything in the right order. In fact, the 1-sort is identical to the insertion sort.

Any sequence ending with 1 will work. (Insertion sorting is a special case of the method with a single increment of 1 being used.) In fact powers of 2 provide a fairly poor performance, and after extensive analysis Knuth suggests some better alternatives. One of these is the sequence used in the routine here (Fig 1, line 21000). The increments are produced from the expression (3^K — 1)/2, with values of K decreasing from some initial value down to 0. (The code given does calculate these values but without recourse to exponentiation, and the increments are held in the array H().) The initial value used is the largest possible, not exceeding one third of the number of items to be sorted. For example, to sort 1000 keys the increments would be 121, 40, 13, 4 and 1.

Quicksort

The Quicksort method was devised by C A R Hoare in 1962. This is one of the more complex methods to code (Fig 1, line 22000) particularly if the implementation language is not recursive — as is the case with Basic. In its basic form, a list of keys is sorted by choosing the first key as a 'pivot' and then dividing the remaining keys into two partitions: keys to the left being less than, or equal to, the pivot; and to the right being greater than, or equal to, the pivot. To obtain these two partitions we scan right from the first key after the pivot until we find a 'rogue' key (greater than the pivot) and scan left from the end until we find another rogue key (less than the pivot). These keys can then be swapped, and this continues until the right scan crosses the left; this is the correct position for the pivot element. For example, quicksorting the following numbers:

5 7 9 4 3 1 2 6 8

Exchange 7 and 2. .

5 2 9 4 3 1 7 6 8

Exchange 9 and 1. .

5 2 1 4 3 9 7 6 8

Place pivot (exchange 5 and 3) . .
3 2 1 4 5 9 7 6 8

At this point the 5 is correctly placed; all the values to the left of it are less than it, and all those to the right are greater. Sorting these two partitions can be seen as two separate independent problems, so we can continue by quicksorting 3, 2, 1 and 4, and then quicksorting 9, 7, 6 and 8, and so on.

There are various refinements to this method. As insertion sorting is generally regarded as the most efficient method for small lists, we can invoke insertion sorting instead of quicksorting when the lists get below a particular size (the value M in Fig 1 at line 22000). There's nothing to lose by abandoning the sorting when a list gets below size M, and then calling insertion sorting just once for the whole list, right at the end. Note that if M is 1, then pure quicksorting is used.

A major problem with quicksorting is that it's at its worst when the list is already sorted. Unlike most methods, it's at its best when the keys are scrambled. This seems very unsatisfactory, and can be corrected to some degree by arranging for a more careful choice of pivot. The method recommended by Knuth is to first interchange the second and middle keys in the list, then sort just the first, second and last keys, pivoting on the middle one. For the aforementioned sequence:
5 7 9 4 3 1 2 6 8

Swap second and middle. .
5 3 9 4 7 1 2 6 8

Sort first, second and last only. .
3 5 9 4 7 1 2 6 8

Now partition the third to last keys using 5 as the pivot. .
3 5 2 4 1 7 9 6 8

Insert pivot in the right position. .
3 1 2 4 5 7 9 6 8

This procedure makes little difference to randomly ordered keys, and considerably improves the situation if the keys are already ordered.

Both these enhancements are incorporated in the routine at line 22000. The routine prompts for a suitable value of M before starting: Knuth recommends 9 as optimum, although the best value depends on the characteristics of the programming language you are using. Lines 22031 to 22039 make a careful selection of the pivot. Simple pivot selection is obtained by deleting the REM at line 22030.

In circumstances where the keys are numeric and have a restricted range of values, a very efficient sorting procedure can be applied by noting the frequency of occurrence of each key. This is the strategy adopted by 'distribution counting' sorting. The first phase of the algorithm obtains the number of occurrences for each key. In Fig 1 at 23000, if the lowest key value is U and the highest is V, then COUNT (O) holds the number of occurrences of U, and COUNT (V-U) holds the number of occurrences of V. For example, the counts for the 2 3 1 1 3 2 1 2 2 would be:
1-count: 3
2-count: 4
3-count: 2

Once sorted, we will see 3 '1's followed by 4 '2's, followed by 2 '3's. If each of the counts is now accumulated, for example, the 2-count becomes 3+4 and the 3-count becomes 3+4+2, then the value in each count will indicate the last position for each of the corresponding keys:
1-count: 3
2-count: 7
3-count: 9
So the '1's will appear in position 1 to 3, the '2's in 4 to 7, and the '3's in 8 to 9.

Now, scanning the numbers from right to left, we search for a key which is too far to the left:

```
      *
2 3 1 1 3 2 1 2 2
```

The totals in the counts make this test relatively easy, and the found key can be inserted at the position indicated by its count (position 9):
2 3 1 1 2 1 2 2 3

By adjusting the counts and repeating this process, it is then possible to get all the keys into the correct order. Fig 1 (at line 23000) contains extra sophistications which further minimise the amount of scanning and moving needed to sort the keys.

In order to assess how effective these different algorithms are, Fig 3 outlines the results of running each of them under various conditions. The times are in minutes and seconds (obtained in interpreted Microsoft Basic on an ACT Apricot — some appreciation of the performances can be gained by noting that it takes all of 12 seconds just to initialise the data for 500 keys). £ signs indicate times definitely in excess of 10 minutes and estimated to be about one hour, demonstrating the appalling behaviour of standard Quicksort if the keys are ordered. The following conclusions can be drawn.

Insertion sorting is good for short-lists but hopeless for long ones, unless the list is already, or very nearly, in order. (All methods appear equal for short lists in Fig 3, but this is due to inadequacies in my reflexes.) This is the only method considered here that maintains equal keys in their original order — this can be important for some applications.

Shell sorting performed well on all tests, with consistent response times no matter what the state of the input.

Quicksorting is excellent for random lists, but no use for ordered lists. Pure Quicksorting (when M=1) is slightly slower than Quicksort combined with insertion sorting. More careful selection of a pivot value mitigates the ordered list problem.

Distribution counting was best all round, but is not universally applicable.

If asked to nominate a good, general-purpose, workhorse sort routine I would choose Shell sorting. In fact it would not be difficult to write a super-sort procedure which, from a preliminary scan of the data, could choose the most appropriate routine. Knuth covers another 20 or so possible algorithms.

Searching

Of the two topics, Knuth gives far more prominence and material to sorting. Searching is concerned with retrieving data that has been stored with a given identification. The identification is the 'key', and the data is the associated 'record'.

Sequential searching is the most obvious technique for searching a list: start at the front, and keep going until either you find the key you want or reach the end. On average half the keys are scanned for a successful search, and all of them are scanned for an unsuccessful one.

A more efficient technique, which is almost as simple to implement, is called binary search (Fig 4); this only works if the list is in order. Given an ordered list of keys, examine the middle one, which will either be greater, less, or equal to the key we are seeking.

If it's equal then we have successfully found the key. If it's less than the given key, then we can continue searching for the key in the right half of the list, otherwise continue on the left. The search terminates unsuccessfully

		500 keys			20 keys
Range of keys	1. .500	1. .10	1. .500	1. .500	1. .20
Init ordering	Random	Random	In order	Reversed	Random
Insertion	16:17	14:37	0:14	>20:00	1.5
Shell	1:55	1:26	1:03	1:35	1.5
Quicksort (M=9)	1:01	0:50	££££	££££	1.5
Quicksort (M=1)	1:03	0:58	££££	££££	1.5
Quicksort + (M=9)	1:00	0:51	7:30	7:04	1.5
Quicksort + (M=1)	1:02	0:59	7:18	6:52	1.5
Distr. Counting	0:34	0:27	0:26	0:34	1.5

Fig 3 Performance of the sort routines

when there is no list left, when lower pointer L exceeds upper pointer U in the routine given.

As it's a more efficient technique, binary search can be blindingly fast even for very long lists. A maximum of 20 comparisons would be made to search a million keys — quite an improvement on straight sequential search. Marginal improvements have been suggested — not examining the middle element every time, but making a more careful choice determined by the key we are seeking. In practice, the increase in complexity offsets any other gains.

Binary trees

Frequently, following an unsuccessful search, we may wish to insert the unfound key. If we are using binary search, then this can be computationally expensive for long lists of keys. If, instead of storing the keys sequentially, a 'binary tree' structure can be used, then binary search and easy insertion can coexist (Fig 5). The price for this is that the tree requires slightly more storage and is more complex to scan.

A binary tree is built up of 'nodes'. Each node contains the text of one key, and pointers to the before and after nodes. (In real applications there may be other information as well.) These pointers reference other nodes from which all the words before or after the current node can be accessed. If there are no other nodes, the pointers are simply 'null'.

A binary tree is searched, starting at the root node. If this node contains the key then we have found the place we want. Otherwise the key must be before or after the current node, and we move to the next node accordingly and repeat the process.

If there is no next node then the key is not in the tree, and we can insert it at this point if necessary.

This method works best with storage management routines to allocate and de-allocate storage as nodes (that is, keys) are added and deleted. In the routine given here only minimal storage management is attempted to keep things simple.

In some cases a binary tree can become unbalanced. The worst case occurs if the keys are inserted in order, when the algorithm just performs an unnecessarily complex sequential search. If the keys are presented in a suitably random order, then all the branches will be at roughly the same depth. Knuth also presents techniques for keeping trees well balanced.

Throughout this analysis we have assumed that it is readily possible to identify two keys as being equal. But when working on an interactive system, it can sometimes be a problem to recall the precise spelling of a word, such as a surname. Knuth presents a technique, called soundexing, which can convert similar sounding words into the same key (Fig 6). The technique was developed by Margaret Odell in 1918, predating computers by a good many years. Essentially the method converts any word into a key, consisting of a letter followed by three digits. Similar sounding letters are assigned the same digit; vowels and a few other letters are ignored altogether, as are repeated letters.

```
35000 REM BINARY SEARCH FOR K IN N KEYS IN K(), RETURNS POSN (=-1 FOR FAILURE)
35010 L=1:U=N
35020 IF U<L THEN POSN =-1:RETURN
35030 POSN=INT((L+U)/2)
35040 IF K<K(POSN)THEN U=POSN-1:GOTO 35020
35050 IF K>K(POSN)THEN L=POSN+1:GOTO 35020
35060 RETURN
```

Fig 4 Binary search routine

```
50000 REM BUILDS AND SEARCHES A BINARY TREE
50010 DIM KEY$(1000),BEFORE(1000),AFTER(1000)
50020 KEY$(1)="ROOT":BEFORE(1)=0:AFTER(1)=0
50030 AVAIL=2
50040 INPUT"TYPE A KEY";KEY$
50050 GOSUB 51000:IF FOUND=1 THEN PRINT"ITS AT NODE ";NODE:GOTO 50040
50060 PRINT"NOT FOUND - INSERTING IT"
50070 GOSUB 52000
50080 PRINT"AND ITS AT NODE ";NNODE:GOTO 50040
51000 REM SEARCH BINARY TREE SETS FOUND AND NODE
51010 NODE=1:REM START AT ROOT
51020 IF KEY$=KEY$(NODE)THEN FOUND=1:RETURN
51030 IF KEY$<KEY$(NODE) AND BEFORE(NODE)<>0 THEN NODE=BEFORE(NODE):GOTO 51020
51040 IF KEY$>KEY$(NODE) AND AFTER(NODE)<>0 THEN NODE=AFTER(NODE):GOTO 51020
51050 FOUND=0:REM FAILURE (BUT NODE SET FOR INSERTION)
51060 RETURN
52000 REM (FOLLOWING UNSUCCESSFUL SEARCH) CREATE AND INSERT A NODE FOR KEY$ BEFORE/AFTER NODE
52010 IF AVAIL>1000 THEN PRINT"STORAGE OVERFLOW!":STOP
52020 KEY$(AVAIL)=KEY$:BEFORE(AVAIL)=0:AFTER(AVAIL)=0:NNODE=AVAIL:AVAIL=AVAIL+1
52030 IF KEY$<KEY$(NODE)THEN BEFORE(NODE)=NNODE:RETURN
52040 AFTER(NODE)=NNODE:RETURN
```

Fig 5 Binary tree program

```
40000 REM SOUNDEX FOR ANY X$ <>"" AND CONTAINING ONLY "A" TO "Z"
40010 DATA "AEHIOUWY","BFPV","CGJKQSXZ","DT","L","MN","R"
40020 DIM GROUP$(6):FOR I=0 TO 6:READ GROUP$(I):NEXT I
40030 REM GROUP$(0) IGNORED, OTHERWISE A LETTER IN GROUP$(I) HAS DIGIT I
40040 SNDEX$=LEFT$(X$,1):REM FIRST LETTERS OF SOUNDEX AND X$ ARE THE SAME
40050 C$=SNDEX$:GOSUB 41000:OVAL$=VALU$
40060 FOR I=2 TO LEN(X$)
40070 C$=MID$(X$,I,1):GOSUB 41000
40080 IF VALU$="0" OR VALU$=OVAL$ THEN 40100:REM SKIP "VOWELS" AND "REPETITIONS"
40090 SNDEX$=SNDEX$+VALU$
40100 OVAL$=VALU$
40110 NEXT I
40120 SNDEX$=LEFT$(SNDEX$+"000",4):REM TRUNCATE/PAD WITH TRAILING 0S
40130 RETURN
41000 REM RETURN VAL$ FOR GIVEN C$ + CHECK FOR ILLEGAL LETTERS
41010 FOR VALU=0 TO 6
41020 CHS$=GROUP$(VALU)
41030 FOR J=1 TO LEN(CHS$)
41040 IF C$=MID$(CHS$,J,1)THEN VALU$=CHR$(ASC("0")+VALU):RETURN
41050 NEXT J
41060 NEXT VALU
41070 PRINT"ILLEGAL LETTER: ";C$:STOP
```

Fig 6 Soundex routine

Conclusion

This concludes my presentation of Knuth's three volumes on *The Art of Computer Programming*. It should be remembered that these volumes run to over two thousand pages in total, so I have had to be highly selective as to which material I have featured.

Unfortunately many interesting and pertinent algorithms have fallen by the wayside, and if my writings have whetted your appetite for more information then you will have to buy the volumes to find out more.

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 END

Functional C

Les Hampson reveals everything you need to know about C functions, from basic patterns to changing variables.

Functions in C are comparable with the procedures of Pascal, or with the built-in functions of Basic like mid$, sin, and inkey$, except that you can write your own of any complexity to add to those provided. The most used functions, for example for file and display access, are supplied in a library with the compiler.

A simple function called 'spaces' to blank part of a line on a display is illustrated in Fig 1. Once this has been defined, it can be used anywhere in a program simply by calling it by name with the number of spaces required: for example, spaces (10).

Only one value is passed to this function, but others might accept none or a list of arguments. One function can call others which can call others, and so on; the example calls a standard library function, putchar, to display each space. A function can also return a value which can then be assigned to a variable or used in any other way. The standard library function, getchar, returns a character entered at the keyboard: for example, c=getchar().

Of course, a returned value can be ignored if it suits your purpose, and you might use the statement getchar (); so that the user presses a key before a program continues.

Advising on how large functions should be might seem like discussing the length of pieces of string, since clearly they can be as short, or long, as the job requires. But a rule which works well in practice is that functions should be less than 60 lines. This arbitrary limit means that each function will fit a sheet of print-out and read as a whole. In fact, many functions will be short enough to fit on a display screen. If you produce a program with a massive main function, then you should probably reconsider how it is structured. It's perfectly reasonable to have a main function of only a few lines which just controls the principle parts of a program.

Basic pattern

The basic pattern for a function is:

```
type function-name
  (list-of-argument-names)
     argument-declarations
     {
     local-data-declarations
     statements
     return value
     }
```

The only restriction is that one function cannot be defined inside another, so local procedures cannot be used. The only essentials are the name, the following brackets and the braces, giving something which would do nothing. For example:

```
myfun ()
     {
     }
```

A rather artificial function with all the components is shown in Fig 2.

The type of a function is the type of the value returned and can be left out if it does not return anything. The type can be int, long, double, and so on, although int can be omitted as it's the default.

The name of the function is followed by a list of names which will be used *internally* to refer to the arguments passed to it. The types of these arguments are declared followed by the body of the function, which is enclosed in braces. Local data is declared before any statements and, unless this is specified as static, it disappears on finally leaving the function. After executing the statements, a function is exited either by reaching the final brace, or by a return statement which can be followed by a value to send back.

Data

A function is called by name with a list of values to be passed in brackets; these can be variables or constants. For example:

```
square (z);
sqrt (3.6);
putchar ('A');
puts ("Your message could go here");
strcmp (str, "testing");
```

Only the values of arguments are passed and made available to the called function. This means that a function can modify the values in any way required, for example as a decreasing loop counter, and will not affect variables in the calling function. A called function simply copies the values and makes them available as values in local variables, with their own names.

This is an important point which affects how C functions manipulate data. You might wonder about character strings and other arrays since there is no obvious value. These are treated somewhat differently with the address in memory being passed, but this is best considered as the mysteries of pointers unfold.

As well as its type, every variable has an associated storage class which determines how it will be kept in memory. Local data is available within the function in which it is defined and

```
spaces(number)
int number;
    {
    while(number-- !=0)          /*loop until counter is zero*/
          putchar(' ');
    }
```

Fig 1 Function to display spaces

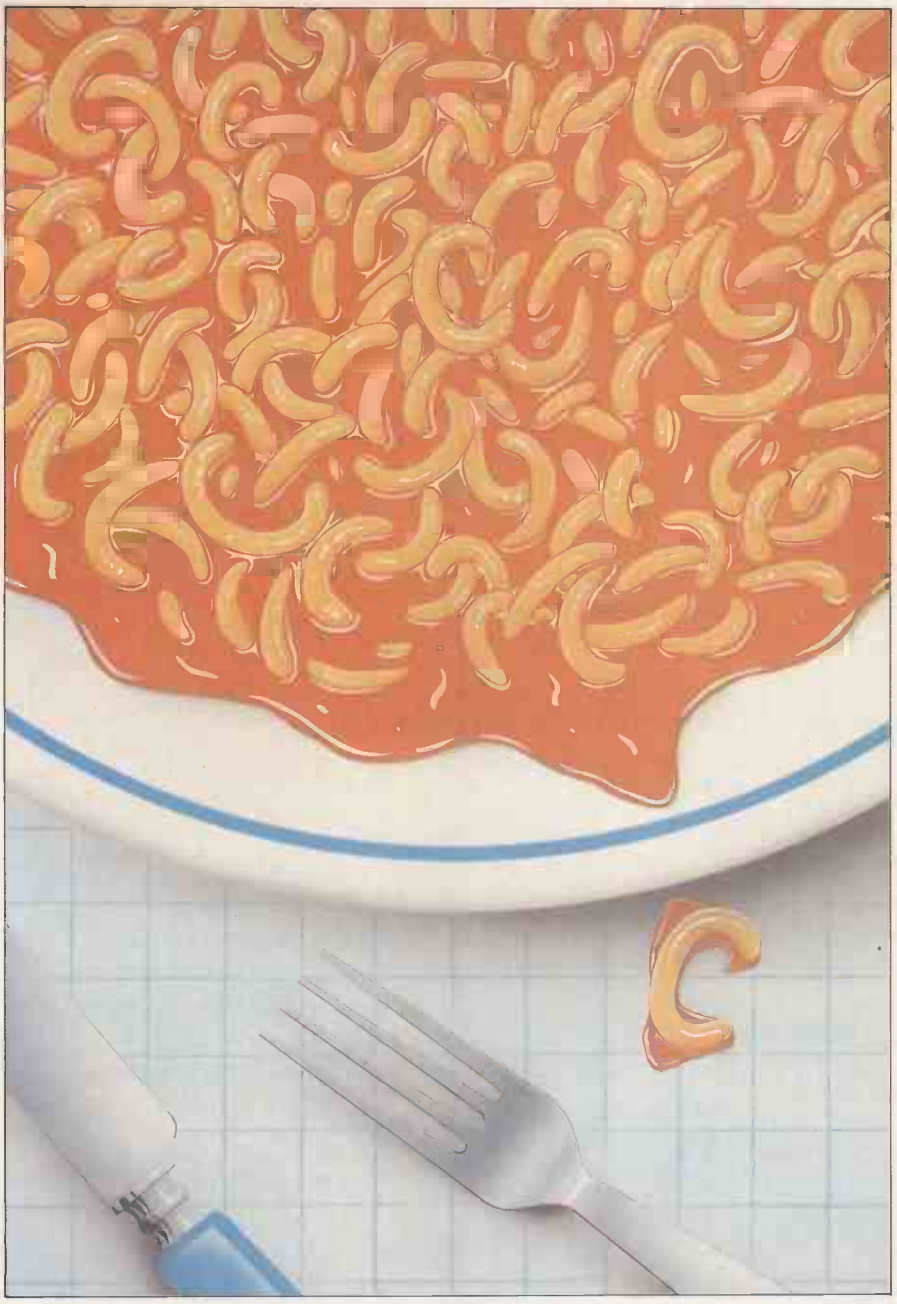
```
double square(x)              /*type specifies double returned*/
double x;                     /*declare argument passed*/
    {
    double result;              /*local variable*/
    result=x*x;                 /*calculate result*/
    return result;              /*return result*/
    }
```

Fig 2 Specimen function

```
range(x)
unsigned x;
    {
    int rval=2;      /* for values>=32768 */

    if(x<256) rval=0;
    else if(x<32768) rval=1;
    return rval;
    }
```

Fig 3 Returning values



nowhere else — not even in other functions called from it. The default for local data is auto, which means that the memory is released and the value lost when the function is finally left. When you need to retain a value for the next time a function is called, this can be done by using the specifier static. You might also use this to retain a count of how many times a function has been called.

Another alternative is to specify a local variable as a register to indicate that it will be very frequently used, perhaps as a loop counter. Many micro versions of C ignore this hint to store it in one of the registers because of the limited number available.

A single value can be sent back to the calling function by a return statement. This can use a variable or constant, or can involve an expression which is first evaluated. For example:

```
return 0;
return x;
return (x>y)? x:0 ;
```

Return statements can occur anywhere in the body of a function. Since they disrupt the logical structure, it's best to use a local variable called, say, rval, which is sent back by a single statement as in Fig 3.

A function call 'leaves behind' its returned value, just as an expression does when evaluated. This means that a function call can be used anywhere a value is acceptable: in an assignment, as part of a complex expression or comparison, or as an argument for another function call. Consequently, it is inevitable that only one value can be returned. You could use:

```
x=sqrt (3.6);
x=sqrt (sin(3.6));
if(getchar()=='a')
x^=rand ();
```

If a function returns a type other than int, then this must be specifically declared before it is used. This is done in a similar way to a data declaration, except that the function name is given with empty brackets. The declaration must correspond to the type specified in the function definition. It is usually convenient to declare all the functions which return non-integers at the start of a source file, so that they are known throughout. For example, the standard maths functions return a double, so must be declared before use:

```
double sqrt (); /*square root
  function*/
double y,x=0.7;
y=sqrt (x);
```

Since the type char is converted to int in expressions and all floating point operations are in double precision, the types used for function declarations need only be int, long, double, or a pointer. The default is int so does not have to be declared and often isn't, although it's good practice to do so.

There must be the expected number of arguments passed to a function and these must be of the expected type and in the correct order; for library functions the requirements will be described in the reference manual. Sometimes we want to use an 'incorrect' type and so must massage the value of our data into the required type using a cast, which is simply a type name in brackets:

```
int x=8;
double sqrt (),y;
y=sqrt ((double)x); /*force value of x
  to double*/
```

If a function requires a long argument and you want to use a constant, use the L suffix as in:

```
lseek(myfile,256L,0);
```

The function lseek is in most libraries and adjusts the position in a file, where the next data will be accessed to give random access. The second argument needs to be a long because it determines the position, and files can be bigger than allowed by an unsigned value.

The C compiler will give no protection against errors involving data types. The program will usually carry on regardless, so if a function expects a double then it assumes one has been provided and will grab what it can from the expected place in memory. If you used sqrt(x), in the example above, then the answer would be meaningless.

The stack

It is useful to have some insight into the mechanics of calling a function, especially how the stack is used. This is simply an expandable area of memory, where values can be added to the top and taken off as required; the size goes up and down as the stack is used. A good analogy is a pile of paper on a spike. When a function is called, the normal process is for the arguments to be placed on the stack, right-most first, then information on how to return, and finally, any space required for local auto variables is allocated. All of this section of the stack is moved on, leaving the function to restore the initial condition. Special arrangements are sometimes made for floating point arguments.

Static variables are not held on the stack but in an area of the memory reserved for permanent data. The compiler ensures that these variables are only accessible from within their functions and that there is no conflict over names.

When values are returned, they are placed in a consistent way according to their type: for example, in one or more registers. The returned type must be declared so that the value can be correctly accessed.

Any function can call itself without conflict of argument or local variables. All that happens is that a new section of the stack is allocated for each call. If this continues, then eventually there will be no memory available and the program must abort. Recursion can lead to very succint programs, especially when using data structures like linked lists.

There is a standard library function, (printf), to display all kinds of formatted output, but as an example we can write a recursive function to display a decimal number. This can't be done directly, since the first character to display is the last available as we repeatedly divide by 10:

```
numsho (num)
    unsigned num;
    {
    unsigned quot,rem;

    quotum/10;
    rem=num%10;
    if(quot!=0)  numsho (quot);
    /*recursion until no remainder*/
    putchar (rem+ '0');
```

The function putchar accepts an argument which is the ASCII value of a character to be displayed. So to use it to display a digit, we need to add the value of rem to '0'.

Changing variables

Any function can make changes to global data items since these are accessible by name. Some global data, needed by many functions, will be used in most programs and this is preferable to long lists of arguments. However, in general, values should be passed between functions using arguments and a returned value, and local variables used. In most versions of Basic, all variables are global; a common problem is that a change to a variable in one part of a program has unexpected side effects on another.

A function cannot directly change local variables in another function, including the one which called it, nor can it return several values. However, we often want to do just that. For example, you might want a function to exchange the values in two integers but cannot use

```
exchange (x,y)  /*this does
  nothing*/
    int x,y;
```

Fig 4 Example program

```
/*
PROGRAM to give dump of a file in hex and ascii
usage example: A>DUMP B:FILENAME.EXT
*/

#include "stdio.h"
#define EOF -1
#define FERROR 0
#define BLOK 8

main(argc,argv)
    int  argc;                          /*number of arguments*/
    char *argv[];                       /*array of pointers to arguments*/
    {
    FILE *infile;
    unsigned i,total=0;
    int c=0;

    if (argc < 2)
            {
            puts("Missing Filename\n");
            exit();
            }


    if ((infile=fopen(argv[1],"r")) == FERROR)
            {
            puts("Cannot Open ");
            puts(argv[1]);
            exit();
            }


    while(c!=EOF)                       /*starting point of loop*/
        {
        showord(total);                 /*display offset in hex*/
        puts("     . ");

        for(i=0;i<BLOK;i++)              /*read and display set of bytes*/
            {

            if ((c=getc(infile))== EOF) /*read a char from the file*/
                                break;      /*exit at end of file*/
            display(c);
            }
       puts("\n");                      /*start a new line*/
       total+=BLOK;                     /*increment offset*/
       }
    }

    /* display a byte */
display(ch)
char ch;
    {
    shobyte(ch);            /*display char in hex*/
    putchar(' ');

    if(ch>=' ' && ch<='~')  /*is char printable*/
            putchar(ch);    /*then display it*/
    else
            putchar(' ');   /*otherwise a space*/

    putchar(' ');
    }

    /* print a word in hex */
showord(wrd)
    unsigned wrd;
    {
    shobyte(wrd>>8);                    /*display high byte*/
    shobyte(wrd);                       /*and low byte*/
    }

    /* print a byte in hex */
shobyte(byt)
    char byt;
    {
    shonib(byt>>4);          /* two hex chars needed for byte */
    shonib(byt);
    }

    /* print a nibble as a hex character 0-9 A-E */
shonib(nib)
    char nib;
```

(continued page 171)

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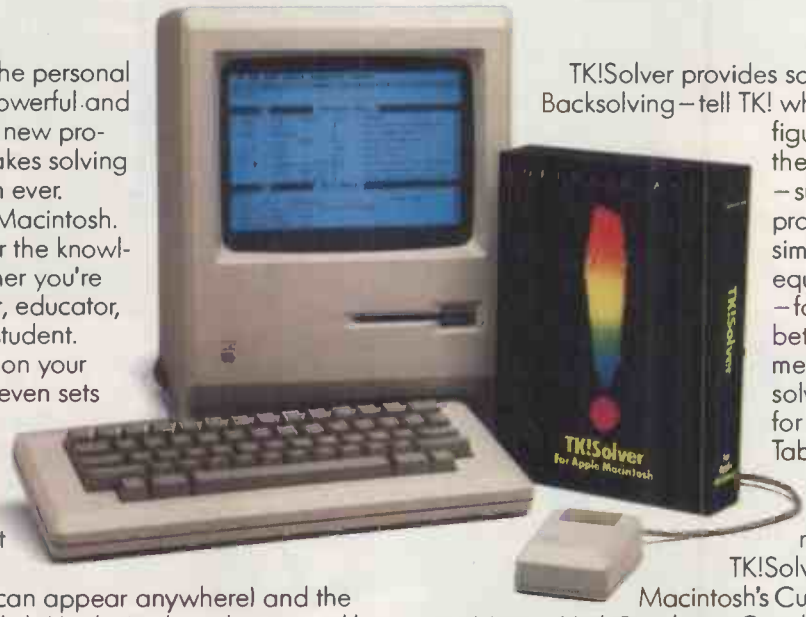

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```
    {
    nib&=15;
    putchar((nib >= 10) ? nib-10+'A': nib+'0');
    }

/*          Sample output

0000        0D    0A    2F /  2A *  0D    0A    50 P  52 R
0008        4F O  47 G  52 R  41 A  4D M  20    74 t  6F o
0010        20    67 g  69 i  76 v  65 e  20    64 d  75 u
0018        6D m  70 p  20    6F o  66 f  20    61 a  20
0020        66 f  69 i  6C l  65 e  20    69 i  6E n  20
0028        68 h  65 e  78 x  20    61 a  6E n  64 d  20

Library functions used
fopen           open a file for reading or writing
getc            get next character from a file
putchar         display a character
puts            display a string
exit            exit program
*/
```

```
/*open file for reading*/
    {
    int temp;

    temp=x;
    x=y;
    y=temp;
    }
```

This will have no effect on the original variables because only their values are passed as arguments. What is needed is to pass values which enable the required variables to be accessed, specifically their addresses in memory. This leads us into the use of pointers which will be considered next month.

Main function

Every program must have a function called main where execution begins. This can have arguments which are provided, not by another function, but by the call to the program. For example, if a program is invoked by entering myprog arg1 arg2, then the two arguments, and in Unix the program name, are available to main. By convention the arguments are declared as follows:

