An Argus Specialist Publication

Computing today

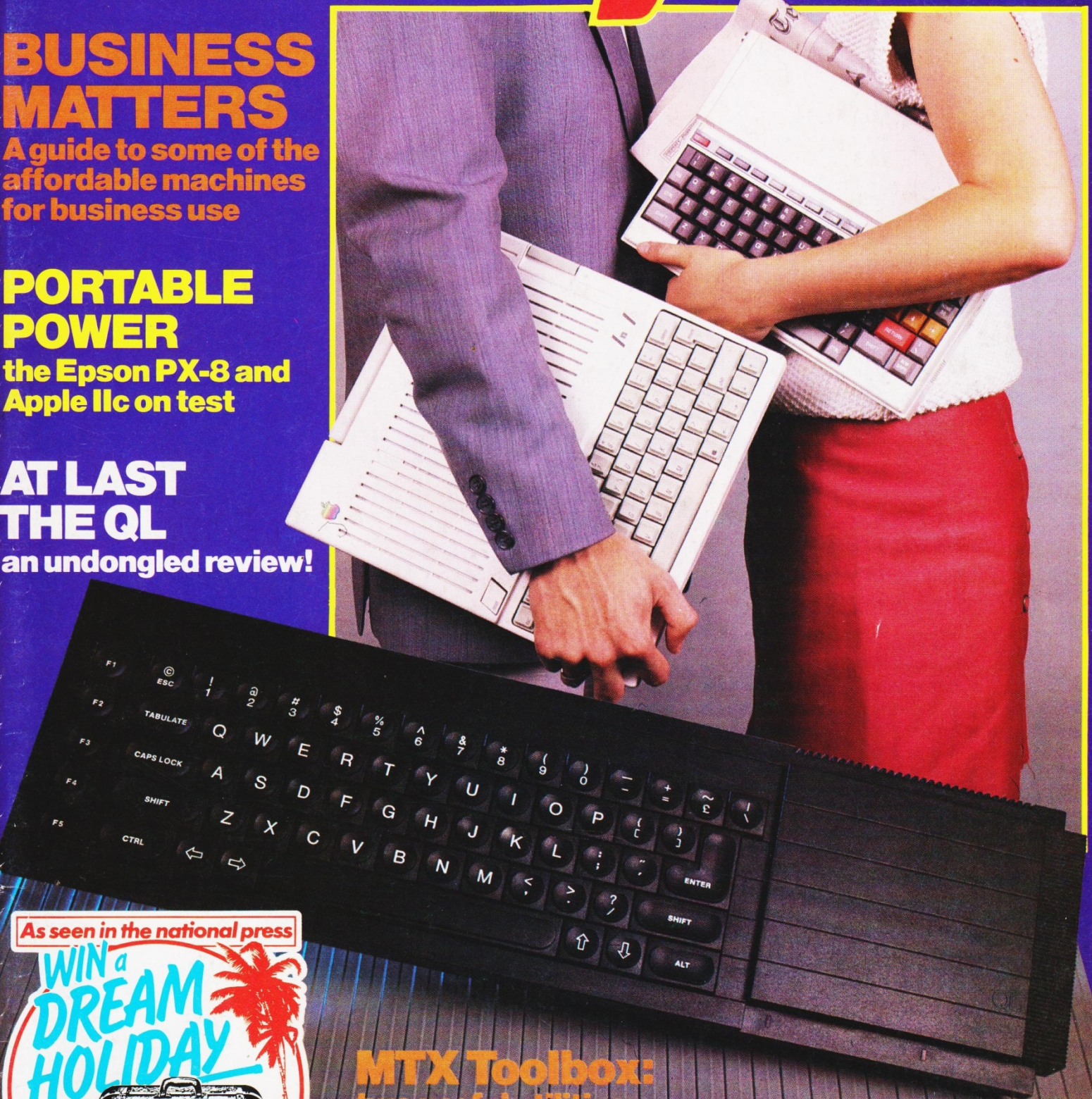
NOVEMBER 1984

90p

BUSINESS MATTERS
A guide to some of the affordable machines for business use

PORTABLE POWER
the Epson PX-8 and Apple IIc on test

AT LAST THE QL
an undongled review!



As seen in the national press
WIN a DREAM HOLIDAY
in our GREAT COMPETITION

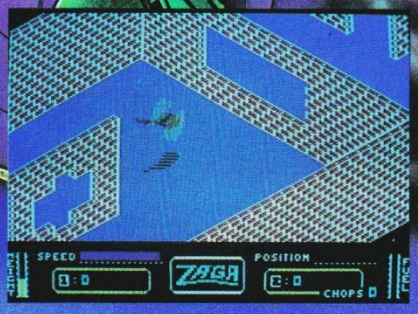
MTX Toolbox:
two useful utilities to type in

A Macreview
of the amazing Macintosh

ANIROG

ZAGA

MISSION



This diagonally scrolling maze game features superb 3D graphics brilliant sound effects and requires 100% concentration to successfully manoeuvre your helicopter through unknown hazards in order to complete Zaga Mission and live to play another day — Commodore 64 — £7.95

Also available on Disk at £9.95

TRADE ENQUIRIES: ANIROG SOFTWARE LTD. 29 WEST HILL DARTFORD KENT (0322) 92513/8
MAIL ORDER: 8 HIGH STREET HORLEY SURREY 24 HOUR CREDIT CARD SALES HORLEY (02934) 6083
PAYMENT BY CHEQUE P.O. ACCESS/VISA 50p POSTAGE & PACKAGING

Editor:
Peter Green

Editorial Assistant:
Fiona Eldridge

Advertisement Manager:
Malcolm Wynd

Advertisement Copy Control:
Sue Couchman,
Lynn Collis

Chairman:
Jim Connell

Origination by Design International.

ABC Member of the Audit Bureau of Circulation
ISSN 0142-7210

Computing Today is normally published on the second Friday in the month preceding cover date. Distributed by: Argus Press Sales & Distribution Ltd, 12-18 Paul Street, London EC2A 4JS. 01-247 8233. Printed by: Alabaster Passmore & Sons Ltd, Maidstone, Kent.

The contents of this publication including all articles, designs, plans, drawings and programs and all copyright and other intellectual property rights therein belong to Argus Specialist Publications Limited. All rights conferred by the Law of Copyright and other intellectual property rights and by virtue of international copyright conventions are specifically reserved to Argus Specialist Publications Limited and any reproduction requires the prior written consent of the Company. © 1984 Argus Specialist Publications Limited.

Subscription rates: UK £13.30 including postage. Airmail and other rates upon application to Computing Today Subscriptions Department, Infonet Ltd, Times House, 179 The Marlowes, Hemel Hempstead, Herts HP1 1BB. England. (phone 0442 48432).

Computing Today is constantly on the look-out for well written articles and programs. If you think that your efforts meet our standards, please feel free to submit your work to us for consideration.

Potential contributors are asked to take note of the points raised in our Program Submissions page, which can be found on page 14 of this issue.

CONTENTS

VOL 6 NO 5 NOVEMBER 1984

EDITORIAL & ADVERTISEMENT OFFICE
No. 1, Golden Square, London W1R 3AB.
Telephone 01-437 0626. Telex 8811896.

NEWS 4
What's happening in the world of computing? Turn the page to find out.

ANOTHER BITE OF THE APPLE 16
After stunning everyone with the Lisa and Macintosh, which took computing in a totally new direction, Apple have done another about-face and brought out the IIc, a portable computer in the traditional Apple mould. Here's our review.

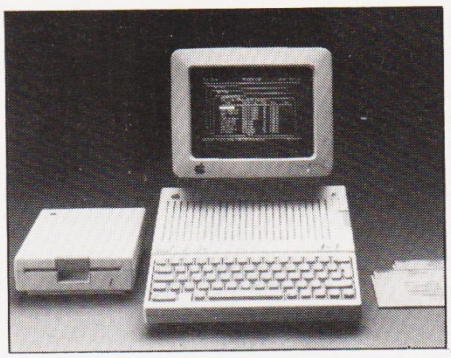
MEMORY MOVES 21
Shunting blocks of memory around can be very useful indeed — fast screen drawing, for example. This Z80 routine for the TRS-80 also stores and extracts hex code from BASIC REM statements, and can be adapted for other Microsoft-type BASICs.

LAPS OF MEMORY 29
Lap portables are advancing by leaps and bounds, and Epson's PX-8 is a notable addition to the genus. With swish styling and a host of features, it provides a CP/M system you can carry under your arm.

COMPETITION 34
Fancy a dream holiday? The Editor does, but he can't enter. Luckily that doesn't apply to you lot.

BUSINESS MATTERS 35
A 16-page guide to buying a business computer.

AT LAST THE QL 51
An unkludged one, that is. We finally got our hands on a QL that had all its electronics inside the case, and quickly passed it on to a reviewer (Sinclair only let us keep it a week!). Here's what he has to say.



OF MICE AND MACS 60
Almost as hard to obtain as a QL, our Macintosh was finally borrowed from an obliging shop rather than Apple. It made quite an impression in the office, but what did our more hard-headed reviewer think?

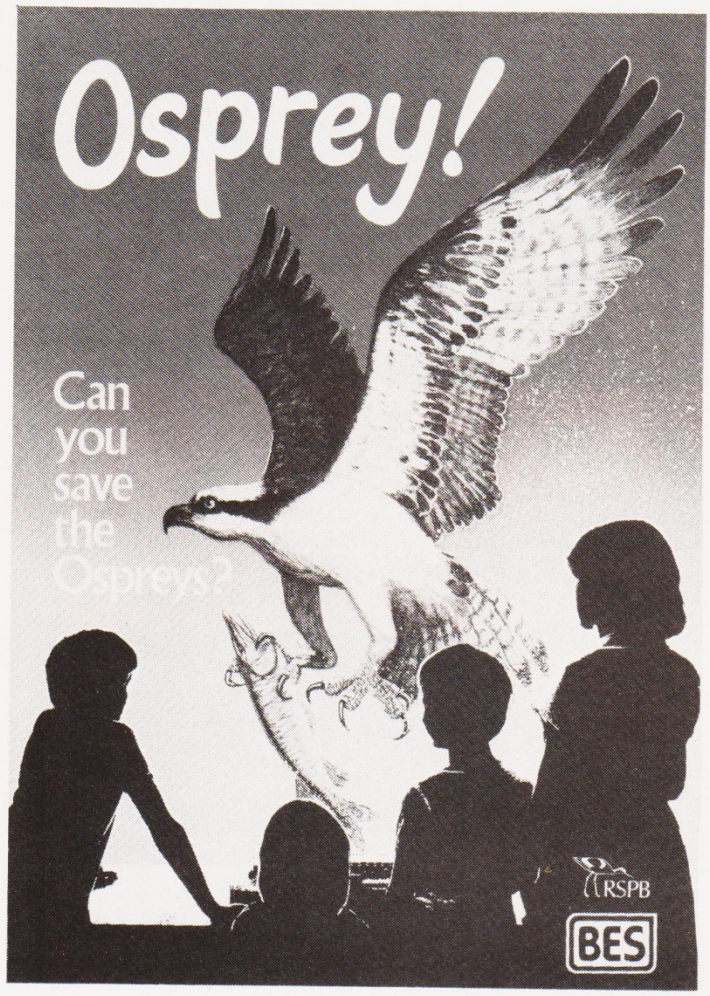
ATARI ANTICS PART 2 ... 66
Our concluding article looks at various animation techniques available on the Atari, from display list manipulation to colour rotation and player-missile graphics.

MTX TOOLBOX 73
A couple of useful utilities that will help MTX owners get more out of their machine (even when Newword crashes).

Shopping List 36
IBM PC 37
ACT Apricot 38
Apple IIc 41
Comparison chart 42
Macintosh 46
Osborne 48
Commodore SX-64 50

Next month's Computing Today 12
Submissions 14
Photocopies 32
Back numbers 58
Home Computing Weekly 59
Subscriptions 72
Binders 76
Microdealer 76
Computamart 80
Classified Ads 81
Advertisers' Index 82

NEWS



NOT GETTING THE BIRD?

Osprey! is the first release of a new series of 'Discovery' programs from Bourne Educational Software. While still being an us-against-them-type game, Osprey! has been developed in conjunction with the RSPB and it's hoped that it will stimulate interest in wildlife conservation.

In Osprey!, you are in charge of protecting the precariously small osprey population, using your wardens to defend the birds from egg-stealers, huntsmen and thoughtless tourists. The program comes complete with a fully illustrated 32 page booklet on the osprey and describes the hazards facing them when they returned to Scotland, where the game is set. There are 10 skill levels in the program and at the end of each season, you can check how successful you have been compared with the actual number of migrating ospreys recorded by the RSPB.

Osprey! is available for the BBC, and Electron and Amstrad CPC 464 at £9.95 and on disk at £11.95 (5¼") and £15.95 (3") for the BBC only. Further details from BES at Bourne House, The Hundred, Romsey, Hants SO5 8BY (phone 0794 523301).

MORE ON MSX

With the arrival of the 'season of mists and mellow fruitfulness' and still no MSX machines on the market as we go to press, the best we can offer is an update on the specifications of both the Sanyo and Toshiba machines. Sanyo's MSX machine, the MPC 100, will offer 10 function keys, full cursor control and a light pen facility and comes complete with a two metre length of television connection coax cable and a cassette lead with eight-pin DIN plug and three mini jack connectors. External connections to the MPC 100 include a 50 pin data connector, a Centronics parallel printer port and PAL composite video and audio outputs. A BASIC programming manual and MPC 100 operating manual will be included in the price of £299.95 and available add-ons will include a joystick and lightpen and cartridge adaptor, priced at £12.95 and £89.95 respectively. Further details from Sanyo Marubeni (UK) Ltd, 8 Greycaine Road, Greycaine Estate, Watford, Herts WD2 4QU (phone 0923 46363).

Toshiba's HX-10 also supports 16 colours for hi-res graphics but can also offer eight octaves and a triple chord facility to provide for every budding Vangelis. Toshiba also offer a range of peripherals, including joysticks and a 105 cps printer. The HX-10 will be priced at approximately £280. More from Toshiba (UK) Ltd at Toshiba House, Frimley Road, Frimley, Camberley, Surrey GU16 (phone 0276 682256).

KIT COLLECTION

The new, improved Cortex II, the 16-bit kit computer from Powertran is now available at a starting price of £299 (plus VAT). The standard Cortex comes equipped with interfaces for cassette, television and RS-232C as well as resident BASIC and a built-in assembler/disassembler. Improvements take the shape of a new slim cabinet and available extras such as interfaces for RGB, floppy disks and an E-Bus expansion port. Kits are available for a Centonics interface card for the E-bus.

Professional business packages, games and programming utilities are being marketed for the Cortex and users can seek advice and ideas not only from Powertran but also from the Cortex Users' Group. Further details on the Cortex II are available from Powertran Cybernetics Ltd, Portway Industrial Estate, Andover, Hants SP10 3BM (phone 0264 64455).

JUPITER REJUVENATED

To dispel any rumours to the contrary, Boldfield Ltd Computing have announced a complete range of accessories and software for the Jupiter Ace micro to prove that it is still alive and kicking. These include 16K RAM packs, video monitor connectors, and joystick interfaces, replacement keyboards and components, motherboards and soundboxes, and software that ranges from arcade games to spreadsheets and an assembler/disassembler. The Jupiter Ace 3K RAM computer and power supply unit costs £26 plus VAT. Prices for accessories and software are obtainable on request from Boldfield at Sussex House, Hobson Street, Cambridge (phone 0487 840740).

MTX MYSTERIES

Level 9 have announced versions of their complete range of adventure games for the Memotech MTX500/512 micro. Colossal Adventure, Adventure Quest, Dungeon Adventure, Snowball and the Lords of Time can all be bought for £9.90 direct from Level 9 or from Memotech dealers. Further details from Level 9 at 229 Hughendon Road, High Wycombe, Bucks HP13 5PG (phone 0494 26871).

ASP FIGHTS THE PIRATES

Much has been said and written in condemnation of software piracy but few have taken a positive stand against it. ASP is among those few that have taken action to help curb the grave problem of home copying of commercial software.

ASP has already taken steps to eliminate advertisements in our magazines which relate to tape duplication for piracy purposes. While it is appreciated that individuals may take 'back-up' copies of their own programs, it should be noted that it is *ILLEGAL* to copy commercially available software for other than personal use.

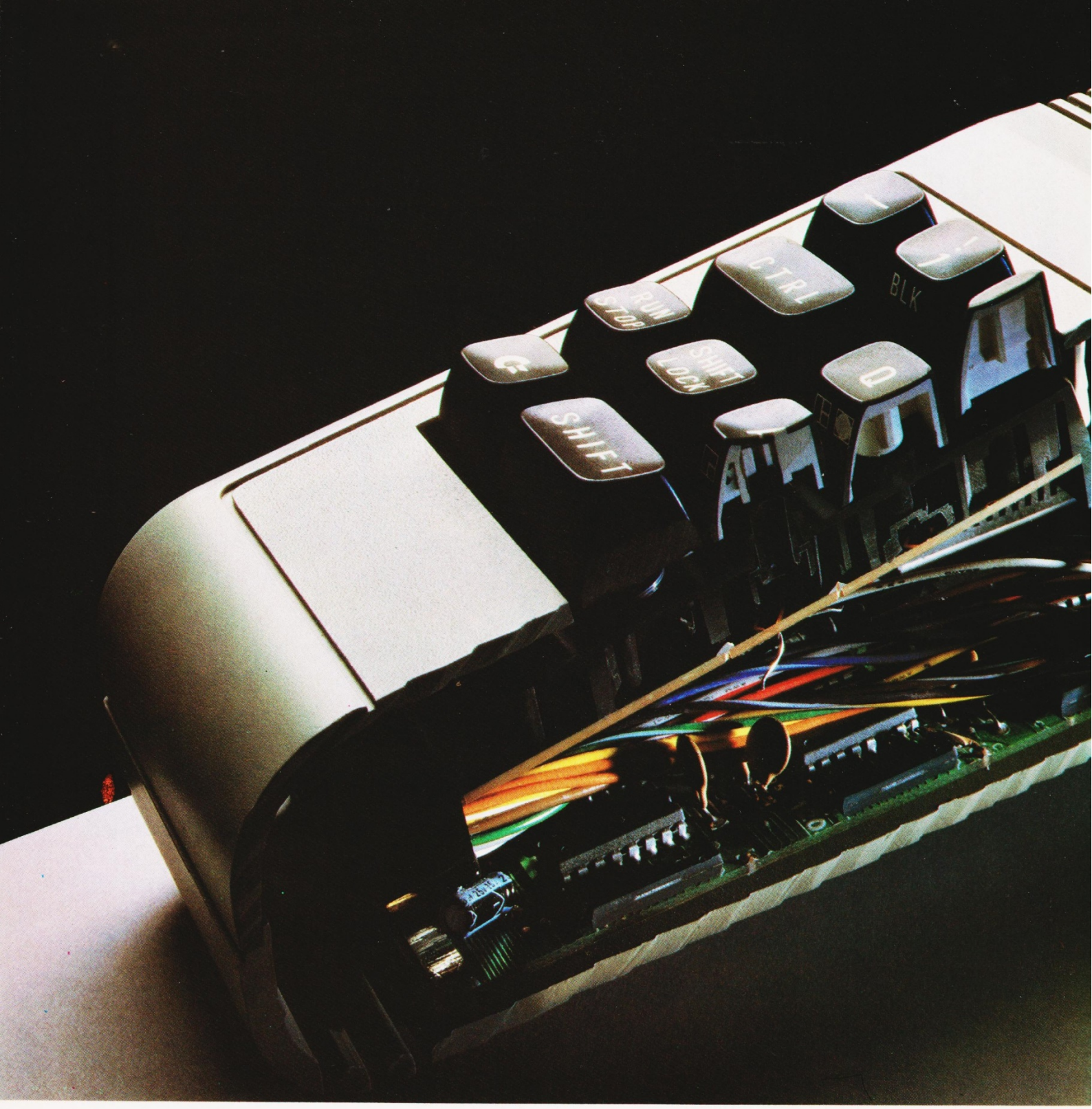
Software piracy is costing the software industry huge sums of money which is detrimental to the future development of the industry. It is in everybody's interests to dramatically reduce the level of software piracy primarily because firms need funds raised from software sales to plough back into research and development of new products. This means that the standard of software products can only improve.

ASP hopes that our action will help combat this serious problem in order to maintain and improve the high standards of the UK software industry. We are asking *you* to do the same by refraining from duplicating or copying commercially available software for anything other than personal use.

SIR FOR SEVEN

If you sorely miss the Mode 7 screen display on your Electron then Sir Computers may be able to provide an answer. The Mode7 Adaptor is a plug-in unit that bolts on to the back of the Electron: the expansion edge-connector is continued from the back of the Mode 7 unit so you can attach other modules, and there are also outputs that allow it to connect to standard RGB and monochrome monitors. Sir's Adaptor provides colour teletext graphics with 78 by 75 pixel resolution. Up to eight colours can be on screen at one time and it also can support flashing and double-height characters. The text display allows 40 by 25 characters and uses 1K.

The Mode 7 Adaptor is compatible with all BASIC and OS commands and over 90 per cent of Beeb Mode 7 software. For more information, contact Sir at 91 Whitechurch Road, Cardiff CF4 3JP (phone 0222 621813).



Are you only using

To play only games on a Commodore computer is like asking Albert Einstein to work out the square root of four.

The computer's brain barely ticks over.

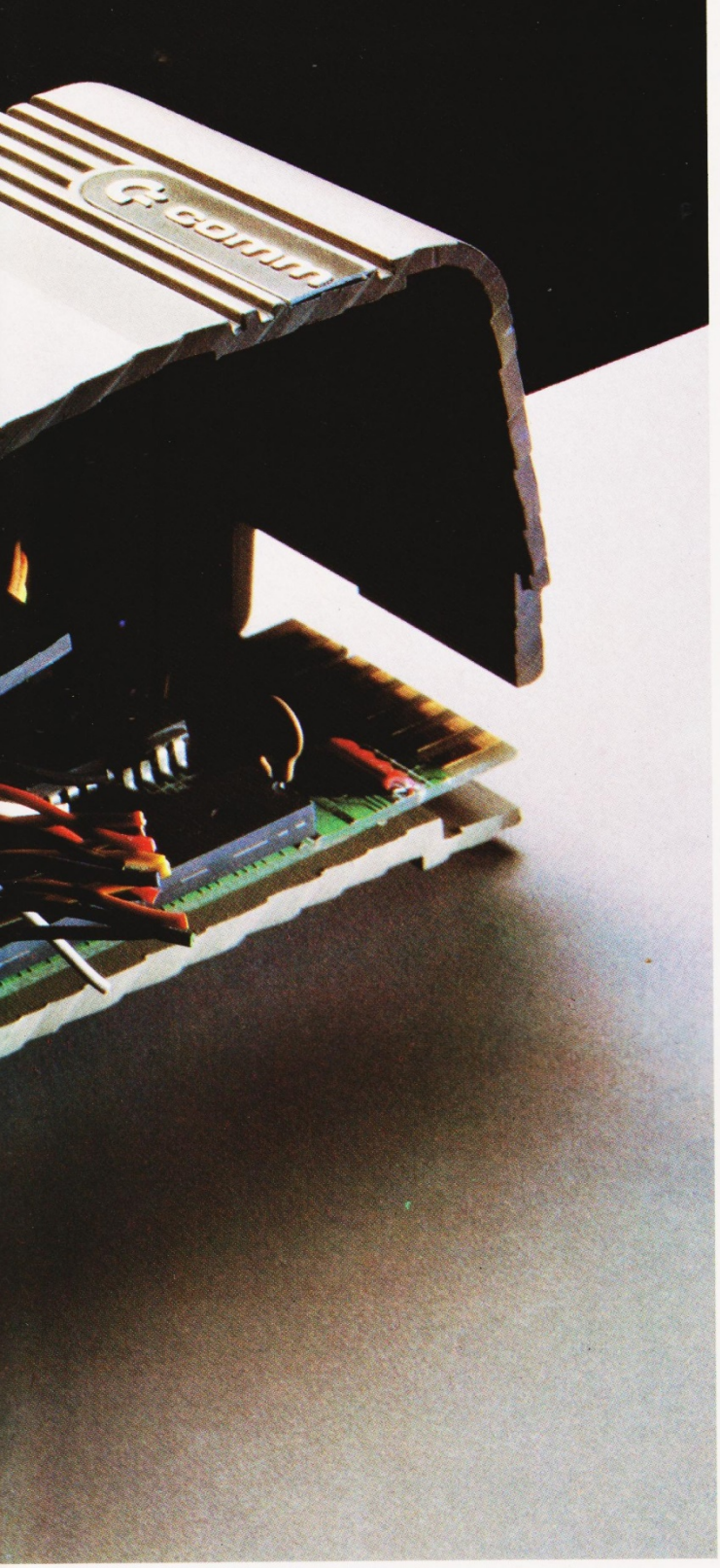
To really stretch it, you need more interesting software programs. For example, record keeping, interactive education, stimulating adventure games or word processing.

And for these you need peripherals.

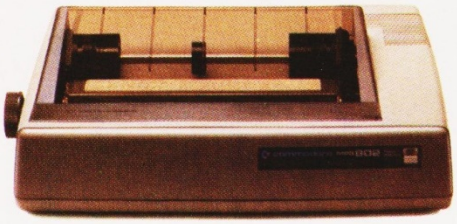
Like a Commodore disk drive, a really fast storage and retrieval system with a vast memory.

Or a Commodore cassette unit, the inexpensive way of loading and storing programs.

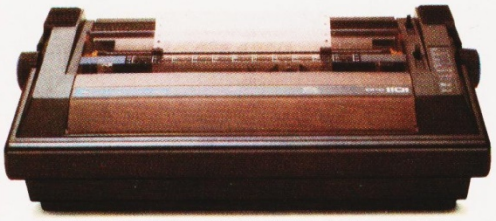
For those who like the idea of text and graphics being more alive and having greater clarity than on a TV, there's the Commodore colour monitor.



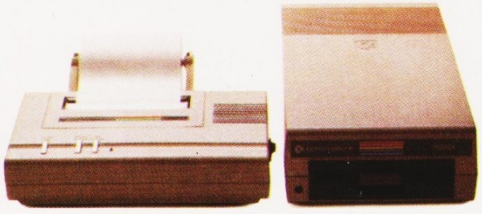
COMMODORE MPS801 ☐
Dot matrix printer. £230.00.
Tractor feed. Print speed:
50 characters per second.



COMMODORE MPS802 ☐
Dot matrix printer. £345.00.
Friction feed for standard
paper. Print speed:
60 characters per second.



COMMODORE DPS1101 ☐
Daisy wheel printer. £399.99.
Letter quality print on
all types of paper. Print speed:
18 characters per second.



COMMODORE 1520 ☐
Printer plotter. £169.99. For
charts and graphs. Print speed:
14 characters per second.

COMMODORE 1541 ☐
Disk drive. £229.00.
170K memory. 5¼" diskette.

COMMODORE 1531 ☐
Cassette unit. £44.95.
For Commodore 16 and
Commodore plus/4.

COMMODORE 1530 ☐
£44.95. For Commodore 64.

COMMODORE 1701 ☐
Colour monitor. £230.00.

JOYSTICKS ☐
(prices from £7.50)

PADDLES (£13.50). ☐

Details correct at time of going to press.

1/10th of your brain?

And for hard copy, there are our three printers and a printer plotter. These will preserve on paper–in colour, black and white, chart form, graphs or text, the fruits of all your labour.

Finally, to make games playing more exciting, there are joysticks and paddles.

So use your brain. And make sure you use all of your computer's brain.

FOR FURTHER INFORMATION, TICK ONE (OR MORE) OF THE BOXES ABOVE AND SEND TO THE COMMODORE INFORMATION CENTRE, 1 HUNTERS ROAD, WELDON, CORBY, NORTHAMPTON NN17 1QX. TEL: CORBY (0536) 205252.

NAME _____

ADDRESS _____

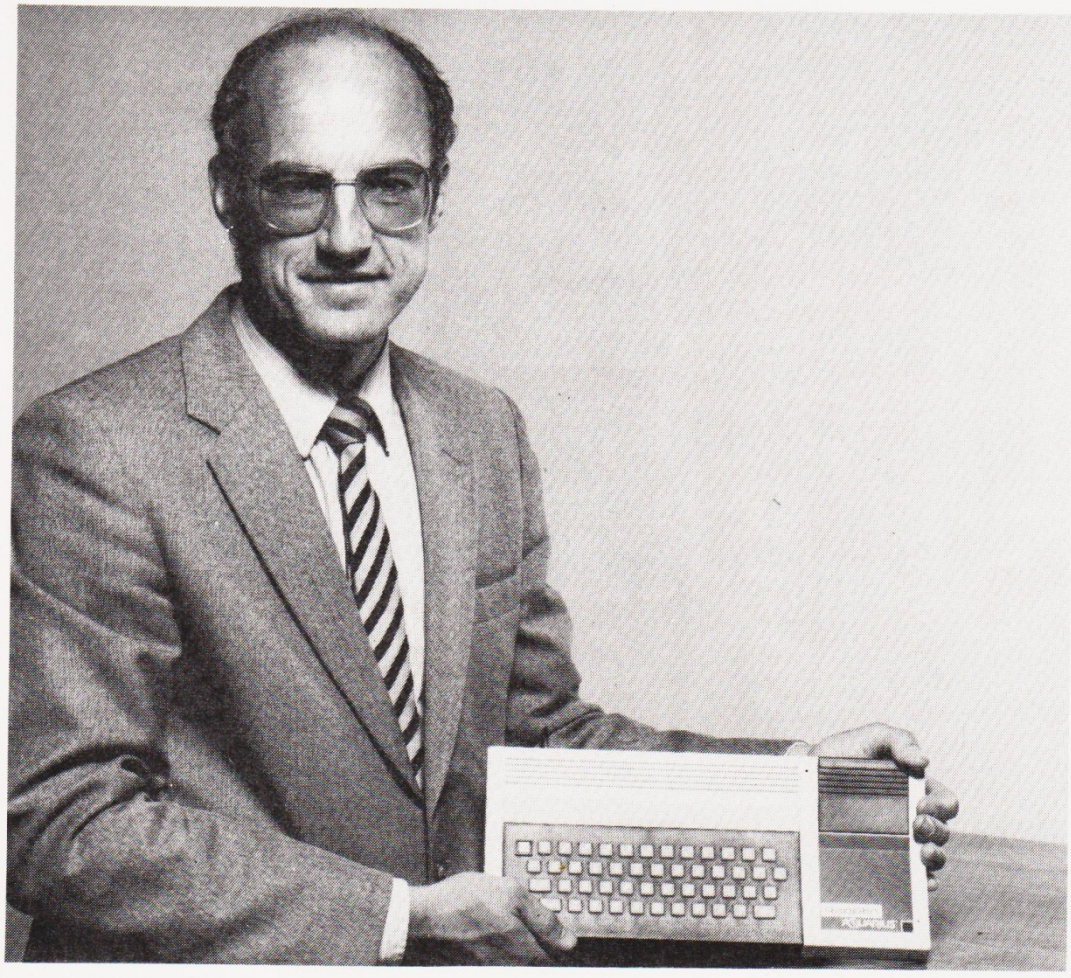
_____

_____

PE CTO 1184

BY APPOINTMENT TO HER MAJESTY THE QUEEN MANUFACTURERS OF COMPUTER BUSINESS SYSTEMS. COMMODORE BUSINESS MACHINES (UK) LIMITED CORBY.

commodore



FAMILY PLOT

Bel Tech have recently released Bel Plot and Bel Subs, two new utilities, and uprated two existing programs, Bel Gen and Bel Base, all for the BBC. Bel Gen, on disk, is a specialist program for those who have always wanted to dig back into history and unearth distant ancestors. As a medium for storing all the details, Bel Gen can be of considerable use with options such as the drawing of a Male/Female line tree and additional fields for dates of marriage, wills and notes. You are able to format your own report using SEARCH and SORTING on any field and you have random access of data on disk with up to 600 people/file on 80T (375 on 40T). Bel Gen on disk costs £17.

Bel Base, Bel Tech's data base has also been uprated to cover 480 characters/record, with up to 20 fields/record. Bel Base includes Mailshot and is compatible with Bel Graph — the complete package costs £18. The uprated versions of both programs can be obtained for £4.50 and free of charge, respectively to existing users.

The two new releases are available on both tape and disk. With Bel Plot you are able to plot graphs from data entered via the keyboard or a file. Equations can also be entered and plotted. Other options include automatic scaling and positioning of axes and edit facilities. Tape and disk versions will cost £9.50 and £11.50 respectively. Bel Subs contains an assortment of sub-routines for programmers. These include routines for drawing graphs and bar charts as well as various sorts and character and envelope generators. Bel Subs will cost £10.50 for the tape version and £12.50 on disk. For further information, contact Bel Tech at Stanmore Industrial Estate, Bridgnorth, Shropshire WV15 5HP (phone 07462 5420).

GEMS ON THE AMSTRAD

Slowly but surely, software is appearing for the Amstrad CPC464. Some of the more recent releases include a colour graphics adventure and a non-violent simulation game, both from Kuma. In Gems of Stradus, your quest is to find a casket of gems, evading the inevitable guardians and finding your way through the maze of over 100 rooms. It is the first of a series of adventures that Kuma plan for the Amstrad.

The other program is Holdfast, a strategy game. Holdfast is the name of the village where you live, in the land of Dictatoria. For years the villagers have been paying taxes but have received no aid in return. Now things are in a desperate state, and the village urgently needs a clinic and a school. It's your job to persuade the government to reconsider their budget, using means at your disposal — negotiation or strike and so on — but you cannot resort to violence because of the government's superior strength.

Gems of Stradus and Holdfast will cost £7.95 and £5.95 respectively and are available from Kuma or retailers. For more information, contact Kuma at 12 Horseshoe Park, Pangbourne RG8 7JW (phone 07357 4335).

THE AGE OF AQUARIUS

Not to be outdone, the Aquarius has recently been relaunched at a recommended price of £49.95 by Radofin Electronics. Mike Quelch, Radofin's newly appointed sales director calls the Aquarius I "an unbeatable micro in this price bracket". It offers 16 colours and a graphics resolution of 320 by 192 pixels and connects to a television set. Documentation is included in the package and there is a range of home management, educational and games software available on both cassette and cartridge. For more information, contact Radofin Electronics, Hyde House, The Hyde, London NW9 (phone 01 205 0044).

MACINTOSH MULTIPLES

With the heady arrival of the Macintosh in Britain, Apple are ensuring that it is well supported with the release over here of several US software products, handpicked for the UK by Phil Peters, manager of Apple (UK)'s Software Business Unit.

Filevision, manufactured by Telos Products costs £159 and is a "visual filing system" that uses pictures to make information management a bit easier. PFS:File is for recording, retrieving, updating and printing information and PFS:Report transforms the information into presentation quality-tabulated reports, mailing labels and so on. PFS File and Report cost £89 and are compatible with the Mac's wordprocessor, MacWrite.

Microsoft Chart, at £99, is a business graphics program that can interpret numerical data into forty different types of graph including area, bar, column, line, pie, scatter and combinations. Other programs available include Habadex, a data base to handle lists, reports, labels and customised letters and MacCash, a program that enables you to set up a cash book to specific requirements. Habadex and MacCash are priced at £159 and £175 respectively and, like all the other programs, should be available through your local Apple dealer. According to Phil Peters, this initial launch is just the tip of the iceberg, with a proposed 150 Macintosh programs on the market by the end of the year.

GNOMINALLY DIFFERENT

Two new software packages have recently been released for the BBC from Gnomonica, a company that specialises in utility and scientific software. DAP1 and DAP2 are data analysis and curve fitting programs available both on cassette and disk at £15 and £20 respectively. Graphs and functions can be produced and optionally dumped to Epson printers and both programs can be interfaced to your own data analysis programs.

If machine code is your speciality then it could well be worth in investing in Mach1, a utility for machine code programmers that features a combined assembler/disassembler. Mach1 is normally supplied in a 16K EPROM at £39.95 but there is also a version on disk for sideways RAM and second processor users, priced at £19.95. For further details, contact Gnomonica at 2 Stable Cottages, Pleystowe, Rusper Road, Capel, Dorking, Surrey (phone 0306 712317).

PETITE PRINT

At the Acorn User Show recently, Phi Mag Systems launched their new, miniature thermal printer, the PhiPrint. With dimensions of 8 by 17 by 20.5 cm and weighing just less than 1 kg, the printer has a full character set of 96 UK ASCII with descenders and standard, elongated and condensed character modes that print 40, 20 or 60 cpl. For graphics printing the PhiPrint outputs 256 by 8 dots per line and has a print speed of about 0.47 lines per second.

The printer interfaces to the BBC or Electron via a standard Centronics-type 8-bit parallel interface and costs under £100. For further information, contact Phi Mag Systems at Tregoniggie Industrial Estate, Falmouth, Cornwall TR11 4RY (phone 0326 76060).

BOARD SIDEWAYS!

If you're fed up with having to open the case of your BBC whenever you want to change the ROM, you could be pleased to hear of a recent release from Micro-Z — an external sideways ROM board. This can be bought to be used either inside or outside the BBC and fitting the system involves no soldering. Two circuit boards are used which are common to either the internal or external board. In both systems the CPU board is mounted internally by plugging into the 6502 socket, but should not occupy any space needed for other BBC upgrades such as RAM extensions.

Micro-2 are hoping to release upgrade modules for the system that will provide RAM expansion and a combined EPROM eraser/programmer. Further details from Micro-Z, PO Box 83, Exeter EX4 7AF.

WHAT'S UP DOC?

A recent package from Acorn marks a distinct change of direction and their first direct move into what they term Britain's "potentially lucrative medical market." The £1999 package was developed by two practising GPs and comprises a disk-based Beeb with monochrome monitor, printer and built in WP program, and specially written software. It is aimed at GPs who want to automate time-consuming work such as repeat prescriptions and patients' record-keeping. Acorn estimate that there should be a wide market for their Doctor's package: of some 8000 practices in this country, as yet, only about five per cent use computers.

They are obviously confident that there is a need for a package of this kind and have plans for other programs for the BBC that will handle financial administration and records such as drug usage statistics and an age/sex register for automatic recall of patients. There are also plans afoot for similar packages for dentists and opticians (and chiropodists?).

The Acorn Doctors Package is available by mail order only from Vector Marketing Ltd, Dennington Industrial Estate, Wellingborough, Northants NN8 2RL.

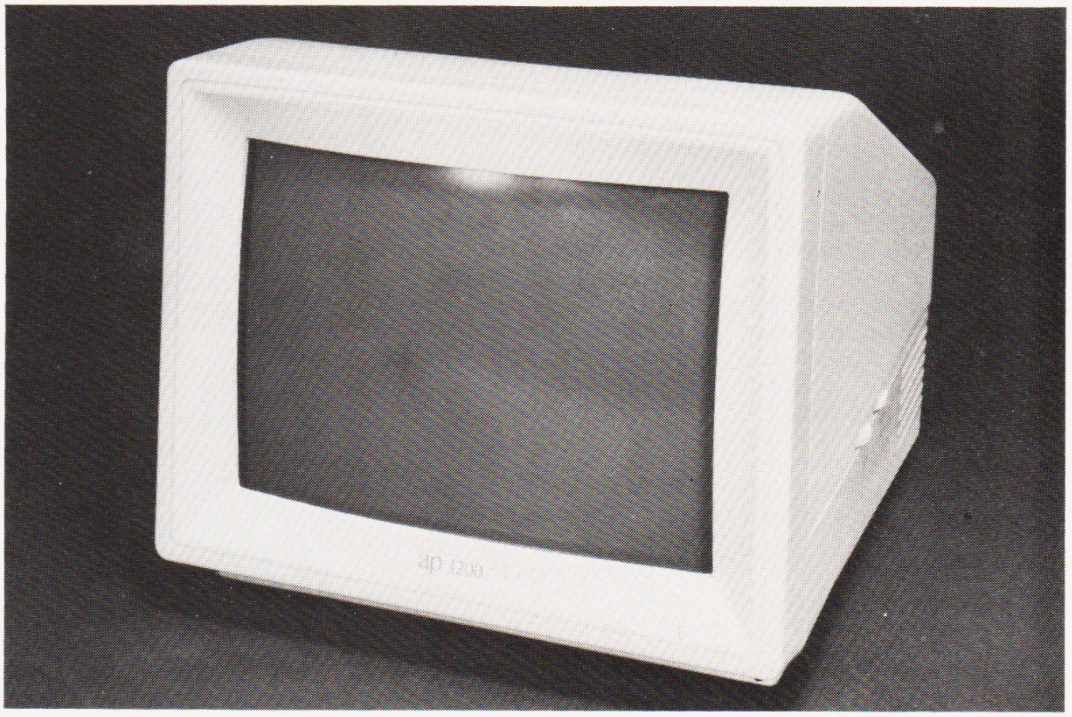
ADAPTABILITY

As a sequel to their Video Output kit, Adapt Electronics have launched an RGB Output Driver module for the Spectrum. This will enable the Spectrum to interface to any RGB (TTL) monitor for a price of £29.95 (plus postage). The module is fitted without any need for modification or internal connections to the Spectrum by plugging into the expansion port and it does not affect the UHF output.

For further details, contact Adapt at 20 Starling Close, Buckhurst Hill, Essex IG9 5TN (phone 504 2840).

MANITRON MATCHING MONITORS

For those who like coordinated hardware, the AP1200 Apricot compatible 12" monitor is now available from the Manitron Division of Ficention Ltd. There are two versions, the AP1200 to match the standard Apricot and the AP1200 xi to match the Apricot xi. Both use a 90° green phosphor tube with P39 long persistance phosphor and anti-glare etch and operate from the Apricot 12V supply via the standard 9-way D connector. The AP1200 measures 31 by 26.8 by 34.4 cm and weighs 5.4Kg. The prices are £179 for the free-standing monitor and £195 with the swivel and tilt base. Further information from Ficention Ltd, Manitron Division, Sanbach, Cheshire (phone 093 67 4171).



DRAGON GOES . . .

It seems that Dragon computers have finally abandoned the Welsh countryside for the sunnier climes of Spain. Eurohard SA have purchased all the assets of Dragon Data Ltd and intend to manufacture both the 32 and 64 micros as well as future Dragon products on a world-wide basis. Further details from Touchmaster Ltd, Kenfig Industrial Estate, Margam, Port Talbot, West Glamorgan SA13 2PE (phone 0656 744700).

NO BUTTS

Good news for BBC owners who feel in need of a little extra room: Aries Computers have cut the price of their Aries-B12 RAM expansion to £79.95.

At the same time, Aries have also launched a sideways ROM expansion system, the Aries-B12 and are looking towards an enhanced disk system as the next "logical step". The moves come as part of Aries' new sales campaign but are also probably designed to counter-attack the production of "cheap imitations" of the Aries-B20. According to managing director Peter Headland, this "barefaced plagiarism" contravenes their Patent Application and they intend to press for damages.

HONG KONG ON LINE

If you happen to be in Hong Kong in the near future, why not pop into the Asian Computer Plaza for a copy of the latest CT.

The Plaza is Asia's first computer centre and comprises a shopping arcade and exhibition and educational facilities. The centre will be open from 10am to 8pm seven days a week and it's hoped that it will exhibit the latest in hardware and software as it appears on the international market. Services will include specialist book stores, and facilities for disk-to-disk conversion and computer rentals as well as a hotline enquiry service and information desk.

If you're travelling to the Far East and would like some further information, phone the Hong Kong Tourist Office on 01 930 4775.

INGERSOLL INCREMENT

Heron Electronics, who manufacture Ingersoll home electronics products, have added a new baby to the range. The XK696 data recorder has been designed specifically for computer use and includes separate load and monitor level slide controls, power on, save and signal LEDs as well as auto-stop, pause, tape counter and cue/review. The XK696 is compatible with most popular home computers and costs £40.95 from high street electrical stores. For more details, contact Heron Electronics at Heron House, 19 Marylebone Road, London NW1 5JL (phone 01 486 4477).

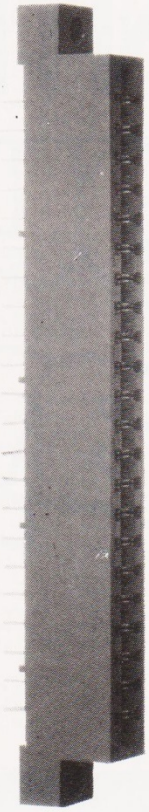
MAKE THE RIGHT CONNECTIONS !

We have the answer whether you need:

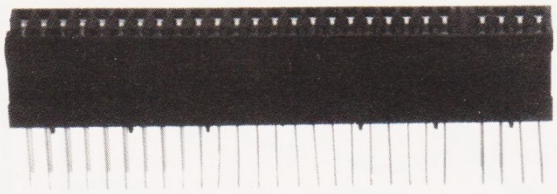
- 0.1" or 0.156" edge connectors
- Two part Euro connectors
- Miniature 'D' connectors
- Ribbon cable connectors (including headers and sockets)

Plus many more

The NEW Delta connector to IEEE 488 specification is now available for either ribbon or round cable connection in both 24 and 36 ways. Metal covers are also available.



For further information on these products and local availability, plus a copy of the 'Hobby Herald', containing the full product range, telephone Chandlers Ford (04215) 62829 or write to :



BICC vero

BICC-VERO ELECTRONICS LIMITED

Retail Dept.,
Industrial Estate,
Chandlers Ford,
Hampshire SO5 3ZR.

COMPUTER ROBOTICS TRAINING

FULL TIME COLLEGE COURSE

SUITABLE FOR APPLICANTS WHO WISH TO ENTER COMPUTER SERVICE OR RELATED INDUSTRIES — HIGH PERCENTAGE OF PRACTICAL COURSE WORK

15 MONTHS
B TEC Certificate in Computing Technology

9 MONTHS
B TEC Higher Certificate in Computing Technology

Subjects: Foundation Electronics, Digital Techniques, Microelectronics, Microprocessors, Microcomputer Based Systems, Industrial Robotics, Machine Code & High Level Programming.

Shortened courses can be arranged for applicants with previous knowledge.

Courses commence Sept, Jan and April (Higher Cert Sept only). Prospectus from:

LONDON ELECTRONICS COLLEGE (Dept C5/6)
20 Penywern Road,
Earls Court, London SW5 9SU.
Tel: 01-373 8721

If an advertisement is wrong we're here to put it right.

If you see an advertisement in the press, in print, on posters or in the cinema which you find unacceptable, write to us at the address below.

The Advertising Standards Authority.

ASA Ltd, Dept 3 Brook House,
Torrington Place, London WC1E 7HN

NEXT MONTH

computing today

DECEMBER ISSUE ON SALE NOVEMBER 9th

Next month Computing Today concentrates on glorious graphics. We'll be featuring a lengthy review of the amazing Acorn Bitstik for the BBC Micro, which effectively gives you a £2000 CAD system. On a more frivolous note, we'll take a look at Acornsoft's Elite, a space adventure game with real-time 3D graphics. There'll be an article on the stunning things you can do with the Pluto system from IO Research, a review of the Koalapad graphics tablet for the CBM64, and a type-it-in listing of a graphics drawing program for the Amstrad. If you don't have an artistic bent, though, we'll be reviewing the GRiD Compass and the Psion Organiser — two pieces of hardware at opposite ends of the portable market.

GIVE THIS TO YOUR NEWSAGENT

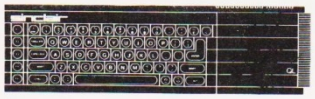
Please reserve me a regular copy of Computing Today

NAME .....

ADDRESS .....

POSTCODE .....

Articles described here are in an advanced state of preparation but circumstances may dictate changes to the final contents.



ORIC AND SINCLAIR COMPUTERS

Oric 1 computer 48K £95 (£92) £102. Oric Atmos computer 48K £171 (£158) £168. Oric colour printer £134 (£123) £140. Oric disc drive £304 (£278) £298. New Sinclair QL Computer £495 (£455) £475. Sinclair Spectrum 48K (with 6 free programs while Sinclair's offer lasts) £131 (£131) £143. Microdrive £51 (£50) £60. RS232 interface 1 £51 (£50) £60. Limited period special offer:- Microdrive + Interface 1 + 4 Blank cartridges £102 (£100) £120. Blank microdrive cartridges £8 (£8) £9. Interface 2 £20.45 (£20) £24. 32K memory upgrade kit for 16K Spectrum (issue 2 and 3 only) £31 (£28) £30. Fuller Master unit for the Spectrum including speech synthesizer, sound synthesizer, amplifier and joystick port £56 (£56) £62. Fuller FDS full sized keyboard for the Spectrum with proper space bar £52 (£52) £62. Spectrum printer interfaces with cables:- Centronics £51 (£47) £52, RS232 £35 (£33) £38. ZX printer has been replaced by the Alphacom 32 £71 (£67) £77. 5 printer rolls (State whether Sinclair or Alphacom) £13 (£16) £21. ZX81 computer £45 (£44) £54. ZX81 16K ram packs £28 (£25) £30.

