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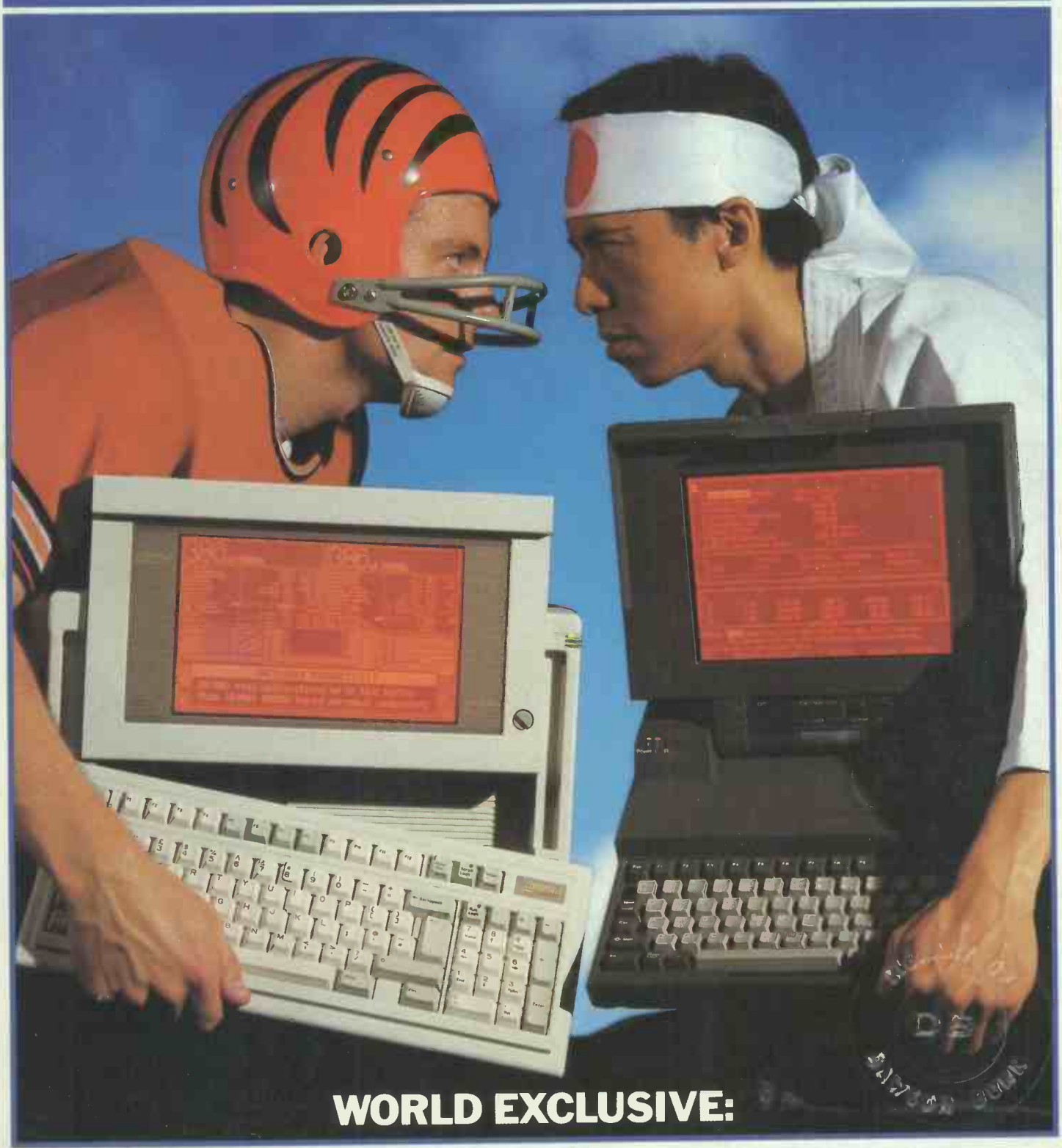

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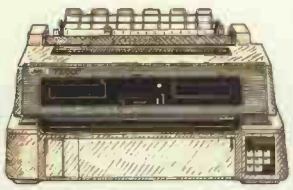

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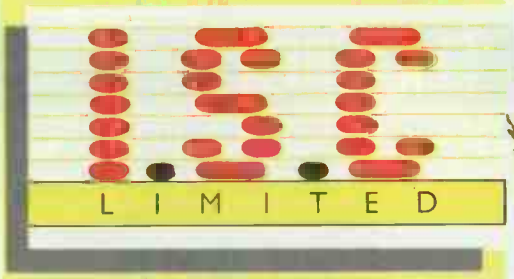

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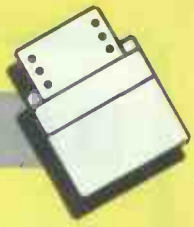

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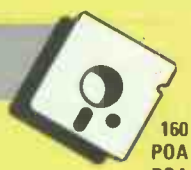

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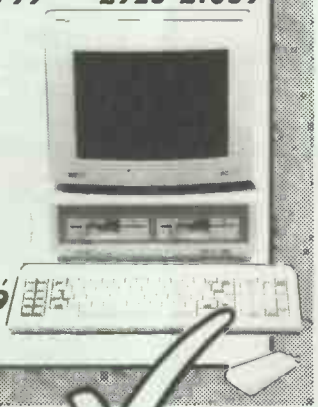

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COMPUTER ADD-ONS

128K Upgrade PC TO 640K	£19.50
Maths Co-Processor 8087-2	£135.00
NEV 30 – Replacement 8086	£28.00
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Word Perfect V4.2	£249.00
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Logistix	£67.00
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TOSHIBA

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Phillips Green Monitor with Hercules Card	£210.00
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And wait. (You could have made a cuppa by the time it flashes up.)

At Dackombe and Company we believe you shouldn't have to do any waiting at all. Ever. That's why we've integrated DSC into all of our top-of-the-line computers.

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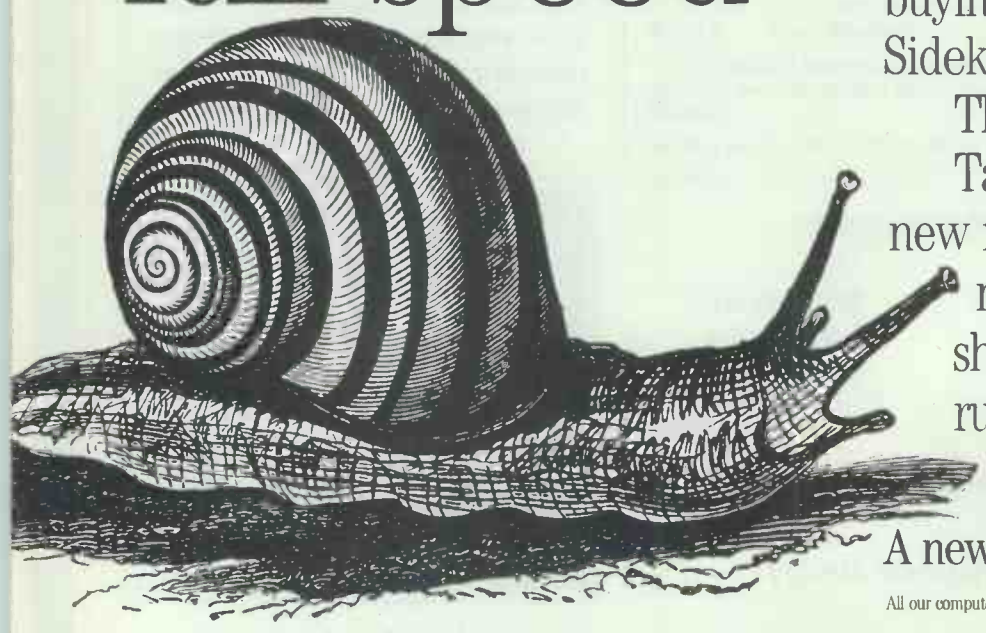

DSC technology offers the same automatic speed switching while the computer is running.

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LISTED BELOW IS JUST A SELECTION FROM OUR WIDE RANGE OF PRODUCTS — AVAILABLE IN A WIDE RANGE OF FORMATS — PLEASE CONTACT US WITH YOUR REQUIREMENTS

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Samna Word IV	£395
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dBase-III Plus V1.1 (unprot.)	£395
Clipper (new version)	£369
Foxbase Plus	£369
Geniffer V1.01 app. gen.	£229
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Q & A V2 (inc. spell. chk.)	£225
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SPARK options include single or dual 720K 3.5" disc drives, 384K or 640K Memory, LCD or EL-Backlit LCD Display.

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NOTE: Please add £10 & VAT for above.

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Hard Disc Optimiser	£39
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MS C Compiler	£249
MS Flight Simulator V2.13	£39
MS Macro-Assembler	£115
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DTP

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WS3000 V22BIS (& V22/V21/V23)	£545
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Pace Linnet V21/23 (Economy)	£139
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Series-4 1200S (V22/V21/V23)	£359
Series-4 2400S (V22bis/V22/V21/V23)	£449
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Product No.

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- 1 × Mono/Graphic/Printer Card
- 1 × Serial Card
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- 1 × Mouse
- 1 × User Guide
- 1 × Keyboard

Price: £495

K2 as above but with STD case and 2 × 360k Disk drives

Price: £575

K3 as K1 but with 1 × 360k Floppy disk,
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Price: £1195

Product No.

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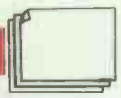

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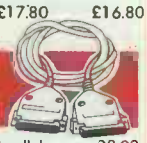

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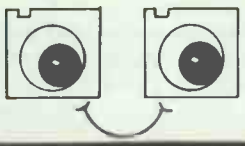
LOOK LOWER PRICES  **LOOK QUALITY DISKS**

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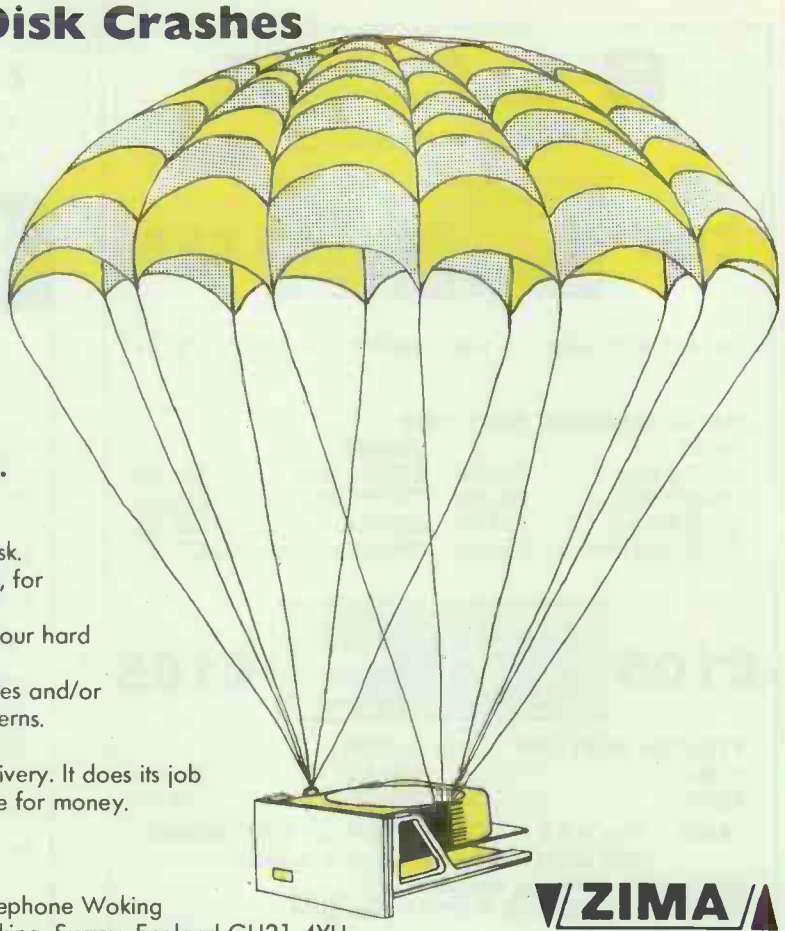

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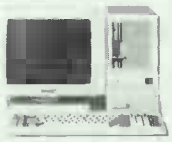

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G4: ASTRO. Dodging enemy ships and meteors. Well animated. Suit all ages.

G5: BABY. Gruesome but popular Kong-type game. Climb levels whilst avoiding the falling babies.

G6: BACKGAMMON. A good version of this popular board game.

G7: BASEBALL.* Match play with strategic choices of play for pitching, hitting.

G8: BEAST. Marauding beasts chase you through a hi-res maze.

G9: BIORHYTHM.* Prints chart of emotional, mental, physical biorhythms.

G10: BLACKFR13.* Investment simulation. Try to increase value of portfolio without going broke.

G11: BLACKJACK. Good version of this popular card game.

G12: BLUESBOX.* Easy to use song composer.

G13: BRICKS. Quick moving game where you hit a ball against a wall to demolish it. Like playing squash against the computer.

G14: BUGS! Centipede creature hunts you through the forest. When you fire and hit it, the creature multiplies! Fast game.

G15: CATCH 88.* Sky is raining letters and numbers. Catch them by correctly matching.

G16: CHASE. You're in a high voltage maze, chased by robots. Compiled with Pascal source code.

G17: CHESS.* Well designed, good board on screen.

G18: CIA.* Adventure with spies and other sinister doings.

G19: CIVILWAR.* Tactical simulation based on actual battles in Civil War.

G20: CRISIS. You're our last hope to save the world from alien invaders.

G20A: DIGGER. Fun to play. Good graphics as digger digs tunnels for gold/emeralds while hungry creatures hunt for digger.

G21: DILEMMA. You have to outguess your opponent. Cooperate or oppose?

G22: DOTS.* Board strategy game against the computer, joining dots with lines.

G23: DSK. Disk Crash. As a floppy disk you have to avoid the falling magnets.

G24: DRAIN. Joke program which causes computer to pretend it's awash and needs to drain.

G27: ELECTION.* Simulates candidate campaigning, raising funds, giving speeches. Good choices win points.

G28: ELEVATOR. You're at the bottom of a series of elevator shafts. Try to reach top without getting clobbered by elevator.

G29: ELI.* Animated cartoon depicting the adventures of Eli.

G30: ELIZA. Classic Psychiatrist game where the computer counsels you. Compiled version.

G31: ENCOUNTE.* Space encounter of the unfriendly kind. Good battle.

G32: ENTRAP. Othello board-type game, cleverly designed, good graphics.

G33: FIRE. Forest fire is raging and you have limited resources to combat. Will you lose the forest? What is your strategy?

G34: FLIGHTMARE. You are a pilot for Omegans against marauding vandals.

G35: FOOTBALL.* Tactical play in a footy simulation.

G36: FORTUNE. Wheel of fortune. Spin the wheel and win prizes or be penalised. More than one can play.

G37: FROG. Frog tries to cross road to safety and avoid being splattered by traffic.

G38: FUN.* Fun with numbers. It helps to understand a little algebra to solve the problems.

G39: GEOGRAPHY. Educational game that tests you on cities, capitals, countries, etc.

G40: PC-GOLF. Very well presented. Takes into account handicaps, clubs, swing, choice of three courses.

G41: GRIME. Hi-res fight against those nasty grimes that threaten to attach and overwhelm.

G42: HANGMAN.* Correctly spell the mystery word before the computer hangs your image.

G43: HANOI.* Transfer disks from one pile to another. Requires thought.

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G45: HORNADETTE. Adventure. Invading the Castle and find the secret formula.

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G48: JUMPJOE. Mad robots chase Joe through rooms and past obstacles on space station.

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G50: LANDER.* Try to land a spacecraft against gravity, adjusting rocket thrust. Good sound and graphics.

G51: LANDMINE. The enemy has buried mines and you have to reach headquarters – preferably intact.

G52: LIFE2. Enter details of bacteria colonies and they breed, generating patterns on the screen.

G53: LOCUST. Spreadsheet setting. Kill the numbers, zero a column to win. They keep growing!

G54: MARS ESCAPE.* Adventure. Your mission is to escape from Mars.

G55: MAZE1. Mazes with different degrees of difficulty. Good graphics.

G56: METEOR.* Erase solid blocks before the constantly falling meteors hit you.

G57: MEM8RANE.* Chemistry game. You are a cell membrane. Learn about cell behaviour.

G58: MUSICIAN. Compose songs, music. Helps you to compose on the screen and play back.

G59: OIL. Offshore Drilling Simulation. Organise resources to strike oil or go broke.

G59A: PACMAN. Classic where you are in a maze hunting treasure while the monsters hunt you. Different levels of play.

G60: PANGO. Attempts to clear bees in a field by stunning or squashing with blocks.

G61: PARATROOPER. Fight off the paratroopers who keep landing until they can overwhelm.

G62: PINBALL. Good screen effects let you play this arcade type game with the cursor keys.

G63: PIRATE.* Adventure set on a pirate ship.

G64: PITFALL. Fast moving flight through valley or pit. Good screen effects. Needs fast reflexes to avoid walls and other dangers.

G65: POKER. Card game. Several can play or just you against the computer.

G66: POKER MACHINE. (ONE ARMED BANDIT). Try to line up the reels for your win.

G67: POLYMAZE. Computer generates hexagonal mazes and will demonstrate how to solve them.

G68: PRESCH.* Spelling and number games for small children.

PROVOCATIVE PINUPS: These are intended for printing. Hang alongside last month's sales figures (or whatever).

G69: CALENDAR GIRL.

G70: JEZABEL.

G71: DAWN.

G72: DELILAH.

PROVOCATIVE SCREEN PICS: These are animated screen pictures.

G73: RECLINING NUDE.

G74: STRIP.

G75: PYRAMID. Fast moving game where you step onto cubes to avoid bouncing rocks and creatures.

G76: QBERT. Bert & the Snake. Jump from one tile to another pursued by the snake and falling fruit.

G77: RACECAR.* You race the computer on racetrack controlling speed, braking, etc.

G78: RAIN. Challenging pinball game that has very good graphics and cursor control.

G79: ROCKETS. Fascinating, fast, hi-res game of space battle.

G80: ROULETTE. Gambling simulation using screen version of a roulette wheel. Cheaper than going to a real casino.

G81: SCATTER. Logic puzzle. Fire a laser to determine whereabouts of 10 atoms in a box.

G82: SEAWOLF.* Valiant submarine commander attempts to sink the invasion fleet with his torpedoes.

G83: SECRET ADVENTURE.* Create your own adventure. For small children. Answer questions about rooms and monsters and it generates a game for you.