```
main (argc,argv)
  int argc; /*the number of
  arguments*/
  char *argv[]; /*array of pointers
  to strings*/
  {
```

You will be able to access the command line arguments after getting to grips with pointers. Since they are local to main, they have to be made available to other functions by passing their values or copying to global variables.

As well as learning C by writing simple programs and trying them out, it is also useful to see examples from other programmers. The program in Fig 4 illustrates some of the features of C which have been described and it might even be useful. The file name is passed to the program as an argument and is available as argv[1]. END

This is part three of a five-part Teach Yourself series. Back issues can be obtained from our office at 53 Frith Street, London W1A 2HG, tel: (01) 439 4242.

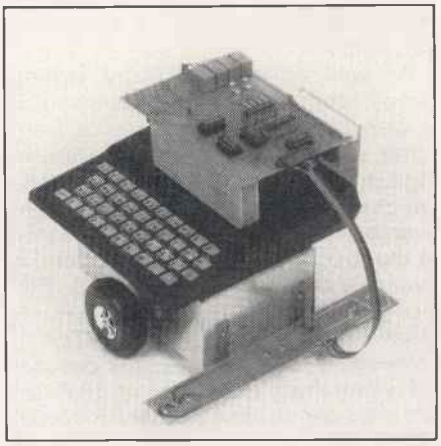
To help you get the best from the Teach Yourself C series, *PCW* has arranged special discounts on several C packages. Identify your machine or operating system from the list below and send the offer tab on the corner of this page with your order to the appropriate address. Enclose a cheque for the full amount, and make sure you state clearly which package you require. This list is not comprehensive. Other suppliers such as Conguin Software and Grey Matter are worth contacting for their prices. Conquin is at 14 Goodwood Close, Morden, Surrey and Grey Matter at 4 Prigg Meadow, Ashburton, Devon.

Company/Address	Machine/Operating System	Package	Price (includes VAT and UK p&p)
Hisoft 180 High Street North Dunstable, Beds	Spectrum	Hisoft C	£22.50 (normal price £25)
System Science 6-7 West Smithfield London EC1	CP/M-80	Software Toolworks C80, Mathpak and *C Programming Language* by Kernighan and Ritchie	£90 (normal price £119.15)
	CP/M-80, MS-DOS	DeSmet C and *C Programming Language*	£155 (normal price £185.40)
		Aztec C86 Compiler and *C Programming Language*	£190 (normal price £255.40)
	Apple DOS 3.0 or Prodos	Aztec C][Compiler and *C Programming Language*	£165 (normal price £220.90)
MLH Technology 14 Burgamot Lane Comberbach, Cheshire	CP/M-86, versions 1 and 2 of MS-DOS and PC-DOS	DeSmet C without debugger	£130 (normal price £158.75)
		DeSmet C with debugger	£181.75 (normal price £216.25)
		BDSC	£118.50 (normal price £176)
MMG Consultants 19 St Andrews Road Great Malvern, Worcs	CP/M	Small C-80	£75 (normal price £110.98)

C DISCOUNT VOUCHER

Trundle along

There must be tens of thousands of ZX81's gathering dust on shelves, as their owners have graduated to bigger machines. Robin Moorshead and Eddie Forrester give new life to the ZX81 — reborn as Trundle.



We set out to make a simple 'robot' that would solve a problem; to find its way through a twisted passage-way with blind alleys, reach an end goal, and know it was there. The programming is not too difficult, it can all be done in Basic (2k of RAM has been fitted to allow even poorly structured programs to fit in). Undoubtedly you could write a machine code program in the ZX81's original 500 bytes, but it wasn't built for experts, it was built for beginners. To see the 'robot' in action tune into *4 Computer Buffs* on Channel 4. (See 'Light Fantastic' page 184 for further details.)

The Trundle package consists of an interface and memory expansion board for the ZX81 and the extra pieces necessary to make a ZX81 based 'Trundle' robot. The system is supplied in kit form with a comprehensive set of instructions.

The package itself breaks down into four main sections: the interface, the memory expansion, the sensor board, the motor/chassis unit.

The interface

This provides eight input lines and eight output lines, the latter being buffered by relays to enable the direct control of small motors, buzzers and so on (Fig 1).

Data is latched onto the output lines by the command:
POKE 9000, data.

The data is presented on the output lines in its binary form for example: If data = 1 then only the relay for bit 1 is energised. If data = 5 then the relays for bits 1 and 4 are energised.

The interface is memory mapped and may be addressed between 8-16k or 40-48k although address 9000 is usually used for convenience. This area was chosen since it is unused by the ZX81 operating system. The area is not however clear, containing a ROM shadow. If this shadow were to be left, the operation of the interface would be corrupted. For this reason, ROMCS is connected to A13 through a diode D9 so that it is pulled high, if any address containing A13 appears on the address bus (as at any address in the 8-16k ROM shadow). This disables the ROM when necessary without affecting the normal operation of the ZX81.

The output of IC3a will only go high if the computer is writing to memory ($\overline{MREQ}$ and $\overline{WR}$ low) in ROM or ROM shadow areas (A14 low). This signal is then 'ANDed' with A13 to ensure that the computer is not trying to communicate with ROM and this output (from IC4b) used to take the 'E' pin of IC6 high. This prepares IC6, an octal latch, for data transfer. When $\overline{MREQ}$ goes high again, the 'E' pin is taken low, the new data being latched onto the output lines on the falling edge. These lines are then used to drive the relays through TR's 1 to 7. The diodes across the relay coils protect the transistors from the back EMF spikes that occur when the relays are de-energised.

The select circuitry for the input port is essentially the same as for the output port differing only in that it provides an active LOW output when the computer wants to READ data. This output is used to enable IC5 (an octal buffer) which effectively connects the input lines directly to the ZX81's data bus.

IC's 7 and 8 are Schmitt inverters and serve to square up the input signal.

Memory expansion

Although the standard 1k ZX81 does not provide enough memory for any but the simplest of interfacing programs, the extra cost and power consumption of a 16k RAM pack are not worth while. Instead, this package contains a CMOS memory board which provides extra memory whilst actually lowering the power consumption of the ZX81 The memory board also serves to connect the ZX81 to the interface board.

IC2 is a 6116, 2k x 8 CMOS RAM. It is selected when both A14 and $\overline{MREQ}$ are low simultaneously. This decoding is essentially the same as that performed in the ZX81's ULA which normally selects the $\overline{RAM}$ when required. However, the $\overline{RAMCS}$ line cannot be used as it must be pulled high permanently to disable the internal RAM.

Trundle bits

In this category fall, all the extra bits necessary to make a ZX81 based 'Trundle' robot which is designed to negotiate a twisting passageway defined by black lines. A sensor board and chassis are supplied in kit form.

The design of the sensor board is simplicity itself, Fig 4. When Infra-red from one of the TIL38 IR transmitting diodes is reflected into one of the photo-transistors, its collector/emitter resistance falls dramatically, pulling the appropriate input line to 0V. When no IR is detected the resistance of the collector/emitter junction becomes extremely large and the input of the port is effectively left floating high. As the signals are inverted by the Schmitt triggers in the interface, a high will appear on the appropriate data line when IR is detected and a low when none is perceived.

The photo-transistors are arranged so that they may provide an indication of Trundle's orientation in a passageway, where there are walls. Fig 6.

The chassis and motors are also supplied in kit form but the instructions make assembly an easy task. The motors are switched by the relays in the interface. See Fig. 7.

Construction

Provided you take care and obey a few simple rules, your circuits will work first time. Too much haste or carelessness inevitably leads to disappointment.

1. It is critical which way round most components are connected. With semiconductors, if you switch them on connected the wrong way round, you will not get a second chance; they are destroyed in a few millionths of a second. The legend on the printed circuit board will tell you the way the components should be connected.

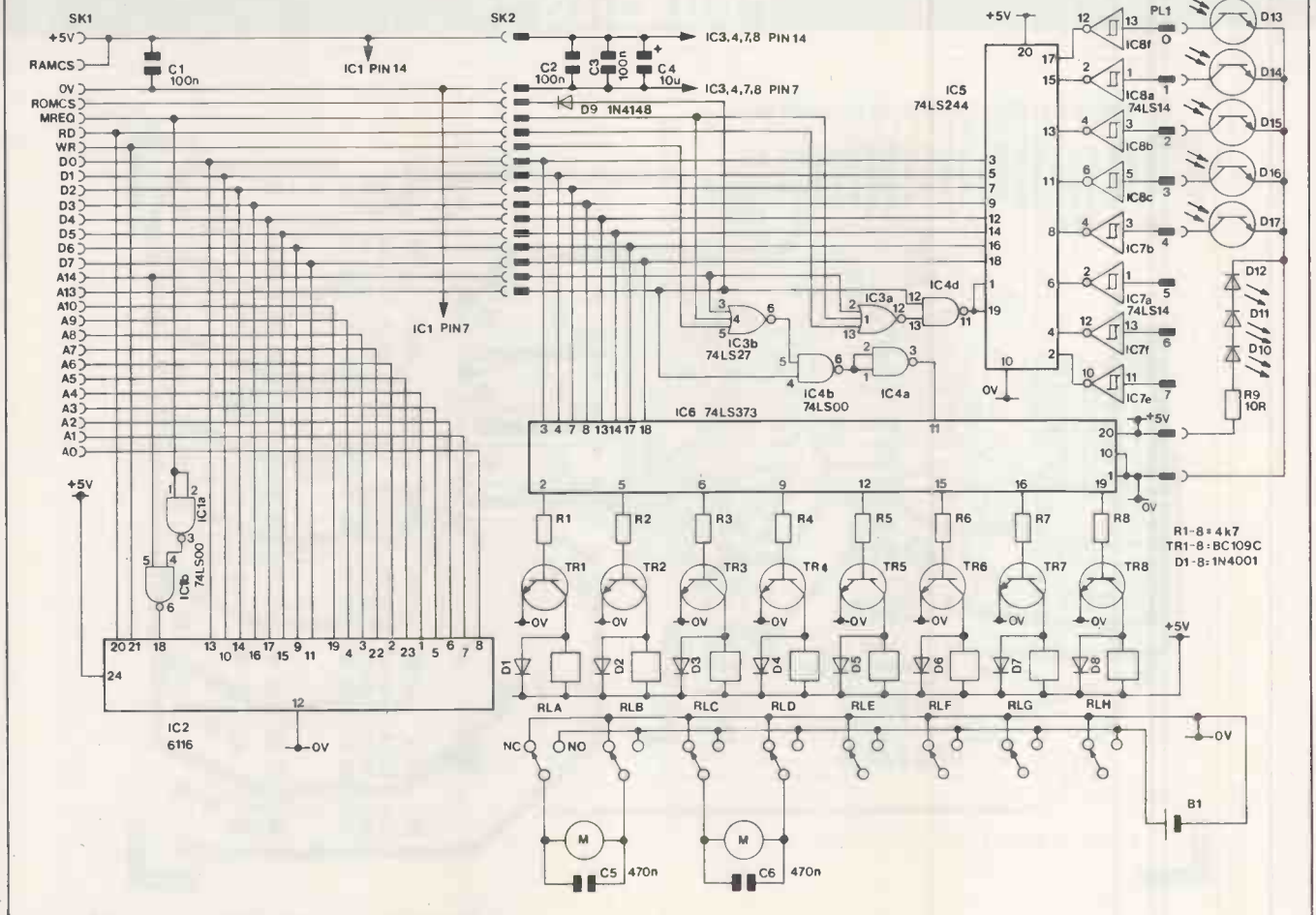


Fig 1 Memory and interface circuit diagrams

The microchips have a 'U' shaped slot in the plastic package. This aligns with the 'V' shaped slot in the socket. The transistors have a tag on the case. The diodes D1 to D4, and D9, have a thick band at one end. The diodes D10 to D12 have the anode lead longer, and D13 to D17 have the anode (collector) lead shorter. The capacitor has a + sign by one lead.

2. Use a miniature soldering iron. When it has heated up, wipe the hot tip on a piece of wet sponge to clean it. Do this regularly to remove excess solder and flux. Hold the soldering iron so that it touches both the copper track and the component lead and after a few seconds apply solder to produce a 'volcano' shaped joint.

Sensor Board

Solder the 10Ω resistor in position (Fig 5). The infra-red detector transistors can be identified as they are transparent and smaller than the emitters.

Insert the transistor into its holes, making sure the emitter and collector are the right way round. Hold the transistor so that it stands 9mm proud of the board and solder it in place (Fig 8). Repeat the process for the other four transistors. Do not clip off these leads.

Now solder in the emitter diodes, noting that the longer lead goes to the 'A' sign. Position them so they are level

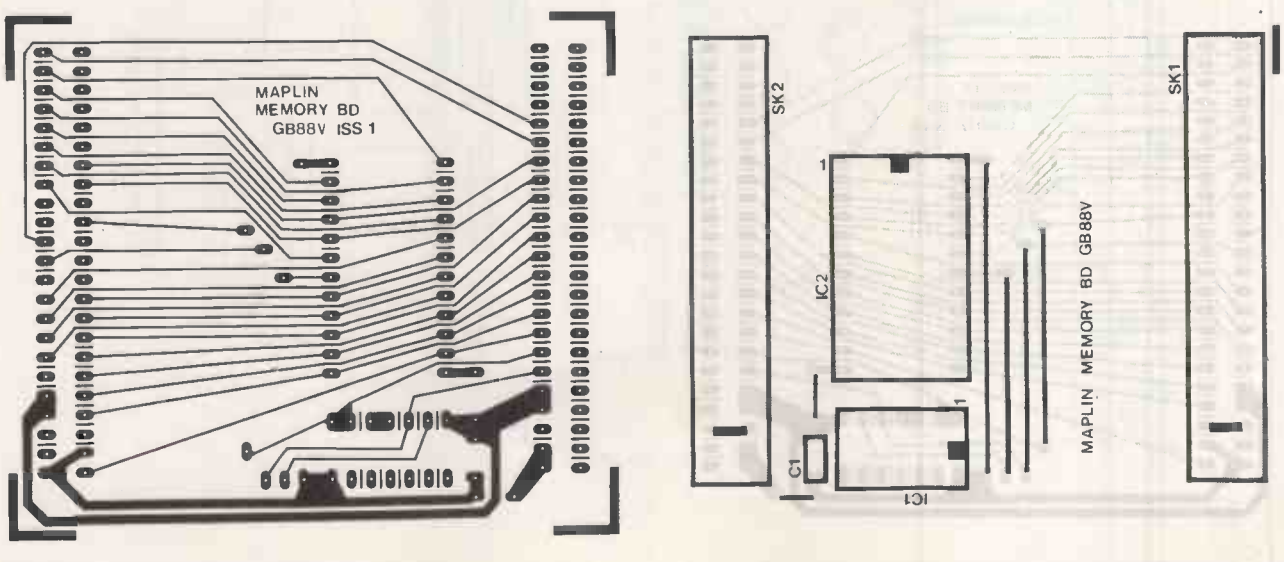
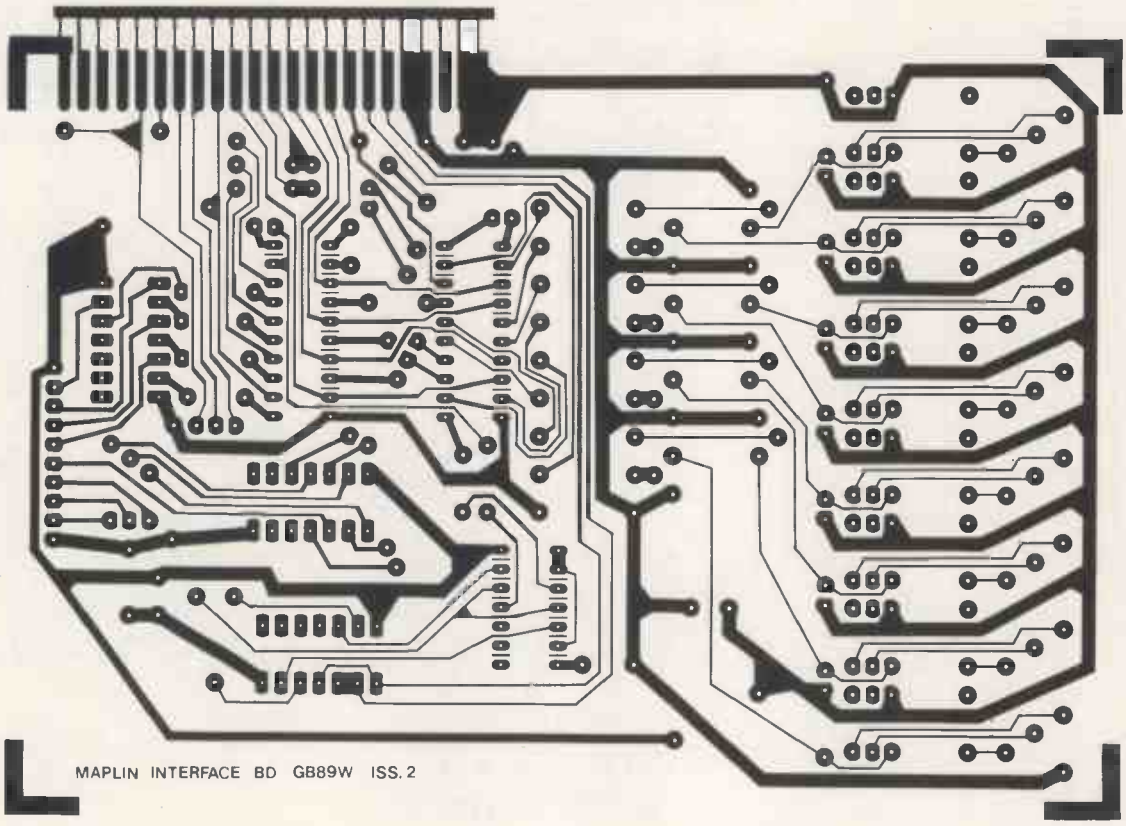


Fig 2 Memory PCB art-work and overlay



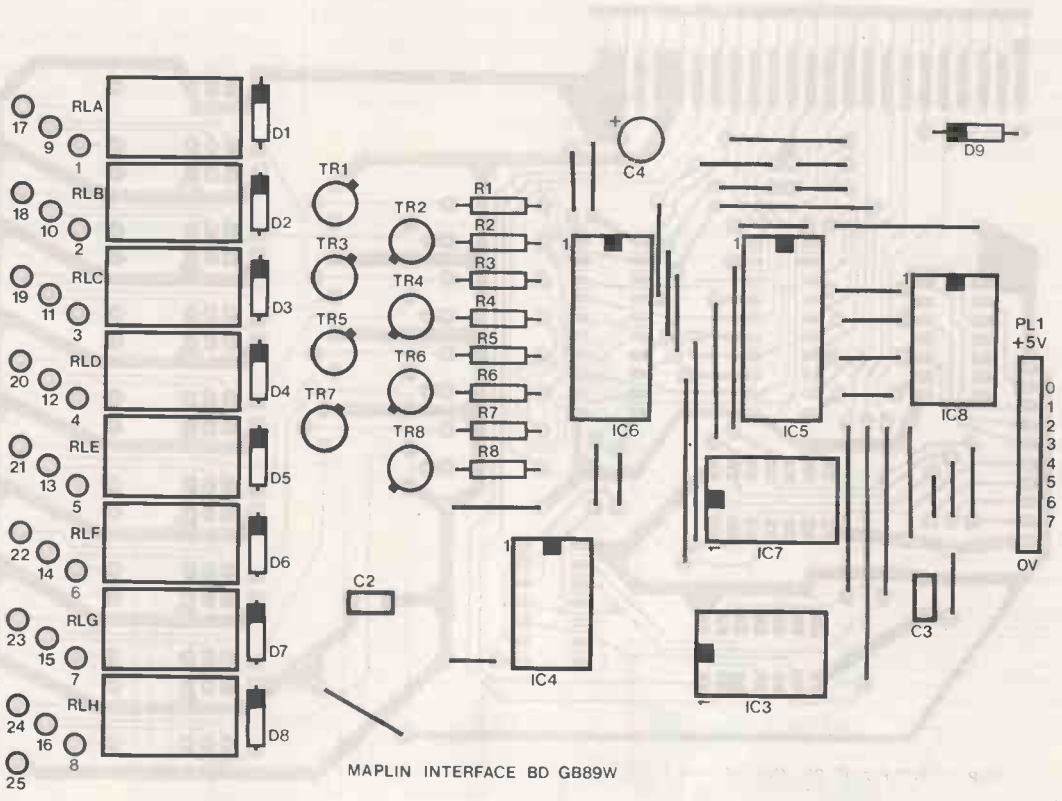


Fig 3 Interface PCB artwork and overlay

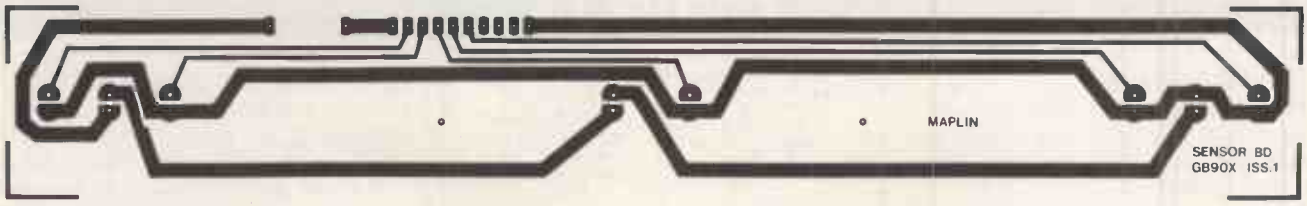


Fig 4 Sensor PCB art-work

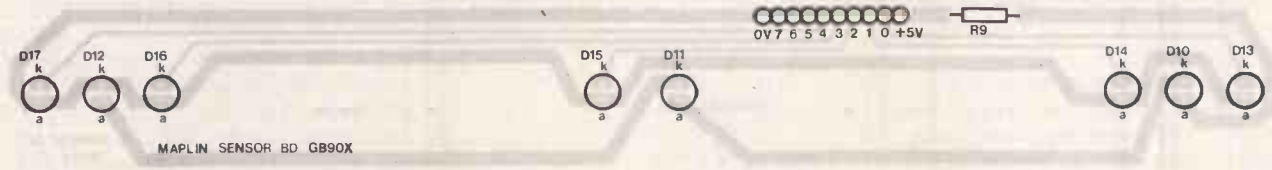


Fig 5 Sensor PCB overlay

with the transistors, (Fig 9). Again, do not clip off the leads.

Cut a 22cm length of ribbon cable and strip off the white, grey and violet leads, leaving a 7-way cable. With a sharp knife, separate the leads from one another for a length of about 1cm at both ends. Remove the insulation from each wire for a length of about 2mm. Make sure the wire strands are tightly bunched together and solder one end to the 'minicon' terminals. You can then push the terminals into the 10-way housing (Fig 10). Do take great care when doing this work as odd straggling wires will cause shorts.

Take the 10μF tantalum capacitor and note that the longer lead is marked +. Offer the capacitor into position C4 with the + mark on the capacitor adjacent to the + mark on the board, and solder into place. Trim off surplus leads. The two 0.1μF capacitors, C2 and C3, can be put in either way round. Solder into place and trim off the surplus leads.

Take 13 of the Vero-pins and push them firmly through the holes P1 to P4, P9 to P12, P17 to P20, and P25 from the copper track side of the board until the collar touches the track. Solder them into place.

With the strapping wire, link pins P17 to P20 inclusive, and P25. Separately link pins P9 to P12. Take 30cm of ribbon cable, remove the blue, violet, grey and white wires; strip off 2mm of sleeving from each of the wires and separate them from each other for a distance of 2cm at one end. Attach this end to the board (Fig 11).

Carefully press the IC's into their sockets. Check to see the legs all rest in their socket holes and if they do, firmly press the IC home. Now check what you have done. Inspect the copper tracks carefully to make sure you have not joined any tracks with solder. Check again that all the transistors, diodes and IC's are the right way round.

Chassis and Motors

Drill and cut the two parts of the box which will form the chassis (Fig 12). You should take particular care when drilling the holes for mounting the motors and sensor board as misalignment here could cause the device to perform poorly.

Assemble the motors and gearboxes following the instructions enclosed in the motor kit. Use four of the black gears and four space washers. You will find the motor will enter its housing more easily if the plastic label is peeled off first. Be careful not to apply excessive pressure when assembling as this may crack the casing. Ensure that the gears all move freely and oil all the moving parts.

Place the main output shaft of the motor onto a vice or similarly hard object (Fig 13). Place the wheel in position and tap into place. Do not use excessive force or this may bend the output shaft or break the plastic casing.

Bolt the motors into place with 6BA nuts and bolts, making sure there is a washer on top of the plastic mounting flange. This will avoid the flange cracking when the bolts are tightened up. Do not use excessive pressure when tightening up as this could break the plastic casing.

Fix the 4BA bolts into place. These act as skids, stopping the chassis rocking backwards and forwards. Bolt the battery box to the chassis using four 6BA nuts, countersunk 1in screws, spacers and washers. The spacers fit between the battery box and chassis to allow cable access and room for the skid nut. Take the free end of the cable from the interface board and peel the green and black wires away from the other wires for a distance of 6cm. Peel the red and brown pair from the orange and yellow pair for a distance of 4cm. Separate the yellow from the orange and the red from the brown for a distance of 2cm. Solder the green wire to the negative (spring end) of the battery box and the black wire to the other end (positive). Solder a 0.4μF capacitor across the terminals of each motor; it doesn't matter which way round they are fitted. Solder the yellow wire to the positive of the right hand motor; orange to the motor's negative tag; the brown wire to positive of the left hand motor and the red to the negative tag of same. (The positive is identified by a small + sign cast into the plastic.) Mount a U2 or HP2 battery in the battery holder with the positive pointing towards the left motor.

Attach the two brackets to the holes in the front with 6BA nuts and bolts. Bolt the sensor board onto the brackets with the track side up, with the cable leaving from the front of the board, and the bracket underneath the board (that is not on the track side Fig 15). Make sure the sensor board is level with the base of the box.

With the set of screws provided, screw the box together. The motor/chassis unit is now complete. Do not try pushing the unit forwards without power running through the motors or you may strip the teeth from the gears in the gearboxes.

The board is now finished. Check it carefully for solder joining tracks together. Also check that the components are inserted the right way round. The diodes and transistors have been left with long leads for final adjustments.

Memory Board

Solder in the six link wires and clip off the surplus leads. Solder in the IC sockets as before, ensuring they are pressed firmly home and the notch faces the same way as on the legend. Solder in the multi-way edge connectors so that the bar on the legend lines up with the locating peg in the socket. Solder in the 0.1μF capacitor C1; this may fit in either way around. Clip off the surplus leads.

Push the 74LS00 into its socket. The 6116 memory chip is sensitive to static electricity so precautions should be taken when fitting it. Always leave it in its box until required. Touch an earth if possible; then touching the pins as little as possible, plug the IC into its socket.

Cut off all excess leads.

Inspect the copper tracks carefully to make sure you have not joined any tracks together with solder; if you have, remove it with the soldering iron.

You can now test the board. Plug it into the back of the ZX81 pushing it home firmly. Switch the computer on; you should see a 'K' in the bottom left-hand corner of the TV screen. Now type in: PRINT PEEK 16388 + 256*PEEK 16389 'new line'.

You should see the number 18432 in the top left-hand side of the screen. You can use the ZX81 with this board only, plugged in like this as the available memory is now nearly doubled.

Main Interface Board

Note that there are no components for relays RLE-RLH, transistors TR5-TR8, resistors R5-R8 or diodes D5-D8. This is because the interface board has been designed to be able to cope with future developments.

First install the link wires. Cut each wire about 8mm longer than the distance between the holes (marked with a bar on the board). Bend the bare ends at right angles to the length of the wire; offer these ends through the holes and solder into place. Trim off any surplus wire above the solder.

Now solder in the six sockets. Note that they have a 'V' shaped notch at one end. This is to help orientate the chips the right way around. Solder in the 10-way 'minicron' plug assembly with the long shafts pointing out from the board. Take one of the BC109 transistors and note the tag which identifies the emitter. Push the transistor TR1 into its holes and solder into place. Trim off the surplus leads. Repeat the process for TR2 to TR4.

Take one of the 1N4001 diodes and note the silver band which identifies the cathode. Repeat the process for the other 1N4001's. Now fit D9 with the thick band on the diode lining up with the thick band on the legend. Solder in place and trim off the surplus leads.

Solder the resistors into positions R1 to R4, and trim off the surplus leads. These may fit either way round, but it looks neater if they are all the same way.

Carefully offer the relay into position RLA pushing it firmly home, and solder it into place. Repeat the process for RLB to RLD.

Assembly and Testing

Take a piece of wood 10mm thick (approximately) by 4cm by 10cm. Push the main interface board into the memory board and the memory board into the back of the computer.

Support the interface board by putting four sticky pads along the long narrow edge of the piece of wood, two on the bottom and two on the top. Place four Quickstick pads onto the top of the aluminium box and stick the computer to the top of the box with the keyboard facing to the right-hand side. To keep the device balanced allow the keyboard to overhang by about 5cm (Fig 16). Plug in the sensor board connector. The black wire should be nearest the memory board.

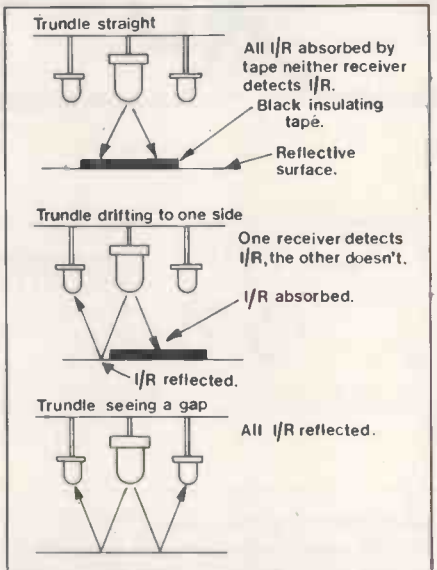


Fig 6 Infra-red detection principle

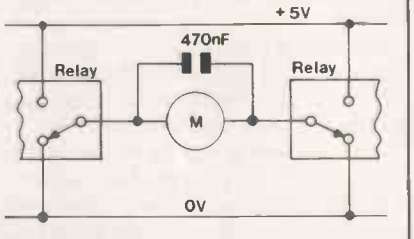


Fig 7 Motor drive

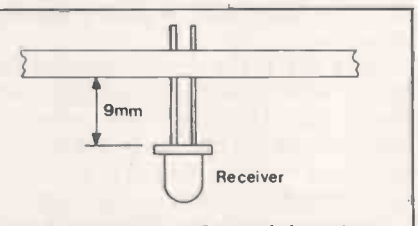


Fig 8 Mounting infra-red detectors

Support the chassis so both wheels are off the ground. Switch the computer on and type in POKE 9000,10 and press NEW LINE. The two wheels should rotate forwards. Now type in POKE 9000,5 and they will both reverse. Now place the device with the sensor board over a white sheet of paper. Switch the computer on and type in

10 PRINT PEEK 9000
20 SCROLL
30 GOTO 10

If the sensor board is reading properly, there should be a series of 31's moving up the left-hand side of the screen. If not adjustments will have to be made. Firstly check the transmitter and receivers are between 2 and 3mm above the paper. If they are not adjust them, either by loosening the bolts holding the brackets to the box or if necessary, by melting the soldering joints and moving the components.

If it still does not read 31 on white paper you can tell which sensors are not receiving (Fig 17). If for example it reads 27, bit 4 needs adjusting. Bend the transistor gently towards the transmitter; this will increase its sensitivity. If it reads 28, both bits 1 and 2 need adjusting, and so on. Now check it by putting the sensors over a strip of black PVC tape. It should read zero; if it does not, the sensors are too sensitive. Move the appropriate receiver away from its transmitter a little. Re-check it over white paper again.

To use Trundle, you will need a problem for it to solve. The passage it travels along should be made of black ¾ inch PVC tape on a white surface. We used an 8 × 4ft sheet of melamine covered chip board, but white-coated or painted hardboard would do. If you could find a large sheet of paper, even that will do but make sure it lays absolutely flat. Mark out your passage carefully in pencil first so the inside edges are 16cm apart. When you stick down the tape, don't stretch it or it will creep out of place. You should include left and right turns and dead ends as well as the end goal. An approximate diagram of our original passage-way is shown in Fig 18.

In the test procedure 'POKE 9000,10' turned on the motors, both going forwards, and 'POKE 9000,0' turned them both off. The rest of the POKE commands are:

Number Poked to 9000	Result
0	Stop
8	Correct left drift
2	Correct right drift
6	Left turn
9	Right turn
6 & 9 also perform about turns	
10	Forward
5	Reverse

(Any other number poked to 9000 may activate the motors but not necessarily producing a useful movement.)

Place Trundle on a piece of white paper onto which two strips of black PVC tape have been placed 16cm apart. Type in:

10 PRINT PEEK 9000
20 SCROLL
30 GOTO 10
'NEW LINE'

With the outer sensors directly over the black lines, you should see a series of 4s moving up the left-hand side of the screen. If not, move it gently from side to side until you do see 4s. If you cannot achieve a 4, go back to the adjustment section and adjust the diodes for bits 1,

2, 8 and 16. The number 4 appears because only the middle sensor sees white.

If there was only a tape on the right (from Trundle's point of view) Bits 4, 2 and 1 would be activated, so you should read 7. Likewise, if there was only tape on the left, you would read 28 (16 + 8 + 4). Move Trundle about gently and try these.

You will need to know what the readings are if it drifts off the straight path. Since these will vary from one Trundle to another, you will have to find these out for yourself. Place Trundle between the two lines so it is reading 4. Now gently push it to the left; the 4 will change (to either 5 or 12). Now push it further, recording all the new numbers until it reaches 31. Repeat the procedure for right drifting and record your results. Make all your readings into a chart, thus:

Reading	Meaning
4	Going straight between two lines
31	No lines (coming out of a 'T' junction)
0	Line under all sensors (at the end of a dead end)
7	Only line to the left
6	Line to the left and Trundle drifting to the left
5	Line to the left and Trundle drifting to the right and so on . . .

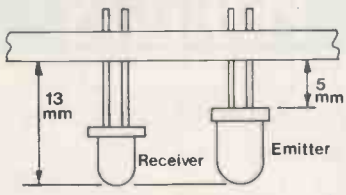


Fig 9 Mounting infra-red emitters

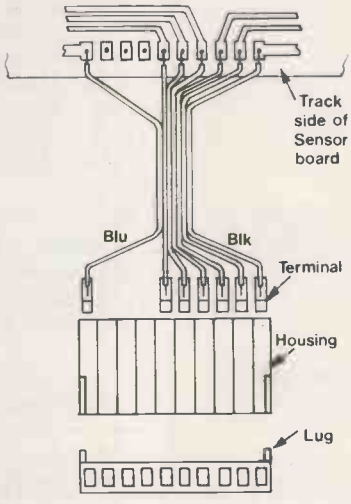


Fig 10 Wiring to minicon terminal socket

Trundle has achieved its goal if it reads 27, since this is the only time 4 would be de-activated while the others are active.

With lists of all the possible PEEKS and POKES in front of you, you can now

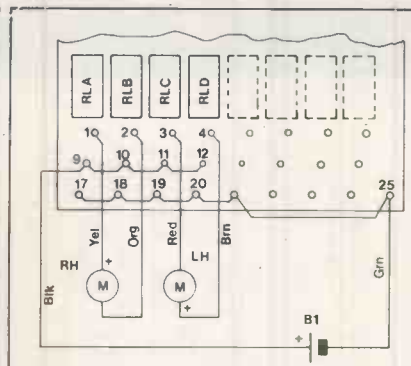


Fig 11 Wiring motor to interface PCB

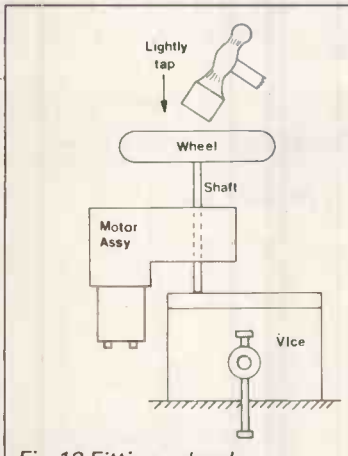


Fig 13 Fitting wheels

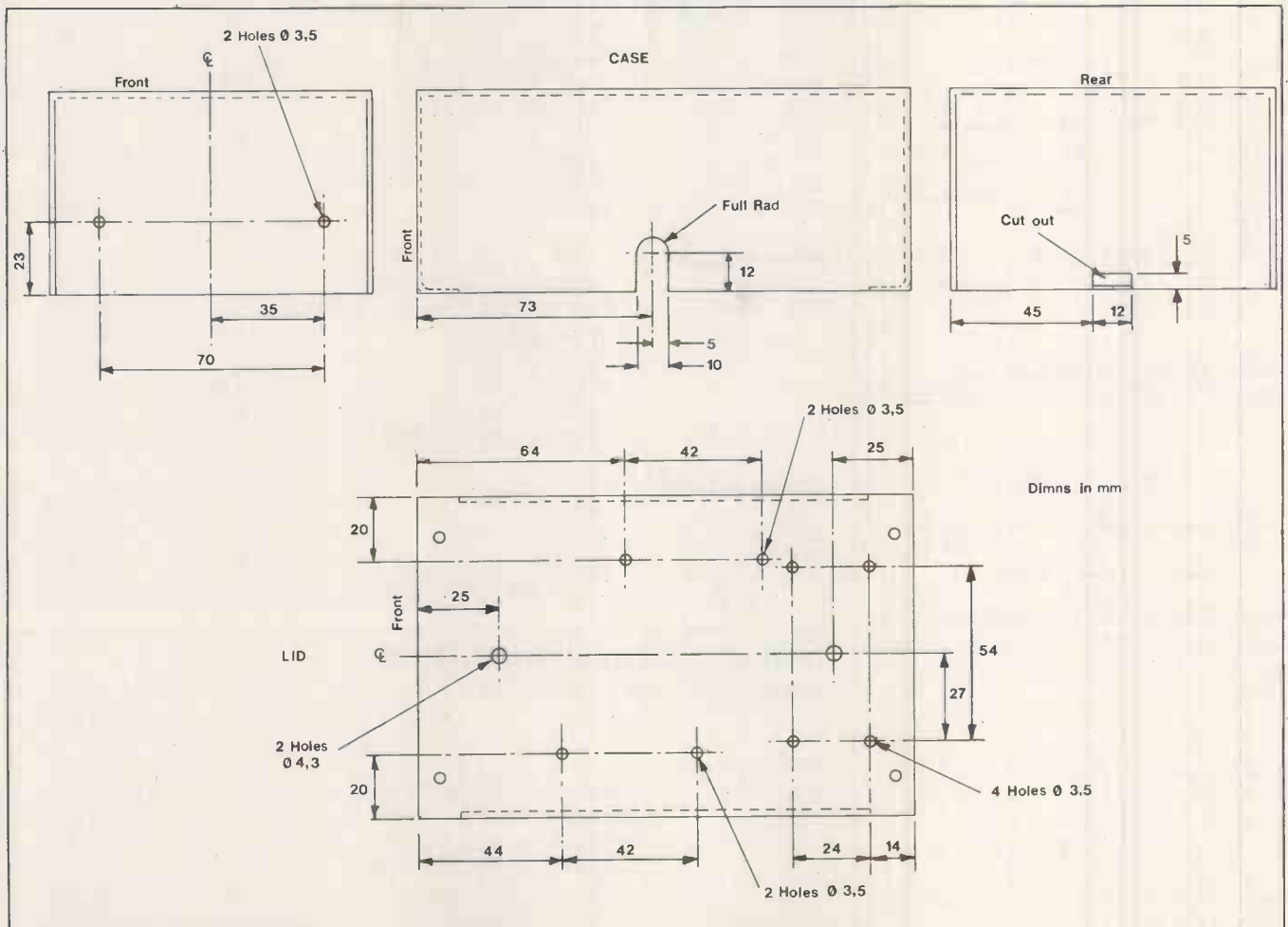


Fig 12a, b Box drilling details

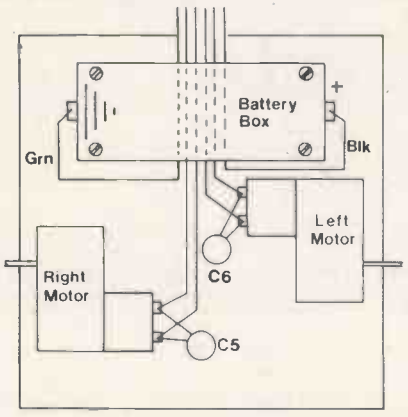


Fig 14 Chassis assembly & wiring

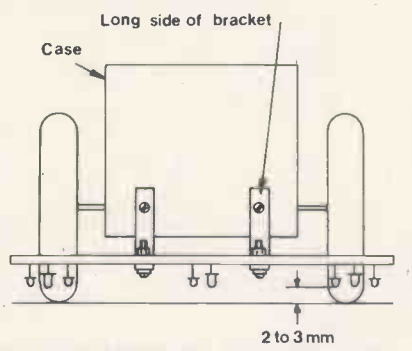


Fig 15 Mounting sensor PCB

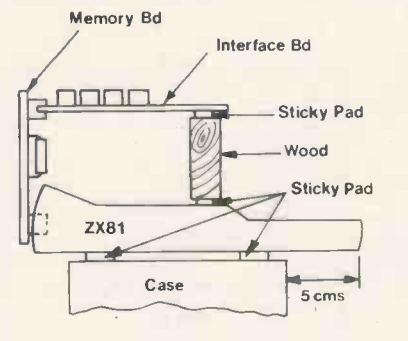


Fig 16 Fixing ZX81 to assembly

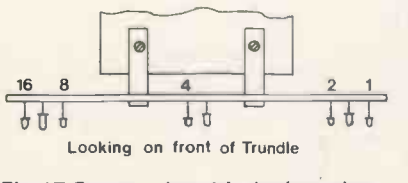


Fig 17 Sensor data bit designation

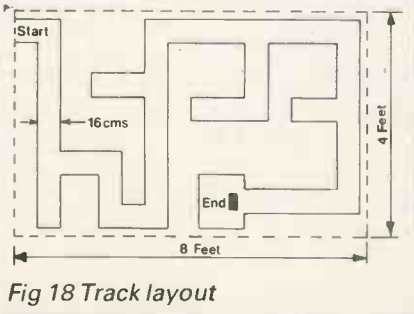


Fig 18 Track layout

Hardware Components

Capacitors			
C5,6	470nF Minidisc	2	(YR76H)
Miscellaneous			
	Case AC64	1	(XB56L)
	Trundle Motor Assembly	2	(FT41U)
	Trundle Wheels	2	(FT42V)
	Trundle Bracket	2	(FT43W)
	Battery Box HP2 Single	1	(BK46A)
	6BA Bolt × ½in	1 Pkt	(BF06G)
	6BA C/S Screws 1in	1 Pkt	(BF13P)
	6BA Spacer × ½in	1 Pkt	(FW35Q)
	6BA Nut	2 Pkts	(BF18U)
	6BA Washer	2 Pkts	(BF22Y)
	4BA Bolt × 1in	1 Pkt	(BF04E)
	4BA Shakewasher	1 Pkt	(BF25C)
	4BA Nut	1 Pkt	(BF17T)
	Quickstick Pads	1	(HB22Y)
Optional			
B1	D Cell Battery	1	(FK57M)

Interface Board Components

Resistors: All 0.4W 1% Metal Film			
R1-4 inc.	4k7	4	(M4K7)
Capacitors			
C2,3	100nF Minidisc	2	(YR75S)
C4	10μF 16V Tantalum	1	(WW68Y)
Semiconductors			
IC3	74LS27	1	(YF18U)
IC4	74LS00	1	(YF00A)
IC6	74LS373	1	(YH15R)
IC5	74LS244	1	(QQ56L)
IC7,8	74LS14	2	(YF12N)
D1-4 inc.	1N4001	4	(QL73Q)
D9	IN4148	1	(QL80B)
TR1-4 inc.	BC109C	4	(QB33L)
Miscellanous			
RLA,B,C,D	Ultra-min Relay 6V DPDT	4	(BK48C)
PL1	RA Latch Minicon Plug 10-way	1	(RK68Y)
	14-pin DIL Skt	4	(BL18U)
	20-pin DIL Skt	2	(HQ77J)
	Veropin 2145	1 Pkt	(FL24B)
	Bell Wire Blue	1 Mtre	(BL86T)
	Trundle Interface PCB	1	(GB89W)
Optional items			
R5-8 inc.	4K7	4	(M4K7)
D5-8 inc.	1N4001	4	(QL73Q)
TR5-8 inc.	BC109C	4	(QB33L)
RLE,F,G,H	Ultra-min Relay 6V DPDT	4	(BK48C)

Sensor Board Components

Resistors: All 0.4W 1% Metal Film			
R2	10R	1	(M10R)
Miscellaneous			
D10,11,12	Infra-red Emitter TIL 38	3	(YH70M)
D13-17 inc.	Infra-red Sensor TIL 78	5	(YY66W)
	10-way Ribbon Cable	1 Mtre	(XR06G)
	10-way Minicon Housing	1	(FY94C)
	Minicon Terminal	10	(YW25C)
	Trundle Sensor PCB	1	(GB90X)
	Veropin 2145	1 Pkt	(FL24B)

Memory Board Components

Capacitors

C1	100nF Minidisc	1	(YR75S)

Semiconductors

IC1	74LS00	1	(YF00A)
IC2	6116	1	(UF33L)

Miscellaneous

SK1,2	2×23-way PC Edgecon	2	(RK35Q)
	24 Pin DIL Skt	1	(BL20W)
	40 Pin DIL Skt	1	(HQ38R)
	Trundle Memory PCB	1	(GB88V)

write a program! I would suggest the first thing you do is write a short routine to make Trundle run along a straight, correcting for drifts.

No, I'm not going to write it for you; that's your problem! Now do the same for dealing with bends. It is useful to know here that as you approach a corner, you can maintain a straight line on one wall. Also, if you stop when all the sensors see the black line at the top of a bend, Trundle is exactly in line to turn into the next passage.

Consider all the situations Trundle can get into and write routines for them. One of the most challenging will be to correctly get it out of a dead end. Unless you are careful, you will find that on coming out of the dead end, Trundle will go back to the beginning again. To avoid this, you will have to arrange a 'flag' in the program to indicate that a choice between two possible pathways was made and if you do hit a dead end, you take the alternative pathway on coming out of it.

Memory saving

If you can write in machine code, you could probably write a good program in the 500 bytes available in the original ZX81. However, we have assumed you will write in Basic so we have changed the memory to 2k bytes. This should be adequate provided you are not wasteful. Useful tips are:

1. Keep variable names as short as possible; each character you use costs a byte.

2. Frequently repeated numbers should be replaced with a variable. A good number to substitute with a variable would be the 9000 repeated in the PEEKs and POKEs.

3. Wherever possible, replace 'IF PEEK 9000 = xxx' with LET D = PEEK 9000, so it would now read 'IF D = xxx'. A good place for this type of saving is in your correction routine. Note that this type of saving is not worthwhile in loops where the contents of the input port are being updated continually.

Signs of a nearly full memory are keyboard lock up, that is, what you type in not appearing on the screen. Incomplete screen listings appearing and most annoying of all, a complete crash, is signified by the screen going grey. If this happens, you've lost your program — so it is advisable to tape any complicated parts of program you've written as soon as they work.

Uses of Trundle

Firstly note that you can install another four relays if you wish. Space has been left on the board for this. You will of course also have to put in the extra transistors, diodes and resistors.

The input port will also accept a total of eight lines. The relays can be used to switch any piece of equipment up to a maximum of 24 volts at 1 amp. Note that they are not suitable for switching mains electricity. To attempt this would be very dangerous. The input port will respond to any system that can produce a suitable voltage transition (Fig 19a).

In the dark, this will produce a logical low at the computer. In the light, it will produce a high. Remember there is an inversion through the interface board. The preset can be adjusted to trigger a high on the computer port at any derived temperature (Fig 19b). When the switch is open, the port will read a high (Fig 19c). When closed, it will read a low or if it is more convenient, the circuit can be reversed to give the opposite logic (Fig 19d).

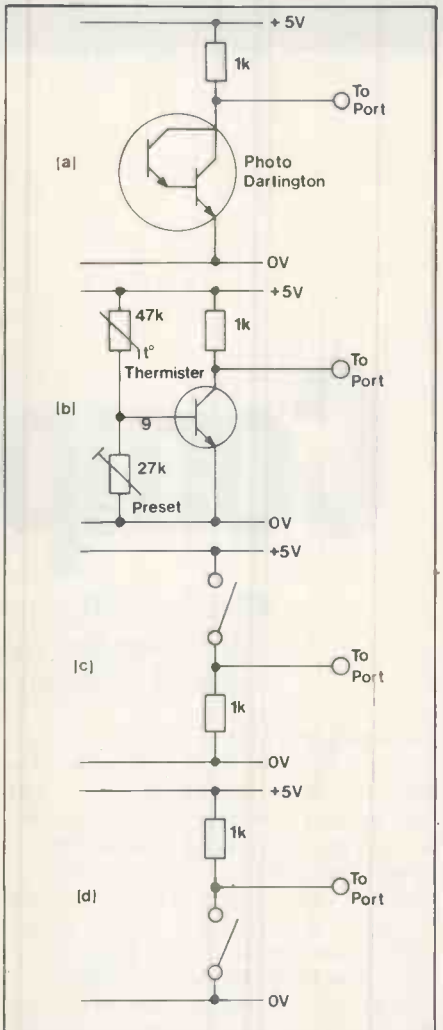


Fig 19 Suggested inputs, (a) Light operated (b) Temperature operated (c & d) Switch operated

You could monitor the doors and windows of a house with reed switches held closed with magnets. If somebody enters the house, the computer could be preprogrammed to recognise where the intruder had entered. Then switch on an alarm or tape recorder with a warning message. If you were to set this up permanently, it would be advisable to cut ventilating holes in the ZX81 case and preferably increase the size of the heatsink since the computer does get very hot when it is left on for long periods.

Use one of the original Trundle motors to move a conveyor belt made from an old bicycle inner tube. Objects moving along the belt could be monitored by placing light sensitive sensors along the belt.

For example, count total bottles passing along the belt with one sensor. Check that each bottle is upright. If one is on its side, stop the belt and use another relay to switch on a relay to push the fallen bottle off the belt. END

A complete kit of parts, excluding optional items, is available.
Order As LK 62S (Trundle Kit) Price £49.95. (A ZX81 computer is also required of course.)
The following are also available separately, but are not included in the 1985 Maplin catalogue:
Trundle Interface PCB. Order as GB89W Price £3.75.
Trundle Sensor PCB. Order as GB90X Price £2.50.
Trundle Memory PCB. Order as GB88V Price £2.75.
Trundle Motor Assembly. Order as FT41U Price £3.99.
Trundle Wheel. Order as FT42V Price 35p.
Trundle Bracket. Order as FT43W Price 29p.

The kit, or all parts separately, are available from Maplin Electronic Supplies Ltd., PO Box 3, Rayleigh, Essex and Maplin shops in London, Manchester, Birmingham, Southampton and Southend-on-Sea. Maplin catalogues are also available in all branches of W. H. Smith.

SCREENTEST

Complete Manager

Alternative Business Systems' The Complete Manager is just that — it provides four system levels in a powerful and flexible applications package. Kathy Lang assesses its suitability for all types of users.

The Complete Manager comes in four flavours, ranging from a menu system used to drive packages, to a full applications development system based upon a powerful database manager. (The terminology is confusing, because the name 'The Complete Manager' is used both for the whole suite of packages, and for the applications development system itself.)

At the simplest level is the Executive Manager, which is essentially a shell providing the ability to construct menus which give access to other application packages, both those written in The Complete Manager itself (for which it provides a run-time system) and third party application packages such as word processors and spreadsheets. A version which includes electronic mail and a diary is available for Unix-based systems. The Executive Manager can thus be likened to the kind of 'electronic office' environment provided by many of the suppliers of major office systems, but with the 'building blocks' constructed from a much wider variety of sources if the user requires that flexibility.

The second level of The Complete Manager is The Enquiring Manager, which is essentially a simple, single-file data management system providing basic facilities in the same part of the market as DMS+, Friday! and Trendisk. The Enquiring Manager is constructed from Complete Manager commands, but is itself menu-driven and reasonably simple to use. I understand that it was originally intended primarily as a demonstration of what The Complete Manager can achieve for ordinary users, and as a simple way in to The Complete Manager.

A number of users have, however, found The Enquiring Manager to be of considerable value in its own right, and it is being developed to provide additional facilities. These are functions which are available within The Complete Manager, but which can at present be accessed by users of The Enquiring Manager only by executing modules which they have constructed in The Complete Manager.

The Complete Manager is a powerful and flexible applications development system, which has at its core a database manager called MKFS. This database manager is also accessible to programs written in high-level languages where additional database handling functions are needed, or where programs need access to files created in Complete Manager applications. In this review, I'll concentrate on The Complete Manager as an applications development system, since the other parts of the package are generated by it or provide a subset of its facilities.

The Complete Manager is essentially a command-driven package which includes within it a command for creating menus, so that sets of Complete Manager commands may be grouped together and invoked from menus. Commands are of two types: immediate commands, which are executed as soon as they are entered (like statements without line numbers in Basic); and stored commands, which are executed when an EXECUTE or RUN command is issued. Any command can be made immediate simply by prefacing it with EX (for EXECUTE). The term 'stored' is a trifle misleading — it refers to the set of commands currently in memory, which may in turn include references to sets of commands stored on disk as macros.

The Complete Manager comes with a set of commands, called internal commands, which developers may use but may not change. They may, however, set up commands of their own, known as external commands in The Complete Manager, which consist of sets of internal and external commands: that is, any external command may include calls upon other external commands. This ability to nest commands — comparable with the use of true subroutines (more powerful than the despised Basic GOSUB) and with the DO command in dBaseIII (which allows the passing of parameters) — is an extremely powerful feature, and one which gives developers' packages (such as The Complete Manager) control facilities comparable with those of good high-level languages.

The Complete Manager stores records as fixed length strings of characters, or combinations of character and binary data. The structure of each record is fixed in the sense that each record must be identical in length, and in order and length of sets of data items of the same type (real numbers, characters, whole numbers). On the other hand, the structure is more flexible than such a description would suggest in the sense that field definitions and the information about how these describe the records are held separately from the records themselves, and any set of records may be described in several different ways.

This is an unusual approach for a microcomputer package. The Complete Manager allows up to ten data files to be open at once, and provides commands to facilitate their linkage.

The Complete Manager is also unusual among microcomputer packages in being truly multi-user. It provides facilities for record locking and unlocking to prevent updating by more than one user at a time. This feature in part reflects its history as a package initially written for a large minicomputer — the Prime — and

then implemented on other minis running Unix and similar operating systems, as well as onto networked micros. The Complete Manager is a British product, written by Alternative Business Systems, and supplied and supported by Pipeline (part of the Tamsys Group) through its network of dealers.

Constraints

Size constraints are unlikely to worry people using The Complete Manager, but the absence of a special date format will be a problem for some, mitigated to some degree by special functions for handling both dates and times. The requirement to have a unique primary key may also cause difficulty in some applications.

File creation and indexing

In order to be able to enter data into records, to amend them, and to analyse them to produce reports, The Complete Manager must be told the format of those records. There is, however, no permanent association between the description of a record format and the data file containing the records. Record definitions are set up using one of two Complete Manager commands, the main differences being in the amount of prompting available and whether amendment is available. When setting up a record definition, you specify for each field its name, type (which includes lists — that is, single-dimension arrays), length in the record and in reports, position in the record (which may be 'immediately following the field I defined last'), and, if you wish, other attributes such as whether the field should be restricted to viewing only. You also assign to each field a unit number, which is used to associate a particular set of field definitions with an appropriate file of data, for when you open a file you must specify the unit number used to reference it. (This has some parallels with the approach used by Basic for handling random access files.)

Every data file may have up to ten keys; these keys may be individual fields or they may be any section of the record which is contiguous, so a key may span more than one field or cover only part of a field. The keys are specified when the file is created through the CREATE command; the first key specified is the primary key, whose value must be unique to each record. If you subsequently need to define extra key fields, you must copy the data file to a new file created with the required key specifications.

Within The Enquiring Manager, menu options are provided to enable you to set up record formats and create files without having to use commands and remember their method of use. This facility is implemented using The Complete Manager's ability to take information from the screen, and use it to create files and field definitions.

Data input and updating

When updating files, the first essential is to provide a set of field descriptions for the file(s) you intend to update, and to open the data file(s) on unit numbers which match those in the appropriate field descriptions; this allows The Complete Manager to relate each data file to its record definition.

The Complete Manager then provides a variety of ways in which to add and amend data. Probably the simplest is the BUILD command, which takes a file number as its parameter. The Complete Manager then presents a default screen format showing all the fields defined for that file number, and allows you to enter values into the fields. If you enter a new value into the primary key field, BUILD will add the record to the file. If you enter an existing value, The Complete Manager requests confirmation before overwriting the existing record.

More sophisticated entry and editing is provided by the ADD and CHANGE commands. Using ADD, you can set up a set of new values for the record in memory, and then save them as a new record. This allows you to accept data via your own screen formats, carry out any validation that may be needed, and calculate field values which depend on the contents of other fields.

The CHANGE command allows similar flexibility: it is prefaced by either the FIND or the NEXT command, to retrieve a specific record or to get the next record in the current key order. It is thus possible to work through a file in order by any key, and you can change the key used for this purpose at will.

The Enquiring Manager uses these commands to provide interactive entry and editing for one file at a time, using simple menus and lists of options. You can, of course, develop more complex systems in which several files are amended in one operation.

Screen display

When entering, amending or viewing data, you can either rely on the simple default format used by the BUILD command, or exploit The Complete Manager's facilities for direct cursor addressing to design more carefully tailored formats. This means that, using the DISPLAY command, you can place prompts anywhere on the screen, and using the ACCEPT command you can take data from any position. This involves specifying the row and column position of the displayed information, either as absolute coordinates or relative to the most recent cursor positioning.

The Complete Manager does not, however, allow you to 'read' the current position of the cursor if it is moved by the user in an unpredictable way. As a result, the facility which The Enquiring Manager provides to allow you to construct your own simple screen formats must, since it uses The Complete Manager facilities, ask you for the column and row coordinates of each prompt and field — no paint-a-screen approach is possible.

Maximum file size	OSL
Max record size (ch)	2000
Max no fields	150
Max field size	48
Max digits	14
Max prime key length	30
Special disk format?	N
File size fixed?	N
Link to ASCII files?	YF
Data types	N, C, I, List
Fixed rec structure?	N
Fixed record length stored?	Y
Amend rec structure?	Y
Link data files?	Y
No. data files open	10
No. sort fields	10+
No. keys	10
Max key length (chars, fields)	24, 24
Subsiduary indexes kept up-to-date?	UTD
Data validation	DIY
Screen formatting	C, D
Unique keys	1M
Report formatting	C, D
Store calculated data	IN, ED, BA
Totals and Statistics	Y
Store selecn criteria	A, O, N
>1criterion/field?	Y
Wild code selection?	SW
Browsing methods	AK
Interaction methods	M, C, FT
Reference Manual+	**
Tutorial Guide+	***
Reference Card+	N
Online Help+	**
Hot-line?	P

Fig 1 Features and constraints

In addition to the formatted screen formats using cursor addressing, The Complete Manager provides two view-only formats. The LIST command is immediate, and shows the values for every field for each record in a file using a default display format. The WRITE command works in a similar way to the DISPLAY command, but is intended for showing information which is only to be viewed. Any report designed with the WRITE command can be displayed or printed, but its primary purpose is to give formatted reports for listing on the printer.

Printed reports

Any report which can be displayed can be sent to the printer, either by echoing screen input using operating system facilities (for example, CTRL/P in CP/M and MS-DOS) or by directing output to the system list device. System commands control the default dimensions of items such as page length, relating to the formatting control options in the

WRITE command. This command also allows the inclusion of headers and footers, and of system variables such as the date and the current page number of the report. When used with the ON command, it can output sub-totals (using keys as break fields) and performs various other formatting tasks such as starting a new page.

The Enquiring Manager uses the facilities of The Complete Manager to allow the production of simple columnar reports.

Selection and sorting

In addition to the facilities already described for selecting individual records, there are two main ways in which you can select sets of records for inclusion in a report or list using The Complete Manager's two methods of cycling through records in a file.

The EXECUTE command carries out the specified procedure once. If you want to carry out parts of the procedure on many records, you include them in one of The Complete Manager's repeat loops (see Tailoring) and then make any selection tests using the IF . . . THEN . . . ELSE . . . ENDIF commands. The conditions which can be attached to IF include the usual comparison operators (equals, less than, and so on) together with string comparisons allowing you to test for whether a character field starts with, ends with or contains the test string. Where more than one criterion is used, you can ask for them all to be met, or any combination, using AND, OR and brackets to determine the correct order of evaluation. Where you simply want to carry out one set of commands once for each record on the file, you can use the RUN command. This cycles through the data file, executing each command in the named procedure once for each record. You can attach selection criteria to the RUN command, so that the procedure is executed only for those records which meet the criteria. These criteria can be set up using the same tests and combinations as those described for the IF command.

Within The Enquiring Manager, you can attach conditions to the production of a report, and again these may include any or all of the tests and combinations described for the IF command.

Sorting is achieved by using the index keys as sort fields. The Complete Manager allows the use of any or all of the keys for ordering purposes when producing reports. Within The Enquiring Manager, you are restricted to a single key for ordering reports. If you wish to change the way the file is indexed, you must copy the data to a new file which has been created using the new key definitions. The field definitions can be re-used, since they form a template laid over the physical data in whatever file it is stored.

SCREENTEST

Calculation

Calculations can be carried out on any numeric fields from data files, or on temporary variables defined as being held in 'file zero'. Arithmetic operators and brackets are available. There is also a 'scale' function, which allows you to have all numeric values scaled by 10 to a given power on input and rescaled on output, thereby maintaining values to a higher precision than would be possible if they were stored at their displayed precision.

Multiple files

Within The Complete Manager, files are referred to by number (which may be a constant or a variable); the connection between numbers and names is made by an Open statement for each file. When processing two or more files, you can link them by reference to any key field in the subsidiary files and any field in the main file. Procedures carried out using RUN will use this process implicitly: that is, linkages are always attempted. Procedures executed using the RUN command work by reading in one record at a time from the main file in use with an appropriate set of file definitions.

If we suppose that such a set of definitions includes a field called 'dept', whose value is to be used to extract a corresponding record from another file, then the FIND command could accomplish such a linkage. The command 'find 1,2,dept' would take the value of 'dept' from the main file and use it to match the second key of the file opened on unit 1. This matching would be attempted once for each record in the main file.

Where procedures are carried out using the EXECUTE command, the same approach can be used but it may be conditional if you wish: that is, the FIND command may be included in IF loops. It is, of course, possible to check whether a FIND command has been successful. It is also possible to use any variable as the match for FIND, including values read in from the keyboard or calculated from other field values.

Tailoring

Many of The Complete Manager's basic facilities come within the range of features which are needed to enable you to tailor a system for your own or others' use. Among those not yet mentioned are the ability to include commands within a WHILE...ENDW loop, to branch anywhere in the current procedure using GOTO (and I mean anywhere, including into IF and WHILE loops), and the ability to construct menus. These may include hidden options which are available only to the *cognoscenti*. For example, on the main The Enquiring Manager menu as distributed, if you know about it then pressing a single key will get you into the full The Complete Manager environment, but no such option is displayed on the menu.

The Complete Manager makes it possible to allow the user to press ESCape at any point, and to react in predictable ways to this key. It is also possible to provide screens of Help text through a 'short-cut' screen display command called MASK, which simply takes the file of text given and displays it on the screen in a sensible layout, replacing temporarily the previous screen image.

BM1	Time to add one new record	Inst
BM2	Time to select record by primary key	Inst
BM3	Time to select record by secondary key	Inst
BM4	Time to select 20 records from 1000 sequentially on three-character field (same field as in BM2 key)	4mins 15secs
BM5	Time to access record using wild code	Inst
BM6	Time to index 1000 records on three-character field	37mins 40secs
BM7	Time to sort 1000 records on five-character field	N/A
BM8	Time to calculate on one field per record and store result in record	4mins 15secs
BM9	Time to total three fields over 1000 records	4mins 40secs
BM10	Time to add one new field to each of 1000 records	32mins 40secs

Time to import a file of 1000 records: 20mins 6secs

Notes: NT = Not tested; NP = Not possible; + = including scrolling
Where two times are given, first is access to first record, second is access to each subsequent record

Fig 2 Benchmarks recorded on IBM PC/XT, H

Any set of The Complete Manager commands may be grouped together to form a macro, and stored in a file in the local or system macro directory. Where this is done, you can call such macros with parameters which are substituted by the appropriate values when the macro is invoked. When the macro finishes, any variables altered within the macro will retain those values. In most respects, including the facility for immediate execution provided by prefacing the name with the EXECUTE command, macros are equivalent to internal commands. The main difference is that macro names cannot, as internal command names can, be abbreviated to their minimum recognisable length.

Creating and editing The Complete Manager macros is achieved by using an appropriate editor. If the editor is named ED.COM it can be called from within The Complete Manager, and can be used either to edit the set of commands currently within memory, or to edit a named file of commands and/or file descriptions. Such editing is facilitated by the RESET command, which clears the memory of all commands but leaves file definitions in place. This allows you to test several macros in succession without resetting file definitions as well.

Security & housekeeping

In a multi-user system, the commands LOCK and UNLOCK allow the system developer to protect records against more than one user attempting to change them at a time.

The Complete Manager includes facilities for copying and deleting files. It also has the ability to ATTACH to any directory, so that files may be located in any directory where the operating system provides these facilities. You can also execute operating system commands from within The Complete Manager, again if the operating system permits it: for example, on versions 2.0 and above of MS-DOS and PC-DOS.

Links with outside

An unkeyed MKFS file containing only character data is simply a fixed-format ASCII sequential file. To import data, therefore, one must ensure that the file contains fixed length fields in the appropriate order, create a file in The Complete Manager specifying the appropriate key field positions, and then copy the external file into it. As you would expect, the implication is that ASCII sequential files can be used directly within The Complete Manager, but none of the direct access commands would then be available.

User image

It is always hard to judge the user image of a package which can be so completely tuned to the user's requirements as can the two simple elements of The Complete Manager, namely The Executive Manager and The Enquiring Manager. In a sense it is unfair to try, since what any user will see will depend on what the system developer has made of the system. Probably the most it is fair to say is that The Enquiring Manager as shipped should be reasonably straightforward for most people to use, if rather pedestrian and limited in its function.

About the underlying development system, however, there need be no such hesitation. As someone who is used to command-driven systems, I found The Complete Manager easy to use. Online help is available, although most floppy systems could not accommodate The Enquiring Manager menus and macros, as well as The Complete Manager itself and all the Help files, on a single floppy disk. For this and other reasons the system is better suited to a hard disk system.

I would expect a novice user, however, to fare badly, although this is probably more the fault of the documentation than of the basic user image of The Complete Manager. On the whole, I would say that the difficulties a novice would experience are inherent within the nature of command-driven systems, where such Help as is provided is only in the form of text screens which can be summoned up by request. This means that, even at the beginning, the user must have a reasonable picture of the way the package functions to get anything out of it.

Documentation

Such a verdict on the user image puts a premium on the quality of the documentation.

The introduction to The Complete Manager is in fact a discussion of all its features at a relatively simple level. I felt it to be lacking in two ways: there is little in the way of an explanation of the overall approach of the system (there is an introduction to commands, but no explanation of how they are actually used in conjunction with file definitions), and there are far too few examples. I found it quite hard going. I suspect that a novice user, who had mastered The Enquiring Manager and wanted to progress further, would find it very difficult indeed.

The reference list of commands also lacks sufficient examples. In addition, it suffers from an even more serious disadvantage: it is neither rigorous nor comprehensive. In some cases, the command description tells you if it is immediate or stored, but often it doesn't — you just have to try it out. Such description of each command, as is given, is often extremely terse, with a single very short uncommented example, often full of meaningless 'etc's where fuller examples could have given more clues to the way the system is commonly used.

Included with the software are two simple demonstration The Complete Manager systems; the commands used by these systems are listed at the front of the manual. Although not quite uncommented, there are insufficient comments to make it easy to follow what is going on, so what could have been the most helpful part of the manual is much less than it could be. A final criticism — the manual is A5, in typed format, right justified, an approach which does not make for the easiest of reading.

Conclusion

Novices wishing to use The Enquiring Manager should be able to get going without too much trouble, and that system can be used in a simple way. It is not, however, intended for people who will never need the full power of The Complete Manager, nor would it be cost-effective to buy the complete package just for that part. I do not believe that an inexperienced computer user, aided only by the current documentation and with a reasonable expenditure of effort, could come to grips with The Complete Manager at the command level.

For system developers, however, and for experienced users wanting a powerful and flexible data management system with multiple files, parameterised procedures and true multi-user capability, The Complete Manager would be well worth investigating. But even for such users, some improvements in the documentation would be highly desirable. END

Summary

Supplier	Pipeline Software
Tel	(07535) 56747
Cost (£)	£530/130
Systems	86, MS, PC, Unix, MU
Version reviewed	1.1
Type	F, E
Features	Three-level system: underlying package is command-driven, with up to 10 files in use at once, multi-user features, parameter-driven macros, all indexes kept up-to-date. Top-level Executive Manager is run-time system (£130).
Drawbacks	Short fields, no date type (although functions provided), primary key must be unique.
Ease of use	Acceptable for experienced users, although documentation poor. Levels 1 & 2 OK for novices, command level very hard.

Light fantastic

Participate in an experiment with PCW *and* Channel 4 *— it involves a new method of software transmission. The circuit has been conceived and implemented by Mike Daley and Richard Theodossiades, and the programs by David Atkins; all three are from University College, Cardiff.*

The new *Channel 4* computer news and current affairs programme for serious computer users currently being broadcast (Monday 5.30-6.00pm from 11 February) offers its viewers a unique opportunity to participate in an experiment. We're all used to transmitting software by making electrons run up and down a wire, but now it's the turn of the photons.

During the broadcast of *4 Computer Buffs*, a flashing white square will appear on the screen roughly where the *TV AM* clock usually sits. If you make a receiver by following the instructions below, you'll be able to pick up free software for the Commodore 64, BBC or Spectrum 48k micros, transmitted via the flashing white square.

Sounds crazy? At least one company we know of, Firstquad Ltd, has applied for a patent for a system which offers commercial data transfer rates and data security levels. If you're interested the

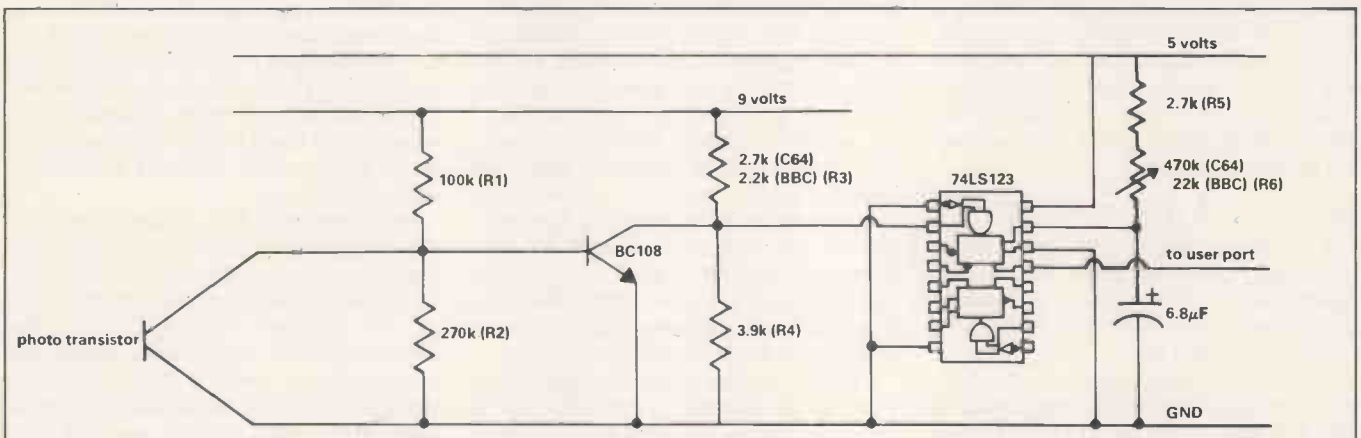


Fig 1 Circuit diagram for the BBC Micro and Commodore 64

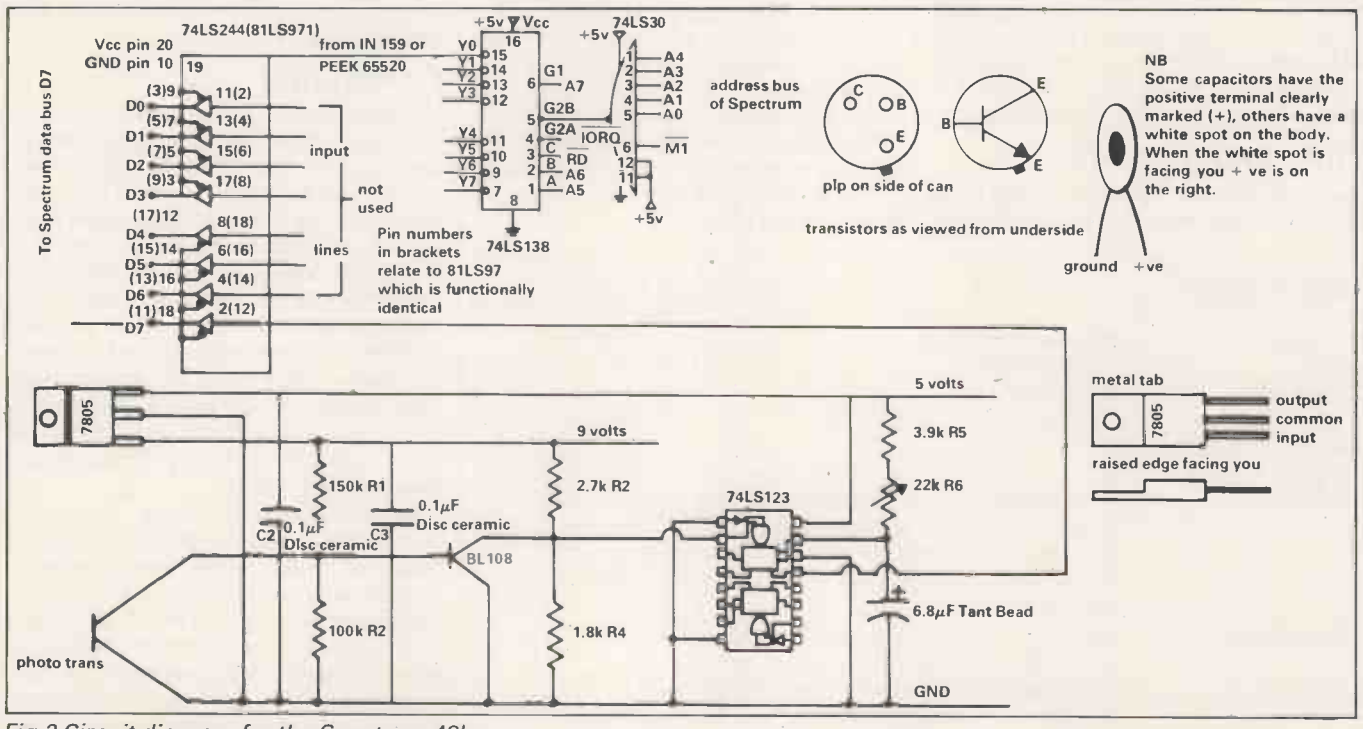


Fig 2 Circuit diagram for the Spectrum 48k

company is on (0222) 752189.

Having constructed a receiver, you need to calibrate it for your particular TV set using the calibration program for your micro. Picking up software is then easy. Tune into *4 Computer Buffs*, connect the receiver, load and run the receiver software, and press the space bar when told to. By the end of that edition of *4 Computer Buffs* you'll have a program in memory which you can save to tape or disk and run in the normal way. Note that the receiver board will only work with the 48k version of the Spectrum. Unfortunately the 16k Spectrum doesn't allow the necessary control over timing.

The actual light detection is done by a phototransistor mounted in a sucker, which is fixed to the screen over the flashing white square.

Construction

To construct the circuit you'll need a piece of veroboard, approximately 60mm × 40mm. The 74LS123 chip is mounted in a 16-pin DIL socket, rather than soldering it in directly. Care should be exercised when soldering the transistors to ensure that excess heat is not applied. Ensure also that the capacitor is put in the right way round, as it is of the electrolytic type and will blow up if connected backwards. The rest of the components are inserted as shown on the circuit diagrams (Figs 1, 2).

The phototransistor is mounted in the centre of the rubber sucker. The best type of sucker is that sold with hooks for the cups (Fig 3).

Try to make as small a hole as possible to achieve an air-tight fit. If necessary a blob of silicon rubber can be put over the hole to seal it (Fig 3).

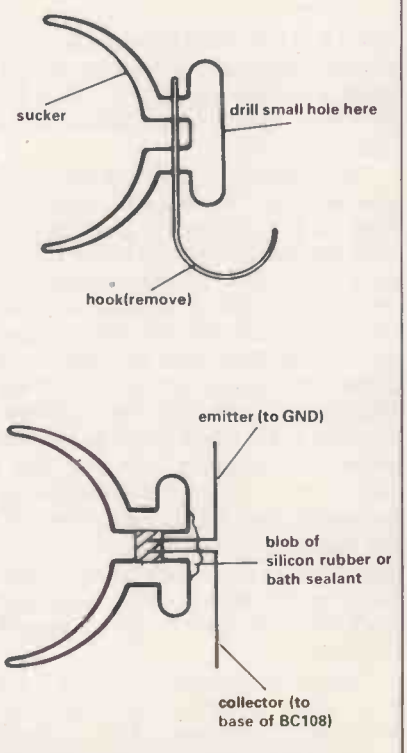


Fig 3 Mounting the phototransistor

Procedure for tuning the receiver board ready for the software broadcast

The following steps should be carried out in a room with low lighting and definitely no direct light on the television screen.

The Basic programs should be typed in and saved onto tape or disk before carrying out the tuning or receiving procedures. The instructions for these procedures assume that the tuning program has been saved with the name TUNE. And that the receiving program has been saved with the name REC.

First set up your computer as normal, using the television set that will be used for the broadcast. Make sure the receiver board is plugged into the computer's port correctly before you switch on.

Then load and run the tuning program:

BBC	CHAIN 'TUNE' CALL & 900
Spectrum	NEW LOAD 'TUNE' RUN
Commodore 64	LOAD 'TUNE' RUN SYS 49152

Adjust brightness and contrast, so that the writing on the screen is a clear white on a steady dark background. Make sure there are no streaks of light across the screen.

Place the sucker over the solid white block in the bottom right-hand corner of the screen. Make sure that it is firmly stuck to the screen.

If there is not also a '*' on the display inbetween the two pointers –> and <–, adjust the variable resistor's value so that one appears. Each time you change the value of the variable resistor, press the space bar afterwards. *This is very important.*

Now adjust the resistor in small steps, so that the '*' just disappears. Again, remember to press the space bar after every adjustment of the variable resistor. Before you can be sure that you have correctly tuned in the board, the tuning program should be left to run for as long as possible after you have made the star disappear. A time of 15 minutes should be adequate. If the '*' reappears during this time then repeat this step again.

Once the board has been tuned in, you are ready to receive the broadcast of software. Now read the procedure for doing so.

Once you have tuned in the receiver board, do *not* alter the value of the resistor on the board, or the brightness, or contrast controls on the television.

The input to the BBC Micro is via the user port and is a 20-way (female) IDC connector. The user guide is misleading about the orientation of this plug. Check with a volt meter if you have one — look for GND and +5v. One wire must go from ground on the receiver board to one of the ground pins; another from

Procedure for receiving a program transmitted during *4 Computer Buffs*

The following steps should be carried out in a room with low lighting — definitely, no direct light on the television screen.

Before *4 Computer Buffs* is due to start, set up your computer as you would do normally, with the receiver board plugged into the port.

Load and run the receiving program:

BBC	*RUN BBCREC CHAIN 'REC' CALL 900
Spectrum	NEW LOAD 'REC' RANDOMISE USR 45056
Commodore 64	LOAD 'REC' RUN SYS 49152

Your computer is now ready to receive the software.

Switch on the television and tune into *4 Computer Buffs*. When it starts, place the receiver sucker over the solid white block in the corner of the screen. Make sure that it is firmly stuck to the screen.

Just before the software is transmitted, you will be told to press the space bar on your computer. After this, the computer will start downloading the program. When the transmission has finished, save the program onto tape or disk using the usual instructions for saving a Basic program.

Before you try to run the software, it is advisable to switch the computer off and on again so that it is completely reset. Load the program back into your computer using the normal instructions for loading a Basic program, and run it.

If you are using the same television set for your computer and for watching the television program, take care that you don't accidentally knock any of the leads when connecting, or disconnecting, the television.

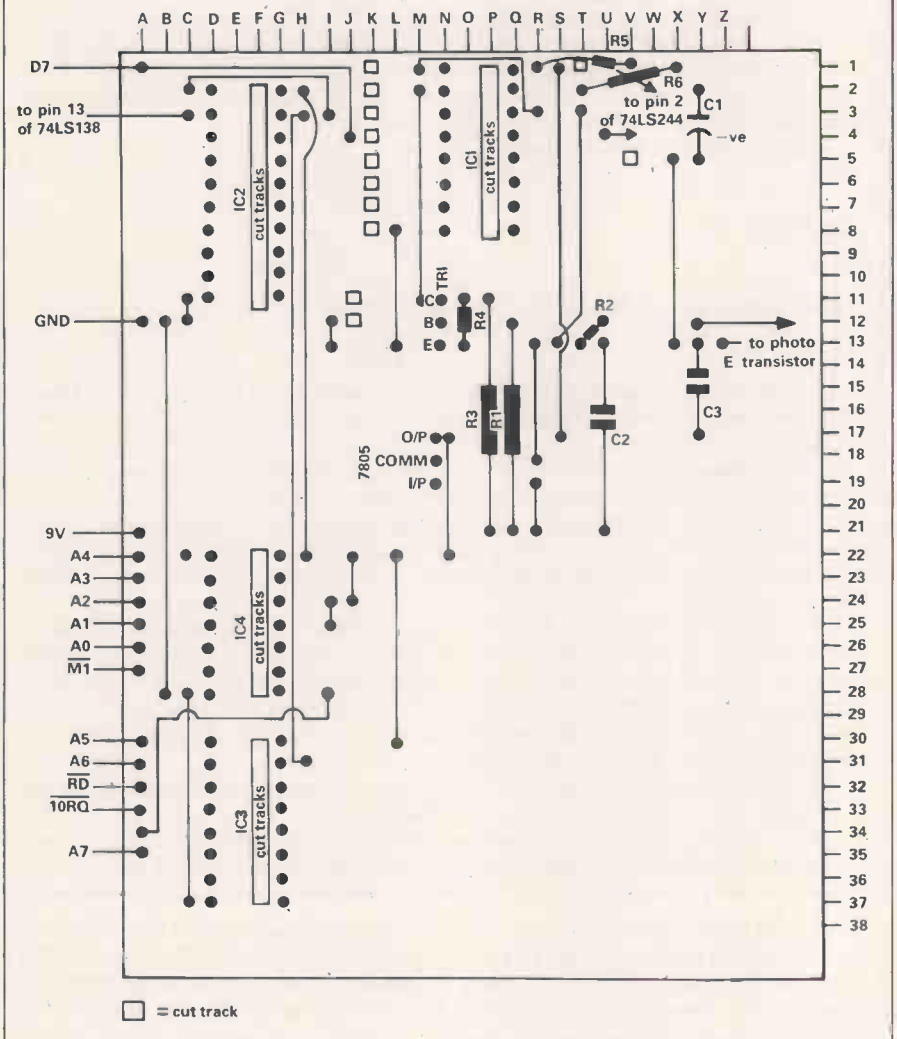


Fig 4 Component mounting for the Spectrum 48k

Component list

Spectrum

Resistors

1 of	150k		R1	¼-watt carbon
1 of	100k		R2	¼-watt carbon
1 of	2.7k		R3	¼-watt carbon
1 of	1.8k		R4	¼-watt carbon
1 of	3.9k		R5	¼-watt carbon
1 of	22k	Preset	R6	¼-watt carbon

Capacitors

1 of	6.8µF Tant bead C1
2 of	0.1µF Disc ceramic C2,C3

Semiconductors

1 of	7805	
1 of	74LS123	1C1
1 of	74LS244	1C2
1 of	74LS138	1C3
1 of	74LS30	1C4
1 of	BC108	TR1
1 of	FPT100	From Tandy stores: Cat No 276-130 or 2N5777 (Phototransistor)

Miscellaneous

Rubber sucker from any ironmonger or DIY shop
28-way double-sided edge connector 1.90
Pair PP3 snap battery connectors
1-14 pin DIL socket, 2-16 pin DIL socket, 1-20 pin DIL socket