COMMODORE COMPUTERS

Commodore 64 £204 (£184) £204. Vic 20 £104 (£97) £117. Vic 20 starter pack £150 (£143) £173. Convertor to allow most ordinary mono cassette recorders to be used with the Vic 20 and the Commodore 64 £9.78 (£9) £11. Bargain package:- cassette convertor + compatible cassette recorder £37 (£38) £44. Commodore cassette recorder £43 (£44) £50. Printer interfaces for Vic 20 and the Commodore 64:- Centronics £45 (£41) £46, RS232 £45 (£41) £46. Disc drive £233 (£209) £234. 1520 printer/plotter £165 (£149) £159. 1525 Printer £235 (£220) £245. 1526 Printer £350 (£330) £360. Vic 20 Accessories:- Super expander high res cartridge £33 (£29) £34, Programmers aid cartridge £33 (£29) £34, Extra memory ram packs 16K £36 (£32) £35, 8K £19 (£17) £20.

ACORN COMPUTERS

Electron £203 (£209) £229. Electron joystick and printer interface £61 (£62) £69. BBC Model B £404 (£357) £387. 14" Colour Monitor £228 (£229) £319. Kenda double density disk interface system £139 (£125) £135. Disc drives 5.25" 40 track:- single £200 (£184) £204, dual £356 (£325) £355.

PRINTERS

Brother HR5 £185 (£171) £190. Shinwa CTI CP80 £225 (£218) £248. Cannon PW1080A £332 (£299) £329. Epson RX80 £277 (£251) £282. Epson RX80F/T £314 (£286) £316. Epson FX80 £399 (£358) £388. Combined matrix printers and electric typewriters:- Brother EP22 £173 (£166) £186, Brother EP44 £258 (£235) £260. Smith Corona TP1 Daisy wheel printer £252 (£225) £255. MCP40 Oric Colour printer/plotter £134 (£123) £140. Interfaces to run the above printers from Vic and the Commodore 64 £45 (£41) £46. We can supply interfaces to run the above printers from Sharp computers £58 (£52) £55.

SWANLEY ELECTRONICS

Dept CT, 32 Goldsel Road, Swanley, Kent BR8 8EZ, England.
TEL: Swanley (0322) 64851

Official orders welcome. All prices are inclusive. UK prices are shown first and include post and VAT. The second price in brackets is for export customers in Europe and includes insured air mail postage. The third price is for export customers outside Europe (include Australia etc) and includes insured airmail postage.

LYNX KEYBOARDS

Consisting of 58 keys in standard QWERTY format 57 of which are connected in a 8X by 10Y electrical matrix. Easily converted to matrix output (instructions provided). A very attractive professional keyboard ideal for updating your micro. Bulk purchasing enables us to offer at £18 including VAT plus £2 postage.

19" RACK KITS

Quality kit by Vero in aluminium. Complete with slotted strip and card guides. Side panel dimensions 220mm high X 410mm length. Compare our special price offer of £18 including VAT plus £3 postage.

COMPUTER POWER SUPPLIES

Asdec model AC 8151 (40 watt series), dual line inputs and regulated outputs of: plus 5V at 2.5A, plus 12V at 2.0A, minus 12V at 0.1A. Stocks at clearance price of £22 each including VAT plus £2.50 postage.

Send for list of special offers on Gould, Farnell, Hewlett Packard etc. . . .

NASCOM COMPONENTS

Send for list (including buffer board kits, Pascall etc.)

Money back guarantees on all above offers so do not hesitate whilst stocks last.

DIONICS, UNIT 50, WHITEMOOR ROAD, KENILWORTH, WARWICKSHIRE
TEL: 0926-59658 (24 hours)
TELEX: 312440 PBSSPA G.

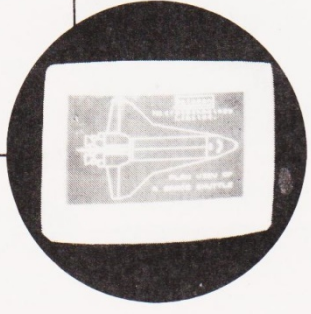
Datapen

A QUALITY LIGHTPEN
for use with the SPECTRUM computer

The DATAPEN lightpen enables you to create high resolution pictures and technical layouts directly on your T.V. screen. The accompanying software allows you to draw any shape or *filled area* you wish, to *pixel accuracy*, in full colour and the results may be utilised within your own programs, e.g. for animation, or to illustrate your title pages. At just £29 inclusive, the Datapen lightpen package represents superb value – just look at the actual screen photographs and you will agree that this must be the best value for money on the market.

PLUS: 3 SOFTWARE PROGRAMS

- Routines and ideas for your own programs. (Menus, games, music, etc.)
- User-defined graphics creation program.
- Superb full colour drawing program as illustrated in these actual screen photographs.



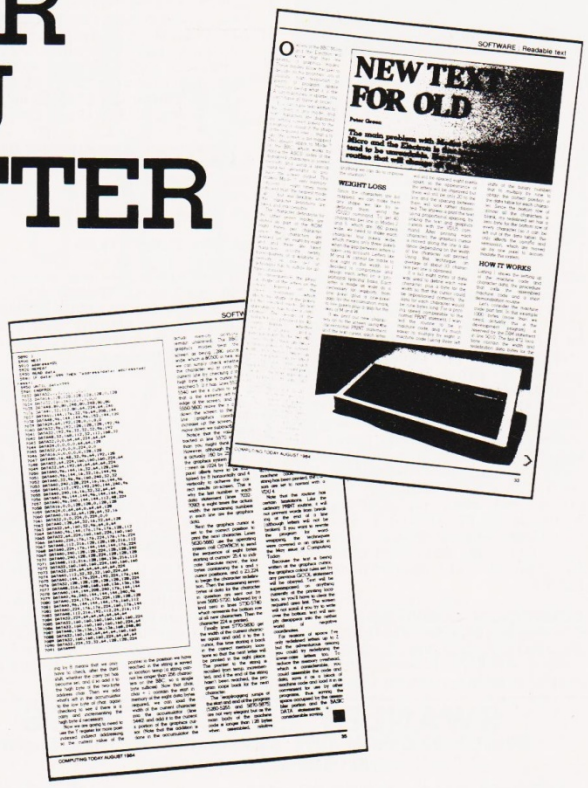
- Incorporates features not provided with other pens.
- Push button operation on pen – no need to use keyboard.
- Works under any lighting conditions.
- Plots to pixel accuracy.
- 20 pre-defined commands allow plotting of geometric shapes, including triangle, lines, circles, etc., text, or user-defined characters.
- Uses all paper and ink colours.
- A screen grid may be turned on and off, at will, to assist drawing.
- Flexible erase capability.
- All drawings can be saved to tape for further use.
- Plugs in direct – no batteries, additional components, or adjustments needed.
- Handbook, plus printout of routines for use in your own programs.

Send cheque or P.O. for £29.00 to: Dept. or ask at your local computer shop. Send S.A.E. for details.

DATAPEN MICROTECHNOLOGY LIMITED (CT3), Kingsclere Road, OVERTON, Hants RG25 3JB
0256 770488

Lightpens and software are also available for BBC B, Dragon, CBM-64 and VIC-20.

HAVE YOU EVER THOUGHT YOU COULD DO BETTER THAN THIS?



Then why haven't you? Why not put our money where your mouth is? *Computing Today* is always on the lookout for new and interesting programs and articles for publication in the magazine. All submissions will be acknoweldged and the copyright in such works, which will pass to Argus Specialist Publications Ltd, will be paid for.

If you're interested in making your hobby pay its way and you've written a program that you think suits the magazine's content, why not send it to us today with the form below (or a photocopy of it). The address is Computing Today, No. 1 Golden Square, London W1R 3AB: and please mark your envelope clearly 'PROGRAM SUBMISSION' so that it doesn't get confused with all the other mail we receive.

We will need a copy of your program on cassette (or disc, for some systems, if you prefer) together with clear documentation on what it does and how it does it, including a list of the major variables, and if possible some indication of how a conversion to other micros might be attempted. We would appreciate a listing of the program and any screen dumps that you feel might be useful, but not on ZX Printer paper (it doesn't reproduce very well in the magazine). Remember that CT is a general computing magazine and accepts articles for any popular computer including Commodore, Acorn, Atari, Sharp, Amstrad, Sinclair, Oric, Tandy and Genie models.

If you would prefer to make a tentative approach to see if we are interested in your program *before* you put a lot of effort into it (or to check whether we have discs for your particular machine), then that's fine too, provided it is understood that a full write-up will be required before we can publish.

Subject matter can be as broad as you like, bearing in mind that the more readers it will interest, the more likely we are to accept it. A brilliant business program that requires the simultaneous use of four disk drives probably won't be accepted! Also we tend to steer clear of simple arcade games unless, like our Frogger, they demonstrate how to use a particular machine's capabilities to the full.

PLEASE COMPLETE IN BLOCK CAPITALS

Your name: .....

Your address: .....

.....

.....

Telephone number: .....

Program name: .....

Computer/memory size it runs on: .....

Amount of memory program occupies: .....

Any special peripherals required? (joystick, discs, printer (etc): .....

Have you sent your submission to another magazine? .....

Is it original or a variation on a theme? .....

Office use only

What's on Your T.V. Tonight

Spectrum 48K - £7.99
CBM 64/BBC/Atari - £9.99

MIND GAMES

Argus Press Software Group

Recommended viewing

Early Evening
6.40 pm Orion Quest

A full feature adventure starring well known nasty aliens **the Zarps**
Can you play the hero and stop their plans to blow up the earth.

Screen play N. White
Costume Design D. Jordan
Directed Martin Edwardes
Produced Argus Press Software

Available for Spectrum 48K, BBC, CBM 64.

Mid-evening
9.00 pm Quest for Eternity

Starring **The Overlords of the Universe**

The candidate (you) have to get to the Chamber of Creation. It's a laugh a minute, since it's 2000 light years away on the most horrible planet in the Universe ... and your starship doesn't work either!

Written by David Cockram
Directed Martin Edwardes
Produced Argus Press Software

Available for Atari, Spectrum 48K, CBM 64.

Midnight Movie
11.55 pm Star Force Seven

Starring **The Zurgs**

After a desperate space battle only one fleet of heroes remain to prevent the invasion of earth. The future of humanity lies with you!

Written by Ian Soutar
Special Effects Ian Soutar
Directed Martin Edwardes
Produced Argus Press Software

Available for BBC, Spectrum 48K, CBM 64.

For mail order, write with cheque/ P.O./card No. to:
Mind Games, Argus Press Software Group, No. 1 Golden Square, London W1.

ANOTHER BITE AT THE APPLE

Simon Dismore

Apple Corporation aim to re-restablish their once dominant postion in the market with four products — the Lisa, Macintosh, Apple Compact and Apple Extended machines. The new IIc marks the third phase of this well-planned campaign. We wondered who would buy it . . .

The microcomputer industry was created by three companies — Digital Research, Commodore and Apple. Digital Research and Commodore are alive and kicking in a new world of corporate strategies. Apple, somehow, retain an image of goodwill and striving perfection.

One might compare Apple with IBM — both companies have the capacity to challenge our ideas of where the business is going (how many other manufacturers can say the same?). In a sense, Apple proved themselves by taking on the mantle that Xerox initiated through 'Smalltalk' and the 'Star' 8010 workstation. If an organisation with that approach to future systems decides to resurrect their older products in a new guise, the world has to sit up and take notice.

The Apple 'IIc' is the first stage in that resurrection, a single drive, compact version of the well-established 'IIe' system, which costs less than £1000 — an important consideration in the UK market which is now largely bracketed at increments of only £500 (hardware price). For the same amount you can buy a Sanyo (partially IBM PC-compatible) machine with a number of bundled programs from MicroPro (authors of the WordStar text editor).

So, who wants to buy this machine, based on the apparently obsolete 6502 processor? Perhaps the 'high technology' buffs among us are in danger of missing the point — most purchasers are only interested in two things: the quality of the machine and the range of software available. The Apple IIc scores strongly in both areas.

SOFTLY, SOFTLY

The range of software is quite fantastic. While the vendors of today's Intel 8086-based products are lucky if they can amass 1,000 programs which will run on their hardware, Apple can claim over 10,000 fully developed third party products — perhaps nearer to 20,000. We have examined this issue in previous articles, but it's worth repeating: old software costs less and carries fewer bugs than new software. Speak to any data processing manager if you doubt this.

This range of usable programs is claimed as one of the major selling points for the IIc. Does this claim stand up to a closer examination? Much of the software is very old indeed. It uses only forty columns of the screen and perhaps isn't written and documented in quite the way we expect nowadays. Furthermore, it runs under the old DOS 3 series, so it loses the speed advantages of Apple's new ProDOS and Pascal operating systems.

So it looks as if much of this existing software would only be interesting to specialised users. This reflects the positioning of the machine (in the US at least) as an excellent system for students. Apple's theory is that they can create an army of young adults who will remain loyal to the Apple brand in years to come. To this end, their documentation contains a number of full colour photographs of children and students. The best tear-jerker shows a homely grandfather looking on in fascination while his all-American High School grand-daughter demonstrates the IIc. You can also choose from images of grandad taking the toddlers off fishing, and the rising young executive relaxing in the garden with his 2.2 children. Interestingly, women aged over 25 do not seem to exist in Apple's schmaltzy new society.

It's hard to believe that this approach will strike a chord with the UK market. There is little possibility of British students finding the IIc an acceptable purchase, simply on price grounds. We already have a wide range of machines for home use, which probably offer better value for money than the IIc — and have a pretty respectable range of mature programs.

Of course, Apple have vast experience of machines for educational use, and deserve warm applause for their two 'teaching' languages: Logo and Pilot. Logo is steadily becoming more popular (Digital Research now offer a version, DR Logo, for the IBM PC) because of its simplicity and power. It offers 'turtle' graphics which can be used to introduce concepts of vectors and geometrical transformations at an early stage in education. Logo is highly structured in the sense that programs are built almost entirely out of procedures, which are built from other procedures, and so on, thus making good programming practice both fun to learn and easy to follow. 'Pilot is a specialised facility for constructing interactive teaching packages, and has been a little slow to take off on this side of the Atlantic.

MOUSE MATTERS

Applesoft BASIC (provided in ROM on the machine) is probably best ignored for the simple reason that variable names can only be two characters long, and you can't teach programming that way. However, it does allow PRINT and INPUT to be redirected between different devices. Thus, LPRINT is replaced by a redirection statement followed by conventional PRINT statements, and Mouse co-ordinates are simply read using the INPUT statement preceded by the appropriate redirection. This is a valuable aid to development and debugging which other dialects of BASIC would do well to emulate.

Incidentally, whoever wrote the Mouse demonstration programs in the Apple documentation should be shot (or condemned to 15 years hard labour unravelling tepid spaghetti). GOTOs cross over each other, the same literals (eg CHR$(4)) are used many times instead of being slotted neatly into a variable at the start of the program, and single routines have multiple exit points. The resulting code is hard to understand and almost impossible to modify.

Apple supply a design package (MousePaint) with the Mouse which offers some of the facilities of the Macintosh MacPaint application. You can use this to create simple diagrams and freehand graphics, though you would need Apple's ImageWriter printer to reproduce your efforts on paper. While MousePaint is fun to use (and remarkably fast, considering the slow CPU at the heart of the system) it really cannot compare with the Mac's product. In practice, the facilities for editing the drawing and for adding text are not quite sufficient for serious work. This, of course, gives your friendly Apple dealer a marvellous opportunity to sell you a Macintosh only a few months later!

The quality of the documentation (example programs aside) is quite superb. The text is clear and remarkably succinct, and diagrams and photographs are used at every stage to make things clear to the reader. A set of training disks come with the system which (tongue firmly in cheek) explore the basics of the IIc fairly thoroughly, though some training on the ProDOS operating system (which receives only cursory attention from the standard documentation) would probably help the user who wants to start programming in a modest way. Nevertheless, Apple certainly deserve congratulations for the thoroughness of their material.

The Apple documentation is already being complemented by books on the machine from third-party publishers. Simon & Schuster, the US publishers, have collaborated with Apple on **Going Places With The New Apple IIc — All You'll Need to Know to Get There,** which adds useful technical information about the inner workings of the machine. Over here, Pitman Books have produced **Introducing the Apple IIc** (by Friedman Wagner-Dobler, technical director of Busisoft). This is rather less technical and in some ways rather more objective about the product's advantages for different applications. The Pitman Book (page 95) reproduces Apple's estimates of the popularity of the system, expressed as the length of time taken to sell 50,000 machines:

Apple II (March 1977):
2½ years
IBM PC (August 1981):
7 months
Macintosh (January 1984):
74 days
Apple IIc (April 1984):
1 day

It is worth commenting that none of these business machines relied upon the unfortunate direct response selling methods which we tolerate in this country.

BUSINESS POTENTIAL

What about the IIc as a business machine? With only 143K available on the single integral disk drive, any large scale processing of accounts or databases would be a very frustrating experience — and though a second drive is good value at £230, it does push the price up into the range of more powerful machines. The best fit for the system is probably as a "management support" facility. It's hard to define exactly what this means, but most people agree that intermittent uses of word processing, data bases and spreadsheets are the key feature. Some call this sort of system a "desk tool" — a sort of direct upgrade from a calculator or a card index. By this definition, we felt that the IIc scored quite strongly.

Our first observation was that the new machine was truly compact: to use the industry jargon, it has a small "footprint". Those of us who find it difficult to keep our desks in a condition even approaching tidiness will find this an important buying point. The machine is cooled entirely by convection, so there are no irritating fans to disturb the creative processes.

The keyboard is made to a very high standard, with the full ASCII character set including the UK '£' sign. The four cursor keys are arranged horizontally (West-East-South-North) to the right of the Space bar. Our only reservation was the small size of the Return key. There is no calculator keypad, but most of the likely applications for the IIc as a "desk tool" should be quite workable without one.

Apple's monochrome monitor has a 9" screen, offering a rocksteady image in both 40 and 80-column modes, well up to the standard of the Apricot's monitor (and in some ways better, if you prefer a low-persistence phosphor). In normal use, you would mount the monitor on the optional stand. This costs £27, which is a lot of money for a hunk of painted cast iron. A cantilever arrangement of the sort used by Wang wouldn't cost much more to manufacture, and would certainly make it easier to move the monitor in and out of use.

For home use, the IIc comes with a TV modulator and a novel switch which selects either the computer or the aerial as the source of signals — a neat idea which eliminates the usual chore of unplugging cables. The monitor runs off the mains, while the system unit (like other compact machines) uses an external transformer to provide a 12 volt supply. The busy executive or commercial traveller would pre-

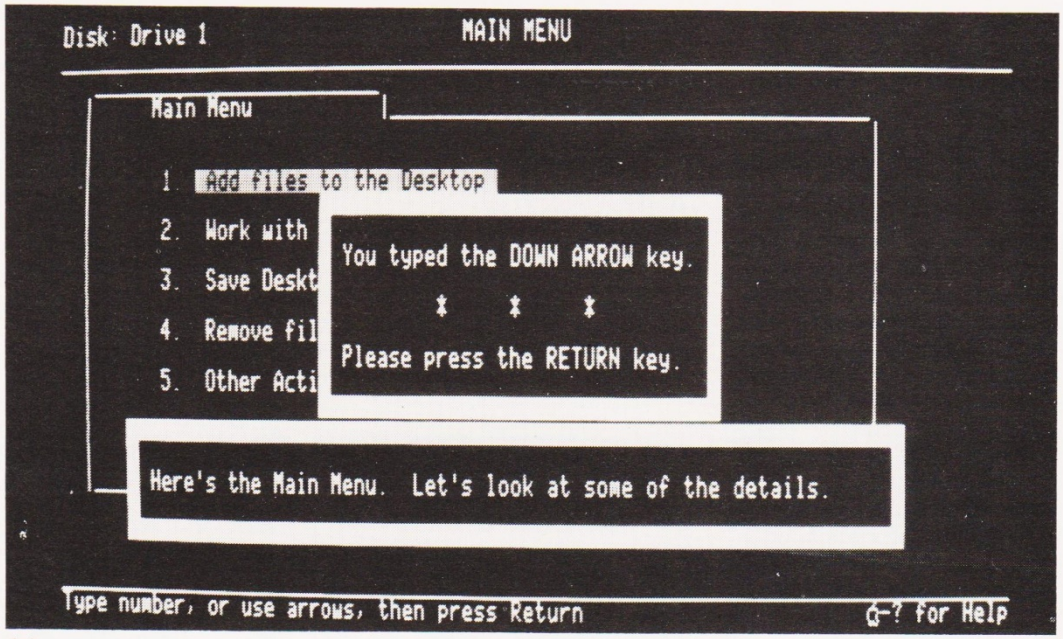
FACTSHEET	Apple IIc
	System Unit (requires monitor or TV) — £925
CPU	CMOS 6502
RAM	128K standard, not expandable
Language	Applesoft Mouse BASIC in ROM
Dimensions (HxWxD)	9" Display — 5.2kg (193mm x 242mm x 258mm)
	System — 3.4kg (63mm x 288mm x 310mm
	Power Supply — 1.5kg (68mm x 144mm x 74mm
Display	540 or 80 columns by 24 lines
	Low-res graphics through Applesoft BASIC
	Hi-res 560 x 192 in 16 colours
I/O	Serial printer/plotter interface (5 pin DIN)
	Serial communications interface (5 pin DIN)
	Apple Mouse/Joystick interface (9 pin D connector)
	Integral 143K 5¼" floppy drive
	Controller and interface for second drive
	Monochrome composite video output
	External modulator for TV
OS	ProDOS supplied with system
	DOS 3.3 (with utility to convert older programs)
	Pascal-based DOS
Options	Apple Mouse IIc — £70
	Monochrome Monitor IIc — £167
	Additional power supply for IIc — £27
	Carrying case for IIc — £27
	Expansion 5¼" Floppy Disk — £230
	LCD full screen display (NYA)
	Imagewriter Printer and adaptor — £423
	Apple Colour Plotter — £661
Software	Apple Logo (128K version) — £75
	AppleWorks — £175
	MousePaint (free with Mouse)

The sleek Apple IIc, displaying a Mousepaint frame.

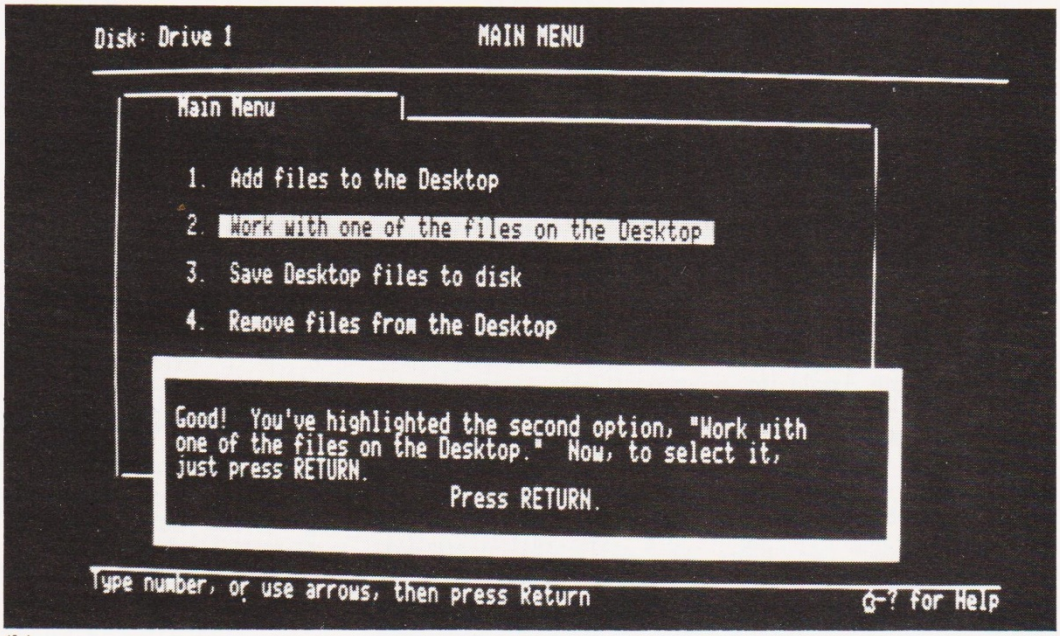
Appleworks integrates a spreadsheet, database and wordprocessor in an environment similar to a desktop, with pop-up folders and a chipboard for transferring information in word processor format.

The Appleworks tutorial program introduces these facilities in a brisk but friendly way. Typing errors are trapped (a) and a simple storyline (your application for a business loan) holds things together (b).

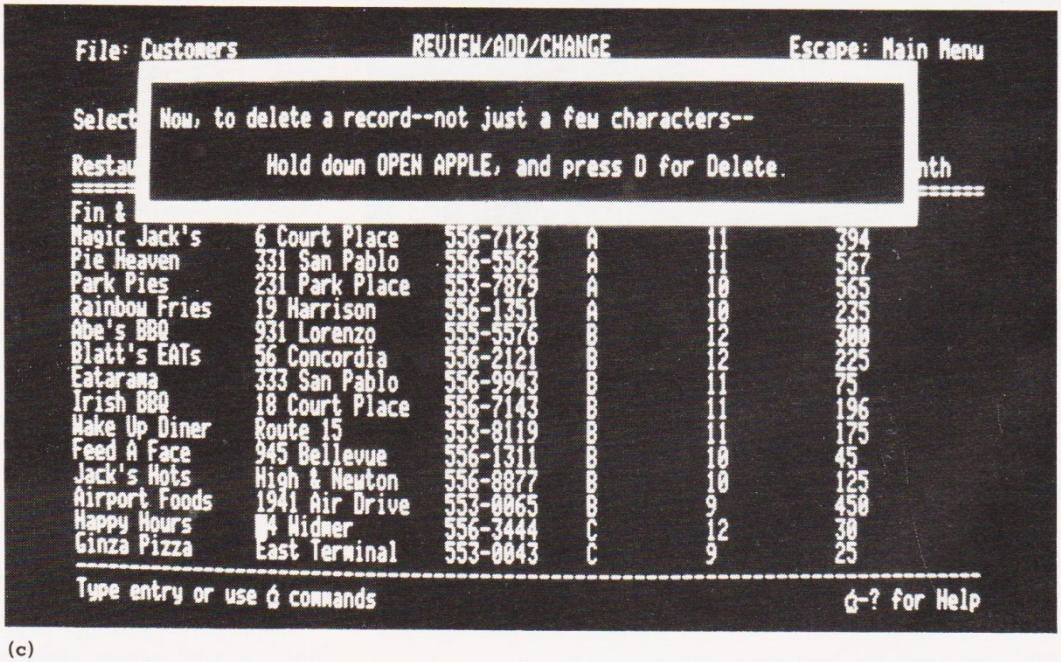
In the example, you provide your bank manager with a suitably edited list of customers (c) using Appleworks rudimentary database. Sales projections for the next few months (d) are adjusted using the spreadsheet, and the information is attached to the begging letter (e) via the clipboard (f) — a simple if somewhat inefficient form of integration.



(a)



(b)



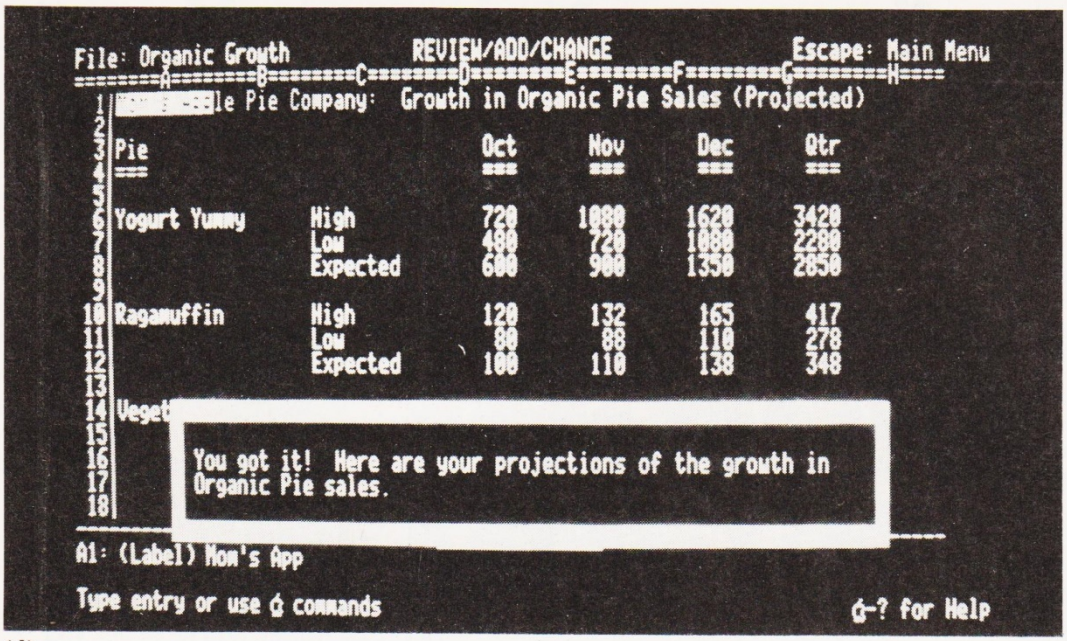
(c)

sumably have two power supplies (£27 each, weighing a hefty 1.5 kg); one with the monitor at the office, and one at home or in the hotel, together with the TV modulator. Apple have also announced a 24 line LCD screen for the IIc, which should be available towards the end of the year. This, if matched with a 21 volt battery pack, would make the system much more portable, at least in theory . . .

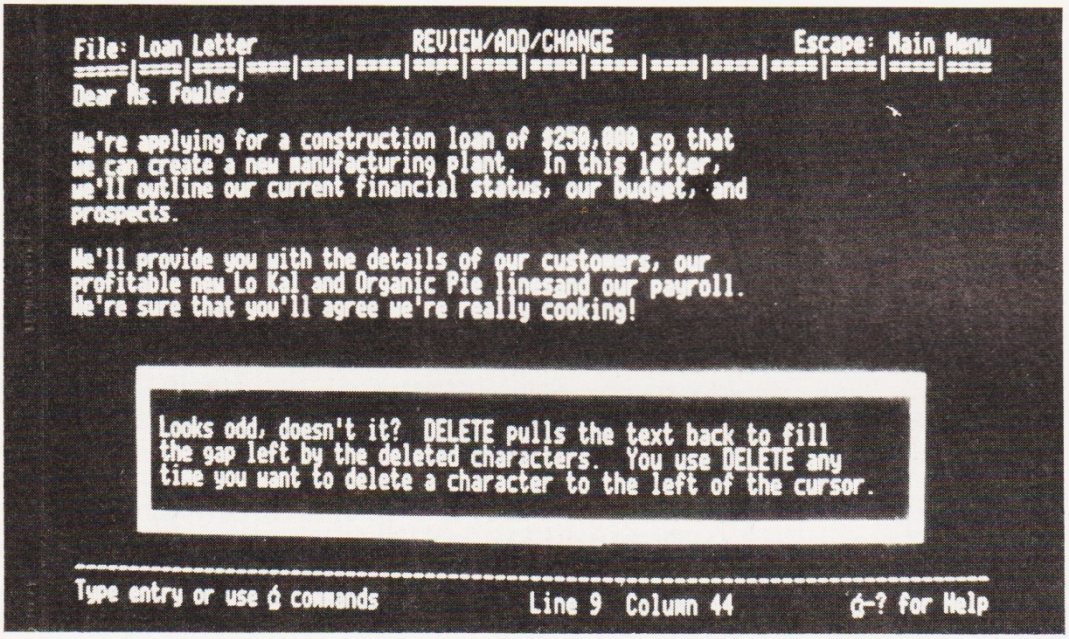
THE COMPLETE WORKS

For the business person, Apple offer an integrated program called AppleWorks, which incorporates WP, database and spreadsheet tasks into a pseudo-desktop environment with pop-up help screens. Once again, there is an excellent tutorial package which takes the novice through the various facilities. AppleWorks is simple to use and, for an eight-bit product, remarkably powerful. It doesn't offer graphics or telecommunications, but has almost everything else the average user might want from a "desk tool".

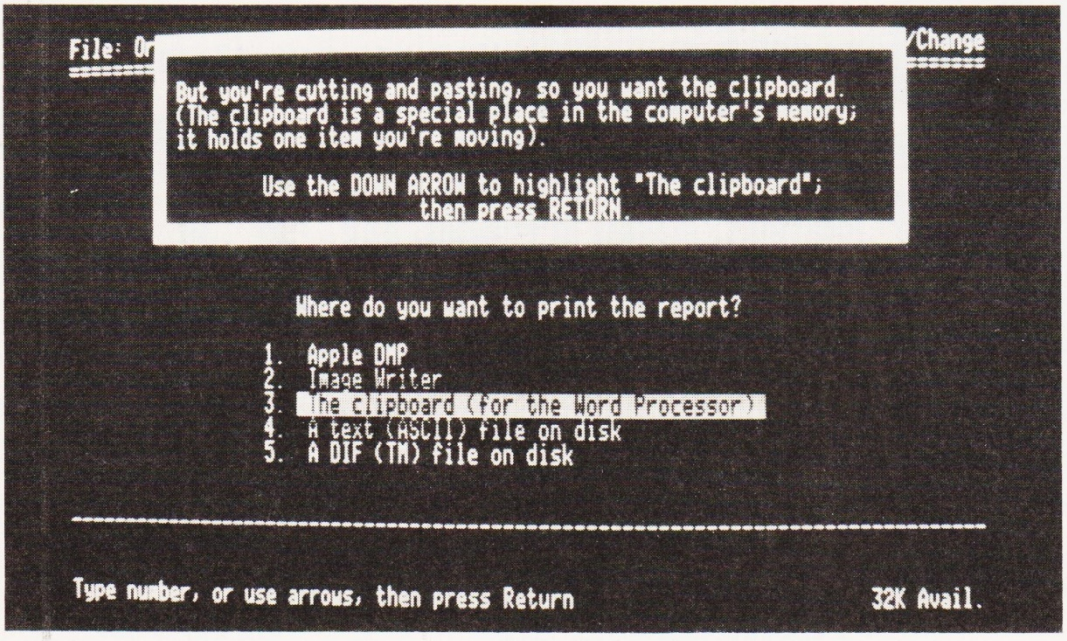
AppleWorks is really only integrated at the software level — true integration of data (which effectively makes



(d)



(e)



(f)

every file a word processing file) would require considerably more disk space and processing power. Information can be moved from the database or the spreadsheet onto a clipboard, the contents of which can then be treated as a block of text ready for inclusion in a word processed document.

AppleWorks makes it easy to switch between tasks so that information can be brought to the screen and selected for the clipboard. This is perfectly acceptable for "one-off" letters and reports but the absence of any mechanism for automating this cut-and-paste chore struck us as a significant drawback for many popular applications. How do you incorporate addresses in direct mail letters, or incorporate standard monthly statistics in reports? Surely AppleWorks could offer some form of command language which allows the word processing software to retrieve information from the other tasks without user intervention.

A PRICE TOO HIGH?

Our final reservation about AppleWorks is the same as our worry about the IIc itself — it costs too much. To put together a workable business configuration which really takes advantage of the IIc features takes a budget of £1690 (plus £70 if you want the Mouse and MousePaint). For a single-drive system which has limited expansion capability (the IIc is a "slotless" machine) this is a little high. There are plenty of manufacturers (Sanyo, ACT and Advance, for example) who can offer rather more power for the same price.

Manufacturers' prices can change in the twinkling of an eye, and there is no doubt that the Apple IIc is a well-designed system which will sell massively in the US. That means plenty of software and perhaps a few cunning add-ons. It isn't Apple's fault that the dollar is so strong against the pound, but, until that fact of life shows signs of changing, we think you would have to drive a hard bargain with your dealer to get value for your money.

You really can't go wrong with any Level 9 game as they are really brilliant

CRASH MICRO SEPT '84.

"Whichever machine you own, if you have the vaguest tendency towards adventure playing then you must try one of these games (unfortunately you'll probably end up wanting to buy the lot!)."
Computing Today, August 84

"To me, all Level 9 adventures create a remarkable atmosphere because the descriptions sound so life-like. This is where so many other adventures fail."
Crash, July 84

"But it's not just the size of the game it's the quality as well that is astonishing ... ... scenes to fire the imagination."
PCG, April 84

"As in all Level 9's adventures, the real pleasure comes not from scoring points but in exploring the world in which the game is set and learning about its denizens."
Which Micro?, February 84

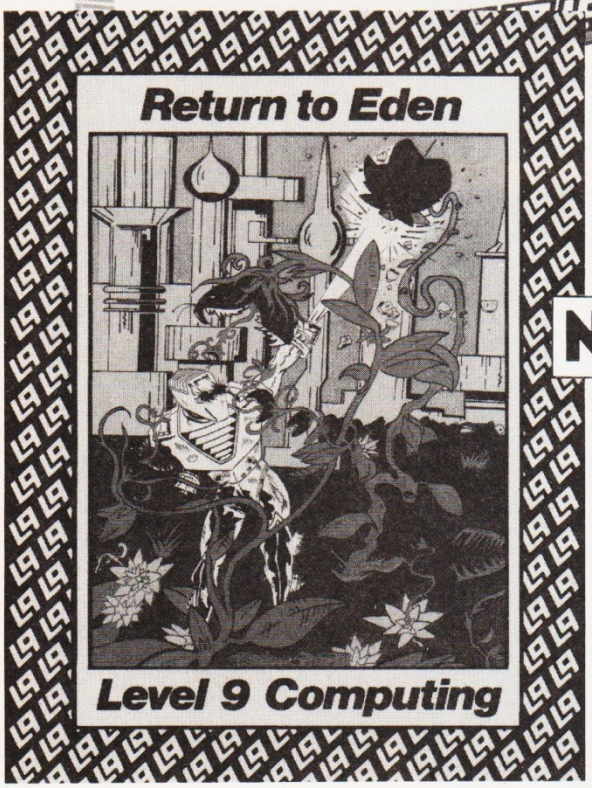
"(LORDS OF TIME). As we have come to expect from Level 9, the program is executed with wonderful style ... Highly recommended."
PCW, 1 February 84

"I thoroughly recommend these Adventures, they are excellent value for money. No self-respecting Adventure-addict should be without them. I believe Level 9 are producing a series of Adventures which should be regarded as classics."
Atari User, July 84

"These programs run very fast and there are no frustrating pauses. Level 9 Adventures are superbly designed and programmed, the contents first rate. The implementation of Colossal Adventure is nothing short of brilliance; rush out and buy it. While you're at it, buy their others too. Simply smashing!"
Your 64, June 84

"Level 9 — arguably the producer of the best adventure games in the UK — has done it again. LORDS OF TIME is a sparkling addition to its stable of winners."
Acorn User, July 84

"(SNOWBALL). This is another imaginative, massive-scaled immensely enjoyable adventure from those experts down at Level 9 Computing."
Your Computer, March 84



Level 9's epic adventures are now here for the AMSTRAD. Disk versions are available for the BBC (40/80 track) and Commodore 64. And, best of all, RETURN TO EDEN is ready. It's been a busy month!

RETURN TO EDEN is the long-awaited sequel to Level 9's top-selling Snowball adventure. Now it's here with 220 locations, masses of puzzles, and with pictures on the CBM and Spectrum versions.

NEW

	Cassette £9.95	Disk £11.95
1. **COLOSSAL ADVENTURE.** The classic mainframe game with 70 bonus rooms.	☐	☐
2. **ADVENTURE QUEST.** An epic journey through Middle Earth.	☐	☐
3. **DUNGEON ADVENTURE.** A massive game which completes the Middle Earth Triology.	☐	☐
4. **SNOWBALL.** Save the interstar freezer, Snowball 9, in a huge space adventure with over 7000 locations.	☐	☐
5. **RETURN TO EDEN.** SF adventure on the weirdest planet ever. The sequel to Snowball, though you don't need to have played this.	☐	☐
7. **LORDS OF TIME.** A humorous romp through World History.	☐	☐

I ENCLOSE A CHEQUE/PO FOR £9.95 EACH (CASSETTE) OR £11.95 EACH (DISK) FOR BBC OR CBM 64

My name: .....

My address: .....

.....

.....

My micro is a: .....

(one of those listed below, with at least 32K of memory).

Contact:
LEVEL 9 COMPUTING
Dept. C , 229, Hughenden Road, High Wycombe, Bucks. HP13 5PG.

Available from W H Smith and good computer shops everywhere. If your local dealer doesn't stock Level 9 adventures yet, get him to contact us or: Centresoft, Microdealer UK, Ferranti & Craig, Leisuresoft, Lime Tree, LVL, PCS, R & R or Wonderbridge.

AMSTRAD BBC CBM64 SPECTRUM MTX ORIC 1 LYNX NASCOM ATARI

MEMORY MOVES

Tom Ithell

If you've ever wanted to move large amounts of memory quickly from one RAM location to another, this article offers some sound advice on how to go about it.

The ability to move large amounts of memory from one ram location to another quickily, can be very useful at times, especially if the memory can be moved into lines within a BASIC program which can then be saved to tape or disc. The program described here has this feature as one of several memory relocation options.

Although it was written for the TRS80 Model I, Model III and Video Genie users should have no trouble using it. Moreover, the principles can be applied to any machine that stores its program lines in a format similar to that shown in Fig. 1.

FEATURES

Having a tape-based system, I have used the three redundant Disc BASIC commands, PUT, SAVE and LOAD, to perform the various memory movements. These three commands are used as follows:

- The screen or any other block of memory can be SAVEd to REM line statements as hexadecimal strings and LOADed back again into RAM.
- The screen or any other block of memory can be PUT from one memory location into another. There are obvious limits here, of course. For instance, SAVEing into ROM is impossible, while PUTting into the program area is suicidal unless done carefully (see SAVE routine). No check is made to ensure that you do not commit suicide, so please be careful in your choice of destinations for memory blocks.
- Hexadecimal assembler code can be LOADed from REM lines into their working position in RAM.
- Machine code programs in RAM can be SAVED into REM lines for backup purposes.
- REM lines with hexadecimal strings can be CSAVEd to tape for future use.

PROGRAM NOTES

Revectoring As is now widely appreciated by Model I owners of tape based systems, there are now simple ways of adding features to Level 2 BASIC.

One way is to intercept the interpreter during one of its regular excursions into the RAM area from 41ACH to 41E2H. On tape systems, the interpreter does not stay long because it finds a RETurn instruction at each place it visits. Altering the RETurn to a JumP instruction at a convenient location in this area can send the interpreter to a user routine elsewhere, usually in high RAM.

Another method, the one used here, is to redirect the Level 3 Commands between 4152H and 41A9H. Taking LOAD as the example, when the interpreter encounters a LOAD statement, it dutifully makes its way to address 4188H where it finds C3 2D 01. This tells the interpreter to jump to address 012DH. Off it goes to discover at 012DH yet more instructions that eventually lead to an L3 ERROR message. All we have to do to make use of LOAD is to poke into addresses 4189H and 418A the address of our routine. We can leave 4188H alone because we need the JumP. Now provided we have a RETurn in our user routine, everytime LOAD occurs in the program, the interpreter will go first to 4188H, then JumP to the new routine, execute it (hopefully!) and finally RETurn to where it would have gone originally had we not intervened! In a similar fashion, other disc commands such as PUT and SAVE can be altered to JumP to user machine code routines. Reassigning addresses in this manner is known as revectoring in the jargon.

Hexadecimal Storage in REM Lines Several methods exist for passing data into memory from BASIC. Lines 106 — 111 (Listing 1) illustrate one commonly used alternative. Line 106 POKEs the data in lines 107 — 111 into RAM starting at address −208 (65328 48K). Subsequently, once LOAD has been revectored, whenever LOAD is encountered by the interpreter, it is directed via 4189/8A to this code in high RAM. While per-

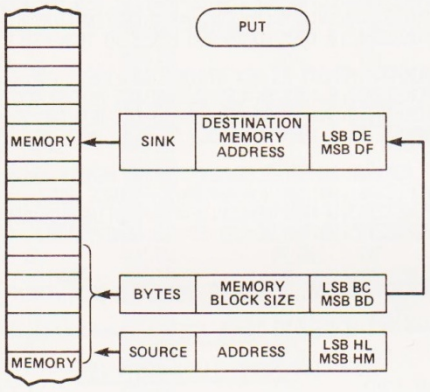
ADDRESS	CONTENTS		INTERPRETATION		
17129	113	LSB	LINK ADDRESS POINTING TO	17265	HOUSE
17130	67	MSB	START OF NEXT STATEMENT		:
17131	1	LSB	2 LINE BYTE NUMBER	LINE 1	:
17132	0	MSB		0	KEEPING
17133	147		TOKEN	REM	
17134	34		ASCII CHARACTER	"	
17135	70		ASCII CHARACTER	F	SAVE
17136	70		ASCII CHARACTER	F	DUMPS/
:	:			F	LOAD
:	:		128 BYTES EACH=ASCII 70=F	F	ACCESSES
:	:			F	HEX
17261	70		ASCII CHARACTER	F	IN THIS
17262	70		ASCII CHARACTER	F	AREA
17263	34		ASCII CHARACTER	"	
17264	0		END OF STATEMENT MARKER	0	HOUSE
17265	249	LSB	LINK ADDRESS POINTING TO	17401	:
17266	67	MSB	START OF NEXT STATEMENT		:
17267	2	LSB	2 BYTE LINE NUMBER	LINE 2	:
17268	0	MSB		0	KEEPING
17269	147		TOKEN	REM	
17270	34		ASCII CHARACTER	"	
ETC					

Fig. 1 Program statement storage: how line 1 in the main program is stored.

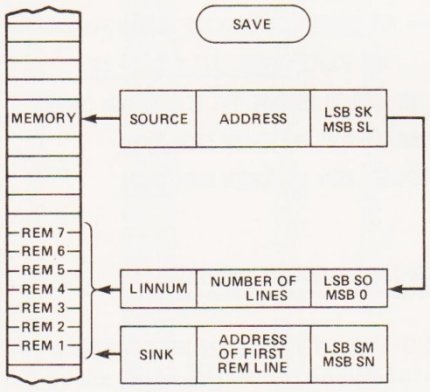
Listing 1. The memory-moving program listing, plus some demonstration routines.

```
1 REM"FFFF
```

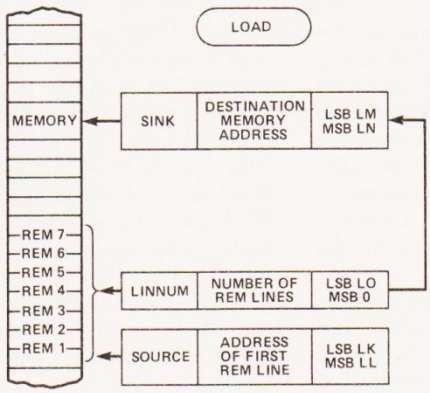
```
230 CLS
231 LOAD
232 PRINT@896,AG$;
233 A$=INKEY$:IFA$="Y"THEN235
234 IFA$="N"THEN236ELSE233
235 CLS:GOTO220
236 REM ************** ONE FINAL DEMONSTRATION **************
237 CLS
238 PRINT"FINALLY,HOW'S THIS?"

239 PRINT"PUT ROM 0 - 1023 TO SCREEN"
240 PRINT"SAVE SCREEN TO REM LINES 1 - 16"
241 PRINT"LOAD REM LINES BACK TO SCREEN"
242 PRINTE$;:INPUTX$
243 HL=0:HM=0:DE=0:DF=60:BC=0:BD=4:GOSUB135:PUT
244 SK=0:SL=60:SM=239:SN=66:SO=16:SP=0:GOSUB130:SAVE
245 CLS
246 LK=231:LL=66:LM=0:LN=60:LO=16:LP=0:GOSUB125:LOAD
247 PRINT@960,CHR$(31);
248 PRINT@960,"PHEW,DONE IT!!NOTE MEM SIZE LINE 5.BYE.....(BREAK)";
249 GOTO249
250 REM ********** GRAPHICS GENERATOR SUBROUTINE *********
251 REM GENERATE A SCREENFUL FOR DEMONSTRATION PURPOSES
252 CLS
253 A=32
254 FOR B=1TO14
255 C=RND(191):IFC<32THEN255
256 D=RND(30)
257 E=15360+A
258 FOR F=1TOD
259 POKEE+F,C:POKE-F,C
260 NEXT F
261 A=A+64
262 NEXT B
263 RETURN
264 REM ********************* END ************************
265 REM **            (C) T.A.ITHELL  1984              **
266 REM **         TRS80 MODEL I/III 16K - 48K          **
267 REM **          HEXADECIMAL STRING STORAGE          **
268 REM ************************************************
```



PUT MEMORY TO MEMORY						
VERSION	16K			48K		
LOCATION	32742		7FE6	65500 : FFDC		
LSB MSB	DEC	HEX	POKE	DEC	HEX	POKE
SOURCE HL HM	32760	7FF8	32760	65518	FFEE	−18
SINK DE DF	32762	7FFA	32762	65520	FFF0	−16
BYTES BC BD	32764	7FFC	32764	65522	FFF2	−14
REVECTOR	16771,230 16778,127			16772,220 16778,255		



SAVE MEMORY TO REM STRINGS						
VERSION	16K LOCATIONS			48K LOCATIONS		
LOCATION	32652		7F8C	65414		FF86
LSB MSB	DEC	HEX	POKE	DEC	HEX	POKE
SOURCE SK SL	32729	7FD9	32729	65491	FFD3	−45
SINK SM SN	32731	7FDB	32731	65493	FFD5	−43
LINNUM SO 00	32733	7FFD	32733	65495	FFD7	−41
REVECTOR	16801,140 16802,127			16801,134 16802, 255		



LOAD REM STRINGS TO MEMORY						
VERSION	16K			48K		
LOCATION	32560		7F30	65328		FF30
LSB MSB	DEC	HEX	POKE	DEC	HEX	POKE
SOURCE LK LL	32637	7F7D	32637	65405	FF7D	−131
SINK LM LN	32639	7F7F	32639	65407	FF7F	−129
LINNUM LO 00	32641	7F81	32641	65409	FF81	−127
REVECTOR	16777,48 16778,127			16777,48 16778,255		

Fig. 2 Parameters of PUT, SAVE and LOAD.

fectly adequate for small amounts of machine code and for passing data into RAM, it becomes rather slow when large chunks are involved. In addition, if memory is to be copied into DATA program lines from RAM as decimals, three or four bytes are needed to store one memory byte — two bytes for numbers between 10 and 99, three for numbers between 100 and 255, plus the comma separator. Other methods such as dummy strings suffer the disadvantages of very untidy listing and the inability to edit the resulting lines.