G84: SKYTREK. Comprehensive strategy game of the Startrek type.

G85: SLOTMACHINE.* Poker Machine game that can be played by all ages. Animated.

G86: SOLITARE. Card game that shows you the draw and you work out where to place each card.

G87: SPACEWARS. Nicely presented Starwars type of game with many factors to consider.

G88: SPACEVADERS. Race across the screen shooting them down. Good graphics.

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G99: XWING. Very good version of starwars-type game where you are pitted against Darth Vader and the Death Star space station.

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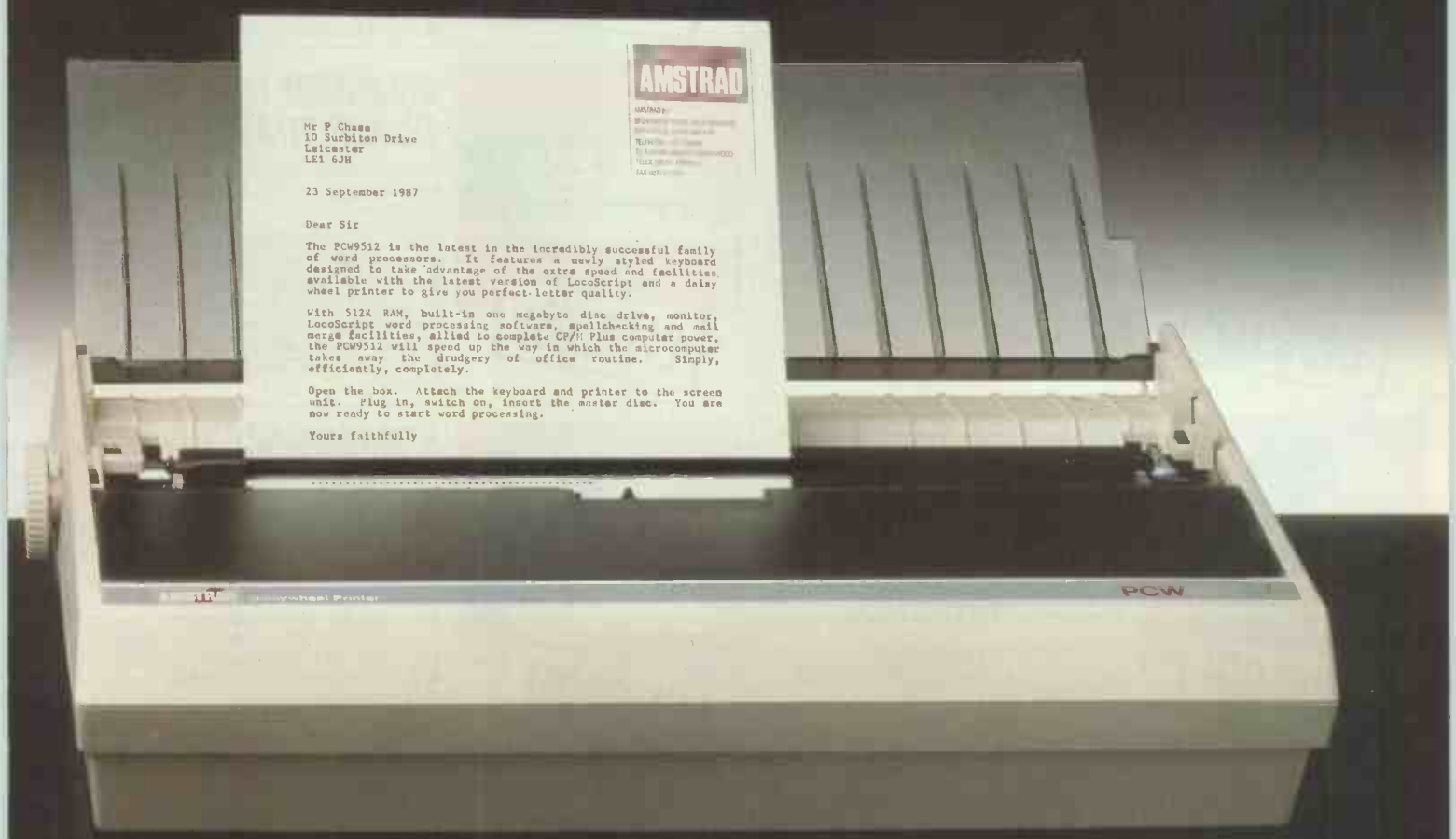

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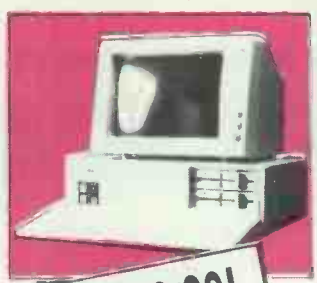

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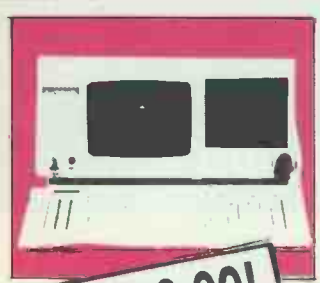

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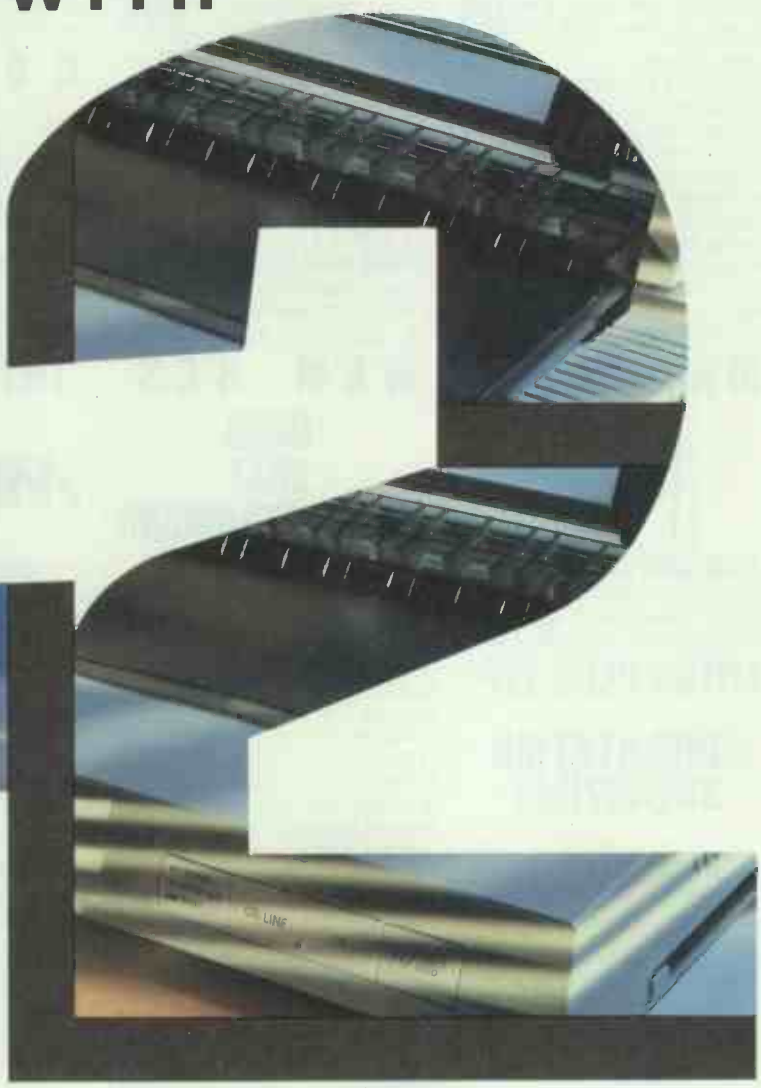

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NLQ mode	30 cps	25 cps
Draft Pica (10cpi)	150 cps	150 cps
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Buffer	4k	3k
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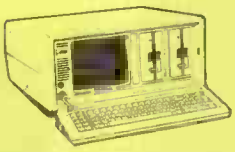

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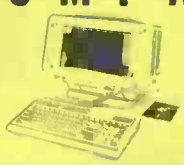

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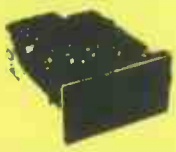

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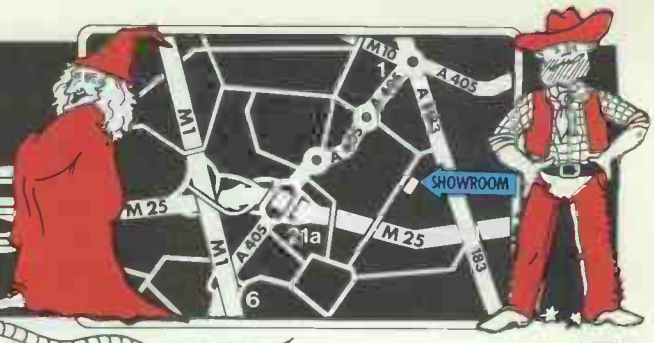
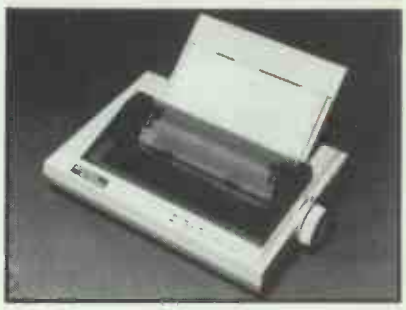


" FIENDISHLY LOW PRICES "

SEIKOSHA SP1200



A high quallity, feature packed printer, ideal for home or light office use. 120cps in Draft, 22cps in NLQ. 80 column carriage. Automatic single sheet feed. Tractor feed. NLQ front control. 12 months warranty. Parallel interface.
£189.00

SEIKOSHA MP5300

Wide carriage dot matrix printer. Fast, quiet and a bargain at the price. Ideal for printing spreadsheets and all continuous stationary. 300cps Draft, 60cps in NLQ. Automatic single sheet feed. Complete control from front panel. Both Parallel and Serial interface. Optional cut-sheet bin feed available. 12 months warranty.
£389.00

SEIKOSHA SP180

The quality home printer at an affordable price. 80 column. 100cps Draft and 16cps NLQ. Friction feed and drop-on tractor feed. Choice of Serial or Parallel interface. Long ribbon life. 12 months parts and labour warranty.
£149.00

EIZO 3010 MONO MONITOR

Green, amber and white reverse. Compatible with IBM composite PAL output. Will also run on BBC, Acorn, Apple II c/e, Epson. 12" matt black screen for low reflection. Complete with phono-phono cable. 12 months warranty.
£55.00

MODEMS – FROM RACAL

Top quality modems at low low prices.

2BM external modem V21/V23 with software.....£299.00
2BM internal modem V21/V23 with software.....£299.00
External modem V22.....£399.00
Internal modem V22.....£360.00
External modem V22 with autodial..£450.00
Internal modem V22 with autodial...£425.00
High spec, multispeed external modem with error correction.....£580.00

AMSTRAD 1512 FAN

Is your Amstrad PC1512 running a little hot? Are you planning to upgrade it with a hard disk? Then you need an Adfan. Designed for the 1512. Full fitting instructions included.
£27.00

CLEAN-UP YOUR POWER SUPPLY

A rugged high performance filtered and conditioned power supply block. 3 x 13 Amp sockets each capable of delivering 5 Amps of clean power. Will protect your PC's from unwanted noise on you power supply. Designed for both wall or floor mounting. A real 'Rolls-Royce' job.
£110.00

EIZO EGA MONITOR

Eizo 8042 EGA monitor. Full EGA compatibility, switchable mono. Looks good and performs like a dream. 0.39mm dot pitch for high resolution. Supplied with a cable to suit IBM. Ask about the special deals we can do on AST and Dataflex EGA cards.
£336.00

EIZO 12" COLOUR MONITOR 7030M

Works with all IBM and compatible PC's. Switchable colour or mono. Low glare screen. Complete with cable.
£179.00

LOCK-UP YOUR PC

Security lock for IBM PC/XT/AT. Screws on to back of PC case and locks over on/off switch. 3 keys supplied.
£25.00

IRWIN TAPE BACK-UP

Save your data securely before you lose it! Irwin are the worlds most popular tape back-up systems. Automatic back-up so you can save data when you are away from your machine. Full error correction to ensure that you can recover data even from a damaged tape. Suitable for most MS DOS machines. Fire, theft, clumsy fingers, spilled coffee – Irwin can protect you from consequences of these disasters.

INTERNAL

10 MB PC & XT/Compatible.....£285
Extra Formatted Cartridges.....£34
20 MB PC/XT/Compatible.....£360
20 MB 286/AT/Compatible.....£360

EXTERNAL

10 MB PC & XT/Compatible.....£349
10 MB AT/Compatible.....£349
Extra Formatted Cartridges.....£34
20 MB PC/XT/Compatible.....£430
20 MB 286/AT/Compatible.....£430

UPGRADE YOUR AMSTRAD

30 MB Hard Disk on a card purpose designed by X-Tech for the PC1512. Low power requirement, low heat generation. Average access time of 65 m.sec – that's fast. Includes free cooling fan and full fitting instructions. It's a real quality hard disk.
£563.00

SEIKOSHA PERFECT LETTER QUALITY

Why bother with a noisy daisy wheel printer when you can have a fabulous 24 pin printer at this price. The Seikosha SL-80 has 50 characters per second in perfect letter quality and 150cps in draft, parallel interface, and 80 column carriage. Fully compatible with IBM and Epson codes.
£349.00

AST MEGAPLUS II

If you have an older PC that you are loathed to part with but want something extra out of it then Megaplus is for you. 64K of RAM, one serial port, clock/calendar and a range of utility software.
£90.00

BOOKWORKER ACCOUNTING S/W

The friendliest accounts system ever. Includes sales, purchase, stock control and nominal ledgers, and even invoicing. Works a treat with the Amstrad 1512 or 1640. Usual price £173.80 plus VAT.
£145.00

EPSON LX-86

High on performance and low on price with a host of built in features. 120cps draft speed and 16cps in NLQ, 80 column carriage and parallel interface. Epson quality at a gift price.
£165.00

SOFTWARE CORNER

GEM Write (Amstrad).....£39.00
GEM Diary (Amstrad).....£19.00
GEM Draw (Amstrad).....£35.00
GEM Graph (Amstrad).....£35.00
GEM Wordchart (Amstrad).....£45.00
GEM Draw Business Library.....£16.00
GEM Fonts + Driver + Editor.....£65.00
Supercalc 3 (IBM).....£99.00
Superproject Plus (IBM).....£99.00
Amstrad PC1512 Sidekick.....£15.00
Microsoft Chart (IBM).....£140.00

All goods guaranteed. Official Purchase orders accepted from Government, Local Authorities, Universities and PLC's. All prices exclusive of VAT and subject to change without notice. Delivery charges extra. No returns or repairs accepted without Returns Authorisation Number (obtainable from our Technical Support Department). Defective dead-on-arrival merchandise repaired or replaced immediately at our carriage expense. Carriage on warranty repairs is paid by the customer. Non-defective credit returns subject to a 10% restocking fee. Technical support available Monday to Friday. Export and trade enquiries welcome.

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TELEX: 8950511 ONE ONE G (Quote Ref: 15412001)
***HEAD OFFICE*•UNIT A•CAXTON CENTRE•PORTERS WOOD•ST ALBANS•HERTFORDSHIRE•AL3 6XT•(0727) 37451**
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COMPUTER EXPRESS AMERICA•1713 S.E. ELLIS STREET•PORTLAND•OR•97202 USA•TELEPHONE (503) 235 0277

" HORDES OF MONSTER BARGAINS "

PANASONIC 1081

This 120cps draft/30cps NLQ little beast is a surprising winner. It continues to sell very well, no doubt helped by the fact that everybody discounts it so massively! But it has excellent 9-pin quality, is Epson and IBM compatible, comes with a tractor feed, is 80 columns wide and amazingly cheap!

£149.00

STAR NL10

For value for money nothing can match our new low price. One of the most popular printers ever with a speed of 120cps draft and 35 NLQ. Built-in back mounted tractor feed, friction and auto single sheet feed. Comes with choice of interfaces. Recommended by Which? Very strong NLQ, 80 column wide.

£179.00

EPSON LX800

Although previous LX series printers were considered under-specified compared to the NL10 and others, the range continues to be the best seller – ever. This latest offering zips along at 150cps draft and 25cps NLQ and comes with Parallel Esc-P or IBM Parallel interfaces as standard, plus a top-mounted tractor feed. Good, clear typeface, 80 column wide.

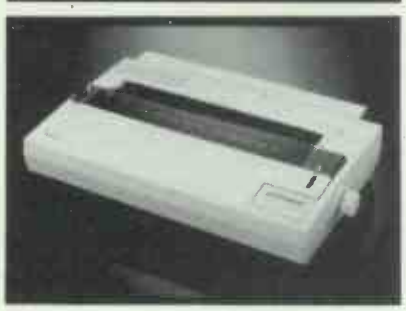
£192.00

NEC P7 PINWRITER

Heavy duty 24-pin dot-matrix prints draft at 180cps and Letter Quality (LQ) at 72cps. A very successful product in the corporate sector. 132 column.

£441.00

EPSON LQ2500



Although very expensive, this fast (270cps, 72cps LQ) printer continues to sell in impressive numbers even in the face of strong competition in a fiercely contested market segment. Probably the best printer Epson ever made. 132 column.

£689.00

MIGENT ABILITY

A knock-down integrated system. We recommend it because it does spreadsheet, WP, Database and Comms professionally. For the budget user there is nothing to match it at this price. Great if you are learning.

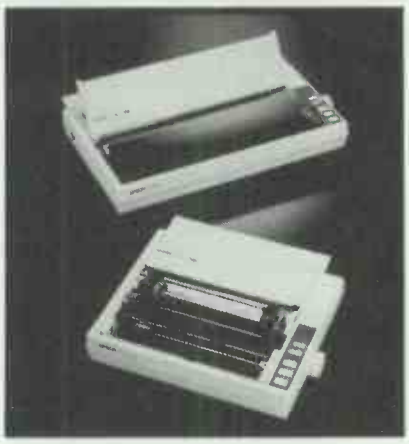
£40.00

MIRACLE WS4000 V21/V23 Modem

This is the most popular Modem in the country today. Why? Mainly because it is cheap, reliable, looks good and does the job, which is really quite a simple one, after all. You can use it to access Telecom Gold, One-to-One, EasyLink, Prestel and all the bulletin boards that keep sprouting up. You also need a serial cable (£15.00) and software. We recommend Sagesoft ChitChat (£71.00) because that package also allows you to access Prestel. Most others don't.