```
 10 REM RECEIVER PROGRAM FOR COMMODORE 64
 20 A=49152
 30 READ N:IF N<0 THEN 60
 40 POKE A,N:A=A+1
 50 GOTO 30
 60 END
 70 DATA 165,43,133,252,165,44,133,253,169,0
 80 DATA 141,3,221,32,228,255,201,0,240,249
 90 DATA 32,77,192,32,117,192,133,254,32,77
100 DATA 192,32,117,192,201,0,208,4,165,254
110 DATA 240,25,32,77,192,32,117,192,32,77
120 DATA 192,32,117,192,32,77,192,32,117,192
130 DATA 201,0,208,246,76,20,192,96,160,124
140 DATA 136,208,253,202,208,248,96,169,9,133
150 DATA 251,173,1,221,41,128,208,249,162,15
160 DATA 32,68,192,169,0,72,173,1,221,10
170 DATA 104,106,162,30,32,68,192,198,251,208
180 DATA 240,162,30,32,68,192,96,-1
```

```
 10 REM TUNING PROGRAM FOR COMMODORE 64
 20 A=49152
 30 READ N:IF N<0 THEN 60
 40 POKE A,N:A=A+1
 50 GOTO 30
 60 END
 70 DATA 169,0,141,3,221,169,0,141,32,208
 80 DATA 141,33,208,169,147,32,210,255,169,5
 90 DATA 32,210,255,174,126,192,172,127,192,32
100 DATA 103,192,162,36,160,22,32,92,192,169
110 DATA 113,32,210,255,173,1,221,10,176,12
120 DATA 162,5,160,3,32,92,192,169,42,32
130 DATA 210,255,32,228,255,240,233,201,3,240
140 DATA 15,162,5,160,3,32,92,192,169,32
150 DATA 32,210,255,76,44,192,169,147,32,210
160 DATA 255,96,152,72,138,168,104,170,24,32
170 DATA 240,255,96,134,251,132,252,160,0,177
180 DATA 251,240,12,32,210,255,230,251,208,243
190 DATA 230,252,76,107,192,96,128,192,13,65
200 DATA 68,74,85,83,84,32,82,69,83,73
210 DATA 83,84,65,78,67,69,32,85,78,84
220 DATA 73,76,32,34,42,34,32,68,73,83
230 DATA 65,80,80,69,65,82,83,46,13,13
240 DATA 32,32,45,62,32,32,32,60,45,13
250 DATA 13,84,79,32,82,69,83,69,84,32
260 DATA 82,69,65,68,73,78,71,32,80,82
270 DATA 69,83,83,32,65,78,89,32,75,69
280 DATA 89,46,13,13,80,82,69,83,83,32
290 DATA 60,82,85,78,47,83,84,79,80,62
300 DATA 32,84,79,32,69,88,73,84,32,80
310 DATA 82,79,71,82,65,77,46,0,-1
```

```
 10 REM * tuning program for ZX Spectrum *
 20 CLEAR 45055
 30 LET a=45056
 40 READ n: IF n<0 THEN GO TO 50
 45 POKE a,n: LET a=a+1
 46 GO TO 40
 50 BORDER 0: PAPER 0: CLS : INK 7
 55 PRINT AT 21,31;"■"
 60 PRINT AT 1,0;"Adjust resistance"
 70 PRINT AT 3,0;"until '*' disappears"
 80 PRINT AT 5,2;"->   <-"
 90 PRINT AT 7,0;"To reset reading press any key."
100 PRINT AT 9,0;"press <break> to exit program."
120 LET x=USR 45056
130 IF x=0 THEN PRINT AT 5,5;"*": GO TO 120
140 IF x=1 THEN PRINT AT 5,5;" ": GO TO 120
160 DATA 62,0,50,8,92,219,159,230,128,32,5,6,0,14,0,201
170 DATA 58,8,92,254,0,40,238,6,0,14,1,201,-1
180 STOP
```

PIN 16 of the 74LS123 on the receiver board to five volts on the user port. The third and final connection is the OUTPUT from PIN 13 of the 74LS123 to the user port pin B7.

The Spectrum does not have a user port as such. The edge connector at the rear of the keyboard has the entire address/databuses and control signals on it. Therefore, to use the Spectrum, an address decoder and input port has to be constructed. The decoder consists of a 74LS138 three-line to eight-line decoder/multiplexor and a 74LS30 eight-input NAND-gate. The input port is built around a 74LS244 Octal buffer three state non-inverting chip. For this experiment only data line seven needs to be connected; the chip is enabled from the address decoder (Fig 2). The power supply is derived from the nine volts at the edge connector, which is regulated, via a 7805 regulator, to give five volts to the board.

The edge connector can be a problem. Watford Electronics can supply one for the Spectrum (28-way double-sided 0.1in pitch), or you can buy a 43-way, double-sided, 0.1in pitch con-

```
10 REM * receiver loader program for ZX Spectrum *
20 CLEAR 45055
30 LET a=45056
40 READ n: IF n<0 THEN GO TO 210
50 POKE a,n: LET a=a+1
60 GO TO 40
80 DATA 62,0,50,8,92,42,83,92,58,8
90 DATA 92,254,0,40,249,205,76,176,205,113
100 DATA 176,230,128,32,37,205,76,176,205,113
110 DATA 176,205,76,176,205,113,176,79,205,76
120 DATA 176,205,113,176,71,205,76,176,205,113
130 DATA 176,11,62,0,184,32,244,185,32,241
140 DATA 24,209,43,34,75,92,201
150 DATA 30,128,29,32,253,21,32,248,201
160 DATA 197,6,9,219,159,230,128,32,250,22
170 DATA 17,205,67,176,14,0,219,159,203,39
180 DATA 203,25,22,34,205,67,176,16,243,121
190 DATA 22,34,205,67,176,193,201
200 DATA 119,35,201,-1
210 STOP
```

```
10 REM TUNING PROGRAM FOR BBC
20 A%=&900
30 READ N%:IF N%<0 THEN 60
40 ?A%=N%:A%=A%+1
50 GOTO 30
60 END
70 DATA 169,0,141,98,254,162,7,32,92,9
80 DATA 32,102,9,162,180,160,9,32,157,9
90 DATA 162,36,160,20,32,143,9,169,255,32
100 DATA 227,255,173,96,254,10,176,12,162,5
110 DATA 160,3,32,143,9,169,42,32,227,255
120 DATA 162,0,160,0,169,129,32,244,255,152
130 DATA 208,15,162,5,160,3,32,143,9,169
140 DATA 32,32,227,255,76,32,9,201,27,208
150 DATA 207,169,126,32,244,255,162,7,32,92
160 DATA 9,96,169,22,32,227,255,138,32,227
170 DATA 255,96,169,23,32,227,255,169,0,32
180 DATA 227,255,169,10,32,227,255,169,32,32
190 DATA 227,255,169,0,32,227,255,32,227,255
200 DATA 32,227,255,32,227,255,32,227,255,32
210 DATA 227,255,96,169,31,32,227,255,138,32
220 DATA 227,255,152,32,227,255,96,134,112,132
230 DATA 113,160,0,177,112,240,12,32,227,255
240 DATA 230,112,208,243,230,113,76,161,9,96
250 DATA 13,65,100,106,117,115,116,32,114,101
260 DATA 115,105,115,116,97,110,99,101,32,117
270 DATA 110,116,105,108,32,39,42,39,32,100
280 DATA 105,115,97,112,112,101,97,114,115,46
290 DATA 13,13,32,32,45,62,32,32,32,60
300 DATA 45,13,13,84,111,32,114,101,115,101
310 DATA 116,32,114,101,97,100,105,110,103,32
320 DATA 112,114,101,115,115,32,97,110,121,32
330 DATA 107,101,121,46,13,13,80,114,101,115
340 DATA 115,32,60,101,115,99,97,112,101,62
350 DATA 32,116,111,32,101,120,105,116,32,112
360 DATA 114,111,103,114,97,109,46,13,0,-1
```

```
10 REM RECEIVER PROGRAM FOR BBC
20 A%=&900
30 READ N%:IF N%<0 THEN 60
40 ?A%=N%:A%=A%+1
50 GOTO 30
60 END
70 DATA 169,0,133,113,165,24,133,114,169,0
80 DATA 141,98,254,32,224,255,32,61,9,32
90 DATA 101,9,32,61,9,32,101,9,41,128
100 DATA 208,19,32,61,9,32,101,9,32,61
110 DATA 9,32,101,9,201,13,208,246,76,22
120 DATA 9,96,160,0,136,208,253,202,208,248
130 DATA 96,169,9,133,112,173,96,254,41,128
140 DATA 208,249,162,15,32,52,9,169,0,72
150 DATA 173,96,254,10,104,106,162,30,32,52
160 DATA 9,198,112,208,240,162,30,32,52,9
170 DATA 96,160,0,145,113,230,113,208,2,230
180 DATA 114,96,-1
```

nector with pin position 37 fitted with a polarising key and cut it down to size so that there are 23 connectors before the key. The input to the Commodore 64 is via the user port, which is a 12-way edge connector with 0.15in pitch contacts.

Circuit operation

Light falling on the base of the phototransistor switches the transistor on, causing conduction which pulls the voltage at the base of Tr1 low, thus switching it off and putting five volts on pin 2 of the 74LS123. Darkness has the opposite effect, so pin 2 goes low.

The 74LS123 is a retriggerable monostable. With pin 1 tied low, a rising edge on pin 2 will cause the output on pin 13 to go high. It will revert to low after a time determined by the RC network (R5, R6 and C1), and is adjustable by means of R6. If the pulses arrive at such a rate that the next pulse arrives before the output goes low, the monostable retriggers so that it simply stays high the whole time.

Readers can obtain a photocopy of connector diagrams by sending an SAE to the *PCW* offices. END

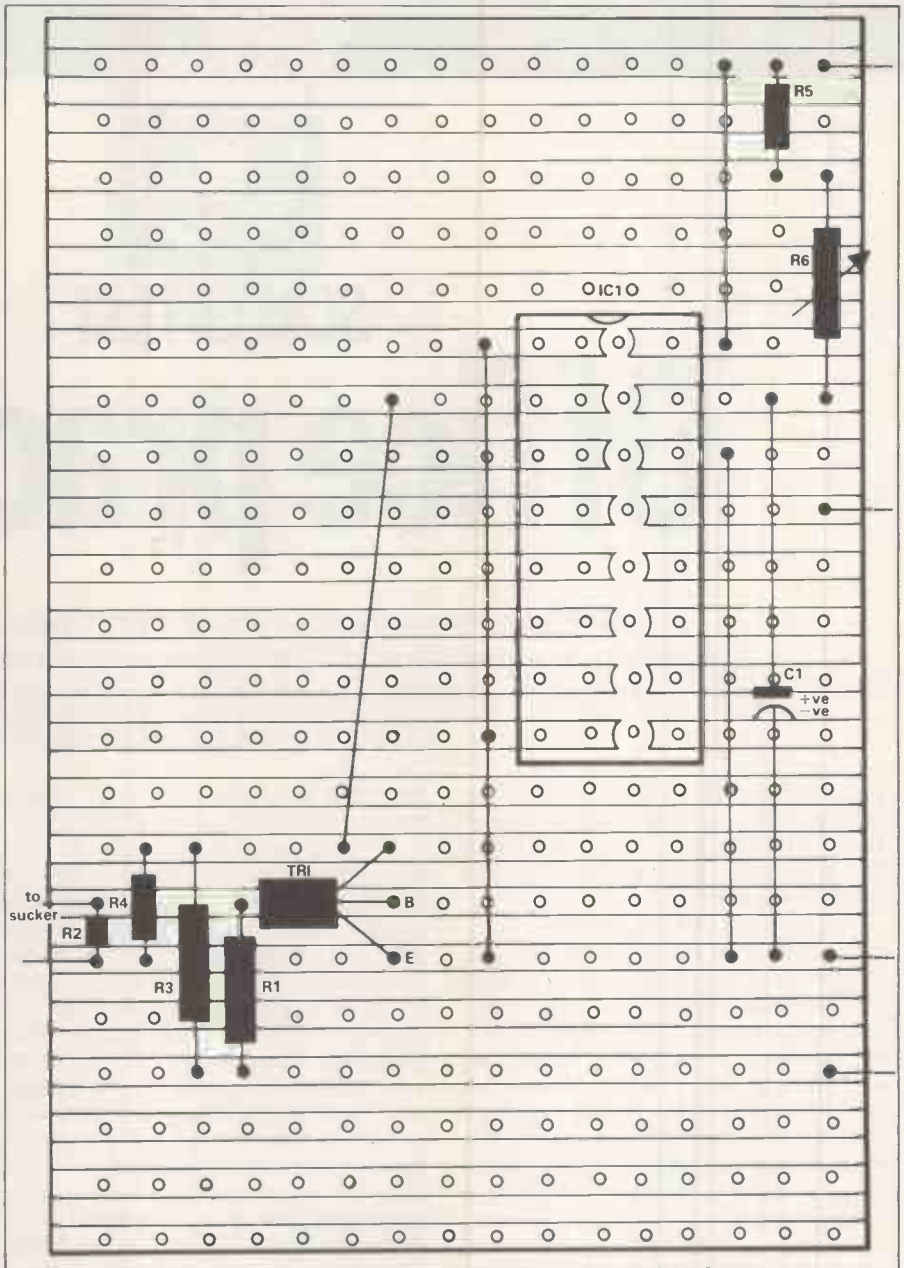


Fig 5 Component mounting for the Commodore 64 and BBC Micro

Component list

Commodore 64 and BBC Micro

Resistors

1 of	100KΩ	R1	¼-watt carbon
1 of	270KΩ	R2	¼-watt carbon
1 of	2.2KΩ*	R3	¼-watt carbon
1 of	3.9KΩ	R4	¼-watt carbon
1 of	2.7KΩ	R5	¼-watt carbon
1 of	22KΩ† Preset	R6	¼-watt carbon

*2.7KΩ for Commodore 64 †470KΩ for Commodore 64

Capacitors

1 of	6.8µF	Tant bead C1

Semiconductors

1 of	74LS123	1C1
1 of	BC108	TR1
1 of	2N5777	(Phototransistor) or
	FPT100 from Tandy stores: Cat No 276-130	

Miscellaneous

Rubber sucker from any ironmonger or DIY shop
20-pin IDC connector (for user port) (female) (BBC micro)
12-way edge connector (0.15in pitch) double-sided (Commodore 64)
Pair PP3 snap battery connectors
1-16 pin DIL socket

SCREENTEST

Office practice

Following the first wave of integrated software packages such as Symphony, Framework and Open Access, which combine a spreadsheet, a word processor and a database, Mike Liardet looks at another trend — the so-called 'desktop' applications.

The idea behind desktop managers is to remove that clutter of address books, diaries and calculators from the top of the desk and embed them in the computer instead.

Some readers may consider a desktop manager to be of dubious value, replacing a few portable and accessible notebooks with an intimidating computer system. In one sense this is right. If the sole reason for getting computerised were to run a desktop manager, then this would be a bit like buying a Ferrari just to listen to its stereo. But anyone who is already computerised may consider a desktop manager a valuable asset.

Whereas integrated spreadsheet/word processor/database systems provide an environment for doing just about anything you could conceivably want, the desktop managers are more limited in scope but considerably easier to use. This article will take a broad look at three of them, all of which are for the IBM PC: Sidekick, QED+, and Spotlight. The most striking thing about these systems is their similarity, in their core facilities at least. It is probable that they were all designed and implemented in ignorance of the others, yet there is an uncanny resemblance between them.

Sidekick

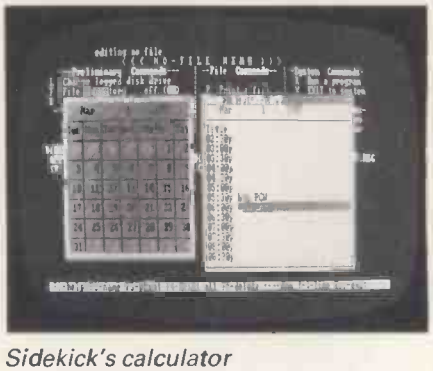
Sidekick was written by Borland International and is distributed in the UK by Alt0r Computer Software. Sidekick is by far the cheapest of the three systems, but that is no expense spared with respect to quality. It is supplied as a slim paperback manual with a copy-protected disk. The files on the disk can be freely copied, to a hard disk for example, but the original disk must always be present when Sidekick is first loaded. If this arrangement is too cumbersome then Borland will supply an unprotected version for 'a small extra charge'.

To load Sidekick simply type 'SK', then, following a brief message, control is returned to the operating system. If you are unfamiliar with desktop managers you can easily assume that something is wrong because nothing seems to have happened. Actually all the software has been loaded into memory, protected from being overwriten by anything else, and the operating system modified to respond to a special keystroke. The consequence of this is that, having loaded Sidekick, you can forget about it and use your normal software packages as if it weren't there. But press the CONTROL and ALT keys together, and up pops a Sidekick menu in the middle of your screen; you can use any of its functions from then on. Once you are finished, the screen is completely restored to its original state and the original application continues as if there had been no intervention at all. If you just want to use Sidekick without any other application, then you just press CONTROL and ALT in response to the normal DOS prompt.

The only overhead for Sidekick arises from the extra memory needed. If one of your applications already consumes all available RAM, it will not be possible to have Sidekick loaded simultaneously. The complete Sidekick program requires about 60k of RAM, and if this is only just too much, then the supplied disk offers some alternative incomplete versions which lack one or other of the facilities.

After pressing the magic key, an eight-option menu is displayed. Five of the options are for the five Sidekick applications, and there are also help, exit and setup options. Menu selection can be made in a variety of ways: by pressing a function key (F1 to F8 for each of the eight options); by pressing a single letter, usually the initial letter of the option; or by moving a horizontal bar which illuminates the current option. This may sound complicated, but it's very easy — the chances are that you are already familiar with at least one of these methods and can use that.

Sidekick has fairly extensive help facilities which are supposedly 'context-sensitive', but are actually only sensitive to the main menu and each of the applications. These are presented as pages of text which you can flick through using the arrow keys, and constitute a useful supplement to the manual.



Sidekick's calculator

WordStar behind the calendar/diary

The notepad facility is the first of the five Sidekick applications. When it is selected a notepad window appears at the bottom of the screen with the rest unchanged. This window can be moved, enlarged or shrunk using the function and arrow keys clearly outlined at the bottom of the screen. Text can be entered and edited into the notepad window in a fairly standard word processor fashion — in fact, Borland has unashamedly copied WordStar's keystrokes. It does not, however, implement all the WordStar facilities and is limited in capacity too, at least in the standard configuration. (You can improve the capacity by modifying a present parameter—this is at the expense of extra memory consumption.)

Notepad does offer the chance to 'capture' text from the original screen into your notes. To do this, you press a function key which redisplays the original screen. You then mark the beginning and end of the text to be captured (using WordStar block beginning and end keystrokes) followed by the block-copy command. The contents of the Notepad can always be saved on file.

If in the middle of writing a note you need to do some calculating, then you can call up Sidekick's calculator. The notepad window is retained onscreen, and a picture of a calculator appears in the top right-hand corner. It has all the functions you would expect from a sophisticated business calculator, plus the ability to work in binary or hexadecimal arithmetic. This is a useful feature for programmers, and could be sufficient justification alone for buying Sidekick since *real* hexadecimal calculators are comparatively pricey.

As with all Sidekick facilities the calculator can be instantly accessed from any other software, so the hexadecimal facility is very useful when working with some of the standard debuggers. With the calculator it's possible to program one of the keys with the current numeric result, so if that key is ever subsequently used then it reproduces the number. This is an easy way of transferring numbers out of the calculator. When you have finished calculating, a touch of the EXIT key causes the calculator to be replaced by the original display and you return to whatever you were doing previously.

Sidekick also provides a calendar/diary facility. The workings of this option are certainly elegant and sophisticated, but I found it the least useful facility. I can see no reason to abandon my eminently portable old-fashioned pocket diary.

A more useful facility is the autodialer which can automatically dial, through your modem, any number in your telephone directory file. It can also recognise and capture telephone numbers off the screen left by previous applications — like a database system, for example.

Sidekick's final facility is simply an ASCII table — it displays all 256 characters together with their codes and other information. This may seem something of a make-weight facility, but it would be useful for anyone involved in software development.

Spotlight

Spotlight is produced by Software Arts, creator of the world-famous VisiCalc spreadsheet system. It offers slightly more facilities than Sidekick, and also costs rather more. The package is supplied as a spiral-bound manual plus disk, housed in a matt black box together with some extra leaflets. One of these leaflets is a Customer Support Plan, with a hotline telephone number in case you have any problems. My version has a US number, but I'm told the UK number is given now.

The supplied disk is copy-protected and must be present when the system is first loaded, but the copy protection does allow up to two backup copies to be made, one of which could be to a hard disk. You load the system in exactly the same way as Sidekick — nothing obvious happens, but a Spotlight facility can subsequently be invoked, at any time, by just a single keystroke.

Spotlight offers six facilities. It does not have the ASCII code chart, but otherwise covers all the Sidekick options. Two facilities not offered by Sidekick are the filer and the index card file.

The index card file can be called up by pressing the SHIFT, ALT and I keys. In general all Spotlight's facilities are brought up by a SHIFT-ALT combination, plus the initial letter of the task. The initial loading operation for Spotlight only loaded the minimal control software to intercept special keystrokes, and so on. This means that in every case, following the keystroke, the code for the required task must first be read from the disk before the task can start. There is an irritating delay before you can use it which completely destroys the feeling of spontaneity which you quickly appreciate with Sidekick.

When the index card filer is ready you are presented with a simple facility for compiling, viewing and searching index cards on the screen. The information on any given index card can be entered in a free format, and the cards are sorted on the contents of their first line. There are two display modes — one displaying a single card, the other displaying the card 'index': that is, all the first lines. Up to 500 cards are allowed in any one list and up to 36 lists can be accommodated, assuming your machine has the capacity. These lists are stored in separate files and are completely unconnected with one another. Unfortunately each list is only identified by a single letter or digit rather than a more meaningful name, so it may be difficult to recall which index list you want.

Spotlight's filer facility is used for manipulating disk files. At first sight this may seem an even stranger inclusion than Sidekick's ASCII table, as it does not provide much that isn't already available through ordinary DOS commands. However, as Spotlight can be invoked in the middle of another activity, this feature provides the option of controlling disk files from within other software. This can occasionally be useful, but can also totally confuse the original program if you're not careful — for examle, you might delete a file it assumes is present.

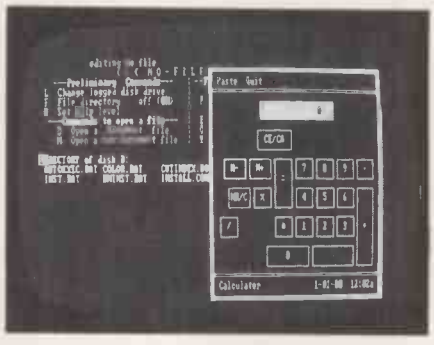
The other advantage of Spotlight's filer is that it might be considered more user-friendly. Inexperienced users, in particular, may prefer to manipulate files through menu control rather than typed commands at the keyboard.

The notepad facility does not conform to the WordStar keystroke conventions, which can be seen as either an advantage or disadvantage depending on your opinion of WordStar. Like Sidekick the notepad has limited capacity (eight pages) but unlike Sidekick this cannot be increased.

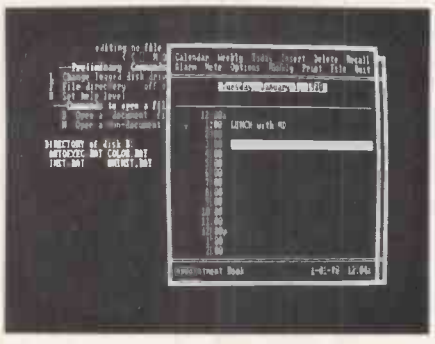
The calculator facility is functionally similar to Sidekick's but does not have a hexadecimal or binary arithmetic option.

Spotlight's phone book is really an alternative presentation of the index card filer. If name and number are placed on the first line of a card, the information will be sorted, and numbers rapidly looked up by viewing the cards in index (first line only) mode. Spotlight does not have an auto-dial facility.

Spotlight's appointments book stands a slightly better chance of prising me away from my trusty diary. It



The Spotlight calculator



The diary has an alarm facility

SCREENTEST

has special facilities for setting up weekly meetings and offers an optional alarm — not to wake you up at the end of a meeting, but to alert you to the fact that one is about to start! The alarm sounds whatever you're doing even if you're not using Spotlight at the time, as long as the computer is switched on.

QED+

QED+ is the only British product of the three. The name is a mnemonic for Quantec Executive Desk, Quantec being the author of the system. Quantec aimed to produce a software package to perform all the personal management tasks that have hitherto been carried out manually, and accordingly it offers a few more facilities than Sidekick and Spotlight. It has a rather more substantial manual and, yet again, a copy-protected disk.

The operation of QED+ is rather more conventional than the other two. When the system is first loaded, it does not simply disappear but displays a menu of the main options. One of these options allows you to set up up to 10 different program names, and then run one of them. It's possible to return to QED+ from that program at any time with just a single keystroke, ALT, and function key 10. The original program can be resumed where you left off by repeating the keystroke. This facility is clearly less flexible than the others and would not be favoured by software developers, for example. However, the system is clearly aimed at business managers who might very well prefer this type of menu control.

Quantec also supplies QED, which is identical to QED+, but without any facility to run other software.

Many of the areas covered by QED+ will be familiar: diary, calculator, address book, and so on. But one of the most surprising inclusions is that of a critical path analysis facility, or project planner as it is sometimes known.

Critical path analysis (CPA) is an invaluable management tool that can be used for scheduling and progress-chasing projects. Unlike most of the desktop applications I have seen, CPA is generally available as a standalone product from a wide variety of suppliers. Most of the other desktop applications are too trivial to enjoy that status.

QED+ provides facilities for building up critical path networks on 'task pages'. A task page specifies a task (for example, recruitment) in terms of its duration, and in terms of the other tasks that must be completed before it (for example, rent new offices). QED+ imposes various limitations on network size (a maximum of 150 tasks) and the number of tasks that can precede a task is six. For each task the points of interest are when it can start and finish, and if there is any slack time (because it is waiting for some other preceding task). QED+ displays all this information on a task page and also provides a barchart display, which gives the same information graphically.

QED+'s desk filing system is considerably more complex and powerful than Spotlight's index card filer, and Sidekick has no equivalent at all. It hinges on the idea of a 'form', which you can design to your own specification. Quantec used this facility itself to create some of the other applications for QED+, such as the address book. A form is built up with boxes on the screen, where information is destined to be entered. The type of information for each box can be specified for validation purposes.

Like its rivals, QED+ offers a calculator, diary, address book and telephone facilities. It has a day book and event file which automatically update the diary, and a number of other sophistications. Like Sidekick it has an auto-dialling facility, but as QED+ is a British product users should not anticipate any problems dealing with our telephone system. Among other things you can set up the auto-dialling to cope with a local PABX: that is, it will precede the number with a 9.

QED+'s Notepad facility is weaker than the other two products, being confined to free-form notes entered in a box on a form. Quantec excuses this on the grounds that a manager would prefer to use a word processor for notes.

Conclusion

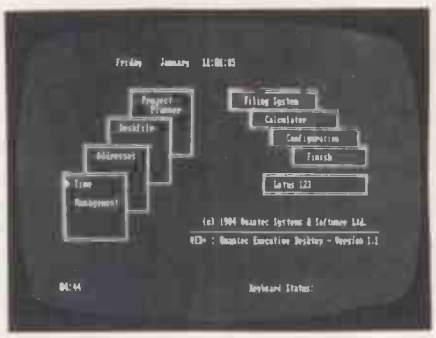
Of the three systems, Sidekick emerges as excellent value for money. If you hold the view that many of the applications covered by desktop managers are tending towards the trivial, then Sidekick's price seems about right. It was also much the easiest to use, and only in part because it offers fewer facilities. Quite simply it's just very well engineered.

Sidekick may also have a special appeal for programmers with its hexadecimal calculator, ASCII table and excellent text editor — which is almost identical to the text editor released with Borland's Turbo-Pascal.

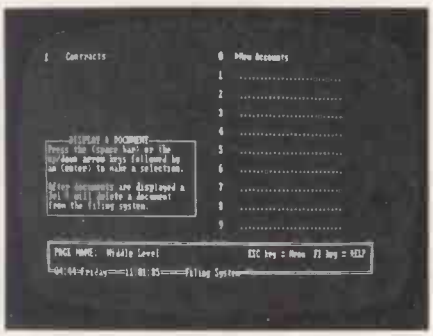
QED+ takes a much more serious view of desktop management. It has a heavyweight feel about it which makes it more difficult to use, but it does attempt to address itself squarely at the manager looking for software to help with his daily work.

The critical path analysis alone makes it worth the price, and the other multiple features could be considered a bonus.

Spotlight falls between two stools. It's certainly no better than Sidekick, but costs rather more. END



The QED+ menu

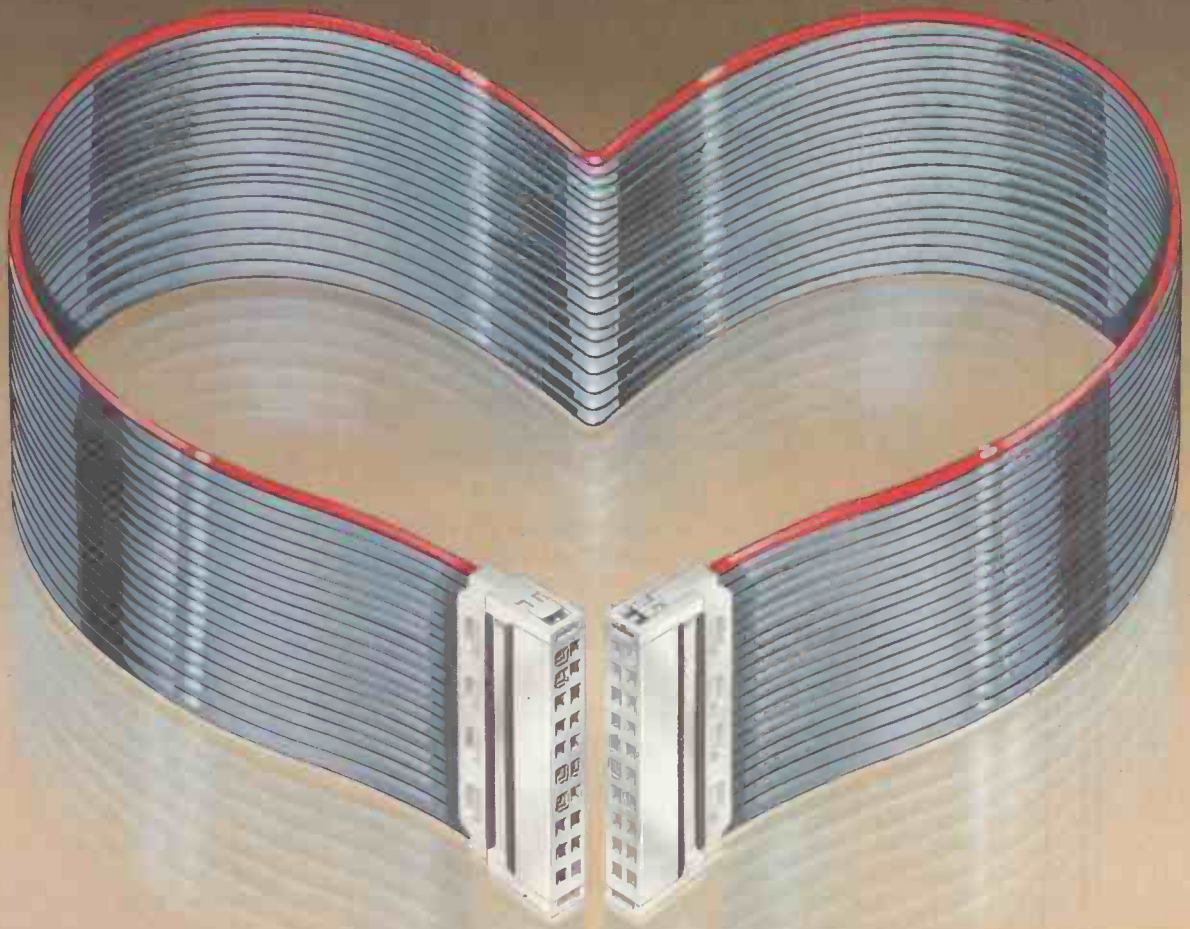


QED+ filing system menu

Summary

	Sidekick	Spotlight	QED+
Appointment book/diary	Yes	Yes	Yes
ASCII table	Yes	No	No
Calculator	Yes	Yes	Yes
Critical Path Analysis	No	No	Yes
DOS Filer	No	Yes	No
On-line Help	Yes	Yes	Yes
Index Card File	No	Yes	Yes+
Note Pad	Yes	Yes	Yes
Phone/address book	Yes	Yes	Yes
Autodial	Yes	No	Yes
Price (ex VAT)	£50	£125	£295

WHY MICROS LOVE MT80



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.

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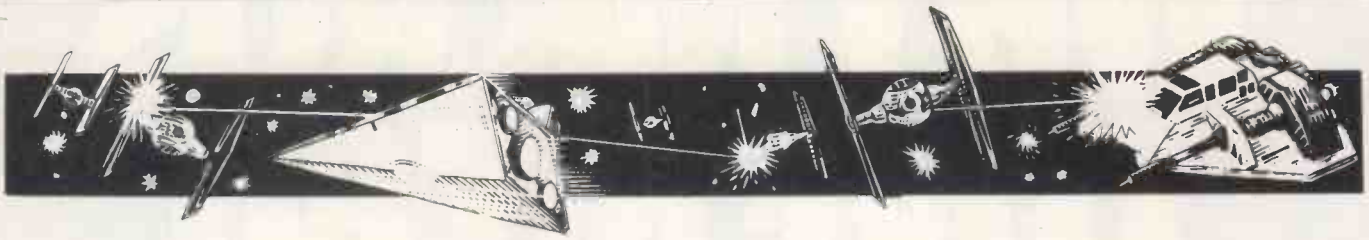
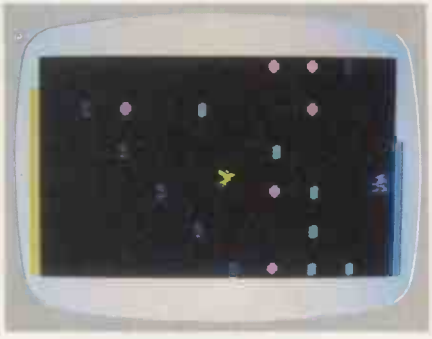
SCREENPLAY



There's more than one way to play chess in this month's pick of the best, and either way the pieces aren't friendly. ButTony Hetherington survives to review games for the Commodore 64, Apple Macintosh and Spectrum.



One night in Archon

Title: Archon
Computer: Commodore 64
Supplier: Ariolasoft
Format: Disk/cassette
Price: £14.95/£11.95

Ariolasoft is a company set up to import software under its own name. The US company providing the goods is Electronics Art, and Archon is one of its best.

It's loosely based on chess, but each of the pieces is a magical creature in a fight between the forces of good and evil. Each creature has its own strengths and abilities, and becoming familiar with these is the key to success. They range from the lowly goblins and knights, which are slow and weak, to dragons and a phoenix.

The most important pieces on the board are the wizard (light) and the sorceress (dark). These characters cast a selection of spells which range from summoning the elements to healing injured creatures or shifting time.

The time-shifting spell alters the cycle that controls the colour of a symmetrical pattern of 33 delta squares. These go through a sequence of six colours from black to white, affecting fortunes in the battle which, in Archon, you have to fight if you want to take a piece.

When this happens, play shifts to a battle area where the two pieces face each other. Their strengths are represented by a coloured bar on either side of the screen which decreases as they are hit.

During the battle the pieces are controlled by joysticks, but they attack in different ways. The goblins and knights attack with clubs and swords, whereas the dragon breathes fire. The unicorn fires energy bolts from a distance, and the phoenix mobilises into a ball of fire which burns everything in its path. The most interesting piece is the dark side's Shapeshifter, which mimics whatever creature it is fighting.

You can either enjoy playing Archon against another player or be slaughtered by a computer opponent.

The prize is right

Title: Hedron
Computer: 48k Spectrum
Supplier: Firebird
Format: Cassette
Price: £9.99

Hedron is described by Firebird as 'the most challenging computer game ever written.' It is also a competition; those skilful enough to complete it will qualify for a tournament, with a Porsche 924 as the prize. But I wouldn't sell the old banger yet as it's a difficult game to play.

In essence it's a maze game in which you are a hedroid dropped into the

maze to destroy an enemy computer. This is not an easy task. The computer is defended by laser-shooting towers and 56 menacing white spheres that are reminiscent of the guardians in The Prisoner.

The spheres trundle around the maze, and are both deadly and impervious to your attack. They also impose a time limit on your efforts for, after a while, they will move into positions that make some routes impossible.

The towers, however, provide a more immediate danger as they shoot to kill on sight. They can be killed but only from behind. Unfortunately the chances are that when you kill one it will reappear elsewhere, as well as changing the direction of a few others.

To help you find your way around the maze, a 3D image is to the right of the main display. Below this map is a helix-shaped damage display, with the number of lines illustrating your current state of health.

Below that is a timer which is synchronised with the sphere movement, and finally, my favourite — a rotating hedroid which is colour coded to show the region of the maze that you are in. There are 12 regions and consequently 12 colours, which is quite an achievement on the eight-colour Spectrum. It is attained by mixing the existing colours to create shades of salmon, turquoise, gold and lilac.

These additional colours are just an example of the technical expertise that created this game. Add to that smooth scrolling, and not only have you got an enjoyable game, but a serious contender for the Game of the Year award.

Wonderland chess

Title: Alice Through the Looking Glass
Computer: Apple Macintosh
Supplier: Apple
Format: Disk
Price: Approx £30

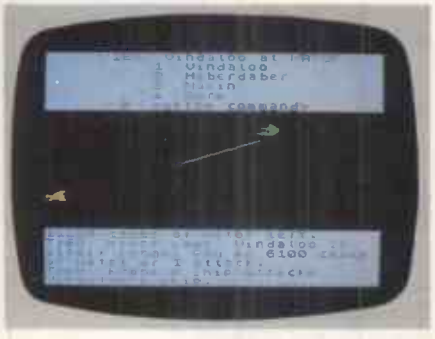
Alice is the first games program I've seen for the Macintosh. It's a chess variant in which you play Alice against a Wonderland chess set.

You start the game by selecting the piece that you wish Alice to mimic. Most people will head straight for a queen but for a real challenge you should try one of the lesser pieces. To move your piece, you move a mouse-driven cursor to the required square and press. The game isn't played in set turns, so if you stop and think you'll be clobbered.

Luckily you are quickly resurrected and the action continues. The best strategy I have found is to click in several moves in advance, but you must have the mouse ready for when things go wrong. For example, avoid the hole that moves around the board swallowing pieces.

Your performance is rated by a score which is increased when pieces are taken, but points are deducted for a hammering. The theoretical maximum is 999 but to achieve this you must take all the opposing pieces, including the pawns once they have been promoted to queens, without being hit. But the prospect of nine queens is somewhat daunting.

Alice is an extremely professional, well presented game. Although the review copy was described as being pre-production, the game was supplied in mock book cover complete with velvet-like inlay and ribbon.



The great space hype

Title: The Great Space Race
Computer: 48k Spectrum, Commodore 64
Supplier: Legend
Format: Cassette
Price: £14.95

The policy behind Screenplay is to review only the best games However, The Great Space Race has been hyped so much that we had to look at it.

According to the hype, it was to feature movie-style graphics in a game that was to follow BMA award winner Valhalla.

Unfortunately the game falls sadly short of the hype, and the movie-style graphics are a nuisance: they interrupt the flow of the game.

You deal in a particularly potent brew called Natof which is coveted throughout the galaxy. Unfortunately you can't deliver the stuff yourself, so you have to hire traders from a motley bunch of drunks, psychopaths and crooks. These characters are more likely to drink the stuff themselves than deliver it.

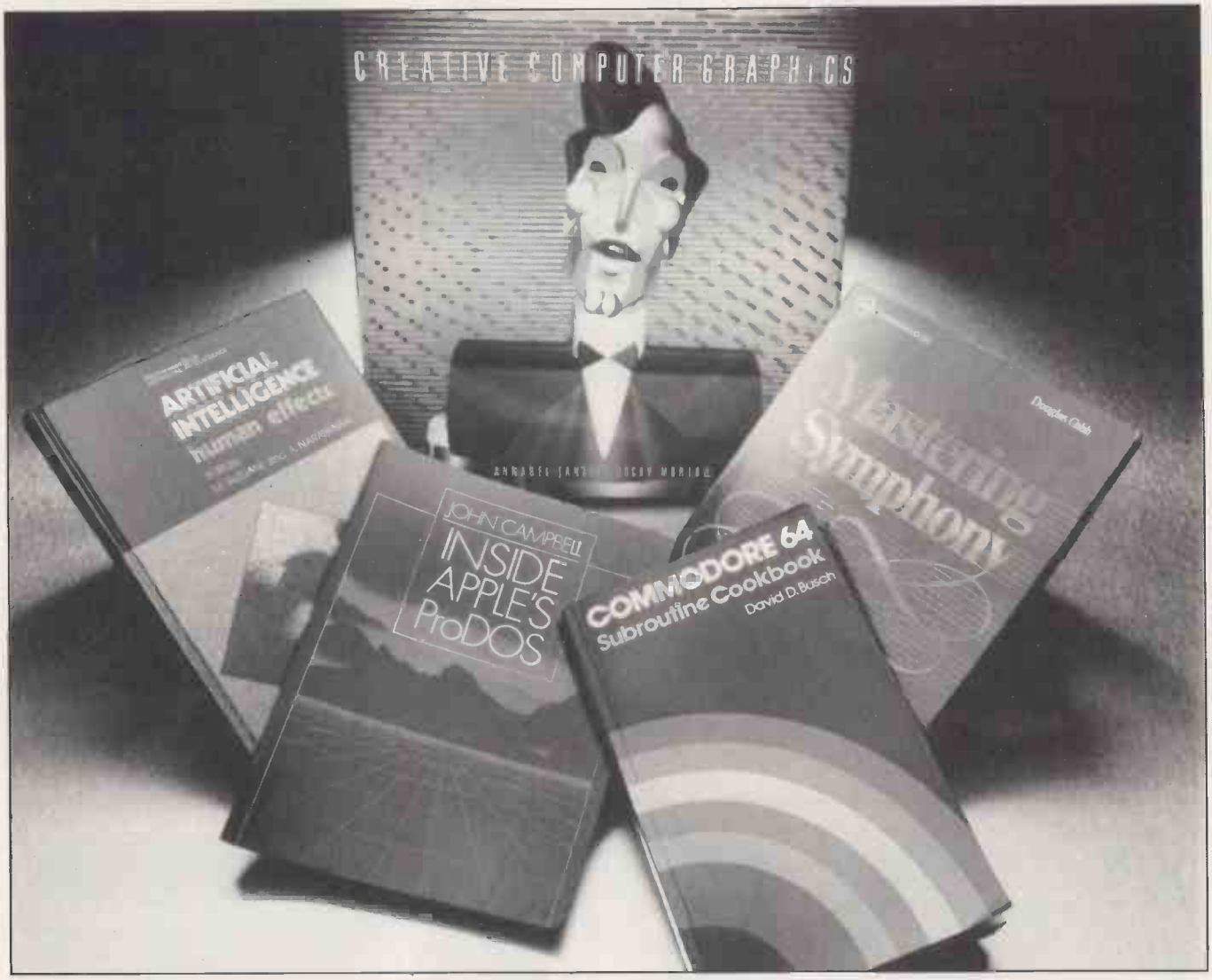
Your problems increase with the intervention of pirates and the galactic police who want their share, not to mention the other racers.

The fight sequences are particularly disappointing. They merely consist of drawings leaping unrealistically around the screen with the occasional line drawn between them. Also, the use of Basic makes the game slow.

The Great Space Race has an interesting plot, but is badly let down by its implementation. END

BIBLIOFILE

From a vast tome on Symphony to the latest coffee table, computer graphics book — David Taylor casts his eye over this month's literary choice.



Symphonic key

Title: Mastering Symphony
Author: Douglas Cobb
Publisher: Sybex
Price: Not available

It's not as if purchasers of Symphony are short of something to read. This whopping packages (six floppies, needing no fewer than 320k or RAM just to boot) comes in a small plastic suitcase containing a 438-page Reference Manual, a 308-page How-To Manual, a further fat Introduction Manual, a separate Glossary and a Quick Reference Guide. To this manual mountain, and to America's massive range of Symphony manual re-writes, Mr Cobb now adds another 760 pages and, if you weaken, will sign you up for his monthly *Symphony User's Journal*, too. 'Patience is one of the keys to learning Symphony,' he asserts. You might need a good optician, too.

Symphony is at heart a spreadsheet, points out Mr Cobb, but not just any old spreadsheet. The act it has to follow is Lotus 1-2-3 with its half a million devotees. Once, way back in 1983, that was the IBM PC's most powerful piece of figure-crunching software and an instant bestseller worldwide. Symphony has to surpass it and, moreover, has to compete with such robust rivals as Framework and Open Access.

All combine awesome spreadsheet power with the current fashion for integrated graphics, word processing, database management and (all-American) communications. All take ages to get to know inside-out.

No question but that Cobb, author of a similar big-selling tome on Lotus 1-2-3, knows the score on Symphony, or that he believes it to be the bee's knees. His text is commendably lucid, if wide-eyed at the wonder of it all. Not a whisper of any Symphonic shortcomings (such as the fact that the comms package supports only two modems, neither usable in Britain) and lots of praise for the word processor which is OK but scarcely any match for the best wp-only packages like Microsoft's Word or Samna.

Still, *Mastering Symphony* is as thorough-going as it is uncritical and as such is a useful adjunct to the Lotus texts, good as they are. Cobb's next job, presumably, will be to set about another brick-sized book for Symphony customers planning to use the extra speed and memory of a PC-AT. I feel for Mrs Cobb who, as is acknowledged at the start of this book, wondered if she

would ever see her husband again.

All graphics and gloss

Title: Creative Computer Graphics
Authors: Annabel Jankel and Rocky Morton
Publisher: Cambridge University Press
Price: Not available

A captivating book, this, of the kind to be savoured over a pot of strong coffee and a box of thin mints. It's a picture book, as glossy as they come, with a bit of text attached to outline the history, the techniques and the applications of computer graphics at their most visually (and expensively) stunning. The disjointed text isn't that wonderful, but the pictures are.

Jankel and Morton met at art school ten years ago and now run a video outfit called Cucumber — TV commercials are a speciality. It's a pity, they say, that while inspired computer graphics are now accepted as an everyday tool for ads, for TV station identity sequences like the tumbling coloured bricks of Channel 4, or for animated titling like the opening sequence of *Weekend World*, no enterprising TV producer has yet risked a programme to exploit the entertainment value of sophisticated computer graphics for their own sake — a sort of Computer Graphics Showcase.

This book ought to persuade someone in TV to give it a go. It collects images from feature films, from scientific simulations, from industry and design, from computer graphics as experimental art and, of course, from computer games. It's a rare collection with some breathtaking stuff. Only a tiny proportion of what's shown relates directly to the humble home micro, but the authors are much encouraged by the recent trend towards high-power, low-cost machines (like the QL and BBC plus 16032 second processor) and can't wait for the imminent wizardry of wall-sized TV screens and laser-driven home holographics.

Still staring at the best of this book, neither can I.

Thinking machines

Title: Artificial Intelligence: Human Effects
Editors: M Yazdani and A Narayanan
Publisher: Ellis Horwood (John Wiley)
Price: £22.50 (hardback) £12.50 (paperback)

Artificial Intelligence, according to an authority named Minsky, is the science of making machines do things that would require intelligence if done by men.

It is also, according to Yazdani and Narayanan, a hot potato. In America, AI is a respectable area for academic research and, with the increasing popularity of so-called Expert Systems (sophisticated software for use in place of human expert opinion) Americans are now taking a close commercial interest in AI besides. The Japanese, with their Brave New Vision of fifth generation computers running the whole human show, are equally intense with their AI deliberations. Over here, the whole vexed subject is still a bit, well, *suspect*.

It isn't that we're short of boffins. Thanks to such Governmental initiatives as The Alvey Directorate, researchers need not be short of cash either. Nevertheless, it is suggested that we British tend to come at the idea of AI with typical reserve, thinking machines don't seem to strike us as quite *respectable*.

Masoud Yazdani and Ajit Narayanan are lecturers at Exeter University (the former familiar to Electron users who get his guide to programming in the Acorn box). They are thus academics and no doubt thoroughly respectable. There's no mistaking their studiousness as here they assemble a collection of learned, and at times stupefyingly impenetrable papers by more academics, (many from Exeter), on the whole intractable subject of what exactly Artificial Intelligence is and where it might or might not be taking us. Their purpose, they stoutly maintain, is not to draw conclusions — merely to encourage lively debate.

Debate we do get but lively it's not. We get discourse on the computer in medical diagnosis or legal counsel. We get a discussion on the social and philosophical implications of AI. AI methodology is examined, AI in education looked at. It sounds interesting enough, but it would take a computer with a brain the match of Einstein's to unscramble some of the contributors' lead-weighted style: 'We consider that one of the biggest blocks to a healthy interaction between psychology and AI is what Pettitt has called AI-centricity. A common conceptual error of the AI-centric is the naive belief in a simple dichotomy between what Miller calls theory development and theory demonstration . . .'.

There is a tremendous amount of thought-provoking, not to say brain-twisting argument and counter-argument in this book, but it is strictly for those who can get along with academic writing at its knottiest.

The last word ought to go to Narayanan, who frankly states: 'We have raised many questions. A cynic could well argue that current research in AI is doing nothing more than providing jobs for a small but expanding elite in esoteric, specialist topics or large, defence-oriented areas, with there being little hope that the vast majority of us will ever benefit in some concrete way from the research, where by *benefit* we mean an accepted and proven gain rather than one which is advertised as being a gain by the elite who spend our money researching into it. The cynic may well have a valid point.'

Second best

Title: Inside Apple's ProDOS
Author: John Campbell
Publisher: Reston (Prentice-Hall)
Price: £18.40 (paperback)

ProDOS, bubbles Mr Campbell, is Apple's exciting new disk operating system with new commands, expanded and improved old commands, file management utilities, assembler, data types, file types and new procedures — everything anyone could ask for the Apple II family.

True enough, I suppose, but what is undoubtedly a damn sight more exciting is Apple's new family of Macintosh computers.

Still, this book is only for those who are stuck with early Apples and looking for an improvement on their DOS 3.3 capability. They should like it. Campbell describes in patient detail all that ProDOS is and does, and attaches examples and listings. I couldn't fault it but I can't pretend I found it an absorbing read. I dare say the same would go for any Apple user who's laid hands on the incomparable Mac.

Suggested recipe for Commodore 64

Title: Commodore 64 Subroutine Cookbook
Author: David D Busch
Publisher: Prentice-Hall
Price: £7.95

If you have a Commodore 64, a sound knowledge of its Basic, enjoy writing your own programs and have £7.95 to hand, you shouldn't hesitate. This little book spells fun.

What Busch does is provide a set of machine-specific subroutines for you to merge into your own listings (some will run on their own) and thus provide instant tricks like sound effects (gunfire, klaxons) an elapsed timer, joystick subroutine, colour peeker, games routines, or small-time business and financial add-ons that will calculate interest rates or simply tidy up display formats.

There are some 70 such 'recipes' — some trivial, some patching up the gaps in Pet 2.0 Basic, a few providing useful comms support, but it's all rather Heath Robinson when set alongside more modern machines. Commodore 64 users generally have my sympathy, but as I was reminded the last time I was a bit sniffy about this machine, there are an awful lot out there and thousands swear by them. For them, if for no-one else, I can unhesitatingly recommend this book. END

TJ'S WORKSHOP

Our monthly pot-pourri of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to TJ's Workshop, PCW, 62 Oxford Street, London W1. Please keep your contributions concise. We will pay £5-£30 for any tips we publish. PCW can accept no responsibility for damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.

SPECTRUM BASIC REMOVER

This program will remove all, or least part of, a Basic program, but will leave the variables unharmed; thus it becomes possible to change Basic programs but retain the same variables. This is most useful if you use programs which run off the same data. It's not always possible to merge such programs directly, but with one program removed the second can be merged with the first's variables.

This machine code can go anywhere in RAM — I find it best above RAM top. Users who don't have an Interface One should be able to convert it using the PRINT USR system.

If you have a hundred-line Basic program, and you wish line 50 onwards to be removed, then all you do is load the HL register pair at USR #R to hold the value 50. If you wish all the program to be removed, then load the HL register with one.

The USR function has been selected to act as the adapted calling command. The USR command, and all commands which immediately follow it, should be located on one multi-statement line; this should be the first line in the program.

If you don't have an Interface One, then remove lines 10 to 240, and lines 280,290,540 and 550. Change the DEFWs' at lines 300 and 560 to Call instruction's, then change the jump instruction at 580 to a RET instruction.

The enclosed Basic program is designed to allow the user to place the program above RAM top, then save it to tape. The data contains the code for the full listing of the machine code program.

Nigel Mossman