When these limitations in mind, I explored the possibility of hexadecimal string storage of memory data. Using this method, any number between 0 and 255 can be represented by two bytes and commas are not needed. Lines 100 and 101 contain an example of this type of storage. In fact this is the machine code for the routines accessed by SAVE and PUT. Lines 116 — 121 use the LOAD command (initialised in line 114) to LOAD the hexadecimal data in lines 100 and 101 into high memory (65414). The obvious overhead required with the technique is the extra machine code needed to pack and unpack hex strings. However, the speed of execution more than compensates for this. Comments in the Assembler Listings 2 and 3 explain how the hexadecimal conversions and string storage are achieved.

Three other points are worth noting at this stage.

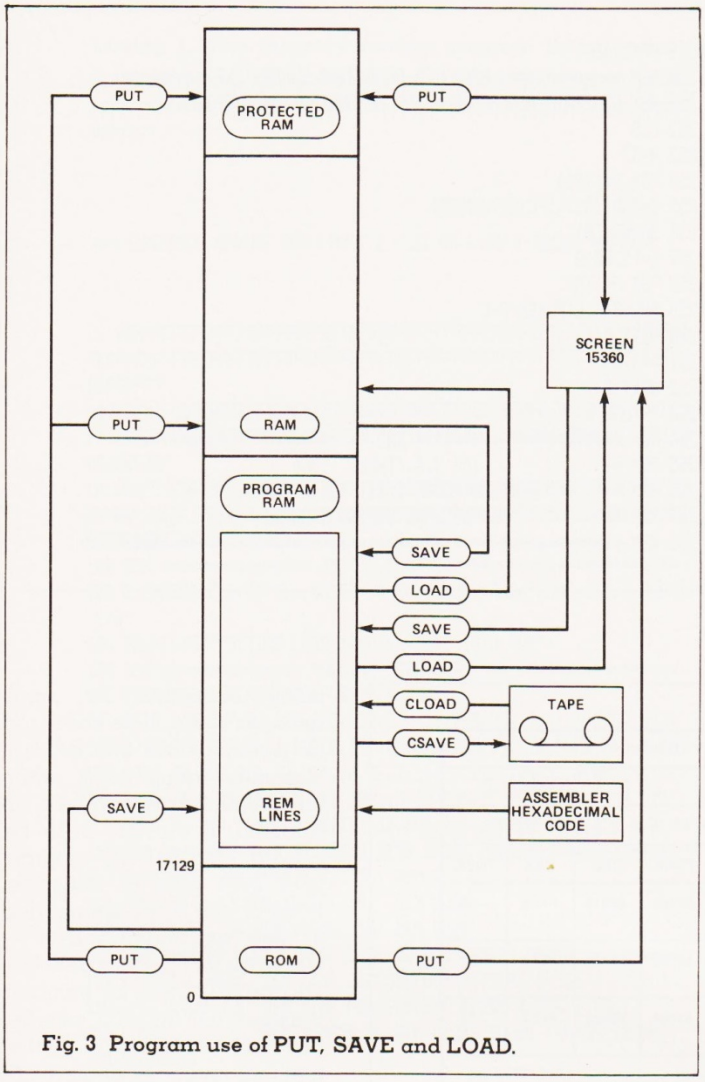


Fig. 3 Program use of PUT, SAVE and LOAD.

```
****************** HEXADECIMAL STRINGS **********************
************** CHANGES TO BE MADE TO MAIN ******************
***************** LISTING FOR 16K MODEL 1 ********************

100 REM"F5D92AD97FED5BDB7F018000DD2ADD7F7EF50F0F0FCDC87FF1CDC8
7F23CDC57F280218EBDD2BDDE5C1CDC57F2818060813 10FD018000 18D778B1C9
E50FC630"
101 REM"FE3A3802C607121130BC9F1D9C900000000000000000000000000F5D9
2AF87FED5BFA7FED4BFC7FEDB0F1D9C900000000000000000000000000000000
00000000"




106 FORA=0TO82:READN:POKE32560+A,N:NEXT

107 DATA 245,217,42,125,127,237,91,127,127,237,75,129,127,197,1

112 REM ************ REVECTOR DISK BASIC COMMANDS ************
113 POKE16771,230:POKE16772,127: REM PUT
114 POKE16777,48:POKE16778,127:  REM LOAD
115 POKE16801,140:POKE16802,127: REM SAVE
118 LM=140:LN=127: REM SINK ADDRESS=32652 (127 X 256 + 140)
124 REM ******** LOAD:SAVE:PUT PARAMETERS TO MEMORY **********
125 REM ***** LOAD HEX STRINGS IN LINES 1-32 TO RAM MEMORY ****
126 POKE32637,LK:POKE32638,LL:REM LK=LSB:LL=MSB 1ST REMLINE ADD
127 POKE32639,LM:POKE32640,LN:REM LM=LSB:LN=MSB DESTINATION ADD
128 POKE32641,LO:POKE32642,0 :REM LO=NO REM LINES TO TRANSFER
129 RETURN
130 REM *** SAVE ROM/RAM MEMORY AS HEX STRINGS IN LINES 1-32 **
131 POKE32729,SK:POKE32730,SL:REM SK=LSB:SL=MSB 1ST MEMORY ADD
132 POKE32731,SM:POKE32732,SN:REM SM=LSB:SN=MSB 1ST REMLINE ADD
133 POKE32733,SO:POKE32734,0 :REM SO=NUMBER OF REM LINES
134 RETURN
135 REM ****** PUT ROM/RAM MEMORY ELSEWHERE IN RAM MEMORY *****
136 POKE32760,HL:POKE32761,HM:REM HL=LSB:HM=MSB SOURCE ADD
137 POKE32762,DE:POKE32763,DF:REM DE=LSB:DF=MSB DESTINATION ADD
138 POKE32764,BC:POKE32765,BD:REM BC=LSB:BD=MSB MEMORY BLOCK
139 RETURN

145 PRINT"DEMONSTRATION TO MOVE SCREEN TO 30000 AND BACK AGAIN"

148 REM ************ PUT SCREEN TO 30000 (7530H) ************
150 DE=48:DF=117:        REM SINK=30000 (117 X 256 + 48)
154 PRINT@896,"IT'S GONE TO 30000,NOW LET'S BRING IT BACK ";
157 REM ************ PUT 30000 BACK ONTO THE SCREEN ************
158 HL=48:HM=117:      REM SOURCE=30000 (117 X 256 + 48)
170 PRINT"PUT WILL BE USED TO RESTORE THE SCREEN FROM 30000"
172 PUT:          REM GET COPY OF SCREEN FROM 30000
188 PUT:          REM GET COPY OF SCREEN FROM 30000



EXCEPT FOR LINES 124-139 CHANGES ARE UNDERLINED
**********************************************

 REMOVE ZEROS AT END OF LINE 101 TO GIVE 128 BYTES BETWEEN QUOTES
```

Listing 1a. Changes to Listing 1 for 16K machines are underlined here.

● Further memory saving is possible by removing the quotes from each REM line. They are there simply to mark the space available for storage. Fewer and longer REM lines could also be used. However, do not alter the format unless you are willing to rejig the the machine code in SAVE and LOAD (Listings 2 and 3). The REM statement is used as the storage vehicle simply because only a single byte is needed to store its token 147.

● Each REM line holds exactly the same amount of data. 64 memory bytes can be stored in the 128 REM line bytes allocated between the quotes. This format has been chosen because if the screen is dumped into the REM lines, one screen line then equals one REM line.

● Figure 4 has the starting addresses for REM lines 1 — 32. It is important to note that SAVE and LOAD have slightly different entry requirements.

The use of SAVE LOAD and PUT Revectoring of these disc BASIC commands takes place in lines 113 - 115. The values given are those for a 48K system. Figure 2 contains the changes for 16K users.

Before it can be used, each command requires three parameters to be defined. For SAVE and LOAD they are passed into buffers called SOURCE, SINK and LINNUM in assembler Listings 2 and 3. PUT buffers are called SOURCE, SINK and BYTES. The variables assigned to the parameters can be found in Figs. 2 and 5. The subroutines between lines 124 and 139 allow you to give values to these variables and pass them into the appropriate SAVE, LOAD and PUT buffers. Once more alter according to Figure 2 for 16K systems.

Taking each routine in turn now:

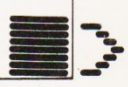
● SAVE copies a block of memory starting at the address specified by SK and SL (= SOURCE) to the first REM line whose address is specified by SM and SN (= SINK) until the number of REM lines are filled as specified by SO (= LINNUM). Listing 1 has examples in lines 166 — 194, Listing 3 has the assembler code for SAVE.

Having got its parameters from the SOURCE, SINK and LINNUM buffers, the routine accesses the designated memory, one byte at a time, converts the decimal content to its hexadecimal equivalent and dumps the two byte result into the first REM line location before returning for the next memory byte. This continues with the REM strings being filled sequentially until all the REM lines have been completed. After each 128 bytes, 8 is added to skip the housekeeping bytes at the end of one REM line and the start of the next, before the dump continues (see Fig. 1).

● LOAD copies the number

```
                00100 ;LISTING 2      LOAD ROUTINE
                00110 ;
                00120 ;*************************************************
                00130 ;* SENDS HEXADECIMAL STRINGS IN  REM LINES TO MEMORY  *
                00140 ;* 2 HEXADECIMAL STRING BYTES = 1 DECIMAL MEMORY BYTE *
                00150 ;* WORKING: AFH = 16 * 10 + 15 = 160 + 15 =175 DEC    *
                00160 ;* (SOURCE) = ADDRESS OF FIRST REM LINE               *
                00170 ;* (SINK)   = THE DESTINATION MEMORY ADDRESS          *
                00180 ;* (LINNUM) = NUMBER OF REM LINES TO BE TRANSFERRED   *
                00190 ;* (C) T.A.ITHELL 1984                               *
                00200 ;*************************************************
                00210 ;
FF30            00220                 ORG     0FF30H  ;65328 FOR 48K SYSTEMS
                00230 ;
0080            00240 STRLEN  EQU     80H
FF30 F5         00250 START   PUSH    AF              ;SAVE AF
FF31 D9         00260         EXX                     ;SAVE BC,DE,HL
FF32 2A7DFF     00270         LD      HL,(SOURCE)     ;SOURCE MEMORY ADDRESS(FIRST REM LINE ADDRESS) TO HL
FF35 ED5B7FFF   00280         LD      DE,(SINK)       ;DESTINATION MEMORY ADDRESS
FF39 ED4B81FF   00290         LD      BC,(LINNUM)     ;NUMBER OF REM LINES TO TRANSFER TO MEMORY
FF3D C5         00300 NXTLIN  PUSH    BC              ;SAVE A COPY FOR LATER
FF3E 010800     00310         LD      BC,8            ;NUMBER OF BASIC LINE HOUSEKEEPING BYTES TO SKIP:LINK ADDRESSES,LINE NUMBERS
FF41 ED4A       00320         ADC     HL,BC           ;ADD THEM TO SOURCE MEMORY COUNT IN HL
FF43 018000     00330         LD      BC,STRLEN       ;BYTES PER REM LINE
FF46 C5         00340 LINLEN  PUSH    BC              ;SAVE A COPY FOR LATER
FF47 7E         00350 NXTBYT  LD      A,(HL)          ;CONTENTS OF MEM ADDRESS TO REG A:BYTE 1/2 OF 2 BYTE HEXADECIMAL
FF48 D630       00360         SUB     30H             ;ASCII OF BYTE IN A - 48
FF4A FE0A       00370         CP      0AH             ;(10 BYTE=0-9:)10 BYTE=A-F
FF4C 3802       00380         JR      C,NOSUB         ;BYTE (10 SO LEAVE IT
FF4E D607       00390         SUB     7H              ;BYTE )10 SO SUB 7 TO GET VALUE
FF50 F5         00400 NOSUB   PUSH    AF              ;SAVE BYTE 1/2:THE MULTIPLIER
FF51 23         00410         INC     HL              ;MOVE SOURCE MEMORY COUNT ON ONE
FF52 7E         00420         LD      A,(HL)          ;CONTENTS OF MEM ADDRESS TO REG A:BYTE 2/2 OF 2 BYTE HEXADECIMAL
FF53 D630       00430         SUB     30H             ;ASCII OF BYTE IN A - 48
FF55 FE0A       00440         CP      0AH             ;(10 BYTE=0-9:)10 BYTE=A-F
FF57 3802       00450         JR      C,NOOSUB        ;BYTE(10 SO LEAVE IT
FF59 D607       00460         SUB     7H              ;BYTE)10 SO SUB 7 TO GET VALUE
FF5B C1         00470 NOOSUB  POP     BC              ;GET MULTIPLIER OFF STACK
FF5C E5         00480         PUSH    HL              ;SAVE MEMORY COUNT WE NEED REG L OF HL FOR SUMS
FF5D 210000     00490         LD      HL,0            ;ZERO HL
FF60 D5         00500         PUSH    DE              ;SAVE SINK ADDRESS WE NEED DE FOR SUMS AS WELL
FF61 111000     00510         LD      DE,10H          ;DE=16 HEXADECIMAL CONSTANT
FF64 19         00520 AGAIN   ADD     HL,DE           ;MULTIPLY BY ADDITION:16*MULTIPLIER IN BC
FF65 10FD       00530         DJNZ    AGAIN           ;CONTINUE UNTIL DONE
FF67 8D         00540         ADC     A,L             ;ADD CONTENTS OF L TO BYTE 2/2 IN REG A
FF68 D1         00550         POP     DE              ;GET SINK ADDRESS FROM STACK
FF69 12         00560         LD      (DE),A          ;PUT DECIMAL VALUE INTO MEMORY SINK
FF6A 13         00570         INC     DE              ;MOVE SINK MEMORY ADDRESS ON ONE
FF6B E1         00580         POP     HL              ;GET SOURCE MEMORY ADDRESS FROM STACK
FF6C 23         00590         INC     HL              ;MOVE SOURCE MEMORY ADDRESS ON ONE
FF6D C1         00600         POP     BC              ;GET BYTES PER LINE COUNT
FF6E 0B         00610         DEC     BC              ;DECREASE BY THE 2 BYTES WE'VE JUST PROCESSED
FF6F 0B         00620         DEC     BC
FF70 78         00630         LD      A,B             ;CHECK LINE HASN'T ENDED
FF71 B1         00640         OR      C               ;IF B=C THEN ZERO FLAGGED
FF72 20D2       00650         JR      NZ,LINLEN       ;BC)0 SO OFF TO PROCESS NEXT 2 BYTES IN THE LINE
FF74 C1         00660         POP     BC              ;END OF LINE SO GET LINE COUNTER FROM STACK
FF75 0B         00670         DEC     BC              ;TAKE ONE OFF FOR THE LINE WE'VE JUST DONE
FF76 78         00680         LD      A,B             ;CHECK LINE COUNT HASN'T REACHED ZERO
FF77 B1         00690         OR      C               ;IF B=C THEN ZERO FLAGGED
FF78 20C3       00700         JR      NZ,NXTLIN       ;BC)0 SO OFF TO PROCESS NEXT LINE
FF7A F1         00710         POP     AF              ;RESTORE AF
FF7B D9         00720         EXX                     ;RESTORE BC,DE,HL
FF7C C9         00730         RET                     ;BC=0 SO WE'VE DONE ALL THE LINES:BACK TO BASIC
FF7D 0000       00740 SOURCE  DEFW    0               ;POKE ADDRESS OF FIRST REM LINE TO BE USED HERE
FF7F 0000       00750 SINK    DEFW    0               ;POKE DESTINATION ADDRESS FOR REM LINES DATA HERE
FF81 0000       00760 LINNUM  DEFW    0               ;POKE NUMBER OF REM LINES TO BE TRANSFERRED HERE
FF30            00765         END     START
00000 TOTAL ERRORS
AGAIN   FF64
LINLEN  FF46
LINNUM  FF81
NOOSUB  FF5B
NOSUB   FF50
NXTBYT  FF47
NXTLIN  FF3D
SINK    FF7F
SOURCE  FF7D
START   FF30
STRLEN  0080
```

Listing 2. Assembler listing for the LOAD routine.



```
                00100 ;LISTING 3      SAVE ROUTINE
                00110 ;
                00120 ;*************************************************
                00130 ;* SENDS MEMORY TO REM LINES AS HEXADECIMAL STRINGS   *
                00140 ;* 1 DECIMAL MEMORY BYTE = 2 HEXADECIMAL STRING BYTES *
                00150 ;* PROCESSES MS NIBBLE OF MEMORY BYTE FIRST           *
                00160 ;* PROCESSES LS NIBBLE OF MEMORY BYTE NEXT            *
                00170 ;* (SOURCE) = ADDRESS OF FIRST MEMORY LOCATION        *
                00180 ;* (SINK)   = ADDRESS OF 1ST REM LINE TO BE FILLED    *
                00190 ;* (LINNUM) = NUMBER OF REM LINES TO BE FILLED        *
                00200 ;* (C) T.A.ITHELL 1984                               *
                00210 ;*************************************************
                00220 ;
FF86            00230                 ORG     0FF86H          ;65414 FOR 48K SYSTEMS
                00240 ;
0080            00250 STRLEN  EQU     80H
FF86 F5         00260 START   PUSH AF                         ;SAVE AF
FF87 D9         00270         EXX                             ;SAVE BC,DE,HL
FF88 2AD3FF     00280         LD      HL,(SOURCE)     ;ADDRESS OF FIRST MEMORY LOCATION TO BE COPIED TO STRINGS
FF8B ED5BD5FF   00290         LD      DE,(SINK)       ;FIRST REM LINE ADDRESS TOBE FILLED
FF8F 018000     00300         LD      BC,STRLEN       ;BYTES PER REM LINE
FF92 DD2AD7FF   00310         LD      IX,(LINNUM)     ;NUMBER OF REM LINES
FF96 7E         00320 NXTBYT  LD      A,(HL)          ;CONTENTS OF MEMORY ADDRESS TO REG A
FF97 F5         00330         PUSH    AF              ;SAVE A COPY FOR LATER
FF98 0F         00340         RRCA                    ;SHIFT MS NIBBLE
FF99 0F         00350         RRCA                    ;TO LS NIBBLE FOR CONVERSION
FF9A 0F         00360         RRCA                    ;NEEDS FOUR ROTATES
FF9B 0F         00370         RRCA                    ;DONE IT!
FF9C CDC2FF     00380         CALL    DECHEX          ;DEC TO HEXDEC SUBROUTINE
FF9F F1         00390         POP     AF              ;GET COPY FOR LS NIBBLE
FFA0 CDC2FF     00400         CALL    DECHEX          ;PROCESS LS NIBBLE
FFA3 23         00410         INC     HL              ;MOVE TO NEXT MEMORY ADDR
FFA4 CDBFFF     00420         CALL    ZERO            ;REACHED END OF REM LINE?
FFA7 2802       00430         JR      Z,NXTLIN        ;YES-GO TO NEXT REM LINE
FFA9 18EB       00440         JR      NXTBYT          ;NO-SO OFF FOR NEXT MEMORY BYTE
FFAB DD2B       00450 NXTLIN  DEC     IX              ;DECREMENT REM LINE COUNT
FFAD DDE5       00460         PUSH    IX              ;TRANSFER COUNT TO BC FOR
FFAF C1         00470         POP     BC              ;LINE COUNT ZERO CHECK
FFB0 CDBFFF     00480         CALL    ZERO            ;FILLED LAST REM LINE?
FFB3 281B       00490         JR      Z,BACK          ;YES SO BACK TO BASIC
FFB5 0608       00500         LD      B,8             ;NO SO SKIP NEXT 8 BYTES
FFB7 13         00510 AGAIN   INC     DE              ;IN REM LINES SECTION OF
FFB8 10FD       00520         DJNZ    AGAIN           ;BASIC PROG(LINK ADDRESSES,LINE NUMBERS ETC)
FFBA 018000     00530         LD      BC,STRLEN       ;RESET BYTES/REM LINE COUNT
FFBD 18D7       00540         JR      NXTBYT          ;BACK TO PROCESS NEXT REM LINE OF 128 BYTES
FFBF 78         00550 ZERO    LD      A,B             ;CHECK IF BC=0
FFC0 B1         00560         OR      C               ;IF B=C THEN ZERO FLAGGED
FFC1 C9         00570         RET                     ;BACK TO NEXT INSTRUCTION
FFC2 E60F       00580 DECHEX  AND     0FH             ;ZAP BITS 4-7 OF REG A
FFC4 C630       00590         ADD     A,30H           ;MAKE BITS 0-3 INTO ASCII
FFC6 FE3A       00600         CP      3AH             ;57=ASCII 9
FFC8 3802       00610         JR      C,LEAVIT        ;A(58 SO LEAVE IT ALONE
FFCA C607       00620         ADD     A,7H            ;A)57 SO ADD 7 TO GET ASCII A - F
FFCC 12         00630 LEAVIT  LD      (DE),A          ;A INTO REM LINE ADDRESS
FFCD 13         00640         INC     DE              ;NEXT ADDRESS IN REM LINE
FFCE 0B         00650         DEC     BC              ;DECREMENT REM LINE BYTES
FFCF C9         00660         RET                     ;BACK TO NEXT INSTRUCTION
FFD0 F1         00670 BACK    POP     AF              ;RESTORE AF
FFD1 D9         00680         EXX                     ;RESTORE BC,DE,HL
FFD2 C9         00690         RET                     ;BACK TO BASIC
FFD3 0000       00700 SOURCE  DEFW    0               ;POKE FIRST MEMORY ADDRESS HERE
FFD5 0000       00710 SINK    DEFW    0               ;POKE STARTING ADDRESS OF REM LINES HERE
FFD7 0000       00720 LINNUM  DEFW    0               ;POKE NUMBER OF REM LINES HERE
FF86            00730         END     START
00000 TOTAL ERRORS
AGAIN   FFB7
BACK    FFD0
DECHEX  FFC2
LEAVIT  FFCC
LINNUM  FFD7
NXTBYT  FF96
NXTLIN  FFAB
SINK    FFD5
SOURCE  FFD3
START   FF86
STRLEN  0080
ZERO    FFBF
```

Listing 3. Assembler listing for the SAVE routine.

SAVE MEMORY TO REM LINES

REM LINE NUMBER (SO)	ADDRESS (SINK)	LSB (SM)	MSB (SN)
1	17135	239	66
2	17271	119	67
3	17407	255	67
4	17543	135	68
5	17679	15	69
6	17815	151	69
7	17951	31	70
8	18087	157	70
9	18223	47	71
10	18359	183	71
11	18495	63	72
12	18631	199	72
13	18767	79	73
14	18903	215	73
15	19039	95	74
16	19175	231	74
17	19311	111	75
18	19447	247	75
19	19583	127	75
20	19719	7	77
21	19855	143	77
22	19991	23	78
23	20127	159	78
24	20263	39	79
25	20399	175	79
26	20535	55	80
27	20671	191	80
28	20807	71	81
29	20943	207	81
30	21079	87	82
31	21215	223	82
32	21351	103	83
100	21487	239	83
101	21623	119	84

LOAD REM LINES TO MEMORY

REM LINE NUMBER (LO)	ADDRESS (SOURCE)	LSB (LK)	MSB (LL)
1	17127	231	66
2	17263	111	67
3	17399	247	67
4	17535	127	68
5	17671	7	69
6	17807	143	69
7	17943	23	70
8	18079	159	70
9	18215	39	71
10	18351	175	71
11	18487	55	72
12	18623	191	72
13	18759	71	73
14	18895	207	73
15	19031	87	74
16	19167	223	74
17	19303	103	75
18	19439	239	75
19	19575	119	76
20	19711	255	76
21	19847	135	77
22	19983	15	78
23	20119	151	78
24	20255	31	79
25	20391	167	79
26	20527	47	80
27	20663	183	80
28	20799	63	81
29	20935	199	81
30	21071	79	82
31	21207	215	82
32	21343	95	83
100	21479	231	83
101	21615	111	84

Fig. 4 Starting addresses for REM lines 1-32.

of REM line hexadecimal string specified by LO (= LINNUM) from the first REM line whose address is specified by LK and LL (= SOURCE) to memory starting at the address speified by LM and LN (= SINK). Listing 1 has examples in lines 116 — 121 and 195-235, Listing 2 has the assembler code for LOAD.
LOAD.

As with SAVE, the parameters are first obtained from the SOURCE, SINK and LINNUM buffers. The routine then gets the first two hexadecimal bytes from the designated REM line and converts them back into decimal form. This value is then loaded into memory and the process repeated until all the REM lines requested have been converted and their contents transferred. Once again account is taken of the housekeeping bytes in the REM lines by adding eight after every 128 bytes.

● PUT copies the number of bytes specified by BC and BD (= BYTES) from the starting address in memory specified by HL and HM (= SOURCE) to the destination address in memory specified by DE and DF (= SINK). Listing 1 has examples in lines 141 — 165, Listing 4 has the assembler code for PUT.

PUT exploits the block transfer instruction LDIR: all the user has to do is to pass the three parameters into the SOURCE, SINK and BYTES buffers. PUT will then effect the block memory move.

Once initialised and with suitable parameters defined in their buffers, LOAD and PUT will also work from command mode. As each REM line requires 128 bytes to store 64 memory bytes you must obviously allow for this when allocating numbers to SO. Here are two examples:

● Saving the first eight screen lines
1 Screen line = 64 memory bytes
1 REM line holds 64 memory bytes
Therefore SO = 8

● Saving 64000 to 65535
Number of bytes = 65535 — 64000 +1 = 1536 memory bytes
REM lines needed = SO = 1536/64 = 24

If SO is greater than 32 then you can add more REM lines after line 32. However, adding more will alter the positions of lines 100 and 101 in memory. As they contain the SAVE and PUT machine code, you must change the values of LK and LL in line 117 to point to the new positions. Each extra REM line added pushes line 100 another 136 bytes further down in memory. See Fig. 4 for memory locations of the various REM lines.

Editing Lines Unlike some other methods of data storage, the hexadecimal strings can be edited and listed like normal lines. You must, of course, make sure that the REM lines always have 128 bytes between the quotes.

EASY ENTERING

The idea of having a program that alters itself during execution is very alien to the purists. Nevertheless the technique can be very useful, but it is not a method for the faint-hearted. One mistake in entering the REM lines and the first time SAVE is executed the interpreter will streak off to infinity at the speed of light, taking your evening's work with it. Moral — CSAVE before you try any of the commands. Type each REM line as follows:

Line number (1 space) REM" type F 128 times " (ENTER)

There is nothing important about F, any valid hexadecimal number 0 — F will do. It is just a way of ensuring that the correct amount of space is left between the quotes.

```
                00100 ;LISTING 4      PUT ROUTINE
                00110 ;
                00120 ;*************************************************
                00130 ;* GENERAL PURPOSE MEMORY BLOCK MOVE ROUTINE     *
                00140 ;* (SOURCE) = START OF MEMORY BLOCK TO BE MOVED  *
                00150 ;* (SINK)   = DESTINATION OF MEMORY BLOCK        *
                00160 ;* (BYTES)  = LENGTH OF MEMORY BLOCK IN BYTES    *
                00170 ;*************************************************
                00180 ;
FFDC            00190                ORG     0FFDCH          ;65500 FOR 48K SYSTEMS
                00200 ;
FFDC F5         00210 START  PUSH    AF              ;SAVE AF
FFDD D9         00220        EXX                     ;SAVE BC,DE,HL
FFDE 2AEEFF     00230        LD      HL,(SOURCE)     ;GET MEMORY BLOCK STARTING ADDRESS
FFE1 ED5BF0FF   00240        LD      DE,(SINK)       ;GET DESTINATION ADDRESS FOR THE BLOCK
FFE5 ED4BF2FF   00250        LD      BC,(BYTES)      ;GET LENGTH OF BLOCK TO BE MOVED
FFE9 EDB0       00260        LDIR                    ;MOVE THE BLOCK
FFEB F1         00270        POP     AF              ;RESTORE AF
FFEC D9         00280        EXX                     ;RESTORE BC,DE,HL
FFED C9         00290        RET                     ;BACK TO BASIC
FFEE 0000       00300 SOURCE DEFW    0               ;POKE STARTING ADDRESS HERE
FFF0 0000       00310 SINK   DEFW    0               ;POKE DESTINATION ADDRESS HERE
FFF2 0000       00320 BYTES  DEFW    0               ;POKE LENGTH OF BLOCK HERE
FFDC            00330        END     START
00000 TOTAL ERRORS
BYTES   FFF2
SINK    FFF0
SOURCE  FFEE
START   FFDC
```

Listing 4. Assembler listing for the PUT routine.

If you examine Fig. 1 showing the way in which REM line 1 and part of 2 are stored, it should be clear why a wrongly typed program will crash. Link addresses, line numbers and end of line markers will be changed irreparably. The task of entering the REM lines is made considerably easier by using the Screen Editor published recently in *Computing Today*, (January 1984).

Because lines 100 and 101 contain the SAVE and PUT machine code they must be copied *exactly*.

An important point to remember is that all REM lines must be the first lines in the program. Nothing can be put before them. SAVE and LOAD assume this is the case.

Before entering the program, set the memory size to 59999 (48K) or 29999 (16K). This will protect both the machine code for SAVE, LOAD and PUT and the space needed to dump the contents of the screen for demonstration purposes. In normal use, protect memory for the machine code and any extra for screen or string dumps.

COMMAND	LABEL	VARIABLE NAME	
		LSB	MSB
PUT	SOURCE	HL	HM
	SINK	DE	DF
	BYTES	BC	BD
SAVE	SOURCE	SK	SL
	SINK	SM	SN
	LINNUM	SO	0
LOAD	SOURCE	LK	LL
	SINK	LM	LN
	LINNUM	LO	0

Fig. 5 Names of LSB and MSB for each command.

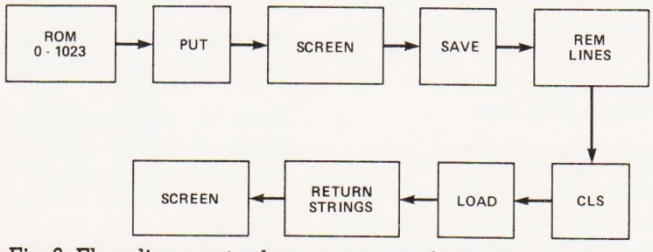


Fig. 6 Flow diagram to show sequence of commands.

USING THE PROGRAM

All the code from line 140 onwards can be deleted once you have seen how the various parts of the program work.

To use each command, pass values for the various parameters into the appropriate subroutine between lines 124 and 139, then execute the command as a program statement or from command mode. The buffers will retain the parameter values until altered. The examples from line 140 onwards make it clear how to set up the parameters. Most of the parameter values represent the least and most significant bytes of the relevant addresses. The way to calculate the LSB and MSB for any address is as follows:

MSB = INT (Address/256)
LSB = Address — (MSB * 256)

Lines 226 and 228 contain examples of the procedure. Figure 5 provides a summary of the names of the LSB and MSB for each command.

One feature lacking on the TRS80 is the ability to load hexadecimal values into RAM. The use of hexadecimal strings overcomes this irritation. Strings of assembler hexadecimals can be created and then placed into memory directly without having to convert them into decimals first. This should be of considerable help to those without a monitor. Using SAVE it is, of course, also possible to dump machine code programs back into the REM lines, allowing back-ups of some types of system tapes to be made.

Finally at the end, in lines 236 — 249 is a small demonstration of all the commands working together. Figure 6 shows what happens.

I use this program for saving single screens of information created by another large drawing program called Sketchpad, appended after line 140. The information on the screen can be transferred to or retrieved from memory at will using PUT. For a permanent record I use SAVE to transfer the screen to strings, then CSAVE the program. When CLOADed again, executing LOAD transfers the strings into memory to be called back by PUT. Allied to a screen-dump routine standard forms, diagrams, games boards and so on can be printed out again and again.

LAPS OF MEMORY

Phil Comes

Manufacturers keep on trying to pack more punch into their portables, and now Epson have produced the PX-8, a lap-sized computer with a lot to offer.

Portable micros have been with us now for a number of years. Starting at the small end was the Sharp PC-1211 and Casio FX-702P, while up at the top end of the range, the Osborne 1 set the ball rolling. Over the last few years the top end machines have got considerably smaller, and there has been a gradual move towards battery from mains operation. And, during the same period, the speed, power and facilities offered by the small hand-held machine have been on the up and up. At the point where the two trends now meet sits the Epson PX-8.

THE HARDWARE

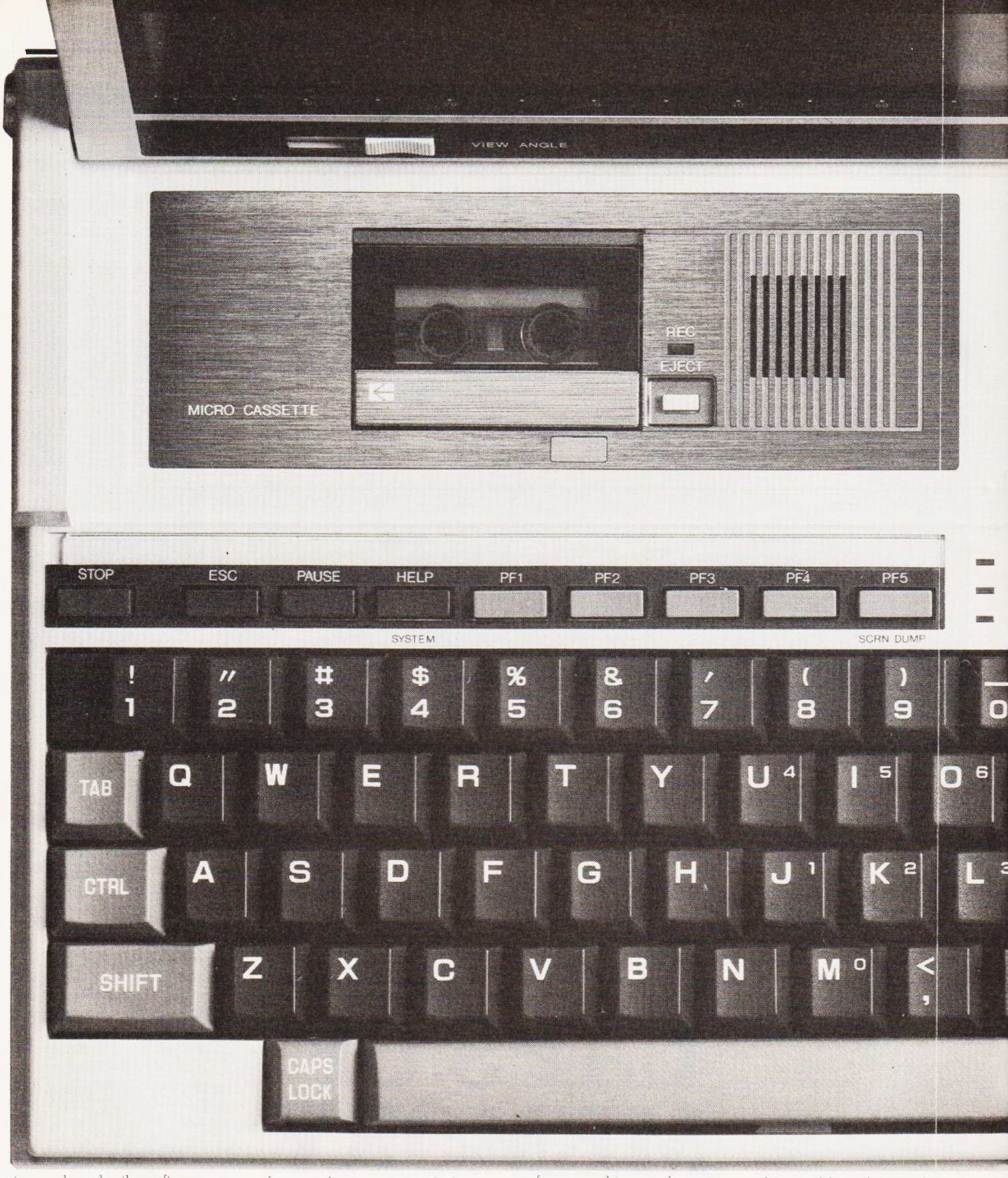
The PX-8 is contained in a compact, A4 size ivory-coloured plastic casing just under two inches deep. A light-grey plastic cover conceals and protects the keyboard, and a large liquid crystal display panel is hinged down flat over a single micro-cassette drive. The unit has two small hinged feet underneath, which can be used to raise the rear end of the machine, so that the keyboard is tilted to the usual typing angle. A carrying handle is also thoughtfully provided.

Removing the protective cover reveals a full-size dark grey standard QWERTY keyboard. In addition to this, several other keys are provided, including four cursor control keys and nine extra function keys, of which five are user definable, with two functions each. Above and to the right of the keyboard is the mechanical switch to unlock the display from its closed position. With the display unlocked, it is free to hinge through 180 degrees in 12 click steps, so that it can be set for the best viewing angle in any given situation.

Moving the display to its working position also uncovers the micro-cassette drive. The tape supplied in the review model was of type MC-30, (15 minutes per side) capable of holding up to 50K of data and programs on each side. Extra tapes, in 30 or 60 minute lengths are best obtained from Epson as they are not the same as the standard dictation machine cassettes.

The loudspeaker for sound output is also mounted under the display to the right of the micro-cassette drive. The sound level can be varied by a volume control on the right-hand side of the machine. Just behind the volume control is the main on/off power switch. For its portable power requirements, the unit contains two re-chargeable battery packs. One of these packs is used to power the machine while it is switched on and should last for 16 hours of continuous use.

The second battery pack is very small and is only used to 'battery back' the unit's memory between charging sessions. The mains power transformer supplied with the machine plugs into a socket on the rear panel and the power supply provides the power for normal office use of the machine and for charging the internal batteries. One final item of standard hardware worthy of a mention is the real time internal clock which, as we shall see, is put



to good use by the software.

EXTRAS

In addition to the hardware so far described, Epson intend to make several extra PX-8 compatible hardware items available in the near future. These items are either under development for release shortly, or drawn from Epson's current range. Several interface sockets are provided on the rear of the PX-8 to cope with this future expansion capability.

Looking at the machine from the rear, the socket on the left is marked SP OUT which is an external loudspeaker jack for listening to music generated by the software. (Music can be generated from BASIC using the BEEP and SOUND commands or from machine code using the operating system sound routine.) Next to this is a second jack socket labelled A/D IN which is actually an analogue to digital converter input. This input can be used to allow the PX-8 to directly monitor external events and voltages in the range 0 to 2 volts. The third jack socket is labelled BRCD and a bard code light pen can plug into this enabling the machine to be used in stock-taking-type applications.

The next interface, an edge connector onto the PX-8's main PCB, is covered by a plastic moulding. This connector is used when you attach the expansion RAM Disk unit which is housed in a matching ivory-coloured, wedge-shaped plastic case which screws in place under-

This photograph of the Epson PX-8 portable is reproduced life-size, so you can try fitting your fingers on the keyboard! The contrast of the LCD display can be adjusted for optimum viewing using the slide switch below the screen. The built-in micro-cassette drive is located beneath the flip-up screen. Various system functions are flagged by small LEDs, and the overall styling is extremely neat and elegant: the various special areas of the keyboard are tastefully colour-coded (see over).

neath the main unit, giving the keyboard the same angle as the two small hinged feet. The memory box adds an extra 120K of RAM to the existing 64K, making 184K in all. The extra RAM is automatically configured by the system to operate as a RAM disk unit. This means that the PX-8 treats this block of memory as though it were the contents of an ordinary disk drive, containing a disk directory and files that can be accessed many times faster than an ordinary disk.

There are two more interface sockets on the back of the machine which are both serial ports. The first is a standard RS232C port: connecting leads are available to attach the PX-8 to any of the standard RS232C devices such as a printer or modem.

The second serial socket is used to connect real disk drives to the machine. These can be of several types including a new 3½", 360K battery powered disk system, manufactured by Epson themselves.

ALL INCLUSIVE

All the hardware that we have looked at so far provides the perfect environment in which to run the software that is supplied bundled with the machine. This begins with CP/M version 2.2 — the world's most successful 8-bit micro computer operating system. The version that runs on the PX-8 has been modified by Epson to give it one or two extra facilities. You will probably know that CP/M is able to control up to 16 disk drives labelled A to P: of these, drives A to H are available as standard on the PX-8. Drive A uses some of the internal 64K of RAM as a small RAM disk or the external 120K RAM disk pack if it is fitted.

The contents of logical drives B and C are physically contained in exchangeable ROMs that are plugged into two special ROM sockets behind an easily removable cover on the underside of the unit. All of the standard application and utility software supplied with the machine is contained in a set of these plug-in ROM modules. Disk drives D to G would be real external disk drives if fitted, and finally drive H is the built-in micro-cassette deck.

The plug-in ROM modules supplied contain all of the usual and necessary software. These include Microsoft MBASIC interpreter, MicroPro Wordstar word processing package and Calc spread sheet, and a useful software appointments book and alarm system also by MicroPro called, imaginatively, Portable Scheduler. A fourth module contains most of the standard CP/M utilities like PIP, STAT, SUBMIT and CONFIG. The latter is included to allow such operations as setting up the user-defined keys, setting the real time clock, choosing printer speeds and the like.

Another useful facility is that of being able to set a password, which has to be entered on power up before the machine becomes active. This sort of security can be very valuable in a portable business machine. A fifth ROM module containing a portable data base program called Cardbox Plus will be supplied with the production machine, though sadly this was not available for review.

Going back to the BASIC, for those of you who want an estimate of the speed of the machine, I ran the eight 'standard' benchmark programs. The results are displayed in Table 1. As you can see, the figures show that the machine doesn't exactly hang around.

TABLE 1

Benchmark	Time
1	2.9
2	7.7
3	18.6
4	18.5
5	20.7
6	39.2
7	61.3
8	87.9
Average	32.1

Times in seconds to run eight standard benchmark tests in MBASIC.

THE FINER POINTS

For the two months I had the machine on loan, it performed extremely well. Incidentally, while using the PX-8, I found an article script about computer music that had been created by someone under Wordstar and left on the micro-cassette. It was very interesting!!! It also provided me with a good example of the sort of material that could easily be created and stored on this machine by an executive or writer, on the train home from an exhibition or seminar.

FACTSHEET	Epson PX-8
CPU	CMOS Z80 (main)/CMOS 6301 (slave)
Clock	2.45 MHz/614 kHz
RAM	64K user plus 6K for video
ROM	32K
Dimensions	11¾" by 8½"
Keyboard	72 key QWERTY type
Display	Built-in flip-up LCD display Text 80 by 8 Graphics 480 by 64
Mass storage	Built-in microcassette Plug-in ROM capsules (maximum two, 8-32K per capsule)
I/O	RS-232C with selectable baud rate Serial port at 150, 600, 4800 or 38400 baud Barcode interface Analogue input Parallel system bus
OS	CP/M
Language	Microsoft BASIC
Bundled software	Portacalc spreadsheet and Wordstar word processor on ROM capsules
Expansion	120K on RAM packs PF-10 3½" 360K battery disk drive (not yet available) TF-15 5¼" mains disk drive (not yet available)
Price	PX-8: £798 plus VAT 120K RAM pack: £270 plus VAT

I found the documentation supplied (four thick books) both adequate in quantity and pleasantly clear in quality, though I have to say that I have used CP/M, MBASIC and Wordstar many times before and so should not have had any difficulty in any case.

The keyboard is well laid out and the keys have a good positive feel. One particularly nice feature is the facility to change the function of a block of the keys so that they double up as a numeric keypad.

The micro-cassette unit, though small in appearance and slow in operation, performed extremely reliably and did not fail once during the review period. The only disappointment about this machine concerned the liquid crystal display. This consists of 480 by 64 individually addressable pixels, normally arranged as eight lines of 80 characters. The problem with the display is one of readability. Most large LCDs seem to suffer from this problem, but the Epson is not too bad if the general level of room lighting is fairly bright. Another common problem of these displays is the length of time they take to update. This can be appreciable particularly at low temperatures, but in the recent heat wave the Epson gave me no problems on this score.

CONCLUSIONS

The PX-8 provides sturdy battery-powered hardware with a good full-sized keyboard in an A4 sized machine. The LCD is plenty big enough for most purposes, though readability might be a problem in dim light conditions. The micro-cassette is very reliable, but slow. To overcome this speed problem, most users will probably fit disks or, for portable use, the 120K RAM disk pack.

Even with the RAM disk pack, the price of this CP/M machine with the standard selection of software is under £1000. This has to represent good value for money by any standards. All in all, the PX-8 is an impressive system easily capable of taking on tasks traditionally requiring a desk top full of kit.

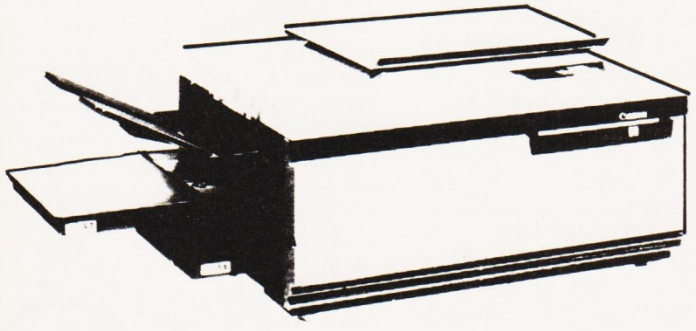
PHOTOCOPIES

A Computing today Reader Service

To take advantage of this simple service, just fill in the required information and send it (or a photocopy) to:

COMPUTING TODAY Photocopies,
No. 1, Golden Square,
London W1R 3AB.

together with your money and we'll do the rest!



Lost and can't be replaced? Well, if you've lost one of the early issues that cannot be replaced from our stocks of backnumbers, all is not quite lost.

If you know the article name and the issue it appeared in, we can supply you with a photocopy for the miserly sum of £1.50 including postage and packing. If you're stuck for the month, try checking in our annual index which is included in the December issue each year.

CT PHOTOCOPIES

NAME .....

ADDRESS .....

..... POSTCODE .....

Please send me Photocopies of the following items

ISSUE	ARTICLE	PAGES

At £1.50 each, I enclose £ .....

Cheques and Postal Orders should be made payable to ASP Ltd.

Software News

INNOVATIVE SOFTWARE

from the professionals

SANYO 550/5 SOFTWARE

Cashman — Very colourful arcade game for Sanyo.	£ 26.00
DC-10 — Flight simulator. Over 30 radio aids.	£ 26.00
Demon Seed — Another excellent arcade game.	£ 26.00
DS-DOS — Double sided DOS (1.25)	£ 37.00
DS-DOS80 — Quad DOS 80 track 9 sector (1.25).	£ 39.00
DS-DOS PLUS — Quad DOS 80 track 10 sector (1.25 or 2.11 state)	£ 39.00
Emperor — A full size wargame from Roman times.	£ 26.00
Freeze Frame — Text & graphics screen dump, colour too.	£ 32.00
French Tutor — Just that.	£ 26.00
Grafiti — Computer assisted graphics. 256K.	£ 35.00
King Arthur — 20 minute wargame.	£ 18.00
Master Graph — Even plots 3-D curves.	£ 62.00
M-DISK — Extra disk in RAM. 256K.	£ 26.00
MI-KEY — Re-define the whole keyboard or part of it.	£ 27.00
MI-TERM — Communications terminal program.	£ 44.00
Mysterious Adventures — A series of 10 classic Adventures. From damsels and dragons to space travel!	
Any 1	£ 18.00
Any 3	£ 45.00
All 10	£120.00
Picasso — The ultimate Paint program.	£ 77.00
Quick & Simple — Very simple database.	£ 39.00
Solitaire — Patience, Poker Squares, Blackjack, etc. Terrific graphics. 192K.	£ 29.00
Super DS-DOS — DS-DOS plus Utility Disk No.1.	£ 62.00
Super Zap — Full disk access and edit.	£ 37.00
Utility Disk No.1 — Collection of utilities.	£ 37.00

All programs supplied on a single sided formatted disk for 128K, unless mentioned, and compatible with colour monitor. DOS's require ownership of either MS-DOS 1.25 or 2.11.

All prices are VAT exclusive. P&P 75p per program.

TEL: [0424] 220391/223636

MOLIMERX™ LTD

A J HARDING (MOLIMERX)

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

TELEX 86736 SOTEX G

Send 24p A4 sized SAE for full list.