£139.00

EPSON FX800/1000



No printer propaganda would be complete without listing the FX series. It was on the back of this range and its ancestors that Epson came to dominate the market. The 800 is the descendent of the 80 and 85, prints draft at 200cps and NLQ at 40cps and is 80 columns wide. The 1000's parents were the famous 100 and 105. It goes at the same speed and is 132 columns wide. Both include tractor feeds and Epson/IBM compatibility. Worthy pedigrees and a safe 9-pin choice.

FX800.....£293.00
FX1000.....£384.00

LOTUS 1-2-3 (VERSION 2.01)

Although imitated by half a dozen lookalikes, the original business spreadsheet continues to out-sell all of its rivals and is the Number One selling software package – ever. Very popular with corporates and government. Our huge volumes enable us to offer it at an exceptionally low price.

£220.00

XEROX VENTURA DESK TOP PUBLISHER (VERSION 1.1)

Rightly or wrongly, Desk Top Publishing (DTP) is the latest industry buzzword. There are a lot of packages about, but the general consensus is that this is the best. It's in fashion.

£527.00

WORD PERFECT (VERSION 4.2)

Statistics show that more Word Processing software is sold than any other kind. Word Perfect is the best selling WP package in the world today – full stop. It is also, in the view of most trade people, the best. Strongly recommended. In software terms, only Lotus outsells it.

£219.00

SUPERCALC 4

If you want an alternative to Lotus 1-2-3 and its clones, this is the only one worth considering. They say it is everything Lotus should have been. Easy to use and quick, good graphics, it may be number two, but it tries harder!

£192.00

AMSTRAD 1640

No listing would be complete without mention of this machine. Some of the shortcomings of the 1512 have been rectified, mainly the display. The 1640 is excellent value for money, coming as it does with an 8086 8MHz chip, 640k RAM, mouse, Gem, MS-DOS and full colour EGA screen. The old 1512 was selling 7000 to 9000 units per month in this country, and we expect the successor 1640 to have similar success. For real value buy the single drive version and add a 32mb Scribecard! Available in colour only.

Single Floppy.....£730.00
Double Floppy.....£825.00
20mb Hard Disk.....£1095.00

TANDON TARGET

This small-footprint mini-AT is about the most stylish around. Fast 20 or 40mb hard disk, 1.2mb floppy, 1mb RAM, serial and parallel ports, 14in mono monitor, keyboard, MS-DOS 3.2. Good price for a pedigree AT.

Target 20.....£1599.00
Target 40.....£1814.00

EPSON PC-AX

This 10MHz AT is robust and sets the standard for big-box design and style. Comes with keyboard and MS-DOS, you need to pay extra for the monitor and graphics adaptor board. This is a popular item for power users on a budget, such as local authorities!

AX20.....£1299.00
AX40.....£1649.00
AX60.....£2399.00

MINISCRIBE 32MB HARD DISK CARD

This Scribecard is revolutionizing hard disk upgrades in the U.S. and U.K. Why? Because it's cheap! It is also easy to install, reasonably fast (65ms) and readily available. Takes up one and a half slots and works great in the Amstrad, IBM, Olivetti. You name it.

£295.00

SMART SYSTEM

The trouble with integrated packages is that they tend to do one thing at most very well, and all the others not so well as a dedicated package. Smart is the only integrated system in which all of its components (WP, Spreadsheet, Database, Graphics, Communications, Diary) are competent to stand on their own against the competition. The best-selling integrated package.

£349.00

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"COME AND MEET OUR TRAINED SHOWROOM STAFF"

NARROW DOT MATRIX PRINTERS

Epson LX800 - The Brand New Best Seller!	£192
Star NL10 - The Number Two Seller-Best Spec	£179
Panasonic 1081 120cps & 80 col - Brand New!	£149
Panasonic 1091 - Byte Magazine Says It's No 1	£227
Epson FX800 - Brand New! 240cps! Wow!	£293
Epson EX800 - 300cps & 80 column-Super Fast!	£373
Seikosha MP1300AI - 300cps!	£299
MP 165 - Cheap Fast And Good Quality 180cps	£169
Oki Microline 182 - The Number 2 Brand	£187
Oki Microline 192 - Perennial Favourite	£282

WIDE DOT MATRIX PRINTERS

Star NX15 - The New Wide-body NL10!	£287
Star NR15 - Replaces the SR15-A Great Mover	£397
Panasonic 1595 - The Panasonic Favorite	£519
Epson FX1000 - Brand New! Replaces FX105	£384
Epson EX1000 - 300cps & 136 column-Super Fast!	£498
Seikosha MP5300AI - 132col Version of MP1300	£439
MP 200 - 200cps! 132 column!	£259
MP 201 - 132 column 200cps	£294
Oki Microline 193 - Worth A Look	£359
Oki Microline 293 - Worth A Long Look	£608

24-PIN DOT MATRIX PRINTERS

Epson LQ800 - Letter Quality-24 Pin Printhead	£420
Epson LQ1000 - Letter Quality-24 Pins-132 Col	£570
Epson LQ2500 - This one is really good!	£689
Star NB15 - The big, up-market Star 24-pin 300cps	£598
Star NB24-15 - Similar to above, but 216cps	£517
Star NB24-10 - 80 column 24-pin winner	£413
NEC P6 - Good Buy	£379
NEC P7 - One of the Best Sellers Ever - 24 pin	£441

DAISY WHEEL PRINTERS

Star Power Type 18cps - The Current Cheap One!	£179
Juki 6100 - 20cps - Very Popular, still no. 1	£253
Juki 6200 - 30cps - Still Popular	£393
Juki 6300 - 40cps - Very Up-Market	£639

COLOUR PRINTERS

Okimate 20 Thermal Printer	£159
Juki 5520 - The Market Leader - Fast!	£335
Epson EX-Series Colour Option	£55
NEC P565XL - Heavy-Duty Office Favorite!	£740
Epson LQ2500 Colour Option/Makes LQ2500 Colour	£55
Seikosha MP1300 Colour Kit/Makes MP1300 Colour	£87

INK JET PRINTERS

Epson SQ2500 - Ink your jet with this one!	£970

PLOTTERS, DIGITIZERS & LASERS

HP LaserJet II - Newer, Better, Cheaper!	£1945
Cherry A3 Digitizer	£475
Roland DXY-880A Plotter - Best Value A3 Plotter	£600
Roland DXY-990A Plotter	£922
Epson GQ3500 - Brand new with HP Emulation!	£1222

RIBBONS

Epson FX80/85/800/LX800 (also MP165, Juki 5510)	£4.75 each
Longbow FX80/85/800/LX800 compatible ribbon	£2.80 each
Epson EX-series cartridge ribbon	£7.51 each
Longbow Oki 182/192/193 compatible ribbon	£4.61 each
Longbow NEC P3-P7 black compatible ribbon	£4.85 each
NEC P-6 black ribbon	£7.88 each
Longbow Panasonic 1080-1081 compatible ribbon	£3.18 each
Star NL10 cartridge ribbon	£4.66 each
Longbow LQ800 compatible ribbon	£2.99 each

NOTE: The minimum quantity for ribbon orders is three (3) units.

CABLES AND THINGS

IBM-Compatible Centronics Parallel Cable (Round)	£12
BBC Centronics Parallel Cable (Ribbon)	£8
Two-Way Printer T-Switch	£45
80 Col Printer Stands	£21
SpaceBase Adjustable Floor-Standing Printer Stand	£85

AMSTRAD PC

Amstrad 1512 Single Floppy/Mono Monitor	£375
Amstrad 1512 Double Floppy/Mono Monitor	£475
Amstrad 1512 Single Floppy/Colour Monitor	£500
Amstrad 1512 Double Floppy/Colour Monitor	£600
Amstrad 1640 Single Floppy (EGA Colour 640k)	£730
Amstrad 1640 Double Floppy (EGA Colour 640k)	£825
Amstrad 1640 20mb Hard Disk (EGA Colour 640k)	£1095

EPSON PC's

Epson PC AX-20 Mark II (640k RAM, 20mb HD & EGA)	£1299
Epson PC AX-40 AT (640k RAM, 1.2mb Floppy, 40mb HD)	£1649
Epson PC AX-60 AT (640k RAM, 1.2mb Floppy, 60mb HD)	£2399
Epson PCe (20mb XT with keyboard, DOS & mono monitor)	£950

MACDOUGALL PC's

MacDougall 286 AT 512k 10mz/20mb HD/mono monitor	£999

TANDON

PCA 20mb Hard Disk AT (1mb RAM Keyboard DOS Monitor)	£1345
PCA 30mb Hard Disk AT (1mb RAM Keyboard DOS Monitor)	£1569
PCA 40mb Hard Disk AT (1mb RAM Keyboard DOS Monitor)	£1789
PCA 70mb Hard Disk AT (1mb RAM Keyboard DOS Monitor)	£2145
Target 20mb Mini AT (Complete mono system)	£1599
Target 40mb Mini AT (Complete mono system)	£1814
PAC-286 (complete EGA AT with removable 32mb hard disk)	£1996

OLIVETTI PC's

Olivetti M28 AT Compatible - 20mb Hard Disk	£1831
Olivetti M240 Double Floppy	£759
Olivetti M240 20mb hard disk)	£1092
Olivetti Mono Monitor for M240	£167
Olivetti 102-key Keyboard for M240	£120
Olivetti M380 40mb hard disk Compact System	£3307

SHARP PORTABLES

Sharp PC7100 20mb Hard Disk SuperTwist Screen	£1399
Sharp PC7200 (20mb 80286 AT Super Twist & Super Fast!)	£2099

TOSHIBA

Toshiba T3100 20mb 80286 Portable	£2790
Toshiba T1100 Plus	£1271
Toshiba T1000	£810
Toshiba T1200	£1946

MONITORS

Eizo ER8042S 14in Ultra-High Res EGA Colour Monitor	£445
ADI 14in Mono Monitor with Tilt/Swivel Stand	£120
NEC Multi-sync EGA monitor	£489

ATARI

Atari Expandable PC Twin Drive Mono (8088/2)	£579
Atari Expandable PC 20mb Hard Disk Mono (8088/2)	£799
Atari 520STFM 512k RAM, disk drive, mouse	£250
Atari 1040STF 1mb RAM, disk drive, mouse, no monitor	£380
Atari 1040STF with Mono Monitor, 1mb RAM, disk drive	£469
Atari 1040STF with Atari SC1224 Colour Monitor	£670
Atari SH204 20mb Hard Disk Drive	£478

ATARI TOP SELLING SOFTWARE

Cyber Studio Cad 3D ver 2.0 - It's here at last!	£64
Flight Simulator II - Very Realistic Best Seller	£36
VIP Professional (Lotus Clone Gem Version)	£149
Metacomco Lattice C Compiler	£71
First Word Plus - Word Processor with Graphics	£62

CATS 'N' MICE

Mouse Systems Mouse with Pop-Up Menus & PC Paint	£140
Mouse Systems Mouse with Pop-Up Menus Only	£125
Microsoft Bus or Serial Mouse - Don't forget the cat!	£132
Logitech Logimouse C7	£77
Logitech Logimouse Plus Package	£89

DISKETTES

Computer Express 5.25in DS/DD 48tpi disks	£1.00 each
Computer Express 5.25in DS/DD 96tpi Hi-Density	£1.65 each
Computer Express Branded 3.5in DS/DD diskettes	£1.99 each
Un-branded Verbatim 3.5in SS/DD diskettes	£1.15 each

COMMUNICATIONS

Miracle WS4000 V21-V23 Modem	£139
Miracle WS3000 V22 Professional Modem	£385
Sage Chitchat Comms Pack (Modem/Software/Cable)	£199
Crosstalk IV Comms Software	£93
Sage Chitchat Comms Software	£71
One-To-One Electronic Mail Subscription	£20
RS232 serial modem cable	£15

HARD DISKS

Dysan/Western Digital 20mb File Card	£279
Miniscribe 32mb Scribecard Hard Disk Card	£295
Western Digital 32mb FileCard (with X-Tree software)	£299
Seagate 20mb Hard Disk with WD controller and cables	£225
Plus HardCard 20mb	£525
Plus HardCard 40mb (the quality leader)	£850

SPECIAL OFFERS

LX-86 Auto Sheet Feed	£39
Olivetti M24 20mb Hard Disk complete mono system	£1199
M24SP Complete System (Monitor/Keyboard/DOS)	£1399

ADD-ON BOARDS

AST SixPack Plus 64k memory Multifunction Card	£165
Qubie SixShooter Multifunction Card 64k memory	£125
Intel AboveBoard with 0k installed	£199
Everex Mini Magic Ram Expansion Card (384K)	£117
Hercules Graphics/Graphics Plus Card	£179
Everex EverGraphics Plus (Clone Hercules Card)	£95
Eizo Auto-Switch EGA Card	£199
Paradise Auto-Switch EGA Card	£219
AST Rampage	£200
AST 3720 Terminal Emulation Card	£649
AST 5251 Model 12 Remote Emulation Card	£525
AST SixPack Premium 256k Clock Parallel & Serial	£330
AST SixPack Premium 1mb EMS daughter board	£150

CHIPS, CO-PROCESSOR AND DRAM

64k dRAM chips (nine to make 64k)	£1.15 each
256k dRAM chips (nine to make 256k) 150 N.S.	£3.00 each
Intel 8087 5mz Maths Co-Processor	£95
Intel 8087-2 8mz Maths Co-Processor	£135
Intel 80287-8 Maths Co-Processor	£185

IBM-COMPATIBLE SOFTWARE

WordStar 2000 Plus release 2	£229
WordStar 3.4	£149
WordStar Professional Version 4	£193
WordStar 2000 Plus	£269
Word Perfect ver 4.2 - The Number 1 WP Package	£219
Microsoft Word ver 3 - Number 2 WP Package	£249
Multimate ver 3.31	£189
Multimate Advantage II	£275
Lotus Manuscript - Latest Blockbuster WP Package!	£235
PFS: First Choice	£108
PFS: Professional Write	£120
Framework II Version 1.1	£311
Symphony version 1.2 (Latest Version)	£318
Symphony Spelling Checker	£69
Symphony Text Outliner	£60
Lotus 1-2-3 ver 2.1 Top Selling Package In The World	£222
Lotus Spotlight - The desktop manager!	£39
Lotus Metro - Lotus front-end organiser	£53
Lotus Report Writer - A must for Lotus fans!	£75
Supercalc ver 4 - The Celebrated Lotus-Beater!	£192
Grafox Logistix	£79
Javelin	£89
Smart System - The Best Intergrated Package	£349
Executive Systems X-Tree (Super Friendly HD Organizer)	£40
Executive Systems Hot! - Make own menus and hot keys!	£36
Rosesoft Prokey - Customise your keyboard	£55
Pegasus Accounts (per Module)	£199
Psion Chess - You too can play like Gary Kasperov	£19
Quaid Software Copywrite (Back up Protected Software)	£35
Microsoft Flight Simulator - Don't crash!	£39
Microsoft Quick Basic version 3 - The Ultimate Basic	£55
Funk Software Sideways	£40
Living Videotext Ready!	£50
Borland Turbo Lightening	£47
Microsoft Windows	£59
Norton Utilities 4 - Every user need this one!	£52
Norton Commander - Control program for power users!	£35
Ventura Desk Top Publisher	£527
Freelance Plus	£266
Delta Professional	£319
Ansa Paradox II - Multi-User Database!	£289
Cardbox Plus	£225
Ashton-Tate Rapid File	£199
dBase III Plus - Best Selling Professional Database	£349
FoxBase Plus	£269

LOW-COST SOFTWARE

VP Planner by Paperback Software - Best Seller!	£61
VP Info (dBASE II Clone)	£62
VP Expert	£75
Borland Sidekick - The Original Co-Resident Process!	£49
Borland Turbo C - C How You Like This!	£65
Borland Turbo Pascal - The Classic Borland Product	£47
Borland Turbo Basic	£55
Sage Bookeeper	£75
Sage Retrieve Database	£71
Sage PC Planner Spreadsheet (Lotus Clone)	£71
Sage Desk-Set	£49
Sage PC-Write Word Processor	£71
Sage Accountant	£110
Sage Accountant Plus - Top Selling Cheap Accounts	£155
Sage Payroll	£85
Sage Financial Controller - Just reduced from 995!	£240
Personal Word Perfect	£139
Word Perfect Junior	£75
Microsoft Word Junior	£59
WordStar 1512	£60
Amstrad Multiplan Junior	£59
Amstrad Supercalc 3	£60
Amstrad Amstrad Reflex	£60
Precision Software Superbase Personal	£75
Migent Ability - Top Integrated Package	£40
Migent Ability II - Spend a Little More, Mate!	£119
Words & Figures - Lotus 123 v1 Clone with WP	£80

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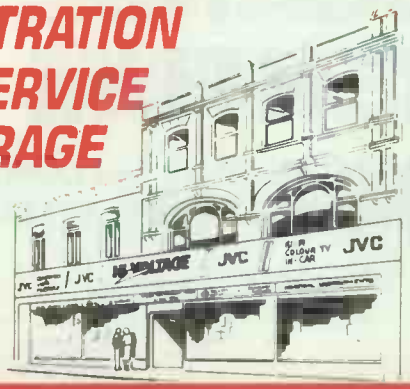

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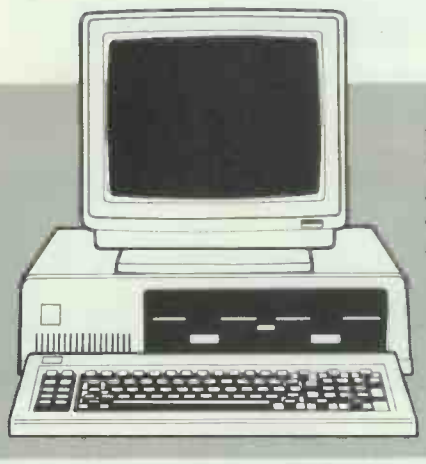

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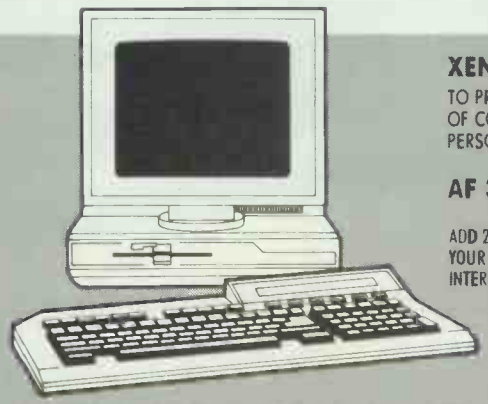