```
00010 ;basic removal routine
00020 ;using extended basic via
00030 ; INTERFACE ONE
00040          rst    smrom        ; select ma
00050 ;                              in rom
00060          defw   get#         ; collect
00070 ;                              next char
00080 ;                              actor
00090          cp     usr          ; is it usr
00100          jr     z,usr#       ; jump if
00110 ;                              it is
00120          jp     syer         ; else synt
00130 ;                              ax error
00140 usr#     rst    smrom        ; select ma
00150 ;                              in rom
00160          defw   next#        ; get next
00170 ;                              charactor
00180          call   syfin        ; advance
00190 ;                              to end &
00200 ;                              exit if
00210 ;                              checking
00220 ;                              syntax
00230 ; the above is not needed when not
00240 ; using interface one
00250 usr#r    ld     hl,100       ; 1st line
00260 ;                              to be del
00270 ;                              eted
00280          rst    smrom        ; select ma
00290 ;                              in rom
00300          defw   addsea       ; call main
00310 ;                              rom to fi
00320 ;                              nd start
00330 ;                              of line
00340          push   hl           ; save a co
00350 ;                              py
00360          push   hl           ; transfer
00370          pop    bc           ; bc
00380          ld     hl, (vars)   ; collect
00390 ;                              address
00400 ;                              of variab
00410 ;                              les
00420          scf                 ; set carry
00430 ;                              flag for
00440 ;                              correct
00450          ccf                 ; subtract
00460          sbc    hl,bc        ; find numb
00470 ;                              er of byt
00480 ;                              es to re
00490 ;                              claim
00500          push hl             ; transfer
00510          pop  bc             ; to bc
00520          pop  hl             ; drop addr
00530 ;                             ess of line
00540          rst  smrom          ; select ma
00550 ;                             in rom
00560          defw recbas         ; remove
00570 ;                             basic
00580          jp   finish         ; exit in
00590 ;                             run time
00600 prog     defl 23635
00610 vars     defl 23627
00620 addsea   defl 0196eh
00630 recbas   defl 019e8h
00640 smrom    defl 010h
00650 get#     defl 018h
00660 usr      defl 192
00670 syer     defl 496
00680 next#    defl 020h
00690 syfin    defl 005b7h
00700 finish   defl 005c1h
```

```
1  REM basic loader for delete routine
10 FORMAT "t";9600: OPEN #4;"t"
20 INPUT "input start address";start:
   LET b=INT (start/256): LET a=start-b*
   256: PRINT a,b: POKE 23735,a: POKE 23736,b
30 CLEAR start: INPUT "start address?";start:
   FOR a=start TO start+40: READ c: POKE a,c:
   NEXT a
60 DATA 215,24,0,254,192,40,3,195,240,1,215,32,
   0,205,183,5,33,100,0,215,110,25,229,229,193,
   42,75,92,55,63,237,66,229,193,225,215,232,
   25,195,193,5
70 SAVE "BASIC REM" CODE start,40
99 USR
```

QL WILD CARD FILE SPECIFICATION

A surprising omission from the QL QDOS operating system is the means to refer to files collectively by the use of wild card characters. For example, all microdrive operations (for example, DELETE or COPY) involve specifying filenames individually, which may be fine for a few files on cartridge, but what happens when the promised hard disk arrives? Trying to back up all or part of a hard disk one file at a time would be virtually impossible.

Users of most other operating systems are much more fortunate. Those who are accustomed to CP/M will be familiar with the following conventions: the symbol '?' is taken to match any single character, while the symbol '*' is taken to match any

group of characters.

Furthermore, in CP/M a filename can have a three-character suffix separated from the main part by a full stop. QDOS also allows this, but uses an underscore character as a separator. The idea of wild card identifiers can therefore be extended.

It can be seen that this system provides a convenient way of referring to Quill, Archive, Easel and Abacus files as a group. The program uses these concepts to provide a powerful and selective DELETE and COPY facility. When this program has been entered, typing 'XD' enters the delete routine. You will be asked to give the microdrive number, and a directory listing will appear in a window on the right of the screen. You must then specify the characters to be matched, and you have the option to confirm the files individually or to have them all deleted automatically. For example, to delete all Quill files type 'XD', then '1' (if microdrive one is wanted), then '*__doc'.

Typing 'XC' enters the copy routine. This is similar to 'XD' but you'll need to specify the 'from' microdrive and the 'to' microdrive. For example, to do a total cartridge back-up from drive one to drive two, type 'XC', then '1', then '2', then '*__*'.

Michael Bryant

```
100 DEFine PROCedure xc
110 WINDOW 268,200,32,16
120 CLS
130 PRINT"File copy routine"
140 INPUT\"Give the number of"\"the 'from' drive ";drive1
150 dirtoscn drive1
160 INPUT\"Give the number of"\"the 'to' drive ";drive2
170 INPUT\"Give the character"\"string to be"\"matched ? ";name$
180 xcopy name$,drive1,drive2
190 END DEFine xc
200 DEFine PROCedure xcopy(name$,drive1,drive2)
210 fileopen drive1,drive2
220 REPeat fileread
230 INPUT£4,a$;
240 b$=a$
250 IF NOT b$="temp_tmp" AND namematch(name$,b$) THEN
260 filecopy=1
270 IF confirm THEN
280 PRINT"Shall I copy file"\a$;" (y/n)?"
290 filecopy=reply
300 END IF
310 IF filecopy THEN
320 PRINT"Copying ";a$
330 DELETE "mdv"&drive2&"_"&a$
340 COPY "mdv"&drive1&"_"&a$ TO "mdv"&drive2&"_"&a$
350 END IF
360 END IF
370 IF EOF(£4) THEN
380 CLOSE£4:DELETE tempfile$
390 dirtoscn drive2
400 EXIT fileread
410 END IF
420 END REPeat fileread
430 END DEFine xcopy
440 DEFine PROCedure xd
450 WINDOW 268,200,32,16
460 CLS
470 PRINT"File delete routine"
480 INPUT\"Give the number of"\"the drive ? ";drive
490 dirtoscn drive
500 INPUT\"Give the character"\"string to be"\"matched ? ";name$
510 xdelete name$,drive
520 END DEFine xd
530 DEFine PROCedure fileopen(d1,d2)
540 PRINT\"Accessing drive ";d2
550 tempfile$="mdv"&d2&"_temp_tmp"
560 OPEN_NEW£4,tempfile$
570 DIR£4,"mdv"&d1&"_"
580 CLOSE£4
590 PRINT\"Confirm individual"\"files (y/n) ?"
600 confirm=reply
610 OPEN£4,tempfile$
620 INPUT£4,a$;a$;
630 END DEFine fileopen
640 DEFine PROCedure xdelete(name$,drive)
650 fileopen drive,drive
660 REPeat fileread
670 INPUT£4,a$;
680 b$=a$
690 IF NOT b$="temp_tmp" AND namematch(name$,b$) THEN
700 filedelete=1
710 IF confirm THEN
720 PRINT"Shall I delete"\a$;" (y/n)?"
730 filedelete=reply
740 END IF
750 IF filedelete THEN
760 PRINT"Deleting ";a$
770 DELETE "mdv"&drive&"_"&a$
780 END IF
790 END IF
800 IF EOF(£4) THEN
810 CLOSE£4:DELETE tempfile$
820 dirtoscn drive
830 EXIT fileread
840 END IF
850 END REPeat fileread
860 END DEFine xdelete
870 DEFine FuNction namematch(file1$,file2$)
880 REPeat position
890 lenfile1=LEN(file1$):lenfile2=LEN(file2$)
900 pos1="_"INSTR file1$:pos2="_"INSTR file2$
910 IF pos1 AND pos2 THEN EXIT position
920 IF NOT pos1 THEN file1$=file1$&"_ "
930 IF NOT pos2 THEN file2$=file2$&"_ "
940 END REPeat position
950 string1$=file1$(1 TO pos1-1)
960 string2$=file2$(1 TO pos2-1)
970 totmatch=checkchars(string1$,string2$)
980 string1$=file1$(pos1+1 TO lenfile1)
990 string2$=file2$(pos2+1 TO lenfile2)
1000 totmatch=totmatch+checkchars(string1$,string2$)
1010 IF totmatch=2 THEN
1020 RETurn 1
1030 ELSE
1040 RETurn 0
1050 END IF
1060 END DEFine namematch
1070 DEFine FuNction checkchars(string1$,string2$)
1080 IF string1$="" OR string2$="" THEN RETurn 0
1090 REPeat expand
1100 IF LEN(string1$)>=LEN(string2$) THEN EXIT expand
1110 string1$=string1$&" "
1120 END REPeat expand
1130 match=1
1140 FOR i=1 TO LEN(string1$)
1150 IF i>LEN(string2$) THEN match=0:EXIT i
1160 IF string1$(i)="*" THEN EXIT i
1170 IF string1$(i)="?" THEN NEXT i:EXIT i
1180 IF NOT string1$(i)=string2$(i) THEN match=0:EXIT i
1190 END FOR i
1200 RETurn match
1210 END DEFine checkchars
1220 DEFine FuNction reply
1230 key=CODE(INKEY$(-1))
1240 IF key=89 OR key=121 THEN
1250 RETurn 1
1260 ELSE
1270 RETurn 0
1280 END IF
1290 END DEFine reply
1300 DEFine PROCedure dirtoscn(drive)
1310 OPEN£4,scr_180x200a300x16
1320 CLS£4
1330 PRINT£4,"Directory of"\"drive mdv";drive:PRINT£4
1340 DIR£4,"mdv"&drive&"_"
1350 CLOSE£4
1360 END DEFine dirtoscn
```

AMSTRAD DISPLAY TIPS

TAG — extremely useful for printing literally anywhere on the screen. However, the printing is done with the graphic pen, and what the Manual doesn't make clear is that if you want to PLOT or DRAW in one colour, then TAG and PRINT in another, you need to PLOT x,y,new col (where x & y are offscreen), MOVE back to where you were, then PRINT. This also means that you might have to restore your previous coordinates and colour to continue with PLOT or DRAW.

COLOURS — there are 32 available (see chapter nine page four of Manual). As numbers 27-31 duplicate five existing colours, only 27 are mentioned elsewhere. Nevertheless, commands such as BORDER 29 are valid.

CONTROLS — characters 0-31 (except 0 & 13) can be embedded in PRINT statements, saving quite a bit of space. For example, try PRINT"[CTRL L] TEXT" instead of CLS:PRINT "TEXT", or PRINT"[CTRL G]" to produce BEEP.

NOTE: INK & BORDER (chrs 28 & 29) should be followed by the ink number and two values, both the same if flashing isn't required. If only one value is used, flashing with the value set previously will result.

HORIZONTAL SCROLLING — as display is controlled by the 6845 chip, OUT 256,No. will move the whole screen area with the edges wrapping round. Here, 'No' is a displacement from the right side, so that although OUT 256,20 moves the display by half a screen, OUT 256,39 will place the left margin at column two.

COLOUR MASKING — use of CHR$(22) with text and CHR$(23) with graphics is one of the most powerful of the Amstrad's features but difficult, perhaps, for beginners to understand in terms of the results achieved. Bearing in mind what was previously said about the PEN results of bit combination in each mode, remember that overlapping pixel colours arise from a logical combination of PEN colours. Try this:

```
10 MODE 1:INK 0,0:INK
   1,24:INK
   2,2:INK 3,15
15 GOTO 30
20 PRINT CHR$(23);CHR$(1)
30 FOR X=300 TO 350 STEP
   2:MOVE X,100:
   DRAWR 0,150,1:NEXT
40 FOR Y=150 TO 200 STEP
   2:MOVE 250,Y:
   DRAWR 150,0,3:NEXT
```

Now delete line 15 and run again. Change INKs 1 & 3 from the keyboard and you'll see that the centre block of colour is unaffected, because the logic result from line 20 remains the same:

1 XOR 3=3
(&X00000001 XOR &X00000011 = &X00000010)

(remember this is 'double width' mode — take the STEPs out of lines 30 & 40 and watch the result!).

Last, but not least, a demonstration of 'hidden line' drawing, using the same example. Having deleted line 15, EDIT line 10 and change INK 2,2 to INK 2,24 and run.

Tony Mayne END

COMPUTER ANSWERS

Send your queries to Simon Goodwin, PCW, 62 Oxford Street, London W1. Note that Simon cannot answer questions on an individual basis, so please don't send an SAE with your query.

Mixing your own paint

Is there any way I can use more than 16 colours on my Commodore 64? I can use extra colours, for example in sprites, but these must be chosen from the 16 available for background displays. I would like to be able to produce shading and graduated hues, as on an Atari or some of the new arcade machines.
Dave Waller, Canning Circus, Nottingham.

You're stuck with just 16 colours on a Commodore 64, although the new Commodore machines (the Plus/4 and the C16) allow the shading you describe. On an Atari every point displayed can have an 'intensity' (brightness) as well as a hue (colour); this means that shades of the same colour can be produced, giving the attractive results you mention.

The electronics of the Commodore 64 can generate only 16 different hue signals for the TV — these correspond to the standard poster colours you are used to. On a Spectrum there are only eight colours available but each can appear in bright or normal intensity, giving 15 possibilities (bright black looks exactly the same, however, as normal black; in fact the difference between bright and normal in most colours can be hard to distinguish).

On an Atari there are 16 colours, but each can be shown in a range of intensities — either eight or 16 different brightnesses, depending on which books you believe. Luckily there is a 'trick' which can enable you to produce the effect of extra colours. Imagine a block of colour on a TV screen, 20 dots wide by 20 dots high. 400 dots would be glowing, producing an area of colour, say, green. Now imagine that alternate rows in the block are set to black. You should have a grid of horizontal lines, but in fact what you get is a darker shade of green — the lines merge, spilling dimly into the black areas. The effect is destroyed if you look closely at the picture, but from a distance it looks as if you have produced a new colour.

The effect may be better if you scatter the contrasting dots (which can be in any colour) throughout the area to be shaded in a chequerboard pattern. A red and yellow check will look orange, red and blue will look purple, and so on. This effect — a kind of computer tartan — can be used on any computer with a high-resolution display. It doesn't work on a low-resolution display or a video monitor since the dots don't merge. It's called 'stippling', named after a process used by some artists.

The Sinclair QL has built-in commands to generate stippled mixtures of its eight standard colours, giving the appearance of over 200 colours. Many commercial programmers use stipples on a variety of machines to generate shading and 3D effects.

Connection conventions

I recently bought a Dragon 32 computer but I can't save or load programs. The problem is that the cable which comes with the computer has small jack plugs at the cassette end, but my tape recorder, a Philips 3302A, expects DIN plugs. Is there any way I can use the tape recorder with the computer, or will I have to buy a new recorder?
Andrea Husbands, Wrexham, Clwyd.

In theory it's possible to use the tape recorder just by changing the plugs at the end of the lead from the computer. You'll need a two-pin DIN loudspeaker plug in place of the EAR jack, and a three-pin DIN plug instead of the MIC jack. These go into the sockets marked with a picture of a loudspeaker and a digit (1), respectively. You'll need to experiment to find the correct way to wire up the two MIC wires to the three-pin DIN plug — one wire should go to the middle pin, and the other to one of the side pins.

In practice it may be more sensible to spend £10 or so on a low-cost, modern, cassette player with jack sockets already fitted. You don't need to buy a special 'computer compatible' model — most of these are just last year's flops tarted up with a tape counter and a few flashing lights. Some of them don't even work reliably with common computers. You'll get just as good service from a cheaper, general-purpose model.

Some hi-fi recorders are useless with computers because they incorporate clever circuitry to 'process' the sound. This makes it sound better to the human ear but confuses a computer, for which raucous bleeps and buzzes have a special meaning.

The most common cause of unreliable loading is incorrectly set up tape heads. This is easily identified, since you experience problems loading other people's tapes (or pre-recorded ones) but your own tapes load perfectly. The misalignment corrects itself on your own tapes — you record them askew and read them back the same way.

Incorrect tape head alignment is a common fault on old machines. With heavy use or rough handling, the head, used to read a cassette, can move out of line, making music sound dull and data unintelligible to a computer. The more 'tinny' a recorder sounds, the better it's likely to work with most computer models. It is possible to re-align the heads on a tape recorder, but it's easy to make things worse rather than better unless you know exactly what you are doing.

Of course, it helps to clean and de-magnetise your tape heads regularly, using one of the kits available from most electrical shops, but this doesn't usually make a great deal of difference — computers are quite tolerant of dirty tape heads (except on a microdrive system). Incorrect alignment gives much greater problems.

Some hi-fi shops or electricians will re-align tape heads for you but prices vary widely, from about £2 to as much as £20.

Translation frustration

I have recently changed from a Sharp MZ-80A to a BBC Model B. This has meant that all the data I had on cassette for the Sharp's data-base is now incompatible with the BBC. As there is so much data on the cassettes it's impractical to type it out again if there is an alternative. What I would like to be able to do is make the data compatible with a BBC data base.
Edward Wilding, Blaby, Leicestershire.

This is a very common problem, in business data processing as well as personal computing. Often companies use the same system for years rather than upgrade to a more useful or efficient one — they simply can't afford the cost of converting all their data from one format to another.

Curiously enough, the essence of the problem is the low cost of computers: it doesn't take very long before the data on a system is worth far more than the machine which processes it.

In your case there's no easy solution. Both computers use special-purpose hardware to generate or detect a cassette signal, and they each use a different approach to the storage of data.

Your Sharp cassettes will make no more sense to the BBC micro than a tape of Culture Club or Beethoven.

Data on a cassette is recorded as a series of clicks or tones. One pitch might correspond to a logic 1, and another to a logic 0, so that a stream of bleeps or clicks can correspond to a program, or a list of data items. The actual pitches or timings used will vary from one computer to another, influencing the reliability of the recording and the speed at which it can be read.

Your BBC Micro uses different tones and a different speed to the Sharp, so you can't just load the data as you would information recorded from another BBC. In fact, the Sharp data would be too fast.

Even if the tones were the same, the format might be different. This is the sequence in which data is recorded, the way file names and locations are handled, and so on. Every file contains extra information besides the data — its name, size, total value (for checking), and so on. These are recorded in different ways on various machines. There's no standard format since each choice has advantages and disadvantages in terms of complexity, flexibility, reliability and speed.

Some computers decode cassettes using software; a program might use simple

electronics to sense individual clicks on the tape. Software translates the pattern of clicks into a message. In such a computer it's possible to read 'foreign' tapes by loading a program which can decipher the timings and format used. This only works with a few computers: for example, it's possible to obtain programs to load TRS-80 data onto a Nascom, or ZX81 programs onto a Spectrum. Even these programs have some restrictions, and they are not able to convert all file types.

The BBC Micro uses hardware to decipher data on cassette. This makes it fast but inflexible — it can decipher only two formats (BBC Micro tapes at 300 or 1200 baud). The Sharp tapes conform to neither system, so they can't be read.

There is a standard way of transferring data from one computer to another, or to another device. The RS232 interface is a gadget which transmits characters, bit by bit, to any other device with the required circuitry. It is often used to communicate with printers, telephone modems, or other peripherals. Your BBC Micro has an RS423 interface, which can produce signals like an RS232. The RS232 is a two-way link, so you can transfer data either way between two computers equipped with the interface — at least, that's the theory the practice is more complicated and fiddly to put into action.

You will need an RS232 interface for the Sharp, and a cable to connect it to the RS423 socket on the back of the BBC Micro. If communication is impossible at first, turn the plug at the BBC end the other way up — the position varies depending which computer thinks it's 'in charge'. You should be able to print data from the Sharp down the RS232 cable, and input it into the BBC Micro. You'll have to read about the commands needed to control the RS232 interface at each end of the link. Once you've got communication underway you can write out the data to a BBC Micro cassette, although you may have to juggle it around a bit to convert it into the format expected by your database package.

Unless you understand a lot about both computers, or can find someone who does, it's much easier to re-type your data onto the new system.

Commodore assemblers

I have been searching through magazines looking for reviews of assemblers for the Commodore 64. I don't have very much money, so £20 is about the most I am prepared to pay. Could you recommend a suitable assembler, bearing in mind my price limit and the fact that I am still using tapes?
Daniel Procida, De La Salle College, Malta.

There are a large number of assemblers available for the Commodore 64 on tape, disk and cartridge. Most of them allow all the standard features of assembly language — mnemonics, labels, and so on.

It's worth making sure, before you buy an assembler, that it conforms to a few basic criteria: it should be written in machine code (Basic assemblers are irritatingly slow); and it should be at least 'two-pass' — this means that you can refer to any label anywhere in your program. Other useful features are macros (facilities to refer to a group of instructions with one name) and built-in debugging commands (to allow you to adjust memory values, start and stop machine code programs, and so on).

There is a big problem associated with learning machine code on a cassette-based computer. When you make a mistake in a Basic program, the most common result is an error message. You can then adjust the program and run it again. But the same cannot be said for machine code programs. The majority of mistakes in machine code cause the computer to stop dead or crash completely, losing all the contents of its memory. In either case you can't fix the mistake until you have re-loaded your assembler program, instructions, debugger (if any) and re-assembled the code. This will take several minutes on a cassette system.

It's much more convenient to have your assembler on a cartridge, so that you don't have to re-load it from tape every time something goes wrong. This may cost a little more than you planned (Commodore's own assembler/editor cartridge costs £24.95 at the time of writing) but the extra money will be well spent — you'll save hours in the first week of serious use. Almost all professional Commodore 64 programmers use cartridge-based assemblers.

If you just want to get some idea of what assembly language is all about, you might as well start with a cheap and cheerful program on tape. Mushroom Software, 193 Rommany Road, London SE27 sells a two-three-pass assembler on cassette for just £5.50, plus £1 for overseas orders.

More Ace space

Last year I bought a 3k Jupiter Ace. I would like to expand the memory, but I understand that the manufacturer of the computer, Jupiter Cantab, has gone out of business. None of the shops near my home stocks accessories for the Ace. Is there anywhere I can still get a RAM pack for my computer? Could I plug in the 16k RAM pack from my ZX81?
John Dewhurst, Middlesbrough, Cleveland

The expansion port on a Jupiter Ace carries the same signals as a ZX81 RAM pack. However, the signals are wired on the port in a different order, so you'll need an adaptor to enable the two devices to work together.

Despite the death of Jupiter Cantab there are still a few firms supplying Ace enthusiasts. The stocks of the Jupiter Ace, and add-ons, are now owned by a company called Boldfield Limited Computing. It sells most of the original add-ons including RAM packs (£23 for 16k), joystick interfaces, keyboard adaptors, and so on. They also stock a motherboard which has an Ace expansion plug on one side and a ZX81 socket on the other; you could use this to connect your Sinclair RAM pack to the Jupiter Ace. It costs £13.80.

For further details you should contact Boldfield at Sussex House, Hobson Street, Cambridge CB1 1NJ.

Dragon key mystery

I have a strange problem with my Dragon 32 computer — sometimes it ignores keys when I'm typing quickly. For example, if I type LIST, the screen shows LST and I get a syntax error when I press ENTER. The problem occurs with some words but not others.

Is there something mechanically wrong with the computer? Why does it work properly when I type slowly?
Graeme Newman, Crown East, Worcester

Your problem stems from some sloppy system programming — there's nothing wrong with the keyboard of your computer. The Basic interpreter in the Dragon, and in the Tandy Color Computer, contains a bug which affects the way multiple key presses are detected. The computer is meant to have 'roll-over', which means that you can press the next key of any sequence before you release the first. Of course, this is only useful for fast typists — when you type slowly you press the keys one by one.

Hold down the L key on your keyboard, then press E. The second letter appears even though L is still depressed. Now hold down key L and press I; this time the second key is ignored.

The Dragon keyboard is wired up in groups of eight keys. The computer reads each group of keys and then works out which key is pressed by examining the resultant pattern. It keeps a record of the last key pressed, so that it can determine which is the 'new key' as your fingers 'roll' from one to the next. The snag is that this is not properly done on the Dragon — it ignores the second key if two in the same group are depressed. I and S are in different groups, but L and I are in the same group.

There's no easy solution to the problem — you have a choice of typing more slowly or writing your own keyboard routine. The bug is not confined to program entry: INPUT AND INKEY$ use the same code, and therefore also suffer from the bug. It has, however, been fixed on the Dragon 64. END

'I'm afraid he's left it all to the computer.'

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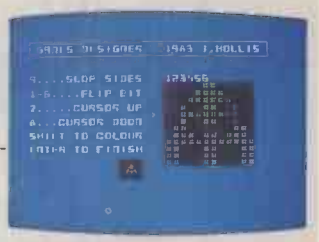

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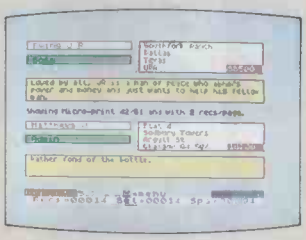

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Your task is to enter the walled city, seek out your captured partner, and escape. At all times you can choose from four angles of view. But beware: the city is patrolled by giant ants...

Written by Quicksilva Ltd. Usual price (RRP): £6.95.

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sinclair

Full speed ahead!

Peter Tootill looks at high-speed bulletin boards, and reveals the common symptoms of problem RS232 interfaces.

Most bulletin boards that provide high-speed access in addition to the normal 300 bits/sec V.21 facility use the Prestel-type V.23 standard. This is fine as long as the BBS is talking to you, but when the roles are reversed, 75 bits/sec can become tedious; this is especially true if you want to upload software or a prepared message. The high-speed standard used in North America is Bell 212, which is equivalent to the CCITT's V.22 and runs at 1200 bits/sec in both directions (full duplex). But the problem with V.22 in the UK is that modems are still expensive (around £500) as miracle chip technology hasn't achieved this standard yet. This is a little surprising as Bell 212 is very popular in the US and Canada, and it's compatible with V.22 at 1200 bits/sec.

As an experiment, Liverpool Mailbox will be providing a V.22 service, in addition to the normal V.21 (300 bits/sec) service, which should be operating now. It will be interesting to see how many V.22 users there are out there, and if this results in any calls from people in the US using Bell 212.

The ICL OPD

The new ICL computer, the One Per Desk, is an interesting development. The concept of combining the busy executive's telephone-answering machine, micro, calculator and mainframe terminal in one unit looks like becoming the way of the future. It would also make a nice addition to any online computer user's equipment.

However, I can't believe that it will really take off as a terminal-to-mainframe system when it has to be used via a modem over a telephone line — and at a pedestrian 1200 bits/sec too. Most existing ICL users will be using terminals connected on high-speed hard-wired links running at 9600 bits/sec. If they were to install a large number of OPDs, they would need racks of modems to answer the calls from the aforementioned busy executive wanting to access the mainframe system.

The hardware implications are daunting and security could also be a headache. Some organisations like to strictly control dial-up access to their computers, and this would be a problem if they had to consider a large number of OPD users.

However, if ICL produces a module that will enable the OPD to act as a hard-wired terminal as well as a stand-alone micro, then it will probably sell in large numbers to such customers.

Null modems

A 'null modem' is useful for connecting the RS232 ports of two computers. It takes care of things like swapping the connections to the transmit and receive data pins so that you don't have both computers talking on pin two and listening on pin three.

It also arranges the control lines in a way that fools the software into thinking that a modem is connected and has detected a carrier tone.

I have been using a null modem made by Peter Inglis, and it performs very well. It's very small, being hardly any bigger than two 25-way connectors. An added bonus is that it has two LEDs, one on each of the data lines, which flicker as the data passes; this can be a very useful feature when troubleshooting. The best news is the price — a remarkably low £9.50 plus 50p p&p. Mr Inglis can supply gender changers at the same price. Contact him at: 14 Arbour Lane, Chelmsford, Essex CM1 5RG. Tel: (0245) 267482.

RS232 troubleshooting

If you're having problems using online systems, there are a number of common symptoms which will give you a clue as to where to look for the cause and cure. Here are the most common cases:

Nothing seems to happen: check that your modem and the one you have called have locked together. Has your modem's carrier detect (CD) light come on? If not, then you are probably calling a system that has incompatible modem standards — Prestel with a 300 bits/sec modem, for example. Try a different system, or change the settings on your modem if it's a multi-standard type. Most systems operating in the UK are V.21 (300 bits/sec) or V.23 (1200/75 bits/sec). Most bulletin boards use V.21, Prestel uses V.23. Some systems provide both, either on separate numbers or by automatically detecting your mode when you call.

If the CD light comes on but nothing appears on your screen, try sending a few carriage returns (for PSS send two carriage returns followed by the characters 'D1', and another return).

If you're still not getting anything on your screen, then it's possible that your computer is not sending (or receiving) data. If your modem has transmit and receive data (TD and RD) indicators, check that the TD one flickers when you type at the keyboard. Is the RD indicator flickering?

If you don't have TD and RD indicators, the easiest way to check that your computer is transmitting and receiving properly is to set your modem to test mode (sometimes called 'analogue loop') if it has this facility. If it doesn't, you can test the computer and RS232 interface by connecting the transmit and receive pins together (pins 2 and 3 on a standard 25-way connector).

In both these cases, with a terminal program running and set to full duplex, whatever you type on the keyboard should be echoed back to the screen. If not, it could be connection problems — are pins 2 and 3 the right way round? Alternatively, perhaps the lack of a control signal is stopping the computer from transmitting. Some software needs to see CD go high before it will start to send.

Try different software or investigate the state of the various pins with a voltmeter. A 6- or 9-volt battery can be used to set the various control lines high or low.

Garbled data: if you are receiving badly, or completely, garbled data when online, the most likely cause is incompatible word length and/or parity settings. The most common settings are 8-bit word, no parity, one or two stop bits, and 7-bit word, even parity, one or two stop bits. The number of stop bits is not as critical as the word length.

Another cause of garbled data is a poor phone line. In this case, you will often get letters appearing when nothing is actually being sent; this is caused by noise on the line.

Missing characters at the start of a line: this is most likely to be caused by your

system needing nulls after carriage returns. The solution, for BBSs at least, is to look for the command that enables you to change your terminal configuration. It is often called FORMAT.

Missing chunks of text: this is probably caused by flow control problems. When information is being sent to you from an online system, there may be times when your computer needs time to catch up. This is especially true at higher speeds, such as 1200 bits/sec. The usual way to pause output is to use a couple of ASCII control characters called X-on and X-off (the 'X' stands for 'transmission'). If you lose chunks of data, it's probably because your system is overloaded with incoming data and is not sending an X-off character to request the sender to pause. Alternatively, it may be sending X-off and the sender doesn't recognise it, but this is unlikely as most online systems support X-on/X-off flow control. X-off is control-S (ASCII decimal 19), X-on is control-Q (ASCII decimal 17).

Everything sent to you appears on one line: this happens when your system needs a line feed after a carriage return and isn't getting one. Most BBSs have the facility to provide line feeds.

The system won't accept your password: if it won't, even though it has done so before, check that you are sending the correct case. Many systems see upper and lower case as different, and it's easy to get it wrong when the system doesn't echo it back to you. END

UK free networks

Bulletin Board	Phone Number	Notes
BABBS-Bath	(0225) 23276	300/300 baud rate; 9pm-8am weekdays, 9am-noon weekends; Atari-based system
BABBS-Felixstowe	(0394) 276306	300/300 baud rate; 24 hours daily; Apple users' group
BABBS TWO-Basildon	(0268) 778956	300/300 baud rate; 24 hours daily; Apple users' group with special area for queries to Apple UK
Basug	(0742) 667983	300/300 baud rate; 24 hours daily
Bettisfield	(094875) 378	300/300 baud rate; 9pm-9am daily; remote CP/M system
Blandford Board	(0258) 54494	300/300 baud rate; 24 hours daily
CABB	(01) 631 3076	300/300 baud rate; 24 hours daily
CBBS SW	(0392) 53116	300/300 baud rate; 24 hours daily
CBBS Woking	(0626) 890014	1200/75 and 300/300 baud rates; 24 hours daily; jokes, jobs, reviews, news
CNOL Lancaster	(0524) 60399	300/300 baud rate; 24 hours daily; Clinical Notes Online service, mainly for medical users; works in conjuction with a database on the Datastar network
Computers Incorporated Newcastle	(0207) 543555	300/300 baud rate; 24 hours daily; primarily business-oriented
Forum 80 Hull	(0482) 859169	300/300 baud rate; 5-11.30pm weekdays, noon-11.30pm weekdays; Bell 103 standard, midnight-8am daily; international electronic mail, library for up/downloading
Forum 80 SPA	(0926) 39871	300/300 baud rate; 11pm-midnight daily; TRS-80 and Genie users' group
Forum 80 Wembley	(01) 902 2546	300/300 baud rate; 7-10pm weekdays, midday-10pm weekdays; electronic mail, library for downloading; ring and ask for Forum 80
Hamnet Hull	(0482) 497150	300/300 baud rate; 6pm-8am daily
Liverpool Mailbox	(051) 4288924	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
Mailbox-80 Stourport	(0384) 635336	300/300 baud rate; 6pm-8am daily
Manchester Open Bulletin Board	(061) 7368449	300/300 baud rate; 24 hours daily
MBBS-Mitcham	(01) 640 2617	300/300 baud rate; 10am-8pm Thursday and Sunday; BBC-based system with jokes, graffiti, electronic mail, and Atari and BBC sections
MG-Net CBBS London	(01) 399 2136	300/300 baud rate; 5-10pm Sunday; electronic mail, program downloading
Microweb Manchester	(061) 4564157	300/300 baud rate; 24 hours daily; *Micro User* magazine, mainly for BBC users
NBBBS-North Birmingham	(0827) 288810	300/300 baud rate; 24 hours daily
OBBS Manchester	(061) 4271596	300/300 baud rate; weekdays except 7pm-9pm, weekends except 10am-10pm
PIP-Sheffield	(0742) 667983	300/300 baud rate; 24 hours daily
Southern BBS	(0243) 511077	300/300 baud rate; 8pm-2am daily; ring-back system (dial the number, let phone ring once, and then ring back); messages, downloading
Stoke ITEC	(0782) 265078	300/300 baud rate; 24 hours daily; remote CP/M system
TBBS London	(01) 348 9400	300/300 baud rate; 9am-7am daily
TBBS London Metro	(01) 341 7840	300/300 and 1200/75 baud rate (including Prestel compatibility); 24 hours daily; temporary number for the TBBS Nottingham system
WABBS-Worthing	(0903) 42013	300/300 baud rate; 24 hours daily; ring-back system (dial the number, let phone ring once, and then ring back); Atari-based

SUBSET

David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send it in and share it with other programmers. Subroutines for any of the popular processors and computers are welcome but please include full documentation. All published code will be paid for. Send your contributions to Sub Set, PCW, 62 Oxford Street, London W1A 2HG.

Z80 floating point

As a somewhat delayed follow-up to his conversion of a 32-bit integer arithmetic suite from Z80 to 6502 code (February 1982, *PCW*), Dennis May of London provides Subset with a Z80 suite to perform floating point binary arithmetic.

The suite acts on arguments anywhere in memory, indexed by the Z80's two 16-bit index registers, IX and IY. It returns the result in the six registers BCDEHL, ready for storage anywhere. The zero and carry flags are used to convey division by zero and overflow error information.

Each number in the format required by the suite is contained in six bytes. The first byte is the exponent and the second is the sign byte of which only bit 7 is actually used. The remaining four bytes form the mantissa, or fraction. The 32-bit precision is about the equivalent of 9.5 decimal digits. The range of magnitude made available by the format is $1 * 2^{-128}$ (about 0.29E-38) to 4, 294,967,295 * 2^{95} (about 0.17E39).

To facilitate the possible use of 16-bit arithmetic, the mantissa is stored with the low-order byte in the third byte of the number, high order in the sixth byte. The mantissa is normalised so that for a non-zero number, bit 31 is always set. (Anyone wishing to try and improve upon the suite might like to utilise this fact — the sign bit can be stored in the high order bit of the mantissa, cutting variable storage by 1/6.)

The exponent is held as an 'excess 128' value; this is similar to the 'two's complement' notation with which you should be familiar but has 128 (80H) as the zero exponent value with lower values negative and higher ones positive. The advantage of excess 128 over the familiar method of indicating signed numbers is that zero — the easiest value to test — signifies either overflow or underflow. Dennis also uses a zero exponent to indicate that a number is zero, making it unnecessary to clear the mantissa and reset the sign.

33-bit subtraction

One elegant feature of the suite worth commenting upon is the implementation of 33-bit arithmetic in the division routine FPDIV. If, in any iteration, the 32-bit subtraction of divisor from dividend fails then a borrow is generated. However, the previous iteration shifts the highest dividend bit out to carry and the subtraction would be possible if this bit were set. In fact the borrow in 33-bit arithmetic will be the inverse of the shifted out bit, and the algorithm used by Dennis simply replaces the 32-bit borrow by the complement of the shifted bit.