As seen in the national press

WIN a DREAM HOLIDAY in our GREAT COMPETITION

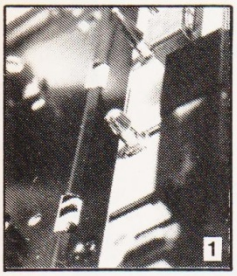
The Prizes:

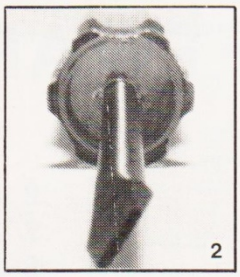
You could win £2,500 to be spent on a dream holiday of your choice for you and your family!

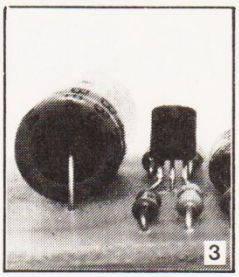
Second prize — a complete Canon portable video outfit worth £1,300.

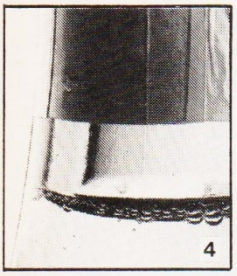
Third prize — a BBC Model B micro computer plus software worth £450.

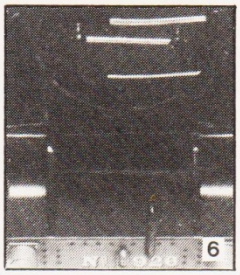
Fourth prize — Minolta X700 camera with a 50mm lens and flashgun, worth £280.

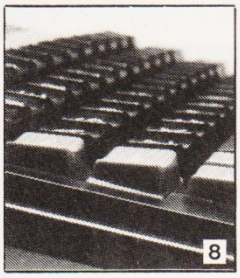


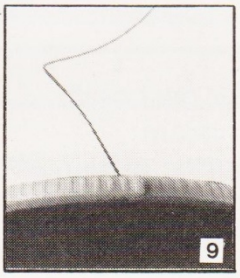


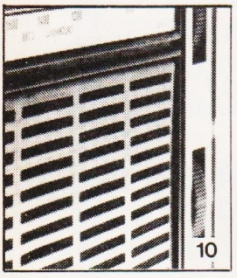


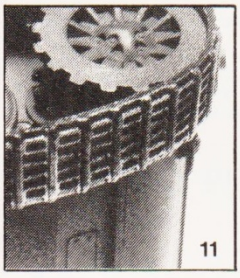


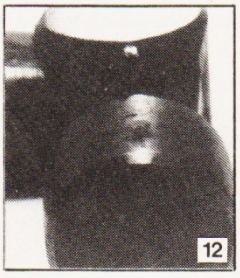












How to enter:

Just identify the twelve objects pictured opposite....

HINT — the Argus Specialist Magazines listed below might give you a clue:

Electronics Today International
Personal Computing Today
Movie Maker
Your Model Railway
Clocks
Home Computing Weekly
Beatbox
Ham Radio Today
Electronics
35mm Photography
Model Cars
Woodworker
Games Computing
Photoplay Movies and Video
ZX Computing
Military Modelling
Hi-Fi Now!
Winemaker
Citizens' Band
Model Boats
Video Today
Popular Crafts
Which Video?
Your Commodore

and write your (one-word) answers in the spaces provided on the coupon. For instance, if you think that number 9 is a record, write 'record' in the space next to 9 on the coupon and so on. Then tell us in up to 20 words why **MAGAZINES MAKE IDEAL HOLIDAY READING.** Complete the coupon in BLOCK LETTERS, and send it to: *DREAM HOLIDAY COMPETITION, Argus Specialist Publications Ltd., No 1 Golden Square, London W1R 3AB,* to reach us no later than 31st December 1984.

Competition rules

1 The competition is open to all UK and Eire readers except employees of Argus Specialist Publications Ltd., their printers and distributors.

2 As long as an original coupon from the magazine(s) of your choice is used for each entry there is no limit to the number of entries per person. Photocopied coupons will not be accepted.

3 All entries must be postmarked before 31st December 1984.

4 The prizes will be awarded to the first four entrants who identify the twelve objects correctly and whose completed sentence is judged the most apt and original.

5 No correspondence will be entered into about the competition results: the judges' decision is final.

6 Winners will be notified by post and the results will be published in a future issue of this magazine.

The 12 objects are

1. . . . . 2. . . . . 3. . . . .

4. . . . . 5. . . . . 6. . . . .

7. . . . . 8. . . . . 9. . . . .

10. . . . . 11. . . . . 12. . . . .

Magazines make ideal holiday reading because *(up to 20 words)* . . . . . .

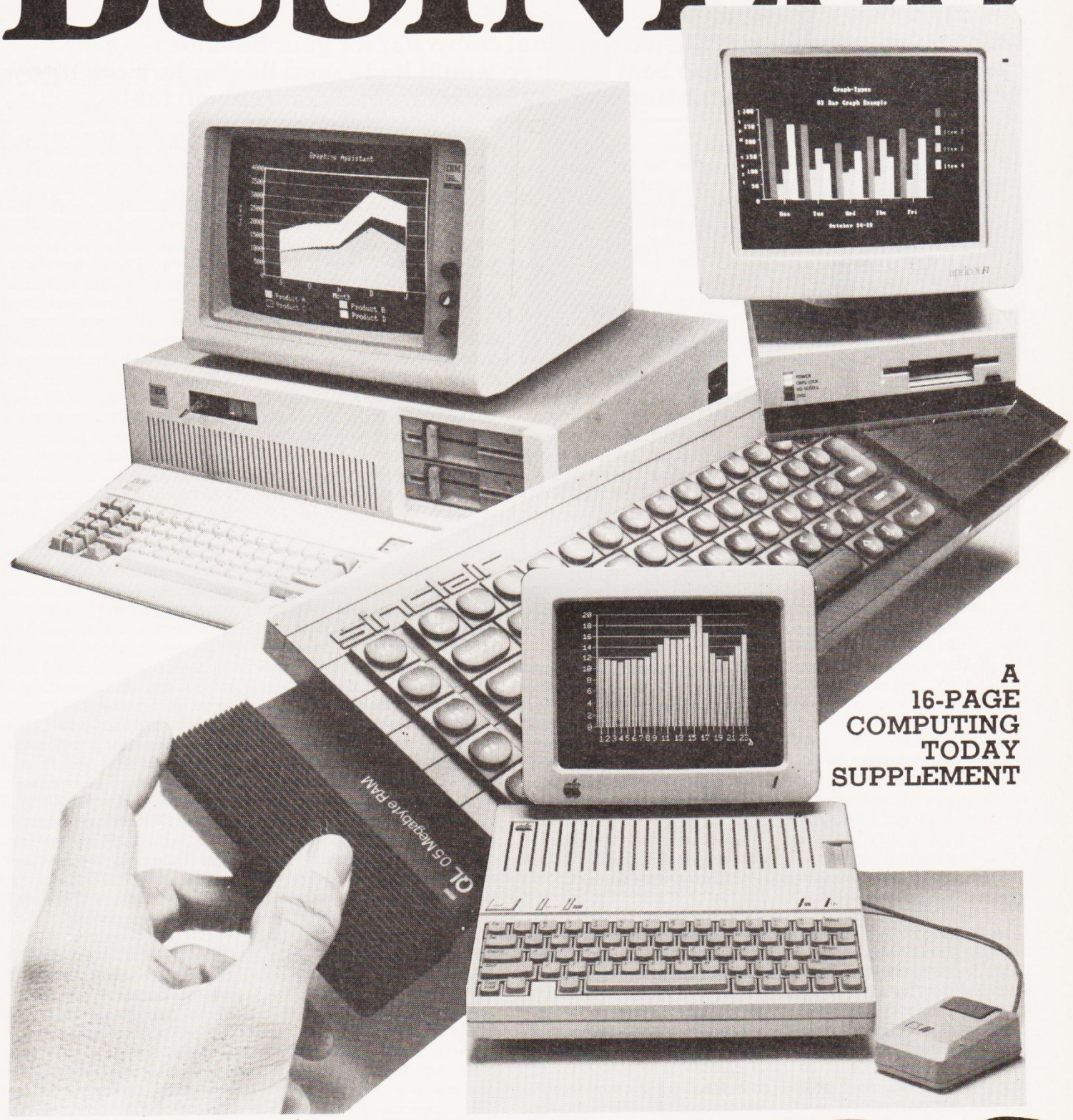
. . . . . .

NAME *(BLOCK LETTERS)* _____ AGE *(if under 18)* _____

ADDRESS _____ CT

Send to **DREAM HOLIDAY COMPETITION,** Argus Specialist Publications, No 1 Golden Square, London W1R 3AB.

BUSINESS



A 16-PAGE COMPUTING TODAY SUPPLEMENT

MATTERS

SHOPPING LIST

Henry Budgett

So you've decided you need a personal computer for your business — now what do you do? Well, the best first step would be to read this feature on how to shop, then browse through our factsheets and comparison table.

Buying a business computer is a subtle blend of knowing what you need and which software it will run on. One without the other, as many an unwary purchaser has found, gives you a very expensive heap of junk. The first, and without doubt the most important, thing that a computer buying businessman needs to do is to establish just what he or she needs the computer to do. If you cannot establish what the computer will do that an existing manual system cannot achieve, you've probably talked yourself out of buying one!

Assuming, however, that you can realistically justify the requirement, why else would you be reading this? — it is now time to sit down again and work out just what you expect the machine to handle. If, for example, you are doing a lot of repetitive letter writing, then a word processing package is an obvious must. Add to that the fact that you are always writing to the same people and a utility to maintain a computerised address book and and take addresses from it automatically becomes a necessity too.

NOW DOUBLE IT

Clear, logical thinking about your requirements, even down to the number of lines each address needs or the amount of clients your company deals with will provide you with a master requirement. Now add at least as much again: you are, after all, planning to expand now you've got over the manual bottleneck! At this point we haven't considered a single proprietry package, program or computer by name or implication. This is a deliberate choice, what you have to do now is to find the ones that can meet your requirements.

Here, at last, is the point where you start to look at the various options available in the High Street multiples or the specialist retail shops. Take only the specification and get one of the shop staff to try to assemble a package of hardware and software that will meet it. If they cannot be bothered or just say that one machine or another will do anything you want, leave quietly and try elsewhere. Until you can see a system performing the types of tasks that you need, don't even begin to think of ordering, let alone paying.

ELIMINATIONS

It is likely that, by the end of a week or so of traipsing around, you will assemble a shortlist of computers and software packages. Now, and only now, can the elimination process begin. Check the various contenders for price, service, backup in this country, number of other packages that will run on them, expandability and so on. Read the various reviews to see if any have known faults and sooner or later you'll end up with, at least, two or three systems that appear to offer what you want.

Now is the time to return to the outlet or dealer who offers the best price on the machine and present your shopping list. As a minimum requirement you will be looking for a system with two disks, a keyboard and screen, a printer and the necessary software. Add to this the immediate consumables like floppy disks, printer paper and ribbons and ask to see the whole thing demonstrated running the software *you* want in the way that *you* will be using it. Once again, if the dealer is unhelpful, take your custom elsewhere — after all, you will be paying at least £1,000 and maybe much, much more. Lack of service at the start is usually an indication that if things do go wrong you'll face even worse when you try to get your computer fixed or the software updated.

The second buying criteria is to see if you can get the whole lot at one time and in one place. This apparently trivial requirement is often a severe problem for smaller outlets who cannot afford to hold large amounts of stock. Going to a bigger dealer, and perhaps, paying a fraction more could be a worthwhile investment in terms of service and backup.

The sheer time and effort involved in doing all the above yourself may persuade you to acquire the services of a consultant. Just as with the hardware and software there are good and bad in this field too. The national network of Microsystems centres run by the National Computing Centre in Manchester is probably the place to start; their prices are reasonable and they tend to stick with the accepted market leaders rather than recommending cut-price but possibly problematical alternatives. The consultant will require a good deal of your time as all the initial analysis of how you operate and what you are expecting to gain from a computer will still need to be accomplished.

WARNINGS

There is a great temptation these days to buy a ready-to-run computer which comes with bundled software. Reason seems to suggest that you'll be able to get by with the standard software. Sure, you'll get by but it's rather like buying a racing bike and fitting it with 3-speed gears — you'll never get the best out of it! Regard the free software as just that. Should it turn out to be perfectly adequate then you've made a little on the deal but always be prepared to buy the exact product that you need, even if it costs a little more.

Beware, too, of the seductive charms of the integrated package. These are, in general, the music centre of the software world in that they offer a collection of packages within a single wrapper. You might expect to get a word processor, a data base and a spreadsheet with, perhaps, a graphics package thrown in for good luck. In general you find that the power of the parts isn't equal to the sum of the whole.

One classic example is the Appleworks packages for the IIe and IIc systems which offer an excellent word processor, data base and spreadsheet but doesn't allow the word processor to use names and addresses in the data base to generate form letters! It must, in fairness, be stated that some of the integrated packages do offer a simple and viable solution to many user's needs but a better solution is to take the manager approach. Here a single piece of software allows you to use a number of quite different products as though they were integrated, the best of both worlds.

Buying a business computer can be likened to buying a house. Once you've moved in and arranged everything to fit it's lovely. The trouble comes when it's time to move to a larger one. Sod's Law determines that you'll have to leave the carpets, curtains and a whole lot besides behind when you move. Computers are much the same so it's important to look forward and ensure that you can, at the very least, take the precious data with you when move to a newer or bigger machine.

IBM PC

MANUFACTURER
IBM

UK SOURCE OF SUPPLY
IBM authorised dealers

PRICE
£1,998 (ex VAT) to £4,140 (ex VAT)

BUNDLED SOFTWARE
Depends on dealer

OPERATING SYSTEM
PC-DOS (MS-DOS converted for IBM) or CP/M-86

GENERAL DESCRIPTION Just the announcement that IBM was to enter the personal computer market rocked several major hardware manufacturers back on their heels. While the US market held its collective breath and waited to see just what would happen, the UK just got on with its business. The delay in introducing the PC over here meant that the ACT Sirius (the now defunct Victor 9000 in America) had effectively stolen the show.
HARDWARE The system can be configured according to the user's requirements: you can start with a single 320K disk and 64K or go the whole hog and have a 10Mb Winchester, 512K of RAM and a 320K floppy disk — prices vary accordingly too!

Based on Intel's 8088 8/16-bit processor, the system breaks no new ground at all except, possibly, in the provision of a really excellent keyboard that everyone else is now copying. The keyboard is certainly well equipped with numeric, cursor and function pads; it offers just about everything you are ever likely to want, but make sure that the software you buy makes good use of it. The basic machine supports an 80-column monochrome display. Colour is available as an optional extra, but beware of some versions as the scrolling has a 'bug' which makes it pretty awful to watch. Peripheral support includes a parallel printer interface (IBM's PC Printer is really an Epson) but serial communications, joysticks and the rest come as extras.

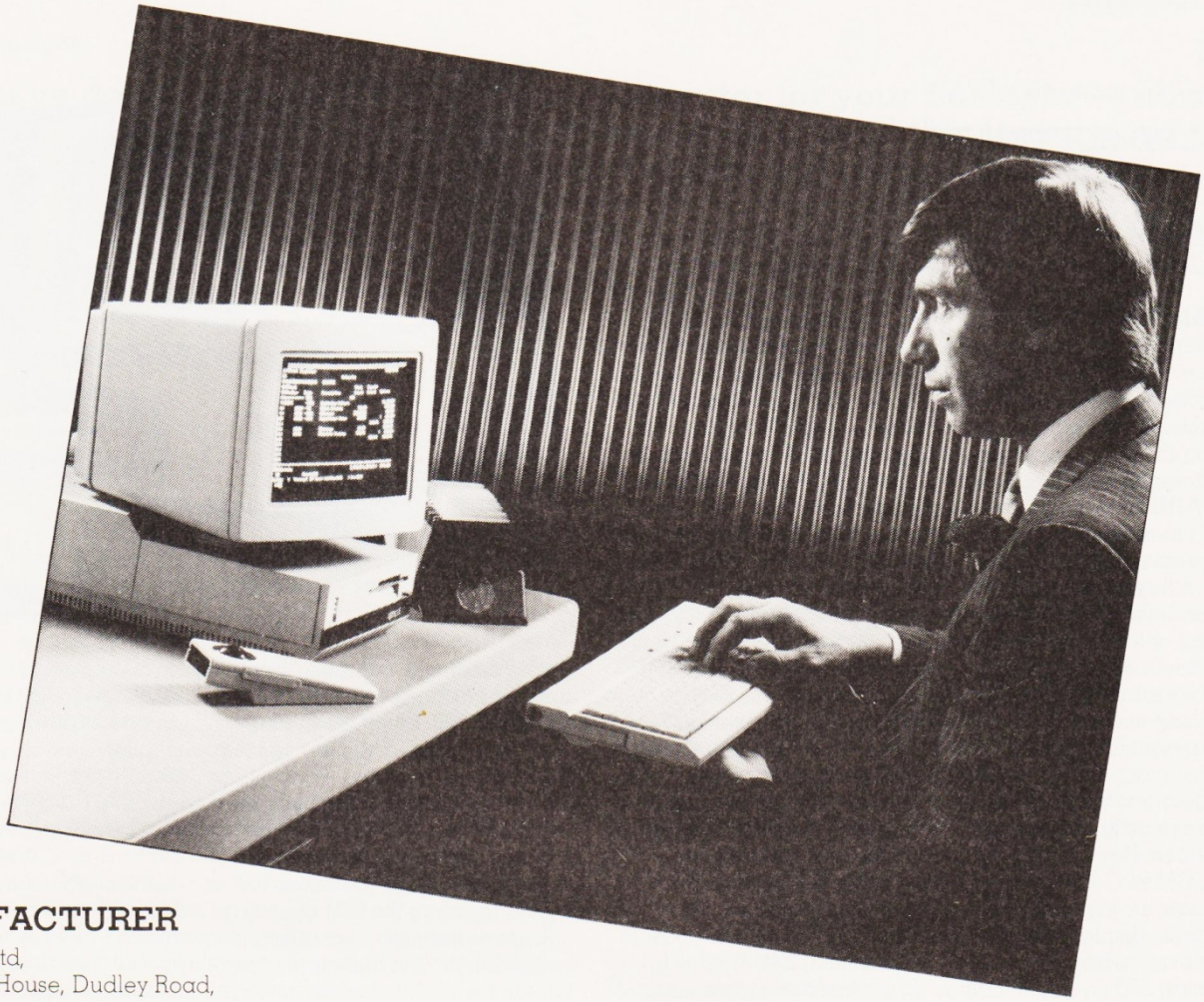
The graphic display formats vary according to whether you're using black and white or colour; the resolution is 640 by 200 in monochrome, 320 by 200 in colour. IBM's graphics system uses all eight bits of each byte in the video RAM so each character has an extra byte associated with it to determine whether it's underlined, highlighted, inverted, and so on. The colour card supports eight background and 16 foreground colours and the extra expense is well worth it if you're into pretty graphics.
SOFTWARE Given IBM's corporate muscle, it comes as little surprise to find that if you want to use any of the industry-standard packages you'll find them on the IBM — just don't expect to find any bells or whistles attached. The limited processing power makes it the 1984 equivalent of a 1982 Z80+64K+CP/M system. Some light relief is added, however, because as well as writing the PC-DOS operating system, Microsoft threw in one of the best pieces of software ever written — Flight Simulator.
MARKET SECTOR In the UK the machine is regarded as a strictly business or professional computer and is almost certainly meeting resistance from the likes of Apricot, Sirius and Macintosh. It has done well though, in spite of its delayed arrival, and a loan from your bank manager is much more likely if the computer has a name he already knows. One wonders what kind of revenge IBM may be planning on Apple for their leap into 32-bit technology with the Macintosh. If IBM can produce a rival, even if it's in two year's time, the whole vicious circle could start all over again. Just how many companies could survive that upheaval...
SUPPORT The IBM PC may have a massive market penetration but that's due more to the third party support than their own efforts. Companies have used IBM's name as a vehicle to their own success, a marketing strategy that Apple have consistently used with their systems.

Much of the support on the hardware side has been stifled by IBM's limited expansion facilities but the growth of the clone market has produced some remarkable add-ons; there's even an Apple emulator! Software abounds from all comers of the globe, the advertising speaks of packages being introduced by the day.
COMMENT The IBM PC simply has to be looked at in the context of being a workhorse computer rather than a high-performance machine. While it has certainly set the benchmark for the last year or so and acquired something like 30% of the total worldwide business market, the machine has no special technical features and in many ways looks just like an 8-bit CP/M machine of three years ago. However, just as those standards are still selling today so the IBM PC will be selling in five years time.

Today's generation of business systems are already well beyond the PC in technical capability and it looks increasingly as though the 32-bit processors will be the next standard. Much of the business sector is based on 8-bit architecture, even today, and it is a very strong possibility that they will upgrade directly to 32-bit machines. Although IBM's PCjr has had a disastrous start on both sides of the Atlantic, its recent re-vamp should make it a much more attractive entrypoint machine for the home/business user. It could just be that IBM knew what they were at all along and used the PCjr as market research to find out what the competition would do!
THE CLONES Possibly the biggest single measure of the machine's acceptance as the 16-bit standard is the sheer volume of the clone market. You can buy IBM look-alikes in portable as well as desktop versions from a dozen or so suppliers on both sides of the Atlantic. Even WH Smith are stocking a look-alike, the Ferranti-assembled Advance 86. Among the other, better known, systems vying for the PC buyer's attention are the Compaq range, Eagle's super fast Plus 2, Hyperion, Olivetti and the Televideo Tele-PC. While these are all highly compatible there are literally dozens of others including the new Encore from Osborne, Tandy's Model 2000 and the Graduate which turns your BBC Micro into a PC.

Quite how much these clones really do duplicate the original varies from maker to maker but as most come with bundled software anyway it doesn't really matter. The end user is unlikely to buy one of each and share the disks between them. Probably the single most used criterion for establishing the compatibility of a clone is getting the supplier to run Microsoft's Flight Simulator. While this is a good test in that it checks out the graphics, a much better assessment is to find the packages that you would want to run on the original PC and then ask for those to be demonstrated. Many software houses employ dodges and shortcuts to speed up the IBM which simply won't work on the chosen clone.

ACT APRICOT



MANUFACTURER

ACT (UK) Ltd,
Shenstone House, Dudley Road,
Halesowen,
West Midlands B63 3NT

UK SOURCE OF SUPPLY

ACT authorised dealers

PRICE

£1,495 (ex VAT) to £2,995 (ex VAT)

BUNDLED SOFTWARE

BASIC, COBOL, SuperCalc, Communications, Manager

OPERATING SYSTEM

MS-DOS, CP/M-86

GENERAL DESCRIPTION The Apricot's sleek design helped ACT set a new standard for neatness and portability in the business market. The idea of carrying your portable computer between monitors is, to say the least, an interesting one. Keep the 12" one at the office and the 9" one at home, you know it makes sense! Packaged into a very slim white case with its detached keyboard, the system both looks nice and handles well. The Sony 3.5" discs help keep the physical size down yet in terms of sheer power, the machine is at least equal to if not more powerful than its Sirius predecessor.

While ACT's original concept of a fully portable machine complete with flat-screen plasma-type display went out of the window at a very early stage, the advent of the new 80 by 24 LCD generation from Sharp and the like allowed ACT to produce the Rascal (see panel below).

HARDWARE Based on Intel's 8086 16-bit processor with 256K of RAM, the Apricot, despite its small size, offers considerable scope for expansion. If you need 'go-faster' maths, the 8087 co-processor can be fitted directly into the main PCB. The internal expansion bus can be used to expand the machine's memory capacity up to a total of 768K. Apart from increases to the Apricot's internal capacity, the single most popular expansion is likely to be the modem board which gives access to systems like Telecom Gold as well as remote contact with any other suitably equipped computer. They even throw the software in!

The keyboard does feel rather dead, the keys have a very short travel, and although it has all the function, cursor and numeric keys a user could want it somehow lacks the quality of the rest of the unit. On a personal experience note, the keyboard is the only part of either of my Apricots to give trouble; two replacements to date. This view is a highly personal one but as the keyboard is the sole source of interaction with the machine it's something to watch out for. ACT has fitted a mousehole to the side of the keyboard but, as far as I know, no suitable rodent has yet taken up residence.

ACT provide an asynchronous serial communications port and a parallel (Centronics) printer port. Both these can be configured under software control. In theory the machine should, therefore, be capable of communicating with almost any printer or modem. A standard Epson FX-80 printer connected to the Centronics port consistently produced extra line feeds regardless of any internal switch setting on the printer. The answer supplied by Epson proved to be to disconnect pin 14 — something that the manuals fail to mention.

The dedicated monitor displays the usual 25 lines of 80 characters which are bit mapped to give 800 by 400 pixels. ACT have also made much of their two-line LCD display on the keyboard called the Microscreen. By using six touch sensitive panels, the Microscreen acts as a set of function keys with programmable labels as well as being a clock/calendar and four-function calculator. Check the versioned software from third party sources to see whether they make use of the Microscreen. It can make the difference between being user friendly and boringly normal!

SOFTWARE Bundled in with the Apricot is (according to ACT at least) £750 worth of business software. The inexperienced user will find the Manager an extremely user-friendly device for configuring the system and loading various programs. The more computerate will probably find that the time saved by building auto-boot discs and ignoring it completely is well worth it! Also residing on the set of three disks are Supercalc, MBASIC, COBOL, the MSX graphics extension to BASIC and sundry other bits and bobs. You also get a bunch of vouchers entitling you to a free copy of Concurrent CP/M-86 and Personal BASIC plus money off the range of BOS software, UCSD Pascal and a Supercalc upgrade.

As well as the usual crop of third party packages there's always ACT's own Pulsar range (which, incidentally, is also available for the IBM PC). Of all their offerings, the most interesting must be the File Transfer System which allows Apricots, Sirii and IBMs to talk to one another and even lets Apples chip in with data files.

MARKET SECTOR Designed for the small business and professional market, the Apricot will also appeal to Sirius users looking to expand but still maintain compatibility. The innovative design and the decision to not quite follow the IBM trail has led to its warm welcome by the press on both sides of the Atlantic. While good reviews are not exactly money in the bank, there's enough evidence to show that the machine meets the requirements of a very diverse section of the market.

SUPPORT Alternative hard discs were available from third party suppliers before ACT got their own into the xi. Other hardware add-ons are promised from a variety of sources.

COMMENT Having specified the Apricot as our standard office system some seven months ago I've yet to find a good reason to make me change my mind. The two we have only failed once and that was through a dodgy keyboard assembly. The fact that the replacement failed was just bad luck. ACT's service was excellent — something that cannot be said for certain other companies.

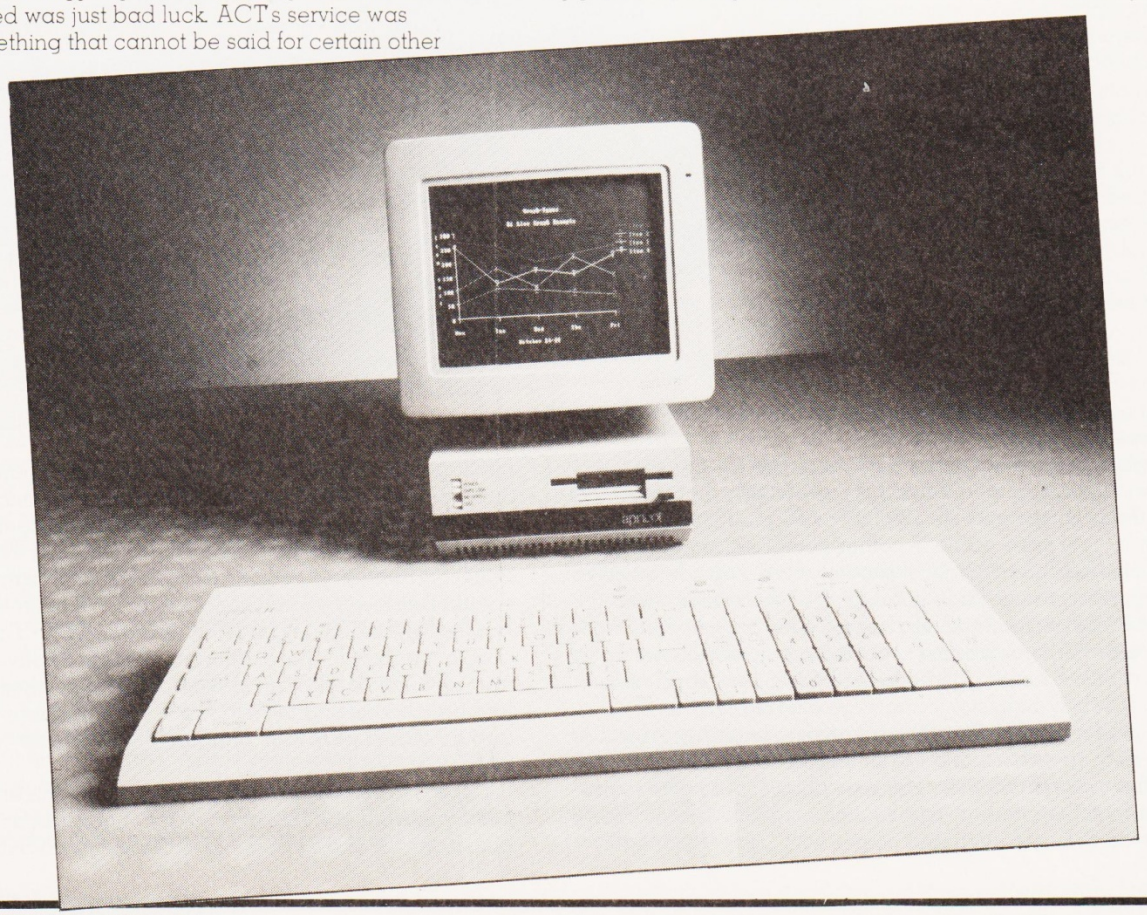
THE OTHER APRICOTS Following the successful introduction of the original Apricot, ACT followed with a double density drive version and the hard disk equipped xi series. A detailed review of the xi appeared in the August issue of *Computing Today* so I won't go over that ground again.

Reluctant to let a good idea slip, ACT has also introduced the Rascal series of Apricot compatibles. The Portable is a 13lb, Hitachi 80 by 25 LCD display equipped system, still mains powered, and look unlike almost any other computer you've ever seen. Among its impressive features are a double-sided 720K Sony disk, 256K of RAM and on-board speech recognition. It shares the scene with two 'half-Apricots', the F1 and F1E. While the Portable is priced at £1695, these are £995 and £795 respectively.

The Apricot Portable, claimed by ACT to be the most advanced around, packs 256K of RAM, a double-sided 720K 3.5" disk, speech recognition and an LCD display into the weirdest shaped box ever. The detached keyboard links by infra-red, as does the optional mouse/trackball. Providing speech recognition gives ACT a 'first' in the field and, from the specification at least, it looks pretty impressive. Any set of 64 words from a vocabulary of 4096 can be accessed at one time and both the ACT sourced packages supplied, Sketch and Diary, make use of the feature. The driver does require a whopping 55K but it is only loaded when the application is making use of the system.

Possibly the single most obvious pointer to the future of computers in general comes in the way that the LCD display is configured. You can use it in either text or graphics (640 by 256 pixels) mode and simultaneously obtain colour graphics from the normal video output. If the LCD is turned on it does restrict the number of colours supported (eight with it on as opposed to 16 when it's off) but the resolution is kept the same. What this allows you to do is to display text on the LCD, perfectly adequate for most normal applications, and simultaneously produce colour graphics on a conventional monitor.

Although the F1 and F1E look pretty much the same their internal configuration differs quite considerably. The bigger, and more expensive, F1 sports a single, double-sided 720K Sony drive along with 256K of RAM that can be expanded to 768K. The F1E has a standard 3.5" disk holding 315K and 128K of RAM but there is an optional expansion pack, called the Business Upgrade Kit, that provides a further 128K of RAM and MS-DOS.



The Apricot F1.

Black is beautiful: the Apricot xi, right, has an internal hard disk, while the new Portable, above, features an unusual design and voice recognition.

The system normally runs under the Digital Research CP/M-86 operating system.

Keyboards on both models are detached, like the one for the Portable, and use an infra-red link. ACT are happy that they have overcome the problems that dogged IBM's PCjr but just in case, they supply a 'light pipe' cable. Another detached peripheral is a 'solid state' mouse. Interestingly, this can be used upside down as well as a trackball, the ideal solution for the businessman who doesn't have enough room on his desk for a mouse rink. Further expansion is possible by adding a common box that allows up to five extra boards to be plugged into the system bus. Hard disks in both 5 and 10Mb Winchester formats are also available.

The use of colour graphics is one interesting facility provided on the F1 and F1E: 16 colours at a resolution of 320 by 256 or 4 colours at the maximum 640 by 256 resolution should give many systems a run for their money. Applications software is bundled in with all but the F1E and even that comes with Logo. Among the packages are three from Sorcim; Superwriter, Supercalc and Superplanner as well as a sketching program and a diary keeper.

Of all the problems that have caused comment about the original Apricot, the most well-known is that of the slow disk access. There is no obvious technical reason why the 3.5" drives should be slower on the Apricot than in its other implementations, but the new machines have an upgraded BIOS in 32K ROM and, according to those fortunate enough to have tried it out, they now go much faster. The move to ROM also frees more memory for applications and in a standard configuration, that gives you about 210K to play with. Imagine an adventure with graphics that big...

Expect to see them in the dealers before the end of the Autumn but if you want one I'd put an order in now because at those prices, the F1 and F1E should shift faster than Seb Coe!

APPLE IIC

MANUFACTURER

Apple Computer (UK) Ltd,
Eastman Way,
Hemel Hempstead,
Hertfordshire HP2 7HQ

UK SOURCE OF SUPPLY

Apple dealer network

PRICE

£925 (ex VAT)

BUNDLED SOFTWARE

Applesoft BASIC in ROM, six-disc training course

OPERATING SYSTEM

ProDOS or DOS 3.3

GENERAL DESCIRPTION When Apple launched the IIe last year and then quietly introduced a whole load of extras from mice to hard disks earlier this year it became obvious that something else was in the works. The 'something' turned out to be the IIc, the biggest potential seller in the portable market yet. Based on the IIe's architecture and including a long-overdue upgrade to the disk operating system, the designers squashed everything but the display into a 7.5lb, 12" by 11.25" by 2.25" box. Display options include a matching style 9" monochrome monitor, TV, colour monitor or an 80-column by 24-line LCD display — although the latter probably won't be available until the end of the year.

As a computer the IIc is hardly a radical new design; the original Apple was, after all, designed in 1976. However, as a package it is intended to introduce disk-based computing to every sector of the market. In designing the mouse into the IIc itself, Apple are also educating the user about such things as icons and pull-down menus. This makes them into potential Macintosh or Lisa owners — long-term strategic planning on a grand scale? The original II and its update the II+ may never have sold in huge volumes (two million units worldwide since its launch in 1977) but Apple is banking on shifting an almost unbelievable one million units of the IIc this year.

HARDWARE The external design is very neat indeed — the stylists were responsible for the Walkman — but the choice of white as a casing colour is a little strange; it gets dirty very quickly. Internally, the machine looks just like a fully expanded IIe but with the obvious difference that all the major functions have been 'chipped'. Based on a CMOS version of the faithful 6502 processor along with 128K of RAM, the hardware offers a full 80-column display, two serial ports, a mousehole and an expansion port for the second disk.

Although the disk holds its usual 143K, the 5¼" format was maintained for compatibility although 3.5" drives may well appear as add-ons. ProDOS, the new disk operating system, is around eight times faster than the previous DOS 3.3 although the latter is still supplied. Apple software generally carries the appropriate DOS with it on the disk so it doesn't matter which you use as long as you don't mix them. The keyboard features all the extra keys found on the IIe and the whole unit can be propped forwards to make it easier to use.

The designers also boosted the graphics capabilities to 560 by 192 pixels, double that of the IIe, and provided 16 colours rather than the normal eight. Sadly, they still left us with the revolting colour mixing problem that makes Apple high resolution text look like a technicolour snowstorm.

SOFTWARE The one thing that the Apple II series has going for it compared with its many 8-bit rivals is the sheer volume of software that it can run. While many computers are launched with a dozen or so packages, the IIc, on its day of release, was estimated to have a staggering 18,000 proven packages! Of these, and all the household names are in the list, the biggest seller is likely to be Apple's own integrated package, AppleWorks. This consists of a word processor, data base and spreadsheet and for £175, it knocks spots off all its rivals. It has its shortcomings; the word processor cannot use data base files to create form letters, but for the average user it provides all the functions he or she is ever likely to need.

Launched at the same time were new versions of Pascal, Logo and Access II. For reasons known only to the management at Hemel Hempstead only the last of that list has yet arrived on my desk and the order has been in since about April. Quite how the management re-shuffle up there has affected the operation is not yet apparent but fingers do need to be extracted!

The biggest worry of all about the IIc is that some of the best-known packages simply won't work. New versions are being created but the time lapse between launch and availability may give the machine a slower start than Apple are hoping for.

MARKET SECTOR Apple's own sales pitch is that the IIc is 'For work. For home. For everywhere in between.' It would take someone a whole lot braver than me to try to argue with that!

SUPPORT Apart from adding a printer, Apple launched two new low-cost ones and a modem at the same time so there's not a lot you really need to add. The system internal expansion capability of the II+ and IIe simply isn't there, so extra cards and second processors cannot be added (by conventional means at least). Both the normal complaints against the original Apples — not enough memory and only 40-column display — are dealt with internally.

COMMENT Being a dedicated IIe user, the launch of the IIc made me look seriously at having a second system to carry around. Sadly, the packages I use most of all; Applewriter, Multiplan, Cardbox and Brainstorm, just won't move across! The first pair really need two disks while the second pair are CP/M-based and I can't fit a second processor.

While my particular needs weren't met by the machine, the IIc undoubtedly has mass appeal and the sheer volume of software that will work means that the machine should do very well indeed, although I see it being used more as a super home machine than a business tool.

COMPARISON TABLE

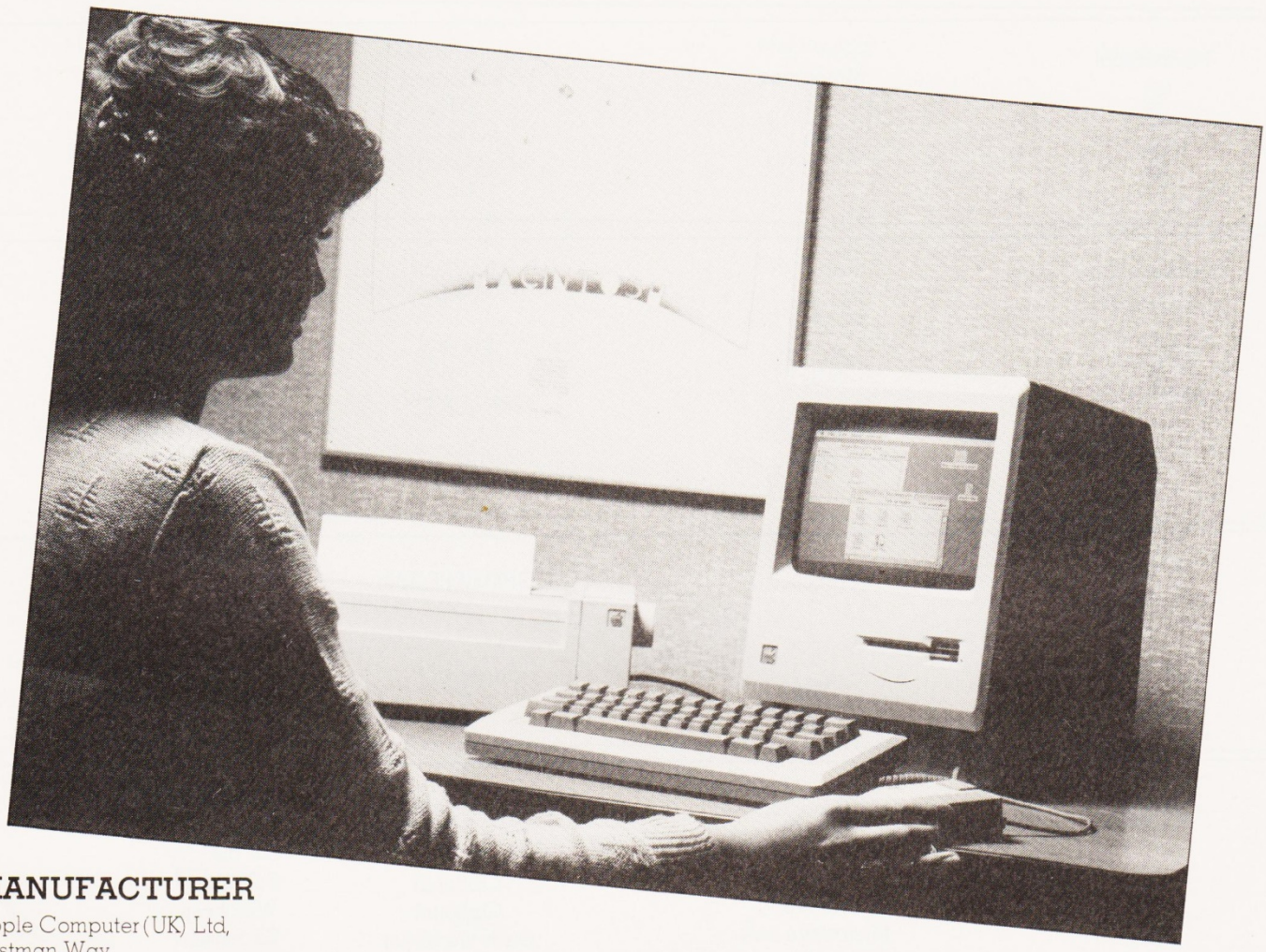
Macintosh	Apple IIc	IBM PC
68000	65C02	8088
32	8	8/16
128K	128K	64K
512K	128K	768K
64K	12K	40K
Mechanical	Mechanical	Mechanical
58	63	83
Optional	No	Yes
No	Keys only	Yes
No	No	10
9 inch mono	-	-
-	Monitor/TV	Monitor
-	Optional	
As required	24 by 40/80	24 by 80
512 by 342	-	640 by 200
Being developed	560 by 192	Optional
-	16	Mode dependent
-	-	-
-	-	1
2	2	Optional
-	1	Optional
Supplied	Interface only	Third party
Polyphonic	Beep only	Beep only
-	-	Yes
Apple's own	ProDOS/DOS 3.3	PC-DOS
1	-	-
-	1	2
Expected	-	Optional
Second disc	Second disc	Yes
-	-	-
Supplied	Selection	Selection
Selection	Selection	Selection
Selection	Selection	Selection
Supplied	Selection	Selection
Selection	Selection	Selection
Yes	Supplied	Supplied
—	Yes	Yes
Yes	Yes	Yes
Yes	Yes	Yes
Yes	Yes	Yes
Yes	As portable	Yes
Yes	Yes	Yes
£1795	£925	£1805

IBMPCjr	ACT Apricot	ACT Portable	
			SYSTEM
8088	8086	8086	Device
8/16	16	16	Number of bits
			MEMORY
64K	256K	256K	Total RAM
128K	768K	768K	Maximum RAM
—	—	32K	Total ROM
			KEYBOARD
Chiclet	Mechanical	Mechanical	Keyboard type
62	96	92	QWERTY keys
No	Yes	Yes	Numeric pad
Yes	Yes	Yes	Cursor pad
No	6	10	Function keys
			DISPLAY
-	-	LCD flat screen	Integral display
Monitor	Monitor	Monitor	External display
-	Microscreen	Integral	LCD/Plasma display
24 by 80	24 by 80	25 by 80	Text
640 by 200	800 by 400	640 by 256	Monochrome graphics
640 by 200	-	640 by 256	Colour graphics
Mode dependent	-	Mode dependent	Available colours
-	-	-	Sprites
			INTERFACES
1	1	1	Parallel
Optional	1	1	Serial
Optional	-	-	Joystick
-	Optional	Optional	Mouse
Beep only	Beep only	Beep only	Sound
Yes	Yes	Yes	Expansion bus
			STORAGE
PC-DOS	MS-DOS CP/M-86	MS-DOS CP/M-86	DOS
-	2	1	3.5 disc
1	-	-	5.25 disc
-	Optional	Optional	Winchester
Yes	Yes	Yes	Expansion
-	-	-	Microdrive
			SOFTWARE
Selection	Selection	Supplied	Wordprocessor
Selection	Selection	Selection	Data Base
Selection	Supplied	Supplied	Spreadsheet
Selection	Selection	Supplied	Graphics
Selection	-	-	Games
			LANGUAGES
Supplied	Supplied	Supplied	Interpreted BASIC
Yes	Yes	Yes	Compiled BASIC
Yes	Yes	Yes	Pascal
Yes	Yes	Yes	Assembler
Yes	Yes	Yes	Others
			APPLICATIONS
No	Yes	Yes (as portable	Business
Yes	Yes	No	Home/Business
–	£1395	£1695	**ENTRY LEVEL PRICE**

ACT F1	Commodore SX64	Osborne 01	Osborne Executive
8086	6510	Z80A	Z80A
16	8	8	8
256K	64K	64K	64K
768K	64K	64K	64K
32K	26K	4K	4K
Mechanical	Mechanical	Mechanical	Mechanical
92	66	69	69
Yes	No	Yes	Yes
Yes	Keys only	Yes	Yes
10	4 (8 functions)	No	No
-	5inch colour	5inch mono	7inch mono
Monitor	Monitor	Monitor/TV	Monitor/TV
-	-	-	-
24 by 80	25 by 40	24 by 52	24 by 80
640 by 256	-	-	-
640 by 256	320 by 200	-	-
Mode dependent	16	-	-
-	8	-	-
1	1	1	1
1	1	2	2
-	2	-	-
Optional	-	-	-
Beep only	3 channels	-	-
Yes	0	-	-
MS-DOS CP/M-86	Commodore's own	CP/M	CP/M
1	-	-	-
-	1	2	2
Optional	-	-	-
Yes	Yes	-	-
-	-	-	-
Supplied	Supplied	Supplied	Supplied
Selection	Supplied	Supplied	Supplied
Supplied	Supplied	Supplied	Supplied
Supplied	Selection	-	-
-	Selection	-	-
Supplied	Supplied	Supplied	Supplied
Yes	Yes	Supplied	Supplied
Yes	-	Yes	Yes
Yes	Yes	Yes	Yes
Yes	Yes	-	-
Yes	As portable	As portable	As portable
Yes	Yes	Yes	Yes
£995	£895	£795	£1295

Osborne Encore	Sinclair QL	Grid Portable	
			SYSTEM
			PROCESSOR
8086	68008	8086/8087	Device
16	8	16	Number of bits
			MEMORY
128K	128K	256K	Total RAM
512K	640K	512K	Maximum RAM
-	32K (48K)	16K	Total ROM
			KEYBOARD
Mechanical	Membrane	Mechanical	Keyboard type
63	65	57	QWERTY keys
Yes	No	No	Numeric pad
Yes	Keys only	No	Cursor pad
10	5	No	Function keys
			DISPLAY
LCD flat screen	-	Electroluminescent	Integral display
-	Monitor/TV	-	External display
Integral	-	Integral	LCD/Plasma display
16 by 80	25 by 85	24 by 80	Text
480 by 128	-	320 by 240	Monochrome graphics
-	512 by 256	-	Colour graphics
-	Mode dependent	-	Available colours
-	-	-	Sprites
			INTERFACES
1	Promised	GPIB (IEEE-488)	Parallel
1	2	2	Serial
-	2	-	Joystick
-	-	-	Mouse
-	Yes	-	Sound
-	Yes	Yes	Expansion bus
			STORAGE
MS-DOS	QDOS	Grid-OS/MS-DOS	DOS
-	-	-	3.5 disc
1	-	Optional	5.25 disc
-	Promised	Optional	Winchester
Yes	Microdrive only	Discs via server	Expansion
-	2	-	Microdrive
			SOFTWARE
Supplied	Supplied	Optional (in ROM)	Wordprocessor
Selection	Supplied	Optional (in ROM)	Data Base
Selection	Supplied	Optional (in ROM)	Spreadsheet
Selection	Supplied	Optional (in ROM)	Graphics
Selection	Promised	-	Games
			LANGUAGES
Selection	Supplied	-	Interpreted BASIC
Selection	No	-	Compiled BASIC
Selection	Promised	Via server	Pascal
Selection	Promised	Via server	Assembler
Selection	Promised	Via server	Others
			APPLICATIONS
As portable	Unlikely	Yes (as portable)	Business
Yes	Yes	No	Home/Business
Available November	£399	£3595	**ENTRY LEVEL PRICE**

APPLE MACINTOSH



MANUFACTURER

Apple Computer (UK) Ltd,
Eastman Way,
Hemel Hempstead,
Hertfordshire HP2 7HQ

UK SOURCE OF SUPPLY

Apple dealer network

PRICE

£1,795 (ex VAT)

BUNDLED SOFTWARE

Launch offer includes MacWrite and MacPaint

OPERATING SYSTEM

Apple's own

GENERAL DESCRIPTION Based around the 'desktop-metaphor' concept developed for its fore-runner, the Lisa, the Macintosh or Mac — as it is affectionately known — must be about the most idiot-proof machine yet. Keyboard operation is kept to a minimum and by using the mouse as a super-fast set of cursor keys, the main functions of the computer and, more importantly, the accompanying software are controlled by screen symbols, called icons. For the total computer novice this is an excellent way to do things. Unfortunately, the computer literate may well find constantly moving between keyboard and mouse and back again to perform the most trivial of tasks somewhat irritating.