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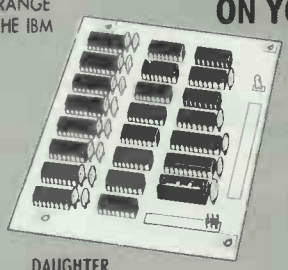

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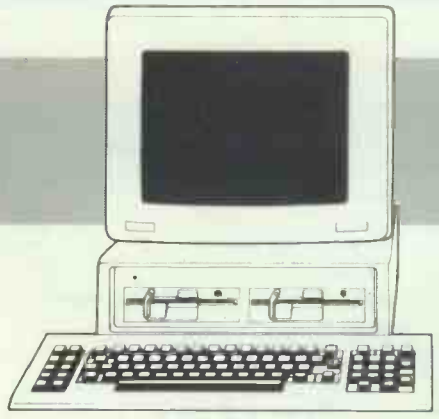

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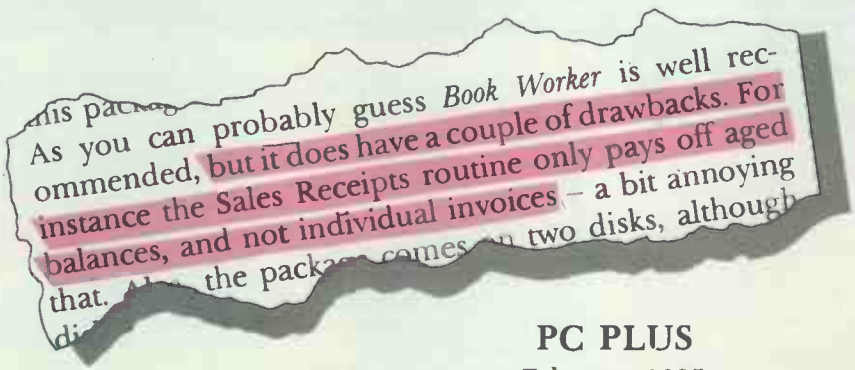

PC PLUS
February 1987

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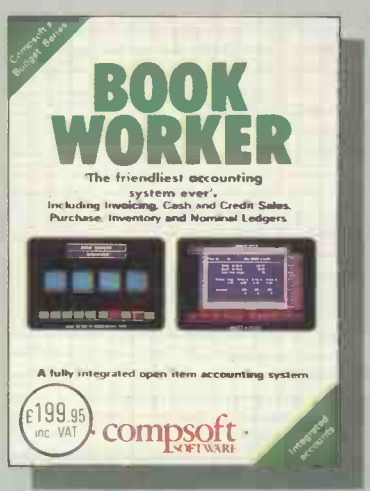

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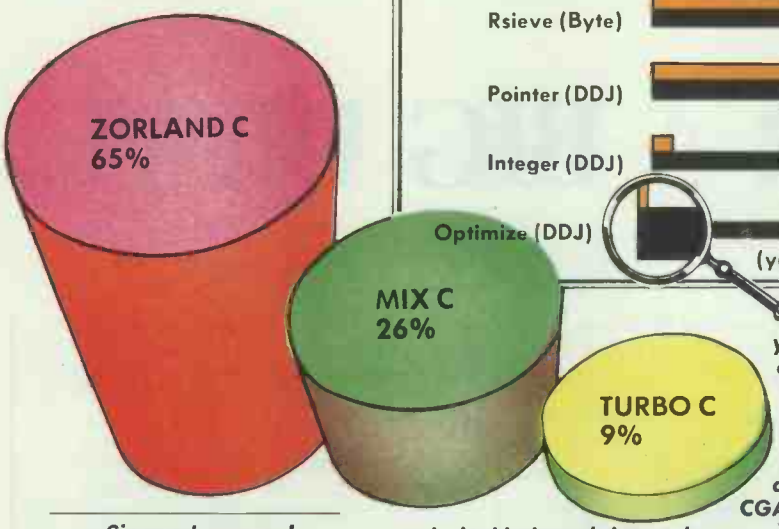

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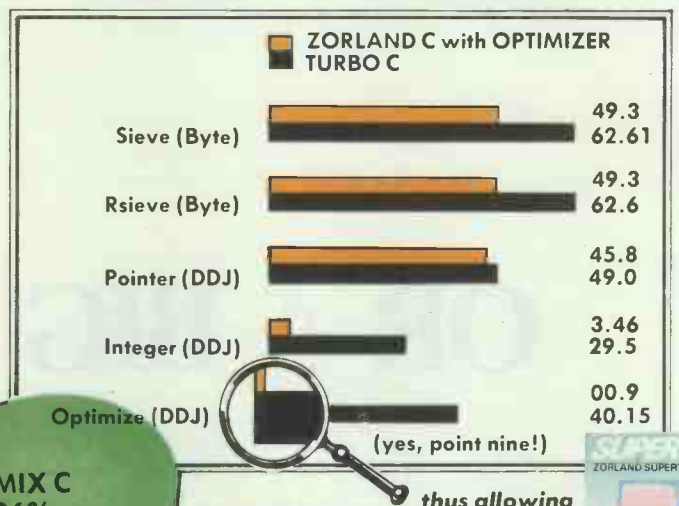

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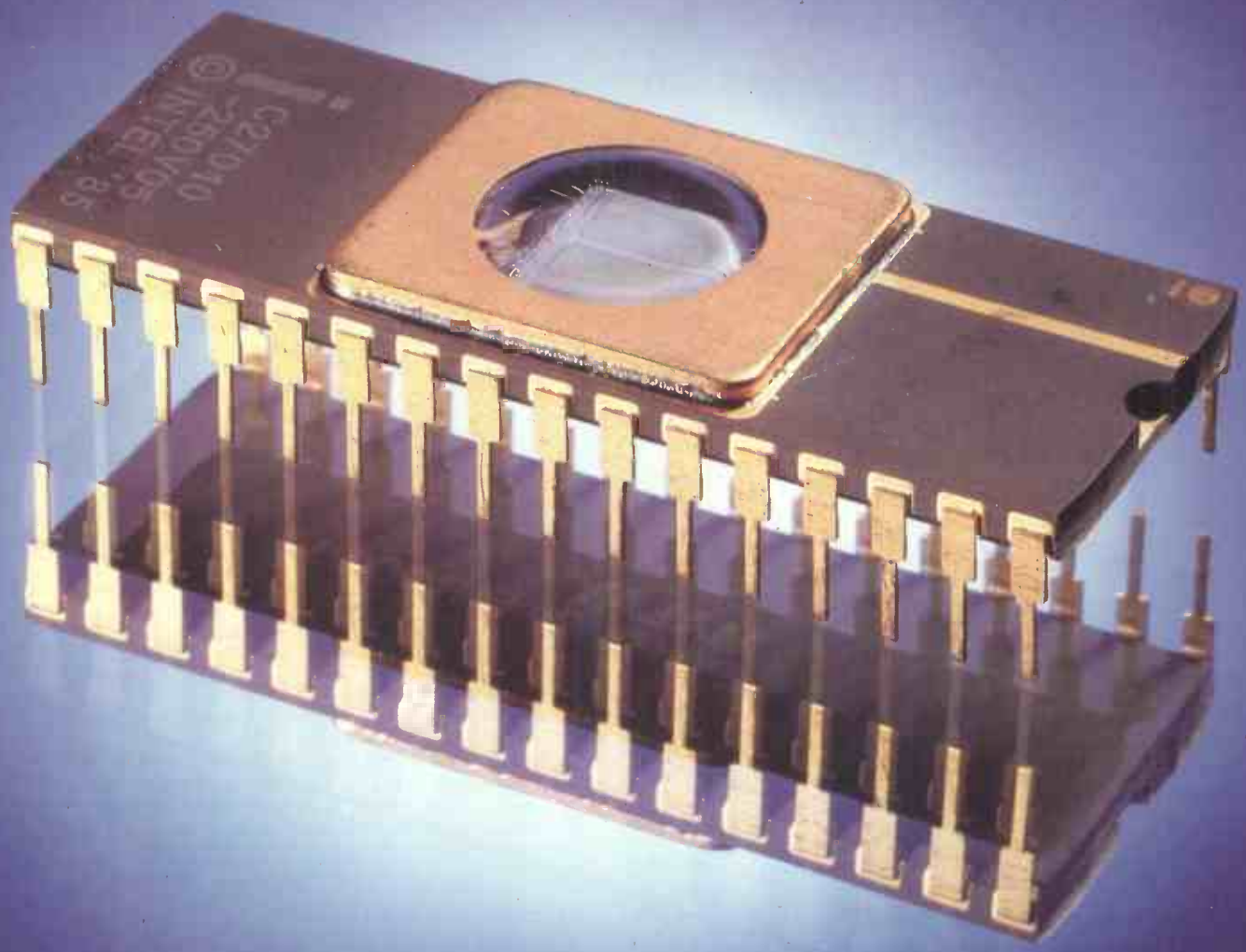

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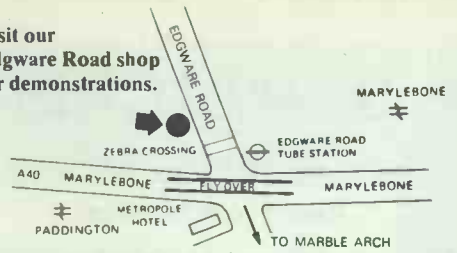

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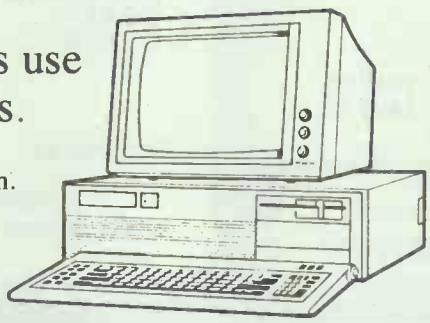

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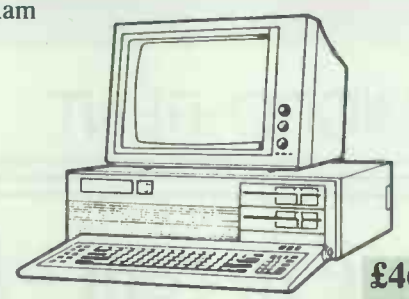

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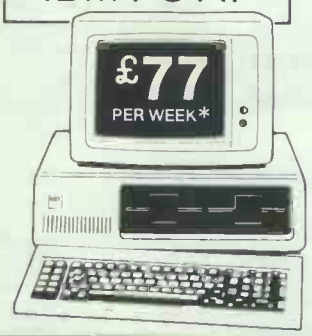

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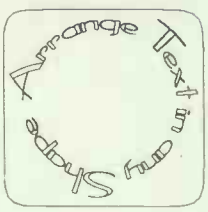

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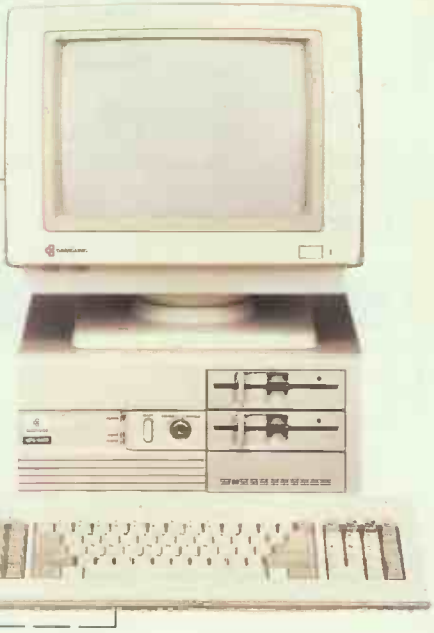

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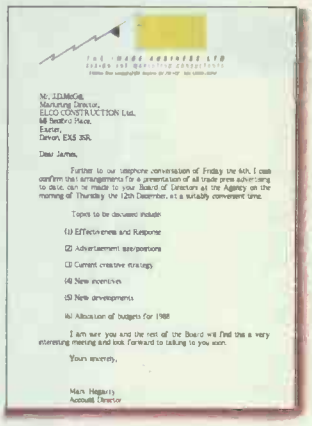

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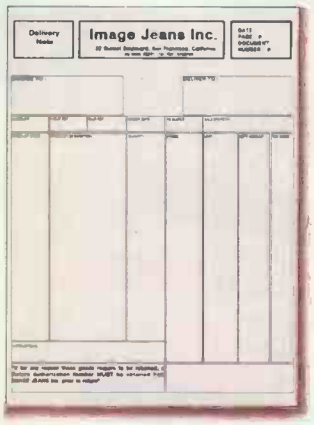

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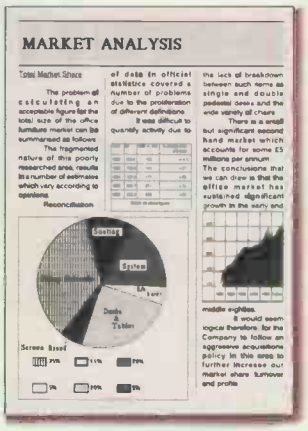

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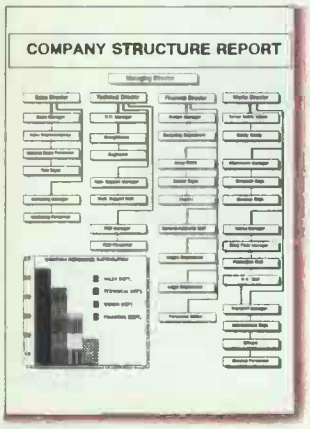

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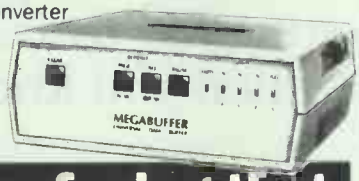

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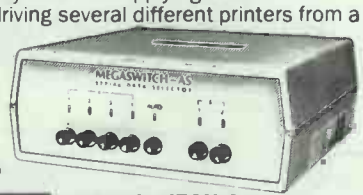

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Rumours of an '80388' chip being available by early 1988 lend foundation to doubts about the success of OS/2 and the 80286. Guy Kewney substantiates these doubts, and lends weight to other industry happenings, in this month's news and views.

Jumping the gun

Doubts about Microsoft's OS/2 operating system have been boosted by the discovery of a chip that makes it look obsolete before it is available.

The chip comes from Intel itself. Rumour in Silicon Valley points to a half-size 80386 chip for early next year. It would probably be called 80388, after the 8088 (which was the 8-bit version of the 8086).

Microsoft is the company most likely to be affected by this news, and IBM could end up with egg on its face, too; the problem of the 80286 chip (the one used in the AT) is now becoming one you don't need to solve.

The problem is simple but virtually impossible to explain in less than three closely-typed pages. So, I'll summarise. The 80286 chip turned out to be incapable of running PC programs in protected segments, because: (a) IBM used illegal interrupts on the 8088 which trip up the 80286 in protected mode; and (b) Intel didn't get the protection system working properly.

But, unfortunately, the latest whizz-bang operating system from IBM and Microsoft is OS/2, and that *has* to work on 80286 machines. Therefore, it can't take advantage of the really nice software protection that is built into the 80386.

The 80286 does have one thing going for it. The advantage of using it is simple: it runs 8088 code fast, and can run at 12MHz — much quicker than any 8086 (standard PC-style family chip) ever could.

It operates at 12 times faster than a standard 8088-based system, which is four times the speed of a good 'turbo-pc'.

It has, therefore, an assured future for the next year or so as the engine in the standard MS-DOS 3.X machine.

But an 80388 would be a 16-bit chip, like the 80286, and should plug into a simpler board than the AT-type boards. It would be cheaper to make, much faster (capable of running at 25MHz, eventually) and, best of all, be able to run a more advanced operating system than OS/2.

Microsoft has already announced Windows 386 for Compaq and Zenith, and, I expect, Olivetti and Tandon, plus one or two Far East clone makers, to follow soon — if it hasn't already by the time this issue of *PCW* is printed.

Hats should not be hung on the OS/2 hook. I think reports of its success are premature.

Hitachi becomes at least the fifth monitor maker to claim that it has 'the first multi-scan colour monitor which has full IBM PS/2 VGA compatibility', with the announcement of its £675 Multi 560. It's nice enough, despite the hype, with 800 by 560 dots and up to 80Hz vertical scan. The company also sells a £350 controller card which will handle software that imagines it is talking to a standard mono, Hercules, CGA or EGA screen, as well as VGA output.

Innovation reaps awards

On the face of it, the idea of an 'Innovation Challenge' is silly, even if it is to be organised by *The Guardian* computer page.

You might ask yourself: 'If bright young inventors won't produce a new idea for the money, why would they come up with one just to get an award from a newspaper?'

However, after a little gloomy thought, I have to admit that I know lots of people who would regard the commercial challenge as too daunting, but who are quite capable, intellectually, of coming up with new technology for the trivial award of being told they are bright.

Should you know any shy but innovative people, phone (0895) 52131 and ask Rena Brimelow for details of the Challenge.

You can also mention to your innovative friend (though I doubt this will really impress them) that the winner will have the project backed, commercially, by Akhter Group.

Games in C

When Zorland says that you can 'write your own games' using its C language compiler, it isn't thinking of arcade blasters in multiple colours. It's thinking of computing games — chess, backgammon, and the like.

The Games Toolkit costs £23 and includes three programs which will play games: chess and backgammon are two, and the third is 'the strategy game, Wari' which I know nothing at all about.

I'm taking all this on trust; also, the news that Zorland has announced a graphics toolkit which draws all sorts of shapes. I know I should have contacted Zorland for corroborative details, but I was giggling too hard at the news that 'the availability of the two new toolkits coincides with the launch of the Zorland C compiler a year ago.'

You ring the company, a year ago if you like, on (01) 854 1194.

A slight technical hitch

You'll read no announcements in *this* column about new Amstrad micros, printers, or whatever . . . well, you *nearly* won't.

I can't resist informing you that a fortnight before the new monochrome PC1640s were released at the PCW Show, a dealer (and a big one) found that an order of PC1512s had arrived and were all 1640s — including the mono ones.

'Oh, heck,' said the distribution manager. 'Can you just put them in the back of the shop and keep quiet about it?'

It was too late. Trade paper *PC Dealer* had already blown the slip-up — the same publication in which Amstrad itself had already goofed by printing the wrong ads three weeks before the launch, giving price details of the new machines.