```
:CPU          Z80
:HARDWARE     FETCH: arguments in RAM. MOPUP: none.
:SOFTWARE     FETCH: none. MOPUP: "NORM" and "ROUND".
;-------------------------------------------------------------------
:INPUT        FETCH: IX and IY address the two arguments
;             MOPUP: Result in 6 bytes on stack addressed by IX.
:OUTPUT       FETCH: IX, IY, AF on stack. Arguments on stack
;                    indexed by IX. All flags cleared.
;                    A, B, DE and HL changed.
;             MOPUP: Result in BCDEHL. IX, IY and A restored.
;                    Z = 1: division by zero (FPDIV).
;                    Z = 0: C = 1: overflow. C = 0: no error.
:ERRORS       None.
:REG USE      F BC DE HL IX IY (A changed in FETCH).
:STACK USE    16 (MOPUP: -16).
:RAM USE      None.
:LENGTH       FETCH: 48.  MOPUP: 39.
:CYCLES       Not given.
;-------------------------------------------------------------------
:CLASS 2      -discreet      *interruptable      *promable
;-*****       *reentrant     *relocatable        *robust
;*******************************************************************
;
FETCH  POP  HL          ;Get return address in HL.      E1
       PUSH IX          ;Save IX, IY and AF on stack    DD E5
       PUSH IY          ;before stacked numbers, other  FD E5
       PUSH AF          ;registers used for output.     F5
       LD   IX,-12      ;Index stack area below         DD 21 F4 FF
       ADD  IX,SP       ;12-byte workspace and set      DD 39
       LD   SP,IX       ;Stack pointer accordingly.     DD F9
       LD   D,(IX+17)   ;Get stacked IX to DE for       DD 56 11
       LD   E,(IX+16)   ;transfer loop source.          DD 5E 10
       LD   B,6         ;Count for 6-byte numbers.      06 06
;
FETCHL LD   A,(DE)      ;Move byte from 1st number to   1A
       LD   (IX+0),A    ;workspace low address.         DD 77 00
       LD   A,(IY+0)    ;Move byte from 2nd number to   FD 7E 00
       LD   (IX+6),A    ;workspace high address.        DD 77 06
       INC  IX          ;Bump workspace pointer         DD 23
       INC  DE          ;and 1st number pointer         13
       INC  IY          ;and 2nd number pointer.        FD 23
       DJNZ FETCHL      ;Repeat for 6-byte numbers.     10 EF
;
       LD   DE,-6       ;Reset IX to point to start     11 FA FF
       ADD  IX,DE       ;of stack workspace area.       DD 19
       LD   (IX+12),B   ;Clear Z and Cy flags (B=0).    DD 70 0C
       JP   (HL)        ;Return by jumping.             E9
;-------------------------------------------------------------------
;
MOPUP                   ;Exit routine with entry points for
                        ;division by zero, overflow, underflow or
                        ;zero result, normalise and round.
;
MOPDZ  SET  6,(IX+12) ;Set stacked Z flag to show       DD CB 0C F6
       JR   MOPPOP    ;division by zero, and exit.     18 10
MOPNR  CALL NORM      ;Normalise if necessary,         CD lo hi
       CALL ROUND     ;then round, and go exit if      CD lo hi
       JR   NZ,MOPPOP ;result exponent not zero.       20 08
MOPOV  SET  0,(IX+12) ;Set stacked Cy: overflow        DD CB 0C C6
MOPUF  LD   (IX+0),0  ;Set exponent 0, zero result.    DD 36 00 00
;
MOPPOP LD   SP,IX     ;Set SP at result, losing any    DD F9
       POP  BC        ;values on stack, and pick up    C1
       POP  HL        ;result in BCDEHL, B = sign,     E1
       POP  DE        ;C = exp, DEHL = mantissa.       D1
       POP  IX        ;Pop 6 bytes of 2nd argument     DD E1
       POP  IX        ;into IX to discard it and       DD E1
       POP  IX        ;move Stack Pointer up to        DD E1
       POP  AF        ;saved registers. Restore A      F1
       POP  IY        ;and result flags. Restore       FD E1
       POP  IX        ;argument pointers IX and IY.    DD E1
       RET            ;Exit floating point suite.      C9
;*******************************************************************
```

DATASHEET 1

```
;*******************************************************************
:* FETCH     Fetch arguments to stack.
:  *MOPUP    (MOPDZ, MOPNR, MOPOV, MOPUF) Exit correctly.
;*******************************************************************
:JOB          FETCH: To copy two arguments to stack work area and
;                    clear result flags.
:             MOPUP: To set correct flags, zeroise result if
;                    necessary, pull results and exit.
:ACTION       See comments.
;-------------------------------------------------------------------
```

DATASHEET 2

```
;*******************************************************************
:* NORM      Normalise floating point number.
:) SWAP      Swap two contiguous floating point numbers.
:) ROUND     Round floating point number.
:) RSHIFT    Shift floating point number justification.
;*******************************************************************
:JOB          Set of four utility subroutines acting on floating
;             point mantissa and exponent.
:ACTION       See individual routine comments.
;-------------------------------------------------------------------
```

```
:CPU          Z80
:HARDWARE     RAM indexed by IX (Stack workspace within suite).
:SOFTWARE     None.
:-------------------------------------------------------------------
:INPUT        IX addresses floating point number.
:             C = rounding byte. D = byte above mantissa.
:             B = bit count for RSHIFT.
:OUTPUT       Number normalised, rounded or right shifted (or
:             exchanged with succeeding number in SWAP).
:             C, D and exponents are corrected. B & A changed.
:             Z set to show exponent overflow in ROUND & RSHIFT.
:ERRORS       None.
:REG USE      NORM:  AF C IX.    SWAP:    F B DE IX.
:             ROUND: AF C IX.    RSHIFT:  AF B C D IX.
:STACK USE    SWAP: 2. Others: none.
:RAM USE      None.
:LENGTH       NORM: 33. SWAP: 24. ROUND: 36. RSHIFT: 39.
:CYCLES       Not given.
:-------------------------------------------------------------------
:CLASS 2      -discreet      *interruptable      *promable
:-*****       *reentrant     *relocatable        *robust
:===================================================================
:
NORM   LD   A(IX+5)  :Test high order bit of        DD 7E 05
       RLA           :mantissa and exit if set      17
       RET  C        :with number normalised.       D8
       LD   A,(IX+0) :Test input or adjusted        DD 7E 00
       OR   A        :exponent and exit if zero as  B7
       RET  Z        :either zero or underflow.     C8
       SLA  C        :Else shift mantissa           CB 21
       RL   (IX+2)   :left one bit with bit from    DD CB 02 16
       RL   (IX+3)   :rounding byte going in to     DD CB 03 16
       RL   (IX+4)   :mantissa lowest bit.          DD CB 04 16
       RL   (IX+5)   :Then subtract 1 from exponent DD CB 05 16
       DEC  (IX+0)   :to show shift made and loop   DD 35 00
       JR   NORM     :until normalised or zero.     18 DF
:-------------------------------------------------------------------
:
SWAP   LD   B,6      :Count for 6-byte numbers.     06 06
SWAPLP LD   E,(IX+0) :Starting with lowest          DD 5E 00
       LD   D,(IX+6) :addressed bytes, exchange     DD 56 06
       LD   (IX+0),D :corresponding bytes in 1st    DD 72 00
       LD   (IX+6),E :and 2nd arguments, index      DD 73 06
       INC  IX       :next bytes higher and repeat  DD 23
       DJNZ SWAPLP   :for all six bytes.            10 F0
       LD   DE,-6    :Restore IX to point to        11 FA FF
       ADD  IX,DE    :lowest workspace byte.        DD 19
       RET           :Exit, numbers swapped.        C9
:-------------------------------------------------------------------
:
ROUND  LD   A,(IX+0) :Test exponent and             DD 7E 00
       OR   A        :if not zero then okay         B7
       JR   NZ,ROUNDB:but if zero then              20 02
       LD   C,0      :zeroise rounding byte C.      0E 00
ROUNDB LD   A,80H    :Get complement of rounding    3E 80
       XOR  C        :bit so exit made with Z = 0   A9
       RET  M        :if now set (no rounding).     F8
:
       INC  (IX+2)   :Else round up mantissa,       DD 34 02
       RET  NZ       :incrementing each byte in     C0
       INC  (IX+3)   :turn if last byte overflowed  DD 34 03
:
       RET  NZ       :else exit Z reset if          C0
       INC  (IX+4)   :at any stage the increment    DD 34 04
       RET  NZ       :does not produce zero (i.e.   C0
       INC  (IX+5)   :no carry to next byte).       DD 34 05
       RET  NZ       :If 4th byte incremented to    C0
       SET  7,(IX+5) :zero then normalise, set top  DD CB 05 FE
       INC  (IX+0)   :bit and increment exponent.   DD 34 00
       RET           :Exit Z set if exp. overflow.  C9
:-------------------------------------------------------------------
:
RSHIFT LD   A,B      :Test input shift count        78
       OR   A        :and exit immediately if zero  B7
       JR   Z,RSHEND :but with Z reset.             28 21
       LD   A,(IX+0) :Test exponent and exit        DD 7E 00
       OR   A        :immediately if zero but       B7
       JR   Z,RSHEND :with Z reset.                 28 1B
:
RSHLP  SRL  D        :Else shift mantissa right     CB 3A
       RR   (IX+5)   :by one bit, bit from D        DD CB 05 1E
       RR   (IX+4)   :going to high order bit       DD CB 04 1E
       RR   (IX+3)   :of mantissa and low order     DD CB 03 1E
       RR   (IX+2)   :bit of mantissa shifted       DD CB 02 1E
       RR   C        :out to rounding byte C.       CB 19
       INC  (IX+0)   :Adjust exponent for shift,    DD 34 00
       RET  Z        :exit Z = 1 on overflow,       C8
       DJNZ RSHLP    :else repeat for count.        10 E6
       LD   A,B      :Ensure Z reset on exit.       78
:
RSHEND INC  A        :Make A non-zero so Z reset    3C
       RET           :to show non-overflow on exit. C9
:===================================================================
```

DATASHEET 3

```
:===================================================================
:= ADDM       Add mantissas of two floating point numbers.
:> SUBM       Subtract mantissas of two floating point numbers.
:> NEGM       Negate mantissa of a floating point number.
:===================================================================
:JOB          Set of three arithmetic utility routines acting on
:             the 4-byte mantissas of floating point numbers.
:ACTION       See individual routine comments.
:-------------------------------------------------------------------
:CPU          Z80
:HARDWARE     RAM indexed by IX (Stack workspace within suite).
:SOFTWARE     None.
:-------------------------------------------------------------------
:INPUT        IX addresses floating point number(s).
:             (C = rounding byte in NEGM).
:OUTPUT       IX unchanged. A changed. Cy = carry or borrow out.
:             ADDM: Sum stored in 1st number mantissa.
:             SUBM: Difference stored in 1st number mantissa.
:                   B = 0 if difference = 0.
:             NEGM: 2's complement negation stored in 1st number
:                   mantissa and rounding byte C.
:                   Cy = 0 if negation = 0, else Cy = 1.
:ERRORS       None.
:REG USE      AF B IX (also C in NEGM).
:STACK USE    4
:RAM USE      None.
:LENGTH       ADDM: 26. SUBM: 32. NEGM: 27.
:CYCLES       Not given.
:-------------------------------------------------------------------
:CLASS 2      -discreet      *interruptable      *promable
:-*****       *reentrant     *relocatable        *robust
:===================================================================
:
ADDM   PUSH DE       :Save DE for use in ADDM.      D5
       LD   B,4      :Set 4-byte mantissa count.    06 04
       OR   A        :Clear Cy initially.           B7
:
ADDMLP LD   A,(IX+2) :Loop adding corresponding     DD 7E 02
       ADC  A,(IX+8) :bytes of mantissa, storing    DD 8E 08
       LD   (IX+2),A :result in number at IX+0.     DD 77 02
       INC  IX       :Repeat for all four bytes     DD 23
       DJNZ ADDMLP   :of mantissa.                  10 F3
:
       PUSH AF       :Save flags while              F5
       LD   DE,-4    :restoring IX to point to      11 FC FF
       ADD  IX,DE    :1st byte of 1st number.       DD 19
       POP  AF       :Restore flags,                F1
       POP  DE       :and DE then exit with         D1
       RET           :mantissa added.               C9
:-------------------------------------------------------------------
:
SUBM   PUSH DE       :Save DE for use in SUBM.      D5
       LD   B,4      :Set 4-byte mantissa count.    06 04
       XOR  A        :Clear borrow initially and    AF
       LD   D,A      :clear zero indicator D.       57
:
SUBMLP LD   A,(IX+2) :Subtract corresponding bytes  DD 7E 02
       SBC  A,(IX+8) :of 2nd number mantissa from    DD 9E 08
       LD   (IX+2),A :1st with result to 1st.       DD 77 02
       PUSH AF       :Save borrow and               F5
       OR   D        :merge any set bits into       B2
       LD   D,A      :zero indicator.               57
       POP  AF       :Restore borrow, then index    F1
       INC  IX       :next bytes and repeat for     DD 23
       DJNZ SUBMLP   :all four bytes of mantissa.   10 EF
:
       PUSH AF       :Save flags and transfer zero  F5
       LD   B,D      :indicator to B. Then          42
       LD   DE,-4    :restore IX to point to        11 FC FF
       ADD  IX,DE    :1st byte of 1st number.       DD 19
       POP  AF       :Restore flags,                F1
       POP  DE       :and DE then exit with         D1
       RET           :mantissa subtracted.          C9
:-------------------------------------------------------------------
:
NEGM   PUSH DE       :Save DE for use in NEGM.      D5
       LD   B,4      :Set 4-byte mantissa count.    06 04
       XOR  A        :Clear Accumulator and Cy.     AF
       SUB  C        :Negate rounding byte in C     91
       LD   C,A      :with possible carry to loop.  4F
:
NEGMLP LD   A,0      :Loop subtracting each byte    3E 00
       SBC  A,(IX+2) :of mantissa and carry from    DD 9E 02
       LD   (IX+2),A :previous byte from zero,      DD 77 02
       INC  IX       :2's complement result back    DD 23
       DJNZ NEGMLP   :to number at IX+0.            10 F4
:
       PUSH AF       :Save flags while              F5
       LD   DE,-4    :restoring IX to point to      11 FC FF
       ADD  IX,DE    :1st byte of 1st number.       DD 19
       POP  AF       :Restore flags,                F1
       POP  DE       :and DE then exit with         D1
       RET           :mantissa negated.             C9
:===================================================================
```

DATASHEET 4

```
:===================================================================
:= FPSUB      Floating point subtraction.
:> FPADD      Floating point addition.
:===================================================================
:JOB          To perform addition or subtraction on two floating
:             point numbers held in memory, returning a valid
:             result in registers or error information in flags.
:ACTION       Move numbers to stack workspace.
:             IF either number = 0 THEN: ( Return other number.)
:             Equalise exponents, justifying mantissas.
:             Add/subtract mantissas with any necessary negation,
:             justification, sign change or exponent zeroising.
:             Exit, result to registers, setting correct flags.
:-------------------------------------------------------------------
:CPU          Z80
:HARDWARE     Memory containing the two numbers.
:SOFTWARE     FETCH MOPUP SWAP RSHIFT ADDM SUBM NEGM
:-------------------------------------------------------------------
:INPUT        IX addresses 1st number, IY 2nd number in memory.
:OUTPUT       IX, IY and indexed numbers unchanged. Z = 0.
:             Cy = 0: Result in BCDEHL. Cy = 1: Overflow.
:ERRORS       None.
:REG USE      F BC DE HL IX IY
:STACK USE    22
:RAM USE      None.
:LENGTH       95
:CYCLES       Not given.
:-------------------------------------------------------------------
:CLASS 2      -discreet      *interruptable      *promable
:-*****       *reentrant     *relocatable        *robust
:===================================================================
:
FPADD  CALL FETCH    :Move arguments to workspace   CD lo hi
       JR   FPAS     :on stack. Go to common part.  18 0B
:
```

```
FPSUB   CALL FETCH      :Get arguments to workspace     CD lo hi
        LD   A,-1       :and negate sign of second      3E FF
        XOR  (IX+7)     :number so add/sub operation    DD AE 07
        LD   (IX+7),A   :is essentially the same.       DD 77 07
;
FPAS    LD   A,(IX+0)   :Get and test 1st exponent      DD 7E 00
        OR   A          :for number = 0. If so, move    B7
        CALL Z,SWAP     :2nd number to result place.    CC lo hi
        LD   A,(IX+6)   :Get and test 2nd exponent.     DD 7E 06
        OR   A          :If zero, return 1st number     B7
        JP   Z,MOPPOP   :as sum or difference.          CA lo hi
;
        SUB  (IX+0)     :Subtract exponents to give     DD 96 00
        JR   NC,FPASEQ  :shifts needed to equalise      30 05
        NEG             :exponents, swapping numbers    ED 44
        CALL SWAP       :if necessary.                  CD lo hi
FPASEQ  LD   C,0        :Clear rounding byte and        0E 00
        LD   D,C        :shift-in byte.                 51
        LD   B,A        :Move shift count to B and      47
        CALL RSHIFT     :shift if needed.               CD lo hi
;
        LD   A,(IX+1)   :Compare signs. If same then    DD 7E 01
        XOR  (IX+7)     :addition of mantissas is       DD AE 07
        RLA             :needed but subtraction if      17
        JR   C,FPMSUB   :signs are different.           38 10
;
        CALL ADDM       :Add mantissas. Prepare for     CD lo hi
        LD   B,1        :shifting carry out of add      06 01
        LD   D,1        :back into mantissa.            16 01
        CALL C,RSHIFT   :Shift any carry back in.       DC lo hi
        JP   Z,MOPOV    :Exit if exponent overflow.     CA lo hi
        JP   MOPNR      :Normalise, round & exit.       C3 lo hi
;
FPMSUB  CALL SUBM       :Subtract mantissas and,        CD lo hi
        PUSH AF         :saving borrow, test            F5
        LD   A,B        :if difference is zero,         78
        OR   A          :if so then exit clearing       B7
        JP   Z,MOPUF    :exponent to show number = 0.   CA lo hi
        POP  AF         :restore borrow and negate      F1
        CALL C,NEGM     :result if borrow generated.    DC lo hi
        RRA             :Use borrow to set correct      1F
        XOR  (IX+1)     :result sign, negating sign     DD AE 01
        LD   (IX+1),A   :only if Cy was set.            DD 77 01
        JP   MOPNR      :Normalise, round & exit.       C3 lo hi
;*****************************************************************
```

DATASHEET 5

```
;*****************************************************************
:= FPMUL    Floating point multiplication.
;*****************************************************************
:JOB        To perform multiplication on two floating point
:           numbers held in memory, returning a valid product in
:           registers or error information in flags.
:ACTION     Move numbers to stack workspace.
:           IF either number = 0 THEN: [ Return zero.]
:           Add exponents, exiting on overflow or underflow.
:           Product sign = multiplier XOR multiplicand signs.
:           Multiply mantissas.
:           Normalise, round and exit, product to registers.
:-----------------------------------------------------------------
:CPU        Z80
:HARDWARE   Memory containing the two numbers.
:SOFTWARE   FETCH MOPUP ADDM
:-----------------------------------------------------------------
:INPUT      IX addresses multiplier, IY multiplicand in memory.
:OUTPUT     IX, IY and indexed numbers unchanged. Z = 0.
:           Cy = 0: Result in BCDEHL. Cy = 1: Overflow.
:ERRORS     None.
:REG USE    F BC DE HL IX IY
:STACK USE  24
:RAM USE    None.
:LENGTH     110
:CYCLES     Not given.
:-----------------------------------------------------------------
:CLASS 2     -discreet      *interruptable      *promable
:-*****      *reentrant     *relocatable        *robust
;*****************************************************************
;
FPMUL   CALL FETCH      :Move numbers to workspace on   CD lo hi
        LD   A,(IX+0)   :stack and test exponent of     DD 7E 00
        OR   A          :multiplier, returning it as    B7
        JP   Z,MOPPOP   :product if zero.               CA lo hi
        LD   A,(IX+6)   :Test multiplicand exponent     DD 7E 06
        OR   A          :and exit with zero product     B7
        JP   Z,MOPUF    :if it is zero.                 CA lo hi
;
        ADD  A,(IX+0)   :Else add exponents, use Cy     DD 86 00
        JR   C,FPMPOS   :and S to determine if add      38 05
        JP   P,MOPUF    :gives underflow or overflow    F2 lo hi
        JR   FPMEXS     :and if so, exit with correct   18 03
FPMPOS  JP   M,MOPOV    :zero result/overflow flag.     FA lo hi
FPMEXS  ADD  A,80H      :Restore excess 128 exponent    C6 80
        LD   (IX+0),A   :to product exponent byte.      DD 77 00
;
        LD   A,(IX+1)   :Exclusive-OR multiplier        DD 7E 01
        XOR  (IX+7)     :and multiplicand signs to      DD AE 07
        LD   (IX+1),A   :give product sign.             DD 77 01
;
        LD   L,(IX+2)   :Move multiplier mantissa       DD 6E 02
        LD   H,(IX+3)   :low-word to (SP)               DD 66 03
        PUSH HL         :and high-word to HL            E5
        LD   L,(IX+4)   :for shifting in                DD 6E 04
        LD   H,(IX+5)   :multiplication loop.           DD 66 05
;
        LD   C,0        :Zeroise rounding byte          0E 00
        LD   (IX+2),C   :and product accumulator        DD 71 02
        LD   (IX+3),C   :(replacing multiplier          DD 71 03
        LD   (IX+4),C   :in workspace).                 DD 71 04
        LD   (IX+5),C   :                               DD 71 05
        LD   D,32       :Set 32 bit count.              16 20
;
FPMLP   SRL  H          :Long multiplication by shift   CB 3C
        RR   L          :and addition at correct bit    CB 1D
        EX   (SP),HL    :place if multiplier bit set.   E3
        RR   H          :Shift right next multiplier    CB 1C
        RR   L          :bit through HL and (SP)        CB 1D
        EX   (SP),HL    :intc Cy.                       E3
        CALL C,ADDM     :If set, add multiplicand       DC lo hi
        RR   (IX+5)     :and shift partial product      DD CB 05 1E
        RR   (IX+4)     :right to next bit place,       DD CB 04 1E
        RR   (IX+3)     :getting any carry from         DD CB 03 1E
        RR   (IX+2),    :addition. Rounding byte        DD CB 02 1E
        RR   C          :takes shift out bits.          CB 19
        DEC  D          :Repeat for all 32 bits of      15
        JR   NZ,FPMLP   :multiplier.                    D0 DE
        JP   MOPNR      :Normalise, round & exit.       C3 lo hi
;*****************************************************************
```

DATASHEET 6

```
;*****************************************************************
:= FPDIV    Floating point division.
;*****************************************************************
:JOB        To perform division on two floating point numbers
:           held in memory, returning a valid quotient in
:           registers or error information in flags.
:ACTION     Move numbers to stack workspace.
:           IF divisor = 0 THEN: [ Exit, division by zero. ]
:           IF dividend = 0 THEN: [ Return zero.]
:           Subtract exponents, exit on overflow or underflow.
:           Quotient sign = dividend XOR divisor signs.
:           Divide mantissas.
:           Normalise, round and exit, quotient to registers.
:-----------------------------------------------------------------
:CPU        Z80
:HARDWARE   Memory containing the two numbers.
:SOFTWARE   FETCH MOPUP SUBM ADDM
:-----------------------------------------------------------------
:INPUT      IX addresses dividend, IY divisor in memory.
:OUTPUT     IX, IY and indexed numbers unchanged.
:           Z = 1: division by zero.
:           Z = 0: Cy = 0: Result in BCDEHL. Cy = 1: Overflow.
:ERRORS     None.
:REG USE    F BC DE HL IX IY
:STACK USE  24
:RAM USE    None.
:LENGTH     114
:CYCLES     Not given.
:-----------------------------------------------------------------
:CLASS 2     -discreet      *interruptable      *promable
:-*****      *reentrant     *relocatable        *robust
;*****************************************************************
;
FPDIV   CALL FETCH      :Move numbers to workspace on   CD lo hi
        LD   A,(IX+6)   :stack and test exponent of     DD 7E 06
        OR   A          :divisor. If zero then error    B7
        JP   Z,MOPDZ    :exit - division by zero.       CA lo hi
        LD   A,(IX+0)   :Test dividend exponent, if     DD 7E 00
        OR   A          :zero then return valid         B7
        JP   Z,MOPUF    :zero quotient.                 CA lo hi
;
        SUB  (IX+6)     :Subtract exponents, use Cy     DD 96 06
        JR   NC,FPDPOS  :and S to test if subtraction   30 05
        JP   P,MOPUF    :gives underflow/overflow,      F2 lo hi
        JR   FPDEXS     :if so exit with correct        18 03
FPDPOS  JP   M,MOPOV    :zero quotient/overflow flag.   FA lo hi
FPDEXS  ADD  A,81H      :Correct excess 128 exponent    C6 81
        JP   Z,MOPOV    :+1 for bit normalisation,      CA lo hi
        LD   (IX+0),A   :exiting if overflow.           DD 77 00
;
        LD   A,(IX+1)   :Exclusive-OR dividend and      DD 7E 01
        XOR  (IX+7)     :divisor sign to give quotient  DD AE 07
        LD   (IX+1),A   :sign, replacing dividend.      DD 77 01
        LD   HL,0       :Clear quotient mantissa in     21 00 00
        PUSH HL         :(SP) and HL, clear rounding    E5
        LD   C,H        :byte C. Set D as 32-bit count  4C
        LD   D,34       :+ 1 normalisation + 1 round.   16 22
;
FPDLP   RL   E          :Save hi-bit shifted out of     CB 13
        CALL SUBM       :dividend and subtract divisor  CD lo hi
        JR   NC,FPDAD   :skip if subtraction went ok    30 03
        RR   E          :else correct for 33-bit        CB 1B
        CCF             :subtraction. If still no go    3F
FPDAD   CALL C,ADDM     :then add divisor back and      DC lo hi
        JR   C,FPDRS    :skip quotient bit setting.     38 02
        SET  5,C        :Set correct place bit.         CB E9
;
FPDRS   SLA  C          :Shift partial quotient and     CB 21
        ADC  HL,HL      :rounding byte in               ED 6A
        EX   (SP),HL    :(SP), HL and C one bit left    E3
        ADC  HL,HL      :to next bit place.             ED 6A
        EX   (SP),HL    :                               E3
        SLA  (IX+2)     :Shift dividend left            DD CB 02 26
        RL   (IX+3)     :by one bit to next bit place   DD CB 03 16
        RL   (IX+4)     :top bit out to Cy.             DD CB 04 16
        RL   (IX+5)     :Repeat for 34 bits             DD CB 05 16
        DEC  D          :needed to ensure correct       15
        JR   NZ,FPDLP   :normalised, rounded quotient.  20 D4
;
        LD   (IX+2),L   :Move quotient mantissa         DD 75 02
        LD   (IX+3),H   :from (SP) and HL to            DD 74 03
        POP  HL         :replace dividend in stack      E1
        LD   (IX+4),L   :workspace as raw quotient      DD 75 04
        LD   (IX+5),H   :then exit to normalise         DD 74 05
        JP   MOPNR      :and round.                     C3 lo hi
;*****************************************************************
```

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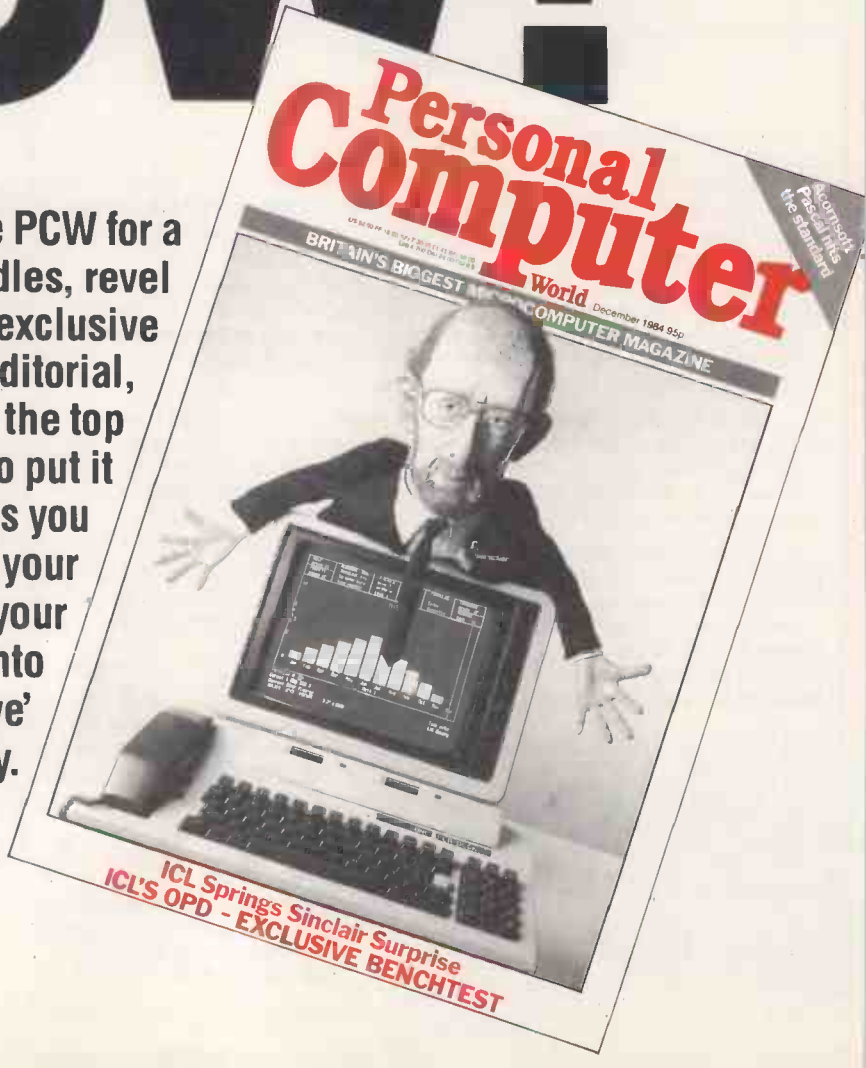

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Any accompanying program listings should be supplied on disk or cassette, ideally with a printout as well.

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 in 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. END

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Readers are strongly advised to check details with exhibition organisers before making arrangements, in order to avoid wasted journeys due to cancellations, printer's errors, etc.

London	(Barbican), Int Computer Graphics User Show & Conference. Contact: Montbuild Ltd, (01) 486 1951	19-21 Feb
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London	(Barbican), PC Trade Show. Contact: EMAP Int Exbns Ltd, (01) 8373699	26-28 Feb
London	(Olympia), DEXPO Europe (Digital Equipment, Hardware & Software Exbn). Contact: CGP Ltd, (01) 582 9256	6-8 March
Glasgow	(Anderston Centre), Scottish Computer Show & Conf. Contact: Cahners Exbns Ltd, (01) 891 5051	12-14 March
USA	(Anaheim), COMDEX/Winter (Computer Conf & Exbn). Contact Interface Group Inc, 300 First Ave, Needham, MA 02194	21-24 March
London	(Olympia), INFO 85 (Information Technology & Office Automation Exbn). Contact: BED Exbns Ltd, (01) 647 1001	26-28 March

LEISURE LINES

Brain-Teasers from J. J. Clessa

Quickie

This month's quickie has an educational slant. In a mixed class of a certain school, each girl student can see as many girl students as she can boy students. But each boy student can see twice as many girl students as he can boy students.

How many boy and girl students are there in the class?

Prize Puzzle

I have a box full of equal sized ball bearings. The total number of ball bearings happens to be a perfect square greater than 4. It is possible to construct a triangular pyramid using every ball bearing.

What is the least number of ball bearings that I could have. Note — in a triangular pyramid, the layers contain 1, 3, 6, 10 ball bearings and so on.

Answers please, on postcards only (letters will be disqualified), to *PCW* Prize Puzzle, March 1985, Leisure Lines, 62 Oxford Street, London W1. Entries to arrive not later than 31 March 1985.

November Prize Puzzle

We had exactly 100 entries for this competition. Program running times to solve the problem ranged from five and a half days on a Spectrum to two minutes on an HP9816. But, since one HP9816 owner said it took 26 hours, I suppose the timings reflect the quality of the programming rather than of the hardware.

Some readers said it couldn't be done, but, to show they are wrong, the required answer is 2199978, which divides with 8799912 exactly, giving a

quotient of 4.

Incidentally, as several of you observed, if you add or remove 9's from the middle of this number the property still remains.

The winning entry comes from Mr. Claes Malcolm from Sweden. Congratulations Claes (or is it Malcolm?), your prize is on its way.

NUMBERS

Problems with primes from Mike Mudge.

Definitions A Prime number is a positive whole number which is exactly divisible by itself and unity only. Thus the sequence of primes begins 2, 3, 5, 7, 11, 13, 17, 19, . . .

A truncatable prime number is a prime which yields a sequence of primes when successive digits are removed: always from the left (for a left-truncatable prime), always from the right (for a right-truncatable prime), or simultaneously from the left and right (for a shrinking prime). For example: 629137 is left truncatable since it is prime and so are 29137, 9137, 137, 37, & 7. 939133 is right-truncatable since it is prime and so are 39133, 9133, 133, 33, & 3.

The State of the Art Angell IO and Godwin HJ *1977 Mathematics of Computation*, vol 31 page 265, have tabulated, to base ten, the largest left-truncatable prime, L_a, with base a between 3 and 11 inclusive also the largest right-truncatable prime, R_a, with base a between 3 and 15 inclusive.

Keith Devlin in *The Guardian* (8/11/84) broadened the problem, base 10, by admitting 1 as a prime. He stated that there are 147 R_{10} the largest being 1979339339. (This reducing to 83 with largest 73939133 if 1 is excluded.)

Further Devlin counted 403 L_{10} less than 10^4 (this reducing to 308 with the exclusion of 1) together with a total of 24 shrinking-primes (reducing to 9 with the exclusion of 1).

The problems set are:

(i) Reproduce the above results.

(ii) Extend the range of a quoted by Angell & Godwin for L_a & R_a.

(iii) Consider shrinking-primes, S_a, in bases different from 10.

(iv) Investigate what happens if a given prime is to be successively truncated by the removal of primes from either or both ends.

Readers are invited to submit their program listings, together with hardware descriptions, run times, any comments and of course the output relating to some (or all) of the above problems. 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 June 1985.

Please address all correspondence to Mike Mudge, 'Square Acre', Stourbridge Road, Penn, Nr Wolverhampton, Staffordshire WV4 5NF. Tel 0902 892141.

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 programmes from the prize winning entry may also be requested.

Prize winner

(Factorial n) + 1 is prime for the following n less than 231: 1,2,3,11, 27,37,41,73,77,116, & 154.

(Primorial p) + 1 is prime for the following p less than 1031: 2,3,5,7,11, 31,379,1019, & 1021.

This month's prizewinner is Gareth Suggett, Chichester, Sussex. Readers should be encouraged by the incompleteness of the winning submission. Gareth has put all of the primes up to 65063 on a data file and implemented some generalised arithmetic routines in Basic on his BBC Micro, in spite of recurring hardware problems. Primorials up to 101 digits and factorials up to 72 digits have been listed. However, the tests for N.T.P. are incomplete being conditional on extending the data file and efficiently coupling it to the remaining programme in a factorisation routine.

Two related areas remaining for investigation are:

a) Define $A_n = n! - (n-1)! + (n-2)! \ldots -(-1)^n 1!$ A_n is prime for n = 3,4,5,6,7,8,10,15,19 at least; whilst n = 27 yields the first A_n with a square factor. When are the A_n N.T.P.?

b) The left factorial function is defined by: !n = 0! + 1! + 2! + 3! + . . . +(n−1)! When is !n prime or N.T.P.?

MICROCHESS

Kevin O'Connell bets on Chaos in the North American Computer chess championship.

The game which follows was played in the last round of the 15th North American Computer Championship, held in San Francisco last October.

The game is proof of grandmother's old saying that one should never bet on a proposition.

White: Chaos. Black: Phoenix. Benoni Defence

1	d2–d4	c7–c5
2	d4–d5	e7–e5
3	e2–e4	d7–d6
4	c2–c4	g7–g6
5	Nb1–c3	Bf8–g7
6	Bf1–d3	Ng8–e7
7	Ng1–e2	O–O
8	Bc1–d2	

(A typical position out of the Old Benoni Defence, which shows the great progress made by programs in the last few years. It is very important here to retain freedom of movement for the f-pawns and both programs seem to understand this.)

8	. . .	f7–f5
9	f2–f3	Nb8–a6
10	Bd2–g5	Na6–b4
11	Bd3–b1	h7–h6
12	Bg5–h4	g6–g5
13	Bh4–f2	f5xe4
14	Bblxe4	

(Having e4 for his pieces promises White some advantage.)

14	. . .	Bc8–f5
15	O–O	Qd8–d7
16	a2–a3	Nb4–a6
17	Qd1–b3	Na6–c7
18	Be4xf5	

(The start of an interesting but very risky plan. This makes the c6 square available to White's queen. However, the net result of the whole manoeuvre is merely a very weak white pawn on c6.)

18	. . .	Ne7xf5
19	Qb3xb7	Rf8–b8
20	Qb7–c6	Qd7xc6
21	d5xc6	Rb8xb2
22	Ra1–b1	Ra8–b8
23	Ne2–g3	Rb2xb1
24	Rf1xb1	Rb8xb1+
25	Nc3xb1	Nf5–e7
26	Ng3–e4	Nc7–e8
27	Ne4xd6	

(A horrible decision to have to make, but against anything else Black simply removes the pawn on c6 and then builds up his central power-house.)

27	. . .	Ne8xd6
28	Bf2xc5	Ne7–c8
29	Nb1–d2	Kg8–f7

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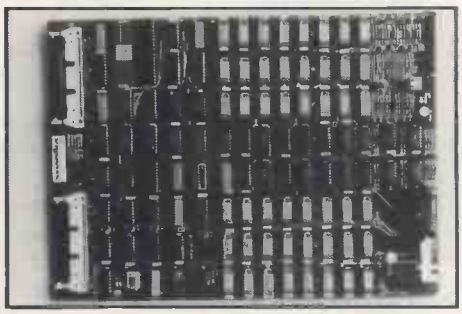

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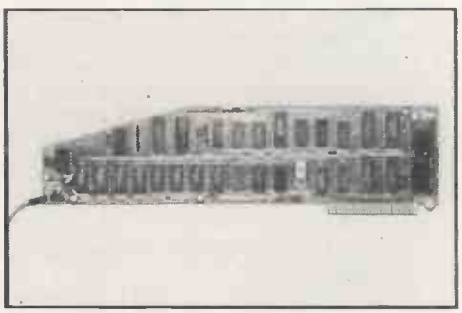

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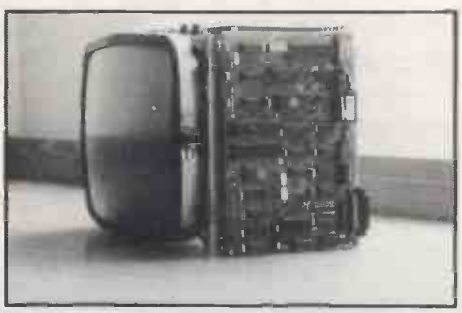

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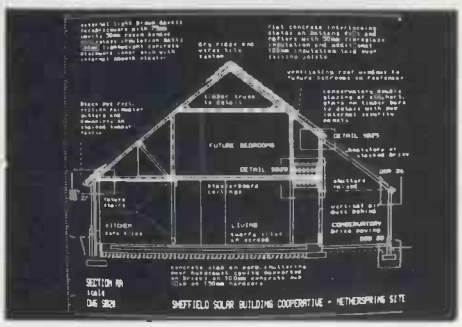

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MICROCHESS

30	Kg1–f2	Kf7–e6
31	Kf2–e3	Nd6xc4+

(Black is winning and this is one way to 'simplify' the position. However, although this increases Black's material advantage, it actually exacerbates the technical difficulties. I would have preferred 31 . . . Bg7–f8, preparing to release the pent-up bishop and ensuring that the white king has no way into the position.)

32	Nd2xc4	Ke6–d5
33	Bc5–b4	Kd5xc4
34	Ke3–e4	Kc4–b5
35	c6–c7	Kb5–b6
36	Ke4–f5	a7–a5
37	Bb4–c3	

(Tournament Director Mike Valvo had just announced to the crowd that it was only a matter of time and technique before Black would win. My colleague David Levy was present, operating the Intelligent Chess Software program. Since it had just won its game, and since David had nothing else to do, and since he has been known to make the occasional wager . . . he now bet one of White's programmers $5 (well, it is not always possible to play for high stakes) that Chaos would not lose. The bet was accepted.)

37	. . .	Kb6xc7
38	Kf5–g6	Bg7–f8
39	Bc3xa5+	Kc7–c6
40	Ba5–b4	Bf8xb4

(This is very dangerous indeed. Better 40. . .Nc8–d6.)

41	a3xb4	Nc8–e7+
42	Kg6xh6	

(Black is not losing yet, but the technical difficulties are now immense and David could not resist offering 'double or quits' that Chaos would now win. The further bet was taken up.)

42	. . .	g5–g4
43	Kh6-g5	g4xf3
44	g2xf3	Kc6–b5

(The start of a manoeuvre which puts both of Black's pieces way over on the queen-side, thus making it impossible for Phoenix to stop White's king-side pawns.)

45	Kg5–f6	Ne7–d5+
46	Kf6xe5	Nd5xb4
47	h2–h4	Nb4–d3+
48	Ke5–f5	Nd3–c5
49	f3–f4	Kb5–c6
50	h4–h5	Nc5–d7
51	h5–h6	Nd7–f8
52	Kf5–f6	Kc6–d7
53	Kf6–f7	Nf8–h7
54	Kf7–g7	Kd7–e7
55	Kg7xh7	Ke7–f7

(It is almost possible to keep White's king trapped, but not quite, so . . .)

56	f4–f5	Kf7–f6
57	Kh7–g8	1–0

(and one of Intelligent Software's partners was $10 richer.)

ACC NEWS

Rupert Steele keeps you up-to-date on computer clubs.

The Association of Computer Clubs (ACC), is the national representative and liaison body for computer clubs around the UK. It is a democratic, non-profit making association run by and for its members through a council consisting of representatives of the computer clubs that are paid up affiliates of the ACC.

The ACC runs a number of services for clubs and for computer enthusiasts interested in the computer club movement.

We offer a free, public liability, insurance scheme and a low cost, equipment insurance scheme for affiliated club meetings. A network of regional contact points is being set up (anybody interested in being a regional contact, please contact me), and we are active on the Prestel database with ClubSpot 810.

ClubSpot is made available by Prestel, for the Hobby Computer Movement. Once accepted as an editor, and trained at one of our regular conferences, you would be able to edit material on behalf of your club, on the national Prestel system. If you are interested in being a ClubSpot editor, please contact Andy Leeder, Church Farm, Stratton St Michael, Norwich, NR15 2QB or call 0508 30355.

This month, I shall look at some of the various National User Groups that support different micro systems.

Attention NewBrain users! There is an internationally recognised user group for you. It is called Open #Stream and the chairman and contact is Philip Crookes, 26 College Road, Bromley, Kent, BR1 3PE, or call 01-290 5262. The annual subscription is £10, from June to June (free if you're disabled), for which you get all the group's publications, including four copies of the 16 page newsletter. Also available are ROM listings, fully commented, showing the paged operating system, disk controller module, the paged Basic and the CP/M BIOS. Not to mention a variety of public domain programs for the expanded and unexpanded NewBrains, a version of Basicode and a number of languages. The club is affiliated to NewBrain user groups in Holland, Denmark and Italy; and is planning to hold meetings in Central London (possibly also Manchester and Scotland).

There has been a change of secretary at the Forth Interest Group (UK). The new man is Douglas Neale, 58 Woodland Way, Morden, Surrey. The group continues to meet on the first Thursday of the month in room 307 of the Polytechnic of the South Bank, London, at 7pm. The membership is now around 700 in total and it is proposed to organise local chapters of FIG outside London.

Serious business users might take note of the Sirius and Apricot User Club, Electron House, 27 Cardiff Road, Luton LU1 1PP, or on 0582 412214. Not exactly an amateur club, this outfit is run as a business — but if you are using Apricot or Sirius professionally you would do well to take a look. They run a telephone hotline, seminars, newsletters, discount schemes, hardware and software exchange schemes, training schemes and much more.

BBC disk system users — have you joined the Format 4080 Club? It is run by Peter Hughes of 5 Marsh Street, Bristol BS1 4AA. The club operates by distributing a disk six times a year, containing both a newsletter and software for members to run. Both 5.5 and 3 inch disks are available. Other products are offered on special offers with each issue of the 'ClubDisk'.

Memotech users may be interested in GENPAT, said to be the official user club for Memotech MTX and FDX systems. I understand that this club is recognised by the manufacturer. The annual subscription is £16, which covers 12 editions of the club magazine, 'Memopad', and 'all the usual benefits of membership of a user group'. Write to Mr K Hook, 3 Bulcock Street, Burnley, BB10 1UH, for details.

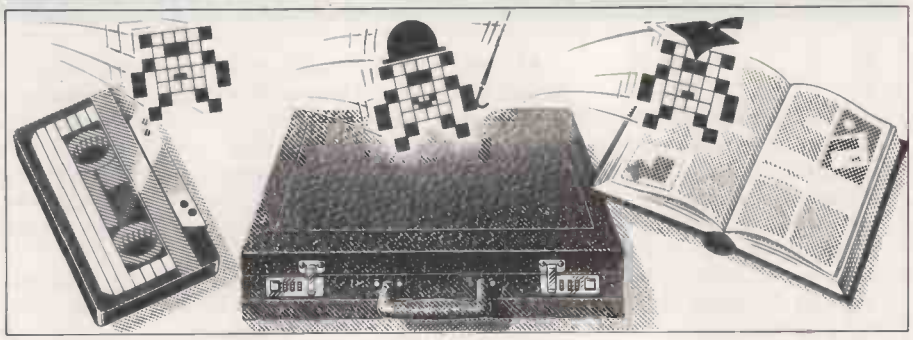
Orientally speaking, are you interested in the Sord-Pips Users Club? If so, contact Peter Kuhn, 134 Marlow Drive, North Cheam, Surrey SM3 9AS.

Texas Instrument TI 99/4A users may be interested in the TI 99/4A Exchange, which is the UK user group for this, now discontinued, machine. There is a quarterly newsletter called TI*MES with a wide variety of material included. The annual subscription is £6, and the group (which is a non-profit organisation), is supported only by its members. For full details, contact TI99/4 Exchange, 40 Barrhill, Patcham, Brighton BN1 8UF.

REMEMBER: If you are interested in the ACC's services, or would like to find out about a computer club near you (or for your machine), or would like a mention for your club in this column, please write to me: Rupert Steele, 17 Lawrie Park Crescent, London, SE26 6HH, or call 01-370 0601.

END

PROGRAM FILE



Nick Walker selects the best of readers' programs — for details on submitting your own, see the end of this section.

The most common objection to the Commodore 64 is its abysmal Basic — anything remotely clever ends up as an encrypted tangle of POKEs. The program of the month turns the 64 into something usable, and gives a Basic programmer simple access to the sprites and music capabilities. In total 29 new commands are added to the Basic, all of which can be used in the normal way. As the program is in machine code, it can be POKEd in with the top of memory lower and the original Basic deleted. This way it occupies only a few hundred bytes, leaving plenty of room for a Basic program, and the commands operate faster than their equivalent POKEs.

Following the NewBrain assembler published last month, there's a machine code monitor of truly exceptional quality. Some of its more outstanding features that place it on a par with commercial products are: a program relocater that updates all the addresses so that the program still runs in its new location; a block move; intelligent search and replace; and a disassembler.

BBC owners can produce professional smooth scrolling of text and graphics with the smooth scroll routine published this month. Text on a graphics screen has always been a problem for Atari owners, but is elegantly solved with the Multi-Mode Text program. Although short it's very powerful when offering text in any graphics screen, and features numerous other niceties.

On the games side there's a Pengo-like arcade game for the Research Machines 380Z and 480Z, and multi-player puzzle game for the Beeb with a clever computer opponent.

Finally, a few loose ends to tidy up. My apologies go to Jeff Aughton who wasn't credited in the intro to Simon Biggs' Golf program (November 1984). This was in fact a conversion of the original Pet Golf program written by Jeff and published over two years ago.

If N Thomas, author of the Commodore assembler program which was printed in the September 1984 issue would contact me, he may discover something to his advantage.

Although the first programs for the Amstrad, QL and MSX are drifting in, they are nothing compared with the demand for quality programs to be published. So, if you have written anything substantial or clever, then do send it to me.

Games
Scientific/mathematic
Business
Toolkit/utilities
Educational/Computer Aided Learning

Program of the Month
Commodore 64 Scroffs Basic
by David Gristwood

I like this program — not just because it's an excellent program that adds 29 new commands to Commodore Basic, but also because all the commands are fully described within the REM statements of the listing. Here's a brief description of the commands:

CLS — clears the screen.
PAPER X — changes the colour of the main screen(paper), X between 0 and 15.
EDGE X — changes the colour of the border, X between 0 and 15.
AT X,Y — is used in conjunction with PRINT to position text anywhere on the text screen.
JUMP X — calculated GOTO, jumps to the line number in X.
KEY — waits for any key to be pressed.
YNKEY — waits for either the Y or N keys to be pressed.
PAUSE X — pauses X seconds.

PROGRAM FILE

EXIT — switches off Scroffs Basic.
CFILL X — fills colour matrix and hence printed colour.
SFILL X — fills the screen with the ASCII character corresponding to X.
REPEAT . . . UNTIL (cond) — normal REPEAT UNTIL loop.
FPOP — allows GOTO exit from a FOR loop without confusing the next FOR loop.
GPOP — allows GOTO exit from a GOSUB without confusing the next GOSUB.
RVS — reverses everything on the screen.
VOL X — sets the volume and selects the type of filter for subsequent sound commands.
VX X — selects the voice (0 to 3) for subsequent sound commands.
ENVEL Attack, Decay, Sustain, Release — defines the envelope to apply to a voice.
MUSIC X — sounds the selected voice at frequency X, plays the note.
PULSE X — applies a pulse to the voice, X defines width of pulse.
PLAY X — POKEs the control register for current voice.
FILTFQ X — defines the cut-off frequency for a filter.
FILTER X — switches on any combinations of the three filters.
SPRITE X — selects the sprite for further sprite commands to act on, X between 0 and 7.
MOBCTRL X — turns on or off any combination of sprites.
COLSP X — changes the colour of the selected sprite.
XSP X — is the x coordinate of the selected sprite.
YSP X — is the y coordinate of the selected sprite.

After typing in and running the program, typing SYS 36864 will enable the extra to be used. After that it is possible to get rid of the program and use the commands for your own programs. LOADing and SAVEing programs will not effect Scroffs Basic — the only way to disable the commands is to either switch off the machine or use the EXIT command.