Existing Lisa users can gain full compatability with the Macintosh through a package called MacWorks or they can get the two systems to communicate through a promised, but not yet delivered, local area network. In both the USA and the UK the machine has smashed its projected sales figures and in America it reduced IBM's struggling PC junior to an also-ran. It undoubtedly has some quirks that the experienced may find frustrating but it isn't really aimed at that sort of marketplace.

HARDWARE With its architecture based on Motorola's 32/16-bit 68000 processor (the bigger brother of the QL's CPU) the Mac comes in a superbly designed and compact package. Its 'footprint' — Americanese for how much desktop space it takes up — is not that much bigger than a telephone. Its overall dimensions are 10.9" by 9.7" and it stands just 13.5" high. The detached keyboard is also pretty tidy but the mouse, on the other hand, takes up more space than the conventional, full-sized keyboard of something like an IBM!

All the main electronics are packed onto just one PCB with a second providing the monitor drive and power supply. Possibly the single most important chip after the CPU is a 64K ROM which contains all the routines to handle icons, windows, pull-down

menus and so on. Apple have only provided 128K of RAM. If this seems rather small it's because they are waiting for the new 256K bit RAM chips before they produce the 512K version called FatMac. (Presumably a rather prominent fastfood chain had prior claims on the other possible name!) A 9" high resolution monochrome monitor is also packed into the box and this supports 512 by 342 pixels. All displays are produced on a pixel basis, even the text, and that's why the output looks so good. According to American media sources, Apple are planning a colour version (something that had been strongly denied at the launch) but don't expect to see it for about a year. One of the companies supposed to have received a prototype is Lucasfilm. I wonder what they are going to use it for...

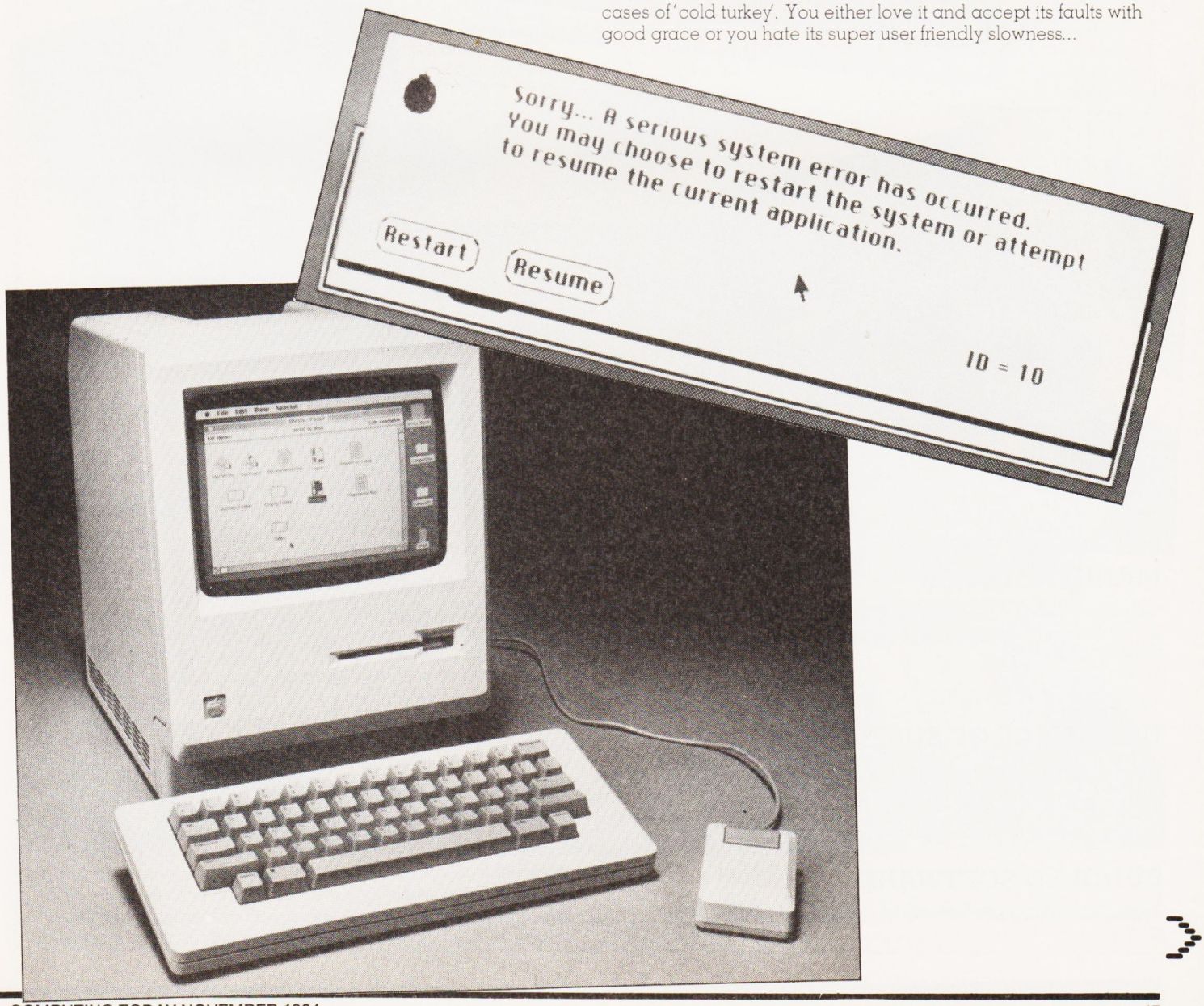
A single Sony 3.5" disk is built in and this holds some 400K — a second, external, drive is supposed to be available but the demand for the machine has meant that most of the drives are being used to make Macs and not add-on units! Apart from this second disk, Mac has interfaces for its mouse, two serial ports (one for the Imageprinter, the other for communications) and a polyphonic sound port. Oh, and there's an on-board clock/calendar too!

SOFTWARE The Macintosh comes complete with MacWrite (a fairly limited word processor) and MacPaint during the launch period, but virtually every best-seller that the business market has ever seen is scheduled for release soon. Included among these promised and 'soon-to-be' products is the best (in my opinion at least) spreadsheet on the market, Multiplan from Microsoft. Of the languages that are promised only BASIC and Forth are currently available (an American software house has just started shipping a version of C) but there's a whole lot more to come from Pascal and beyond. Currently the major software developers are being encouraged to do it on Lisa in C and move it across in machine code, but Apple announced recently that an assembler/editor/debugger will be available for Mac later this year. All this support for a product that wasn't even complete at the time the deals were struck speaks volumes for the industry's faith in the new machine. Time alone will tell if it has all been justified.

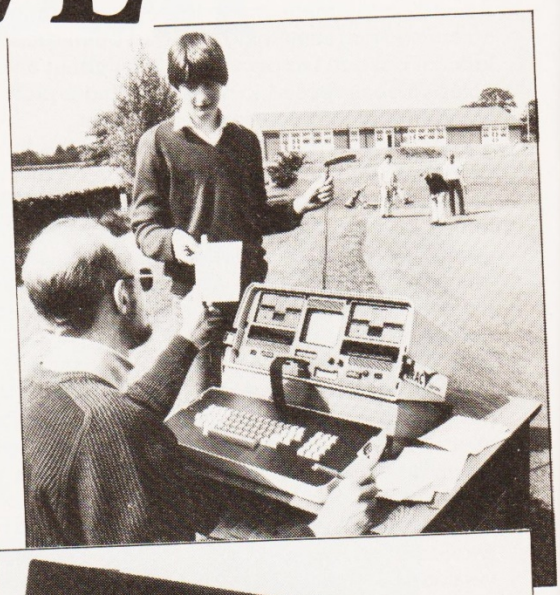
MARKET SECTOR Apple themselves have targeted their campaign directly at the 90% of the business sector who have no personal computing systems. However, its price may also make it appealing to writers, designers and so on who were thinking of buying a top-end home/business computer. Apple also follow the same 'brand loyalty' strategy that Jack Tramiel used to preach when h thwas head of Commodore. The philosophy that today's student bwill become tomorrow's corporate decision makers is far from being a bad one. It also means that students get cheap hardware which is no bad thing in itself.

SUPPORT Apple's policy of supporting third party development of both hardware and software is already running in overdrive for the Mac. There are hard disks, plotters, printers and a whole bunch of other add-ons but at the moment few have made it across the Atlantic. If you want it and Apple doesn't supply it try one of the specialist dealers like Pete & Pam (now, somewhat boringly, known as P&P Micro Distributors) or Personal Computers and they'll probably be able to find it.

COMMENT Macfever can be catching! You can spot the symptoms by keeping an eye on your post or inter-office memos as Maclovers can't resist covering documents with pretty little doodles and multiple font styles. The disease, sadly, has no known cure and removal of the offending object can cause severe cases of 'cold turkey'. You either love it and accept its faults with good grace or you hate its super user friendly slowness...



OSBORNE 01/ EXECUTIVE



MANUFACTURER

Osborne UK,
38 Tanners Drive,
Blakelands North,
Milton Keynes,
Buckinghamshire MK14 5LL

UK SOURCE OF SUPPLY

Multiple Outlets

PRICE

£945 (ex VAT) to £1,595 (ex VAT) but watch for bargains!

BUNDLED SOFTWARE

WordStar, Mailmerge, SuperCalc, MBASIC, CBASIC (plus others!)

OPERATING SYSTEM

CP/M-80 (CP/M Plus on the Executive)

GENERAL DESCRIPTION This is the original portable business computer conceived by expatriate Adam Osborne that everyone thought was doomed to instant failure and then scrambled to copy. Following a couple of years of 'Hypergrowth', the Osborne empire collapsed although the UK operation survived remarkably unscathed and even the American parent looks set to rise, Phoenix like, from its ashes.

The actual machine was no innovation, it was just a portable version of a standard CP/M system. The reason many of its opponents regarded it as a serious threat was because of the bundled software. Included in the already very reasonable price were WordStar, Mailmerge, Supercalc and two versions of BASIC. To buy the software on its own would have cost the end-user nearly as much again as the hardware yet Osborne was giving it

all away for free. The results of this direct challenge to the way the computer makers had previously done business are still being seen today.

HARDWARE A traditionally designed Z80 with 64K of RAM — Osborne himself described it as being 'plain vanilla' — the 01 didn't exactly break new ground. What interested the business community, though, was the way that the complete system with its 5" monitor, twin disk drives and detached keyboard were packed into a luggable 24lb box.

The CP/M implementation suffers slightly as a result of the puny 100K per disk storage capacity. Later versions of the machine had the option of double density drives. The use of a fully memory mapped screen (so scrolling can be achieved to compensate for the reduced viewing area) means that the user only gets 54K for applications programs.

SOFTWARE In the unlikely event that the user should be unsatisfied with the bundled packages he or she got for free, virtually any standard CP/M package will run on the Executive. The smaller screened 01 works best with software tailored to its scrolling window system but you could always use a full-size monitor screen which supports the full 80 columns. If the machine is going to be used as a stand-alone computer rather than as a portable, it is probably safer to go for the more expensive Executive.

MARKET SECTOR As the original business portable machine supplied with bundled software, the 01 (and to a lesser extent the Executive) have already taken their slice of the available market. Following the US collapse and the subsequent down-pricing, the machine now has considerable appeal for the growing home/business sector and even offers good value to the serious home user. Quite how long this momentum will last may well be determined by the remaining stock of machines. But for anyone looking for a CP/M based portable with industry standard software then this has to be the machine to buy — provided you get a cast-iron guarantee of service.

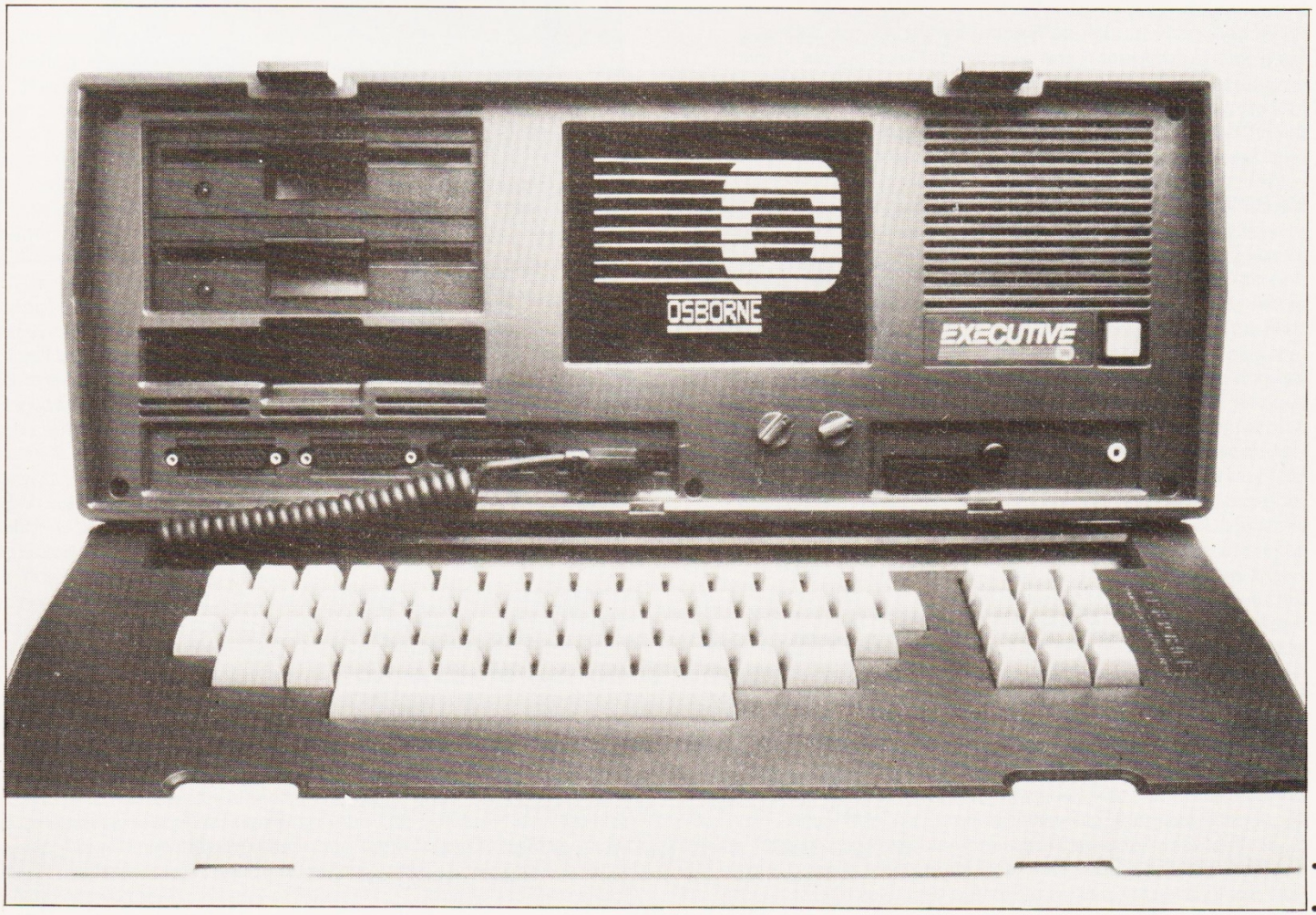
SUPPORT Apart from upgrading an older system to double density disks or adding an 80-column facility, there isn't a lot that you really need to add. A printer and a modem are about the only two obvious extra peripherals and there are plenty of those to choose from.

COMMENT Before journalists were seduced by the Tandy 100 and its various clones or the new Epson PX-8, this was the machine we tended to drag around with us. Time has passed the original concept by but the value for money aspect still operates in its favour, especially if you want access to the vast CP/M library and occasionally need to move the beast from place to place.

THE NEW ENCORE As promised, Osborne released their IBM PC-compatible portable earlier this year. Ingeniously designed to look like a sewing machine case, the Encore uses a 16-line LCD display (the 25-line ones weren't available at that time but the system can, and will be upgraded when they are) and features a CMOS 8086 with 128K of RAM. Supplied as standard with a single disk, there are options for a second drive and a RAM (or cache) disk to be fitted.

For the man or woman on the move, there's also supposed to be a built-in modem and the whole thing can be powered from a battery pack which gives about five hours use. One hopes that the ghost of the original 01 battery pack has been laid to rest — it never appeared! Standard interfaces supplied are Centronics for parallel printers and a serial port for anything else like external modems or communications.

On the software side, the system runs under MS-DOS and is supposed to be fully compatible with 'well-behaved' IBM software. What this effectively means is that it will only run software that has been written to obey the rules: the 16 line screen restriction will introduce problems of its own anyway. Interestingly, Osborne have 'forced' the Lotus 1-2-3 package to operate correctly by writing a special boot program. The only bundled software is NewWord, a Wordstar look-alike, but by the time it becomes available in volume there may be more. Expect to pay around £1,500 for it and, with a full 25-line display, it both looks and feels like a very good value product indeed.



COMMODORE SX-64

MANUFACTURER

Commodore (UK) Ltd,
675 Ajax Avenue,
Slough,
Berkshire

UK SOURCE OF SUPPLY

High Street/dealer network

PRICE

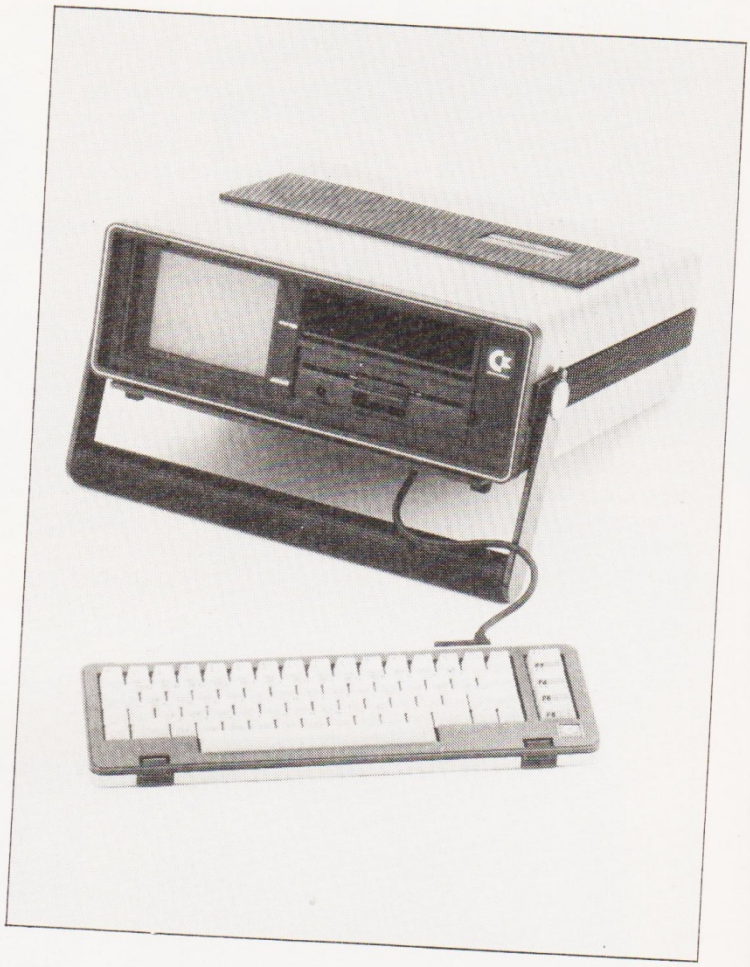
£895

BUNDLED SOFTWARE

BASIC 2.0 in ROM, EasyScript, EasyFile, Future Finance

OPERATING SYSTEM

Commodore's own



GENERAL DESCRIPTION Designed around the existing hardware of the popular Commodore 64 home computer, the SX-64 was Commodore's shot at tackling the portable/business sector. Whereas the original home system was well suited to its market with graphics, sprites and sound, the latter two of those facilities have little if any real application to the serious businessman.

Pitched into a market dominated by the likes of Osborne, Compaq and Hyperion, the machine arrived too late in this country to challenge the serious end of the market. Add to this the launch of the Apple IIc and one really begins to wonder whether the SX-64 has a business future at all. Commodore themselves must be worried, they are currently looking at producing the Hyperion machine under licence.

HARDWARE Although the SX-64 is 'based on' the original machine, there has been substantial re-design of the various internal circuitry. Using a 6510, an upgraded version of the 6502, and equipped with the now famous elephantine 64K of RAM, the SX-64 still uses most of the original Commodore standard chips such as the SID. On the interface side, there's a parallel user port that can be adapted to drive the IEEE 488 devices, two nine-pin joystick/serial interface connectors and two DIN-type sockets that support the serial interface for disks, printers and the full sized colour monitor. There is no way to connect either the original Commodore cassette unit or a standard television set which means that you've got to buy the Commodore monitor if you want a bigger display. Test display on the 5" colour monitor is the standard 25 lines of 40 characters and is quite legible, although a full-sized display is really needed for non-remote operation.

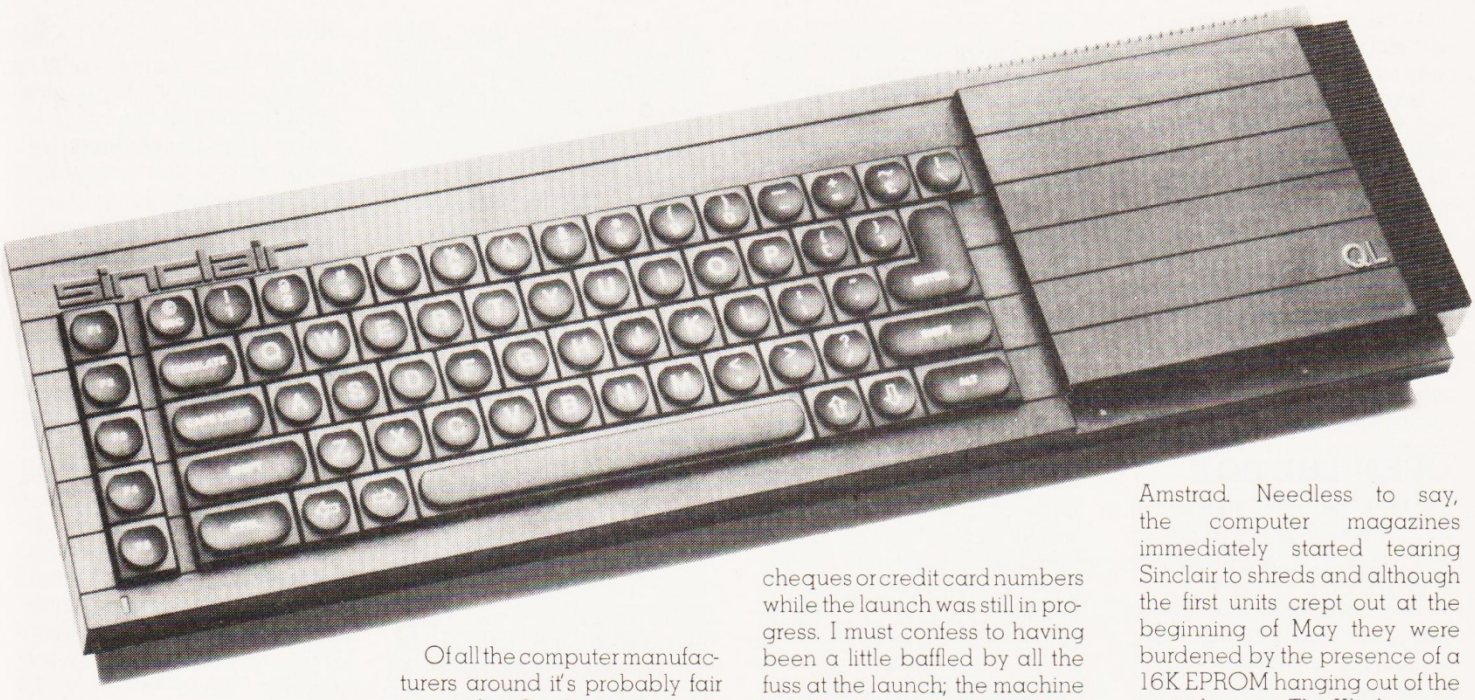
The keyboard is detached and acts as the lid to the case. A cable links it to the underside of the main unit. Neglecting to remove the cable before swinging the handle to the carrying position can neatly smash the keyboard plug. The handle itself definitely needs re-designing as soon as possible — it seems to be intended to make the SX-64 uncarryable as it cuts into the hands.

SOFTWARE Bundled in with the machine are Easy Script, Easy File and Future Finance. The speed of the internal disk drive is barely better than a fast cassette interface, indeed there are now some turbo loading cassette systems which load faster than disc. Sadly the lack of a cassette interface means that you can't use this software with the SX-64. Commodore are now offering a fast 1 Mb disc but that requires extra hardware as it uses the IEEE standard bus rather than the serial one provided.

MARKET SECTOR While Commodore would love to see the machine being used as a serious business portable, the speed of the disks and the vast amount of games software available will probably lower the market to the home/business level. It also looks very attractive to the serious home user looking for a disk-based system with a high entertainment content.

CONTENT As well as being able to add extra disk drives externally or adapt to use the faster IEEE drives, Commodore offer a range of printers, a pen plotter, the VIC modem and a choice of monitors.

COMMENT In pure technology terms, the SX-64 is now far too dated to achieve success in the business sector. As a top-end home machine, the substantial software support makes it attractive, just as the original PET survived well past its time. The recent announcement of the cut-down '16' to replace the even more aged VIC-20, and the Plus 4 with its bundled ROM software may make the potential buyer consider these instead. However, they are still fundamentally the same machines in a different wrapper and suffer the same agonising faults. In today's marketplace you may do better by taking the Apple IIc route or, if you're really serious about a portable powerhouse, the Apricot Portable. As a pure home computer though, it still takes a lot of beating.



AT LAST THE QL

Henry Budgett

Seven months after the launch of the QL, we had just about given up on a review model. Suddenly Sinclair rang out of the blue and two hours later we had one, albeit for a week only. This is not as long a time in journalism as it is in politics, but here's what we managed to discover.

Reviewers, you may well imagine, perch high in their ivory towers and have a lot of fun playing with the latest personal computers. Normally this vision is not too far from the truth. We do get early versions of machines to play with and get a feel for — then, generally later, we get the genuine article to review. Manufacturers are usually fairly flexible in their approach to us: allowing a reviewer a month with the product ensures that by the time the article gets into print it will, or should, accurately reflect the new system's strengths and weaknesses.

Some magazines with a penchant for sticking 'EXCLUSIVE' in pretty colours on their front covers seem to adopt the attitude that even a press briefing can provide sufficient information to actually write a 'review'. This practice is generally dangerous for, at the least, the 'reviewer' is misleading the readership and, possibly worse, these early articles can stimulate the market for what is essentially an unfinished product.

Writing a pre-release review certainly is not wrong. It's just something that needs to be handled very carefully indeed. Doyen of the computer magazine world, *Byte*, recently, and publicly, stated their revised reviewing policy because they felt that they hadn't been making the distinction between Preview and Review clear enough. Perhaps some UK magazines could learn a lesson or two here?

Of all the computer manufacturers around it's probably fair to say that Sinclair commands the most 'instant' press coverage. Ever since the launch of the original ZX80, each successive machine has attracted more and more attention than the last. Each launch has also been dogged by ever-longer production delays coupled with bigger demands. The original launch of the QL to the assembled multitudes of Press was on January 12th, and much was made of the fact that the machine would be delivered within 28 days if you ordered there and then.

To establish the veracity of this fact at least three journalists of my acquaintance parted with their personal, hard earned cheques or credit card numbers while the launch was still in progress. I must confess to having been a little baffled by all the fuss at the launch; the machine may be interesting but there's nothing *that* outstanding about it; even bundled software has been done before!

THE DELAYS START NOW

It almost goes without saying these days that if someone launches today and promises tomorrow as a delivery date, you might get the goods in a month! In the computer field Sinclair has been as guilty as all the others of promising things that it patently couldn't deliver. Indeed, about the only computer company to meet its release date in recent months (or even years, come to that) has been the complete outsider, Amstrad. Needless to say, the computer magazines immediately started tearing Sinclair to shreds and although the first units crept out at the beginning of May they were burdened by the presence of a 16K EPROM hanging out of the cartridge port. This Kludge contained the bits of SuperBASIC and QDOS that the programmers at Cambridge couldn't quite get to fit inside! With at least 20,000 QLs out and about as this review is written, Sinclair is now delivering the 'real' thing although several originally-promised features like concurrency seem to have been lost along the way.

To make things up to the baying packs of reviewers who couldn't get machines to play with, Sinclair also arranged trips to the factory to see the QL and talk with the Psion programmers. Stories about the chaos which resulted as Version X software failed to run on Version Y machines have now passed into legend and aren't worth repeating here. What I wanted was the real thing, in the peace and quiet of my home and not a trip to Cambridge!

The problem of the reviewer is now one of time. Having waited since the day of the launch to get a genuine, as-promised-to-the-public QL rather than a kludged-up prototype, he now discovers that Sinclair will only let him keep it for a week. A week to them means, at best, four evenings and half of a weekend in which to tackle the innermost secrets of the computer and its accompanying software. Just the briefest of looks at the documentation and a quick run through Quill and Easel revealed that to do a serious review of the software alone would need the Sinclair-allocated week with each! Ah, how those other superhuman re-

viewers must have worked to get all that information in just a day at Cambridge!

So, a decision had to be taken about the way in which this review would be tackled. Those expecting an in-depth review of the various Psion packages bundled in with the QL are, I'm afraid, going to have to wait. What you have here is a nutshell review of the machine as it came, the hardware environment that the software inhabits and a brief note or two on the packages themselves.

OPEN THE BOX

Packed into the substantial polystyrene box is, more or less, what you would expect if you'd ever opened a Sinclair Research parcel before. The QL is, like everything they've made since the ZX80, in a stylish black plastic case. No splotches of colour here — the case is black, the keys are black with white lettering... Hang on, something's wrong! Ah, he's abandoned that quirky single-key keyword entry system that reduced competent typists to gibbering wrecks on the ZX Spectrum.

He's also done the decent thing and stuck a proper keyboard on it. Well, let's be fair, what's been fitted looks like a decent keyboard (it's very similar to the NCR Decision Mate in styling) but the instant you touch it you realise that lurking under the hard keytops is that good old membrane system! The unrelieved monotony of the black is relieved (Uh, that's not right — Ed) by some rather snazzy ribbing and a chunky, heatsink-looking finned area at the rear. Shame that they didn't provide any holes for the hot air to get out through, though... The keyboard is as near 'standard' as any and features all the usual keys you would expect to find on an upmarket personal machine; it's even got a column of five function keys on the right which are heavily used by the four Psion packages.

The area to the right of the keyboard is slightly raised and the two QL Microdrives live underneath. Cartridges are fed to them (literally, one feels at times) through a couple of slots at the front. Two red LEDs indicate which of the drives is in operation — that's the one that you mustn't pull the cartridge out of! A third, yellow, LED is located at the bottom left of the keyboard and is supposed to indicate that the power is on; I say "supposed to" because the thing glowed so dimly I didn't even realise what it was supposed to do at first — I suspect a fault here rather than a deliberate error. Oh, yes, I nearly forgot — there is no power switch.

The front and sides of the keyboard overhang the base plinth by about 10 mm (the whole case measures some 475 mm by 140 mm by 50 mm and weighs 1.2 kg) and conceal the various sockets from first glance. On the left of the keyboard is (or should be, but ours was missing) a plastic cap covering the hole for promised RAM and disc expansions to slot into. The connector inside is well recessed — the modules are going to be quite big by the looks of things — and is a 64-way Euroconnector. On the right of the keyboard is a familiar-looking edge connector that will allow you to expand your Microdrive capacity up to a total of eight. Just above and behind is... Great Scott, it's a Reset button! Press this and the machine will totally reset itself (shame about whatever you had in memory), and return you to the initial power-on state. It also makes remarkably pretty patterns on the screen as the RAM clears!

The back panel contains a host of socketry. From left to right (looking at the back) we have; two Local Area Network sockets (3.5 mm jack as on the Interface 1), the three-pin power cable, and a monitor port (eight-pin DIN which doesn't work with Microvitec monitors, but does with Hitachi and Sanyo if you can afford the £14 that Sinclair Research will charge you for the lead). Next to this is a standard phono socket which is the modulated UHF output, and then comes a row of four of those lovely little sockets that British Telecom is now fitting all over the place. Nice, sturdy, well-designed things, but have you ever tried to buy cables for them? As a genuine reader service I'll let you know that Verospeed stock them but I'm sure that other places do as well.

The first pair are labelled SER 1 and SER 2 and provide the RS232 serial ports: the second pair are labelled CTL 1 and CTL 2 and are the joystick ports. Although there are two serial ports the signals appear as mirror images of each other, useful for certain common RS232 problems where you are never quite sure whether you're DCE or DTE/ One of the more frustrating things about the two serial ports is that both input and output have to be set to the same baud rate, making them useless for operation with a system like Prestel.

Quite why Sinclair put joystick ports on a business machine is a little bit of a mystery. It could be that they want to add a mouse at a later date, but the system's software doesn't seem capable of handling it except through SuperBASIC.

Finally there is the edge connector socket for the ROM cartridge which, until recently, has been the home for the Kludge board. Although it is the same size and shape as the one found on the Spectrum's Interface 2, the cartridges from that machine will obviously not work with the QL (wrong processor!). Psion are promising to put later versions of their packages into ROM and, presumably, this is where they'll plug in, but more com-

ment on this later.

The underside of the box is held on by a number of screws and there are six rubber feet. The instant feel of the QL is that it is too flat to type on, and Sinclair have provided three extension feet to raise the back of the case to a better typing angle. The politest word I can find to describe them is useless! Packed into the box along with the QL is a chunky power supply brick in matching black plastic, the ring-bound manual, a handful of leads including the free RS232 lead and two packs of four Microdrive cartridges; one of blanks and the other with the four packages. The review machine came with a second copy of Abacus, a blank cartridge stuffed in the drives and only two blanks...

THE MACHINE INSIDE

Undoing the front and rear screws — *not* those under the Microdrives — releases the lid from the base. Two flat mylar-type ribbon cables connect the main PCB to the keyboard and there's also a bundle of separate wires to power the three LEDs. The keyboard assembly is shielded from the rest of the internal circuitry by a substantial aluminium subframe which also helps to keep the whole thing rigid.

The main PCB is well laid out and has remarkably few components. It's also smaller than you would expect, as the left-hand edge has been recessed to allow the plug-in modules plenty of room and the right-hand end is shaped to fit round the Microdrive mechanisms. All the main chips are socketed, a welcome improvement, and the biggest of these is the Motorola 68008 CPU located at the extreme left of the PCB. Next to this is a custom gate array which handles the memory management.

Then comes a block of 16 RAM chips, 4164s, which make up the 128K of supposedly user memory. If there is any fundamental flaw in the design of the QL this is where it is to be found. According to my rough calculations, by the time the screen has had its chunk of 32K and the operating system has nibbled around the edges, I don't think that there can be much over 90K left and even this could be generous. The total memory addressing capacity of the 68008 is 1 Mb and Sinclair's promised 0.5 Mb RAM pack will certainly help in this area.

At the far right of the PCB is an Intel keyboard processor chip which also looks after the RS232 and sound, although on the review model the device was sourced from Philips. Behind the bank of RAM are two sockets for the QDOS and SuperBASIC ROMs. The review machine actually had three EPROMs, the left-hand socket holding the soldered one on top of the other. Labelled as being AH series, they have most of the early quirks ironed out but I'm sure that there's plenty of scope yet for bug-hunting hackers. The EPROM solution is neater than the Kludge in that only a single extra wire is needed, and this is carefully fitted, but it's certainly not an ideal solution. The loss of another 8K from the memory map to SuperBASIC and QDOS further reinforces the argument that the former should never have been put in ROM at all.

The only other large IC is another custom chip for the Microdrive and network ports. The two Microdrives look exactly like the guts from the old Spectrum ones but the electronics have been tweaked to boost the data packing — the cartridges should now hold about 100K. The remaining circuitry is for the power supply and video drive; a standard Astec channel 36 modulator serves for the TV. A reasonable heatsink has been fitted to the primary power regulating chip, another long-awaited improvement, but the case still gets pretty hot as there are no air holes. The only holes deliberately drilled in the case are a set at the front underneath the Microdrives which let the piezo-electric loudspeaker BEEP quietly as you press the keys.

GOING ROUND AND ROUND...

The most obvious change to the Microdrives is that the data packing has been improved, but it's still worthwhile running FORMAT a few times to 'condition' the tapes. As storage media they are still as fundamentally unreliable as ever and even Sinclair are now acknowledging this by warning users to back up their Psion packages immediately. If you did this, you then wouldn't have any spare blank tapes, and as Quill demands a formatted blank in the second drive you can't use it without another shopping trip!

With a new operating system dedicated to the Microdrive one could reasonably have expected to be rid of the ludicrous syntax that Interface 1 users suffer; **LOAD *"m";1;"filename"** hardly rates as user friendly! QL users now have the almost equally stupid requirement that the device must be stated; **mdv1_** even when they are the only I/O source you are using. There must be the capability for a default option somewhere in the ROM and the sooner it's found the better.

The manual does cover all the various system commands pretty well but a first-time user definitely has the advantage over a crusty old reviewer who has had to learn about 20 different operating systems and sometimes forgets which machine he's using today! What would be really nice, though, is to separate out the QDOS commands from SuperBASIC — ideally they should never have been mixed up in the first place — and provide the entry points. Software written by third party houses will need this information in order to do anything really useful and it would save the serious user a lot of trouble.

The fact that QDOS isn't any sort of standard is, considering Sinclair's previous track record, hardly surprising. I'd love to have been able to spend a little more time checking out the networking because this, in theory at least, should be the way to communicate between packages: export your data down the network to another user so they can take spreadsheet data and build it into a text report or get a graphical display.

SuperBASIC

An awful lot of nonsense has been talked about languages and most has been heaped, generally unfairly, on the head of BASIC. Sir Clive's right hand man, Nigel Searle, reckoned that SuperBASIC was so different to BASIC that it needed a new name. Well, they've certainly added some useful structures: procedures, defined functions and repeated loops, but there's nothing here that hasn't been seen before. It's almost BBC BASIC in some ways, in others it looks a little like the C language but it has missed out completely on the provision of data structures.

There are certainly lots of little tricky bits; jumping out of FOR...NEXT loops is no longer bad programming with the EXIT command, and you can even have conditional ON...GOTO structures that look something like Pascal's CASE, but aren't quite so tricky to program. Although AUTO-numbering and block line deletion have now been added the RENUMBERing command is slightly less useful than expected, as it cannot handle RESTORE statements and often manages to mess up computed GOTO and GOSUB jumps.

The graphics commands included in SuperBASIC are pretty thorough and although the screen can have 256 by 256 or 512 by 256 resolution, the thing is actually pixel-mapped to make displays have the same proportions. With the much heralded windowing facility, different bits of the screen can be split to show different outputs, but this isn't a lot of use when you've only got a TV. PAPER and INK remain from the days of the Spectrum and line, circle and arc functions are all provided. New on the scene are a rectangle drawing function and a fill command: you can also re-define the screen colours.

Virtually all the rest of the commands and functions are pretty standard although it's nice to see a real-time clock-calendar and true bitwise logical comparisons. Multiple fonts can be synthesised by altering the x, y ratios of the characters to get up to four times normal size text but once again this looks best on a monitor.

Although the QL's SuperBASIC offers a lot of nice structures and many powerful features not often seen, it still suffers from being BASIC. Now, I've got nothing against BASIC — I use it all the time — but I fail to see why the language was built into the machine instead of coming on Microdrive or ROM cartridge. The space used up for system variables is wasted as far as the user of one of the Psion packages is concerned and we could have had an extra 32K of RAM fitted to allocate to the screen rather than having it

pinched from user memory. As for all this talk of offering C, I doubt if much will come of it until we have that extra 0.5 Mb RAM cartridge.

The most stunning thing about SuperBASIC, though, quite apart from the fact that it's really only as far removed from the original Dartmouth standard as BBC BASIC, is that it is slow. Benchmarks run well below expectations; it's about as fast as the Apricot which is a true 16-bit computer. This is the final nail in the coffin of those who keep on believing that the 32-bit processor will make things go four times as fast as an eight-bit. The 68008 is a 32-bit processor but only once you've got all the information *into* it... The eight-bit data bus would seem to mean that four bites were needed to get the four bytes into the processor, except for the rather clever Motorola system known as pipelining, where the processor can fetch information while simultaneously processing the last byte.

This system gives it an advantage over most eight-bit systems and puts it equal to many 16-bit ones, although the BBC Micro's BASIC is quicker, but also shows up the fact that the Benchmark tests are long overdue for a radical overhaul! What we should be looking for these days is the power of the machine in terms of handling information; how fast is the screen, how quickly can you load programs and data from the mass storage unit and so on. On these tests the QL appears to have pretty quick graphics but the data transfer speed is way down on a disk-based system. Perhaps the readers could submit their ideas for a new set of standard tests?

THE PSION FOURSOME

Considering that Psion must have written the original versions of all four packages without any access to a real QL, their achievement is remarkable. Although the programs aren't integrated in the sense that they can cohabit the QL's memory (there isn't enough for that) they can Export and Import information from each other via the Microdrive. It isn't surprising to hear that new versions are being released all the time, just sad for those who aren't members of QLUB and won't get their upgrades for free.

FACTSHEET	Sinclair QL Price £399 including VAT, postage & packing £7.95
CPU	68008
Clock	7.5 MHz
RAM	128K (expansion to 640K; not yet available)
ROM	48K
Dimensions	138 mm by 46 mm by 472 mm (5½" by 1¼" by 18¼")
Weight	1.4 kg (3 lbs)
Keyboard	Full-size QWERTY layout, 65 keys& including five function keys
Display	Up to 85 by 25 text display with various character sizes: TV format 40 to 60 columns High resolution graphics 512 by 256 four-colour or 256 by 256 eight-colour
I/N	Twin built-in Microdrives for mass storage, capacity average 85K each. Two RS232 interfaces (baud rate selectable) Two local area network sockets ROM cartridge socket Two joystick ports Parallel expansion bus
OS	Sinclair QDOS
Language	Sinclar SuperBASIC
Bundled Software	Quill Word Processor Archive Database Abacus Spreadsheet Easel Business Graphics
Supplier	Sinclair Research. Mail order address is Freepost, Camberley, Surrey GU15 3BR, phone 0276 686100. QLs will be on retail sale from this month.

No surprise, either, to hear that versions will be produced for other systems like the IBM PC and Apricot. They certainly should sell very well in that environment.

Although the packages are likely to be the main selling point of the QL they are in many ways restricted by it. There isn't enough memory for them and the slowness of the Microdrives compared with disks make them look far less powerful than they really are. Give this sort of software away with an IBM or Macintosh and you could well start a revolution! The latest indication is that the stuff will start to come in ROM cartridges rather than Microdrives. This will help the memory shortage somewhat as well as making them 'instant'.

QUILL

Out of the four packages that come with the QL this is almost certain to get the most use by the 'average' purchaser. It's pretty easy to get on with; at least it seemed that way during the short period that I actually managed to spend with it. Full on-screen help and the use of colour and brightness provide the much-vaunted WYSIWYG format. This wonderful acronym stands, in case you didn't know, for What You See Is What You Get. Personally I feel that all that colour contributes to the headaches I seem to be suffering these days!

It has most of the usual features that you would imagine a word processor ought to have; automatic formatting, adjustable tabs, block moves and copies and the ever-useful glossary. While all the previous are mundane, a glossary function is all that keeps most serious word processors from doing their computers to death and reverting to hunt and peck on a battered old manual typewriter (Heretic! Ed).

Compared to other word processing packages I have known, loved or hated (sorry, MicroPro but I *still* find Wordstar fundamentally annoying), the Quill is slower than it has any right to be. My typing certainly isn't fast but I found it relatively easy to out-type the look-ahead buffer. Mind you, the speed (or lack of it) of the keyboard probably works to Quill's favour in this respect. On the whole, though, Quill will be perfectly adequate for someone who's wordage output runs to a couple of letters a day. Journalists tempted by the unusual provision of a word counter (as opposed to the normal character count) or producers of large volumes of text probably need something a little bit better.

ABACUS

You either love your spreadsheet or covet someone else's. I have a particular fondness for Multiplan but given Abacus and a more powerful system than the QL I might, with some further trials, be persuaded that Psion really have got something rather good here. On small models, however, the package works rapidly and effectively and there's plenty of on-screen information and help available should you feel the need.

One of the troubles is that Psion, along with many other software houses producing spreadsheets, face a conceptual barrier. The general public seem to be convinced that a spreadsheet can only be used for handling information about money. Nothing could be further from the truth. A recent feature on Multiplan extolled the use of the machine in computing batting and bowling averages for a cricket club. I habitually use the product for generating comparison charts, although for this purpose a graphics option would be nice at times. Abacus can satisfy demands even as weird as these and does offer graphics through the Easel package.

ARCHIVE

This package is what you make of it, literally. At the most mundane of levels — and it must be admitted that the level at which I used it was pretty mundane — it offers a very easy-to-use data base system where you can set up card index type files. Searching, sorting and otherwise analysing the data is a snip, although it's a shame that Psion couldn't come up with a more entertaining demo than the old Vu-File Glossary. Mind you, it is the only one of the four to actually be provided with a demonstration file.

On the other hand Archive could become a remarkably powerful data base tool by making use of its built-in programming language. Although not by any means a serious challenge to the likes of dBase II and Friday! from Ashton Tate, it will cover the majority of needs.

It is here, more than with any other package, that the disastrous limitations of the Microdrive become apparent. I suspect that until the promised 0.5 Mb RAM pack and hard disk interface become available, most users will restrict themselves to small files. Losing a data base *really* hurts...

EASEL

If you want to paint pretty pictures on your TV or monitor then forget it. Easel is a remarkably serious business graphics tool and not another on-screen sketching program. Once the raw data is in the memory it can be displayed in any one of eight basic ways and, should these prove inadequate, you can make up your own as well.

Possibly the most annoying thing from the user's point of view is that because the higher resolution of screen has to be used there are only four colours available, which makes things a little difficult at times. From a personal point of view this is the package that I wanted more of and wasn't able to get because Sinclair took my QL away before I'd really got to grips with it!

SUPPORT

As far as the independent developers are concerned there is just one problem, the Microdrive. As an independently developed 'cheap' mass storage device for the ZX Spectrum it had appeal, but as the sole way (at the moment) of storing your precious data on a QL it simply isn't reliable enough.

For the software house there is another problem in the form of price. The cost of the basic cartridge to the end user is £4.95 with the bulk buyer getting something like 40% off. That still makes the cost of the media over twice that of an equivalent capacity disk and that's before any program has been duplicated onto it.

Here, again, the developer runs into trouble There are a limited number of duplicators that are capable of handling the Microdrive cartridge and the mass buyers like Sinclair and Psion will, by virtue of the size of their orders, be almost certain to get priority. Even developing software for Sinclair Research carries this duplication problem although Sinclair will supply the cartridges themselves.

These difficulties were present with the ZX Spectrum's Microdrive and, to the best of my knowledge at least, only one software house produced on that medium — not counting the 'give-away' software that comes with the re-packaged Interface 1/Microdrive Expansion System. The major software effort at the moment seems to be centred on Joe the Lion's plan to get ZX Spectrum software, written in Z80 machine code, to run on the QL. Cross Assemblers are two a penny these days, the trick here is to get the Spectrum-format cassettes to load into a machine that doesn't have a cassette port!

On the hardware side we have already been offered standard disks and third-party parallel printer interfaces, not to mention colour-matched monitors and printers. Promises are one thing, seeing the goods appears to be another... Support has appeared, however, in the Read Only Floppy field (magazines, you fool). No less than two magazines have appeared (although the public could be forgiven for thinking that there's only one), along with an independent Users Group. The usual flood of books has also poured in; some good, some average and a lot that are downright awful. The interesting point about all this support is that it requires minimum commitment, like any service industry, and so it should prosper regardless of how well the QL does!

CONCLUSION

So, just who is going to be parting with their hard-earned £400 (although that assumes they've already got a TV or suitable monitor and printer) for the QL? Well, I doubt if it's going to be today's Spectrum owner. Even Sinclair must have been taken aback by the slow start that the Spectrum had with the ZX81-owing fraternity and I'd lay odds that the same is going to happen here. For a start, the QL is just too different to the existing machine for the owner to want to throw out all his existing software and add-ons.

No, the ideal market for the QL doesn't really exist yet. It's partially going to be made up of those people who've been playing around with something like a ZX81 for the last couple of years and who know that they can use a computer for specific tasks but that their machine simply isn't big enough. Another group of potential users are those who use computers in their jobs and can see specific areas of use for a QL-like system in their home. It's going to sell on the strength of the bundled software, even if there are finite limits to the sort of use you can put the Microdrives to. As a 'hacker's' machine the QL is almost a total non-starter compared with systems like the Amstrad or Einstein, which offer just as powerful facilities and the advantage of being a whole lot more 'standard'.

The BBC Micro, now looking rather long in the tooth, was generally bought against the ZX Spectrum because of its better graphics and (for its time) superb expandability. The QL misses out on both the potential areas. It's also worth considering that if SuperBASIC had been made available on Microdrive or cartridge rather than in ROM, the whole machine might, just might, have really been available on time! The potential users, and certainly those who are going to be buying the machine in volume, are unlikely to write programs in BASIC of any kind. They are going to be far too busy using the various packages for that.