It made a dull summer bearable, I suppose. ▶

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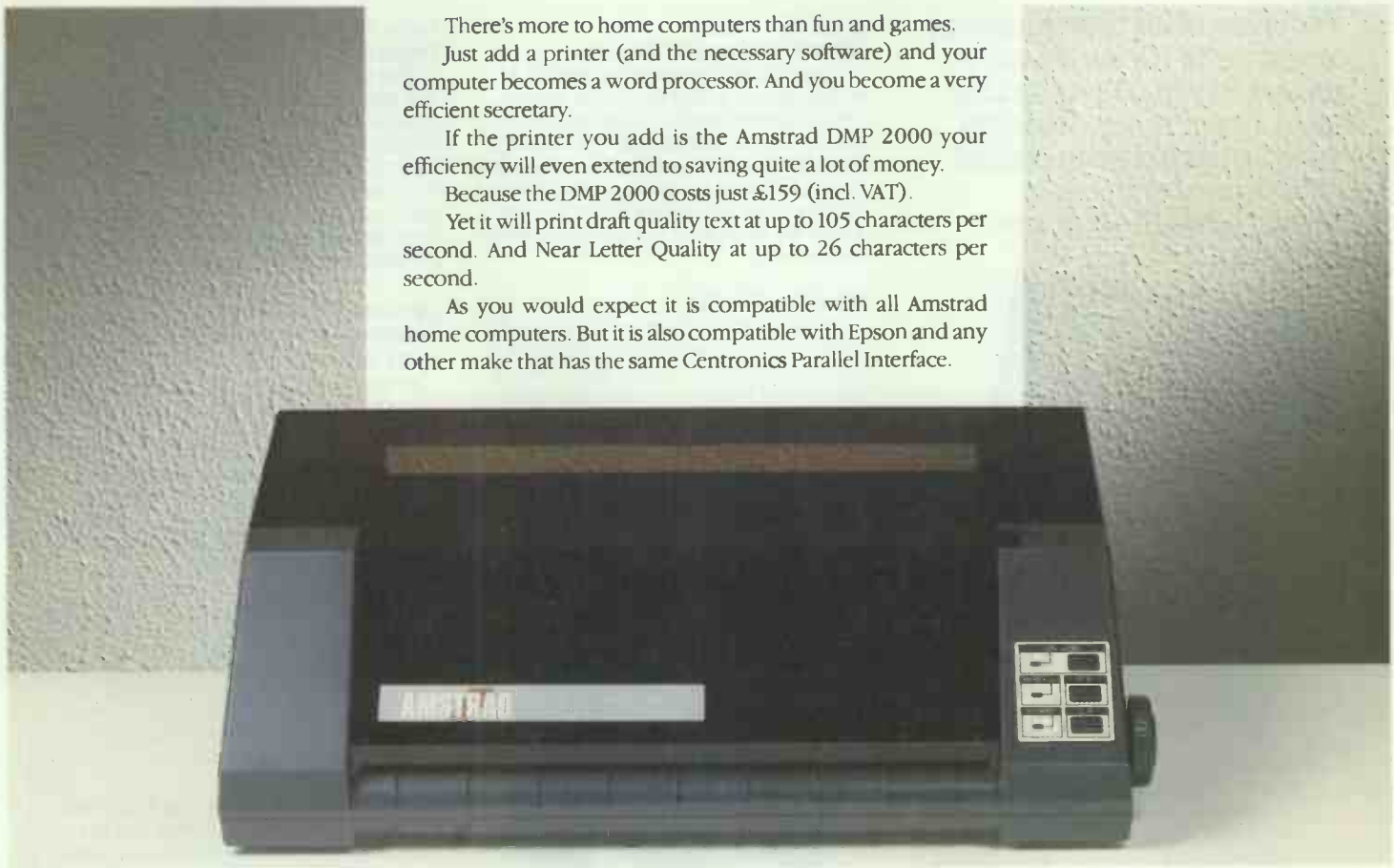

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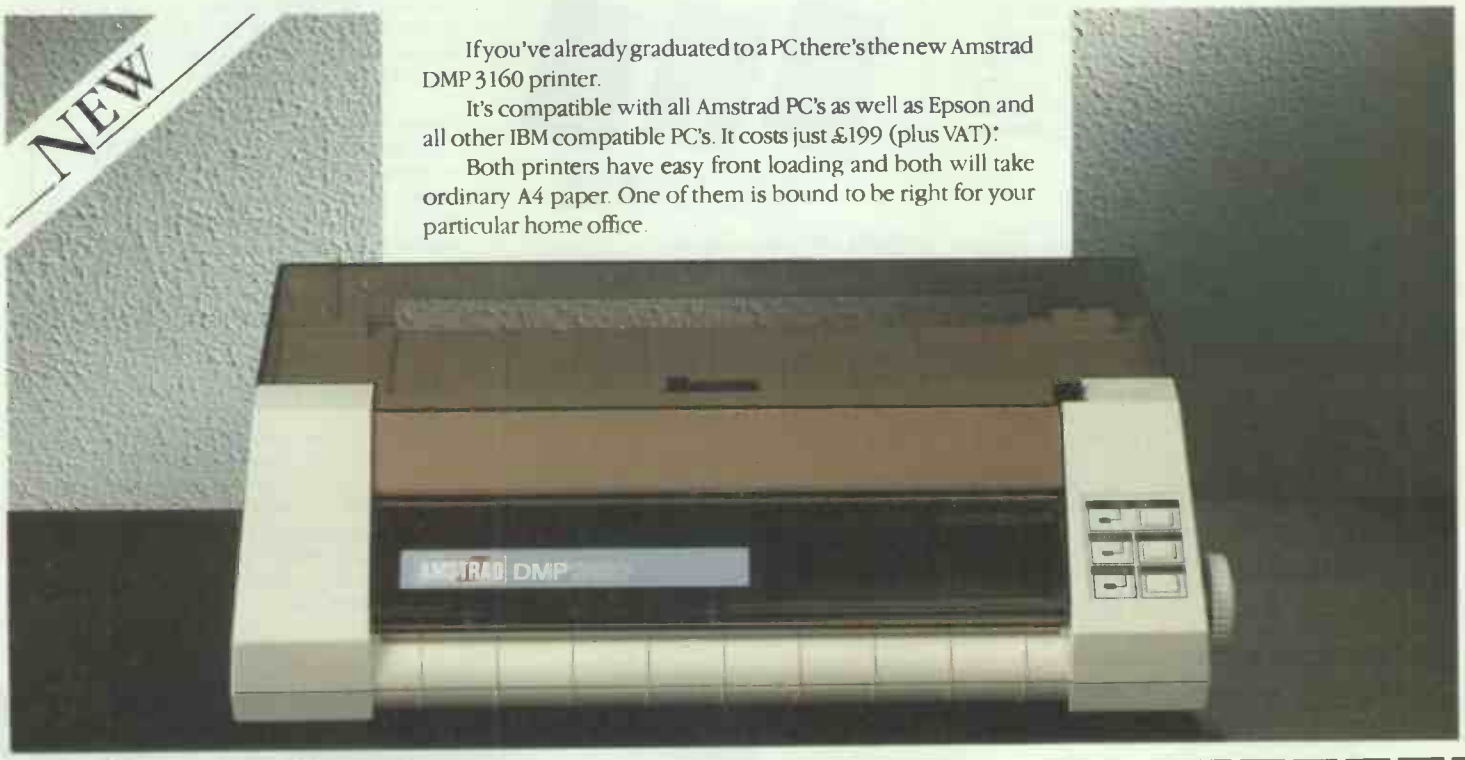

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It's the electronic organizer for this electronic age. Neither you nor your secretary need to face 1987 with old-fashioned 1887 diaries. Traveling SideKick has everything they have—and a lot more. (Unlike dusty old diaries, Traveling SideKick doesn't "expire" at the end of '87, because it's electronic and good for '88, '89, '90 and on and on and on.) It's a professional binder, a software program, and a report generator—a modern business tool that prints your ever-changing appointments in daily/weekly/monthly/yearly form. (If your schedule changes *hourly* Traveling SideKick handles the changes instantly.) Whether you use your own personal computer or have someone's help with that, Traveling SideKick is the smart new way to take your computer with you—without taking your computer with you. Minimum memory: 256K.

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While you use SideKick, Reflex, Lotus 1-2-3,® and most popular programs, Turbo Lightning proofreads *as you write!* If you misspell a word, Turbo Lightning will beep at you instantly, and suggest a correction for the word you just misspelled. Press one key, and the misspelled word is immediately replaced by the correct word. And if you're ever stuck for a word, Turbo Lightning's thesaurus is there with instant alternatives. Minimum memory: 256K.

Lightning Word Wizard™
Technical Reference Manual For Turbo Lightning!

An important addition to Turbo Lightning, Lightning Word Wizard includes fascinating and challenging word games like "Akerue" (try reading that backwards), "That's Rite," "CodeCracker," "CrossSolver," "MixUp," and "FixUp," to name some of them. Lightning Word Wizard introduces you to the "nuts and bolts" of Turbo Lightning technology, and gives you more than 20 different calls to the Lightning engine. Minimum memory: 256K.

Turbo Pascal, the worldwide standard in high-speed compilers, and Family.

Turbo Database Toolbox®

A perfect complement to Turbo Pascal, because it contains a complete library of Pascal procedures that allows you to search and sort data and build powerful database applications. It comes with source code for a free sample database—right on disk. Minimum memory: 128K.

Turbo Editor Toolbox®

Recently released, we call our new Turbo Editor Toolbox a "construction set to write your own word processor." Source code is included, and we also include MicroStar, a full-blown text editor with pull-down menus and windowing. It interfaces directly with Turbo Lightning to let you spell-check your MicroStar files. Minimum memory: 192K.

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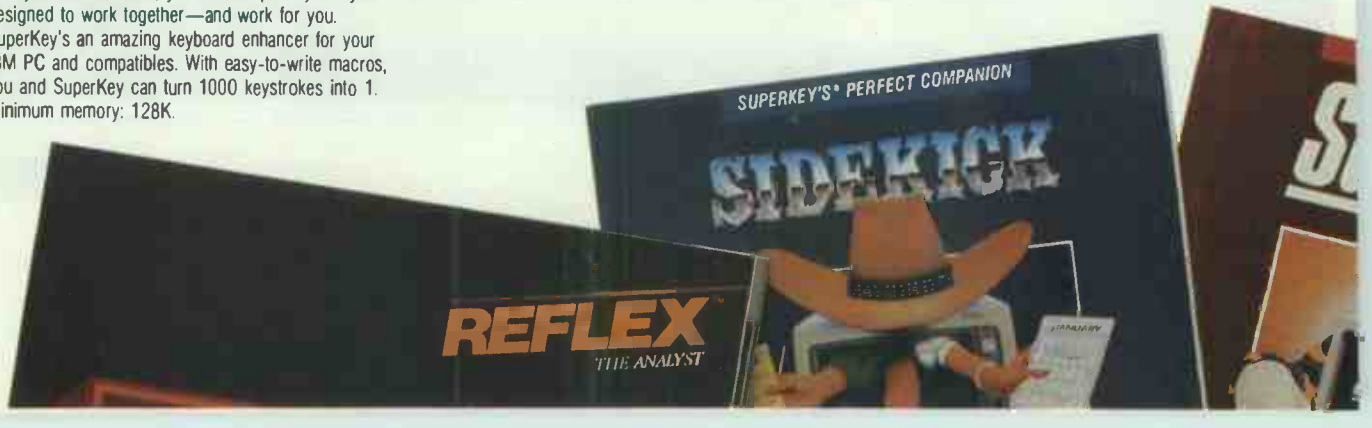

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Technical Specifications

- ☑ Compiler. One-pass compiler generating linkable object modules and inline assembler support. Included is Borland's high performance "Turbo Linker". The object module is compatible with the PC-DOS linker. Supports tiny, small, compact, medium, large, and huge memory model libraries. Can mix models with near and far pointers. Includes floating point emulator (utilises 8087/80287 if installed).
- ☑ Interactive Editor : The system includes a powerful, interactive fullscreen text editor. If the compiler detects an error, the editor automatically positions the cursor appropriately in the source code.
- ☑ Development Environment : A powerful "Make" is included so that managing Turbo C program development is highly efficient. Also includes pull-down menus and windows.
- ☑ Links with relocatable object modules created using Borland's Turbo Prolog into a single program.
- ☑ ANSI C compatible.
- ☑ Start-up routine source code included.
- ☑ Both command line and integrated environment versions included.

Sieve benchmark (25 iterations)

	Turbo C	Microsoft C	Lattice C
Compile time	3.89	16.37	13.90
Compile and link time	9.94	29.06	27.79
Execution time	5.77	9.51	13.79
Object code size	274	297	301

Benchmark run on a 6 Mhz IBM AT using Turbo C version 1.0 and the Turbo Linker version 1.0 ; Microsoft C version 4.0 and the MS overlay linker version 3.51 ; Lattice C version 3.1 and the MS object linker version 3.05.

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My computer's name and model is

E11

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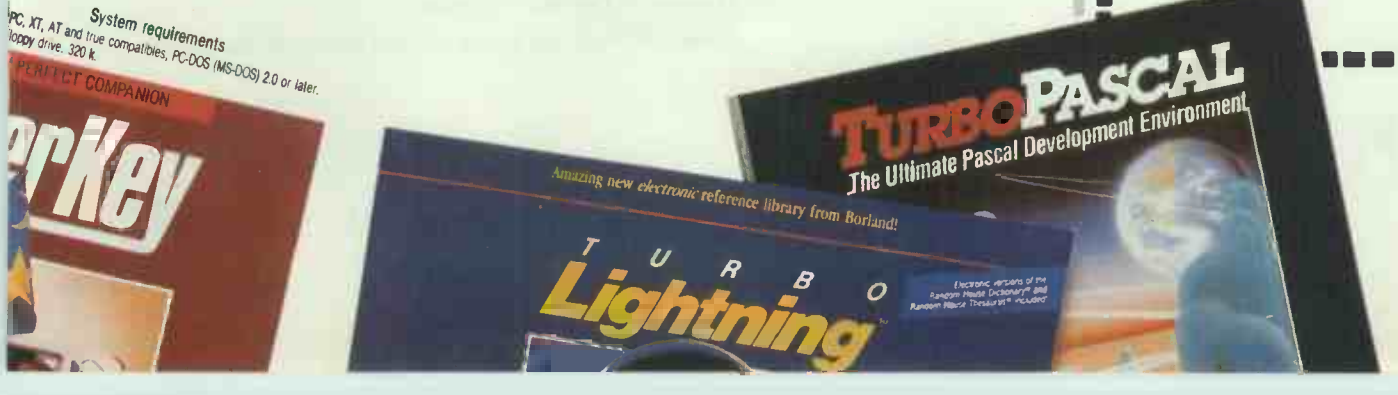


Publish and be praised.

THE COMPANY
BUSINESS Report
May 1987
Volume 1, No. 1

Desktop Publishing Increases Its Share of the Market

Employees Interested in Receiving Their Own Desktop Publishing Software

GEM Desktop Publisher Sets Price/Performance Benchmark for Software Industry

Digital Research announces its high performance easy to use, full-function page composition software application -GEM Desktop Publisher. Introducing the true price/performer, available at the end of May, at a suggested retail price of £295.

"We're excited to provide an integrated team of products for personal publishing with the addition of GEM Desktop Publisher to our family of GEM applications," said *Dick Williams*, Chief Executive Officer of Digital Research. "Users now have a more complete and easier to use solution for combining text and graphics than ever before. But more important for the user is the outstanding price/performance offered by our product," continued Williams.

Flexibility is a key feature of this GEM-based software product. The user can define a location anywhere in a document and automatically place text or graphics at that location.

Continued on page 5

Projected Market Shares

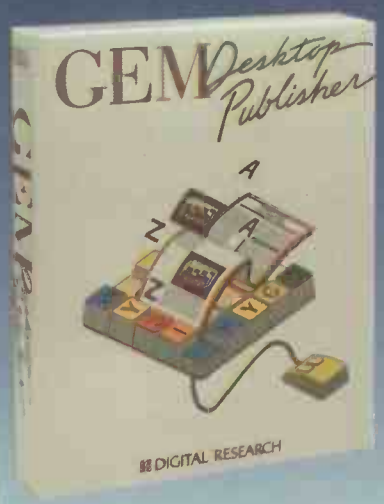
Desktop publishing expert *John W. Seybold*, establishes some shopping criteria for the "godsend" desktop publishing software, from the May issue of *Byte*. He feels the system should "let you compose text in a manner that comes close to the requirements of typesetting." Including well-designed and proportionally spaced characters, multiple fonts, sizes, etc.

Seybold also believes that the system should allow you to perform the composition tasks "in a manner that is considerably less code-intensive than that which characterizes trade computer typesetting." This includes the feature of WYSIWYG which "lets you point to the effects desired rather than requiring that you describe them by some sort of command language". He feels that software programs that were "code-intensive" and required "considerable user experience" should not be included in the desktop publishing category.

"As a product offering, it's the best thing that ever happened to personal computers," says desktop publishing expert, *John W. Seybold*, about desktop publishing, in the May issue of *Byte*.

Desktop publishing, the latest development in microcomputers, offers the user the ability to combine text and graphics to create professional quality brochures, newsletters, fliers, sales reports, marketing briefs, books, manuals, forms, and other publications on their own computer. And, as *Stewart Alsop* says in the February edition of *PC Magazine*, "Ever since Guttenberg, publishers have been looking for a better, cheaper, faster way to get words and pictures on paper."

Growth for PC Software Market
Software Revenues for U.S. Suppliers



GEM® Desktop Publisher™ makes it easy.

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GEM Desktop Publisher is so easy to learn and use. Its icon-based, 'drop-down' menus eliminate the need to memorise complicated commands and help you become productive immediately. GEM Desktop Publisher features the fastest turn around time from concept to high quality finished output.

It is big on performance and features yet small on price, setting a new price/performance benchmark at £295 (ex. VAT).

GEM Desktop Publisher is compatible with your existing word processor software. You can easily incorporate images that you create with the GEM family of applications from GEM Draw Plus to GEM Graph.

GEM Desktop Publisher is so flexible that you can use word processor files or keyboard commands from many popular word processors, such as WordStar™ and MultiMate™.

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Mission wins

The Mission 386: £1990 worth of 'comprehensively configured' Wearnes-built micro

All the people who were laughing at Mission at the PC User Show in June can now wipe the smile off their faces: the company has regained the 'exclusive' badge for its imports of Wearnes-built ALR machines in the UK.