```
100 REM  ****************************
150 REM  *    SCROFF'S BASIC 1.0    *
200 REM  *   FOR THE COMMODORE 64   *
250 REM  *    BY DAVID GRISTWOOD    *
300 REM  ****************************
350 REM
400 POKE 55,0:POKE 56,144:CLR:REM RESERVE 4K OF MEMORY
450 CLST=9*4096+12*256:CZ=0
500 PLLST=9*4096+15*256:PHLST=PLLST+8*16:PZ=0
550 BL$="                                        "
1000 REM
1005 REM * INTRODUCTION *
1010 REM
1050 PRINT CHR$(8):PRINT CHR$(142):PRINT CHR$(147)
1100 PRINT TAB(8)"WELCOME TO SCROFF'S BASIC":PRINT
1150 PRINT"  WHEN RUN, THIS  PROGRAM ADDS 29 EXTRA"
1180 PRINT" COMMANDS  TO BASIC. THE 'REM'S IN THIS"
1200 PRINT" PROGRAM GIVE FULL DETAILS OF THESE NEW"
1240 PRINT" COMMANDS AND HOW TO USE THEM."
1260 PRINT:PRINT"      LOADING DATA NOW. PLEASE WAIT."
1280 GOTO 2000
1300 REM
1305 REM * DATA ERROR ROUTINE *
1310 REM
1315 REM PRINT ERROR MESSAGE THEN STOP
1320 PRINT:PRINT"?BAD DATA ERROR IN LINE";
1340 PRINT PEEK(63)+256*PEEK(64)
1360 END:GOTO 1360
1400 REM
1405 REM * LOADING SUBROUTINE *
1410 REM
1420 REM READS IN A HEX NUMBER OF LENGTH DG
1450 AZ=0:READ AZ$
1460 IF LEN(AZ$)<>DG THEN 1300
1470 IF AZ$="ZZ" OR AZ$="ZZZZ" THEN RETURN
1480 FOR T1=1 TO DG
1500 :TV$=MID$(AZ$,T1,1):TV=ASC(TV$)
1520 :IF (TV>47ANDTV<58) OR (TV>64ANDTV<71) THEN 1560
1540 :GOTO 1300
1560 :V=VAL(TV$):IF V<>0 OR TV$="0" THEN 1600
1580 :V=TV-55
1600 :AZ=AZ+(V*16^(DG-T1))
1640 NEXT T1
1680 RETURN
2000 REM
2005 REM * MAIN LOADING ROUTINE *
2010 REM
2040 REM READ STARTING ADDR OF ROUTINE
2050 DG=4:GOSUB 1400:IF AZ$="ZZZZ" THEN POKE CLST+CZ,0:END
2080 AZ=INT(AZ)-1:AH=INT(AZ/256):AL=AZ-(256*AH):ADDR=AZ+1
2100 POKE PLLST+PZ,AL:POKE PHLST+PZ,AH:PZ=PZ+1
2140 REM READ NAME OF ROUTINE
2160 READ NAME$:IF LEN(NAME$)<2 THEN 1300
2200 FOR T=1 TO LEN(NAME$)
2220 :NAME=ASC(MID$(NAME$,T,1)):IF NAME>64 AND NAME<91 THEN 2250
2240 :GOTO 1300
2250 :IF T=LEN(NAME$) THEN NAME=NAME+128
2260 :POKE CLST+CZ,NAME:CZ=CZ+1
2280 NEXT T
2400 PRINT CHR$(19):FOR T=1 TO 9:PRINT:NEXT T
2440 PRINT BL$:PRINT CHR$(145);"    ROUTINE: ";NAME$
2500 REM READ IN DATA FOR ROUTINE
```

PROGRAM FILE

```
2520 DG=2:GOSUB 1400
2540 IF AZ$="ZZ" THEN 2000:REM END OF ONE ROUTINE
2580 POKE ADDR,AZ:ADDR=ADDR+1
2600 GOTO 2500
2980 REM
2990 REM
3000 DATA 9000, WEDGE
3020 REM ******************************
3040 REM *            WEDGE             *
3060 REM ******************************
3080 REM THIS IS NOT A  NEW COMMAND FOR
3100 REM BASIC.THIS IS THE MACHINE CODE
3110 REM ROUTINE  THAT LINKS  THE EXTRA
3120 REM COMMANDS TO BASIC.IT IS CALLED
3140 REM BY A 'SYS' CALL:
3150 REM          SYS 9*4096
3160 REM  OR
3165 REM          SYS 36864
3180 REM THIS  MUST BE USED  BEFORE ANY
3200 REM OF THE NEW COMMANDS WILL WORK.
3240 REM
3260 DATA A9,50,8D,08,03,A9,90,8D
3280 DATA 09,03,A9,30,A0,90,20,1E
3300 DATA AB,60,A9,E4,8D,08,03,A9
3320 DATA A7,8D,09,03,60,3E,FC,FF
3340 DATA 00,50,8D,08,06,C5,AE,00
3360 DATA 00,03,A9,36,A0,9F,CE,00
3380 DATA 28,43,29,20,44,41,56,49
3400 DATA 44,20,47,52,49,53,54,57
3420 DATA 4F,4F,44,20,31,39,38,34
3440 DATA 00,58,ED,8C,72,D4,28,FF
3460 DATA 20,73,00,20,59,90,4C,AE
3480 DATA A7,D0,03,4C,2B,A8,E9,80
3500 DATA 90,03,4C,F3,A7,A5,7A,48
3520 DATA A5,7B,48,A2,00,A0,00,B1
3540 DATA 7A,C9,41,B0,03,4C,89,90
3560 DATA C9,5B,B0,F9,9D,ED,90,E8
3580 DATA E6,7A,D0,02,E6,7B,4C,6F
3600 DATA 90,A9,00,9D,ED,90,AA,A8
3620 DATA 8D,B1,02,B9,ED,90,DD,00
3640 DATA 9C,D0,04,C8,4C,C3,90,BD
3660 DATA 00,9C,C9,B0,90,10,BD,00
3680 DATA 9C,38,E9,B0,D9,ED,90,F0
3700 DATA 26,A0,00,4C,C3,90,A0,00
3720 DATA E8,BD,00,9C,C9,B0,90,F8
3740 DATA EE,B1,02,E8,BD,00,9C,C9
3760 DATA 00,F0,03,4C,93,90,68,85
3780 DATA 7B,68,85,7A,4C,A5,A9,C8
3800 DATA B9,ED,90,C9,00,D0,EF,68
3820 DATA 68,AC,B1,02,B9,B0,9F,48
3840 DATA B9,00,9F,48,60,43,46,49
3860 DATA 4C,4C,00,20,13,10,01,03
3880 DATA ZZ
3890 REM
4000 REM  THE FOLLOWING DATA IS FOR THE
4020 REM EXTRA BASIC COMMANDS.WITH EACH
4040 REM IS A  COMPLETE  DESCRIPTION OF
4060 REM WHAT EACH COMMAND DOES, HOW TO
4080 REM USE  IT, WHICH PARAMETERS  ARE
4100 REM REQUIRED  AND EXAMPLES  OF HOW
4120 REM THEY  MIGHT  BE  USED  IN  A
4140 REM PROGRAM.
4160 REM  THE DATA  STATEMENTS  CONTAIN
4180 REM THE MACHINE  CODE INSTRUCTIONS
4200 REM IN  HEX (BASE 16).
4260 REM THE FORMAT OF THIS PROGRAM HAS
4280 REM BEEN  DESIGNED  SO  THAT  NEW
4300 REM COMMANDS CAN  EASILY BE ADDED.
4350 REM WARNING - DO NOT USE LOCATIONS
4360 REM $02A0-$02B5 (TEMP. WORK SPACE)
4390 REM
4400 DATA 9100, CLS
4420 REM ******************************
4440 REM *            CLS               *
4460 REM ******************************
4480 REM CLEAR SCREEN.IT IS THE SAME AS
4510 REM        PRINT CHR$(147)
4520 REM BUT IS  EASIER TO READ  AND TO
4540 REM REMEMBER.THIS COMMAND COMBINED
4560 REM WITH THE  'AT'  FUNCTION, WILL
4580 REM SAVE MEMORY & MAKE HARD COPIES
4600 REM OF PROGRAMS EASIER TO READ.
4620 REM IT REQUIRES NO PARAMETERS.E.G.
4640 REM        10 CLS:PRINT A$
4650 REM
4680 DATA A9,93,20,47,AB,60
4730 DATA ZZ
4740 REM
4800 DATA 9110, PAPER
4820 REM ******************************
4840 REM *            PAPER             *
4860 REM ******************************
4880 REM  CHANGES THE BACKGROUND COLOUR
4900 REM OF THE  SCREEN  (THE 'PAPER').
4920 REM IT REQUIRES ONE PARAMETER, AND
4940 REM THE COMMAND TAKES THE FORM:
4960 REM             PAPER X
4980 REM WHERE X IS ANY  INTEGER IN THE
5000 REM RANGE 0 TO 15. THE NUMBERS ARE
```

PROGRAM FILE

```
5020 REM THE  STANDARD  ONES  FOR  EACH
5040 REM COLOUR  I.E,
5060 REM        0=BLACK    1=WHITE
5080 REM        2=RED         ETC
5100 REM IF A NUMBER  HIGHER THAN 15 IS
5120 REM IS USED, ONLY THE LOWER NIBBLE
5140 REM WILL  COUNT . THIS  COMMAND IS
5160 REM THE EQUIVALENT OF
5180 REM          POKE 53281,X
5200 REM EG      10PAPER 0:CLS
5220 REM
5240 DATA 20,8A,AD,20,F7,B7,A5,14
5260 DATA 8D,21,D0,60
5340 DATA ZZ
5350 REM
5400 DATA 9120, EDGE
5420 REM ******************************
5440 REM *            EDGE              *
5460 REM ******************************
5480 REM  CHANGES  THE  COLOUR  OF  THE
5500 REM BORDER OF THE SCREEN ('EDGE').
5520 REM IT REQUIRES ONE PARAMETER, AND
5540 REM THE COMMAND TAKES THE FORM:
5560 REM              EDGE X
5580 REM WHERE X IS ANY  INTEGER IN THE
5600 REM RANGE 0 TO 15.  THE NUMBERS ARE
5620 REM THE  STANDARD  ONES  FOR  EACH
5640 REM COLOUR  I.E.
5660 REM        0=BLACK    1=WHITE
5680 REM        2=RED         ETC
5700 REM IF A NUMBER  HIGHER THAN 15 IS
5720 REM IS USED, ONLY THE LOWER NIBBLE
5740 REM WILL  COUNT . THIS  COMMAND IS
5760 REM THE EQUIVALENT OF
5780 REM          POKE 53280,X
5790 REM 'EDGE' IS OFTEN USED  WITH THE
5795 REM 'PAPER' COMMAND  E.G.
5800 REM      10 PAPER 0:EDGE 0:CLS
5820 REM
5840 DATA 20,8A,AD,20,F7,B7,A5,14
5860 DATA 8D,20,D0,60
5940 DATA ZZ
5980 REM
6000 DATA 9130, AT
6020 REM ******************************
6040 REM *             AT               *
6060 REM ******************************
6080 REM  USED WITH  THE PRINT OR INPUT
6100 REM STATEMENT TO FORMAT THE SCREEN
6120 REM IT REQUIRES TWO PARAMETERS AND
6140 REM THE COMMAND TAKES THE FORM:
6160 REM              AT X,Y
6180 REM WHERE X IS THE X COORDINATE OF
6200 REM THE SCREEN (0 TO 39) ,AND Y IS
6220 REM THE Y COORDINATE (0 TO 24).THE
6240 REM POINT  0,0  IS IN THE TOP LEFT
6260 REM HAND CORNER.NOTE : NO CHECK IS
6280 REM THAT X  AND  Y ARE  IN  RANGE.
6300 REM WITH 'AT' ,FEW CURSOR CONTROLS
6320 REM WITHIN  PRINT STATEMENTS  NEED
6340 REM BE USED.  E.G.
6360 REM     10 CLS
6380 REM     20 AT 15,2:PRINT'DEMO'
6390 REM     30 AT 10,5:INPUT A$
6395 REM
6400 DATA 20,8A,AD,20,F7,B7,98,48
6420 DATA 20,FD,AE,20,8A,AD,20,F7
6440 DATA B7,A6,14,68,A8,18,20,F0
6460 DATA FF,60
6660 DATA ZZ
6670 REM
6700 DATA 9150, JUMP
6720 REM ******************************
6740 REM *            JUMP              *
6760 REM ******************************
6780 REM  A CALCULATED 'GOTO'.   I.E. A
6800 REM VARIABLE OR  EXPRESSION CAN BE
6820 REM USED FOR THE LINE TO BE JUMPED
6840 REM TO.    IN NORMAL CBM BASIC
6860 REM            10 GOTO X
6880 REM WILL GIVE AN ERROR. BUT 'JUMP'
6900 REM ACCEPTS  ANY  EXPRESSION  AS A
6920 REM PARAMETER.  E.G
6940 REM            10 X=25
6960 REM            20 JUMP X*2
6980 REM WILL  GOTO  ('JUMP')  LINE 50.
6990 REM
7000 DATA 20,8A,AD,20,F7,B7,4C,A3
7020 DATA A8
7060 DATA ZZ
7090 REM
7100 DATA 9160, KEY
7120 REM ******************************
7140 REM *             KEY              *
7160 REM ******************************
7180 REM WAITS FOR A KEY TO BE PRESSED.
7200 REM IT DISABLES THE 'RUN STOP' KEY
7220 REM & EMPTIES THE KEYBOARD BUFFER.
7240 REM IT WILL NOT ACCEPT 'SHIFT' AND
```

PROGRAM FILE

```
7260 REM 'CBM' ETC KEYS AS VALID.  E.G.
7280 REM 10PRINT'HIT A KEY TO CONTINUE'
7300 REM 20KEY
7320 REM TO FIND WHICH KEY WAS PRESSED,
7340 REM FOLLOW 'KEY' WITH A 'GET' E.G.
7360 REM       10 KEY:GET A$
7390 REM
7400 DATA A9,00,8D,C6,00,A5,C5,C9
7420 DATA 40,F0,FA,60
7480 DATA ZZ
7490 REM
7500 DATA 9170, YNKEY
7520 REM ******************************
7540 REM *           YNKEY              *
7560 REM ******************************
7580 REM SIMILAR TO 'KEY' BUT WILL WAIT
7600 REM UNTIL THE 'Y'  OR THE  'N' KEY
7620 REM IS PRESSED. IDEAL FOR A PROMPT
7640 REM WHICH REQUIRES ONLY A  YES  OR
7660 REM NO  ANSWER. USE THE  'GET'  TO
7680 REM FIND WHICH KEY IT WAS.  E.G.
7700 REM  10 PRINT'PLAY AGAIN (Y/N)?'
7720 REM  20 YNKEY: GET A$
7740 REM  30 IF A$='N' THEN END
7760 REM  40 REM PLAY GAME AGAIN
7790 REM
7800 DATA A9,00,85,C6,A5,C5,C9,40
7820 DATA F0,FA,C9,27,F0,07,C9,19
7840 DATA F0,03,4C,74,91,60
7970 DATA ZZ
7980 REM
8000 DATA 9190, PAUSE
8020 REM ******************************
8040 REM *           PAUSE              *
8060 REM ******************************
8080 REM WAITS  ('PAUSES')  FOR  A  SET
8100 REM TIME.  THIS  DELAY  IS  THE VALUE
8120 REM OF THE EXPRESSION  IN SECONDS.
8140 REM THUS  IT  REQUIRES  ONLY  ONE
8160 REM PARAMETER.     E.G.
8180 REM         10 PAUSE 5
8200 REM WAITS FOR FIVE SECONDS  BEFORE
8220 REM THE  PROGRAM  CONTINUES.  THE
8240 REM EXPRESSION IS  EVALUATED AS AN
8260 REM INTEGER. NOTE : THE 'RUN STOP'
8280 REM KEY IS DISABLED  AND THE VALUE
8300 REM OF TI AND TI$ WILL BE ALTERED.
8320 REM
8340 DATA 20,8A,AD,20,F7,B7,A5,14
8360 DATA F0,0E,A9,00,85,A2,A5,A2
8380 DATA C9,3C,D0,FA,C6,14,D0,F2
8400 DATA 60
8550 DATA ZZ
8560 REM
8600 DATA 91B0, EXIT
8620 REM ******************************
8640 REM *           EXIT               *
8660 REM ******************************
8680 REM SWITCHES OFF SCROFF'S BASIC.IT
8700 REM REQUIRES NO PARAMETERS, AND IS
8720 REM NORMALLY USED IN DIRECT MODE :
8740 REM E.G.         EXIT
8760 REM IF ALTERING  SCROFF'S BASIC AT
8780 REM ALL, USE THE  'EXIT' COMMMAND.
8800 REM            SYS 36882
8820 REM CAN BE USED INSTEAD OF 'EXIT'.
8840 REM
8860 DATA 4C,12,90
8870 DATA ZZ
8880 REM
8900 DATA 91C0, CFILL
8920 REM ******************************
8940 REM *           CFILL              *
8960 REM ******************************
8980 REM COLOUR FILL - FILLS THE COLOUR
9000 REM MATRIX,  WHERE THE COLOURS  OF
9020 REM EACH SQUARE  ARE STORED,  WITH
9040 REM THE  VALUE  OF  'CFILL'S  ONLY
9060 REM PARAMETER.  THE  NORMAL COLOUR
9080 REM CODE APPLIES.      E.G
9100 REM        10 CFILL 0
9120 REM WILL CHANGE EVERYTHING PRINTED
9140 REM ON   THE   SCREEN   TO  BLACK.
9150 REM
9160 DATA 20,8A,AD,20,F7,B7,A9,00
9170 DATA 85,FB,A9,D8,85,FC,A0,00
9180 DATA A5,14,91,FB,C8,D0,FB,E6
9200 DATA FC,A5,FC,C9,DC,D0,EF,60
9460 DATA ZZ
9480 REM
9500 DATA 91F0, SFILL
9520 REM ******************************
9540 REM *           SFILL              *
9560 REM ******************************
9580 REM SCREEN FILL - FILLS THE SCREEN
9600 REM WITH  A  PARTICULAR  GRAPHIC
9620 REM SYMBOL ,  DETERMINED  BY  IT'S
9640 REM PARAMETER, WHICH  SHOULD BE IN
9660 REM THE RANGE 0 TO 255.THE CODE IS
```

PROGRAM FILE

```
9680 REM THE 'POKE' CODE  I.E.
9700 REM       0=@    1=A    33=!
9720 REM      49=1    58=:    ETC.
9740 REM THE SCREEN *MUST* BE AT 1024!!
9750 REM
9760 DATA 20,8A,AD,20,F7,B7,A9,00
9770 DATA 85,FB,A9,04,85,FC,A0,00
9780 DATA A5,14,91,FB,C8,D0,FB,E6
9800 DATA FC,A5,FC,C9,08,D0,EF,60
9860 DATA ZZ
9880 REM
10000 DATA 9220, REPEAT
10020 REM ****************************
10040 REM *          REPEAT          *
10060 REM ****************************
10080 REM  PART OF A 'REPEAT'...'UNTIL'
10100 REM LOOP. IT IS AN ALTERNATIVE TO
10120 REM THE 'FOR'....'NEXT' LOOP WHEN
10140 REM THE NUMBER OF  TIMES THE LOOP
10160 REM MUST  BE REPEATED IS UNKNOWN.
10180 REM IT REQUIRES NO PARAMETERS BUT
10200 REM *MUST*  BE THE FIRST  COMMAND
10220 REM ON THE LINE.
10240 REM
10260 DATA 68,68,A9,03,20,FB,A3,38
10280 DATA A5,7A,E9,0B,48,A5,7B,E9
10300 DATA 00,48,A5,3A,48,A5,39,48
10320 DATA A9,CC,48,4C,56,90
10340 DATA ZZ
10360 REM
10400 DATA 9250, UNTIL
10420 REM ****************************
10440 REM *          UNTIL           *
10460 REM ****************************
10480 REM  PART OF A 'REPEAT'...'UNTIL'
10500 REM LOOP. THE FOLLOWING PARAMETER
10520 REM IS  EVALUATED. IF  FALSE  THE
10540 REM PROGRAM FLOW  RETURNS TO  THE
10560 REM LAST 'REPEAT' COMMAND.IF TRUE
10580 REM THE   PROGRAM  FLOW  IS   NOT
10600 REM AFFECTED  AND  THE  PROGRAM
10620 REM CONTINUES AS NORMAL. 'REPEAT'
10640 REM .'UNTIL' LOOPS MAY BE NESTED.
10660 REM AN E.G.
10680 REM        10 A=1
10700 REM        20 REPEAT
10720 REM        30 ::PRINT A:A=A+1
10740 REM        40 UNTIL A=11
10760 REM
10780 DATA 68,68,68,C9,CC,D0,FB,20
10800 DATA 9E,AD,A5,61,F0,07,68,68
10820 DATA 68,68,4C,56,90,68,85,39
10840 DATA 68,85,3A,68,85,7B,68,85
10860 DATA 7A,4C,56,90
10880 DATA ZZ
10890 REM
11000 DATA 9290, FPOP
11020 REM ****************************
11040 REM *          FPOP            *
11060 REM ****************************
11080 REM  POPS THE LAST 'FOR' LOOP OFF
11100 REM THE STACK. NORMALLY  IF THERE
11120 REM IS A JUMP OUT OF A 'FOR'.....
11140 REM ..'NEXT' LOOP, INFORMATION IS
11180 REM LEFT ON THE STACK,AND IF THIS
11200 REM HAPPENS OFTEN,NO ROOM IS LEFT
11220 REM ON  THE STACK,  SO  AN 'OUT OF
11240 REM MEMORY ERROR' OCCURS. CALLING
11260 REM 'FPOP'   *IMMEDIATELY*  AFTER
11280 REM LEAVING THE LOOP, SOLVES THIS
11300 REM PROBLEM.   E.G.
11320 REM    100 FOR T=1 TO 50
11340 REM    110 ::IF X(T)=NM THEN 130
11350 REM    120 NEXT T
11360 REM    130 FPOP
11380 REM    140 REST OF PROGRAM
11400 REM
11420 DATA 68,68,68,C9,81,D0,FB,A2
11440 DATA 11,68,CA,D0,FC,4C,56,90
11460 DATA ZZ
11480 REM
11500 DATA 92B0, GPOP
11520 REM ****************************
11540 REM *          GPOP            *
11560 REM ****************************
11580 REM POPS THE LAST 'GOSUB' OFF THE
11600 REM STACK. SEE "FPOP' FOR SIMILAR
11620 REM PROBLEMS WITH STACK. USED  IF
11640 REM YOU DON'T WISH TO RETURN FROM
11660 REM A  GOSUB. DO NOT  USE  IN THE
11680 REM MIDDLE OF A 'FOR'.'NEXT' LOOP
11700 REM OR A 'REPEAT'...'UNTIL' LOOP.
11720 REM
11740 DATA 68,68,68,C9,8D,D0,FB,A2
11760 DATA 06,68,CA,D0,FC,4C,56,90
11780 DATA ZZ
11790 REM
11800 DATA 92D0, RVS
11820 REM ****************************
11840 REM *          RVS             *
```

PROGRAM FILE

```
11860 REM ****************************
11880 REM  REVERSES THE FIELD OF  EVERY
11900 REM CHARACTER ON THE SCREEN. I.E.
11920 REM NORMAL GOES TO REVERSE FIELD,
11940 REM AND REVERSE GOES TO NORMAL.It
11960 REM REQUIRES NO PARAMETERS.  E.G.
11980 REM              10 RVS
12000 REM SCREEN  *MUST*  BE  AT 1024!!
12020 REM
12040 DATA A9,00,85,FB,A9,04,85,FC
12060 DATA A0,00,B1,FB,49,80,91,FB
12080 DATA C8,D0,F7,E6,FC,A5,FC,C9
12100 DATA 08,D0,ED,60
12120 DATA ZZ
12140 REM
12200 DATA 9300, VOL
12220 REM ****************************
12240 REM *           VOL            *
12260 REM ****************************
12280 REM  REQUIRES ONE PARAMETER - THE
12300 REM VOLUME  FOR ALL THREE  VOICES
12320 REM OF THE SID CHIP. IF NOT USING
12340 REM FILTERS, PARAMETER  SHOULD BE
12360 REM IN RANGE 0(OFF) TO 15(MAX).EG
12380 REM          10 VOL 15
12400 REM IF USING FILTERS  SEE SECTION
12420 REM ON FILTERS, AND ADD FOLLOWING
12440 REM VALUES TO VOL:
12460 REM     +16  LOW-PASS FILTER ON
12480 REM     +32  BANDPASS FILTER ON
12500 REM     +64  HIGH-PASS FILTER ON
12520 REM     +128 VOICE 3 DISCONNECTED
12540 REM     +80  NOTCH FILTER ON
12560 REM E.G.     10 VOL 15+16
12580 REM IS VOL 15 AND LOW-PASS FILTER
12600 REM
12620 DATA 20,8A,AD,20,F7,B7,A5,14
12640 DATA 8D,18,D4,60
12660 DATA ZZ
12680 REM
12700 DATA 9320, VX
12720 REM ****************************
12740 REM *            VX            *
12760 REM ****************************
12780 REM  REQUIRES ONE PARAMETER - THE
12800 REM VOICE  FOR  THE  OTHER  MUSIC
12820 REM COMMANDS.I.E. 'ENVEL','MUSIC'
12840 REM 'PULSE' & 'PLAY'.THESE ACT ON
12860 REM THE MOST RECENT VOICE DEFINED
12880 REM WITH THE 'VX'  COMMAND. USE A
12900 REM LOOP FOR DEFINING ETC ALL THE
12920 REM VOICES. E.G.
12940 REM  10 FOR I=1 TO 3: VX I
12960 REM  20 REM OTHER MUSIC COMMANDS
12980 REM  30 NEXT I
12990 REM THE MOST RECENT  'VX'  IS THE
12995 REM CURRENT VOICE DEFINED.
13000 REM
13020 DATA 20,8A,AD,20,F7,B7,A9,00
13040 DATA 8D,B0,02,A5,14,C9,02,D0
13060 DATA 06,A9,07,8D,B0,02,60,C9
13080 DATA 03,D0,05,A9,0E,8D,B0,02
13090 DATA 60
13100 DATA ZZ
13120 REM
13200 DATA 9350, ENVEL
13220 REM ****************************
13240 REM *          ENVEL           *
13260 REM ****************************
13280 REM  REQUIRES FOUR PARAMETERS-THE
13300 REM ATTACK,DECAY,SUSTAIN, RELEASE
13320 REM IN THE RANGE 0  TO  15 (MAX),
13340 REM FOR THE LAST DEFINED 'VX'. EG
13360 REM        10 VX 1
13380 REM        20 ENVEL 0,7,4,2
13400 REM DEFINES THE WAVEFORM OF VOICE
13420 REM ONE (A=0, D=7, S=4, R=2).
13430 REM
13440 DATA 20,8A,AD,20,F7,B7,A5,14
13460 DATA 0A,0A,0A,0A,8D,A7,02,20
13480 DATA FD,AE,20,8A,AD,20,F7::
13500 DATA B7,A5,14,29,0F,0D,A7,02
13520 DATA AC,B0,02,C8,C8,C8,C8,C8
13540 DATA 99,00,D4,C8,8C,A8,02,20
13560 DATA FD,AE,20,8A,AD,20,F7,B7
13580 DATA A5,14,0A,0A,0A,0A,8D,A7
13600 DATA 02,20,FD,AE,20,8A,AD,20
13620 DATA F7,B7,A5,14,29,0F,0D,A7
13640 DATA 02,AC,A8,02,99,00,D4,60
13660 DATA ZZ
13680 REM
13700 DATA 93B0, MUSIC
13720 REM ****************************
13740 REM *          MUSIC           *
13760 REM ****************************
13780 REM  REQUIRES ONE PARAMETER - THE
13800 REM FREQUENCY ( OR NOTE ) FOR THE
13820 REM LAST 'VX' TO BE PLAYED.  MUST
13840 REM BE IN RANGE 0 TO 65535.  E.G.
```

PROGRAM FILE

```
13860 REM        10 MUSIC 4000
13880 REM
13900 DATA 20,8A,AD,20,F7,B7,AC,B0
13920 DATA 02,A5,14,99,00,D4,C8,A5
13940 DATA 15,99,00,D4,60
13960 DATA ZZ
13980 REM
14000 DATA 93D0, PULSE
14020 REM ****************************
14040 REM *          PULSE           *
14060 REM ****************************
14080 REM  REQUIRES ONE PARAMETER - THE
14100 REM WIDTH  OF  THE  PULSE, *IF* A
14120 REM SQUARE WAVE IS TO BE SELECTED
14130 REM (OF MOST RECENT 'VX' COMMAND)
14140 REM MUST BE IN RANGE  0  TO  4095
14160 REM (0 OR 4095  PRODUCE  CONSTANT
14180 REM OUTPUT,2048 PRODUCES A SQUARE
14200 REM WAVE.) E.G.
14220 REM         20 PULSE 2000
14240 REM
14260 DATA 20,8A,AD,20,F7,B7,AC,B0
14280 DATA 02,C8,C8,A5,14,99,00,D4
14300 DATA C8,A5,15,99,00,D4,60
14320 DATA ZZ
14360 REM
14400 DATA 93F0, PLAY
14420 REM ****************************
14440 REM *          PLAY            *
14460 REM ****************************
14480 REM  REQUIRES ONE PARAMETER - THE
14500 REM WAVE FORM OF THE CURRENT 'VX'
14520 REM      129  NOISE
14530 REM       65  PULSE
14540 REM       33  TRIANGLE
14560 REM       17  SAW TOOTH
14580 REM SHOULD  'PLAY 0'  BEFORE  THE
14600 REM NEW'PLAY'COMMAND.'PLAY' POKES
14620 REM INTO THE CONTROL REG. FOR THE
14640 REM CURRENT VOICE,SO OTHER VALUES
14660 REM CAN BE USED FOR RING MOD ETC.
14680 REM TO PLAY A COMPLETE VOICE :
14700 REM     10 VOL 15:VX 1
14720 REM     20 ENVEL 2,10,2,0
14740 REM     30 MUSIC 4000
14760 REM     40 PLAY 0:PLAY 17
14780 REM
14800 DATA 20,8A,AD,20,F7,B7,AC,B0
14820 DATA 02,C8,C8,C8,C8,A5,14,99
14840 DATA 00,D4,60
14860 DATA ZZ
14880 REM
15000 DATA 9410, FILTFQ
15020 REM ****************************
15040 REM *         FILTFQ           *
15060 REM ****************************
15080 REM  REQUIRES ONE PARAMETER - THE
15100 REM CUTOFF   FREQUENCY   OF   THE
15120 REM FILTER (SEE 'VOL' & 'FILTER')
15140 REM FREQUENCY  IS IN RANGE  0  TO
15160 REM 2048. E.G.
15180 REM        10 FILTFQ 1000
15200 REM
15220 DATA 20,8A,AD,20,F7,B7,A5,14
15240 DATA 8D,15,D4,4A,4A,4A,85,14
15260 DATA A5,15,0A,0A,0A,05,14,8D
15280 DATA 16,D4,60
15300 DATA ZZ
15320 REM
15400 DATA 9440, FILTER
15420 REM ****************************
15440 REM *         FILTER           *
15460 REM ****************************
15480 REM  REQUIRES ONE PARAMETER - THE
15500 REM FILTERS TO  SWITCH ON OR OFF.
15520 REM E.G. 1  FILTER 1 ON
15540 REM      2  FILTER 2 ON
15550 REM      4  FILTER 3 ON
15560 REM      7  ALL FILTERS ON
15570 REM      0  ALL FILTERS OFF
15580 REM OR COMBINATIONS. THE TOP FOUR
15600 REM BITS CONTROL THE RESONANCE OF
15620 REM THE FILTER.
15640 REM
15660 DATA 20,8A,AD,20,F7,B7,A5,14
15680 DATA 8D,17,D4,60
15700 DATA ZZ
15720 REM
16000 DATA 9460, SPRITE
16020 REM ****************************
16040 REM *         SPRITE           *
16060 REM ****************************
16080 REM  REQUIRES ONE PARAMETER - THE
16100 REM CURRENT SPRITE ON  WHICH  THE
16120 REM OTHER SPRITE COMMANDS ACT IE:
16140 REM 'COLSP', 'XSP' & 'YSP'. USE A
16160 REM LOOP TO DESIGNATE EACH SPRITE
16180 REM IN TURN. E.G.
16200 REM       10 FOR T=0 TO 7
```

PROGRAM FILE

```
16220 REM       20 SPRITE T:COLSP 1
16240 REM       30 NEXT I
16260 REM SPRITES ARE NUMBERED  0 TO 7.
16280 REM
16300 DATA 20,8A,AD,20,F7,B7,A5,14
16320 DATA 29,07,8D,B2,02,60
16340 DATA ZZ
16360 REM
16400 DATA 9480, MOBCTRL
16420 REM ****************************
16440 REM *         MOBCTRL          *
16460 REM ****************************
16480 REM  REQUIRES ONE PARAMETER - THE
16500 REM SPRITES THAT ARE TO BE TURNED
16520 REM ON. 'MOBCTRL' IS  INDEPENDANT
16540 REM OF  THE 'SPRITE' COMMAND. E.G.
16560 REM     0    ALL SPRITES OFF
16580 REM   255    ALL SPRITES ON
16600 REM     1    SPRITE 0 ON
16620 REM     2    SPRITE 1 ON
16640 REM     4    SPRITE 2 ON   ETC.
16680 REM
16700 DATA 20,8A,AD,20,F7,B7,A5,14
16720 DATA 8D,15,D0,60
16740 DATA ZZ
16760 REM
16800 DATA 9490, COLSP
16820 REM ****************************
16840 REM *         COLSP            *
16860 REM ****************************
16880 REM  REQUIRES ONE PARAMETER - THE
16900 REM COLOUR  ( 0 TO 15 )   OF  THE
16920 REM CURRENT SPRITE. SEE  'SPRITE'
16940 REM FOR AN EXAMPLE.
16960 REM
17000 DATA 20,8A,AD,20,F7,B7,A5,14
17020 DATA AC,B2,02,99,27,D0,60
17040 DATA ZZ
17060 REM
17100 DATA 9480, XSP
17120 REM ****************************
17140 REM *          XSP             *
17160 REM ****************************
17180 REM  REQUIRES ONE PARAMETER - THE
17200 REM X- COORDINATE OF THE  CURRENT
17220 REM SPRITE. IT  MUST  BE  BETWEEN
17240 REM 0 AND 511. ( ALTHOUGH NOT ALL
17260 REM WILL  BE ON THE SCREEN ). SEE
17280 REM 'YSP' FOR AN EXAMPLE.
17300 REM
17320 DATA 20,8A,AD,20,F7,B7,A9,00
17340 DATA AC,B2,02,F0,07,18,69,02
17360 DATA 88,4C,8B,94,A8,A5,14,99
17380 DATA 00,D0,A5,15,29,01,85,15
17400 DATA AC,B2,02,C8,B9,F4,94,85
17420 DATA 14,AD,10,D0,25,14,8D,10
17440 DATA D0,A5,15,D0,01,60,B9,FD
17460 DATA 94,85,14,AD,10,D0,05,14
17480 DATA 8D,10,D0,60,EA,FE,FD:::
17500 DATA FB,F7,EF,DF,BF,7F,EA,01
17520 DATA 02,04,08,10,20,40,80
17540 DATA ZZ
17560 REM
17600 DATA 9510, YSP
17620 REM ****************************
17640 REM *          YSP             *
17660 REM ****************************
17680 REM  REQUIRES ONE PARAMETER - THE
17700 REM Y  COORDINATE OF THE  CURRENT
17720 REM SPRITE. IT  MUST  BE  BETWEEN
17740 REM 0 AND 255. ( ALTHOUGH NOT ALL
17760 REM WILL  BE ON THE SCREEN ).  EG
17780 REM      10 SPRITE 0:COLSP 0
17800 REM      20 XSP 300:YSP 100
17820 REM
17840 DATA 20,8A,AD,20,F7,B7,A9,01
17860 DATA AC,B2,02,F0,07,18,69,02
17880 DATA 88,4C,1B,95,A8,A5,14,99
17900 DATA 00,D0,60
17920 DATA ZZ
17940 REM
50000 DATA ZZZZ:REM END OF PROGRAM DATA MARKER

READY.
```

BBC/Electron Dizzy Dots

by R N Arrowsmith

Dizzy Dots for the BBC Models A and B and the Acorn Electron is a computer version of a game I, for one, used to play at school.

Given a square of dots, each player takes turns to try and form squares by

PROGRAM FILE

joining adjacent dots. If a player forms a square he gets one point and another turn. The game will cope with up to five players and one computer opponent — I've yet to beat the computer opponent!

```
>LIST
   10REM************************
   20REM*                      *
   30REM* D I Z Z Y  D O T S  *
   40REM*                      *
   50REM* R.N.Arrowsmith 1984 *
   60REM*                      *
   70REM* FOR BBC Micro or    *
   80REM*     Acorn Electron  *
   90REM*                      *
  100REM************************
  110*KEY10"OLD|MRUN|M"
  120*FX200,1
  130MODE1:PROCinstruct
  140REPEAT
  150PROCsetup
  160PROCstartgame
  170REPEATPROCmove
  180UNTILboxesleft%=0
  190PROCendgame:UNTILFALSE
  200END
  210:
  220DEFPROCinstruct
  230PROCtitle
  240PRINTTAB(0,7)" Each player takes tu
rns to join the"'"dots to form squares."
''" Whenever a player completes a square
"'"they get one point and another turn."
  250PRINT'" You can play against the co
mputer, or"'"just use the computer as a
playing"'"board."
  260maxx%=9:maxy%=9:maxplayer%=6
  270DIMdots%(maxx%,maxy%),boxs%(maxx%-1
,maxy%-1),player$(maxplayer%),score%(max
player%)
  280DIMcol1%(maxplayer%),col2%(maxplaye
r%)
  290FORA%=0TOmaxplayer%-1:READcol1%(A%)
,col2%(A%):NEXT
  300DATA1,1,2,2,3,3,1,2,1,3,2,3
  310VDU4
  320ENVELOPE1,4,20,-15,-15,6,3,3,127,33
,-4,-10,126,126
  330ENVELOPE2,4,-10,-2,0,3,0,0,127,100,
-1,-10,120,122
  340ENVELOPE3,1,4,8,4,30,30,5,5,5,-10,-
30,126,10
  350COLOUR2
  360PRINT'"DO YOU WANT THE NOISES? (Y/N
)";
  370REPEATA=GET OR32:UNTILA=121 OR A=11
0
  380IFA=110THEN*FX210,1
  390IFA=121THEN*FX210,0
  400COLOUR1
  410PRINTTAB(10,20)"PRESS THE SPACE BAR
":REPEATUNTILGET=32
  420ENDPROC
  430:
  440DEFPROCsetup
  450FORX%=0TOmaxx%:FORY%=0TOmaxy%:dots%
(X%,Y%)=0:IFX%<maxx% ANDY%<maxy% boxs%(X
```

```
%,Y%)=0
  460NEXTY%:IFX%<maxplayer%player$(X%)="
":score%(X%)=0
  470NEXTX%
  480VDU28,0,30,39,6,12
  490VDU19,3,2,0;0;0;
  500COLOUR3
  510PRINT'"Do you want me to play? (Y/N
)";
  520REPEATA=GET OR32:UNTILA=121 OR A=11
0
  530IFA=121PRINT''"Oh GOODY! I like thi
s game!":min%=1:max%=maxplayer%-1 ELSEPR
INT''"I hope youve got a partner then!":
min%=2:max%=maxplayer%
  540PRINT'"How many of you humans are t
here?"
  550PRINT"Only ";min%;" to ";max%;" may
 play?";
  560REPEATA%=GET-48:UNTILA%>=min% AND A
%<=max%
  570VDUA%-48
  580PRINT''"OK! Thats ";A%;" human";:IF
A%>1PRINT"s";
  590IFA=121PRINT" and me":A%=A%+1:ELSE
PRINT
  600max%=A%
  610PRINT
  620maxx%=(4+max%):IFmaxx%>9THENmaxx%=9
  630maxy%=maxx%
  640FORB%=0TOA%-1
  650IFB%=A%-1 ANDA=121PRINT"Ok I'll go
last!":player$(B%)="Dizzy":GOTO700
  660PRINT"Enter the name of player ";B%
+1:IFA=121PRINT" or press enter for my t
urn"
  670PRINT':INPUTplayer$(B%)
  680IFplayer$(B%)=""ANDA<>121THENPRINT"
Don't be daft!":GOTO660
  690IFplayer$(B%)=""THENplayer$(B%)="Di
zzy":A=122
  700NEXT
  710COLOUR1
  720PRINT''"PRESS THE SPACE BAR":REPEAT
UNTILGET=32
  730VDU26
  740ENDPROC
  750:
  760DEFPROCstartgame
  770CLS:COLOUR1:GCOLO,1
  780FORX%=0TOmaxx%
  790FORY%=0TOmaxy%
  800PROCdot(X%,Y%):NEXT:NEXT
  810PRINTTAB(3,1);
  820FORX%=1TO10
  830COLOURX%MOD3+1:PRINT"  ";MID$("DIZZ
Y DOTS",X%,1);
  840NEXT
  850@%=0:VDU5
  860X1%=FNxcoord(-1)
  870X2%=FNxcoord(maxx%+1)
  880FORY%=0TOmaxy%:MOVE X1%,FNycoord(Y%
):PRINTY%
  890MOVEX2%,FNycoord(Y%):PRINTY%
  900NEXT
  910Y1%=FNycoord(-1)
```

PROGRAM FILE

```
  920Y2%=FNycoord(maxy%+1)
  930FORX%=0TOmaxx%:MOVEFNxcoord(X%),Y1%
:VDUX%+65
  940MOVEFNxcoord(X%),Y2%:VDUX%+65
  950NEXT:VDU4
  960boxesleft%=maxx%*maxy%
  970thisplayer%=0
  980ENDPROC
  990:
 1000DEFPROCdot(X%,Y%)
 1010X%=FNxcoord(X%)
 1020Y%=FNycoord(Y%)
 1030MOVEX%,Y%:DRAWX%,Y%+4:DRAWX%+8,Y%+4
:DRAWX%+8,Y%
 1040ENDPROC
 1050:
 1060DEFFNxcoord(X%)=240+X%*80
 1070:
 1080DEFFNycoord(Y%)=288+Y%*64
 1090:
 1100DEFPROCmove
 1110REPEAT
 1120PROCgetmove
 1130PROCmakemove
 1140UNTILNOT scored% ORboxesleft%=0
 1150thisplayer%=thisplayer%+1:IFthispla
yer%=max% thisplayer%=0
 1160ENDPROC
 1170:
 1180DEFPROCgetmove
 1190REPEAT
 1200IFplayer$(thisplayer%)="Dizzy"PROCm
ymove ELSEPROCtheirmove
 1210UNTILFNmoveok
 1220ENDPROC
 1230:
 1240DEFPROCguessmove
 1250X1%=RND(maxx%+1)-1:Y1%=RND(maxy%+1)
-1
 1260X2%=X1%:Y2%=Y1%
 1270IFRND>.5 THENX2%=X2%+1 ELSEY2%=Y2%+
1
 1280ENDPROC
 1290:
 1300DEFFNmoveok
 1310IFX1%>maxx%ORX2%>maxx%ORY1%>maxy%OR
Y2%>maxy%THENGOTO1400
 1320dir1%=0
 1330IFABS(X1%-X2%)+ABS(Y1%-Y2%)<>1 THEN
GOTO1400
 1340IFX2%-X1%=1 dir1%=1:dir2%=2
 1350IFX1%-X2%=1 dir1%=2:dir2%=1
 1360IFY2%-Y1%=1 dir1%=4:dir2%=8
 1370IFY1%-Y2%=1 dir1%=8:dir2%=4
 1380IFdir1%=0 THEN VDU7:=FALSE
 1390IF(dots%(X1%,Y1%) ANDdir1%)=0 THEN=
TRUE
 1400IFplayer$(thisplayer%)="Dizzy"THEN=
FALSE
 1410SOUND&101,2,100,10:SOUND&100,2,100,
10
 1420=FALSE
 1430:
 1440DEFPROCmakemove
 1450SOUND1,1,100,10:SOUND2,1,130,10
 1460dots%(X1%,Y1%)=dots%(X1%,Y1%) ORdir
```

PROGRAM FILE

```
1%
 1470dots%(X2%,Y2%)=dots%(X2%,Y2%) ORdir
2%
 1480MOVEFNxcoord(X1%),FNycoord(Y1%):GCO
L1,2:DRAWFNxcoord(X2%),FNycoord(Y2%)
 1490scored%=FALSE
 1500IFdir1%=1:PROCcheckv(X1%,Y1%)
 1510IFdir1%=2:PROCcheckv(X2%,Y2%)
 1520IFdir1%=4:PROCcheckh(X1%,Y1%)
 1530IFdir1%=8:PROCcheckh(X2%,Y2%)
 1540ENDPROC
 1550:
 1560DEFPROCcheckv(X%,Y%)
 1570IFY%<maxy%PROCcheckbox(X%,Y%,8)
 1580IFY%>0PROCcheckbox(X%,Y%-1,2)
 1590ENDPROC
 1600:
 1610DEFPROCcheckh(X%,Y%)
 1620IFX%<maxx%PROCcheckbox(X%,Y%,4)
 1630IFX%>0PROCcheckbox(X%-1,Y%,1)
 1640ENDPROC
 1650:
 1660DEFPROCcheckbox(X%,Y%,side%)
 1670IFX%<0 OR X%>maxx% OR Y%<0 OR Y%>ma
xy% THENENDPROC
 1680boxs%(X%,Y%)=boxs%(X%,Y%)ORside%
 1690IFboxs%(X%,Y%)<>15THENENDPROC
 1700PROCbox(X%,Y%)
 1710score%(thisplayer%)=score%(thisplay
er%)+1
 1720boxesleft%=boxesleft%-1
 1730scored%=TRUE
 1740ENDPROC
 1750:
 1760DEFPROCtheirmove
 1770PRINTTAB(0,27);SPC(20);TAB(0,27);"I
t's your move ";player$(thisplayer%)
 1780PRINTTAB(0,28);SPC(20);TAB(0,28);
 1790REPEATX1%=(GET0R32)-97:UNTILX1%>=0
AND X1%<maxx%+1:VDUX1%+65
 1800REPEATY1%=(GET0R16)-48:UNTILY1%>=0
AND Y1%<maxy%+1:VDUY1%+48
 1810PRINT" to ";
 1820REPEATX2%=(GET0R32)-97:UNTILX2%>=0
AND X2%<maxx%+1:VDUX2%+65
 1830REPEATY2%=(GET0R16)-48:UNTILY2%>=0
AND Y2%<maxy%+1:VDUY2%+48
 1840ENDPROC
 1850:
 1860DEFPROCmymove
 1870X1%=maxx%+1
 1880FORX%=0TOmaxx%-1:FORY%=0TOmaxy%-1
 1890IFboxs%(X%,Y%)=7 ORboxs%(X%,Y%)=11
ORboxs%(X%,Y%)=13 ORboxs%(X%,Y%)=14 THEN
PROClastside
 1900NEXTY%:NEXTX%
 1910IFX1%>maxx%THENREPEATPROCguessmove:
UNTILFNmoveok
 1920ENDPROC
 1930:
 1940DEFPROClastside
 1950IFboxs%(X%,Y%)=7 ORboxs%(X%,Y%)=11
THEN X1%=X%:Y1%=Y% ELSEX1%=X%+1:Y1%=Y%+1
 1960IFboxs%(X%,Y%)=7 ORboxs%(X%,Y%)=14T
HEN X2%=X%+1:Y2%=Y% ELSEX2%=X%:Y2%=Y%+1
 1970ENDPROC
```

PROGRAM FILE

```
 1980RUN
 1990DEFPROCbox(X%,Y%)
 2000X%=FNxcoord(X%)+40
 2010SOUND3,3,10,10
 2020FORy%=FNycoord(Y%)TOFNycoord(Y%+1)-
4STEP4
 2030IFy%MOD8=0THENGCOL1,col1%(thisplaye
r%) ELSEGCOL1,col2%(thisplayer%)
 2040PLOT&4D,X%,y%:NEXT:ENDPROC
 2050:
 2060DEFPROCtitle
 2070CLS:GCOL0,1:Y%=900
 2080VDU5:FORX%=300TO340STEP4
 2090MOVEX%,Y%:PRINT"D I Z Z Y   D O T S
":Y%=Y%-2:NEXT
 2100GCOL0,2:MOVE344,Y%-2:PRINT"D I Z Z
Y   D O T S"
 2110VDU4:ENDPROC
 2120:
 2130DEFPROCendgame
 2140PROCtitle
 2150hiscore%=0:nohi=0
 2160VDU28,0,30,39,5,12
 2170FORthisplayer%=0TOmax%-1
 2180PRINTplayer$(thisplayer%);" scored
 ";score%(thisplayer%)
 2190IFscore%(thisplayer%)>hiscore%:hisc
ore%=score%(thisplayer%):nohi=1 ELSEIFsc
ore%(thisplayer%)=hiscore%:nohi=nohi+1
 2200NEXT
 2210PRINT''"CONGRATULATIONS ... ";
 2220FORthisplayer%=0TOmax%
 2230IFscore%(thisplayer%)=hiscore%THENP
RINTTAB(20)player$(thisplayer%);","
 2240NEXT
 2250PRINTTAB(10)"PRESS THE SPACE BAR"
 2260REPEATUNTILGET=32
 2270VDU26:ENDPROC
```

NewBrain Newmon
by Niels Larsen

This program is a machine code monitor for the NewBrain. The program is written in two parts, a loader and the data; this gives an enormous gain in speed when you load it at the expense of a little more complication when typing in.

If you do things in the following order there shouldn't be any problems:

1 NEW the machine code and make sure TOP>30000.
2 Enter the loader program.
3 SAVE it at the start of a blank tape, leaving the tape where it is.
4 NEW the machine again.
5 Enter the data program. This is best done in several sessions, saving to a separate tape until finished.
6 RUN it and correct any errors displayed.
7 Repeat step 6 until the program reports 'Press NEWLINE when tape-recorder ready.'
8 Press the RECORD button on the tape recorder, and press NEWLINE.
9 NEWMON is now saved. When you want to use it, just load the loader program and RUN it.

Having done that, you're left with a very professional monitor capable of the following commands:

A Lists an area of memory in ASCII. Example: A1000 2000 lists from 1000 to 2000 in ASCII.
B Returns to Basic with program and variables intact. NEWMON may be called again by entering 'CALL 27500'.
C Calls a machine code program. The program must end with a RET (C9) command. On return to NEWMON, the Z80 registers will be displayed. Example: C6000 calls a program at 6000.
D Disassembles an area of memory. Example: D5734 5926 disassembles from 5734 to 5926.
E Edits an area of memory. The current

PROGRAM FILE

contents of the address, which is shown, may be changed by entering a new number.
Example: E2000 3466 edits memory from 2000 to 3466.

F Finds a value in memory.
Example: F4000 7000 55 searches memory from 4000 to 7000 for the value 55.

H Lists an area of memory in hex and ASCII.
Example: H2000 3567 lists from 2000 to 3567 in hex and ASCII.

J Jumps to program.
Example: J2346 jumps to program at 2346.

M Moves an area of memory.
Example: M5567 5578 4400 moves memory block starting at 5567 and ending at 5578 to 4400.

P Sets new printer stream. Default stream is 8.
Example: P16 sets stream 16 as the stream on which to output to the printer.

R Relocates an area of memory. Used when relocating a program. Same as MOVE except that it changes all addresses within the block pointing to another address within the block. This is one of the most powerful commands, because it allows any program to be moved to another address. Newmon itself could be relocated.
Example: R3000 3145 4000 relocates program starting at 3000 and ending at 3145, to 4000.

S Selects width of screen. This command does not open a new screen, it just sets the width.
Example: S40 selects a 40-character screen.

T Edits an area of memory. Instead of entering a number, you can directly enter text with this command.
Example: T3000 3015 allows you to type text in 3000 to 3015.

V Verifies two memory blocks against each other. If two addresses differ, they will be displayed.

X Functions as very mini-calculator. When given two numbers, it displays the sum and difference of the numbers. It may also function as a hex to decimal convertor, because all the numbers are displayed in both hex and decimal.
Example: X4 7 calculates the sum and difference of 4 and 7.

Z Sets all locations in a block of memory to the same value.
Example: Z6000 7000 33 makes all locations between 6000 and 7000 equal to the value 33.

If a command doesn't have all the parameters given in the examples, the missing parameters are assumed to be 0; this is particularly helpful when using the E or T commands. You don't have to specify the end address because the command will keep on running until stopped by pressing '*'. The same technique may be used when using the A, D or H commands, except that these commands are stopped by pressing the ESCAPE key. They may also be halted temporarily by pressing the SPACE key. Pressing the SPACE key repeatedly will list one line for each keypress. Any other key will continue the automatic listing.