Interesting rumours are currently circulating to the effect that Psion are going to be putting together a portable QL system to challenge the Apple IIc, but these are strenuously denied. What can't be denied is that Sinclair produced some speculative designs for an ICL personal computer quite some time before they actually released the QL. Plans seem to be well afoot to finish this off with a machine called OPD or One Per Desk. What price a QL with real disks and tele-communications built in as an Apricot challenge?

PRINTERS

DOT MATRIX

All printers have centronic parallel interface unless otherwise stated. All printers have hi res dot addressable graphic mode. Please send SAE for full details.

EPSON

FX80 160CPS 10″ wide friction & pin feed	£324 + VAT	**£373**
FX100 160 CPS 15″ wide friction & tractor feed	£499 + VAT	**£574**
RX80 F/T 100 CPS 10″ wide friction & tractor feed	£239 + VAT	**£275**
RX80 100 CPS 10″ wide tractor feed	£199 + VAT	**£229**
RX100 F/T 100 CPS friction & tractor feed	£385 + VAT	**£443**
8143 RS 23 Interface for FX and RX printers	£39 + VAT	**£45**
8148 RS 232 Interface with 2K buffer x on x off	£60 + VAT	**£69**
Ribbon Cartridge for RX80 FX80 & MX80	£5 + VAT	**£6**
Ribbon Cartridge for FX100 & MX100	£7 + VAT	**£8**

STAR

Gemini 10X120 CPS 10″ wide friction & tractor feed	£200 + VAT	**£229**
Gemini 15X120 CPS 15″ wide friction & tractor feed	£295 + VAT	**£339**
Gemini Ribbon	£3 + VAT	**£3**

SEIKOSHA

BP 420 designed for the business world, 420CPS in draft mode, 110CPS in NLQ mode. £1095 + VAT **£1259**

SMITH CORONA

Fastext 80: 80 col, 80CPS. Friction feed standard
£149 + VAT **£171**

ENSIGN

1650 Standard, Correspondance and Graphics Modes; friction and tractor feed; 165 CPS; bi-directional logic seeking £269 + VAT **£309**

TAXAN KAGA

160CPS 10″ wide 27CPS NLQ 24 x 16 matrix	£259 + VAT	**£298**
160CPS 15″ wide 27CPS NLQ 24 x 16 matrix	£349 + VAT	**£401**

COLOUR PRINTERS

Seikosha GP700A 7 colour 50CPS printer	£347 + VAT	**£399**
Canon PJ1080A 7 colour 40CPS ink jot printer	£391 + VAT	**£449**

All our printers have 1 year warranty

DAISYWHEEL

JUKI 6100/I PRINT

20 CPS Bi-Directional Logic seeking 10 12 15 CP1 + PS spacing 2K buffer best selling Daisywheel	£299 + VAT	**£344**
Singer sheet feeder unit	£217 + VAT	**£249**
Tractor Unit	£95 + VAT	**£109**
RS 232 Interface	£52 + VAT	**£59**
Spare Daisywheel	£14 + VAT	**£16**

BROTHER HR-15

13 CPS Bi-directional 10, 12, 15 CP1 + PS	£344 + VAT	**£395**
Keyboard Unit	£139 + VAT	**£159**
Single Sheet Feeder Unit	£217 + VAT	**£249**
Tractor Unit	£95 + VAT	**£109**

QUENDATA

20 CPS Unidirectional 10 12 15 CP1	£217 + VAT	**£250**

ACORN

BBC MICROCOMPUTER SYSTEM

WE ARE AN OFFICIAL BBC COMPUTER DISTRIBUTOR

DEALER ENQUIRIES ARE WELCOMED

Acorn Electron £199 INC VAT

Free Cassette Recorder with every Electron

BBC is the best microcomputer currently on the market 32K RAM
32K ROM 8 modes of operation full colour full-size keyboard internal expansions such as disc interface speech synthesizer Econet interface — in short it is a personal computer capable of expanding into a small business system.

APPROVED ECONET SERVICE CENTRE

WE STOCK A LARGE RANGE OF SOFTWARE FOR BBC MICRO INCLUDING ACORNSOFT, BBC SOFTWARE, LONGMANS SOFTWARE, PLEASE SEND LARGE STAMPED ADDRESSED ENVELOPE FOR FULL DETAILS.

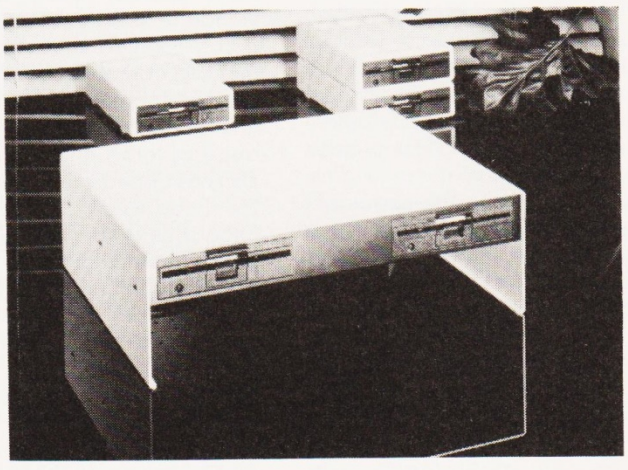
AKHTER

COMPUTER GROUP

28/29 BURNT MILL HARLOW, ESSEX CM20 2HU U.K.
Tel. HARLOW (0279) 443521 Telex: 818894 AKHTER G

DISC

100% BBC COMPATIBLE MITSUBISHI AND TEAC SLIMLINE DISK DRIVES



These drives are supplied ready cased with all the necessary cables formatting program and User Guide
There are some very useful utilities included on formating disc e.g.

* DISASSEMBLER: This is 6502 machine code disassembler
* DUP: To copy and rename a file on disc
* FORMAT: Formating progam for 40 & 80 tracks

PRODUCTS

BBC Microcomputer Model B	£348	+ VAT	**£399**
BBC Mod B - disk interface	£409	+ VAT	**£469**
BBC Mod B - Econet interface	£389	+ VAT	**£447**
BBC Mod B - disk and Econet interfaces	£450	+ VAT	**£517**
BBC Compatible 100K disk drive	£86	+ VAT	**£99**
BBC Compatible dual 800K disk drive	£312	+ VAT	**£359**
Acorn Z80	£347	+ VAT	**£399**
Acorn 6502 Second Processor	£173	+ VAT	**£199**
Acorn Bit stick	£327	+ VAT	**£375**
Acorn IEE Interface	£282	+ VAT	**£325**
Acorn Electron plus 1 interface	£52	+ VAT	**£60**
BBC Prestel Adaptor	£115	+ VAT	**£132**
BBC Telext receiver (Aug)	£196	+ VAT	**£225**
BBC cassette recorder and lead	£30	+ VAT	**£35**
Disk interface kit (free fitting)	£84	+ VAT	**£96**
Mod A to Mod B upgrade kit	£70	+ VAT	**£80**
Fitting charge for A to B upgrade kit	£20	+ VAT	**£23**
16K memory upgrade kit	£30	+ VAT	**£34**
Games paddles	£16	+ VAT	**£19**
User Guide	£10		
Advanced User Guide	£12.95		
Econet Guide	£7.50		
Econet interface (free fitting)	£60	+ VAT	**£69**
Speech interface (free fitting)	£47	+ VAT	**£54**
BBC disk manual - formating disk	£30	+ VAT	**£34**
Parallel printer cable	£10	+ VAT	**£11**
BBC word processor (view)	£52	+ VAT	**£59**
BBC Fourth language cassette	£15	+ VAT	**£17**
BBC Lisp language cassette	£15	+ VAT	**£17**

YOUR CONTACT AT AKHTER
Tel: 0279 443521 (12 lines)

		EXT
DEALER/BULK ENQUIRIES	HAMAYUN MUGHAL	202
TELEPHONE ORDERS	CARON ANDREWS	210
DEALER ORDERS	JULIA ALLUM	209
EXPORT ENQUIRIES	MOHAMAD EDIB	201
TECHNICAL SUPPORT	ALAN LAFFOLEY	207
ACCOUNTS	JULIE AMBLER	211
LITERATURE REQUEST	JOHN MAULE	201

ORDERING INFORMATION

We accept official orders from UK Government and Education establishments. Carriage is £2.50 + VAT (UK only) for normal delivery. If express delivery is required please add £8.00 + VAT per parcel. We accept telephone orders on Barclay and Access card please ring (0279) 443521 (10 lines). all cheques made payable to "AKHTER INSTRUMENTS".

N.B. All prices are subject to change without notice and are rounded up to the nearest pound

OPENING HOURS: MON-FRI 9am-6.30pm, SAT 10am-5pm. We welcome callers, no parking problems.

DRIVES

* FREE: This utility provides a disk usage analysis
* MDUMP: Enables you to display and modify any part of BBC memory
* MERGE: Merge a number of text files into one file
* RELOCATE: Downloads a basic program to &E00
* SDUMP: Screen dump for EPSON In all graphic modes
* VERIFY: Verifies every sector on a disk
* MENU: A flexible menu program

Single drive 100K 40 trks single sided	£86 + VAT	**£99**
Dual drive 200K 40 trks single sided	£164 + VAT	**£189**
Single drive 200K 40 trks double sided	£138 + VAT	**£159**
Dual drive 400K 40 trks double sided	£260 + VAT	**£299**
Single drive 400K 80 trks double sided	£152 + VAT	**£175**
Single drive 400K 40 80 trks switchable DS	£155 + VAT	**£179**
Dual drive 800K 80 trks double sided	£303 + VAT	**£349**
Dual drive 800K 40 80 trks switchable DS	£312 + VAT	**£359**
Dual Drive 800K 40 80 trks + PSU + built in monitor stand	£373 + VAT	**£429**

All above drives are low power slimline (0 3 A typ at + 12v and 0 4 at + 5v per drive) Normally extra power supply is not required. The BBC Computer power supply is designed to drive to low power drive (IT IS NOT DESIGNED TO DRIVE INTERNAL ROM BOARD)

40 Track SS DD disketts (10 Box)	£18 + VAT	**£20**
40 Track DS DD disketts (10 Box)	£23 + VAT	**£26**
80 Track SS DD disketts (10 Box	£28 + VAT	**£32**
80 Track DS DD disketts (10 Box)	£30 + VAT	**£34**

ALL ABOVE DISKETTES ARE CERTIFIED 3M

BUSINESS SYSTEMS

COMPLETE BUSINESS PACKAGE

This system is based on 16 Bit 8088 Processor 128K RAM, 2X730K Floppy Disc Drives, High Res Monitor, fast (160cps) Dot Matrix Printer, Wordstar Wordprocessor, Calcstar Spreadsheet Program, complete integrated Accounts package consisting of Sales Ledger, Purchase Ledger, Nominal Ledger, Invoicing, Stock Control, Payroll and Pro-mail.
Complete turnkey system at an unbelievable price.
Delivered Only £1495 + VAT **£1719**
Delivered and Installed plus ½ day training £1595 + VAT **£1834**

APRICOT PC

"Portable Executive Computer" 16 Bit Micro. 256K RAM up to 1.44 megabytes flopy disk storage. 3½" Sony disks. Portable brief case styling. Modem with auto dialler (optional) hard disk optional. Vast software library (compatible with Sirius 1).
Apricot with Double Drive, Monitor and ***Free Printer*** £1790 + VAT **£2059**

APRICOT XI

As above but with 10MB Winchester Drive and Single 315K Drive plus Superwriter, Supercalc and ***FREE JUKI 6100 Printer***
£2995 + VAT **£3444**

SANYO PROFESSIONAL COMPUTER

SANYO 550

16 Bit Micro 128K RAM expandable to 256K. Single or Double Disk drive built in full colour graphics (640 x 200 pixels in 8 colours) IBM compatible. Free software. Sanyo MBC 550 128K RAM single drive and free software including Wordstar and Calcstar **£749 + VAT £862**

SANYO 550-2

As 550 but with Dual Drive 2 x 160K £849 + VAT **£976**

SANYO 550-360

As 550 but with 2 x 360K Drives £999 + VAT **£1149**

SANYO 550-730

As 550 but with 2 x 730K Drives £1049 + VAT **£1206**

SANYO 555

Sanyo MBC555 128K double drive and free software including Wordstar, Calcstar, Inforstar, Datastar etc. **£999 + VAT £1149**

SANYO 555-360

As 555 but with 2 x 360K Drives £1249 + VAT **£1436**

SANYO 555-730

As 555 but with 2 x 730K Drives £1299 + VAT **£1494**

SANYO SYSTEMS INCLUDE FREE HIGH RES GREEN MONITOR

WORD PROCESSING

COMPLETE SYSTEMS FROM £650 + VAT

BBC 1: BBC Micro Model B, View (or Wordwise) Wordprocessor, Quendata 20 CPS Daisywheel Printer, High Res Green Monitor, Cassette Recorder plus 10 cassettes and all the necessary cables £650 + VAT = **£747.50**

BBC 2: BBC Micro Model B + Disk Interface, View (or Wordwise) Wordprocessor, 100K Disk Drive, High Res Green Monitor, Quendata 20 CPS Daisywheel Printer, 1 Box of Disks and all the necessary cables £799 + VAT = **£803.35**

BBC 3: Same as System BBC2 but with 400K Drive £875 + VAT = **£1006.25**

BBC 4: Same as System BBC 2 but with 400K Drive and JUKI 6100 Daisywheel Printer £975 + VAT = **£1121.25.**

BBC 5: BBC Model B + Disk Interface, View (or Wordwise) Wordprocessor, 800K Dual Disk Drive (Mitsubishi), High Res Green Monitor, JUKI 6100 Daisywheel Printer, 1 Box (10) of 80 Track DS discs and all necessary cables £1145 + VAT = **£1316.75.**

SAN 1: Sanyo MBC 550 Series 16 Bit Microcomputer, 128K Ram, Dual 160K drives (2 x 160K), High Res Graphics (600 x 200 pixels in 8 colours), JUKI 6100 Daisywheel Printer, High Res Green Monitor, 1 Box of 10 discs, Wordstar Wordprocessor, Calcstar spreadsheet and all the necessary cables £1175 + VAT = **£1351.25**

SAN 2: Same as SAN 1 but with Dual 360K Drives (2 x 360K) £1345 + VAT = **£1546.75**

SAN 3: Same as SAN 1 but with Dual 720K Drives £1395 + VAT = **£1604.25**

SAN 4: Sanyo MBC 555 Series 16 Bit Microcomputer, 128K Ram, Dual 160K Drives (2 x 160K), High Res Graphics (600 x 200 pixels in 8 colours) JUKI 6100 Daisywheel Printer, High Res Green Monitor, 1 Box of 10 discs, Wordstar, Wordprocessor, Calcstar spreadsheet, Mailmerge, Spellstar (dictionary), Datastar (database), Reportstar plus all the necessary cables £1295 + VAT = **£1489.25.**

SAN 5: Same as SAN 4 but with Dual 360K Drives £1475 + VAT = **£1696.25**

SAN 6: Same as SAN 4 but with Dual 730K Drives £1525 + VAT = **£1753.75**

If you require High Res Colour Monitor instead of High Res Green Monitor in Sanyo Systems please add £320 + VAT = £368 to the above prices.
*128K RAM Upgrade for all above Sanyo systems (makes a total of 256K RAM) £150 + VAT = £172.50 including fitting.

MONITORS

PHILIPS

7001 High Res Green Screen and sound input £65 + VAT **£75**

GM1211

GM1211 18 MHZ High Res Monochrome Monitor with tilt and swivel stand available in green or amber etched antiglare screen (please specify colour £86 + VAT **£99**

SAMWOO

24MHZ High Res Monochrome etched antiglare green screen IBM/BBC Compatible £86 + VAT **£99**

SANYO

DM8112 12" Green screeen 18MHZ Hi-Res £86 + VAT **£99**
DM2112 12" Green screen 15MHZ £66 + VAT **£75**

MICROVITEC CUB

1431 MS 14" RGB Normal Res Colour £173 + VAT **£199**
1451 MS 14" RGB Medium Res Colour £289 + VAT **£332**
1441 MS 14" RGB High Res Colour £417 + VAT **£479**

MICROVITEC FOR QL

1451 14" Medium Res Colour.
Specially designed for Sinclair QL
£239 + VAT **£275**

BACKNUMBERS

MARCH 1983
Colour Genie reviewed, Epson HX-20 review, PEEKing the Spectrum, Into Atari's BASIC, Terminology translated.

APRIL 1983
Froglet on the BBC Micro, PC-1251 hand-held review, Valley Variations, Galaxy reviewed, Micro Database, Lower case UK101.

MAY 1983
Spectrum Book Survey, Oric-1 Review, Going FORTH Again, Jupiter Ace review.

JUNE 1983
Interrupt handling, Rubic simulation on the Spectrum, Beating the RS232 Blues, Lynx review, Indexer.

JULY 1983
Atari renumber, 16-bit micros, Bomb-proof Tandy, Olivetti Praxis 30 review, Ikon Hobbit tape drive review.

AUGUST 1983
Speeding up the Sharp, Premier Dragon disc drive, Sord M5 review, BBC String Store, Planetfall.

SEPTEMBER 1983
FELIX knowledge shops, Software protection, Torch disc pack, ZX81 Backgammon, Dragon character generator, Three Tandy computers.

OCTOBER 1983
Slingshot game, Sharp MZ-700 review, Sharp MZ-3541 review, Z80 Disassembler, A better TRSDOS, Improved VIC-20 editor.

NOVEMBER 1983
BBC Word Processor, ZX LPRINT review, Laser 200 review, Writing Adventures, Learning FORTH Part 1, PET tape append.

DECEMBER 1983
MIKRO assembler review, Getting More from the 64 Part 1, Adventures part 2, Curve-fitting, BBC Touch Typing Tutor.

JANUARY 1984
TRS-80 programmer's aid, Apple music, Electron review, TRS-80 screen editor, calendar program.

FEBRUARY 1984
Using MX-80 graphics, Colour Genie monitor, non-random random numbers, ZX81-FORTH, Program recovery on the Commodore 64.

MARCH 1984
Easycode part 1, BBC poker, Spectrum SCOPE review, Genie utilities, Spectrum Centronics interface.

APRIL 1984
Memotech MTX500 review, Genie BASIC extensions, Brainstorm review, Disassembly techniques, Recursion.

If you've lost, lent or had stolen one of those precious back copies of Computing Today then now is your chance to fill the gap in your collection. The list of issues given here represents the few remaining copies that we have available to help complete your library of all that's good in features, programs and reviews.

If you want one of these issues, it's going to cost you £1.40 (including postage and packing) but we think that's a small price to pay for the satisfaction you'll get. Ordering could hardly be made simpler — just fill in the form, cut it out (or send a photocopy) together with your money to:

Backnumbers,
Infonet Ltd,
Times House,
179 The Marlowes,
Hemel Hempstead,
Herts HP1 1BB.

If you wait until next month to do it, the chances are that we'll have run out of the very issue you wanted!

A Computing today Reader Service

BACKNUMBERS

Please send me the following Backnumbers

ISSUE

At £1.40 each. I enclose £.....

NAME .....

ADDRESS .....

.....

.....

..... POSTCODE .....

Signature .....

I enclose a cheque/PO for £.....(Payable to ASP Ltd)
I wish to pay by credit card

Access ☐ Barclaycard ☐

Buy it with Access

BARCLAYCARD VISA

Insert Card No.

If you wish to pay by Access or Barclaycard, just fill in your card number and sign the form, do not send your card.

Please allow 21 days for delivery.

Unless you order

Home Computing WEEKLY

from your newsagent

this is what you're in danger of missing:

Latest software reviews — our experts tell you what to watch for ... and what to avoid

Quality-tested listings for all popular home computers — games utilities and educational

Up-to-date news of the micro scene

The liveliest letters page around

Software charts — see what's selling best for your computer

U.S. Scene — our man in California brings you regular reports

Spot the bargains on our classified pages

Free supplements on things you need to know

Free-to-enter competitions. Our readers have won prizes worth tens of thousands of pounds

You can't afford to be without Home Computing Weekly. And all you have to do to make sure you get your copy is to fill in the form below and hand it to your newsagent.

Dear newsagent

Please deliver/reserve for me a copy of Home Computing Weekly every week.

Name .....

Address .....

.....

.....

Newsagent: trade distribution of Home Computing Weekly is by Argus Press Sales and Distribution, 12-14 Paul Street, London EC2A 4JS. Phone: 01-247 8233

On sale every tuesday only 45p

OF MICE AND MACS

Simon MacDismore

A long time ago in a galaxy far, far away. . . a group of researchers at Xerox's Palo Alto Research Centre sought to escape the evil clutches of conventional programming. Their work inspired the Smalltalk language, Xerox's Alto and Star workstations and Apple's Lisa. Now the Macintosh brings the revolution out into the streets. Will computing ever be the same again?

A lot of very bright people worked for a very long time on the ideas which the Macintosh embodies. This alone would make Apple's new system remarkable in the microcomputer arena, for the Macintosh (Mac for short) taps directly into the highly theoretical world of future office systems. Few people in the micro community have any idea what this is all about — hence the fact that it has taken years for microcomputer word processing to get anywhere near the quality of the dedicated systems of the middle seventies.

Back in 1973, when Xerox established a 'Learning Research Group' to look at the ways in which office systems might be designed, there were two big worries about the direction of 'conventional' computing. First, there was the problems of 'modes' and the confusion that they caused. How could the user be taught to handle concepts like "inserting", "editing", "sorting"? Worse, how could one make the transition between different ways of working on that same information? The realisation dawned that people don't think in modes at all. The brain simultaneously works on many different views

of the same information — and is understandably confused when a computer can only offer one at a time.

The Xerox researchers called this one-mode-at-a-time problem 'pre-emption', and they didn't like it. Being programmers, they wanted to be able to execute a piece of software, suspend it when they found a bug, and then edit their code without discarding the visual evidence of the error. Thus were 'windows' born — screen displays that behaved like sheets of paper which could be filed, placed on top of one another and folded to the smallest size necessary for the view required. Windows were still mode-oriented, but at least the user could work in several modes at the same time. The infamous 'mouse' followed naturally as the most convenient way of moving around the screen.

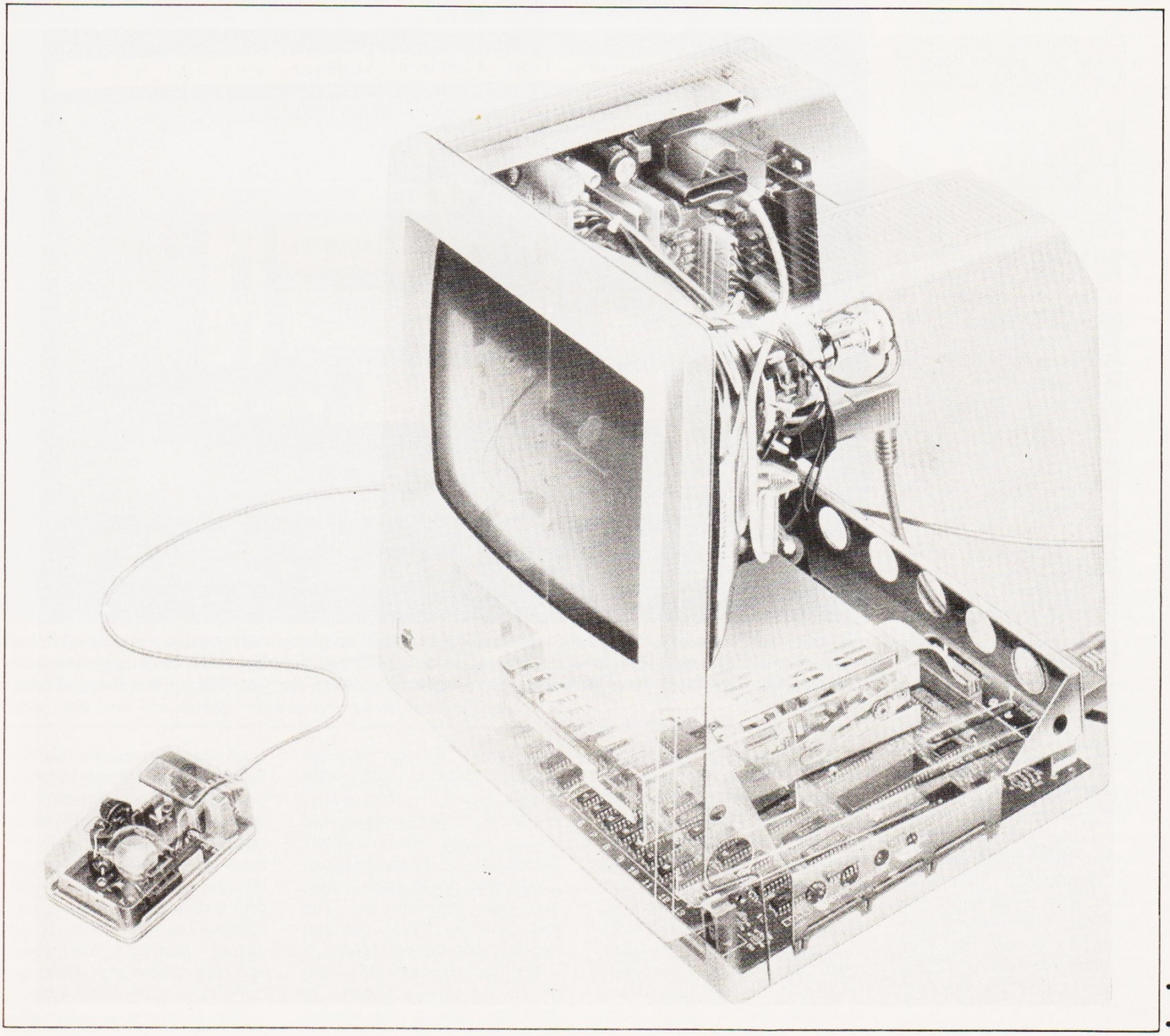
The second worry was more fundamental. During the seventies, everyone wanted to design their own programming language. Literally thousands of new languages were conceived and implemented. Almost all of them behaved in the same way: you wrote a program, gave it some data, and got an answer. This distinction between data and what you could do with it didn't seem right to designers of office systems. It seemed quite obvious that, in most cases, how you could manipulate your data was more an attribute of the data itself than the program.

This led to a new idea about programming. Where existing languages were "procedure-oriented" — working on dumb data in great detail — the new Xerox approach was to be "object-oriented" — manipulating data that knew about itself. An item of information which had the intelligence to know what could be done with it was called an object.

Xerox built a whole language and environment around these two concepts and called it 'Smalltalk'. The new environment was good at handling graphics, a task which involves particularly troublesome types of data. Xerox and graphic reproduction go hand in hand, and the lessons learned have been put to good use on their 8010 workstation (the 'Star') which sits on their local area network creating high-quality materials for laser printing.

Apple were smart enough to realise that this way of working with computers might catch on if the product was affordable. They spent a small fortune recruiting Xerox's researchers and designing their own product. According to some, the Lisa cost almost $200 million to create, and when it hit the market everyone said it was wonderful. They also said that it was too expensive and too slow. Bigger companies might have considered hari-kiri at this point. Apple, however, is just a group of people doing what they feel like doing, so they tinkered with the design and started planning for the days of cheaper chips. They didn't have long to wait, and now the Macintosh, and a faster, cheaper Lisa 2, show the fruits oetheir patience.

The Mac, by the way,

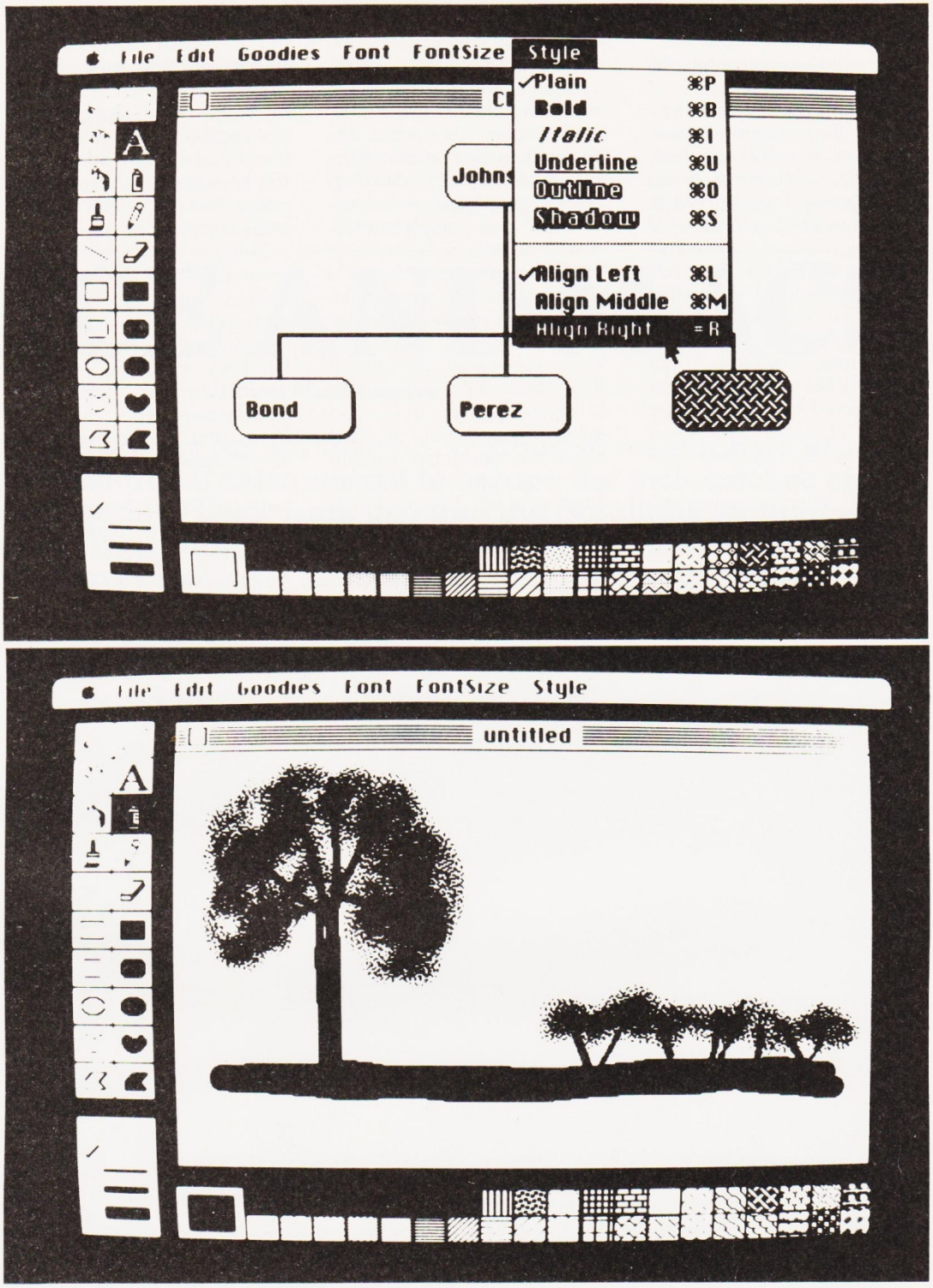


doesn't actually run Smalltalk — and indeed doesn't behave in quite the way that the Xerox group had intended (nor, for that matter, does the Xerox Star). To the user, though, it embodies most of the important features. Once you've grasped the concept of windows and objects (rather than dumb data) the behaviour of the Macintosh is disarmingly predictable.

FIRST, CATCH YOUR MOUSE

Find a clear area on your desk for the mouse — a little box with a rubber ball underneath it, which is connected to the system with a thin, very flexible cable. If your desk is dirty or very smooth, put a sheet of paper down for the mouse to travel on. To start with, you will probably want to use quite a large area (up to two square feet) for the mouse — much lesr once you get the hang of using it. Switch the power on and a quizzical picture of a floppy disk appears. Insert your disk (probably the MacWrite/MacPaint disk which comes bundled with the system) and the little picture grins at you while the system examines the disk. After a second or two (the delay is just below the threshold of irritation) the screen clears and your desktop appears. At the top, there is a menu bar (a list of instructions along a horizontal line). On the desk itself are illustrations of a disk (labelled MacWrite) and a Trash Can. These are "icons". For the time being, you can think of them as files or programs.

When you first sit at the desk, the disk and trash icons usually appear at the right hand side. Remember that this is only an assumption that the system makes — you can move them anywhere on the desktop by highlighting with the mouse and pulling them around. Why do this? When you have four or five windows (the most that are really useful at any one time) open on the same screen you may wish to override the Mac's assumptions about the most convenient way to arrange you paperwork. If everything gets unbearably messy the Mac will even provide an office cleaner to tidy the disk up again!

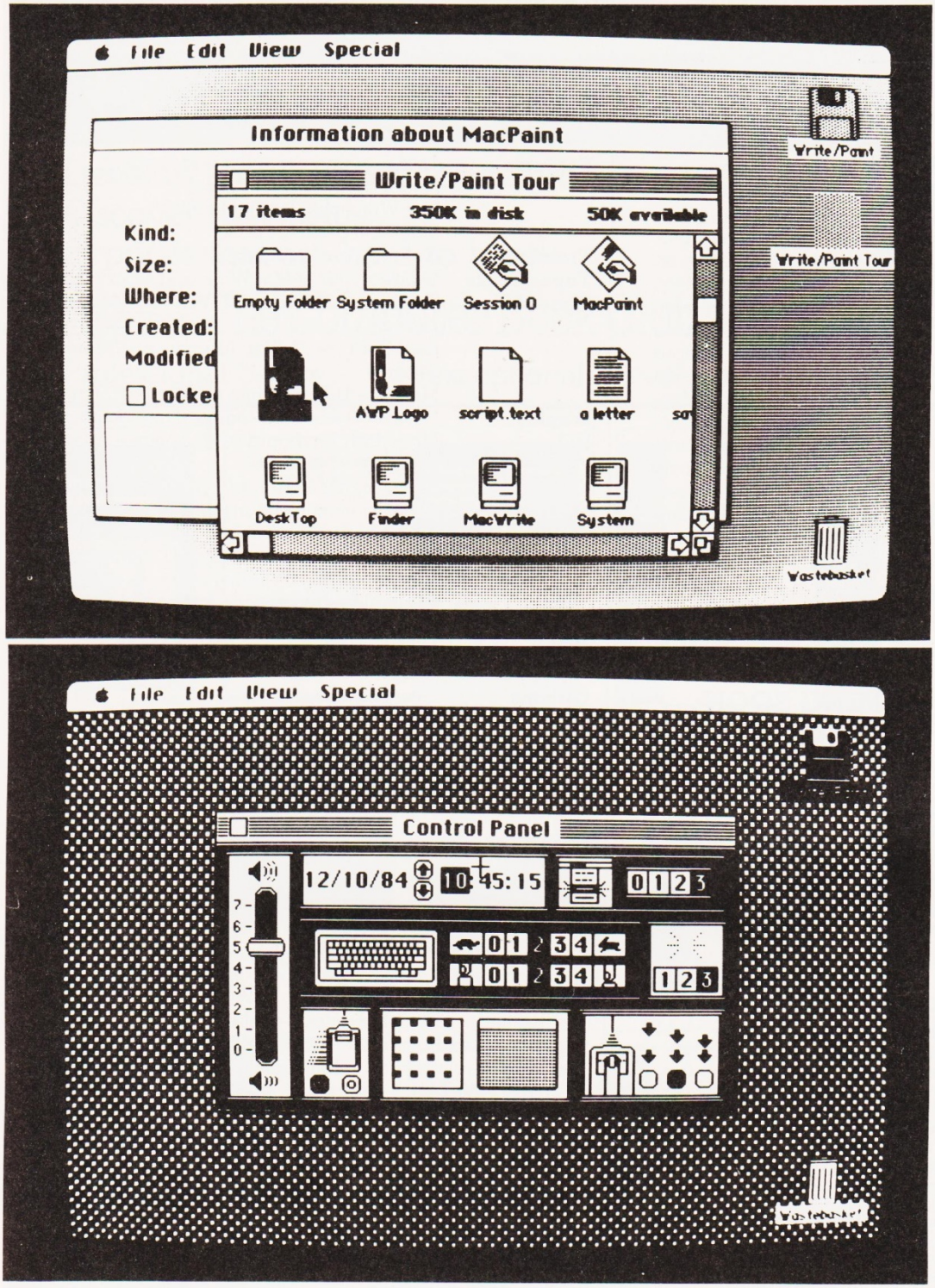


MacPaint offers a convincing demonstration of the Macintosh's strengths, equally at home with charts (top) and freehand drawings (bottom). These graphics can be integrated with the slightly less thrilling MacWrite to generate illustrated documents on the ImageWriter printer.

Once an icon is highlighted, you can "open" it. For each of the instructions (File, Edit, View, etc) on the menu bar there is a larger menu which you can pull down (like a window blind) using the mouse. In this case, the File menu shows "open" as a valid option (options that exist but aren't appropriate are displayed in a light tone instead of black). If you "open" your disk, a new window appears on the desktop containing many different documents, programs, system routines and folders (which can hold many documents of different types). Information about each icon is available through the File menu, while icons can be copied using the edit Menu.

An intuitive understanding of the system begins to develop after a remarkably short time, helped by the fact that it is very difficult to make an irrevocable error on the system. To discard an object, put it into the trash can. It can be retrieved at any time until the space it occupies on the disk is needed for more recent information. To rename an object, highlight the name with the mouse and type the new name at the keyboard.

This is where the strengths



The Macintosh protects users from the innards of the operating system. The various entities on the desk are identifiable by icon and name (top), while changes to the environment are made by adjusting the system's 'control panel' (bottom) — thus eliminating any confusion over operating system syntax or missing files.

of an object-oriented approach really make themselves felt. Because an object knows what can be done with it, the system logically cannot do anything foolish. If you highlight a document (perhaps prepared under the Macintosh multifont editor MacWrite) and open it, the MacWrite application is invoked immediately. By the same token, it is impossible to open a (potentially dangerous) system routine unless an appropriate application exists.

The accompanying photographs show how the desktop is used, and illustrate some of the things that are possible using MacWrite and MacPaint. It's still too early to tell what software will be developed for the Mac — or how good it will be. Microsoft have been working on Mac-Versions of their Multiplan Spreadsheet, BASIC language and 'The Word' editor, and we gather that some 100 other software houses are also committed to Macintosh support. The desktop metaphor is probably a good guarantee of usability, in that it forces authors to take a relatively consistent approach to user interaction. Information is integrated using cut-and-paste via a special area called the 'clipboard'.

Becoming conversant with the Macintosh takes about twelve hours, including MacWrite and MacPaint. Apple supply training cassettes and disks which are synchronised with demonstrations on the screen. These were superbly produced, and took the listener through the system at quite high speed without being either superficial or patronising. It is definitely *not* safe to use the training disks for normal work — you risk serious problems (which are appropriately reported with an icon showing a fizzing bomb!).

To be cynical, the desktop is also Apple's best guaranteed of continuing income: any fool can design a mouse-based high resolution computer, but no other microcomputer operating system comes anywhere near the Mac/Lisa. After all, didn't two large manufacturers (no names, no pack drill) greet the first Lisa with promises of competing systems "within 12 months". Three years later, there is still no sign of these products (though very similar environments are appearing on larger Unix-type systems).

THE HARDWARE

The Macintosh hardware is simple — the key to reliable mass production. The system unit encloses a built-in 400K drive using a special version of the Sony 3½" microfloppy with a variable speed controller, and an interface for an optional second drive unit (about which more later). All the logic circuitry is contained on a single board which limits the potential for expansion. 128K RAM already seems too little for the system, and we were worried that there was no scope for increasing memory without fitting a new processor board. A second board drives the black on white high resolution screen, and there is no facility for driving external monitors.

Peripherals attach to the rear of the machine, which is clearly labelled with international symbols. There are interfaces for the mouse, a printer, serial communications and an external amplifier/loudspeaker. The only printer which will reproduce Macin-

Our thanks to First Computer Ltd, who kindly lent us a Macintosh for review.

tosh graphics is the Apple Imagewriter (available in 10" and 15" carriage widths) which therefore increases the price of the system by £400 to £600.

The keyboard is linked to the front of the system using a US telephone jack (though users are cautioned against testing the keyboard on their phone socket). Various shifts are available to select a range of non-standard characters, and an optional numeric pad can be daisychained to the keyboard if required. The balance between the keyboard and the mouse takes some getting used to — particularly under MacPaint, where the Shift key on the main keyboard conditions the software to draw only at 45 and 90 degree angles. Perhaps Xerox *were* right to put several buttons on the mouse: Apple only use one button, which is more elegant but not necessarily the most practical solution.

The system unit comes with a plastic push switch which when fitted on the side of the cabinet can be used to force a reset or interrupt: programmers can therefore experiment to their hearts' content without worrying about untrained users doing the same thing.

THE USER VIEW

This is a machine for the first-time user. More experienced (and perhaps cynical) hackers have to unlearn their prejudices. That takes a little time. The most controversial issue is the transition between the mouse and the keyboard — perhaps Apple would have been better off with a 'trackball' mounted on the keyboard unit. But trackballs are harder to use than mice, and it could be difficult to incorporate a selection button. Still, a hardware add-on of this sort might make sense for frequent users.

More seriously, there have been some significant compromises in order to keep the price down. The single disk drive is fine while you work through the Mac's tutorial disks, but in the real world people need to maintain separate disks for programs and data. Some people even make backup copies of their data disks! The Macintosh falls down very hard at this point. One would have throught that the effort of swapping disks in and out is just what Apple would have tried to avoid in a user-acceptable system.

In our tests, we soon got to the point where data and programs could not co-exist on the same disk. Unfortunately, there is simply not enough room in 128K RAM to fit an application and the various system routines that it needs. Under MacWrite and MacPaint, this means that considerable effort goes into swapping disks, over and over again. Copying a document takes forever, and we honestly did not have the energy to embark in any test of a full disk copy. Jerry Pournelle, in his influential column in BYTE magazine, is quite scathing on the subject.

COMING SOON . . .

Our understanding is that a 512K RAM version of the Mac will be available once Apple have decided on a source for 256K bit chips. This would mean that an entire diskfull of applications coud be held in memory, and still leave 112K for data. Until that day arrives, an additional drive would be essential for any serious use. This brings the price of our recommended configuration up to £2716 plus VAT. Another alternative is to buy a minimal configuration of the Lisa 2, which comes with 512K and a MacOmpatible operating system as standard (apologies for the MacAbre pun). At £3346, configured with printer, this is hardly a cheap way to avoid the problems of the Mac's single drive, though it does offer an attractive expansion path to a hard-disk system.

The Macintosh, like the Apple IIc, is essentially a non-expandable machine. There are no slots free for interesting goodies, whether from Apple or anyone else — so a field upgrade to 512K seems unlikely. Adding a second disk drive eliminates one of the best features of the Mac — the small space it occupies on a desk and the resulting 'transportability'.

On balance, we felt that the disk space problems were so significant that Apple would probably put effort into a better configuration as a matter of urgency. If they don't, the BYTE verdict that the Macintosh is a wonderful toy may come home to roost. The small amount of memory means that many useful programs cannot be transferred to the machine. We could be wrong — if the market is big enough someone will find a way to cram a quart of software into the Mac's pint pot. Indeed, Peachtree are already selling Cash Book and Ledger Card products for the machine — and MacCoutancy (sorry . . .) is normally regarded as a particularly greedy user of space.

The Macintosh *will* be a great machine, but at the moment is held back by a lack of appropriate software and potential problems with disk and memory space. As an office system, it would also benefit from some sort of local area network or shared disk facility. Another year should see a much more mature product. If you have an immediate requirement for multifont, multilingual word processing with graphics, buy a Mac before the pound sinks any further against the dollar. If your needs are not yet served by the machine you should either wait or think again.

FACTSHEET	Apple Macintosh
	System Unit — £1795
CPU	Motorola 68000 at 7.83 MHz
RAM	128K standard, not expandable
ROM	64K, containing system routines
Standard Features	Macintosh Mouse
	4 voice sound controller and speaker
	Finder desktop environment
	MacWrite multi-font text editor
	MacPaint graphics editor
Training Tapes/Disks	*Guided Tour of Macintosh*
	Guided Tour of MacWrite and *MacPaint*
Dimensions	System — 7.5Kg (344mm x 246mm x 276mm)
	Keyboard — 1.2kg (65mm x 336mm x 146mm)
	Mouse — 0.2kg (37mm x 60mm x 109mm)
Display	Hi-res 560 x 342 bit-mapped monochrome
I/O	Macintosh Keyboard (with optional numeric keypad)
	Serial printer interface (9 pin D connector)
	Serial communications interface (9 pin D connector)
	Apple Mouse interface (9 pin D connector)
	Integral 400K 3½" floppy drive
	Controller and interface for second drive
	No external video output
OS	Macintosh custom DOS supplied with system
Options	Carrying case — £39 (standard), £69 (de luxe)
	Expansion 3½" Floppy Disk — £349
	Imagewriter Printer — £423 (10"), £563 (15")
	Security fixing kit — £34
	Numeric keypad — £69
Current Software	MacWrite/MacPaint — £149 (bundled with Macintosh)
	MacTerminal — £69
	Microsoft Multiplan — £149
	Microsoft BASIC — £99
	Macintosh Multichart — £99
Planned Software	MacBasic, MacPascal, Assembler, Logo, MacProject, MacDraw, Multifile, Multiword

We estimate that a Macintosh configuration with external drive, bundled MacWrite/MacPaint, the Imagewriter printer and one language or additional application would cost £2716.

A Lisa 2 with one drive, 512K RAM, the Macintosh operating system, MacPaint/MacWrite at list price, Imagewriter and one additional application would cost about £3346.

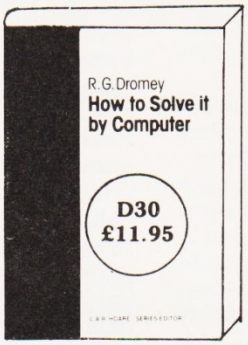
The Computer Book Club
. . . for your career

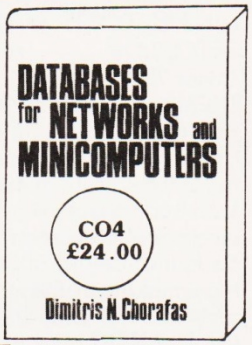
TAKE ANY 3 FOR ONLY £1.75 EACH plus p&p* & SAVE!
Value to £82.85

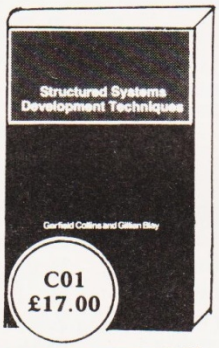
Develop an advanced technique . . .
Discover new fields . . .
at prices that are hard to beat!

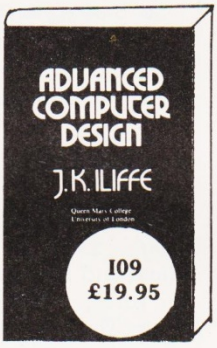
The Computer Book Club

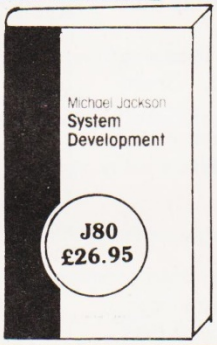
Professional books . . . at exceptional prices!

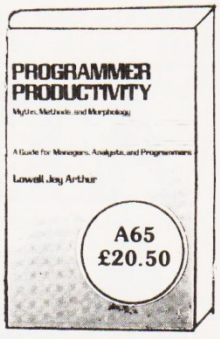




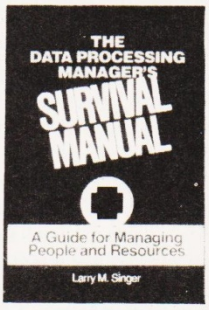








SPECIAL BONUS OFFER
As a special bonus for joining now, all applicants whose membership forms are received by November 15 will receive at no extra charge:
The Data Processing Manager's Survival Manual
by Larry M. Singer
Packed full of 'how to do it' guidance on the management of people and resources in the D P field, The Survival Manual is a hardcover volume of 226 pages, retailing at £23.70



Why is the Computer Book Club a great source of top quality books at surprisingly low prices?

- **Editorial Quality:** Each month you'll find on offer a range of fine books covering a variety of fields of interest, all carefully reviewed and selected by our own team of experts.
- **Big Savings:** In addition to getting your choice of three books for £1.75 each plus p&p* membership will entitle you to keep on saving – up to 25% (sometimes even more) off on all books.
- **No Pressure to Buy:** You have both real choice and an easy to handle commitment with The Computer Book Club. We'll send you the Club News monthly – describing the latest selections – but you needn't take any particular book or take one book a month. All we ask is that you take at least four books during your first year of membership.
- **Added Advantages:** You'll be able to read the Club News at your leisure, make your selection from the comfort of home and have the books you select delivered to your door.

Please accept my application and enrol me as a member of The Computer Book Club. Send me the three book choices whose numbers I have indicated below. You will charge me a total of £5.25 for my introductory books, plus £2.00 towards postage and packing*. If not completely satisfied I may return the books within 10 days, cancel my membership and owe nothing.

As a member my commitment is to buy 4 books in my first year of membership. I do not need to take a book each month. If I want an alternative to the main selection, or no book at all, I will tell you so on the form provided. I am over 18 years of age.