At the show, Euromicro was able to offer a 386 system for £1600 — a good £400 below Mission's price. And both systems were built by Singapore-based Wearnes, which owns the American firm, Advanced Logic Research (which designed its hardware).

The original plan was for Wearnes to establish itself, slowly and carefully, in the UK, using Euromicro as the stock onto which it would graft itself.

But Mission boss, Farad Azima, is not a man to deal in half measures, and he stepped into the market with a big splash. Not only did he hold a banquet in a large (and expensive) London hotel to celebrate winning the ALR franchise, but he flew all the ALR people over to London to witness the launch.

Presumably, the mesage reached home — that Mission was the company which was prepared to spend a lot of money establishing the ALR range in the public eye; and Euromicro, which had a 'gentlemen's agreement' to buy hundreds of 80386 machines from the factory direct, suddenly found itself out in the cold.

'We have had our distribution agreement terminated,' said Jim Wood at Euromicro. 'And there is no possibility of Wearnes taking us over to start their European headquarters — they have now set up in Italy.'

With some satisfaction, Farad Azima confirmed that he was now sole importer of ALR hardware, and attributed this achievement to his plans for 1988.

'We will be working towards building the ALR machines here in the UK, but, more than that, we will actually be designing parts of the system here, contributing to the range,' he said.

An Apricot AT-compatible with a built-in network has appeared, just in time to prevent people from wondering whether the company's products were starting to look rather ordinary.

This trick of being one jump ahead of the dull mob is what characterised Apricot when it was the leading UK micro maker, and it's nice to see it again.

On the other hand, £2000 for an AT clone (with a green screen) these days isn't very special, even with a 30Mbyte hard disk. So, if Apricot does make a success of this new range, it will be proof that its name still carries some weight in the market.

The network is provided on the main board of the computer, in a single chip 'which will make it possible to build full-function 286-based networks at approximately 50 per cent of the cost of systems currently available'.

Apricot does specialise in corporate networks and multi-user systems, these days; and that sort of touch should appeal to people who don't necessarily buy the cheapest network system around.

But the writing is on the wall. At press time, I was eagerly looking forward to seeing a Mitac system, based on the far superior 80386 chip, for well under £2000 — a price level which Mission has already reached.

Tarnished Gold

It's hard for me to talk to my friends inside Telecom Gold these days because they live by a different set of assumptions from mine. They seem to regard themselves as an essential utility which has to *cover* its costs. I regard them as a commercial venture which has to *manage* its costs.

I'll have another moan about money in a moment. But first, consider: unlike Prestel, you can't play Shades and mail isn't free. Unlike BIX, there aren't lots and lots of fascinating other users in various online conferences. Unlike The Source, you can't download interesting shareware programs. And, unlike CompuServe, you can't send messages to most American computer users through CServe Mail or MCI Mail.

And, Gold has pitifully few users because it only sells well in the UK (where it is said to be the market leader).

The discovery that you can send and receive proper computer files rather than plain text (ASCII files) was made by accident — I discovered that my system manager had installed FT (File Transfer).

You can only use this if you dial into the system through packet-switching networks because Telecom Gold's own PADs are strictly 7-bit outfits. As a result of this, you can't transfer files from one Gold computer to another without a few interesting kludges.

I took a nice, simple file, 2k or so in length, which happens to be a program called TFind from Kiwisoft (a public domain source). I uploaded it to my own system, system 81:, using an error-correcting protocol called Xmodem. I have seen slower versions of Xmoden, but not often.

On my system, I was given the option of storing this file as an ASCII file (no use, obviously), a binary file, or an 'expanded hex' file. So I did it twice: once as binary; and once as 'expanded hex' because it warned me that binary files couldn't be sent as electronic mail to other users on different systems.

The expanded hex looked just like an old 'DUMP' under CP/M and it did, indeed, prove possible to send to another user on another system. Magically, although it had an introduction saying 'To You from Him (and so on)' at the top, it was perfectly transparent to the expanded hex downloader at the other end, and the recipient was able to run the program. Success!

But at what price?

Sending via this version of Xmodem took an incredibly long time and, although time charges are somewhat lower than they used to be, it would be silly to try transmitting a file of anything like the length of this Newsprint column.

Worse, you are charged something close to 30p to transmit, and another 30p to receive a simple 2k file. This column — which is an outline format file — would cost *pounds* at each end.

The still-embryonic Mercury Link 7500 rival service reckons that Telecom Gold can only manage 400 users per computer, where Mercury can accommodate 1000. Mercury encourages users to log on, transmit data fast using fast modems, and log off, leaving the lines free. Gold, by contrast, complains that it can't make money now that its users have worked out this cost-saving trick.

A commercial outfit, given this problem, would restructure its billing system and its costs in order to continue to attract users.

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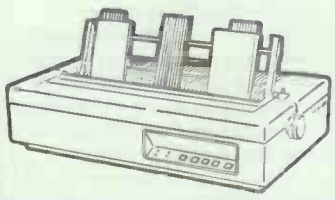

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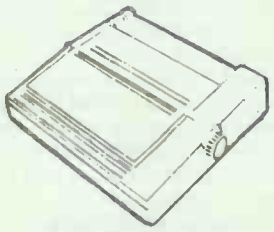

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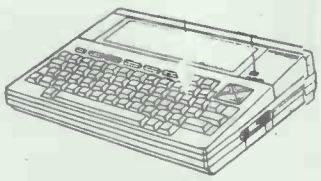

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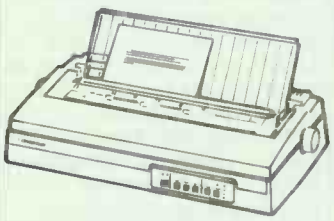

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The future belongs to us

Our future is being decided now. Most readers of *PCW* are playing the role of unwitting midwives, facilitating the birth of who knows what kind of technological nightmares.

Because we're devoted to our computer technology, we tend not to think in terms of right and wrong, good and bad. We're in the computer game because we find it interesting for its own sake. We push the occasional worry about the consequences of our work to the backs of our minds.

But it's time we took stock and, with the help of BBC1's *Welcome to my World*, entered the vital debate which will decide the future for us and our descendants.

This short series (five programmes, BBC1, Sunday nights) takes us into the future we are presently creating. Each programme takes a single theme and presents it in the form of a documentary. This means that if you missed the first (broadcast on 11 October) you won't be lost if you switch on next Sunday.

To give you an idea of what the series is about, programme one looks at the future of employment (or lack of it) and the way companies leave the country to avoid the high taxes required to support those they've thrown out of work.

Another programme reveals what happens when a car company discovers that it can return better profits to its shareholders by playing the money markets. We are all caught up in the stock market as we go to the garage or the supermarket to find the prices changing by the day.

Other programmes tackle computerised warfare, the privatisation of information, and how a smoothing iron could make £10m profit on the stock market. There's much more, but you get the general idea.

There is a positive side, if you can call it that. Individuals find ways of breaking into the electronic systems. With a telephone, you could commit an electronic crime in Toronto while based in Mongolia. One chap even makes a tidy living reprogramming bank cash cards.

Today, we can still choose from a variety of different futures, but, as the ownership of real computer power becomes more and more concentrated and its distribution more and more dispersed, we will lose the opportunity to choose. Those with power will become increasingly powerful and those without (like you and me) won't stand a chance.

The programs might frighten you because it already seems too late to stop our present drift towards a world in which dancing electrons become more important than people; a world in which a computer-aided killing on the Stock Exchange is more worthwhile than productive work performed by human beings.

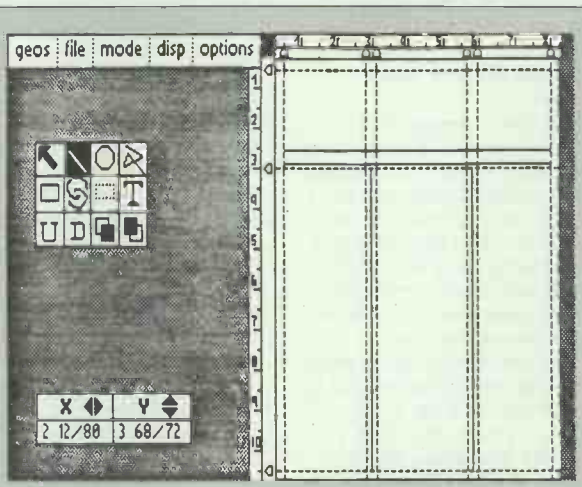
Please watch the rest of the series or, better still, video them so you can watch them twice. The program brings home, in a fictional documentary style, the possible results of our present love affair with information technology. We need public debate, urgently, about the consequences of present decisions (or lack of them). What better place to start than through the pages of *PCW*.

Don't wait for another TV series or another appeal in the magazine. Watch this series. Think about what's being said. Sleep on it, and if you feel you have a contribution (for or against), write to the editor or to me at *PCW*, VNU House, 32-34 Broadwick Street, London W1A 2HG, and we'll get the debate into the open before it's too late.

David Tebbutt

BBC

The BBC: an investigation of IT out of control



Windowing on the Commodore 64 is the province of GEOS (graphic environment operating system): this now has a desktop-publishing system attached. Geopublish is from Berkley Softworks, which wrote Geos. It will sell for $70, and the company is (perhaps understandably) unforthcoming about exactly which versions of the Commodore 64 it will run on.

Details from California on (415) 664 0883.

Driving mice away

Amstrad's decision to put a mouse on every PC was great: unfortunately, as time goes by, little problems emerge. In particular, using this system with Microsoft Windows isn't normally possible because, although Amstrad meets most of Microsoft's published mouse requirements, Microsoft itself uses 'illegal' mouse calls.

A solution has been devised by Dr George Bielstein at Mercantile and General Facilities: a piece of software costing £22.50 which will 'drive' the mouse correctly.

Another problem that has bugged me with one or two timer-based programs on the Amstrad, is the fact that the mouse alters the clock to 18 clicks per second rather than 55 clicks.

This is easy to solve if you can sacrifice your mouse: just don't use the MOUSE program at startup and the clock will work normally. Otherwise, you could be in trouble.

Dr Bielstein is available on (01) 876 1670.

The search goes on

The quest for the ideal comms program continues, with Mirror and Transend being my two newsworthy developments of the month; and there's still no outright winner.

Transend now has the ability to do sliding-window Kermit file transfers, which every serious bulletin board hacker will want for transatlantic work. It still does Prestel well, and has a noticeably improved user interface, editor and programming language.

Mirror remains the only program that will work in the background, leaving me to run programs while it stores incoming batches of data. But it still doesn't do Prestel/viewdata, and *won't* do sliding window Kermit or Xmodem.

Then, in September, Softklone executives arrived in the UK and took me to a quiet corner of a hotel in Essex where they showed me work in progress on both these essentials.

The new Mirror should be out in a few months — possibly before the end of the year, definitely in time for the Which Computer? Show in February 1988. That version will probably not have a sliding window facility, but it will have Prestel — handled, cleverly, as a terminal emulation. However, it doesn't make the program any larger.

Taking the risk

You might like to risk the sum of £12 on a program called Encode for the BBC Micro, especially if you have a shared hard disk in a network.

The software encrypts any BBC file with a password, so that even somebody with a disk sector editor would not be able to read it.

The author, TK Boyd, claims that he'll give a prize (no details) to anybody who breaks his encryption system, and he'll sell you the manual for £1 (to be deducted from the cost of the software later) to read before buying the code.

It could be well worth doing, especially if you have confidential school reports, or a diary, or some other embarassing information which you don't want casual passers-through-the-system to read.

Details from Boyd at Seaford College, Petworth GU28 0NB.

Brown Bag strikes again

Sandy Schupper wanted to know (he said) what I thought of legal proceedings against Database, publisher of various computer magazines. 'It's a disaster for us, don't you think?' he said.

This calls for some explanation. Make yourself comfortable.

Schupper is about to release an 'artificial intelligence' text editor, called Mind Reader, onto the UK market. It's an editor which studies your writing habits, learns what you are likely to type, and offers to complete the word or even the sentence for you. So, if I type a capital V, it might assume I was starting to type VNU, the publisher of *PCW*.

With this launch under way, Sandy is very worried about his image, and that image has just been given a big PR boost by a smallish Database publication which gave away copies of PC Outline — a software outline processor used extensively in the *PCW* office — to several thousand readers.

Most people would consider such publicity a boon, but Sandy reckons it is a disaster.

His company is trying to popularise the concept of free-trial software, known as 'shareware'. It's a concept which has made money for several American suppliers, and Sandy has brought it to the UK where he has added his own special touch, trying to create a new kind of 'pyramid shareware' for us.

That isn't what *he* calls it. He calls it Brown Bag Software UK, and it's a publishing/distribution outfit which owns the rights to HomeBase and PC Outline, and a few others.

All these programs have one thing in common: you can copy them freely and give them to friends. If you use them, however, you have to write to Sandy Schupper's Brown Bag Software and pay the 'registration fee'.

And Sandy's big innovation is that he offers you something back if anybody else registers a copy that you gave them to try. A pyramid-selling system, in fact; but not, I would think, in any way unethical.

The 'disaster' which had Sandy reaching for his expensive lawyers was simple — this Database magazine gave away the wrong version of PC Outline. It carried the American address for registration, suggested the wrong price, and was not the latest, relatively bug-free version.

Sandy went wild (say his colleagues) and raised hell. 'Well, what do you think?' he asked.

This put me in a tricky situation.

For a start, I reckon the situation could only be seen as a disaster if he got nothing out of it. Knowing Sandy as I do, I find this hard to imagine. He appears to have the magazine over a barrel on a technicality (the sign-on does specifically prohibit using the software in a promotional campaign without the written permission of the copyright holder) and so he is certain to beat it into offering a pretty nice deal in exchange for calling off his lawyers. Well, calling it a disaster is probably going to increase the magazine's sense of his rage, so why not?

After that, before agreeing that disaster has struck, you have to ask what would have happened if the magazine had given away the correct copy.

The answer is that one, I'm afraid, is that if it had proved popular, Brown Bag UK would have been placed under extreme strain.

And it is my considered opinion that it wouldn't have stood it.

The organisation currently (at press time) consists of a contract outfit (two people) receiving requests for software and money for registration. It's a complex system because they receive requests from two sources and have to keep accurate records.

One of the sources is Brown Bag's own bulletin board — which, by the by, you are welcome to call on (0279) 74885 — which has the advantage of being a *great* way of leaving a message for Sandy Schupper himself — he reads it.

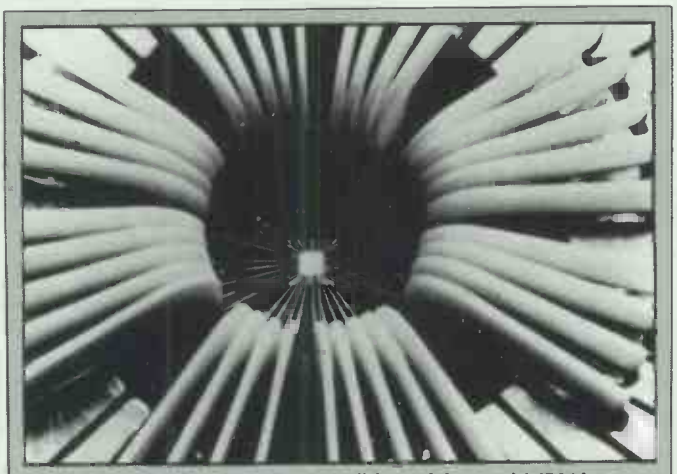
I offer a final Sandy Schupper anecdote: I put the phone down on his voice, resoundingly pointing out that the giveaway disks 'had the wrong version of PC Outline, and had the price in dollars, and had the American address, for God's sake. Nobody's going to send registration to an American address! It's done us incalcuable harm in the market . . .'

And, I download PC Outline from Brown Bag's UK bulletin board. Not only was it the same version, with the same American address and with the price in dollars, but it had the same bug in 'version 3.24' which I reported in version 1.6 when I first met Sandy, a year ago.

I don't know what would have happened if many of the 35,000-odd recipients of the disks had tired to register with the UK office, but the American address might be seen by some as not so much a disaster but more of a lucky escape.

Despite all these misgivings, it has to be added that Sandy is taking this shareware idea seriously. He's even commissioned some serious market research showing, for example, that 95 per cent of corporate users of shareware do pay for it, but that less than 10 per cent of home users do.

I hope he can have the bugs ironed out and make a go of it.



Frightening, the semiconductor builders of the world. IBM has released pictures of transistors, made with parts 'one thousand times thinner than a human hair' — something which theorists had doubted was possible. Just to remind you (if you had forgotten) that IBM is the world's largest *and* most advanced builder of silicon devices.

It also builds computers, of course.

Monitor madness

A very worried Microvitek has sent out a message warning anybody who has its Cub monitor that they shouldn't open the thing up and try adapting it for the Acorn Archimedes.

Normally, nobody would dream of doing this, but it seems that somebody — 'I'm afraid we don't know who' said the publicity manager at Microvitek — has published an article showing how.

'The article apparently advises that reconnecting some of the circuitry inside the monitor will enable it to work with the Archimedes,' said this executive. 'I've only seen a copy of the article, and I haven't tried doing the operation, but it seems that it could be very dangerous.'

The voltages inside colour monitors are very high — not just dangerous, but *lethally high*. Could a skilled person make the changes safely, I asked?

'We're seriously looking into that, but the point is that even if you did have the skill to make the alteration, you probably wouldn't, because the Cub doesn't have the performance needed. It would produce a very poor-quality picture with this modification,' said the Microvitek source.

Sharing the cost

An alternative to the shareware concept, and one being tried by MathSoft to publicise its MathCAD package (reviewed in *PCW* last month) is to offer a cut-down version of the program, free.

MathCAD itself understands equations. 'The user can enter equations, and see them displayed with all of the special symbols and notations, as if written on a notepad,' promises MathSoft International.

The company has a 'mini-MathCAD' available free, on a disk, and will send this — 'free of charge' it says — to any *PCW* readers who request it by phoning (0827) 86239, or writing to MathSoft, Freepost, Tamworth, Sussex B79 7BR.