```
NEWMON LOADER

10 IF TOP)27300 RESERVE TOP-27300
20 CLOSE#1:OPEN#1,1
30 FOR I=27500 TO 32568:GET#1,A:POKE I,A:NEXT I
40 CLOSE#1:PUT31:?"TYPE 'CALL 27500' TO ENTER NEWMON"
50 END



NEWMON DATA

5 IF TOP)27500 RESERVE TOP-27500
10 FOR I=27500 TO 32568 STEP 16
15   CK=0
20   FOR J=I TO I+15
25     READ X
30     POKE J,X
35     CK=CK+X
40   NEXT J
45   READ C
50   IF C<>CK THEN ?"ERROR IN LINE:"100+((I-27500)/16)*10:END
55 NEXT I
60 LINPUT("PRESS NEWLINE, WHEN TAPE-RECORDER READY")Z$
65 OPENOUT#1,1,CHR$(31)+"NEWMON  Version:10.2"+CHR$(13)+CHR$(28)+"Please wait wh
ile loading...."
70 FOR I=27500 TO 32568
75   PUT#1,PEEK(I)
80 NEXT I:CLOSE#1
85 END
100 DATA 205,154,108,17,188,108,205,176,119,49,108,107,175,6,11,33,1769
110 DATA 45,127,119,35,16,252,17,254,108,205,176,119,33,88,127,6,1727
120 DATA 0,205,7,119,254,8,40,16,119,254,45,40,77,0,0,0,1184
130 DATA 254,13,40,87,35,4,24,233,120,254,0,40,228,62,8,0,1402
140 DATA 0,0,5,43,24,219,254,48,216,254,58,56,8,254,65,216,1720
150 DATA 254,71,208,214,7,230,15,41,41,41,41,213,22,0,95,25,1518
160 DATA 209,201,125,2,3,124,2,3,33,0,0,201,82,69,65,68,1187
170 DATA 89,32,80,82,73,78,84,69,82,141,205,114,119,17,216,107,1588
180 DATA 205,176,119,205,7,119,62,255,50,45,127,17,88,127,26,50,1678
190 DATA 28,127,19,26,254,32,40,250,27,19,48,127,33,0,0,19,1031
200 DATA 26,254,32,32,5,205,206,107,24,242,254,13,40,9,254,45,1748
210 DATA 40,5,205,178,107,24,232,205,206,107,42,48,127,58,28,127,1739
220 DATA 254,65,202,13,109,254,66,202,169,108,254,68,202,162,109,254,2491
230 DATA 69,202,95,111,254,70,202,18,111,254,72,202,132,114,254,67,2227
240 DATA 202,0,114,254,74,32,1,233,254,77,202,170,111,254,80,32,2090
250 DATA 6,125,50,101,119,24,35,254,82,202,232,111,254,83,202,155,2035
260 DATA 113,254,84,202,136,111,254,86,202,179,111,254,87,202,45,111,2431
270 DATA 254,88,202,169,112,254,90,202,79,111,195,117,107,0,0,0,1980
280 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,225,237,462
290 DATA 115,182,108,229,221,34,184,108,253,34,186,108,201,237,123,182,2505
300 DATA 108,221,42,184,108,253,42,186,108,201,98,2,146,61,8,15,1783
```

PROGRAM FILE

```
310 DATA 31,78,69,87,77,79,78,32,32,86,101,114,115,105,111,110,1305
320 DATA 58,49,48,46,50,13,67,114,101,97,116,101,100,32,48,52,1092
330 DATA 47,49,49,47,56,52,13,40,67,41,32,78,105,101,108,115,1000
340 DATA 32,76,97,114,115,101,110,141,0,0,0,0,0,0,0,0,786
350 DATA 0,0,67,79,77,77,65,78,68,191,0,205,146,118,0,0,1171
360 DATA 0,205,130,119,6,64,205,28,109,16,251,205,219,110,24,241,1932
370 DATA 126,35,230,127,254,32,48,2,62,46,195,63,119,205,130,119,1793
380 DATA 6,16,126,205,44,119,205,118,119,35,16,246,205,219,110,24,1813
390 DATA 236,229,205,1,115,17,88,127,62,211,18,19,33,56,127,1,1545
400 DATA 6,0,237,176,62,7,50,29,127,62,176,6,5,17,30,127,1117
410 DATA 18,19,16,252,60,50,32,127,205,118,110,205,169,116,205,250,1952
420 DATA 118,175,50,26,127,62,24,205,139,119,62,255,50,46,127,50,1635
430 DATA 47,127,17,102,121,205,176,119,62,32,50,47,127,205,139,119,1695
440 DATA 62,255,50,47,127,225,124,205,33,119,125,205,44,119,62,72,1874
450 DATA 205,63,119,13,6,119,175,50,47,127,205,130,119,126,34,48,1586
460 DATA 127,205,111,121,197,50,25,127,71,205,154,119,205,118,119,35,1989
470 DATA 16,247,62,24,205,139,119,58,46,127,254,255,32,6,50,47,1687
480 DATA 127,205,118,110,205,176,119,175,50,47,127,62,32,205,139,119,2016
490 DATA 193,120,254,0,40,32,58,46,127,254,255,32,6,50,47,127,1641
500 DATA 205,149,110,120,205,124,113,121,254,0,40,10,205,110,119,121,2006
510 DATA 217,65,217,205,124,113,62,48,205,139,119,62,59,205,63,119,2022
520 DATA 42,48,127,58,25,127,205,161,119,35,61,32,249,58,46,127,1520
530 DATA 254,255,40,6,205,219,110,195,162,109,50,47,127,205,114,119,2217
540 DATA 205,206,110,40,2,48,27,58,24,127,254,1,32,6,205,7,1352
550 DATA 111,195,162,109,205,130,113,183,254,42,40,6,205,246,110,195,2306
560 DATA 162,109,205,118,110,6,5,17,106,121,205,155,110,58,29,127,1643
570 DATA 254,0,40,7,62,32,205,163,110,24,242,205,254,118,17,56,1789
580 DATA 127,203,40,68,194,147,116,195,163,116,213,17,33,127,26,60,1847
590 DATA 254,186,56,6,62,176,18,27,24,244,18,17,30,127,6,5,1256
600 DATA 205,155,110,62,32,205,163,110,209,62,9,205,163,110,201,26,2027
610 DATA 205,163,110,19,16,249,201,229,213,197,245,71,33,88,127,22,2188
620 DATA 0,58,29,127,95,25,112,60,32,16,0,0,0,0,0,0,554
630 DATA 0,0,0,0,0,0,0,0,0,0,50,29,127,241,193,209,849
640 DATA 225,201,237,91,50,127,122,179,200,229,183,237,82,225,201,205,2794
650 DATA 114,119,205,206,110,40,3,210,27,119,58,24,127,254,1,40,1657
660 DATA 26,205,130,113,183,254,27,202,27,119,254,32,32,6,62,1,1673
670 DATA 50,24,127,201,254,42,40,3,254,96,192,205,138,113,254,32,2025
680 DATA 200,175,50,24,127,201,205,67,111,58,52,127,237,177,226,27,2064
690 DATA 119,245,205,36,111,241,24,244,43,205,130,119,205,219,110,35,2291
700 DATA 201,205,67,111,237,91,52,127,123,237,177,226,27,119,126,186,2312
710 DATA 32,246,205,36,111,24,237,235,42,50,127,183,237,82,35,229,2111
720 DATA 193,235,201,205,67,111,58,52,127,119,11,229,209,19,237,176,2249
730 DATA 195,117,107,205,130,119,126,205,44,119,62,45,205,63,119,229,2090
740 DATA 33,0,0,205,7,119,254,8,40,249,0,0,0,254,13,40,1222
750 DATA 5,205,178,107,24,237,125,225,119,35,24,215,205,130,119,126,2079
760 DATA 205,44,119,205,194,119,205,161,119,205,199,119,62,45,205,63,2269
770 DATA 119,205,205,113,205,63,119,119,35,205,114,119,24,222,205,67,2139
780 DATA 111,237,91,52,127,24,167,205,67,111,237,91,52,127,26,190,1915
790 DATA 40,22,235,175,50,26,127,205,222,111,62,10,205,139,119,235,1983
800 DATA 205,222,111,213,205,219,110,209,35,19,11,120,177,32,223,195,2306
810 DATA 117,107,205,122,119,205,118,119,126,195,44,119,237,91,52,127,2103
820 DATA 237,83,54,127,126,205,111,121,50,25,127,254,3,40,25,254,1842
830 DATA 4,32,107,126,254,237,40,7,35,126,43,254,43,48,95,35,1486
840 DATA 35,126,95,35,126,43,24,14,126,254,221,40,81,254,253,40,1767
850 DATA 77,35,126,95,35,126,87,43,43,229,237,75,48,127,183,213,1779
860 DATA 225,237,66,56,56,9,237,75,50,127,183,237,66,40,2,48,1714
870 DATA 44,9,237,75,48,127,183,237,66,237,75,52,127,9,229,193,1948
880 DATA 225,197,58,25,127,214,2,71,237,91,54,127,126,18,35,19,1626
890 DATA 16,250,193,121,18,19,35,120,18,19,35,24,15,225,58,25,1191
900 DATA 127,71,237,91,54,127,126,18,19,35,16,250,237,83,54,127,1672
910 DATA 229,235,42,50,127,183,237,82,40,3,218,117,107,225,195,240,2330
920 DATA 111,65,32,32,32,32,32,66,32,32,32,32,65,43,66,736
930 DATA 32,32,32,65,45,66,32,32,32,66,45,65,141,17,141,112,955
940 DATA 205,176,119,175,50,26,127,205,122,119,62,6,205,139,119,42,1897
950 DATA 50,127,205,122,119,62,12,205,139,119,42,48,127,237,91,50,1755
960 DATA 127,25,205,122,119,62,18,205,139,119,42,48,127,237,91,50,1736
970 DATA 127,183,237,82,205,122,119,62,24,205,139,119,42,50,127,237,2080
980 DATA 91,48,127,183,237,82,205,122,119,205,114,119,175,50,26,127,2030
990 DATA 42,48,127,205,71,113,62,6,205,139,119,42,50,127,205,71,1632
1000 DATA 113,62,12,205,139,119,42,48,127,237,91,50,127,25,205,71,1673
1010 DATA 113,62,18,205,139,119,42,48,127,237,91,50,127,183,237,82,1880
1020 DATA 205,71,113,62,24,205,139,119,42,50,127,237,91,48,127,183,1843
1030 DATA 237,82,205,71,113,205,114,119,195,117,107,253,33,35,127,175,2188
1040 DATA 253,86,1,253,94,0,183,237,82,56,3,60,24,248,25,198,1803
1050 DATA 48,205,63,119,253,35,253,35,123,254,1,32,226,201,0,0,1848
1060 DATA 213,30,0,231,49,209,201,245,213,30,0,231,48,209,241,201,2351
1070 DATA 229,205,241,119,225,201,229,231,57,231,58,225,183,201,229,213,3077
1080 DATA 197,231,56,231,58,193,209,225,201,62,31,205,115,113,201,125,2453
1090 DATA 254,64,32,33,62,19,50,191,109,62,25,50,216,109,62,36,1374
1100 DATA 50,3,110,62,0,50,8,110,62,32,50,17,109,62,8,50,783
1110 DATA 136,114,195,117,107,62,24,50,191,109,62,32,50,216,109,62,1636
1120 DATA 48,50,3,110,62,59,50,8,110,62,64,50,17,109,62,16,880
1130 DATA 50,136,114,24,221,0,0,0,0,0,0,0,0,0,0,0,545
1140 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1150 DATA 0,0,0,0,1,5,114,197,233,245,213,17,102,114,205,176,1622
1160 DATA 119,205,122,119,205,118,119,225,205,122,119,205,118,119,197,225,2542
1170 DATA 205,122,119,205,118,119,225,205,122,119,6,4,205,118,119,16,2027
1180 DATA 251,203,69,205,81,114,203,77,205,81,114,203,85,205,81,114,2291
1190 DATA 203,101,205,81,114,203,117,205,81,114,203,125,205,81,114,205,2357
1200 DATA 114,119,195,117,107,245,245,193,203,113,32,7,62,49,205,63,2069
1210 DATA 119,241,201,62,48,205,63,119,241,201,72,32,76,32,32,68,1812
1220 DATA 32,69,32,32,66,32,67,32,32,65,32,70,32,32,32,70,727
1230 DATA 61,67,78,80,72,90,83,141,205,130,119,14,16,65,229,126,1576
1240 DATA 205,44,119,205,118,119,35,16,246,225,205,118,119,65,205,28,2072
1250 DATA 109,16,251,205,219,110,24,224,0,0,0,0,0,0,0,0,1158
1260 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1270 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1280 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1290 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1300 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1310 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1320 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1330 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1340 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1350 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1360 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1370 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1380 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1390 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1400 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1410 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1420 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1430 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1440 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1450 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1460 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1470 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1480 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1490 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1500 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1510 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
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PROGRAM FILE

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1520 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1530 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1540 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1550 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1560 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1570 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1580 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
1590 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,57,58
1600 DATA 116,116,62,2,0,205,223,116,123,205,223,116,122,205,223,116,2173
1610 DATA 26,205,223,116,19,16,249,201,221,33,88,127,197,6,0,221,1948
1620 DATA 9,193,221,119,0,12,192,213,17,56,127,205,60,68,32,156,1680
1630 DATA 209,201,62,136,33,26,2,24,5,62,168,33,160,18,50,146,1335
1640 DATA 117,34,165,117,42,48,127,205,178,117,125,254,35,56,5,17,1642
1650 DATA 114,117,24,76,254,17,32,13,58,146,117,254,168,32,4,60,1486
1660 DATA 50,146,117,62,17,237,91,50,127,87,42,52,127,205,178,117,1705
1670 DATA 237,75,54,127,229,243,62,1,50,225,55,33,0,0,43,124,1558
1680 DATA 181,32,251,62,1,50,225,55,225,45,250,117,107,229,205,120,2155
1690 DATA 117,32,10,28,123,214,10,32,234,95,20,24,230,17,109,117,1412
1700 DATA 205,176,119,195,117,107,255,0,255,0,255,0,197,205,128,117,2331
1710 DATA 225,200,68,77,237,83,238,55,33,236,55,54,27,245,241,245,2319
1720 DATA 241,126,15,56,252,54,136,213,17,239,55,197,193,197,193,24,2208
1730 DATA 3,15,48,10,126,203,79,40,248,26,2,3,24,246,126,230,1429
1740 DATA 92,209,200,54,208,201,213,68,77,33,0,0,120,205,196,117,1993
1750 DATA 56,4,121,205,196,117,209,201,71,205,204,117,216,120,24,4,2070
1760 DATA 7,7,7,7,230,15,254,10,63,216,84,93,41,41,25,41,1141
1770 DATA 22,0,95,25,201,229,205,134,118,225,125,254,9,210,117,107,2076
1780 DATA 211,232,58,167,118,211,234,1,241,118,9,126,221,119,4,211,2281
1790 DATA 233,195,117,107,205,134,118,205,125,118,183,40,3,205,63,119,2170
1800 DATA 205,108,113,183,40,225,254,1,202,27,119,205,116,118,24,231,2171
1810 DATA 205,134,118,205,125,118,183,40,23,230,15,7,7,7,7,245,1669
1820 DATA 205,125,118,183,40,250,230,15,193,176,119,205,28,109,24,227,2247
1830 DATA 205,108,113,183,40,221,254,1,202,27,119,24,214,205,134,118,2168
1840 DATA 229,33,0,16,43,124,181,32,251,225,126,245,15,15,15,15,1565
1850 DATA 230,15,246,48,205,116,118,241,230,15,246,48,205,116,118,126,2323
1860 DATA 205,28,109,205,222,110,24,226,17,160,118,197,6,32,195,0,1854
1870 DATA 70,17,160,118,197,6,64,195,0,70,17,169,118,237,83,161,1682
1880 DATA 118,58,168,118,254,0,200,175,50,168,118,17,160,118,197,6,1925
1890 DATA 128,195,0,70,224,61,118,0,0,0,0,0,255,120,23,56,1250
1900 DATA 33,23,56,5,23,56,14,175,201,0,255,0,255,0,255,0,1351
1910 DATA 255,0,255,0,255,0,255,0,255,0,255,0,255,0,2040
1920 DATA 255,0,255,0,255,0,255,0,255,0,255,0,255,0,2040
1930 DATA 255,0,255,0,255,0,255,0,255,0,255,0,255,0,2040
1940 DATA 255,0,255,0,255,34,68,85,102,119,170,204,238,255,62,201,2303
1950 DATA 24,2,62,195,50,12,64,50,18,64,201,213,205,108,113,209,1590
1960 DATA 254,42,40,11,254,32,208,254,31,192,205,149,113,24,3,205,2017
1970 DATA 114,119,195,117,107,254,160,56,7,245,62,48,205,63,119,241,2112
1980 DATA 245,15,15,15,15,205,53,119,241,230,15,198,48,254,58,56,1782
1990 DATA 2,198,7,245,213,229,230,127,205,115,113,95,58,45,127,254,2263
2000 DATA 255,204,97,119,58,47,127,254,255,123,204,163,110,33,26,127,2202
2010 DATA 52,225,209,241,201,213,245,123,30,8,231,48,241,209,201,0,2477
2020 DATA 0,0,62,44,24,205,62,13,24,201,62,32,24,197,124,205,1279
2030 DATA 44,119,125,195,44,119,175,50,26,127,205,122,119,62,6,197,1735
2040 DATA 71,58,26,127,184,48,5,205,118,119,24,245,193,201,245,126,1995
2050 DATA 205,44,119,241,201,245,126,230,127,254,32,48,2,62,46,205,2187
2060 DATA 63,119,241,201,26,205,63,119,203,127,192,19,24,246,26,205,2079
2070 DATA 0,70,19,16,249,201,245,62,40,24,3,245,62,41,205,63,1545
2080 DATA 119,241,201,66,67,68,69,72,76,65,70,39,78,90,78,67,1466
2090 DATA 80,79,80,69,80,77,48,49,50,51,52,53,54,55,83,80,1040
2100 DATA 82,73,88,73,89,245,203,127,196,194,119,203,119,40,99,203,2153
2110 DATA 111,32,17,203,103,32,29,217,120,205,33,119,217,62,72,205,1777
2120 DATA 63,119,24,97,43,126,205,33,119,43,126,205,44,119,35,35,1436
2130 DATA 241,245,24,233,203,95,32,26,229,217,225,22,0,120,254,0,2166
2140 DATA 242,49,120,22,255,95,25,124,205,33,119,125,205,44,119,217,1999
2150 DATA 24,203,217,17,207,119,58,27,127,111,38,0,25,197,6,2,1378
2160 DATA 126,205,63,119,35,16,249,62,43,205,63,119,241,205,33,119,1903
2170 DATA 24,170,230,31,217,17,207,119,104,38,0,25,71,126,205,63,1647
2180 DATA 119,35,16,249,217,241,203,127,196,199,119,201,76,196,65,68,2327
2190 DATA 196,32,65,68,195,32,83,85,194,32,83,66,195,32,65,78,1501
2200 DATA 196,32,88,79,210,32,79,210,140,107,67,208,73,78,195,68,1862
2210 DATA 69,195,68,74,78,218,74,210,74,208,67,65,76,204,82,69,1831
2220 DATA 212,80,85,83,200,80,79,208,69,216,69,88,216,82,83,212,2062
2230 DATA 72,65,76,212,78,79,208,82,76,195,32,82,82,195,32,82,1648
2240 DATA 204,140,107,82,210,140,107,83,76,193,32,83,82,193,32,68,1832
2250 DATA 69,70,194,83,82,204,66,73,212,82,69,211,83,69,212,82,1861
2260 DATA 76,67,193,82,82,67,193,82,76,193,32,82,82,193,32,68,1600
2270 DATA 65,193,32,67,80,204,32,83,67,198,32,67,67,198,68,201,1654
2280 DATA 69,201,73,206,79,85,212,78,69,199,82,69,84,206,82,69,1863
2290 DATA 84,201,73,205,82,82,196,82,76,196,76,68,201,32,67,80,1801
2300 DATA 201,32,73,78,201,32,79,85,84,201,76,68,196,32,67,80,1585
2310 DATA 196,32,73,78,196,32,79,85,84,196,76,68,73,210,67,80,1625
2320 DATA 73,210,73,78,73,210,79,84,73,210,76,68,68,210,67,80,1732
2330 DATA 68,210,73,78,68,210,79,84,68,210,79,82,199,32,69,78,1687
2340 DATA 196,13,26,126,254,64,56,13,254,128,218,229,122,254,192,218,2363
2350 DATA 4,123,195,45,123,230,7,254,0,202,41,122,254,1,202,11,1814
2360 DATA 122,254,2,40,74,254,3,40,51,254,4,40,39,254,5,40,1476
2370 DATA 30,254,6,40,11,17,235,120,205,33,123,6,0,62,1,201,1344
2380 DATA 205,220,122,205,206,122,205,250,122,17,120,120,62,2,201,17,2196
2390 DATA 155,120,24,3,17,152,120,14,0,195,250,122,126,17,155,120,1590
2400 DATA 203,95,32,3,17,152,120,205,142,122,14,0,62,1,201,126,1495
2410 DATA 17,120,120,205,142,122,254,5,56,6,217,6,6,217,6,1,1500
2420 DATA 126,254,34,48,16,203,248,203,95,62,1,194,211,122,14,1,1832
2430 DATA 217,14,6,217,201,14,224,203,95,204,198,122,62,3,201,126,2107
2440 DATA 205,142,122,126,203,95,32,7,17,120,120,14,96,24,237,17,1577
2450 DATA 122,120,72,6,2,217,72,6,4,217,62,1,201,126,254,0,1482
2460 DATA 32,6,17,192,120,195,167,121,254,8,32,14,17,180,120,1,1476
2470 DATA 3,2,217,1,6,6,217,62,1,201,6,80,229,217,225,35,1508
2480 DATA 70,217,126,17,162,120,254,16,32,8,17,158,120,14,0,62,1393
2490 DATA 2,201,254,24,40,247,205,206,122,230,24,205,159,122,24,239,2304
2500 DATA 230,7,6,1,217,254,6,56,11,40,3,61,24,6,6,4,932
2510 DATA 217,6,130,201,71,217,201,205,142,122,254,27,192,217,6,6,2214
2520 DATA 217,201,15,15,15,230,6,6,2,217,254,6,56,2,62,27,1331
2530 DATA 71,217,201,15,15,15,230,7,245,198,9,254,14,56,6,60,1613
2540 DATA 254,16,56,1,60,217,71,217,6,2,241,254,0,200,254,2,1851
2550 DATA 200,254,4,200,254,5,200,6,1,201,205,201,122,120,65,79,2117
2560 DATA 217,201,72,217,72,217,201,217,72,6,6,217,72,6,1,201,1995
2570 DATA 6,64,229,217,225,35,70,217,201,254,118,32,8,17,188,120,2001
2580 DATA 1,0,0,24,16,17,120,120,205,108,122,205,206,122,126,15,1407
2590 DATA 15,15,205,108,122,62,1,201,205,108,122,205,12,123,24,245,1773
2600 DATA 17,122,120,205,33,123,14,0,126,203,111,192,230,56,254,16,1822
2610 DATA 200,205,211,122,201,126,15,230,28,229,38,0,111,25,235,225,2201
2620 DATA 201,230,7,254,0,40,63,254,1,40,105,254,2,40,45,254,1790
2630 DATA 3,202,221,123,254,4,40,31,254,5,40,52,254,6,40,14,1543
2640 DATA 17,185,120,126,230,56,217,71,217,6,64,195,89,122,205,220,2140
2650 DATA 122,205,12,123,62,2,201,17,166,120,24,3,17,164,120,126,1484
2660 DATA 205,159,122,195,23,122,17,170,120,126,205,159,122,195,214,121,2275
2670 DATA 126,203,95,32,9,17,173,120,205,131,122,195,214,121,254,205,2222
2680 DATA 32,10,17,166,120,6,96,14,0,62,3,201,254,237,202,134,1554
2690 DATA 124,195,158,125,126,203,95,32,5,17,177,120,24,218,254,201,2074
2700 DATA 32,6,17,170,120,195,167,121,254,217,32,6,17,182,120,195,1851
2710 DATA 167,121,254,233,32,13,17,164,120,1,0,130,217,6,4,217,1696
2720 DATA 62,1,201,17,120,120,1,2,2,217,1,4,27,217,62,1,1055
```

PROGRAM FILE

```
2730 DATA 201,126,254,195,32,5,17,164,120,24,170,254,211,32,17,17,1839
2740 DATA 16,121,205,220,122,6,192,14,1,217,14,6,217,62,2,201,1616
2750 DATA 254,227,32,13,17,180,120,1,2,130,217,1,4,27,217,24,1466
2760 DATA 47,254,243,32,6,17,10,121,195,167,121,254,203,202,69,124,2065
2770 DATA 254,219,32,13,17,14,121,205,220,122,6,192,205,211,122,24,1977
2780 DATA 204,254,235,32,14,17,180,120,1,2,2,217,1,4,2,217,1502
2790 DATA 62,1,201,17,12,121,195,167,121,35,126,205,108,122,126,254,1873
2800 DATA 64,48,21,254,48,56,5,254,56,218,10,127,17,195,120,205,1698
2810 DATA 33,123,14,0,43,62,2,201,17,226,120,254,128,56,10,17,1306
2820 DATA 229,120,254,192,56,3,17,232,120,205,206,122,6,1,217,15,1995
2830 DATA 15,15,230,7,198,19,71,217,24,218,35,126,203,127,40,49,1594
2840 DATA 203,87,194,10,127,254,192,210,10,127,203,103,32,12,17,38,1819
2850 DATA 121,203,95,40,15,17,54,121,24,10,17,70,121,203,95,40,1246
2860 DATA 3,17,86,121,7,7,230,12,229,38,0,111,25,235,225,24,1370
2870 DATA 112,230,7,254,0,40,50,254,1,40,60,254,2,40,73,254,1671
2880 DATA 3,40,99,254,6,40,116,254,7,202,110,125,126,254,68,32,1736
2890 DATA 5,17,19,121,24,75,254,69,32,5,17,22,121,24,66,254,1125
2900 DATA 77,194,10,127,17,26,121,24,56,205,250,122,14,129,217,14,1603
2910 DATA 1,217,17,14,121,24,44,205,250,122,205,206,122,6,129,217,1900
2920 DATA 6,1,217,17,16,121,24,27,126,17,126,120,203,95,32,3,1151
2930 DATA 17,134,120,205,142,122,205,206,122,6,2,217,6,4,217,24,1749
2940 DATA 2,6,0,195,96,124,126,17,120,120,205,142,122,14,232,126,1647
2950 DATA 203,95,32,3,205,198,122,43,62,4,201,126,17,30,121,230,1692
2960 DATA 24,217,254,0,32,4,6,19,24,18,254,16,32,4,6,20,930
2970 DATA 24,10,254,24,40,4,217,195,10,127,6,21,217,1,0,1,1151
2980 DATA 24,193,126,203,111,32,24,17,120,120,205,211,122,14,1,217,1740
2990 DATA 14,30,203,95,40,1,13,217,203,103,204,198,122,24,164,254,1885
3000 DATA 103,32,5,17,32,121,24,153,254,111,194,10,127,17,35,121,1356
3010 DATA 24,143,6,30,254,221,40,2,6,32,120,50,27,127,35,126,1243
3020 DATA 254,64,218,145,126,254,128,218,102,126,254,192,218,129,126,254,2808
3030 DATA 203,40,82,254,225,218,10,127,17,177,120,40,7,254,229,32,2035
3040 DATA 7,17,173,120,6,2,24,21,254,227,32,8,17,180,120,1,1209
3050 DATA 2,130,24,32,254,233,32,17,17,164,120,6,130,14,0,217,1392
3060 DATA 58,27,127,71,217,43,62,2,201,254,249,194,10,127,17,120,1779
3070 DATA 120,1,2,2,217,6,27,58,27,127,79,24,231,35,126,6,1088
3080 DATA 216,217,71,217,201,205,9,126,35,126,230,7,254,6,40,5,1965
3090 DATA 43,43,195,10,127,126,254,64,48,14,17,195,120,205,33,123,1617
3100 DATA 14,0,43,43,43,62,4,201,17,226,120,254,128,56,10,17,1238
3110 DATA 229,120,254,192,56,3,17,232,120,205,117,124,24,229,230,7,2159
3120 DATA 254,6,194,10,127,126,15,15,15,205,108,122,205,206,122,205,1935
3130 DATA 9,126,205,198,122,43,43,62,3,201,17,120,120,254,112,56,1691
3140 DATA 221,254,118,202,10,127,254,120,48,212,205,108,122,205,206,122,2534
3150 DATA 205,9,126,24,224,230,7,254,6,194,10,127,205,9,126,43,1799
3160 DATA 205,12,123,24,209,17,152,120,14,0,254,52,40,226,254,35,1737
3170 DATA 40,11,17,155,120,254,53,40,215,254,43,32,5,6,2,195,1442
3180 DATA 235,125,17,120,120,254,33,32,12,1,104,2,217,58,27,127,1484
3190 DATA 71,217,195,48,126,254,34,32,12,1,2,232,217,58,27,127,1653
3200 DATA 79,217,195,48,126,254,42,32,5,1,232,2,24,222,254,54,1787
3210 DATA 32,13,205,9,126,35,126,14,64,217,79,217,195,46,126,230,1734
3220 DATA 15,254,9,32,25,17,122,120,126,205,142,122,254,4,32,6,1485
3230 DATA 217,58,27,127,71,217,205,206,122,6,2,195,235,125,43,126,1982
3240 DATA 17,219,120,1,0,64,217,71,217,62,1,201,0,2,129,30,1351
3250 DATA 66,0,121,205,23,124,14,16,39,232,3,100,0,10,0,1,954
3260 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
```

Research Machines 380Z/480Z Jungle

by Paul Ramsden

Jungle is a high-resolution graphics arcade game for the Research Machines 480Z of the push-the-blocks-and-trap-the-bad-guys kind. Although written on a 480Z, the program should run on a 380Z fitted with an HRG board. Level II graphics is also needed — the sign-on message will state what level is supported.

On running the program and selecting the instructions option, it's possible to configure the keyboard control. The cursor cluster is used as the default movement key on the 480Z; 380Z owners will have to use the redefine option. Also from the instructions option it's possible to select black and white or colour displays.

The object of the game is to survive. You are the running figure who is being pursued by a number of hungry beasts (two initially). The jungle clearing is strewn with boulders which you can slide along to make traps for the wild beasts. When all the beasts have been trapped and are unable to move, you continue to a higher level.

On the other hand, should the player walk into the jaws of a waiting beast, then he, naturally, gets eaten.

```
100 REM              ********************************
110 REM              *                              *
120 REM              *    'JUNGLE' by P. Ramsden    *
130 REM              *                              *
140 REM              *    this version : 211184     *
150 REM              *                              *
160 REM              ********************************
170 :
180 REM       This program needs LEVEL II graphics support to work.
190 REM     It was written on a 480Z but should run OK on a 380Z with HRG.
200 :
210 REM- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
220 :
230 ON BREAK GOTO 1320
240 PUT31,27,"=0J"
250 UP=11:DN=10:RT=24:LT=8:F1=127:F2=4:F3=7:F4=22
260 GOSUB 1350
270 DL=0:NM=1
280 REM DRAW SCREEN
290 :
300 PUT31,21
310 RANDOMIZE
320 CALL"CLEAR":IF BW=0 THEN CALL"COLOUR"
330 FOR X=0 TO 39*8 STEP 8
340 CALL"STPLOT",X,0,VARADR(T$),GN:CALL"STPLOT",X,22*8,VARADR(T$),GN
350 NEXT
360 FOR Y=0 TO 22*8 STEP 8
```

PROGRAM FILE

```
370 CALL"STPLOT",0,Y,VARADR(T$),GN:CALL"STPLOT",39*8,Y,VARADR(T$),GN
380 NEXT
390 FOR R=0 TO 180
400 X=8*INT(1+RND(1)*38)
410 Y=8*INT(1+RND(1)*21)
420 CALL"RDOUT",X+7,Y,VAR OR(PP): IF PP THEN RANDOMIZE:GOTO400
430 CALL"STPLOT",X,Y,VARAUR(B$),BU
440 NEXT
450 HX=8*INT(1*RND(1)*38)
460 HY=8*INT(1+RND(1)*21)
470 CALL"RDOUT",HX+4,HY+4,VARADR(PP):IF PP THEN RANDOMIZE: GOTO 450
480 CALL"STPLOT",HX,HY,VARADR(H$),RD
490 FOR M=0 TO NM
500 MX(M)=8*INT(1+RND(1)*38)
510 MY(M)=8*INT(1+RND(1)*21)
520 IF ABS(HX-MX(M))<40 AND ABS(HY-MY(M))<40 THEN 500
530 CALL"RDOUT",MX(M)+4,MY(M)+4,VARADR(PP):IF PP THEN RANDOMIZE :GOTO 500
540 CALL"STPLOT",MX(M),MY(M),VARADR(M$),RD
550 NEXT
560 REM WARNING SHRIEK AND GAME STARTS....
570 :
580 FOR T=1 TO 20+RND(1):PUT27,64,20,3,65,7:PUT27,64,5,3,65,7:NEXT
590 M=0
600 X=0:Y=0
610 TT=0
620 REM START OF MAIN LOOP
630 :
640 G=GET(DL):IF G=0 THEN 690
650 IF G=ASC("F") THEN HALT=GET():GOTO 640
660 X=(G=F1) OR (G=LT) OR (G=F3) OR (-1*((G=F2) OR (G=RT) OR (G=F4)))
670 Y=(G=F3) OR (G=DN) OR (G=F4) OR (-1*((G=F1) OR (G=UP) OR (G=F2)))
680 X=X*8:Y=Y*8
690 TT=TT+.5:PUT22,0,0,"TIME TAKEN "+STR$(TT)+"    "
700 IF X<>0 OR Y<>0 THEN CALL"RDOUT",HX+X+4,HY+Y+4,VARADR(PP):IF PP THEN 750
710 IF X OR Y THEN CALL"STPLOT",HX,HY,VARADR(SP$),0
720 HX=HX+X:HY=HY+Y
730 CALL"STPLOT",HX,HY,VARADR(H$),RD
740 GOTO 880
750 REM HIT OBSTACLE
760 :
770 IF PP=GN THEN 880
780 IF PP=RD THEN 1120
790 L=0
800 L=L+1:REM LEN PILE
810 PX=HX+X*L:PY=HY+Y*L
820 CALL"RDOUT",PX+4,PY+4,VARADR(PQ):REM FIND CHARACTER AT END OF PILE
830 IF PQ=RD OR PQ=GN THEN 880
840 IF PQ=BU THEN GOTO 800
850 CALL"STPLOT",PX,PY,VARADR(B$),BU:CALL"STPLOT",HX,HY,VARADR(SP$),0
860 HX=HX+X:HY=HY+Y
870 CALL"STPLOT",HX,HY,VARADR(SP$),0:CALL"STPLOT",HX,HY,VARADR(H$),RD
880 REM MOVE MONSTERS
890 :
900 DX=8*SGN(HX-MX(M)):DY=8*SGN(HY-MY(M)):  REM DIRECT HEADING
910 CALL"RDOUT",MX(M)+DX+4,MY(M)+DY+4,VARADR(PP)
920 IF PP <> 0 THEN 950
930 CALL"STPLOT",MX(M),MY(M),VARADR(SP$),0:MX(M)=MX(M)+DX:MY(M)=MY(M)+DY
940 CALL"STPLOT",MX(M),MY(M),VARADR(M$),RD:GOTO 1070
950 IF PP=RD AND MX(M)+DX=HX AND MY(M)+DY=HY THEN 1120
960 IF DX=0 THEN DX=8
970 IF DY=0 THEN DY=8
980 T=0
990 FOR XX=DX TO -DX STEP-DX
1000 FOR YY=DY TO -DY STEP-DY
1010 CALL"RDOUT",MX(M)+XX+4,MY(M)+YY+4,VARADR(PP)
1020 IF PP<>0 THEN 1050
1030 CALL"STPLOT",MX(M),MY(M),VARADR(SP$),0:MX(M)=MX(M)+XX:MY(M)=MY(M)+YY:CALL"S
TPLOT",MX(M),MY(M),VARADR(M$),RD
1040 YY=2*-DY:XX=2*-DX:T=1
1050 NEXT YY,XX
1060 IF T=0 THEN MT(M)=1
1070 FOR Q=0 TO NM: IF MT(Q)=0 THEN Q=NM+3
1080 NEXT:IF Q<>NM+4 THEN 1250
1090 M=M+1+((NM+1)*(M=NM)):MT(M)=0:GOTO 640
1100 REM YOU'VE BEEN GOT
1110 :
1120 CALL"STPLOT",MX(M),MY(M),VARADR(SP$),0:CALL"STPLOT",HX,HY,VARADR(SP$),0:CAL
L"STPLOT",HX,HY,VARADR(M$),RD
1130 NM=NM-1-(NM=1)
1140 FOR T=0 TO 10
1150 PUT27,64,100,4,65,7
1160 PUT27,64,20,4,65,7
1170 CALL"COLOUR",RD,T*25
1180 NEXT
1190 IF GET(0)<>0 THEN 1190
1200 ?"ANOTHER GO (Y/N) ?":G$=GET$():IF G$="N" OR G$="n" THEN 1230
1210 TT=0
1220 GOTO 300
1230 TEXT
1240 GOTO 1320
1250 REM YOU GOT 'EM
1260 :
1270 NM=NM+1:FOR T=0 TO NM:MT(T)=0:NEXT
1280 FOR T=0 TO 5
1290 FOR D=250 TO 10 STEP-10
1300 PUT27,64,D,2,65,7:NEXTD,T
1310 GOTO 1200
1320 CALL"CLEAR":END
1330 :
1340 :
1350 REM SET UP GRAPHICS STUFF
1360 :
1370 TEXT:PUT12:CALL"RESOLUTION",0,2
1380 A$="MONSTERS"
1390 CALL"CHARSIZE",4,4
1400 CALL"COLOUR",3,0
1410 CALL"STPLOT",20,150,VARADR(A$),3
1420 CALL"DEFCHAR",0,36,21,77,105,58,28,24,24
1430 T$=CHR$(0)
1440 CALL"DEFCHAR",1,28,28,72,126,27,120,78,194
1450 H$=CHR$(1)
1460 CALL"DEFCHAR",2,0,60,94,111,113,113,49,31
1470 B$=CHR$(2)
1480 CALL"DEFCHAR",3,68,170,16,124,214,124,40,108
1490 M$=CHR$(3)
1500 CALL"DEFCHAR",4,255,255,255,255,255,255,255,255
1510 SP$=CHR$(4)
1520 GN=2:BU=3:RD=1
1530 CALL"STPLOT",60,30,VARADR(M$),GN
1540 CALL"STPLOT",180,50,VARADR(M$),GN
1550 CALL"STPLOT",120,50,VARADR(H$),RD
1560 FOR T=0 TO 255:CALL"COLOUR",3,T:NEXT
```

PROGRAM FILE

```
1570 PUT12,"PRESS 'H' FOR HELP OR ANY KEY TO START"
1580 PLOT14,35,"An Epic by P.Ramsden"
1590 G=GET():IF G=ASC("H") OR G=ASC("h") THEN GOSUB 1620
1600 CALL"CHARSIZE",1,1
1610 RETURN
1620 REM INSTRUCTIONS (TELL 'EM WHAT TO DO)
1630 :
1640 CALL"CLEAR"
1650 PUT31
1660 ?TAB(12);"JUNGLE!"
1670 ?TAB(12);"======="
1680 ?:?:?"You are a brave adventurer in a jungle"
1690 ?"clearing. You are suddenly aware of eyes"
1700 ?"staring at you from behind the rocks  "
1710 ?"strewn around the clearing. Then with a"
1720 ?"spine-chilling scream the monsters leap"
1730 ?"out and come after you!"
1740 ?:?"You find that you are able to push the"
1750 ?"rocks around and are able to make traps."
1760 ?:?"If you are clever you might be able to "
1770 ?"lure the beasts into the traps and    "
1780 ?"perhaps even manage to  squash them.  "
1790 ?"   -you'll be lucky!"
1800 ?:?"Use the cursor/Function keys to move"
1810 ?:?"PRESS ANY KEY TO CONTINUE":G=GET()
1820 PUT31
1830 ?"Do you wish to re-define the movement   keys ? (Y/N)"
1840 G$=GET$():IF G$<>"Y" AND G$<>"y" THEN GOTO 1900
1850 ?"Press the key for UP ":UP=GET()
1860 ?"Press the key for DOWN  ":DN=GET()
1870 ?"Press the key for RIGHT ":RT=GET()
1880 ?"Press the key for LEFT  ":LT=GET()
1890 ?:?"OK. Thanks. The diagonals are still on  keys F1 to F4."
1900 ?:?"Are you using a black & white monitor   (Y/N)"
1910 BW=0
1920 G$=GET$():IF G$<>"Y" AND G$<>"y" THEN GOTO1940
1930 BW=1:CALL"COLOUR",1,255:CALL"COLOUR",3,128
1940 PUT31:RETURN
```

Atari Multi-Mode Text

by Garry Whittaker

Much has been written about the problems of getting text onto a graphics screen with Atari home computers, but most of the solutions have relied on large amounts of data statements to define the character set in terms of plot positions, and virtually all have offered text in only one graphics mode. This short utility allows you to print text in any graphics mode.

The first listing is the actual machine code routine and should be saved before running. There is a checksum, so if upon running you receive the message 'You have a data error', correct the error in the data statements and re-run. The second listing is a demonstration of how to use the program.

As well as printing text on a graphics screen, the second listing also shows how the program can be used to obtain the following effects:

1 Printing text at any pixel on the screen.
2 Smooth pixel scrolling of a single character (good for animation).
3 Different sizes and textures of text. Produced by varying the internal graphics registers.
4 Large text can be produced in graphics 0 by treating each character position as a pixel.
5 Multiple character sets can be displayed onscreen at the same time.

After correctly typing in and running listing one, type in the necessary lines of listing two for the demo.

```
100 REM NOTE THE REMARKS IN THIS PROG.
        MAKE IT LOOK LONG & DIFFICULT,
        IT IS NOT! THE ACTUAL ROUTINE
110 REM IS SHORT AND EASY TO USE IN
        YOUR OWN PROGRAMS - WHILE AT
        THE SAME TIME BEING A VERY
120 REM FLEXIBLE WAY OF DISPLAYING
        TEXT ON ANY ATARI GRAPHICS
        SCREEN - DO NOT BE AFRAID TO
130 REM EXPERIMENT
140 REM
150 REM  MULTI-MODE  | BY
160 REM  ATARI       |
170 REM  GRAPHICS    | Garry. J.
180 REM  INDEPENDANT |
190 REM  CHARACTERS  |    Whittaker
200 REM
210 REM  *******ALL GRAPHIC MODE*****
                TEXT DISPLAY
         *********DEMONSTRATION******
220 REM
230 GOSUB 520:REM INITIALISE MC$ -
                  MAGIC ROUTINE
240 CHSET=PEEK(756)*256:REM .........
  **CHARACTER SET POSITION DOES NOT ***
```

PROGRAM FILE

```
  **NEED TO START ON EVEN BOUNDARY  ***

250 CHWIDTH=8:REM CHARACTER WIDTH IN
                                 BITS

260 X=0:Y=0:REM X Y POSITION ONLY
                 LIMITED BY GR. MODE...

270 GRMODE=7:REM .......GRAPHICS MODE
- NOTE THIS IS ONLY INCLUDED AS A  -
REMINDER THAT GR. MODE NEEDS TO BE SET

280 INK=0:REM FOREGROUND COLOUR - USE
              THE SAME PARAMETER AS
              COLOR IN BASIC          .

290 PAPER=9:REM BACKGROUND COLOUR.....

300 TEXT$="Hello readers of ":REM ....
NOTE THAT AS THE FIRST CALL IS TO THE
WHOLE ROUTINE TEXT$ DOES NOT END IN ■
310 REM
320 REM ********ALL GRAPHIC MODE*****
                    TEXT DISPLAY
          **********TITLE PAGE********
330 REM THE FOLLOWING ROUTINE DISPLAYS
        THE MAGIC TITLE PAGE. NOTE USE
        OF INK,PAPER,TEXT$,X,Y,CHWIDTH

340 REM ALSO NOTE THE USE OF POKE 87,9
        TO FOOL THE OPERATING SYSTEM
        INTO THINKING IT IS IN GR.9
350 REM THE PATTERNED EFFECT IS DUE
        TO GR.9 ACCEPTING DATA FOR
        EACH POINT RATHER THAN JUST A
360 REM COLOUR FROM INK AND PAPER TRY
        CHANGING THESE PARAMETERS.....
370 GOSUB 690:X=A:INK=2:TEXT$="PCW■":G
OSUB 710:X=A:TEXT$="This is ■":GOSUB 7
10
380 X=A:INK=2:PAPER=3:TEXT$="20■":GOSU
B 710:X=A:INK=2:PAPER=1:TEXT$=" Char/L
ine■":GOSUB 710
390 Y=8:FOR X=25 TO 80 STEP 1:Y=Y+1:PA
PER=X-19:INK=PAPER-2:TEXT$="MAGIC■":GO
SUB 710:NEXT X
400 FOR Y=64 TO 58 STEP -1:PAPER=Y-56:
INK=PAPER-2:X=X+1:GOSUB 710:NEXT Y
410 Y=8:FOR X=80 TO 25 STEP -1:Y=Y+1:P
APER=X-19:INK=PAPER-2:TEXT$="MAGIC■":G
OSUB 710:NEXT X
420 X=17:Y=35:POKE 87,9:GOSUB 710:REM
YOU CAN STILL FOOL THE OPERATING SYSTE
M WITH POKE 87,GRAPHICS MODE
430 ? "PRESS ANY KEY TO CONTINUE"
440 POKE 764,255
450 IF PEEK(764)=255 THEN 450
460 GRAPHICS 8:X=8:Y=0:INK=255:PAPER=3
2:TEXT$="Multimode Atari Graphics Inde
pendant■"
470 FOR CHWIDTH=3 TO 8:GOSUB 710:NEXT
CHWIDTH:REM YOU CAN VARY THE WIDTH IN
BITS OF THE CHARACTERS
480 CHWIDTH=7:TEXT$="CHARACTERS■":X=8:
Y=Y+10:GOSUB 710:POKE 87,7:X=4:GOSUB 7
10:X=2:POKE 87,9:GOSUB 710
490 END
500 REM THE FOLLOWING CODE IS WHAT
        ACTUALLY DOES THE WORK I WOULD
        SUGGEST YOU LIST IT TO CASSTTE

510 REM OR DISK FOR INCLUSION IN YOUR
        OWN PROGRAMS
520 REM ********ALL GRAPHIC MODE*****
                    TEXT DISPLAY
          **********INITIALISE********
530 REM
540 DIM MC$(210),TEXT$(256)
550 MC$="hh,■h,■hh,■h,■h,■hh,■h,■h,■hh
```

PROGRAM FILE

```
560  MC$(LEN(MC$)+1)="P
570  MC$(LEN(MC$)+1)="
580  MC$(LEN(MC$)+1)="
590  GOSUB 740
600  RETURN
610  REM
620  REM ******ALL GRAPHIC MODE*****
                TEXT DISPLAY
          ***********EXECUTE**********
630  REM
640  REM THE FOLLOWING CODE SHOULD BE
          CALLED TO EXECUTE MAGIC - IT
          IS POSSIBLE TO BYPASS THE 1ST
650  REM TWO LINES BY SETTING GRAPHICS
          MODE & PUTTING A CTRL 2 "B" ON
          THE END OF TEXT$ BEFORE GOSUB
660  REM NOTE-PARAMETERS IN USR CALL
          ARE : MC$-MAGIC CODE STRING,
          X,Y-POSITION TO PRINT TEXT$,
670  REM CHSET - ADDRESS IN BYTES OF
          CHARACTER SET - NOTE DOES NOT
          NEED TO BE ON A PAGE BOUNDARY
680  REM CHWIDTH- CHARACTER WIDTH IN
          BYTES, INK-FOREGROUND & PAPER
          -BACKGROUND COLOUR

690  TEXT$(LEN(TEXT$)+1)="B"
700  GRAPHICS GRMODE
710  A=USR(ADR(MC$),X,Y,CHSET,CHWIDTH,A
DR(TEXT$),INK,PAPER)
720  RETURN
730  REM ******ALL GRAPHIC MODE*****
                TEXT DISPLAY
          ********USE CORRECT OS CALL*****
740  SD=PEEK(58390)+PEEK(58391)*256+1
750  SDH=INT(SD/256):SDL=SD-SDH*256
760  MC$(156,156)=CHR$(SDL):MC$(157,157
)=CHR$(SDH)
770  RETURN
```

BBC Smooth Scroller

by Andrew Thomas

You may have seen, in some of the commercial software available for the BBC Model B, text scrolling across the screen. One way to do this is to use the commands MID$ and LEFT$, but the text scrolls at a jerky eight pixels or one character at a time. This short utility moves text or graphics across the screen in mode two at a much smoother two pixels at a time.

The first few lines of the program give an example of how the routine scroll can be called for use within any program. For those who want the technicalities, lines 180 to 270 do the actual scrolling. It works by getting an address in &78,&79, adding on eight and then storing in &74,&75. The character block in &74,&75 is then shifted left into &70,&71, and the two addresses are incremented by eight until the end of the line is reached.

If you have OS 0.10 you will have to remove line 300. This is the equivalent of the Basic command *FX 19, which waits until the start of the sync to produce smoother graphics and scrolling.