Write the codes for your choices here: ☐ ☐ ☐

Mr/Mrs/Miss _____

(please print)
Address _____

_____

_____ **Postcode** _____

Signature _____

CT11

Tick here to receive your special bonus offer ☐

SEND NO MONEY NOW. Allow up to 3 weeks for delivery.
Post to: THE COMPUTER BOOK CLUB, CASTERTON HALL, KIRKBY LONSDALE, VIA CARNFORTH, LANCS LA6 2LA.

ATARI ANTICS PART 2

G. Lawrence

Having discussed Player Missile Graphics in October's article, this month we look at animation with plenty of examples to put some life into your programs.

Animation is movement, or implied movement, of objects around the screen. While most of this article is about animation on the 32K Atari 800, it can easily be converted, if necessary, for other machines. Animation on the Atari can be achieved, several different ways, before explaining these routines, I will introduce two ideas.

Colour registers The nine bytes in memory (704-712) where data is stored detailing the colours/luminances of the screen, characters, players and missiles. They can be set either by POKEs or use of the SETCOLOR command (bytes 708-712)

Display list This is the simple program ANTIC (the Atari graphics chip) uses for displaying to the screen. In its simplest form it consists of the address in memory where screen data is to be found, details of the mode types making up the screen display and the jump instruction to take ANTIC back to the start of the list again.

There can be more than one LMS (Load Memory Scan) address in the list — in fact, you can separately address every mode line if you need to.

CHARACTER MOVEMENT

The simplest form of animation is a movement of characters around the screen, as in Listing 1. This moves the letter 'A' rapidly across the screen and leaves it at position 37,0. Another method is to use strings, as in Listings 2,3 and 4.

On their own, these are of little use, but if we make use of the Atari's programmable character capability we can get some amusing action — see Listing 5. Fun isn't it! Now add the following lines:

65 POKE 755,4

and watch him run across the ceiling. Sadly, if we wish to put scenery behind our little character, life becomes very complicated. But, the Atari has an answer (more of which later).

SCROLLS

As mentioned earlier, ANTIC takes data for the screen from memory areas pointed to by the LMS bytes in the display. If the values of the LMS address bytes are varied, the data displayed is altered. By repeatedly altering these by a set amount, a scrolling effect can be achieved.

Vertical scrolls Usually, a computer scrolls data by shifting the whole screenful up or down through the screen memory. It's not so on the Atari. In the normal graphics modes, the whole screenful of data can be taken from memory pointed to by a single LMS byte and its two address bytes. To simulate a shift up or down merely requires that we increment or decrement these two address bytes by the number of bytes taking up a screen line, eg 20 in BASIC Mode 1 (see Listing 6).

Horizontal scrolls This is more complex in that each line to be scrolled must have its own LMS command and address bytes. This means that we have to rewrite the display list and use a short machine code routine in order to get a smooth scroll. To simplify matters, it is common practice to assign each line of the screen to a different 'page' in memory and to scroll within the confines of this page by simply altering the low byte. Left scrolling is achieved by subtracting one from the value — right scrolling by adding one. For example, see Listing 7.

In effect, this program is like looking through a window 20 characters wide, and scanning back and forth over a page 60 characters wide. With some thought, I'm sure you could arrange for each line to be part of, for instance, a word processor program. In the earlier examples, I have moved the whole screen, but by applying the LMS only to selected lines or areas, you can move just parts of the screen (see Listing 8). You can even arrange for alternate lines to move in opposite directions, or whole sections of text to be deleted from the display.

As a rule, never let the memory areas you use cross 4K boundaries as it will confuse ANTIC. And one last thought; I wonder what would happen if you varied the LMS bytes in accordance with a simple mathematical formula?

Fine scrolls The Atari allows true fine scrolling of data over a limited range (up to 16 scan lines vertically and 16 colour clocks horizontally). This does not limit you in any way, though, for if you combine coarse and fine scrolling, you can scroll across the whole screen. The following two steps will implement fine scrolling.

- Set the fine scroll enable bits for the lines to be moved: horizontal scroll, bit 4 of the Mode number in the display list. For example, to enable a BASIC 0 line, change to 16+2 (BASIC 0 = ANTIC 2) = 18. Vertical scroll, bit 5 of the Mode number. For the above exam-

```
10 GRAPHICS 0: POKE 752,1
20 POSITION 0,0
30 FOR W=0 TO 37
40 FOR T=0 TO 20: NEXT T: REM ** DELAY
50 PRINT "< A";: REM ** "< " IS CURSOR LEFT
60 NEXT W
70 GOTO 20
```

Listing 1

```
10 GRAPHICS 0: POKE 752,1
20 DIM A$(40)
30 FOR W=1 TO 40: A$(W,W)=" ": NEXT W
40 A$(38,38)="A"
50 FOR W=1 TO 40
60 POSITION 0,0
70 PRINT A$(W)
80 NEXT W
90 GOTO 50
```

Listing 2

```
 10 GRAPHICS 0: POKE 752,1
 20 DIM A$(40),B$(2)
 30 FOR W=1 TO 40: A$(W,W)=" ": NEXT W
 40 B$="A "
 50 FOR W=38 TO 1 STEP -1
 60 FOR T=0 TO 20: NEXT T: REM ** DELAY
 70 POSITION 0,0
 80 A$(W,W+1)=B$
 90 PRINT A$
100 NEXT W
110 GOTO 50
```

Listing 3

```
10 GRAPHICS 0:POKE 752,1
20 DIM A$(2)
30 A$="A'"
40 FOR W=38 TO 1 STEP -1
50 POSITION W,0: PRINT A$
60 FOR T=0 TO 20: NEXT T
70 NEXT W
80 GOTO 40
```

Listing 4

```
   10 GRAPHICS 17
   20 POKE 709,0: POKE 712,140
   30 FOR W=1536 TO 1575: READ A: POKE W,A: NEXT W
   40 DATA 0,0,0,0,0,0,0,0,0,0,0,3,23,45,71,130,0,
0,0,192,232,180,226,65
   50 DATA 0,0,0,3,7,29,39,18,0,0,0,192,224,184,22
8,72
   60 POKE 756,6
   70 FOR W=18 TO 0 STEP -2
   80 FOR T=0 TO 90: NEXT T
   90 POSITION W,0
  100 PRINT #6;CHR$(1);CHR$(2);CHR$(0);
  110 FOR T=0 TO 90: NEXT T
  120 POSITION W-1,0
  130 PRINT #6;CHR$(3);CHR$(4);CHR$(0);
  140 NEXT W
  150 POSITION 1,0: PRINT #6;CHR$(0);CHR$(0);
  160 GOTO 70
```

Listing 5

```
    1 REM LISTING 6
   10 GRAPHICS 17: DIM A$(1000),B$(50)
   20 B$="@@this@is@a@page@of@@text@that@will@be@@
@scrolled@by@me@@@@@@": REM ** @ = CONTROL/ ,
   30 A$(LEN(A$)+1)=B$
   40 FOR W=1 TO 4
   50 A$(LEN(A$)+1)=A$
   60 NEXT W
   70 HI=INT(ADR(A$)/256): LO=ADR(A$)-HI*256
   80 DL=PEEK(560)+256*PEEK(561)+4: REM ** LOW BYT
E OF THE L.M.S.
   90 POKE DL,LO: POKE DL+1,HI
  100 REM ** NOW MOVE DOWN
  110 FOR W=1 TO 9
  120 FOR T=0 TO 75: NEXT T
  130 P=PEEK(DL): Q=PEEK(DL+1)
  140 P=P+20: IF P>255 THEN P=P-256:Q=Q+1
  150 POKE DL,P: POKE DL+1,Q
  160 NEXT W
  170 POKE 764,255
  180 IF PEEK(764)=255 THEN 180: REM ** PRESS KEY
TO CONTINUE
  190 REM ** MOVE UP
  200 FOR W=1 TO 9
  210 FOR T=0 TO 75: NEXT T
  220 P=PEEK(DL): Q=PEEK(DL+1)
  230 P=P-20: IF P<0 THEN P=P+256:Q=Q-1
  240 POKE DL,P: POKE DL+1,Q
  250 NEXT W
  260 REM ** LOOP BACK
  270 POKE 764,255
  280 IF PEEK(764)=255 THEN 270
  290 GOTO 110
```

Listing 6

ple the number will be 34.

- Store, in the appropriate scroll register, the number of scan lines or colour clocks you wish to scroll by. Horizontal scroll = 54276, vertical scroll = 54277. This will be applied to every line enabled.

As for normal scrolling, there must be a reserve of data to be scrolled in, and to prevent the nasty jerking you get on the last line, it's best not to enable this line. Listing 9 is a simple example. If you change line 70 to POKE W.82...., delete line 100 and change line 140 to POKE 54276,W, you will now have horizontal scrolling.

PAGE FLIPPING

This uses the same principles as coarse scrolling, except that you alter the LMS byte at the top of the area sufficient to completely change the displayed data within that area. So that you can still print this new screen, you also have to amend bytes 88-89 to point to the same address (see Listing 10).

COLOUR CHANGE IMPLIED MOTION

Moving pictures on a television screen are composed of a series of still pictures shown in rapid succession. Thus, if you could show a series of computer pictures in rapid succession, you would simulate motion in the same way. You usually need to resort to machine code to achieve the necessary writing speeds, but there is another possibility. If you draw the images in 'invisible ink', you can make them visible one after the other by switching the colour register for that 'ink' to a

```
    1 REM LISTING 7
   10 REM ** COMPOSE GRAPHICS 2 SCREEN
   20 GRAPHICS 18: REM ** SET UP EVERYTHING
   30 POKE 1536,112: POKE 1537,112: POKE 1538,112
   40 FOR W=0 TO 35 STEP 3
   50 POKE W+1539,71: REM ** ANTIC MODE 7 (BASIC 2
) WITH L.M.S.
   60 POKE W+1540,128: REM ** MIDDLE OF PAGE
   70 POKE W+1541,W/3: REM ** SET UP PAGE
   80 NEXT W
   90 POKE 1575,65: POKE 1576,0: POKE 1577,6
  100 POKE 559,0: POKE 560,0: POKE 561,6: POKE 559
,34: REM ** ENABLE NEW DL
  110 REM ** YOU NOW SEE A JUMBLE OF LETTERS
  115 REM ** BUT YOU COULD HAVE MADE IT TEXT
  120 REM SET UP M/C PROGRAM
  130 FOR W=1580 TO 1603: READ A: POKE W,A: NEXT W
  140 DATA 72,138,72,162,36,254,1,6,202,202,202,20
8,248,104,170,104,141,43,6,104,173,43,6,96
  150 REM ** SCROLL LEFT
  160 POKE 1585,254
  170 FOR W=1 TO 60: GOSUB 500: U=USR(1580): NEXT
W
  180 REM ** SCROLL RIGHT
  190 POKE 1585,222
  200 FOR W=1 TO 60: GOSUB 500: U=USR(1580): NEXT
W
  210 GOTO 160
  499 REM ** DELAY LOOP
  500 FOR T=0 TO 25: NEXT T: RETURN
```

Listing 7

```
    1 REM LISTING 8
   10 DIM A$(150),B$(90),C$(90),F$(40)
   15 F$="@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
"
   18 REM ** @ = CONTROL/ ,
   20 A$(1)=F$
   22 A$(41)="can@you@see@this@@@if@not@press@Q"
   23 A$(74)=F$
   24 REM ** Q=CONTROL/Q
   30 B$="@@@@@@@@@@@@@@@@@@@@can@you@read@this@be
tter@"
   35 B$(LEN(B$)+1)="if@not@press@R@@@@@@@@@@@@@@@
@@@@@@"
   37 REM R = CONTROL/R
   40 C$="@@@@@@@@@@@@@@@@@@@@you@must@be@able@to@
"
   45 C$(LEN(C$)+1)="read@this@now@@@@@@@@@@@@@@@@
@@"
   50 FOR W=1536 TO 1561: READ A: POKE W,A: NEXT W
   60 DATA 112,112,112,66,0,0,65,0,6,112,112,112
   62 DATA 70,0,0,65,9,6,112,112,112,71,0,0,65,18,
6
   70 A=INT(ADR(A$)/256): B=ADR(A$)-A*256
   80 POKE 1540,B: POKE 1541,A
   90 POKE 599,0: POKE 560,0: POKE 561,6: POKE 559
,34
  100 FOR W=1 TO LEN(A$)-40
  110 GOSUB 500
  120 P=PEEK(1540): Q=PEEK(1541)
  130 P=P+1: IF P>255 THEN P=P-256: Q=Q+1
  140 POKE 1540,P: POKE 1541,Q
  150 NEXT W
  160 IF PEEK(764)=31 THEN 180
  170 GOTO 70
  180 POKE 560,9
  190 A=INT(ADR(B$)/256): B=ADR(B$)-A*256
  200 POKE 1549,B: POKE 1550,A
  210 FOR W=1 TO LEN(B$)-20
  220 GOSUB 500
  230 P=PEEK(1549): Q=PEEK(1550)
  240 P=P+1: IF P>255 THEN P=P-256: Q=Q+1
  250 POKE 1549,P: POKE 1550,Q
  260 NEXT W
  270 IF PEEK(764)=30 THEN 290
  280 GOTO 190
  290 POKE 560,18
  300 A=INT(ADR(C$)/256): B=ADR(C$)-A*256
  310 POKE 1558,B: POKE 1559,A
  320 FOR W=1 TO LEN(C$)-15
  330 GOSUB 500
  340 P=PEEK(1558): Q=PEEK(1559)
  350 P=P+1: IF P>255 THEN P=P-256: Q=Q+1
  360 POKE 1558,P: POKE 1559,Q
  370 NEXT W
  380 GOTO 300
  499 REM ** DELAY
  500 FOR DELAY=0 TO 50: NEXT DELAY: RETURN
```

Listing 8

```
  1 REM LISTING 9
  5 PRINT CHR$(125)
 10 DIM A$(40)
 20 A$="@@@@@@@@@@@@@@@now@you@see@it@@@@@@@@@@@@@@
@"
 30 POKE 710,14: POKE 712,14
 40 B=INT(ADR(A$)/256): A=ADR(A$)-B*256
 50 POKE 1536,112: POKE 1537,112: POKE 1538,112
 60 FOR W=1539 TO 1610 STEP 3
 70 POKE W,90: POKE W+1,A: POKE W+2,B
 80 NEXT W
 90 POKE 1611,65: POKE 1612,0:POKE 1613,6
100 POKE 1608,66: REM ** NO SCROLL LAST LINE
110 POKE 559,0: POKE 560,0: POKE 561,6: POKE 559
,34
120 FOR W=1 TO 7
130 FOR T=0 TO 50: NEXT T: REM ** DELAY
140 POKE 54277,W: REM ** 'W' SCAN LINES
150 NEXT W
200 GOTO 120
```

Listing 9

contrasting colour. Listings 11, 12 and 13 show examples of such a technique.

PLAYER MISSILE GRAPHICS

As already mentioned, moving multibyte characters around the screen can involve very complex calculations. To simplify matters, Atari invented the idea of Player Missile Graphics. In this system, each player missile is a sequential list of 256 eight-bit bytes which are very easily moved, as explained below. In addition, PMG allows the following:

- Four players, each in its own selectable colour.
- Four missiles, each in the same colour as its player.
- Three width settings for each player and missile.
- Two vertical resolutions.
- Overlapped areas in the third colour.
- Selectable priorities allowing 3D effects.
- Collision detection.

Players Up to four players and four missiles are possible (more if you use special techniques): each has a colour determined by its own colour register (704-707). They consist of up to 256 bytes (128 in double line resolution mode) whose binary representation on screen forms the image. They may be placed anywhere in RAM provided that the PM base address is on a 2K (1K for double resolution) boundary. This PM address is set by POKEing its page number to memory address 54279. The actual data is POKEd into RAM starting 768 bytes (384 for double resolution) above this. The values in Table 1 are offset from the PM base address. Once filled with data (bytes that are not used should be emptied by POKEing with zeros) they should be activated with:

POKE 53277,3

Widths The widths of the players are individually controllable by their width registers (53256 to 53259). The options are 0 = normal width, 1 = double width and 3 = quadruple width. Similarly, the widths of the missiles are controlled by their respective bit pairs in byte 53260.

Vertical resolution Players can be made up of either 256 or 128 bytes by POKEing 559 with either 62 for single resolution or 46 for double resolution. As mentioned above, the PM area must be set up differently for each player and missile.

Overlapping areas By setting bit five of the priority select register 623, you can choose to have the overlapping areas of colour in a third hue.

Priority selection Bits 0 to 3 of byte 623 are used to select the relative priorities of the players and the playfield: see Table 2.

```
  1 REM LISTING 10
 10  GRAPHICS 18
 15  DIM A$(1),B$(1),C$(1),D$(1),E$(1),F$(1),G$(
1),H$(1)
 18 REM ** SET UP NEW CHARACTERS
 20  FOR W=1536 TO 1599: READ A
 25  POKE W,A: NEXT W
 30 DATA 0,0,0,0,0,0,0,0
 32 DATA 255,255,255,255,255,255,255,255
 34 DATA 1,2,4,8,16,32,64,128
 36 DATA 128,64,32,16,8,4,2,1
 40 DATA 1,1,1,1,1,1,1,1
 42 DATA 255,0,0,0,0,0,0,0
 44 DATA 128,128,128,128,128,128,128,128
 46 DATA 126,255,219,255,239,255,195,126
 49 REM ** SET UP COLOURS
 50 FOR W=708 TO 712: READ A
 55 POKE W,A: NEXT W
 60 DATA 39,31,28,136,0
 70 POKE 756,6: REM ** NEW CHAR SET
 80 D=PEEK(560)+256*PEEK(561)+5
 85 REM ** LOW BYTE OF L.M.S. ADDRESS
 90 A$=CHR$(0): B$=CHR$(1): C$=CHR$(2)
 92 D$=CHR$(3):E$=CHR$(4):F$=CHR$(5)
 94 G$=CHR$(6):F$=CHR$(7)
 95 POSITION 9,2: PRINT #6;H$
100 POSITION 7,3: PRINT #6;C$;B$;B$;B$;D$
110 POSITION 7,4: PRINT #6;D$;B$;B$;B$;C$
120 POSITION 8,5: PRINT #6;B$;B$;B$;
130 POSITION 8,6: PRINT #6;E$;A$;G$
140 POSITION 8,7: PRINT #6;E$;A$;G$
150 POSITION 8,8: PRINT #6;F$;A$;F$
160 POKE D,PEEK(D)-8: POKE 89,PEEK(D)
165 REM ** FLIP PAGE
170 POSITION 9,2: PRINT #6;H$
180 POSITION 5,3: PRINT #6;F$;F$;F$;B$;B$;B$;F$;
F$;F$
190 POSITION 8,4: PRINT #6;B$;B$;B$
200 POSITION 8,5: PRINT #6;B$;B$;B$
210 POSITION 8,6: PRINT #6;C$;A$;D$
220 POSITION 7,7: PRINT #6;C$;A$;A$;A$;D$
230 POSITION 6,8: PRINT #6;F$;A$;A$;A$;A$;A$;F$
240 POKE D,PEEK(D)+8
250 FOR G=0 TO 50: NEXT G
260 POKE D,PEEK(D)-8
270 FOR G=0 TO 50: NEXT G
280 GOTO 240
```

Listing 10

```
  1 REM LISTING 11
 10 GRAPHICS 10
 20 FOR W=705 TO 712: READ A: POKE W,A: NEXT W
 30 DATA 28,14,200,136,56,39,143,221
 35 REM ** NORMALLY THESE WOULD BE IN THE BACKGR
OUND
 36 REM ** COLOUR, SO THAT THEY ARE INVISIBLE
 40 FOR W=1 TO 8
 50 COLOR W
 60 PLOT 10,W*3: DRAWTO 50,(W*3)+10
 70 NEXT W
 80 FOR W=705 TO 712: POKE W,0: NEXT W
 85 REM ** NOW THEY ARE INVISIBLE
 90 W=705
100 IF W=705 THEN POKE 712,0: POKE W,15: GOTO 12
0
110 POKE W-1,0: POKE W,15
120 W=W+1: IF W=713 THEN W=705
130 FOR T=0 TO 50: NEXT T: REM ** DELAY
140 GOTO 100
```

Listing 11

```
  1 REM LISTING 12
 10 GRAPHICS 1: C=1: DEG
 20 FOR W=705 TO 712: POKE W,255*RND(2): NEXT W
 30 FOR W=0 TO 359 STEP 2
 40 COLOR C: C=C+1: IF C=9 THEN C=1
 50 PLOT 40+9*SIN(W),80+20*COS(W)
 60 NEXT W
 70 FOR W=0 TO 359 STEP 5
 80 COLOR C: C=C+1: IF C=9 THEN C=1
 90 PLOT 60+19*SIN(W),80+20*COS(W)
100 PLOT 20+19*SIN(W),80+20*COS(W)
110 NEXT W
120 FOR W=0 TO 359 STEP 5
130 COLOR C: C=C+1: IF C=9 THEN C=1
140 PLOT 40+9*SIN(W),40+39*COS(W)
150 PLOT 40+9*SIN(W),120+39*COS(W)
160 NEXT W
170 W=705
180 IF W=705 THEN POKE 712,0: POKE 705,15: GOTO
200
190 POKE W-1,0: POKE W,15
200 W=W+1: IF W=713 THEN W=705
210 FOR H=0 TO 8: NEXT H
220 GOTO 180
```

Listing 12

```
  1 REM LISTING 13
 10 GRAPHICS 10
 20 FOR W=705 TO 712: READ A: POKE W,A: NEXT W
 30 DATA 28,143,56,200,136,221,35,15
 40 DEG
 50 P=1
 60 FOR W=90 TO 450 STEP 5
 70 COLOR P: P=P+1: IF P=9 THEN P=1
 80 PLOT 40+15*SIN(W),20+10*COS(W)
 90 DRAWTO 40+15*SIN(W),120+10*COS(W)
100 NEXT W
110 P=PEEK(705)
120 FOR W=705 TO 711: POKE W,PEEK(W)+1: NEXT W
130 POKE 712,P
140 GOTO 110
```

Listing 13

```
  1 REM LISTING 14
 10 GRAPHICS 23
 15 REM ** SET UP COLOURS
 20 FOR W=704 TO 712: READ A: POKE W,A: NEXT W
 30 DATA 56,200,56,200,15,28,0,19,19
 40 REM ** PMG SET-UP
 50 P=PEEK(106)-32: POKE 54279,P:A=P*256
 60 POKE 599,62
 70 FOR W=A+1024 TO A+2047: POKE W,0: NEXT W
 80 H1=53248: H2=53249: H3=53250: H4=53251
 90 FOR W=A+1098 TO A+1106: READ B: POKE W,B: NE
XT W
100 DATA 255,60,90,149,149,149,149,66,60
110 FOR W=A+1354 TO A+1362: READ B: POKE W,B: NE
XT W
120 DATA 255,0,36,106,106,106,106,60,0
130 FOR W=A+1602 TO A+1610: READ B: POKE W,B: NE
XT W
140 DATA 60,66,149,149,149,149,90,60,255
150 FOR W=A+1858 TO A+1866: READ B: POKE W,B: NE
XT W
160 DATA 0,60,106,106,106,106,36,0,255
170 POKE 53277,3
180 REM ** DRAW SCENE
190 COLOR 3
200 FOR W=1 TO 7: READ J,K,L,M: PLOT J,K: DRAWTO
L,M: NEXT W
210 DATA 77,79,150,30,78,79,151,30,79,79,152
212 DATA 30,80,79,153,30,81,79,152,31,82,79
220 DATA 151,32,83,79,150,33
230 COLOR 1
240 FOR W=1 TO 7: READ J,K,L,M: PLOT J,K: DRAWTO
L,M: NEXT W
250 DATA 77,79,77,30,78,79,78,29,79,79,79,28,80
255 DATA 79,80,27,81,79,81,28,82,79,82,29
260 DATA 83,79,83,30
270 COLOR 2
280 FOR W=1 TO 7: READ J,K,L,M: PLOT J,K: DRAWTO
L,M: NEXT W
290 DATA 77,24,77,22,78,25,78,21,79,26,79,20,80
300 DATA 24,80,18,81,26,81,20,82,25,82,21,83,24,
83,22
310 REM ** NOW SET THINGS MOVING
320 FOR W=-30 TO 30 STEP 2
330 POKE 623,2
340 POKE H1,125+W: POKE H2,125+W: POKE H3,0: POK
E H4,0
350 FOR T=0 TO 10: NEXT T
360 POKE H3,125+W: POKE H4,125+W: POKE H1,0: POK
E H2,0
370 FOR T=0 TO 10: NEXT T
380 NEXT W
390 FOR W=-30 TO 30 STEP -2
400 POKE 623,0
410 POKE H1,125+W: POKE H2,125+W: POKE H3,0: POK
E H4,0
420 FOR T=0 TO 10: NEXT T
430 POKE H3,125+W: POKE H4,125+W: POKE H1,0: POK
E H2,0
440 FOR T=0 TO 10: NEXT T
450 NEXT W
460 GOTO 320
```

Listing 14

Collision detection. Each of the various collisions possible are logged in their own bytes: see Table 3. A POKE of any number to 53278 will clear these registers.

MOVING IN PMG

The two types of movements possible are achieved in two different ways.

Horizontal These require one simple POKE to the position registers 53248-53251 for players, and 53252-53255 for missiles. Although a range of 0 to 255 might seem possible, usually only 50 to 210 approximately are visible. Outside this range may be used for resting players when not in use. Note that these bytes may only be written to, reading them reveals the collision status.

Vertical This is more complicated, although much easier than without PMG. It is best achieved by a short machine code routine that moves all zero bytes up or down one. See Listing 14 for an example: Listings 15 and 16 are assorted programs. Apparently, the author of 'De Re Atari' has a method of moving horizontally in PMG that uses strings and is rapid but does not use machine code, but I will leave that for you and your £16.95 to find out.

```
  1 REM LISTING 15
 10 GRAPHICS 10
 20 DEG: P=1
 30 FOR W=705 TO 712: POKE W,255*RND(9): NEXT W
 40 FOR W=0 TO 3600 STEP 10
 50 COLOR P: P=P+1: IF P=9 THEN P=1
 60 PLOT 40+(W/100)*SIN(W),80+(W/50)*COS(W)
 70 NEXT W
 80 W=705
 90 IF W=705 THEN POKE 712,0: POKE W,15: GOTO 11
0
100 POKE W-1,0: POKE W,15
110 W=W+1: IF W=713 THEN W=705
120 FOR T=0 TO 25: NEXT T
130 GOTO 90
```

Listing 15

```
  1 REM LISTING 16
 10 GRAPHICS 10: P=1
 20 FOR W=705 TO 712: READ A: POKE W,A: NEXT W
 30 DATA 23,200,221,40,15,56,143,80
 40 FOR W=39 TO 1 STEP -1
 50 COLOR P: P=P+1: IF P=9 THEN P=1
 60 PLOT 40+W,80-W: DRAWTO 40+W,80+W
 70 DRAWTO 40-W,80+W: DRAWTO 40-W,80-W
 80 DRAWTO 40+W,80-W
 90 NEXT W
100 P=PEEK(705)
110 FOR W=705 TO 711: POKE W,PEEK(W+1):NEXT W
120 POKE 712,P
130 GOTO 100
```

Listing 16

TABLE 1

Object	Single Resolution	Double Resolution
Missiles	+768 to +1023	+384 to +511
Player 0	+1024 to +1279	+512 to +639
Player 1	+1280 to +1535	+640 to +767
Player 2	+1536 to +1791	+768 to +895
Player 3	+1792 to +2047	+896 to +1023

TABLE 2

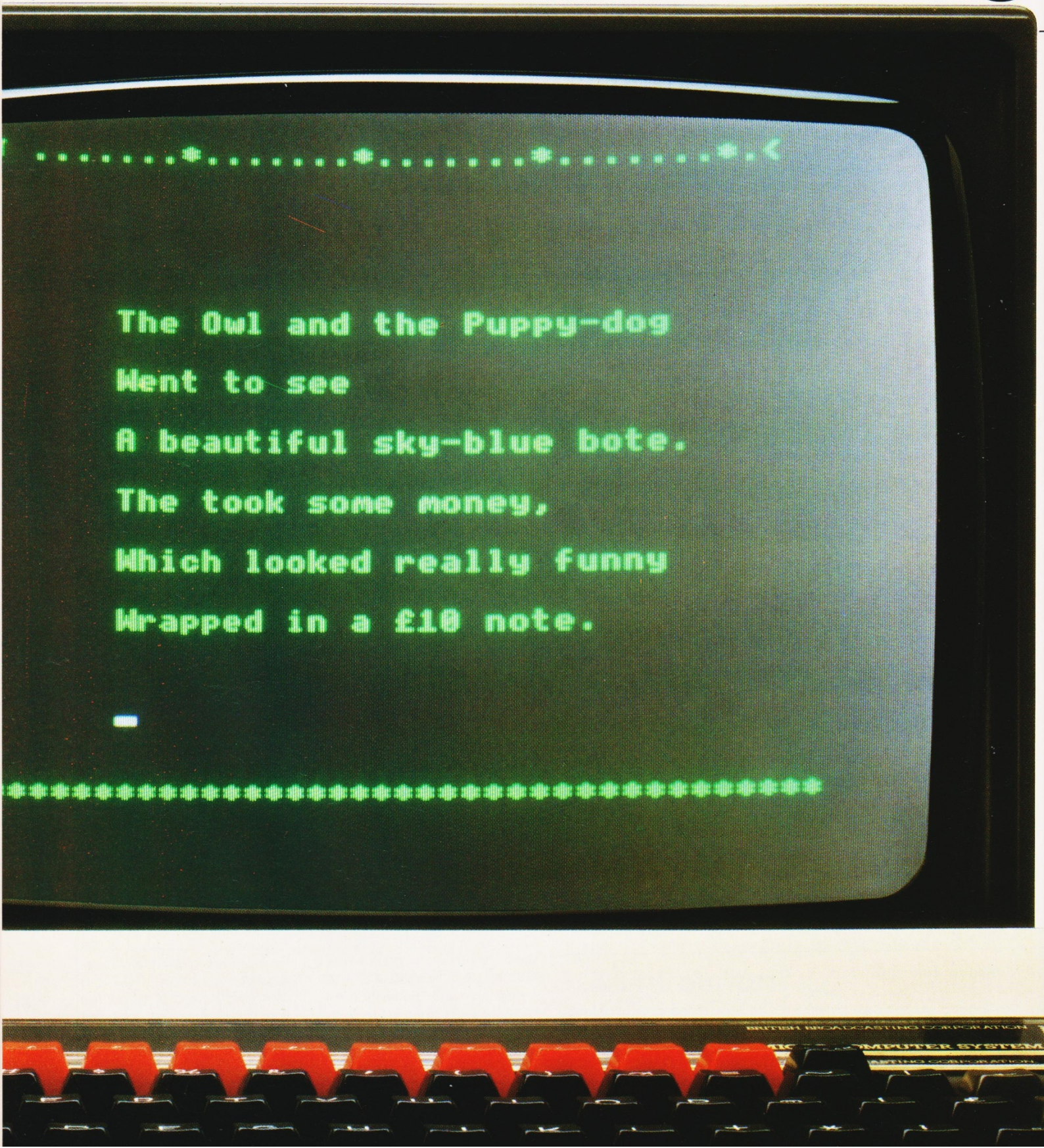
Bit	Priority
0	p0,p1,p2,p3,pf0,pf1,pf2,pf3,background
1	p0,p1,pf0,pf1,pf2,pf3,p2,p3,background
2	pf0,pf1,pf2,pf3,p0,p1,p2,p3,background
3	pf0,pf1,p0,p1,p2,p3,pf2,pf3,background
4	use all missiles as fifth player colour as pf3

Note: p = player, pf = playfield.

TABLE 3

Missile/playfield	53248 — 53251
Player/playfield	53252 — 53255
Missile/player	53256 — 53259
Player/player	53260 — 53264

How to become before committing



a great writer yourself to paper.

It takes only two minutes and £59.80 to transform your BBC Micro into the heart of a word processor with VIEW from Acornsoft.

The VIEW word processing system is programmed into a single chip, a 16K plug-in ROM. Once it's installed into your BBC Micro – a simple job for your local dealer – you just switch on and VIEW is operating. (You can switch to other programs, like BASIC, with a single command.)

VIEW is a professional system, yet it's surprisingly straightforward to use.

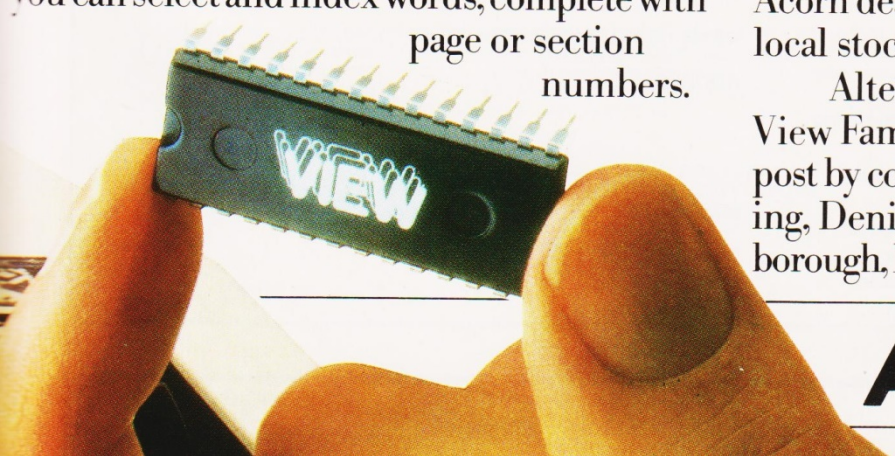
And it's so outstanding it's won the 1984 British Microcomputing Award for Home Software.

All you do is type out your text on the keyboard, and view it on the screen.

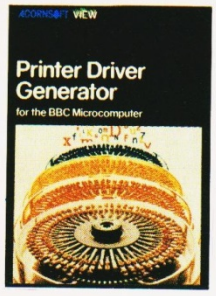
VIEW can search, change and replace particular words whenever they occur in your text. It can swap paragraphs. Automatically alter page numbers. Even count words.

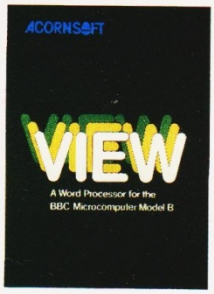
The possibilities are endless, because you can check, edit and change as much or as little as you like until you're satisfied. Then, with a single command, your final version will appear on the screen.

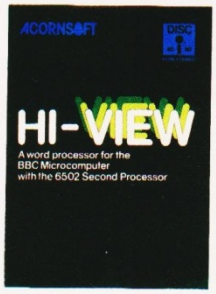
If you want to go even further, the simple addition of ViewIndex, just £14.95, means you can select and index words, complete with page or section numbers.

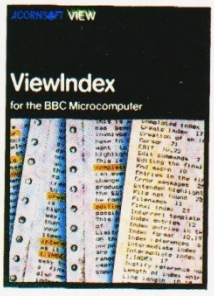


And of course, when you're ready, any printer that will operate with your BBC Micro will operate with VIEW. But if you want to use the printer's special facilities, such as bold printing or underlining, Acornsoft's Printer Driver Generator (£9.95 on cassette, £11.50 on disc) enables you to do so.









For the more specialised user who wants to take advantage of the extra power offered by the 6502 Second Processor, Hi-VIEW (£59.80) provides 47K of text space in any of the BBC Micro's screen modes.

So whether you're composing a 300 page business document, a letter to the gas board, or a bit of Victorian nonsense, you can polish it to your heart's content, wasting precious little time. And even less paper.

You can get VIEW products from your Acorn dealer. Just phone 01-200 0200 for your local stockist.

Alternatively, you can send off for the View Family brochure and order through the post by contacting Acornsoft, c/o Vector Marketing, Denington Industrial Estate, Wellingborough, Northants NN8 2RL. Tel: 0933 79300.

ACORNSOFT

The text on the screen is in Mode 6.

Subscriptions

Personally, we think you'll like our approach to microcomputing. Each month, we invite our readers to join us in an abundance of feature articles, projects, general topics, software listings, news and reviews – all to help committed micro users make more of their microcomputers at home or at work.

However, if you've ever missed a copy of Computing Today on the newstands, you'll not need us to tell you how valuable a subscription can be. Subscribe to CT and for a whole year you can sit back, assured that each issue, lovingly wrapped, will find its way through your letter box.

And it's not difficult! All you have to do is fill in the form below, cut it out and send it (or a photocopy) with your cheque or Postal Order (made payable to ASP Ltd) to:

COMPUTING TODAY Subscriptions,

Infonet Ltd,
Times House,
179 The Marlowes,
Hemel Hempstead,
Herts HP1 1BB.

Alternatively, you can pay by Access or Barclaycard in which case, simply fill in your card number, sign the form and send it off. Please don't send in your card.

Looking for a magazine with a professional approach with material written by micro users for micro users? Why not do yourself a favour and make 1984 the year you subscribe to Computing Today and we'll give you a truly personal approach to microcomputing.

SUBSCRIPTION ORDER FORM

Cut out and SEND TO :
COMPUTING TODAY Subscriptions
INFONET LTD,
TIMES HOUSE,
179 THE MARLOWES,
HEMEL HEMPSTEAD,
HERTS HP1 1BB.

Please commence my subscription to Computing Today with the ..... issue.

SUBSCRIPTION RATES (tick ☐ as appropriate)

£13.90 for 12 issues UK ☐
£17.55 for 12 issues Overseas Surface ☐
£37.20 for 12 issues Overseas Airmail ☐

I am enclosing my (delete as necessary) cheque/ Postal Order/ International Money Order for £.....
(made payable to ASP Ltd)
or
Debit my Access/ Barclaycard* (*delete as necessary)

BARCLAYCARD VISA

Please use BLOCK CAPITALS and include postcodes.

NAME (Mr/ Mrs/ Miss) .....
delete accordingly
ADDRESS .....
.....
..... POSTCODE .....
Signature .....
Date .....

MTX TOOLBOX

Richard Sargent

Routines to produce hi-res screen dumps and recover copy from a possible crash: essential reading for all MTX owners.

Avid readers of computer journals will probably realise that there are two ways of obtaining "hard copy" from the individual pixels of a high-resolution screen. The first method uses BASIC's "POINT" (or similarly named function) to decide whether a pixel is INKed or not, and to send the result to a dot-matrix printer capable of producing high-resolution graphics. The problem with this approach is that there is a fair amount of maths involved in manipulating the way in which POINT scans the screen co-ordinates. The code is not difficult to write, it's just that graphics screens have the bits in every byte laid horizontally in neat lines because that's the order in which the Cathode Ray Tube expects them; elements in *one* pixel-row. The dot matrix printer, on the other hand, needs to receive bytes in which the bits represent a single element in eight separate rows. All this adds up to the fact that the 10 lines or so of screen-dumping BASIC can take half an hour or so to do its work.

TABLE 1

Bit 7	1	ink pixel at 0,191
Bit 6	0	paper only at 0,190
Bit 5	1	ink pixel at 0,189
Bit 4	1	ink pixel at 0,188
Bit 3	1	ink pixel at 0,187
Bit 2	1	ink pixel at 0,186
Bit 1	1	ink pixel at 0,185
Bit 0	1	ink pixel at 0,184

MACHINE CODE SOLUTION

If something is inefficient in BASIC, the usual course of action is to put the offending routine into machine code. The user can now sit back and watch the screen print out in 60 seconds. Splendid? Well, splendid until you come to use a different type of printer and need to find the machine code routine (was it in high-memory or in the second-reserve cassette buffer ??) and then change the bytes (which ones?) to suit the new printer controls...

Why, then, are screen-dump routines not in the computer's own ROM? The answer is simple. Printer control-codes are not standardised and the computer manufacturer cannot possibly anticipate which model of printer you are going to use. (Sinclair is, of course, the exception which proves the rule.) However, Memotech have been rather more ingenious than the competition and have provided a routine in ROM which facilitates the writing of fast screen dump routines in BASIC:

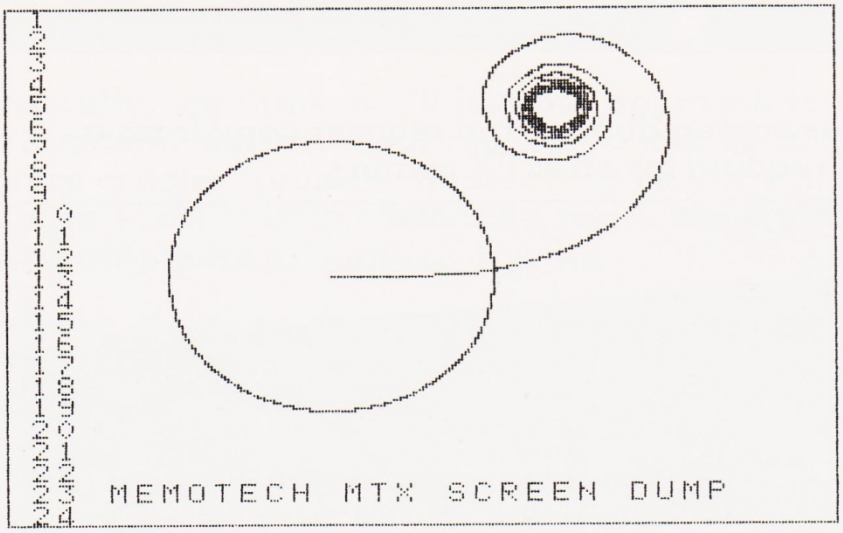
GR$ x,y,b

GR$ is the name of the special MTX function. It looks at the pixel co-ordinates x,y and reads b number of bits from the

```
10 LPRINT CHR$(27);"A";CHR$(8) :REM THE PRINTER IS SET TO AN 8-DOT LINE-FEED
15 FOR Y=191 TO 0 STEP -8       :REM STEP DOWN THE SCREEN IN 8-DOT LEAPS
20 LPRINT CHR$(27);"K";         :REM THE EPSON IS PUT INTO STANDARD HI-RES MODE
25 LPRINT CHR$(0);CHR$(1);      :REM 00;01 IS REALLY 0100H OR 256 BYTES
30 REM NOW SEND 256 BYTES OF HI-RES INFORMATION
35 FOR X=0 TO 255
40 LET A=ASC(GR$(X,Y,8)):LPRINT CHR$(A);:NEXT X
45 LPRINT                       :REM THAT'S THE LINE FEED
50 NEXT Y                       :REM DO ALL THE Y COORDINATES
55 LPRINT                       :REM FINISHING LINEFEED
60 LPRINT CHR$(27);"@"          :REM EPSON'S CODE TO RESET THE PRINTER
65 STOP                         :REM ** ALL DONE **
```

Listing 1. BASIC Screen dump.

Little and Large — the two sizes demonstrated at full size.

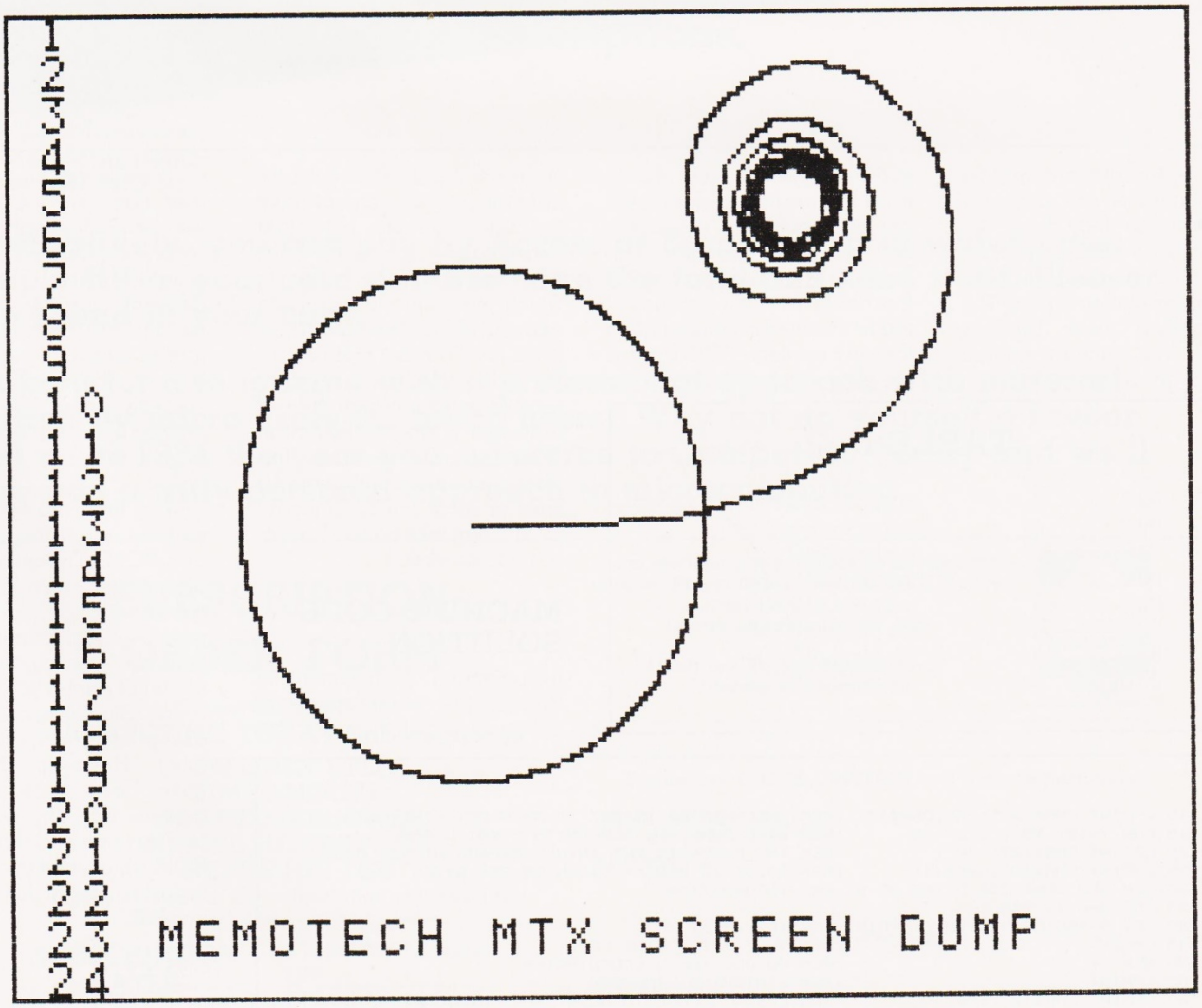


screen, returning bit = 1 for every pixel which is set. The cleverness of GR$ is that it looks at a vertical arrangement of pixels so that the value returned is in precisely the format required by the dot-matrix printer (see Table 1, which uses GR$(0, 191,8) as an example.

For some reason, GR$ doesn't quite behave in the most logical of ways. **LPRINT GR$(x,y,8)** doesn't work, which is a shame, and neither does **LPRINT CHR$(ASC(GR$(x, y,8)))**, which perhaps isn't so surprising. However, **LET A= ASC(GR$(x,y,8)): LPRINT CHR$(A)** *does* work, so Memotech can breath a sigh of relief — they needn't start replacing their ROMs!

THE NEXT TIME

Two simple FOR-NEXT loops can now be set up to pass the



```
30 CLOCK "000000"
34 LPRINT CHR$(27);"A";CHR$(8)
35 FOR Y=191 TO 0 STEP -8
40 LPRINT CHR$(27);"*";CHR$(4);CHR$(0);CHR$(2);
50 FOR X=0 TO 255
60 POKE 64161,ASC(GR$(X,Y,8))
61 CODE

407C          LD A,(64161)
407F          LD D,0
4081          LD B,4
4083 L1:      RLA
4084          PUSH AF
4085          RL D
4087          POP AF
4088          RL D
408A          DJNZ L1
408C          LD A,D
408D          LD (64161),A
4090          RET

Symbols:
L1      4083

62 LET A=PEEK(64161): LPRINT CHR$(A);CHR$(A);: NEXT X
63 LPRINT : LPRINT CHR$(27);"*";CHR$(4);CHR$(0);CHR$(2);
64 FOR X=0 TO 255
65 POKE 64161,ASC(GR$(X,Y,8))
66 CODE

4122          LD A,(64161)
4125          RLA
4126          RLA
4127          RLA
4128          RLA
4129          LD D,0
412B          LD B,4
412D L2:      RLA
412E          PUSH AF
412F          RL D
4131          POP AF
4132          RL D
4134          DJNZ L2
4136          LD A,D
4137          LD (64161),A
413A          RET

Symbols:
L2      412D

67 LET A=PEEK(64161): LPRINT CHR$(A);CHR$(A);: NEXT X
80 LPRINT : NEXT Y
83 LPRINT : LPRINT CHR$(27);"@";CHR$(13);CHR$(27);"F"
90 VS 5: PRINT TIME$: LPRINT TIME$: STOP
200 VS 4: CLS
201 FOR T=1 TO 22
202 PRINT T: NEXT T
203 PRINT " 23 MEMOTECH MTX SCREEN DUMP": PRINT " 24";
210 PLOT 100,92: ANGLE 0
240 FOR I=0 TO 1 STEP .01
250 DRAW 7: PHI I: NEXT I
280 CIRCLE 100,92,50
282 LINE 0,0,0,191: LINE 0,191,255,191
284 LINE 255,191,255,0: LINE 255,0,0,0
290 GOTO 30
```

Listing 2. Listing for the double-size dump.

screen information to the printer. Listing 1 shows the screen dump routine set for the Epson series printers, including the MT-80 if it has the high-res graphics ROMs fitted.