This mini-version comprises a demo program to run through some of the features; a tutorial to teach the basics; and a Mathcad system, restricted only in being unable to do serious printing, store documents or work on large documents. ▶

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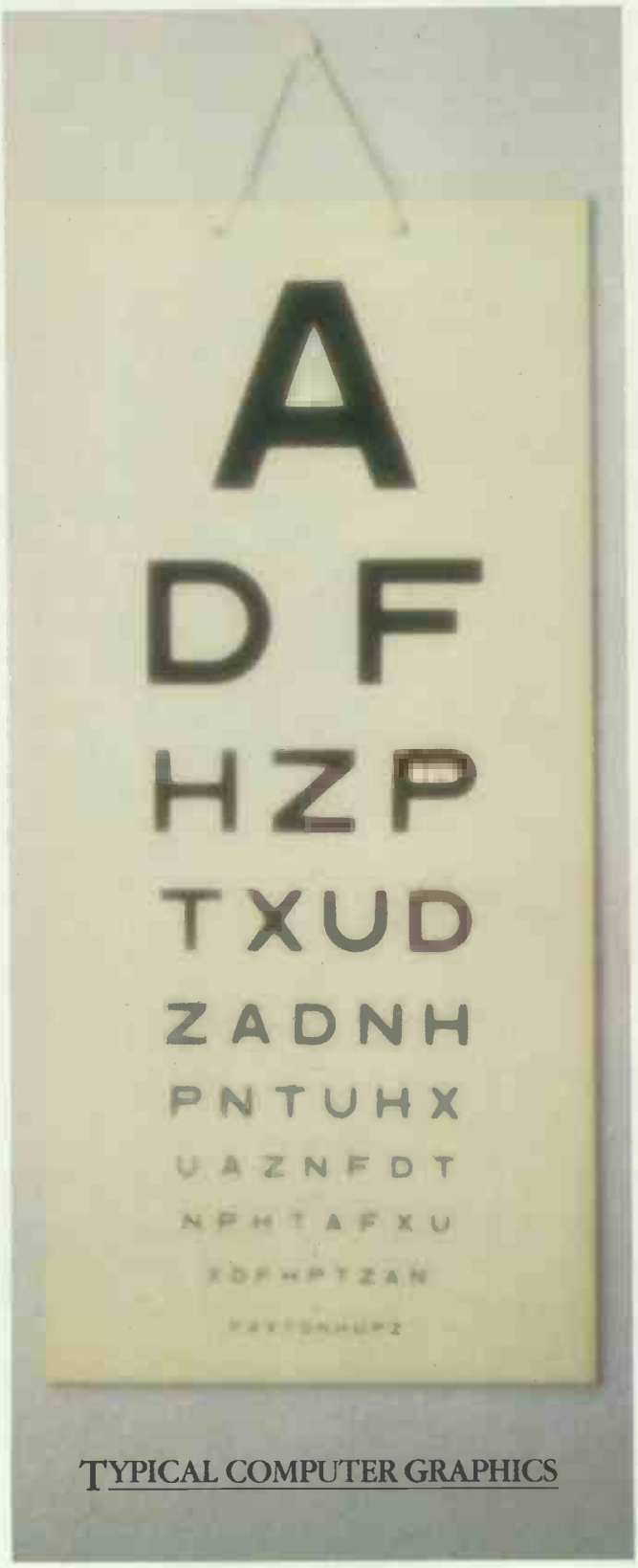
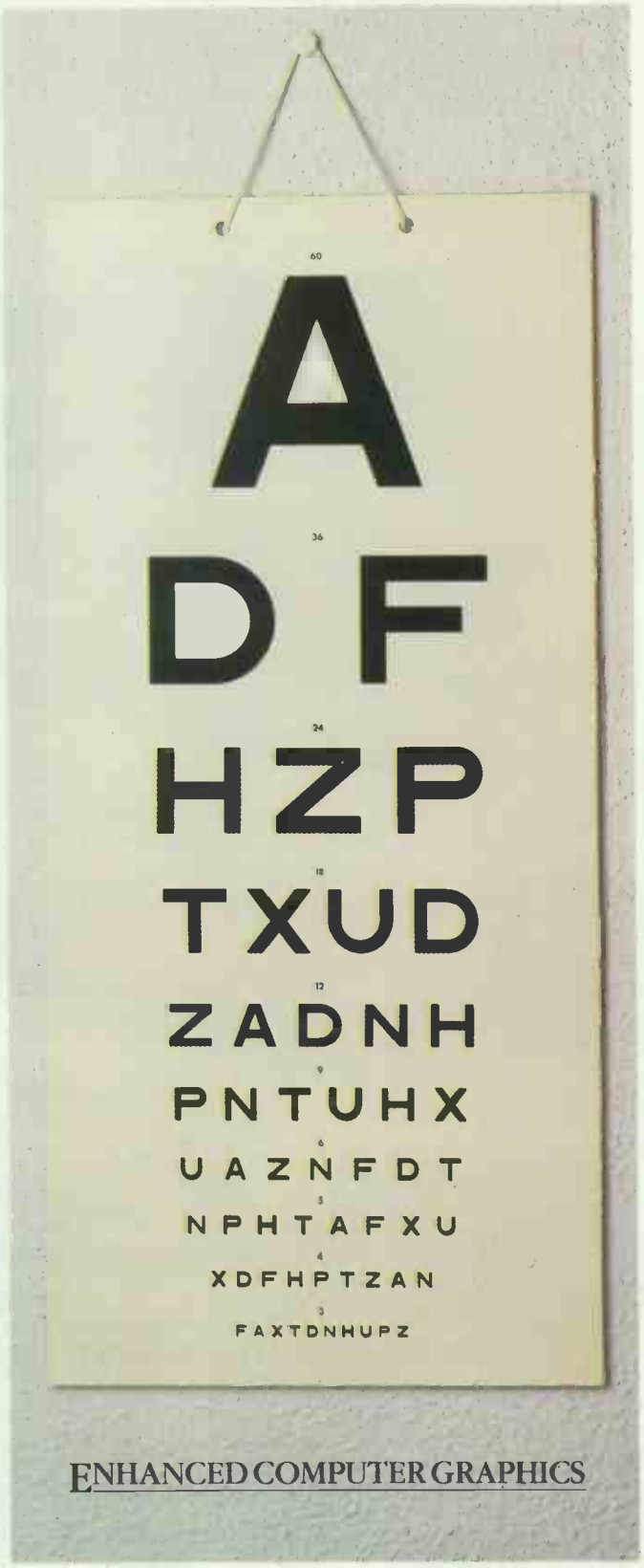


TYPICAL COMPUTER GRAPHICS



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For the experts, this means EGA and CGA with colour ECD monitors. And MDA, monochrome EGA and Hercules with monochrome monitors. For the ordinary user it just means clearer information, and the chance to get into high quality desktop publishing as well as exciting areas such as Computer Aided Design.

BIGGER AS WELL AS BETTER

The standard memory is now even bigger at 640K RAM. And all 1640's are powered by the 8 Mhz 8086 processor, still up to twice the speed of some of our competitors.

There are 3 full size expansion slots allowing you to use your 1640 for networking, modems and other applications.

And you get an RS 232 C serial port as well as a parallel interface port for printers and lots of other add-ons. (There's even a joystick port, so you can play ultra high resolution games.)

There are 9 models in the range, with a choice of enhanced colour, colour or monochrome.

From 360K byte floppy disk to 20 megabyte hard disk and all including a mouse and free software. So whatever your needs, there's an Amstrad PC 1640 that is exactly right for you.

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WordPerfect PlanPerfect Library Executive

A little dodgy, maybe . . .

You certainly won't be patronising PC-XS (get it? Excess?) for used micros. But, nonetheless, you might soon find yourself buying from somebody who does.

This new outfit charges a hefty £100-£400 to anybody with a micro to sell (depending on the number of items) and keeps a database of used equipment. It then offers the database to potential buyers at £250 per year — and, on top of that, it takes a commission charge.

The idea is to 'encourage the second-hand market for computer equipment' and, at first sight, it sounds absurd. Who would pay that sort of money?

Well, possibly, dealers and distributors, and corporate buyers.

Despite the new company's proud words, there already is a market in used micros (used mainframes, of course, have sold briskly for years). It is generated by repair firms.

In the last few months, several people have written to *PCW* offering ultra-cheap PCs — someone had 300 for prices as low as £250, built out of spare parts left over from dead machines.

One big maintenance firm sells used IBM PCs, refurbished, for just over £1000 complete — and there are a lot of people who are quite delighted to have the Real Thing at the price of a clone.

The question does arise, however, as to whether these prices would make it worthwhile selling.

Car distributors and dealers have a well-organised system of auctions and trades, so that any dealer who wants to can buy your used car as a part-exchange on a new one. But computers are much cheaper than cars.

Consider: someone is taken by a new AT clone, cost around £1500. They offer the dealer their old CP/M machine in part-exchange — it possibly cost £1500 itself when new, six years ago.

The dealer will have to pay £100 to this broker. The machine, after £200 (at least) has been spent repairing it, will have to go out and compete with the new Amstrad 9512 at £500 — including printer! At best, it might fetch £300 retail. The broker takes a percentage, the buyer has to pay a fee, and at the end of all that, what is left for the dealer?

'I could maybe give you a fiver for it,' he will say, sincerely.

And, if the trade-in is a genuine XT, which costs £3000 at birth, it has to slug it out with brand-new clones at £500.

Dataflex has come up with the idea of a replacement 80386 motherboard, costing £1750, for the original IBM PC or XT. You keep the case and plug in the new board: it takes just 20 minutes (Dataflex says!) and you have a supermicro.

Even that deal doesn't sound all that wonderful to me. I know where I can get a complete 80386 system, with a high-density 1.2Mbyte drive and a proper big-system power supply, for roughly that price — talk to my friend, Robin Bradbeer, about a Mitac system. And I'd be able to keep my old PC as a spare, or a means of educating my children, or for writing 360k diskettes . . .

I think people will just keep their old machines — unless, of course, PC-XS can cut overheads. Now, where did I hear about somebody with an old mule and a cart?

PC-XS can be contacted on (0734) 591551.

Dataflex sells the Hauppage 386 motherboard, on (01) 543 6417.

HEADLINE NEWS Summer '87

LaserMaker

a brief introduction...

by TOM O'CONNOR, Managing Director

IBM 4250/II ElectroCompositor

ElectroErosion Technology and the IBM 4250

Satellite Keyboards

"the image setters"

I was quite impressed with the specification of IBM's latest 'High Resolution Printer, model 4250' — until somebody sent me some printout.

The printer is one which LaserMaker now supports with its pretty pricey Composition Software; and, to prove it, the company sent me a page which could be used as a master for making a print plate. It's an *electro-sensitive sheet of silvered paper!*

For making plates, of course, this is no drawback; the contrast between the aluminised surface and the carbon sub-layer is very high. And the 600 dots per inch resolution is quite good enough for newspaper production, frankly.

But, somehow, when you have spent £20,000 on a printer and £1595 on publishing software, you don't expect to get a sheet of paper that looks as if a giant Sinclair Spectrum printer shoved it out!

LaserMaker is on (0602) 731803.

Clouding the view

Let's play a game. Imagine for one moment that you are a whacking-big software house. You have spent a few million dollars developing a nice, easy-to-use, graphical front-end for MS-DOS. You have publicly said that the future lies not with the boring A> prompt, but with windows and icons. You even scold other software houses when they write directly to the hardware, ignoring the pretty (slow) user interface. Finally, you decide to launch an upgrade to your word processor.

Q Do you upgrade your word processor so that it runs under your amazing graphical environment?

A Of course you do.

Unless you're Microsoft. For a company that considers Windows to be the answer to life, the universe and everything, you may think that Microsoft is displaying much *chutzpah* in releasing Word 4.0 *— not running under Windows.*

I think it was a good decision for users, but bad for the company. Good for the users because Word 4.0 has lots of nice, new features and is faster than Word 3.1. Bad for the company because Microsoft is going head over heels to persuade other software houses to revise their applications to run under Windows.

Interestingly, Windows comes complete with its own word processor, Windows Write. I use Windows Write and Word 4.0 for different purposes. Windows Write is great for short letters (incorporating graphics), while Word 4.0 is useful for longer documents.

For Word 4.0, not running under Windows means two big things: firstly, it doesn't display *true* WYSIWYG; and, secondly, it is *very* fast.

Having used Word 4.0 for over a month now, I love it. With added functions like revision marking, redefinable keys, document retrieval and macros, it gives Word Perfect a run for its money.

Word 4.0 sells for £425 and Microsoft can be contacted on (0734) 500741.

Martin Wren-Hilton

Anything to declare?

I have to admit that I've never needed a customs form for a portable computer when lugging one around the world, but should you be worried about the possibility, you'll be reassured to hear that the London Chamber of Commerce has researched the problem.

Kindly, that body has passed on its own phone number as a point of reference for people wanting a 'carnet' or machine passport.

The Chamber says: 'Many business travellers have a rude awakening at the Customs desk when they cannot carry their PC along with their camera and calculator, and an admissions carnet and export licence can avoid long delays at Customs.'

I suspect the advice is more important if you are crossing borders into and out of Comecom countries, where certain hi-tech stuff is prohibited for export from the West. Although I have to add that I've never even seen a Customs official on my way out of a country, it's always imports they're looking for — and I gather they're more likely to be interested in bags of white powder than silicon chips.

Details can be obtained on (01) 248 4444 from Brian Burke at the London Chamber of Commerce. ▶

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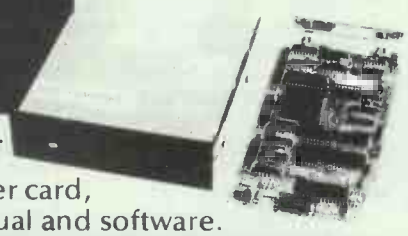

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AMSTRADS – Lowest prices guaranteed – phone for details

All Kudos Systems' products come with a 12 month no-quibble guarantee

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Noise reduction level

Normally, boxes to quieten printers cost more than the printers themselves. At a startling price of £40 (£36 if you assemble it yourself from parts) Kador has combined the tasks of an acoustic box with the requirement for a printer stand, with a kit called Peace'n'quiet.

Kador also makes a data switch box for the Amstrad PCW (old version) at £278. This marvel can be used for both serial and parallel connections, the company says, though the details supplied are scanty. The idea is that you keep your old PCW printer when you buy a new daisywheel, and can switch easily between the two. Or you can switch between printer and modem without constant unplugging.

I do like clever little accessories like this, so (under protest) I'll even mention Kador's £14.50 screen filter (even though I can't stand the things).

Details of all these products can be obtained from Kador on (0784) 2522662.

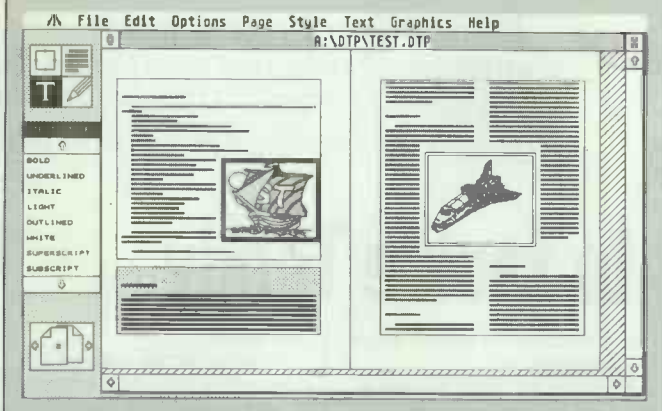
Connect four more

For people who have often wondered just how to win at 'Connect Four', a plastic-based game where you have to create rows of four counters, vertical, horizontal or diagonal, 4-Sight will give you a better insight into just how it can be done.

It's one of four releases from Gamma Games, on a disk worth £14.95 and including a pretty good chess game, a backgammon game, and a lot of frustration for the poor, unfortunate human playing the PC.

As you probably suspected, or know from playing a brother or sister who wasn't any good, the trick to winning seems to involve counting spaces as well as watching potential patterns develop. 4-Sight is supposed to be 'hard to beat' at level five, and the default level is level two. At level two, it took me half an hour to get near it. And my sister had better watch out next time!

It's very good value, and details can be obtained from (0279) 412441.



GST was kind enuogh to invite me to its secret headquarters somewhere in Cambridge just before the grand unveiling of its new baby at the PCW Show. The baby, baptised 'Timeworks Desktop Publisher', is the latest addition to the already crowded DTP software family.

Originally developed for the American software house that generously lent its name to the product, Timeworks will be available in November for the Atari ST and Amstrad PC or compatible running GEM. The Atari version will retail for £99, making it one of the cheapest DTP packages for the ST; and, although no price has been fixed for the PC version, it is not expected to be significantly higher.

During my introductory session with Timeworks, I noticed that GST has broken with its tradition and provided keyboard shortcuts in addition to the GEM menus. On further investigation I discovered that the company is considering adding this feature to future updates of its existing range; this may come as good news to people using GEM on the slower PCs, where moving the mouse can be more like walking your tortoise on a lead.

The program will feature an elaborate graphics editor similar to Easy Draw, and GST is developing a sophisticated algorithm to re-size pictures imported from other drawing programs without adversely affecting the clarity. At present, the company plans to support GEM-standard object files as well as Degas, Neochrome and PC Paintbrush.

GST is the company which brought you First Word, the word processor that was once bundled with the ST, and as such you would expect good text handling. You won't be disappointed, with basic word-processing functions being built into Timeworks as well as the ability to load in files from Wordstar, First Word, Wordwriter and, of course, ASCII. Commands can be embedded within these files so that much of the initial formatting, such as typeface and point size, can be set within the word processor, and automatic onscreen 'greeking' makes the full-page views pleasantly tidy.

The version that I saw running was unfinished but still impressive; its only serious omission being the lack of automatic kerning. Printer suport is provided via standard GEM drivers, meaning that virtually all 9 and 24-pin printers are already supported, as are Postscript and HP laser printers. Currently, the only clear thing about Atari's laser printer is that it will require a lot of memory, so as yet there is no driver for it. It shouldn't be too before one becomes available, however.

The ability to send Postcript files to disk means that expensive printing hardware becomes unnecessary, as it will be relatively cheap to send disks or mail directly to professional typesetters.

Timeworks will be published in England by Electric Software, which can be contacted on (0954) 61258.

Grapevine

● **Borland** has released version 4.0 of Turbo Pascal, which breaks out of the 64k segment barrier of the IBM PC. No news, however, of CP/M versions as yet. Watch for a thorough review in *PCW* in the near future.

● **Fascimile** for computer users has taken a step closer with the launch of Akhterfax 'which will cost only a quarter of the price of a traditional fax' — an add-in board for PCs which will send or receive documents in the ordinary way. However, to send an image of a piece of paper, you do need one more device — a paper scanner. Details from Akhter's publicity agent on (0895) 52131.

● **Virgin** has moved into business software. It calls its Virgin Software label 'Useful Programs for the PC'. First off was Collectors Catalogue for recording your stamps, records, comics, postcards, or whatever else you hoard. Six other titles are under development. No reports as yet on quality. Details on (01) 727 8070.