```
>L.
 10REM ****     138 West Street,
 20REM ****     Marlow,
 30REM ****     Bucks.
 40REM ****     SL7 2BU
 50REM ****     Tel: MARLOW 74745
 60REM ****     ANDREW THOMAS
 70REM ****     Machine:BBC 32K
```

PROGRAM FILE

```
 80REM ****      Model B
 90REM ****      1.00 O.S. or above
100REM **** Smooth Scrolling text,in Mode 2 ****
110REM **** (C) Copyright A.J.Thomas 1984 ****
120MODE2
130VDU23;10,32,0;0;0;23,224,66,36,255,153,189,231,90,195
140DIM TEXT 255
150$TEXT="This is an example of smooth scrolling in mode
    2.It could be used for titles in games, or for scrolling
    little   characters "+CHR$224+CHR$224+CHR$224+"
    What ever you wish!  "+CHR$224+"    "+CHR$224+"
160?&80=0:?&81=0
170PROCASS:COLOUR2:PRINTTAB(0,4);
"You may use the    'scroll' routine in your programs."
180COLOUR1
190CALLmain
200COLOUR7
210END
220DEFPROCASS
230DIM CODE 200
240FORI%=0TO2STEP2
250P%=CODE
260[OPTI%
270.scroll LDA£0:STA&78:LDA&7C:STA&70:LDA&7D:
    STA&71:LDA&7C:CLC:ADC£8:STA&74:LDA&7D:
    ADC£0:STA&75:LDY£0

280.scloop
290LDA(&74),Y:STA(&70),Y
300INY:CPY£8:BNE scloop
310LDY£0
320LDA&70:CLC:ADC£8:STA&70:LDA&71:ADC£0:STA&71
330LDA&74:CLC:ADC£8:STA&74:LDA&75:ADC£0:STA&75
340INC&78
350LDA&78:CMP£80:BNEscloop
360RTS
370.getnums JSRcheck:.gnloop
380LDA£&0:STA&7C:LDA£&5D:STA&7D:JSRscroll
390LDA£19:JSR&FFF4
400RTS
410.ptext
420LDX&80
430LDA£31:JSR&FFEE:LDA£19:
    JSR&FFEE:LDA£18:JSR&FFEE
440LDA TEXT,X:JSR&FFEE
450INC&80:LDA£0:STA&81
460RTS:.check INC&81:LDA&81:CMP£4:BEQptext
470RTS
480.main
490JSRgetnums
500LDA£167:CMP&80:BNEmain
510RTS:]
520NEXT
530ENDPROC
```

BBC Anti-List Utility

by Daniel Greenspan

This is a short but powerful utility for the BBC Micro; it will protect any Basic

PROGRAM FILE

program from being listed.

Instructions

1 Type in and run the program with a blank tape or disk installed.
2 Load the program to be protected.
3 If using tape rewind and press PLAY.
4 SAVE your program in the normal program.
5 List your program.

```
10 REM **PROTECTION UTILITY**
20 *SPOOL PRTEC
30 PRINT "REN. 20,20"
40 FOR I=10 TO 4000 STEP 20
50 PRINT;I;"REM !!!!"
60 NEXT I
70 FOR I=1 TO 100:X=RND(4000)
80 IF X MOD 10 = 0 THEN NEXT I
90 PRINT;X;"REM !!!!"
100 IF I<90 THEN NEXT I
110 PRINT "FOR I=PAGE TO TOP:IF
    ?I=33 AND I?1=33 AND I?2=33
    AND I?3=33 THEN
    ?I=6:I?1=7:I?2=
    12:I?3=21:N. I:ELSE: N.I"
120 PRINT "20000REM!!!!"
130 PRINT "FOR I=PAGE TO TOP:IF
    ?I=33 AND I?1=33 AND I?2=33
    AND I?3=33 THEN ?I=6:I?1=7:
    I?2=12:I?3=6:N. I:ELSE: N.I"
140 PRINT "REN."
150 *SPOOL
```

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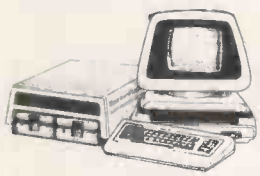

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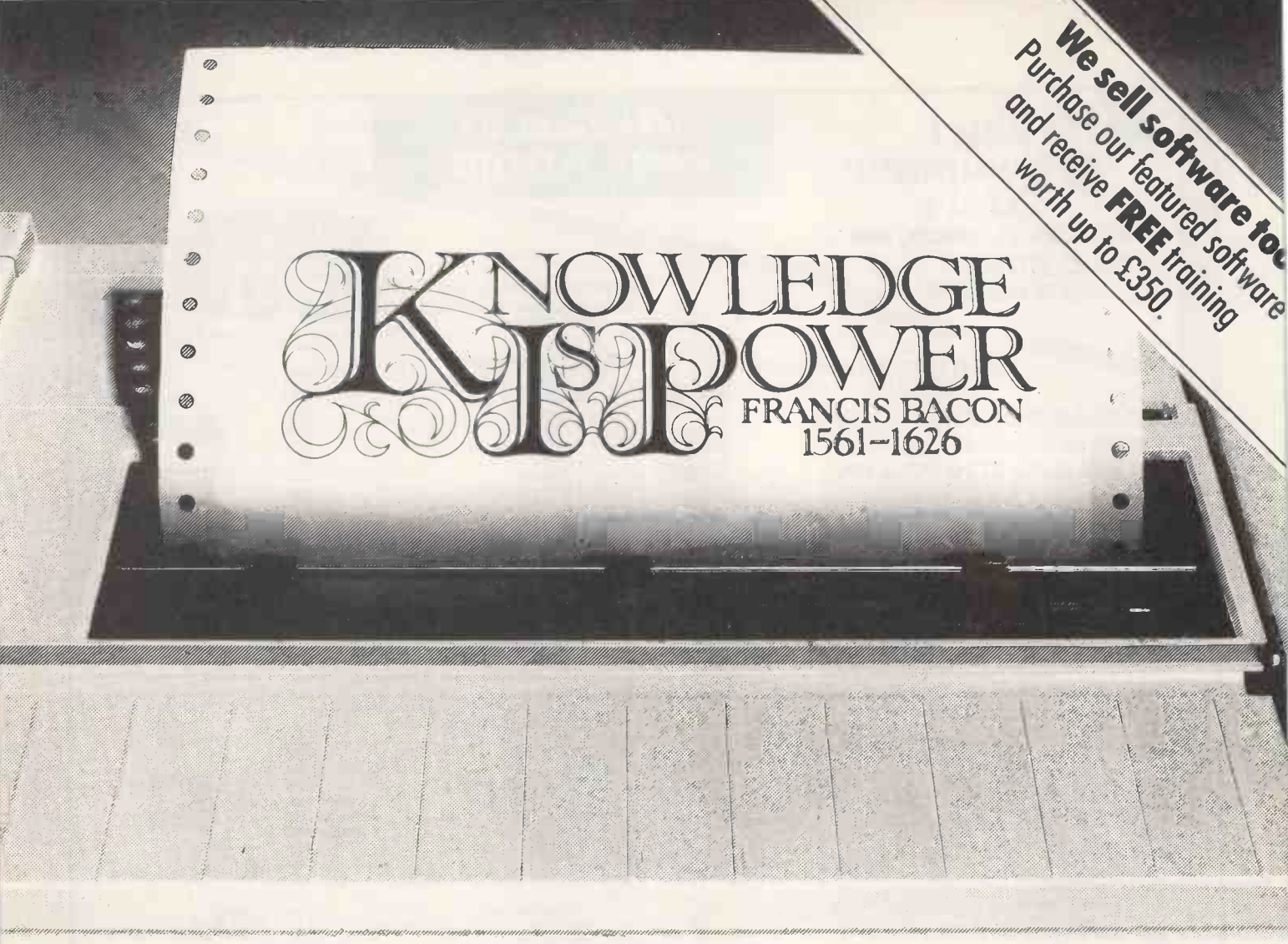

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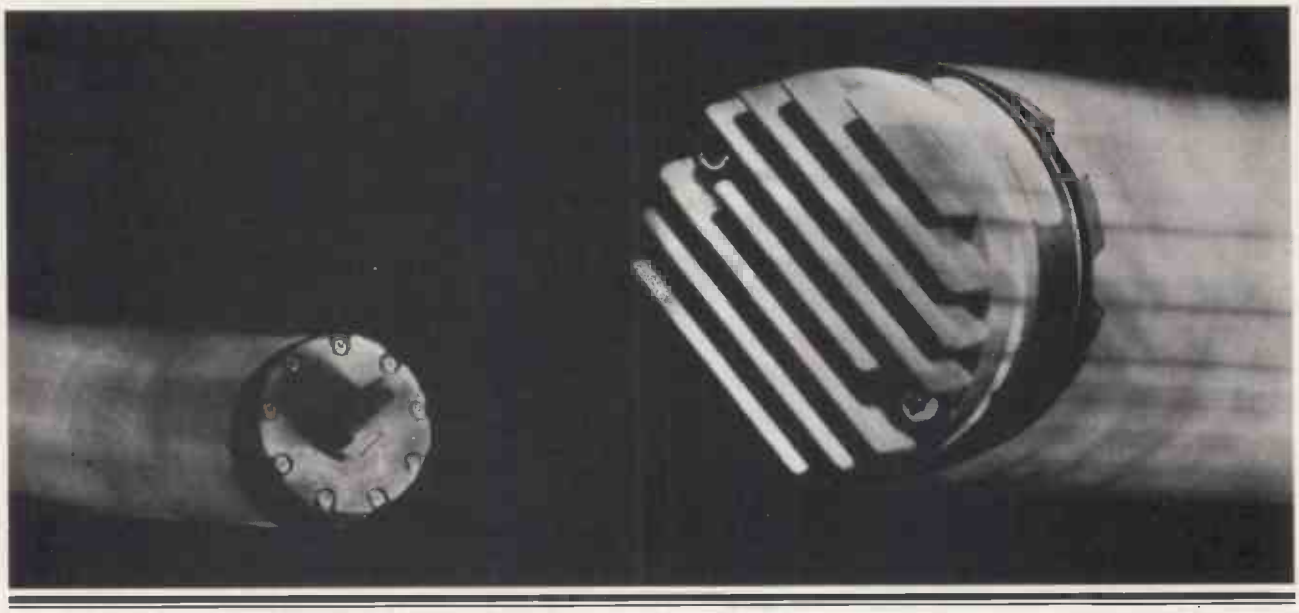

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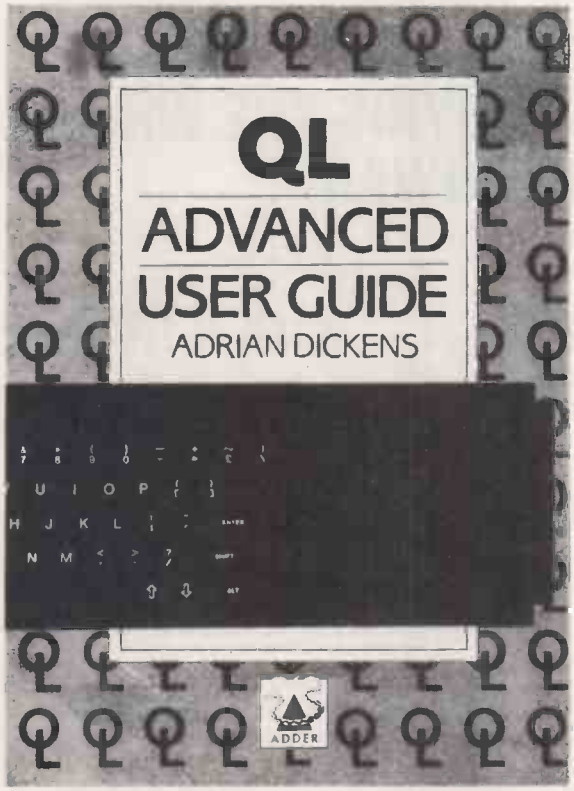

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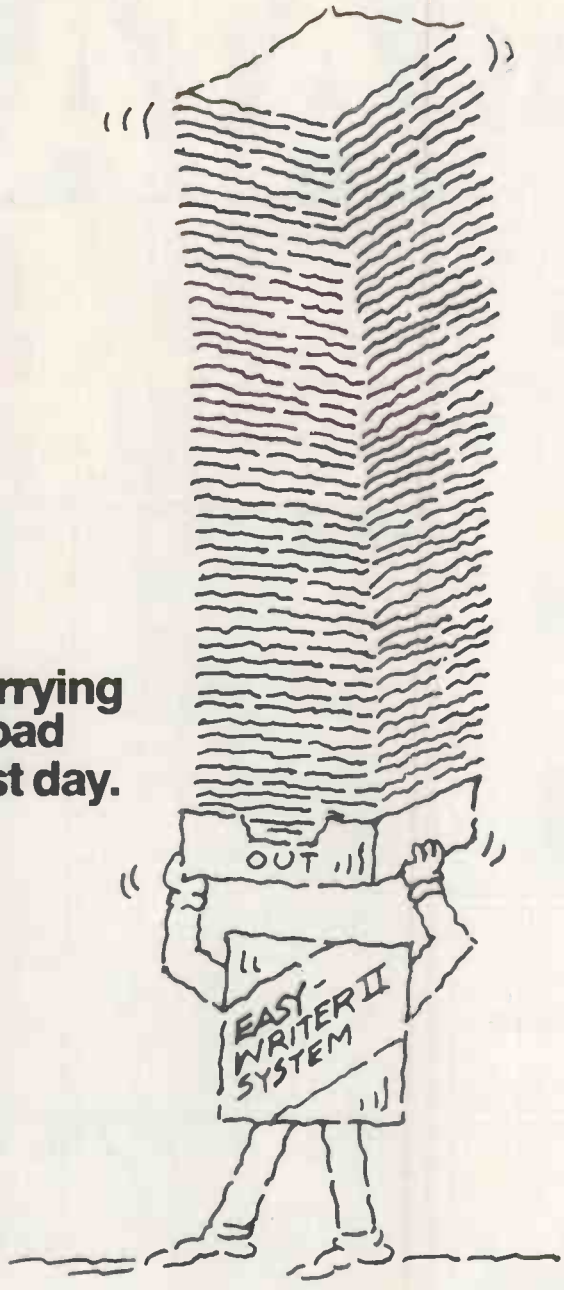

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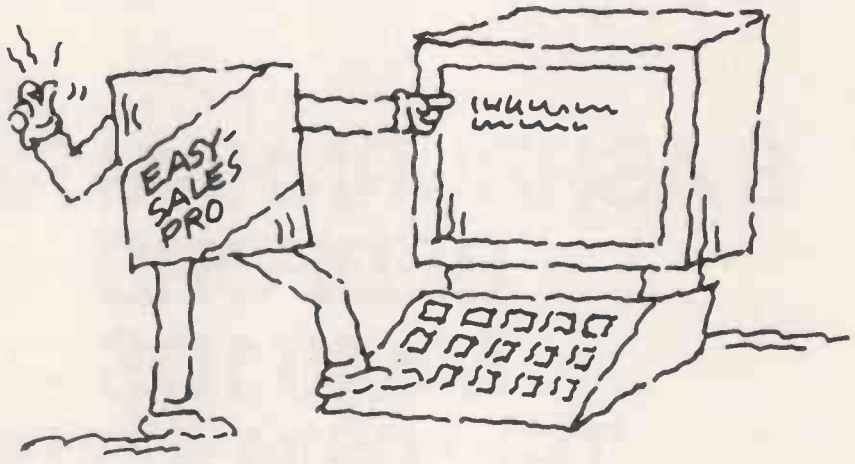

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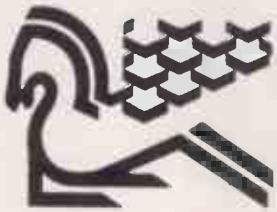

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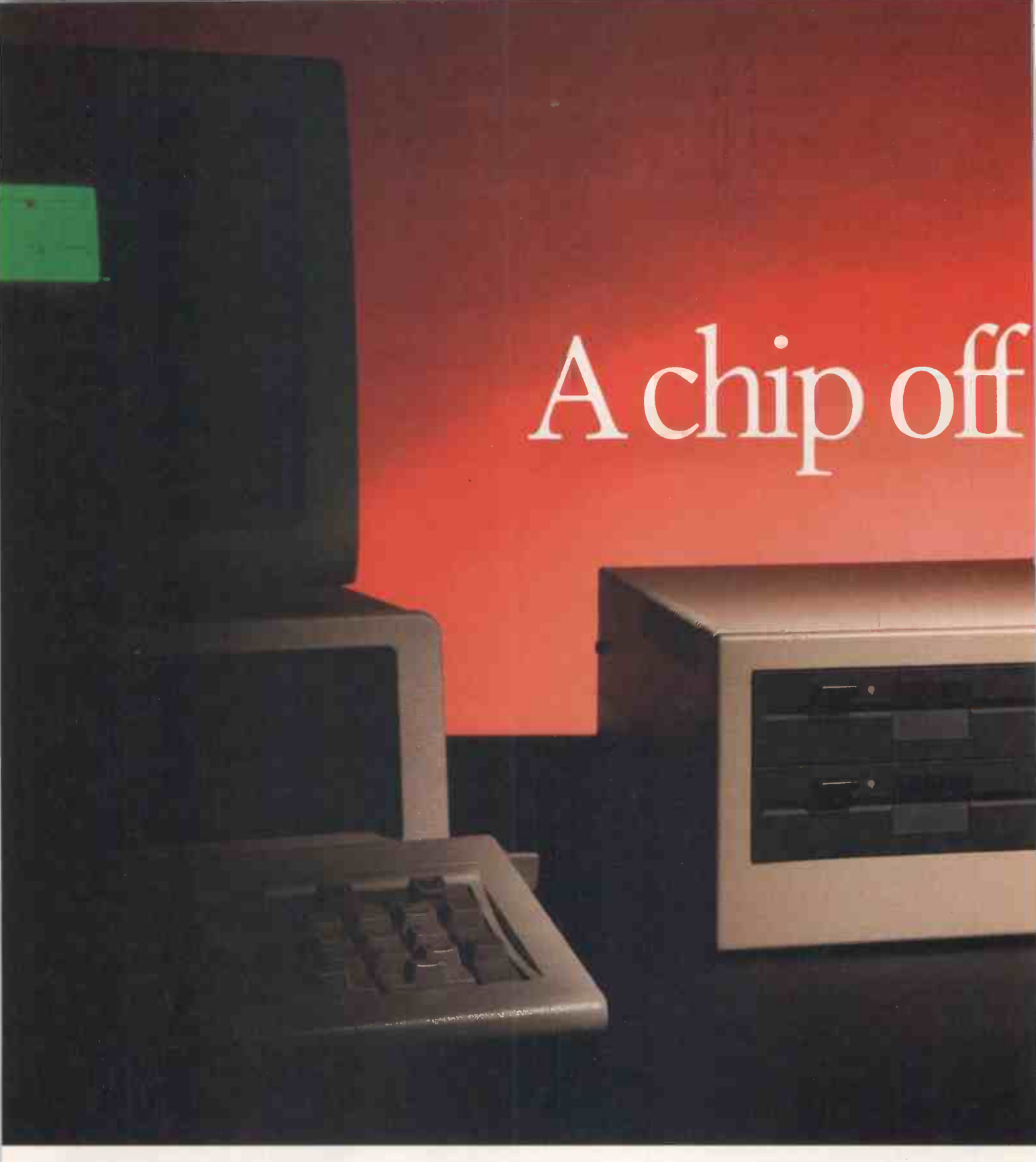

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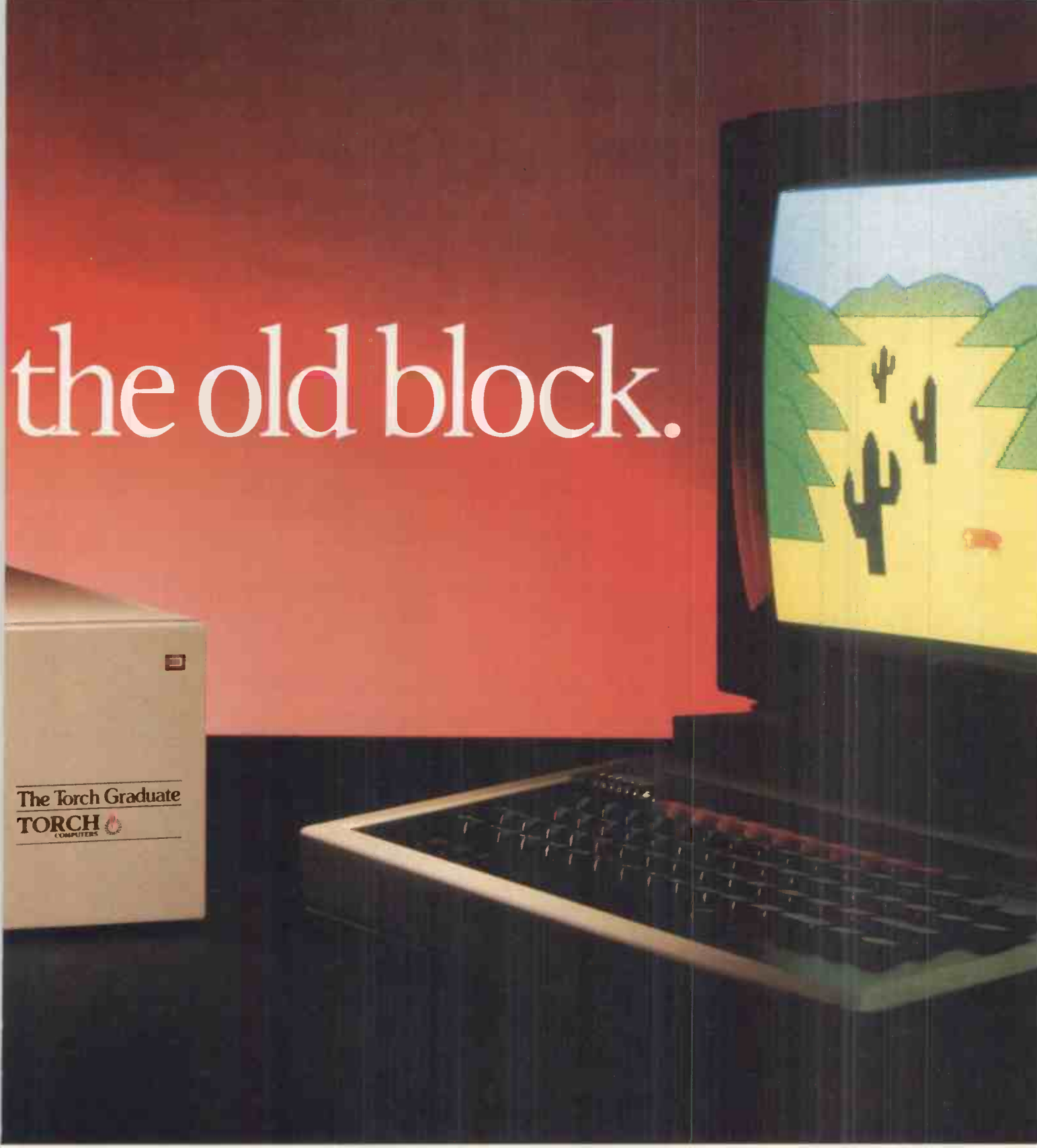

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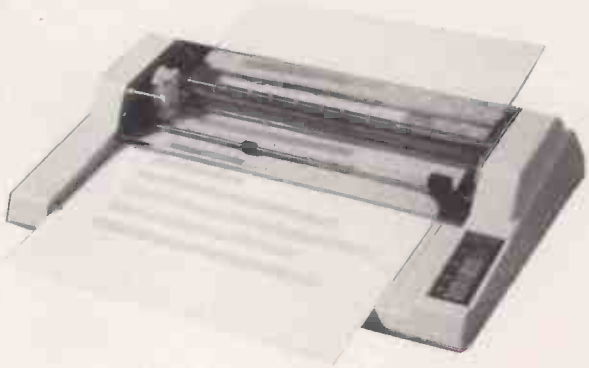

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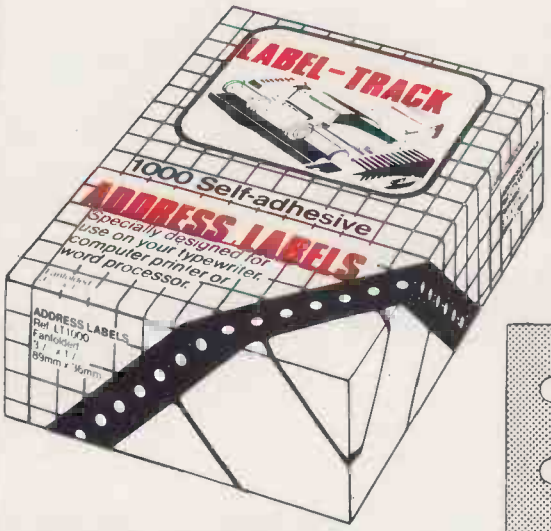

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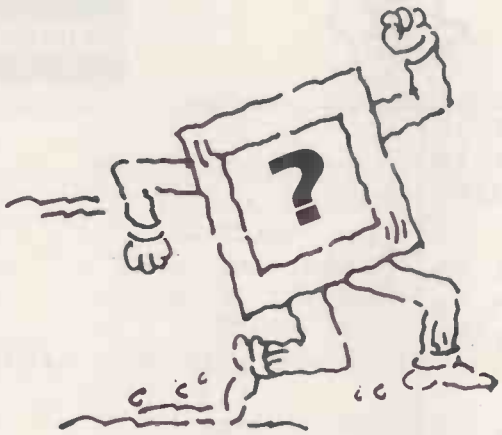

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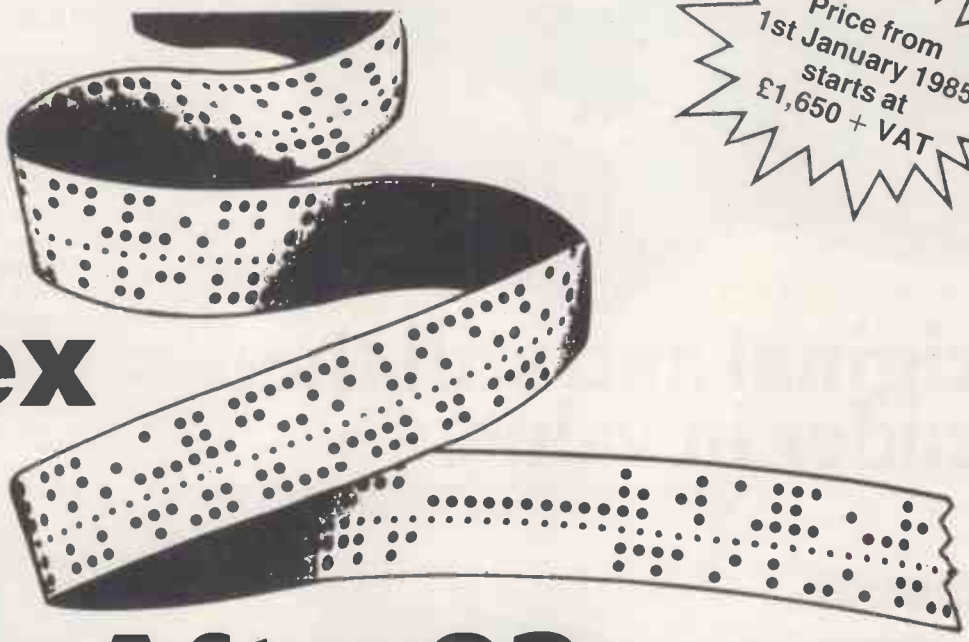

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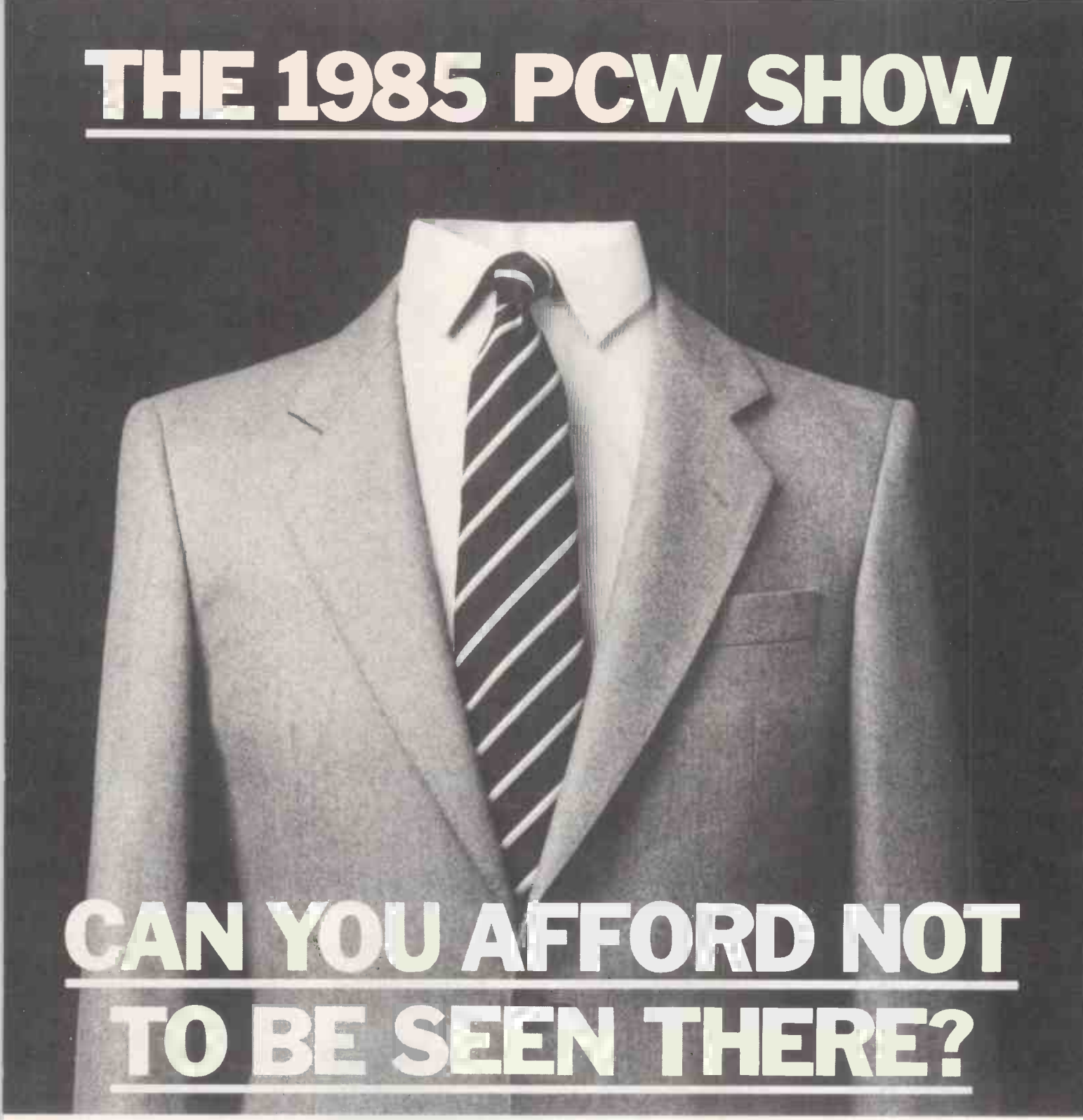

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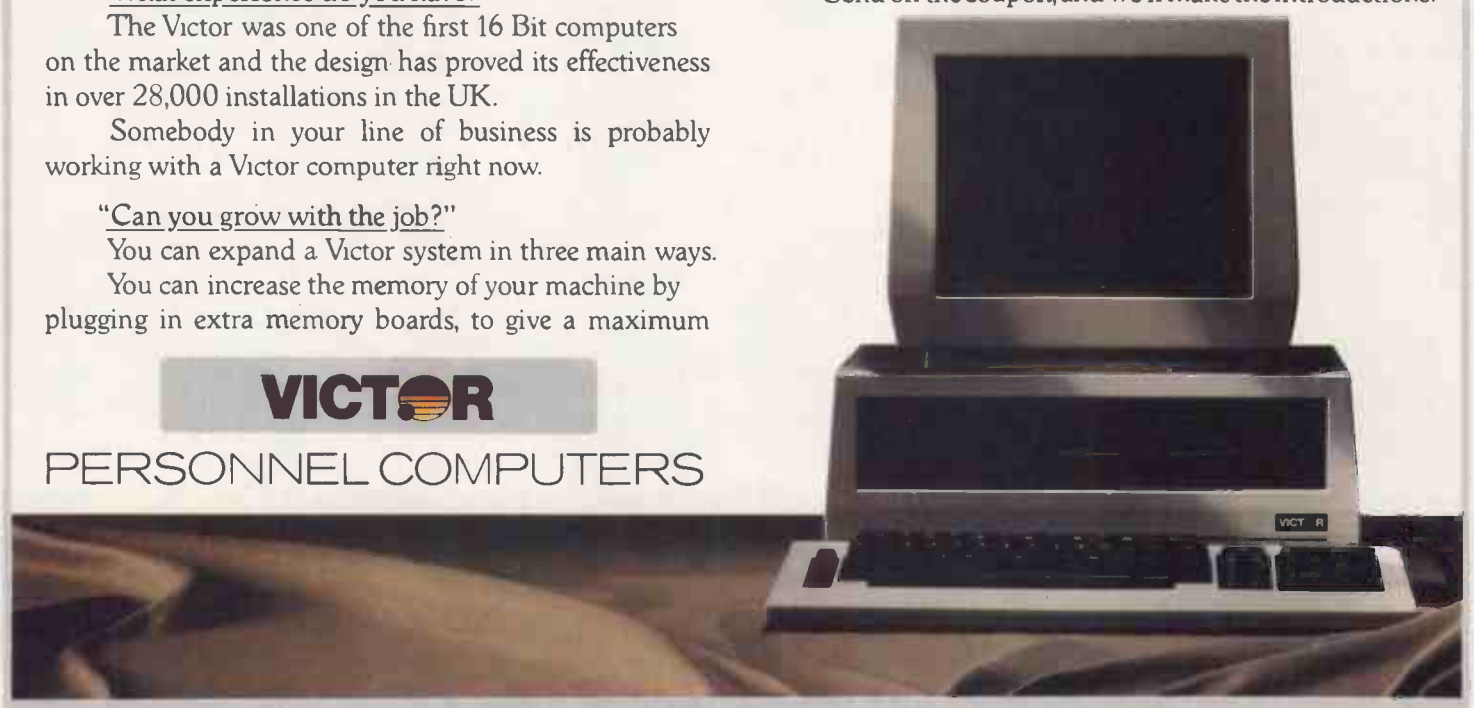

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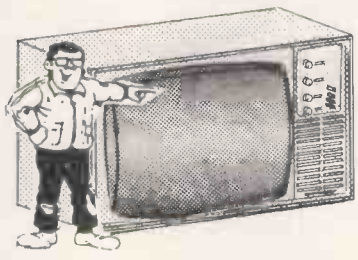

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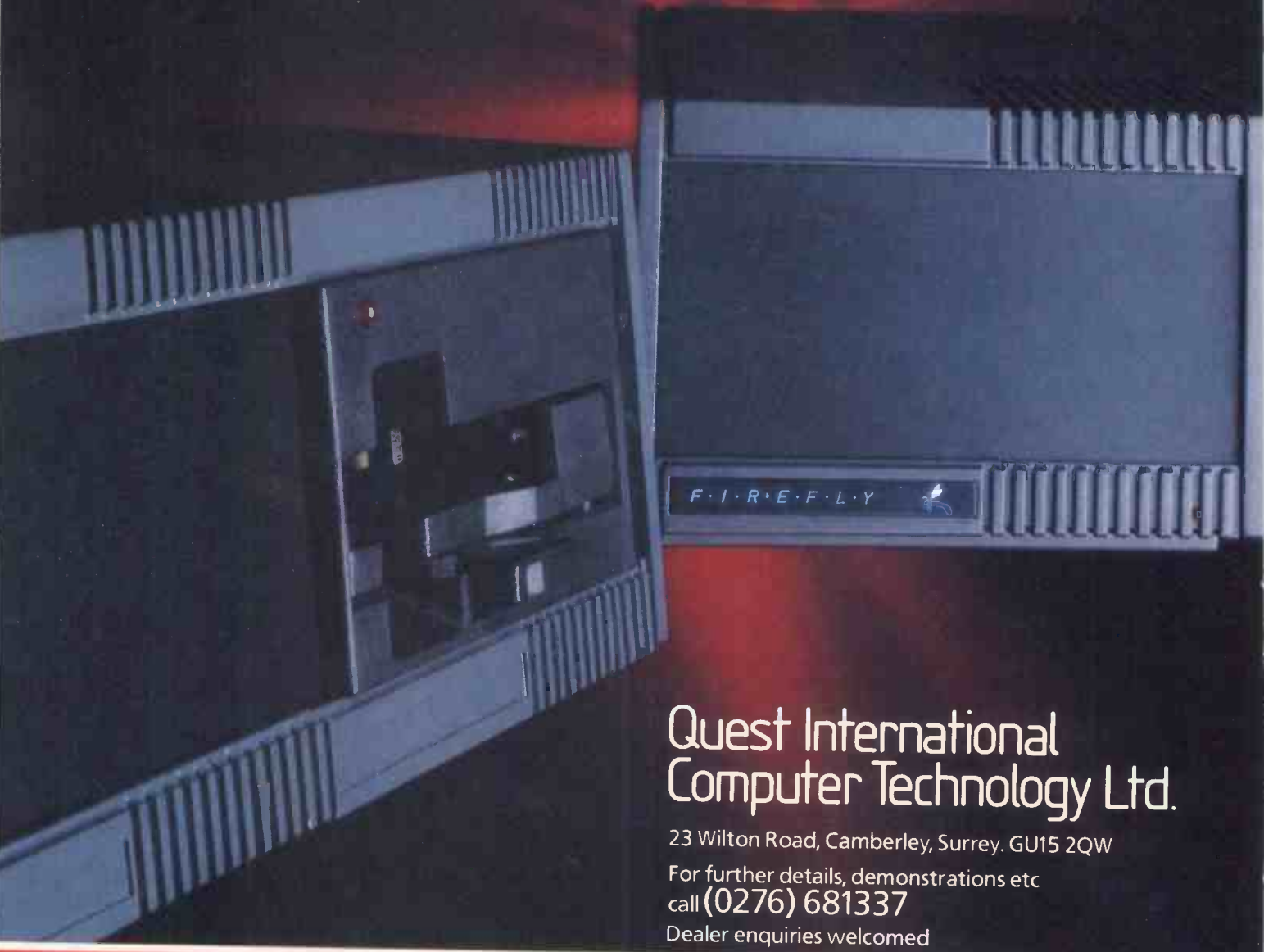

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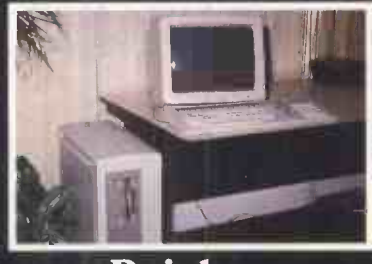

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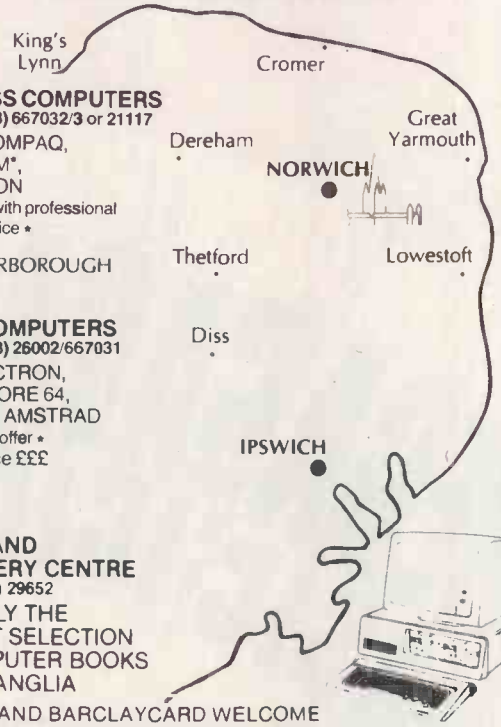

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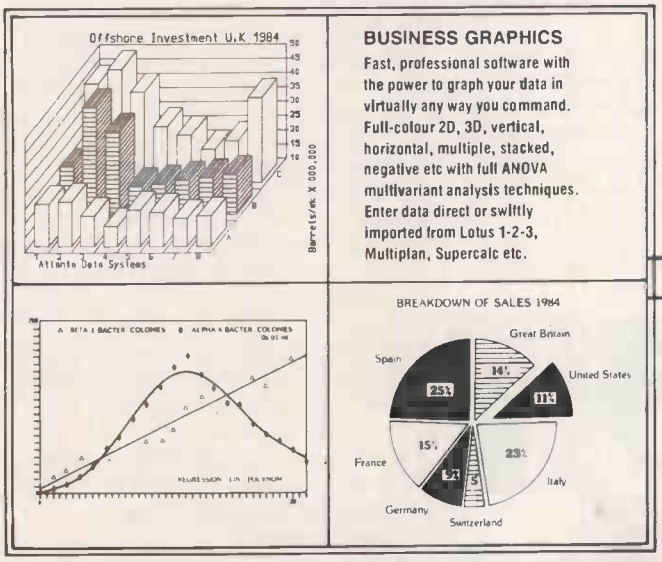

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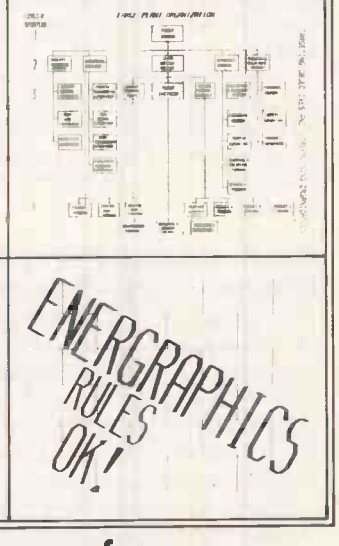

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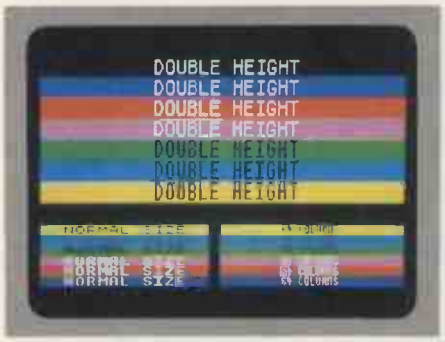

Here, *YS MegaBasic* is showing off its multifarious character sizes and fonts. Each window contains text in three different sizes: double height, normal height and that used for 64-columns; double height and standard text can be output in three different fonts.

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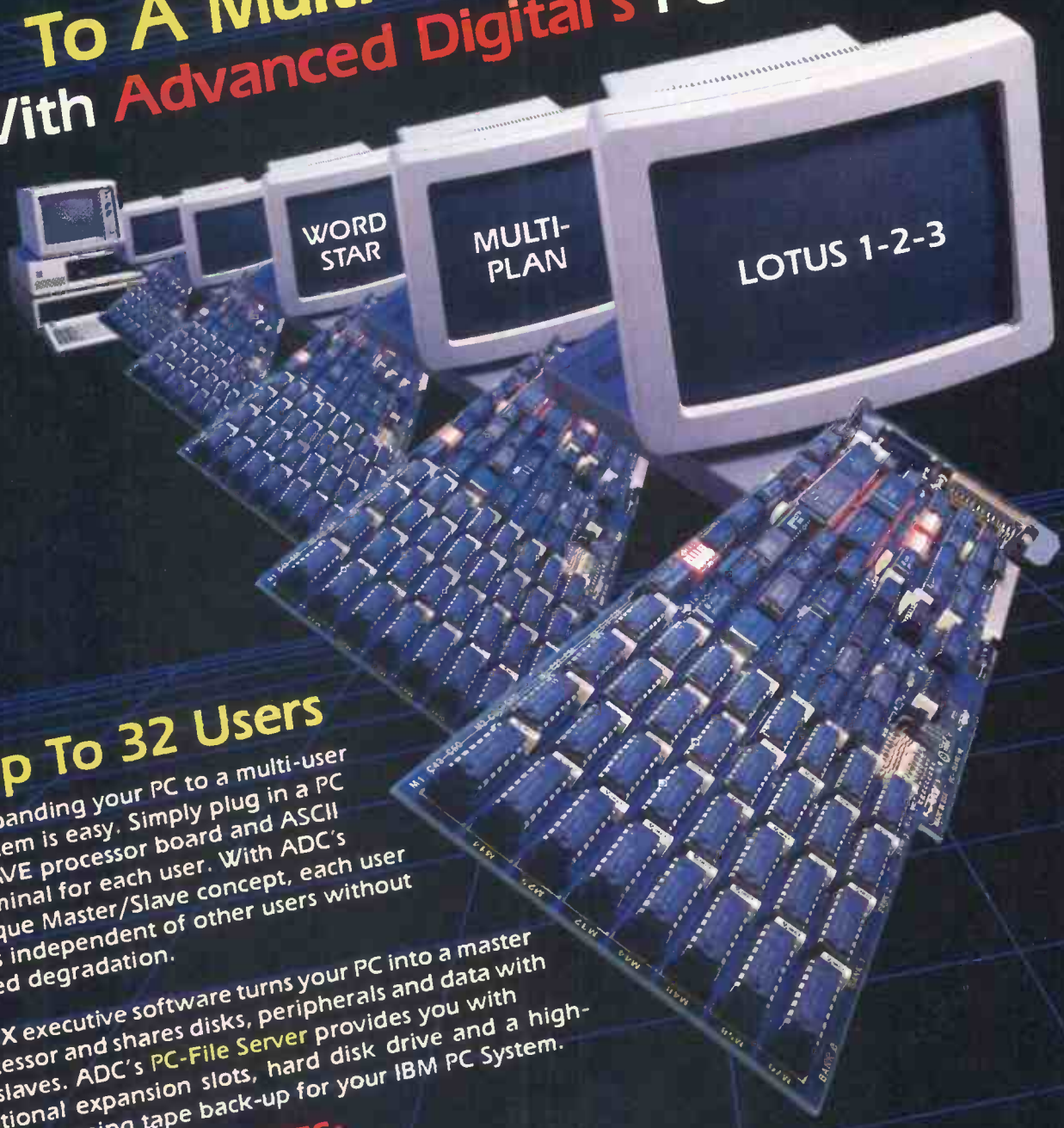

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CHIP CHAT

It's a man's life in micro manufacturing: Chris Curry's birthday celebrations are likely to be quieter this year than last when guests at the Curry mansion had an eventful time. Their meal was eaten to the accompaniment of various ghost noises, slime seeping through the floorboards and collapsing curtains. Those who made it through to the last course were relieved to find that the 'ghosts' had in fact been hired for the evening. All this was mild stuff compared to the Acorn boss's original idea — he wanted a squad of SAS-style troopers to come bursting in through the windows.

Many happy returns: Clive Sinclair got into the spirit of Christmas by pursuing Chris Curry round various Cambridge pubs. Tempers, newspapers — and in some reports even fists — were raised in anger as the two disagreed about their respective machines' reliability. An irate Sir Clive is the last person we want to meet in our local — but we have to point out that the blurb on one game we received recently says, 'to achieve reliable microdrive operation, please format each new microdrive cartridge at least 20 times before use.'

Trigger happy: not to be outdone, Commodore made its own contribution to capturing the true spirit of Christmas. It sent out a card depicting the three wise men and the Star of David. To add a touch of spice, one of the wise men was shown zapping the Star.

Frosty: Atari's gesture of goodwill was similarly in tune with the spirit of the times. The company reportedly laid off more than 200 people at its Irish video games factory before Christmas. Jack the knife in action. Still on the subject of Jack Tramiel, the new Atari machine previewed in this issue is seen as a rival to Apple's Macintosh — and has already been dubbed the 'Jacintosh'.

Three wheels on my wagon: the best aside we've heard about Sinclair's new car runs as follows: 'Guaranteed to get you there in less than 28 days'.

No hairs on them: Electronic Data Systems likes to get the important details right — such as insisting that its staff be clean-shaven. No details are available of what happens to staff who prefer to stick to their beards, although if you see any male faces covered with cotton wool sympathy might be in order.

It never rains, but it pours: a consoling thought for those who suffered through the cold January. The story goes that the plumbing in Clive Sinclair's London house burst, resulting in inappropriate waterfalls in all the wrong places. At least Sir Clive kept his sense of humour. He blamed the problem on low technology.

Acronym-happy: others with a sense of humour include software houses Quicksilva and Bug-Byte, who joined forces to announce their awards for the computer industry. The award for the 'Biggest United Liaison of Leading Suppliers of Hardware Innovative Technology' went to the MSX manufacturers.

Black marks: Amstrad's move into micros hasn't all been plain sailing. In fact the company keeps a black book with the names of all the people who haven't been helpful along the way, Micropro included. And Amstrad says that it has got WordStar running on its drives — with a little bit of tweaking of the software.

Enterprising: being privatised has obviously gone to British Telecom's head. It's selling its own version of ICL's OPD — called Tonto. If BT really thinks that Red Indians are the market of the future or that all businessmen see themselves as Lone Rangers in search of an assistant, now might be a wise time to sell those shares.

Time's up: the questionnaire in our January issue didn't impress one of our readers. He wrote to the market research company concerned to point out that if he answered all the questions he wouldn't have time to use his micro, make money, or read magazines — let alone breathe. As money was going to charity for all the questionnaires returned he decided to send in 10p instead.

END

Maureen the elephant's days as a TV star are over. Commodore came up with the bright idea of using Maureen to represent the 64's giant memory, but animal-lovers weren't impressed. Commodore insists that the RSPCA knew about the ad and let it go through — and that the campaign had run its course anyway. Either way it's back to the big top for Maureen.

This heart-warming scene is the latest advertisement for Winalot. At least we think it's for Winalot — it might well be for the micro featured, which is Sharp's MZ5600. The dogs look as puzzled as we are. Any suggestions as to what they might be thinking are welcome, and the best will win £10. Send your suggestions on the back of a postcard to ChipChat, PCW, 62 Oxford Street, London W1, to reach us by 28th March. Remember to include your name and address. And congratulations to Bob Smith in Norway for his December winner.

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Macintosh™ Centre

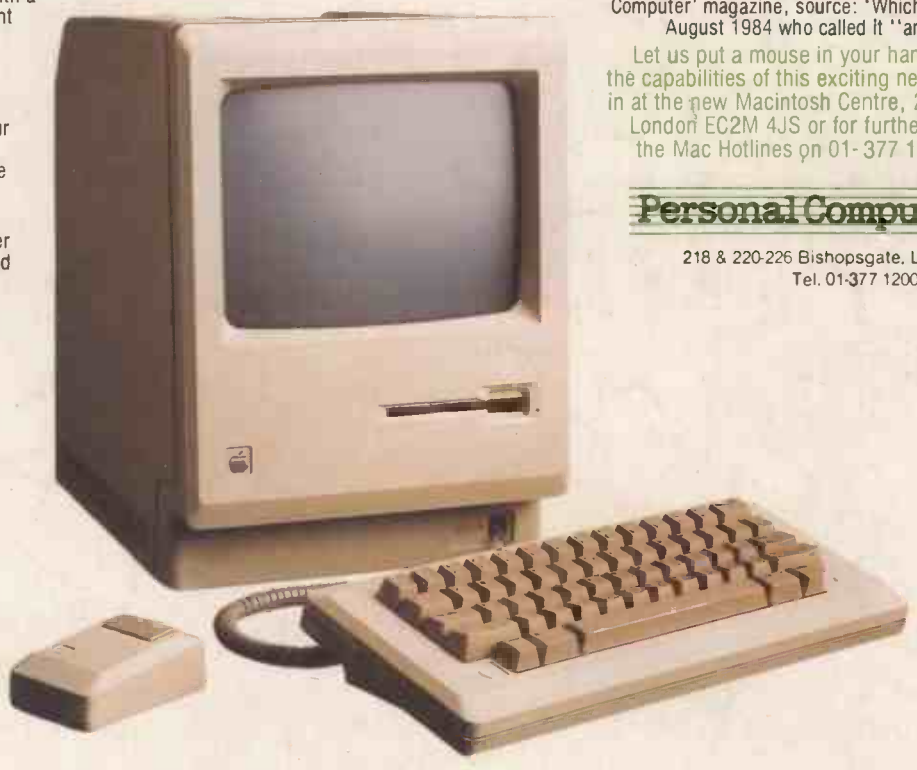
(first again)

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!

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