It should be possible to change the control codes to suit other printers. If you have the Seikosha uni-hammer printer, try changing all the 8s to 7s since this particular printer prints 7 pixel rows in hi-res graphics mode. The routine in Listing 1 prints a 108mm by 67mm screen dump in 102 seconds on an Epson RX-80.

The size of printout and the density of dots on the printout can both be altered by changing the hi-res graphics mode. For example, **CHR$(27);"L";** will give you a distorted image 51 mm by 67mm. These screen-dumps are all rather small, so a special routine has been written to produce jumbo-sized printouts of 160mm by 135mm.

The new routine uses software to print a "four-pixel square" on the paper for every pixel on the screen, but the printer's hi-res graphics mode is also different and so the hardware is placing about 8 dots in the "four-pixel square" thus giving a dark, sharp image.

Listing 2 shows the full program, which has a demonstration routine at lines 200 onwards. The program should be started by a GOTO 200. The clue to whether or not your printer will accept the bytes given to it lies in line 40. Here the Epson RX-80 (or FX-80) is told to accept a single line of 00;02 or 0200H (512) bytes. If other makes of printer can do that, the subsequent routines will work.

The large image is produced by expanding the bits (pixels) vertically, which is the task of the two embedded machine code routines, and expanding each byte horizontally, which is done by the **CHR$(A);CHR$(A),** in lines 62 and 67. MTX owners will, I hope, remember to type "ASSEM 61" and not "61 CODE" when they come to line 61 in the listing.

The jumbo print-out, although four times the size of the smaller version, prints faster and takes 303 seconds to complete. The mysterious location 64161 is a NODDY expansion vector which normally holds C9 or C3 hex. The contents of 64161 should really be saved prior to using the screen dump routine, and restored immediately afterwards, or else poor NODDY will crash...

```
2 REM NEWWORD RECOVERY
4 LET R=0: LET A=35083: REM OR 38274
5 LPRINT : LET R=R+1: IF R=20 THEN GOTO 120
20 LET A=A+1: LET V=PEEK(A): IF V=0 THEN GOTO 140
50 IF V=141 OR V=253 OR V=13 THEN GOTO 5
80 IF V>127 THEN LET V=V-128
90 IF V<32 THEN GOTO 20
100 LPRINT CHR$(V);: GOTO 20
120 LPRINT : INPUT "Continue?";I$: LET R=0: GOTO 5
140 LPRINT : PRINT "Text ended": STOP
```

Listing 3. For the recovery of Newword.

NEWWORD RECOVERY

Our second routine concerns Memotech's wordprocessing software for the MTX, Newword, which like all wordprocessors, can sometimes crash due to either computer or human errors. But, unless you have suffered a power supply failure, your words of wisdom are probably still in the MTX dynamic memory: pity you can't get at them... Newword cannot warmstart.

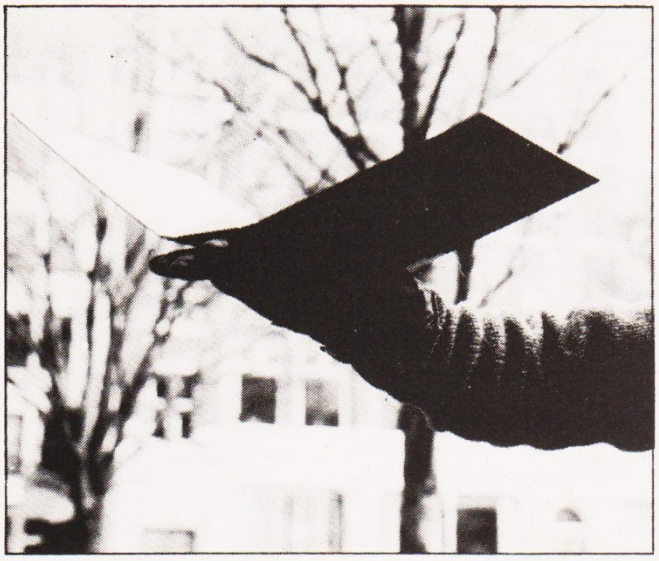
The manner in which your words of wit and wisdom can be lost differs depending upon whether you have the disk or the ROM-based Newword. The trauma is the same in both cases, and can be triggered by one of three separate exercises:

- Accidentally pressing the MTX RESET keys.
- Locking up in BDOS ERROR: BAD SECTOR in disk-Newword.
- Accidentally giving the "Quit without saving" command in ROM-Newword.

At worst, you could lose as much as 4000 characters in a disk-Newword crash and about twice as much in a ROM Newword crash. It really all depends on how conscientious you are about making your back-up copy every quarter of an hour. The short BASIC routine saves the day (more or less). It isn't perfect because it doesn't restore your text into Newword, it merely types out whatever is in RAM memory, but it's certainly better than nothing. However, should you be visited by the Muse in a big way and entirely neglect the SAVE routines, you will not find yourself lost for words if you have this stand-by program.

The recovery is simple. Reset the MTX and use ROM BASIC or disk BASIC to enter or LOAD the recovery routine. The recovery routine is so short that it will not overwrite the Newword document, which is in high memory. **LET A=38274** for the disk version and **LET A=35083** for the ROM-based package.

If you suspect that you have a very early version of MTX Newword, it is worth checking these addresses. This is but a small task, and involves typing "quick brown fox" into a fresh Newword document, then resetting the MTX and using the PANEL to locate "quick brown fox" in memory. The program screens and prints 20 lines of text at a time and will continue to do so until the null end-of-file marker is reached. All types of Newword carriage-return and linefeed codes are processed as simple 0Ds and 0As and all other control codes are ignored. The printed result may not look beautiful, but the words will be there and your innovative formula for a water-driven pollution-free electrically-heated rickshaw will be preserved for posterity.



In days gone by, falconry was the sport of gentlemen and kings — this noble and time-honoured tradition is not so prevalent in these technological times, and it is quite a pity, too. Just imagine the pride you'd feel standing in your own back yard while your very own hunting falcon swooped down upon unsuspecting dogs, cats and Ford Sierras.

For a limited time only, Computing Today is offering you the chance to experience the thrill of commanding your own bird of prey, with the new CT Hunting Falcon/Magazine Binder. Swift of wing, sure of eye and made of genuine vinyl and cardboard, the Computing Today Hunting Falcon/Magazine Binder is the spitting image of the hunting birds of old to anybody suffering from cataracts. Release it from your arm, and it dives just like a traditional hawk. If it lands on a small animal, it will probably stun it. Also, when you tire of the sport, and would rather hunt hedgehogs with your Ford Sierra, your CT Hunting Falcon converts into a useful magazine binder that holds a full year's supply of Computing Today. The new CT Hunting Falcon/Magazine Binder will cost you not a farthing more than the old binder alone used to: just £5.00. This includes postage and packing, so your falcon won't have to tire itself out flying to your abode.

Cut out and send to:

COMPUTING TODAY HUNTING FALCON/MAGAZINE BINDER, INFONET LTD, TIMES HOUSE, 179 THE MARLOWES, HEMEL HEMPSTEAD, HERTS HP1 1BB, ENGLAND

I am enclosing my (delete as necessary) Cheque/Postal Order/International Money Order for £ .....
(made payable to ASP Ltd)
OR
Debit my Access/Barclaycard*
(*delete as necessary)

Insert card no.

Please use BLOCK CAPITALS and include post codes.

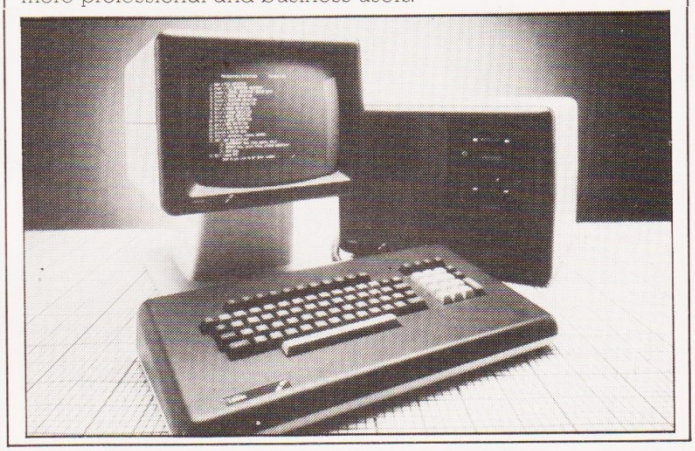
Name (Mr/Mrs/Miss) .....
(delete accordingly)
Address .....
.....
.....
Signature .....
Date .....

LUCAS MICRO

LUCAS LX

CPU	Z80
MEMORY	64K RAM
LANGUAGE	Microsoft BASIC
MASS STORAGE	Cassette at 300 or 1200 baud Single or twin 5¼" floppy disc drives
OS	CP/M 2.2 (supplied) or NAS-DOS
KEYBOARD	QWERTY, cursor, numeric pad, function keys
INTERFACES	RS-232C, Centronics, interface for 5 Mb Winchester, control bus (see below)
DISPLAY	Monochrome monitor supplied, colour optional
GRAPHICS	80 by 25 text, with user-defined block graphics 392 by 256 eight-colour or 784 by 256 two-colour high-resolution graphics
SOUND	No

Notes. The Lucas LX is a computer which is aimed at the more professional and business users.



SHARP MICRO

SHARP MZ-3541

CPU	Z80A (two), 80C49
MEMORY	128K RAM, 8K ROM
LANGUAGE	Sharp BASIC
MASS STORAGE	Twin integral 5¼" floppy disk drives, total capacity 1.28 Mb
KEYBOARD	QWERTY, cursor, numeric pad, function keys
INTERFACES	RS-232C, Centronics, interface for extra external floppy disks
DISPLAY	Monochrome monitor, colour optional
GRAPHICS	80 by 25 text, 640 by 400 high-resolution graphics
SOUND	Single channel

Notes. The Sharp MZ-3541 is aimed at the businessman. RAM is expandable to 256K, while two disk drives may be added externally to complement the integral pair. Colour is only possible with the optional graphics expansion RAM. One Z80 handles the main CPU activities while the other handles peripheral activities. The third processor handles the keyboard. The availability of CP/M means a ready supply of business software.

DEALER

DEVON

PLYMOUTH'S DEALER nascom
S & R BREWSTER LIMITED
86-88 Union Street, Plymouth PL1 3HG
Tel: 0752 665011 Open: 6 days

DORSET

PARKSTONE COMPUTER SYSTEMS
Main Nascom Dealer & Service Centre
Also Dealers for Gemini, Transtec, Genie
18 Station Road, Lower Parkstone, Poole, Dorset BH14 8UB.
Tel: PARKSTONE (0202) 746555

LANCASHIRE

EV COMPUTING
700 Burnage Lane,
Manchester M19.
Tel: 061-431 4866
80-BUS SOLUTIONS

SUFFOLK

M. D. W. ELECTRONICS
47 Woodbridge Rd. East, Ipswich IP4 5QN.
Tel: (0473) 78295
Nascom, Nasbus, Gemini, Multiboard Stockists

WALES

BYTE-RITE
Llandaff R & TV Ltd, 24-26 High St., Llandaff, Cardiff. Tel: 0222 563760
Nascom, Gemini, Lucas Logic, C.A.D. Networks, Dragon, Peripherals

DEALER

CAMBRIDGESHIRE

MS CONSULTANTS (CAMBRIDGE) LTD
Bridgefoot House,
159 High St., Huntingdon
PE18 6TF. Tel: 0480 51721
Specialists in Sharp Hardware & Software

LONDON

SHARPSOFT LTD.
With the Sharp user in mind
Sharp MZ 700 including cassette £199.99
Sharpsoft Ltd. Crisallen House, 86-90 Paul Street, London EC2.
Tel: 01 - 729 5588.

LANCASHIRE

STATION ELECTRICAL
Dept CT, Coastal Road,
West Bank,
Lancs LH26HN. Tel: 0524 824519
Large range of software, books and peripherals for SHARP MZ 700. 2nd hand computers bought, sold and part exchange. Also repairs.
SAE for lists

CBM MICRODEALER

HERTFORDSHIRE

Alpha Business Systems Ltd
Church Street, Industrial Area, Ware, Herts. Tel: 0920 68926
Specialists in recommending and supplying complete systems for small businesses.

LONDON

Da Vinci Computer Store
APRICOT
SIRIUS
COMMODORE
IBM
Approved Dealer
112 Brent Street,
Hendon,
NW4 2DT
Tel: 01-202-2272

MAYFAIR MICROS
for a full range of Commodore equipment at very competitive prices. Blenheim House, Podmore Road, London SW18 1AJ.
01-629-2487

STAFFS

COMPUTER CABIN
The store with everything for the enthusiast. Official Commodore Dealer and service and information centre.
24 The Parade, Silverdale, Newcastle, Staffs. Tel: 0782 636911.

TYNE & WEAR

KEY COMPUTER SERVICES LIMITED
Micro Computer solutions to everyday business problems.
Osborne House, 28 Osborne Road, Newcastle upon Tyne NE2 2AJ.
Telephone: (0632) 815157
Directors: J. Sowerby, V. Shepernson.

WALES

SIGMA SYSTEMS LTD
266 North Road, CARDIFF
Tel: 621414
Also authorised dealer for CBM Digital, IBM, ACT, Sirius & Apricot

WEST MIDLANDS

MICRO BUSINESS CENTRE LTD
Wolverhampton Computer Centre, 17-19 Lichfield Street, Wolverhampton, West Midlands WV1 1EA. Tel: (0902) 29907 or 29021
Complete range of Commodore products always available.

YORKSHIRE

YORKSHIRE ELECTRONICS
Commodore Appointed Commerical Systems Dealer
Full range of peripherals and Software available
Caxton House, 17 Fountain St., Morley, West Yorkshire.
Tel: 0532 522181

COMMODORE 715B

CPU	6509
MEMORY	56K RAM, 20K ROM
LANGUAGE	Commodore BASIC
MASS STORAGE	No cassette Single or dual 5¼" floppy disk drives
OS	Commodore's DOS
KEYBOARD	QWERTY, cursor, numeric pad, function keys
INTERFACES	RS-232C, IEEE 488, memory bus, eight-bit parallel, cassette port, second processor bus
DISPLAY	Monochrome monitor supplied
GRAPHICS	80 by 25 text, block graphics
SOUND	Three channels

Notes. The Commodore 715B is the top model in the 700 range of business machines. Although built round the 6509 processor, there is a second processor option (8088). The machine has been designed to meet IEC specifications. The black-and-white monitor screen is integral and features tilt and swivel. The keyboard may be detached.

COMMODORE 64

CPU	6510
MEMORY	64K RAM, 26K ROM
LANGUAGE	Commodore BASIC
MASS STORAGE	Cassette unit at 300 baud 5¼" floppy discs available
OS	Commodore's own
KEYBOARD	QWERTY, cursor, function keys
INTERFACES	IEEE 488 bus, cartridge port, cassette port, two joystick/light pen ports
DISPLAY	TV output
GRAPHICS	40 by 25 text, block graphics (user-definable) 320 by 200 high resolution graphics in 16 colours
SOUND	Three channels

Notes. The Commodore 64 is a popular micro with a great deal of games software available. There is also some business software, such as spreadsheets and word processors, available but this suffers from the lack of an 80-column screen. Graphics and sound have extensive capabilities, for example eight multicolour sprites and three channels of sound covering nine octaves each.

ACT

xi APRICOT

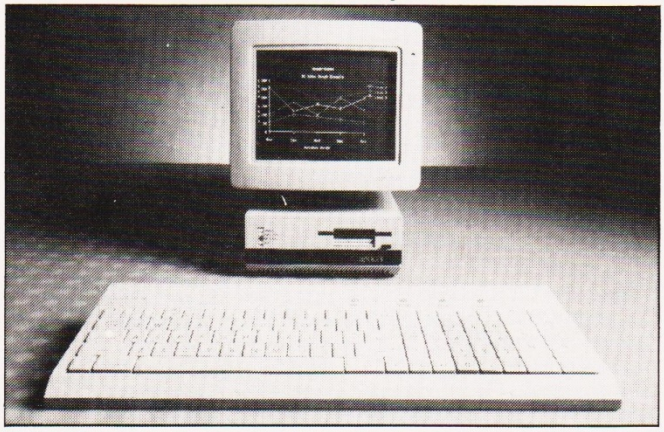
CPU	8086
MEMORY	256K RAM
LANGUAGES	Microsoft BASIC, Personal BASIC
MASS STORAGE	No cassette drive Integral Sony 3½" 315K microfloppy disk drive Integral 5 or 10 Mb hard disk
OS	MS-DOS 2.11 with GSX bundled CP/M-86 (not yet available) Concurrent CP/M-86 (not yet available)
KEYBOARD	QWERTY, cursor, numeric pad, function keys
INTERFACES	RS-232C, Centronics, Microsoft mouse
DISPLAY	Monitor (supplied)
GRAPHICS	80 by 24 text with block graphics 800 by 400 high-res graphics under GSX
SOUND	No

Notes. The Apricot xi is a development of the award-winning Apricot, and replaces one of the latter's disk drives with an integral hard disk, providing vastly increased storage with faster access. Memory may be expanded in 128K increments to a maximum of 768K. The languages and operating systems mentioned above come bundled (except for Concurrent CP/M) and four software tools are also bundled, including an asynchronous package for use with the optional modem card.

APRICOT F1

CPU	8086
MEMORY	256K RAM
LANGUAGES	MS-DOS, Concurrent DOS (Optional)
MASS STORAGE	No cassette drive One integral 3½" 720K Sony microfloppy disk drive
OS	MS-DOS 2.11, Concurrent DOS (optional)
KEYBOARD	QWERTY, cursor, numeric pad
INTERFACES	Infra-red link for keyboard or mouse, expansion slot, RS-232C, Centronics
DISPLAY	TV or optional monitor
GRAPHICS	80 by 24 text 640 by 256 four-colour, 320 by 256 16-colour maximum high resolution
SOUND	No

Notes. The Apricot F1 is designed as a low-cost entry-level machine for small businesses (a cheaper cut-down version, the F1e, is for schools and colleges). It includes several bundled applications including SuperCalc, SuperWriter and SuperPlanner. An optional five-slot expansion bus may be added: also a 10 Mb Winchester unit. There is an optional infra-red mouse/trackball. RAM is expandable to 768K.



MICRODEALER

CAMBRIDGESHIRE

MS Consultants (Cambridge) Ltd
Bridgefoot House, 159 High St., Huntingdon PE18 6TF.
Tel: 0480 51721
Specialists in ACT hard & software

HAMPSHIRE

TIMATIC SYSTEMS LTD
The Market, Fareham.
Tel: (0329) 239953
For the complete range of Apricot hardware and software. Also dealers for Zenith, Memotech. For future information call or ring anytime.

KENT

BROMLEY BUSINESS COMPUTERS
Tower House, College Road, Bromley, Kent BR1 3NJ.
Tel: Bromley 6226

LONDON

POSEIDON COMPUTER SERVICES LTD.
of Hampton
S.W. London dealer for Sirius I
Demonstations by appointment. Most types of printers supplied.
Bespoke Software a speciality
Competitive prices. Full UK delivery
Tel: 01-941 1147/5986 Telex: 8954665

PROGRAMS UNLIMITED COMPUTER CENTERS
35 Baker Street, London W.1.

PROGRAMS UNLIMITED COMPUTER CENTERS
15-19 Kingsway, London WC2.

MANCHESTER

PROGRAMS UNLIMITED COMPUTER CENTERS
81 Washway Road, Sale, Manchester M33 1TQ.

FOR DETAILS ON MICRO DEALER FEATURES RING 01 - 437 0699

MIDDLESEX

SIRIUS AND APRICOT IN STAINES
Micronomy Ltd., Unit 18, Central Trading Estate, Staines, Middlesex TW18 4XE.
TEL: STAINES 63651

SCOTLAND

SIRIUS
is alive and well and supported at
ROBOX
(Office Equipment) Ltd,
The Scottish Computer Centre
Anderson Centre, Glasgow
041-221 8413/4
34 Queen Street, Edinburgh
031-225 3871

PROGRAMS UNLIMITED COMPUTER CENTERS
17 Queen Street, Edinburgh EH2 1JX.

SURREY

PROGRAMS UNLIMITED COMPUTER CENTERS
60 George Street, Croydon, Surrey CR10 1PD.

SUSSEX

CROWN BUSINESS CENTRE LTD for ACT
55-58 South Street Ltd., Eastbourne, Sussex BN21 4U2
Tel: 0323 639983

WALES

SIGMA SYSTEMS LTD
266 North Road, Cardiff
Tel: 0222 621414
Main dealer and Service for ACT, SIRIUS, APRICOT, IBM, COMMODORE & DIGITAL

WEST MIDLANDS

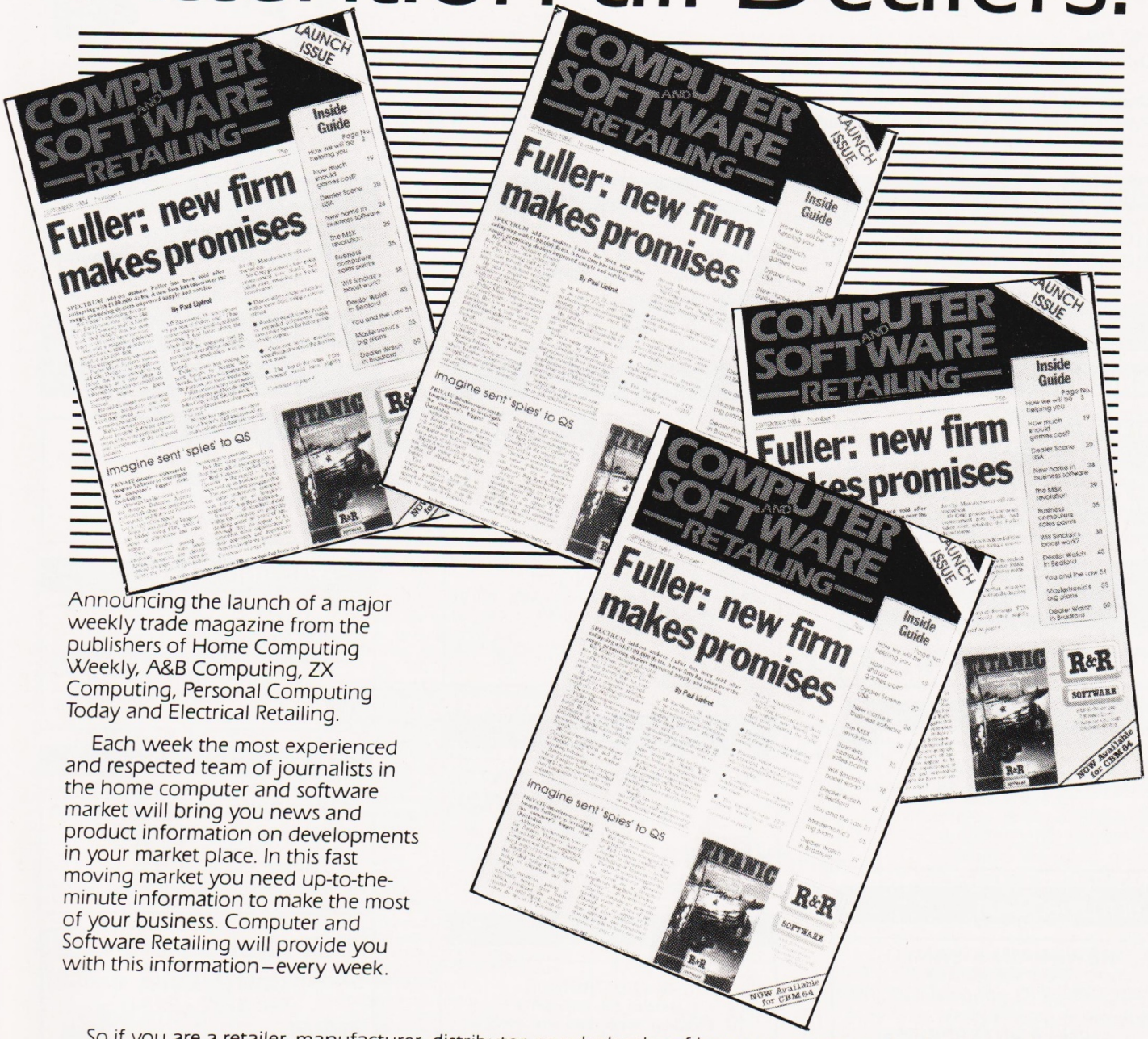
Q data limited
The Black Country's specialist in microcomputing. Full range of ACT Apricots and IBM personal computers.
The Limes, High Holborn, Sedgley, West Midlands.
Tel: Sedgley (09073) 62331

YORKSHIRE

PROGRAMS UNLIMITED COMPUTER CENTERS
26 Fosgate, York YO1 2TA.

Attention all Dealers!

Attention all Dealers!
Attention all Dealers!
Attention all Dealers!



Announcing the launch of a major weekly trade magazine from the publishers of Home Computing Weekly, A&B Computing, ZX Computing, Personal Computing Today and Electrical Retailing.

Each week the most experienced and respected team of journalists in the home computer and software market will bring you news and product information on developments in your market place. In this fast moving market you need up-to-the-minute information to make the most of your business. Computer and Software Retailing will provide you with this information–every week.

So if you are a retailer, manufacturer, distributor, or wholesaler of home computers and software and business micros and software, reserve your regular free copy of Computer and Software Retailing *now.*

Reader applications should be addressed to:

Paul D'Inverno,
Computer and Software Retailing,
Argus Specialist Publications Ltd.,
London W1R 3AB

Advertisers who wish to take advantage of the complete high street and distributor coverage offered by Computer and Software Retailing should contact John Sorrenti on **(01) 437 0626**.

COMPUTAMART

AT A GLANCE...AT A GLANCE...AT A GLANCE...AT A GLANCE...AT A GLANCE...AT A GLANCE...

Please include my business details in the next available issue of Computing Today:

Business Name: .....

Address: .....

.....

.....

Tel. No.: .....

Open Hrs: .....

Contact (Office Use Only): .....

Post To: Computamart, Computing Today, 1 Golden Square, London W1.

ONLY £17.50!

BERKSHIRE

Micro General — PRINTER SPECIALISTS
Call for advice on printer selection
Epson & Microline stockists. Interfaces & cables available for all popular micros.
6 THE BIRCHWOODS, TILEHURST, READING.
TEL: 0734 25226

CHESHIRE

northern computers
Churchfield Rd., Frodsham.
Tel: (0928) 35110
Open: 6 days 9-6. Retail and Wholesale. Apple II & III. Atom. BBC. VIC20/64. Newbrain. Dragon 32. Electron. Spectrum. All accessories. Easy parking off M56.

Computer Junk Shop
We Buy, Sell, Break Computers & Peripherals.
10 Waterloo Rd. Widnes. Halton. Tel: 051 420 4590

CORNWALL/DEVON

A. B. & C. COMPUTERS (CT)
Duchy House, 6 Lower Aylmer Sq., St. Austell.
Tel: 0726 64463/67337
Wide range of popular Micros, Printers, books and accessories. We stock all U need — try us first for service and competitive prices

HERTFORDSHIRE

NEWBRAIN & SANYO
HARDWARE & SOFTWARE
Printers. Epson, KDC, Juki etc. Monitors, Tape Recorders, Books, Expansions, CP/M. **Sanyo 550/555 Computers.** Access/Mail Order. Ask for details.
ANGELA ENTERPRISES
Tel: Stevenage (0438) 812439 anytime

LANCASHIRE

LANCASHIRE MICROS
51 QUEEN STREET, MORECAMBE.
Tel: 411435. Also open Sundays.
Sinclair, Commodore, Acorn/BBC + Dragon. Authorised dealer for Bug-Byte, Imagine, Quicksilva, Artic, Melbourne House, Silversoft etc.

LINCOLNSHIRE

SHARP CENTRE
16 Melville Street, Lincoln.
Tel: Lincoln 32379.
Open: 9am-5.30pm closed Wed.

LONDON

A. J. Duchesne
(Computer Consultants) Limited
Specialists in Small Business Computing
10-12 Creechurch Lane, London EC3A 5AY
Telephone: 01-621 0433

COMPUTING +
264 Earls Court Road, London SW5. Tel: 01 373 4508 or **01 373 5000 Ext 240.** Suppliers of mini and micro computers for home and office use, together with supporting software. Leading manufacturers' products supplied.
Come and see the Mackintosh.

SOUTH LONDON

CROYDON COMPUTER CENTRE
Authorised Acorn Service Centre
29a Brigstock Rd., Thornton Heath, Surrey. Tel: 01 - 689 1280
BBC, Acorn, Electron, Genie, Oric, Kaga, Microvitek, Zenith, Monitors, OKI 80, 82A + 84 Printers, Paper, Ribbons, Software etc. BUY-HIRE.

MIDDLESEX

L.B. ELECTRONICS
11 Hercies Rd, Hillingdon.
Tel: Uxbridge 55399 (24hr ans. service)
Open: 6 days, 9.30am-6pm, (lunch 1-2.15 except Sat)
Surplus equipment, memory, EPROMs etc. Also established mail order service.

SCREENS MICROCOMPUTERS
6 Main Avenue, Moor Park, Northwood, Middlesex
Tel: Northwood (09274) 20664

Official Dealers for: Acorn, Atari, Commodore, Dragon, Memotech, Oric, Sinclair, Sirius, Apricot.

SCOTLAND

VICTOR MORRIS GLASGOW
TANDY TRS 80, VIC 20, VIDEO GENIE, APPLE PANASONIC, CUMANA, EPSOM ETC.
340 Argyle Street, Glasgow G2: 041 221 8958

SUSSEX

GAMER
24 Gloucester Road, Brighton.
Tel: 0273-698424.
Open: Mon-Fri 10am-5.30pm, Sat 9am-5.30pm.

TYNE AND WEAR

HCCS ASSOCIATES
533 Durham Rd., Low Fell, Gateshead. Tel. Newcastle 821924.
Open: 6 days 9am-5.30pm (Sat 10am-5.30pm). Specialists in: Acorn, BBC, Video Genie, VIC 20.

WALES

STEVE'S COMPUTER COMPANY LTD
CASTLE ARCADE, CARDIFF
Tel: 0222 — 371578
OPEN: Mon — Sat. 9 — 5.30
FOR COMPONENTS TO COMPUTERS

SIR Computers Ltd.
91 Whitchurch Road, Cardiff.
Tel: 0222 - 21341
BBC ACORN COMPUTER

NORFOLK

ANGLIA COMPUTER CENTRE
88 St Benedicts Street, Norwich.
Tel: (0603) 29652/26002.
Open: 6 days 9am-5.30pm.

COMPUTING TODAY

Lineage: 40p per word.

Semi display: £9.00 per single column centimetre
Ring for information on series bookings/discounts.

All advertisements in this section must be prepaid.
Advertisements are accepted subject to the terms and conditions printed on the advertisement rate card (available on request).

01-437 0699

Send your requirements to:
IAN ATKINSON
ASP LTD, 1 GOLDEN SQUARE,
LONDON W1

SOFTWARE APPLICATIONS

HARDWARE

NEWBRAIN & SANYO

Professional Micro Computers for the price of hobby machines.

NEWBRAIN ON SPECIAL OFFER
With over £200.00 free software. (Accounts, databases, etc, etc)
Limited Offer-ring now!

SANYO 550/555 COMPUTERS
Micropro Wordstar, Calcstar etc at no extra cost! **Printers:** Epson, KDC, Juki, Shinwa, Daisystep 2000 etc. **Sanyo Monitors & Recorders.**

Call STEVENAGE (0438) 812439 anytime for hardware/software lists.

Mail Order and **Access** facilities.

ANGELA ENTERPRISES
4 Ninnings Lane, Rabley Heath, Welwyn, Herts AL6 9TD.

UNAVAILABLE Components? If we can't get them nobody can. Quote without obligation or charge. Quote or order period approx. 2 weeks. No order is too small. Rickman, South Ronaldsay, Orkney KN17 2TW. Phone: 085683 430.

Buying and selling in the Classified Columns of Computing Today brings the best results.

For further details ring 01 - 437 0699

COMPONENTS

68000 SYSTEM KITS

A range of high quality, double sided, 8 by 8 PCB's which form the core of a 68000 system.

CPU contains 68000 L8 micro with a mHz crystal clock, dynamic refresh sequencer, bus buffering etc. PCB £80. Component set £110.

B10 provides 8/16 K Eprom, Ram, 20 I/O lines, RS232 interface, counter-timer, interrupt handling etc. PCB £80. Component set £98.

RAM 256K dynamic. Page/address selectable. PCB £85. Component set £245.

A boot loader/monitor is available in EPROMS at £30.

Add VAT to above prices. Delivery 14 to 28 days.

P. L. Watson, 101 Village Road, Bromham, Bedford MK43 8HU.
Tel: 02302 2867

UTILITIES

QL UTILITIES

4 Programs on Microdrive for Sinclair QL to prevent Directory overflowing the screen provide single key loading or DELETION of files, repeat FORMATING of cartridges and back-up copying of whole or part of the cartridge. **£10** from:

W.D. SOFTWARE,
Hill Top, St. Mary, Jersey, C.I.
Tel: 0334 81392

ACCESSORIES

BLANK CASSETTES

Guaranteed top quality computer/audio cassettes at great budget prices.
Packed in boxes of 10 with labels, inlay cards and library case.
Prices include VAT, post and packing.

☐ (C5) **£4.35** ☐ (C10) **£4.40**
☐ (C12) **£4.45** ☐ (C15) **£4.50**
☐ (C30) **£4.70** ☐ (C60) **£5.30**
☐ (C90) **£7.00**

BASF FLOPPY DISCS
Prices of boxes of 10
☐ 5¼ Single side/Single density **£19.55**
☐ 5¼ Double side/Double density **£21.85**
☐ 5¼ Double side/Quad density **£28.75**

DISC DRIVES
Include Manual, Leads, Utilities Disc
☐ TEAC 55A 40 tracks – £139 each
☐ TEAC 55F 40/80 switchable D.S. – £209 each **Free delivery UK only**
Indicate quantity of each product required in boxes
Cheque/P.O. enclosed for £ _____
NAME .....
ADDRESS .....
.....

PROFESSIONAL MAGNETICS LTD
Cassette House, 329 Hunslet Road, Leeds LS10 3YY
FREEPOST Tel. (0532) 706066 **CT**

AUCTIONS

MICRO COMPUTER AUCTIONS

Regular monthly auctions for all micro hard & software.

Send for entry form or next catalogue to:

MICRO COMPUTER AUCTIONS (CT),
59 Grays Inn Road, London WC1X 8TL

Tel: 01-242 0012 (24 hours)

SOFTWARE

COMPUTER SOFTWARE BUSINESS AND GAMES FOR MOST COMPUTERS
Commodore 64, VIC 20, BBC, Atari, Dragon, Spectrum MZ700, ZX81.

New releases for CBM 64, Spectrum, BBC, Atari, Dragon, Spectrum, MZ700, ZX81.

New releases for CBM 64, Spectrum, BBC. Every 2 weeks — just send SAE and we send you a new list every 2 weeks.

Altai C10 data cassettes 40p each. 5 C15 data cassettes £2.40 5¼" floppy discs D/sided — DL density. £2.30 each or 5 for £10.

Send to: **M. J. Seaward, St. Olaf's Road, Stratton, Nr. Bude, Cornwall EX23 9AF**
Tel: (0288) 4179

S/W GAMES

ASTRA

SOFTWARE FOR ZX SPECTRUM

Strategy, simulation, scientific e.g.

DESERTWAR **£4.25**
MARKOFF **£3.95**

SAE FOR LIST

34 Clairville Gardens, London W7 3HZ.

COMPUTER SOFTWARE for your: Commodore 64/Spectrum/BBC Micro/Vic 20/ Acorn Electron/ZX81. Quality games from leading software companies. For details send SAE to: Lister Software Suppliers, 15 Hamilton Gardens, Leeds LS7 4AZ or Tel: Leeds 869493 (after 6pm).

ALARMS

BURGLAR ALARM equipment. Please visit our 2,000 sq. ft. showrooms or write or phone for your free catalogue. C.W.A.S. Ltd., 100 Rooley Avenue, Bradford BD6 1DR. Telephone: 0274 731532.

HARDWARE AND SOFTWARE

COMPUTING +

The Apple only store
143 Earls Court Rd, London SW5.
Tel: 01-373 5000 Ext 240

Suppliers of mini and micro computers for home and office use, together with supporting software. Leading manufacturers' products supplied.

Just in from APPLE the MACKINTOSH and 2C bringing Hi-TECHNOLOGY to your fingers.

BOOKS AND PUBLICATIONS

PARAPHYSICS Journal (Russian Translations); Psychotronics, Kirlianography, Heliphonic Music, Telekinetics, Computer Software. SAE 4 x 9". Paralab, Downton, Wiltshire.

FOR SALE

SHARP NZ 700 64K. Good condition. Only 2 months old. £150 with software and manuals and leads. Tel: 01-263 0265.

TELETYPES ASR33 £30 each, collected or £150 all six. Gilinsky, 15 Thornhill Park, Sunderland. 0783 44770.

FOR SALE Nascon 2 cased 48K Ram B AVC Model B extended basic Kaga RGB Vision-I Monitor £600. Redditch (0527) 67234 evenings.

N.C.R. 8130 COMPUTER, 4 x 8" disc drives, V.D.U., Matrix Printer 64KB C.P.U., Payroll, Sales Ledger, Stock Control, £1000?. Melton Mowbray 822332.

SERVICES

DRAGON 32 variable dump and listing of your BASIC software from cassette or DRAGONDOS DISK. For fast service send back-up media, SAE and £1.25 per program to: Mr. M. A. Seymour, 13 Meller Close, Beddington, Surrey CR40 4UB.

LIBRARIES

LOOK! Any program for any micro at 20% discount. Also the only tape exchange club specialising in today's TOP 20. (Spectrum, Commodore). Membership free. Write, stating micro to: Ham Software Library (CT), Ham Lane, Elstead, Surrey GU8 6HQ. We've got the lot.

CLASSIFIED ADVERTISEMENT — ORDER FORM

1.	2.	3.
4.	5.	6.
7.	8.	9.
10.	11.	12.
13.	14.	15.

When placing your ad, please state classification required 40p per word.
Send to: ASP Classified, 1 Golden Square, London W.1. Tel: 01 - 437 0699.

Name .....

Address .....

.....

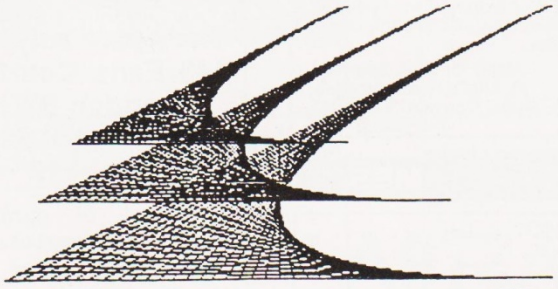
.....

Tel. No. (Day) .....

Please place my advert in **COMPUTING TODAY** for ..... issues commencing as soon as possible.

GÖRLITZ COMPUTERBAU

MUCH MORE ON YOUR SIXTY-FOUR



Print your heart out using EPSON printers and GÖRLITZ interfaces – over 10.000 sold in West Germany. Definitively THE BEST connection between VIC-64 and EPSON printers is our VIC-EPSON-INTERFACE:

Plugs right into any EPSON (board 8422) * 2K Buffer (8K option) * Z80 processor * lots of additional control functions * brings you the original CBM character set with all graphics in up to 40 sizes * including double height and double width printing of CBM characters * precise HARDCOPY from SIMON's BASIC * BUS connector doubled like 1541 * DIL-switch for device address * printer remains unchanged * Interface can be switched off if Centronics port is used * No. 8423 for external use with EPSON-compatible printers like STAR etc. * Prices include DIN cable (im) and manual.

VIC-EPSON Interface type 8422 (board) ..... £ 78.50
VIC-Centronics-Interface type 8423 (external) ..... £ 79.50

prices do not include VAT. This is just one GÖRLITZ product. We are looking for dealers in UK. Our Phone: (01049)-261-27500. Mailbox for letters, queries and orders starting October: (01049)-261-2044.

GÖRLITZ COMPUTERBAU * P.O.BOX 852 * D-5400 KOBLENZ, WEST GERMANY

AD INDEX

Acorn 70, 71
Akhter Instruments 54, 55
Anirog ..... IFC
Bicc Vero 11
Brother Industries ..... OBC
Computer Book Club 65
Commodore 6, 7
Dionics 13
Level 9 Computing 20
London Electronics College 11
Microvitec 72
Molimerx 33
Silica Shop ..... IBC
Swanley Electronics 13

1 800XL 64K COMPUTER £169

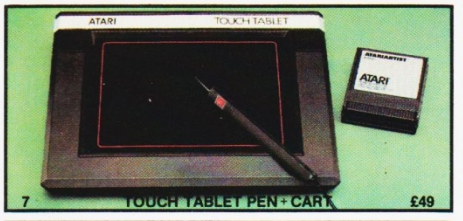
2 800 48K COMPUTER £69

3 1010 PROGRAM RECORDER £34

4 1050 127K DISK DRIVE £199

5 1020 4 COLOUR PRINTER £99

6 LETTER QUALITY PRINTER £249



7 TOUCH TABLET PEN+CART £49

8 TRAK BALL £19.95

9 SUPER CONTROLLER £14.95

ATARI XL

THE NEW ATARI 64K 800XL £169

EVERYTHING YOU WANT FROM A HOME COMPUTER

1. **ATARI 64K 800XL - £169:** The Atari 800XL has many facilities and includes such advanced specifications that you will be amazed by its performance. At the new retail price of only £169 for a full specification 64K computer with a proper full stroke keyboard, we believe that the 800XL cannot be beaten. Just look at the following specifications:-
   COLOUR CAPABILITIES: 16 colours and 16 intensities giving 256 different colours (all of the 256 colours can be displayed at the same time).
   OPERATING SYSTEM: 24K ROM including Atari Basic programming language and a self diagnostic test program.
   KEYBOARD: Full stroke design with 62 keys including help key and 4 special function keys, international character set and 29 graphics keys.
   SOUND: 4 independent sound synthesisers each capable of producing music across a 3½ octave range or a wide variety of special sound effects. (Additional programming can achieve an octave range of up to nine octaves!)
   DISPLAY: 11 graphic modes and 5 text modes. Up to 320×192 resolution. Maximum text display 24 lines by 40 columns.
   SPECIAL ATARI INTEGRATED CIRCUITS: GTIA for graphics display. Pokey for sound and controller ports. Antic for screen control and I/0 (Input/Output).
   CPU: 6502C microprocessor - 0.50 microsecond cycle and a clock speed of 1.79 MHz.
   EXTENDED GRAPHICS FUNCTIONS: High resolution graphics. Multi-coloured character set. Software screen switching. Multiple redifined character sets. Player missile (sprite) graphics. Fine screen scrolling. Changeable colour registers. Smooth character movement. Simple colour animation facilities.
   PROGRAMMING FEATURES: Built in Atari Basic programming language supporting peek, poke and USR plus at least 8 other languages available. The help key will provide additional information and menu screens with certain software. Full on-screen editing is available as well as syntax checking on entry.
   INPUT/OUTPUT: External processor bus for expansion with memory and peripherals. Composite video monitor output. Peripheral port for direct connection to Atari standard peripherals. Software cartridge slot is included as well as 2 joystick controller ports.
   SOFTWARE: Over 1,500 items of software are available including self teaching programs with unique voice over. The range of programs includes Education, Home Management & Programming aids. There is also APX (Atari Program Exchange) and of course Atari's famous entertainment software now at only £9.95. In addition there is a host of support and help available from specialist Atari magazines like Antic and Analog and from over 75 Atari books/manuals.
2. **ATARI 800 48K COMPUTER - £69:** We have a limited number of the Mk1 model 800 computer with 48K. The price is £69 (as a games machine) or £99 with the Basic Programmer Kit (Basic cartridge & 2 manuals). Both come with a full 12 months guarantee.
3. **ATARI 1010 PROGRAM RECORDER - £34:** For low cost storage and retrieval capability. Data transmission 600 baud. Storage capability 100K bytes on a sixty minute cassette. Track configuration four track, two channels (digital and audio). Auto record/playback/pause control/unique soundthrough facility. Also included is built in accidental erasure prevention and automatic shutoff after each program as well as a 3 digit tape counter.
4. **ATARI 1050 DUAL DENSITY DISK DRIVE - £199:** 5¼" disks holding 127K randomly accessible bytes provide both expansion and flexibility for your 400/800 or XL system with new 'helpful' DOS 3. All customers who purchase a Disk Drive from Silica Shop will be automatically given a FREE set of 100 programs on 3 Disks recorded on both sides.
5. **ATARI 1020 COLOUR PRINTER - £99:** Printer and Plotter with four colour graphic print capability. 40 column width printing at 10 characters per second. Can print 5, 10 and 20 characters per inch. 64 character sizes. Prints text in 4 directions. Choice of line types.
6. **ATARI 1027 LETTER QUALITY PRINTER - £249:** For word processing letters in professional type. Print speed of 20 chars per second.
7. **ATARI TOUCH TABLET - £49:** Enables you to draw and paint pictures on your T.V. screen, with the touch of a stylus.
8. **ATARI TRAK BALL CONTROLLER - £19.95:** Enables cursor movement in any direction and adds arcade realism to your games.
9. **ATARI SUPER CONTROLLER - £9.95:** The ultimate joystick with double fire button to give you a greater competitive edge in your games.

SILICA SHOP ARE THE No1 ATARI SPECIALIST

Silica Shop are now firmly established as the No 1 Atari retail/mail order and wholesale specialist in the U.K. We already offer our service to over 120,000 customers, 10,000 of whom have purchased Atari Home Computers. Because we specialise (and with a turnover of £1.5 million), we are able to keep prices low by bulk purchases. Ring one of our 45 staff and we will be glad to be of service to you. Complete the coupon below and we will send you our Atari pack with price list and colour catalogue:

EXTENDED TWO YEAR GUARANTEE: We are an Atari Service Centre, able to service and repair Atari equipment and have added a 12 month guarantee to the year offered by Atari, giving you a full 2 year guarantee on your computer if you buy it from us.

SPECIALIST SUPPORT: Our technical staff are always available on the telephone to help and advise you. We endeavour to hold stocks of every Atari compatible item available in the U.K. and we stock over 75 Atari books and manuals.

AFTER SALES SERVICE: Your name will automatically be added to our mailing list and you will receive price lists, newsletters and details of new releases and developments as well as special offers which are exclusive to Silica Atari Computer Owners.

LOW PRICES: Our prices are extremely competitive and we will normally match any lower price offered by our competitors.

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

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

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

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

SILICA SHOP LTD, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX Tel: 01-309 1111

ORDER NOW-OR SEND FOR A FREE COLOUR BROCHURE

To: SILICA SHOP LTD, Dept CT 1184, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX Telephone: 01-309 1111

LITERATURE REQUEST:

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

☐ I own a ..... Videogame ☐ I own a ..... Computer

Mr/Mrs/Ms: ..... Initials: ..... Surname .....

Address: .....

.....

..... Postcode: .....

ORDER REQUEST:

Please send me:

☐ 800XL 64K Computer	£169	☐ 1020 4 Colour Printer	£99
☐ 800 48K Computer	£99	☐ Letter Quality Printer	£249
☐ 1010 Program Recorder	£34	☐ Touch Tablet + Cartridge	£49
☐ 1050 127K Disk Drive	£199	☐ Trak Ball	£19.95
		☐ Super Controller	£9.95

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

☐ CREDIT CARD - Please debit my Access/Barclaycard/Visa/American Express/Diners Club

Card Number .....

Choosing a printer is a lot easier than choosing a computer.

THERE are dozens of quality printers from which to choose. With quality price tags of around £250.

The Brother M-1009, however, breaks all the rules.

Stays defiantly below the £200 barrier.

Though it has far more than its fair share of features, it maintains the extraordinarily low price of £199.95.

Travels at a steady fifty.

In the speed stakes, the M-1009 is certainly no slouch, being fully capable of up to 50 characters per second.

Providing bi-directional and logic seeking printing for normal characters and uni-directional printing for super and sub script and graphics.

Prints on any paper.

Being an impact printer, the M-1009 will print on virtually any paper, including letter headings, invoices and standard office stationery.

It will even print two copies together with your original.

A superb character recommendation.

In its price range, the M-1009 has a great deal more character than many printers.

96 no less, plus international type and graphic characters.

Reliability comes as standard.

Built to the same exacting standards as Brother's elite office printers, the Brother M-1009 already has faultless credentials for reliability.

Its 9 x 9 dot matrix head, for example, has an astonishing 20 million character service life.

One printer that doesn't block out the light.

Many home computers tend to be a little on the large side.

In contrast, the compact M-1009, at only 7 cm high, keeps a discreet profile.

Well designed, reliable – and conscientious.

The Brother M-1009.

brother®

The future at your fingertips.

DEPT P, BROTHER OFFICE EQUIPMENT DIVISION, JONES + BROTHER, SHEPLEY STREET, GUIDE BRIDGE, AUDENSHAW, MANCHESTER M34 5JD.
TEL: 061-330 6531 (10 LINES) 061-330 0111 (6 LINES) 061-330 3036 (4 LINES) TELEX: 669092
BROTHER INDUSTRIES LIMITED, NAGOYA, JAPAN.