● **Logotron** has decided that it doesn't have to live in the education ghetto for ever. With a price of £13 per program it has jumped into business programs — but not just for the PC. Its 1295 label (the number of pennies per package) includes a 'writer' and a 'filer' as well as a 'planner', and runs on Commodore machines as well as PCs. Details on (0223) 323656.

● **Sir Clive** is about to hit the American market: his Cambridge Computer Z88 *finally* has a ROMable operating system, a big factory, and an American backer in SCI. SCI is very big, but computer enthusiasts will remember it from the long-ago Sprinter rotary printer and, more recently, from the fact that it built the Zenith 171 and thus allowed the company to win a big order from the American tax authorities. Now, SCI has someone on the board of Sinclair's company — and has put in some money, too. The machine remains nice but is still at least £100 over-priced. At that, I still expect to see Cambridge Computer sell over 20,000 by the end of 1987.

● **Greek** characters with a BBC Micro and an Epson-compatible matrix printer can be produced by Sciways, a package which can actually produce 350 newly-defined characters both onscreen and on the printer. It's a 'sideways' ROM that you buy, and it gives chemistry symbols, maths characters and strange languages for a total of £38.52.

Details on (0202) 747695.

● **DAT** — digital audio tape — turns out to be a better way of storing computer data on tape than any computer tape drive. Sony and Hewlett-Packard have jointly announced that they will develop this audio technology for computer users, offering a disk backup device that can store 1.2Gbytes, and a fast-search capability with a 20-second average access time.

● **Digitask** has saved me hours of hard work in writing about its new machines, by observing three times in two paragraphs that it advertises in *PCW*. I can take a hint, you chaps: you don't want me to say anything that might contradict your claims, right?

It's fine by me. . . END

THE WEST COAST CONNECTION

Tandy is firmly placed as the world's number one distributor of personal computers, but Atari is keen to change that. PCW's US correspondent Tim Bajarin reports on Tramiel's obsession with the microchip.

Tramiel set to tackle Tandy

With over 600 computer centres and over 4000 electronic retail outlets, Tandy is one of the largest distributors of personal computers in the world. Only IBM and Apple, with their dealer networks, move more boxes. But for Tandy, it has taken a long time to get to this point.

While the TRS models became a standard for computer hobbyists, Tandy's initial attempt to get into the business market was very poor, partly because the company took a long time to realise that the IBM PC operating system was the *real* standard.

But, when Tandy grasped the direction of the market, it really began to move. The model 3000 and 1000 series are quickly becoming bestsellers in the US and the company-owned stores give Tandy the best distribution network anyone could have. The company has come a long way from the days when it was peddling its leather products.

This success story has caused many a personal computer vendor to envy Tandy and consider emulating its distribution operation.

Now Atari's ever-resourceful head, Jack Tramiel, has decided to take on Tandy with his version of a company-owned distribution strategy. In August, Atari bought the Federated Electronics chain of 70 stores.

These stores, most in the western US, carry everything from car stereos to television cameras.

Although Atari is not necessarily into the traditional consumer electronics market, Tramiel says that he is interested in making *anything* that uses a micro chip.

In fact, company insiders say that his next major purchase will be a semiconductor company. Some think he may buy into the National Semiconductor consortium, but others believe he is more interested in Inmos, the Thorn EMI subsidiary that produced the Transputer, a chip Tramiel is interested in.

Most US analysts looked at the Federated deal as an important way for Atari to gain US distribution. Up to now, Atari has struggled to persuade 'serious' computer shops to carry his ST line.

With the Federated distribution channel, he can push more products out of the door and continue on his profitable road.

However, the big question is whether, in the end, this risky venture will pay off.

Federated has been losing about $5 million a quarter, and it will take a lot of money and new marketing directions for it to recover.

Stewart Alsop, editor of a US PC industry insider newsletter, believes this is the 'first serious mistake Tramiel has made.'

Alsop cites the failures of companies who made similar moves, and thinks that buying Federated could be detrimental to Atari.

But never count Tramiel out — he has a way of making things work. With his new manufacturing plants in Asia, you can expect him to do *exactly* what he says he will do and produce *any* product that uses a microcomputer chip. So, expect to see Atari TVs, phones and CD players, and perhaps even high-tech toasters.

While a lot of attention has centred on Atari's Federated acquisition, **Amstrad** has also taken some similar steps to gain better control of its US distribution.

Amstrad's purchase of its Texas-based distributor, VidCo, is seen by analysts and vendors as simply a way for Amstrad to have more say in the US market.

In the US, Amstrad products have met with only mild acceptance, and, like Atari, have not penetrated the computer speciality stores.

Atari chief Jack Tramiel: diverse interests

Jobs plots his NeXT move

When Steve Jobs left Apple Computer in the summer of 1985 and started his own company, NeXT, his aim was to develop a high-end computer for the education market.

During his two-year moratorium with Apple — during which time he could not compete with it — he acquired Pixar, the graphics computer manufacturer. This added credence to his high-end workstation plans and had many believing that he really was going after the education market.

There was only one problem with that direction. Universities and colleges are very mean with money, and, although Stanford and some other universities put funds into Jobs' company, most analysts could not see the university market as making NeXT any money.

Sources close to Jobs are now explaining that he is, in fact, looking at giving the world the next major computer for both education *and* business.

In California recently, Jobs talked about the three waves of personal computer technology. According to him, the first was the Apple II, second was the IBM PC, and third was the Mac, with each wave lasting about ten years.

Jobs implied that 1989/90 will see the next wave of technology and, although not actually naming himself as the one who would initiate it, it was clear to the audience that NeXT is his guess as the next technology leader.

Jobs believes that the user interface is vital to a machine's success, and he clarified his plans to add a new user windowing interface to Unix — the operating system he has chosen.

Those close to the company claim that Jobs has taken his two years of non-competition with Apple and made the most of it. As a result, it is becoming clear that Steve Jobs, the man who gave us the Apple II and Mac standard today, is aggressively trying to give us the technology that will lead the market for another decade.

Steve Jobs: aggressive approach

Company insiders say that the NeXT PC will use the new 68030 Motorola chips with 32-bit colour depth.

The only flaw in his plan, according to informed sources, is his choice of Unix as his operating system. Its success has been small when compared to the Apple II or MS-DOS.

Many agree that all PCs will eventually run under multi-user/multi-tasking windowing environments, but OS/2 with the Presentation Manager will probably provide the best way of implementing this approach in personal computing.

THE WEST COAST CONNECTION

Postscript clones compete in PDL market

Steve Jobs declared Hewlett-Packard (HP) 'brain dead' for choosing a page description language (PDL) other than Adobe's Postscript for its printers. HP has now changed its mind and, with the help of QMS, now offers Postscript on its LaserJet printers.

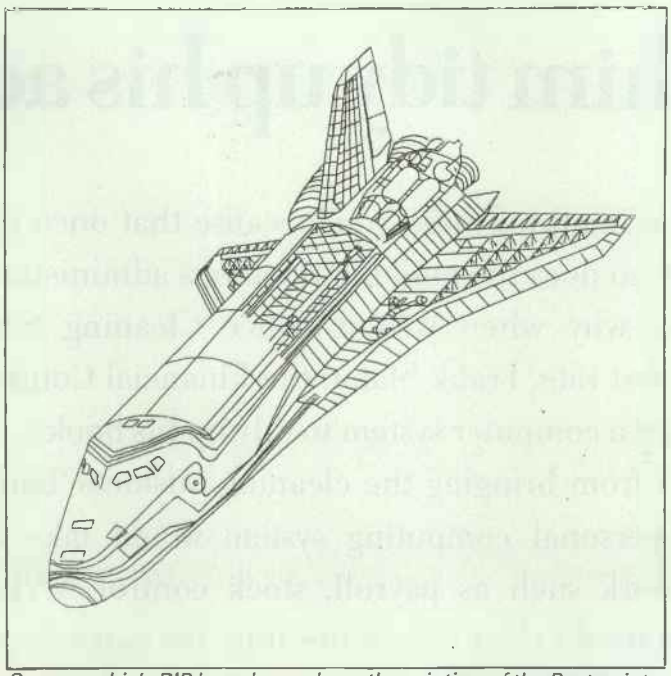
The industry is watching the announcement of the new Postscript clones very carefully as they move into a market dominated by Adobe for three years.

There are other alternatives to Postscript, such as Imagen's DDL or Xerox's Interpress, but Postscript is clearly the industry standard of today — particularly after IBM announced its support. HP's HPGL, the limited page description language on the LaserJet, is actually the market leader since HP claims 80 per cent of the market for laser printers.

Apple's own QuickDraw routines will soon be a part of its PDL offerings. But, even in their best form, they cannot compete with Postscript for high-quality output, font rotation and true font smoothing.

New lasers are coming onto the market monthly, and the continuing demand for high-quality typography raises the issue of Postscript clones' potential for adding user cost to Postscript printers, making these clones items to watch as we approach 1988.

The two leaders in this field — Phoenix Technologies and Conographic Corporation. Phoenix, and Bitstream. an electronic-font supplier from Cambridge, Mass — recentiy announced a high-performance PDL interpreter for laser printers with Postscript compatibility.



Conographic's RIP board speeds up the printing of the Postscript file of the Space Shuttle Columbia from 3 minutes to 2.69 seconds

It provides high-speed printing of text and graphics, and features an open architecture design to accommodate other page description language and device standards.

Now printer manufacturers who want Postscript compatibility and HPGL compatibility can go to Phoenix, obtain its board and have a printer that emulates Apple's LaserWriter and HP's LaserJet all in one.

Phoenix describes its 100 per cent compatible architecture as 'light table-compatible', which means that the output precisely matches. And its pre-processed outline technology allows for high-speed printing of Postscript fonts.

Phoenix claims that the Bitstream fonts are a key component to the technology and gives true Postscript compatibility.

The other major player, Conographic, also has a Postscript-compatible solution through its ConoScript software running on a Conodesk 6000 RIP board.

Conographic actually licenses the same fonts as Adobe, and so also claims 100 per cent Postscript compatibility.

The RIP board is the fastest output enhancer I have seen, giving a standard Canon laser printer anywhere from 10 to 50 times faster performance than the Apple LaserWriter.

As an example. the Postscript file of the Space Shuttle takes around three minutes to process on the Apple LaserWriter. If you use the Conographic system, that same file takes 2.69 seconds to process.

Another key example comes from a complicated font-sheet Postscript file. A very basic 8pt full sheet on the Laserwriter takes 44.5 seconds to process; on the Conographic system it takes just 1.43 seconds.

The key issue for the new Postscript clones is not just compatibility but also new levels of processing speed and flexibility.

Although Adobe is working on a new generation of Postscript technology, as well as adding colour and its new Postscript Display product, it will have to do much more to the processing power if it wants to maintain its market-place lead.

Many major Japanese manufacturers, and perhaps even some European and domestic vendors, will produce Postscript clones in 1988. This competition may bring the price of these printers down, but the main advantage will be the performance boost given to existing laser printing engines.

Phoenix Technologies is on (617) 769 7020. Conographic Corporation is on (714) 474 1188. Bitstream is on (617) 497 6222.

More punch for hard disk back-up

Utility software lacks the glamour and appeal of packages such as Excel or Pagemaker, and so tends to get lost in all of the application hype. This is especially true when it comes to disk back-up products. They're generally very bland, but if you have ever crashed your hard disk. you know how important these products are

One company, United Software Security of Vienna. Virginia. has decided to give its disk back-up product. TakeTWO, more punch

TakeTWO Manager is one of the most powerful tools for hard disk management I have seen. combining disk back-up with file management, file annotation and report generation features.

A fast OOPS feature allows you to undelete files and completely restore lost files; and. if you accidentally format your hard disk instead of a floppy. just type A:TT and you resurrect all your files.

individual products offer some of these features, but this type of integrated solution on one disk is a utility that hard-disk users will find very useful.

The price is $139.

United Software is on (703) 556 0007.

New technology for Christmas

Last Christmas saw low-cost PCs entering the US market for the first time. Many thousands of professionals who were familiar with PCs through their work decided that, at under $1000, they could afford to buy one to use at home.

But, this was old technology. The low-cost PCs were 8088-based machines running at 4.77MHz. Ironically, these 'old technology' products were similar to machines that were bought in great numbers for $4000 a few years ago.

Since last Christmas, 8088-based boxes have further reduced in price. You can buy an 8088 PC with 640k memory, dual disks and a monochrome monitor for as little as $599.

While *this* Christmas will see many new users attracted to these machines, the real trend will be for the professional workers and computer literate set to buy 80286-based AT machines.

A quick check of retail stores shows 80286 PCs running at 8MHz, with 640k memory, a single 1.2Mbyte floppy, a 20Mbyte hard disk and a monochrome monitor, retailing for as little as $1295. Some colour systems with a 40Mbyte hard disk are selling for $1895.

The coming months should see the 80286 XT/AT class machines become the computer of preference for the home professionals. END

Frank Slater knew all about cleaning, but it took IBM to help him tidy up his accounts.

If you've got a small business, you'll realise that once your company starts to grow, so does the amount of tedious administrative work.

That's why when Wetton Office Cleaning Services began growing at a fast rate, Frank Slater, the Financial Controller decided that he needed a computer system to tidy up his books.

Apart from bringing the cleaning business 'bang up to date', installing a personal computing system would take care of time consuming work such as payroll, stock control, VAT returns and invoicing. He would then have more time for more important things like financial forecasting.

With this in mind, Frank spoke to his local IBM Dealer. They sat down together, discussed the company's particular needs and developed the most suitable solution.

Frank was pleased because his dealer 'got down to the nitty gritty' of what he wanted and worked out a system that was simple to use. As a result, business has become more efficient; Frank instantly knows how profitable any one contract is at any time.

What's more, he feels that he can rely on the back-up and support of a company like IBM who will be here 'into the next century.'

Write to us for our two free booklets. They explain, in plain English, how IBM and its dealers can not only tidy up your accounts but also sort out your word processing needs.

Please send me the IBM accounting and word processing booklets.

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Company_____

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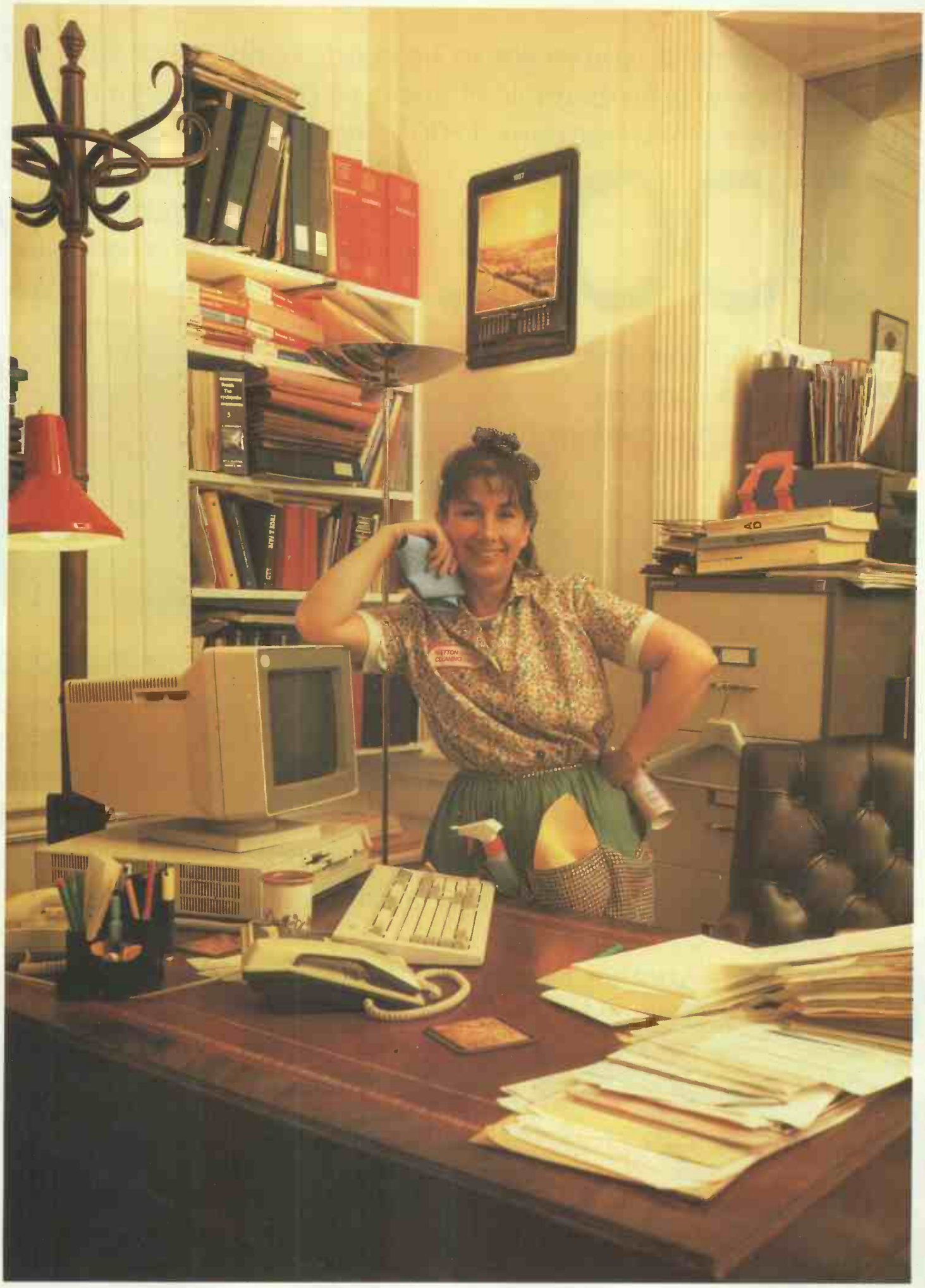

To be the best, you've got to be good. Really good. And the modem below is an example of just how good a modem can be. It's a Hayes Smartmodem 1200™ with V.21, V.22, V.23. A

GOOD,

"purpose built" modem that is specially designed and configured for international communications by Hayes, the world's foremost PC modem manufacturer.

This 1200 bps modem is available in both a stand-alone version (Smartmodem 1200) and an internal version (Smartmodem 1200B™).

Along with all the requisite features, the Smartmodem 1200 is endowed with many automatic features—such as automatic speed selection, auto-answer and auto-dial, and an automatic speed buffer (flow control), a feature new to 1200 bps modems that compensates for different data rates between modems and computers. The Smartmodem 1200 also offers you full-duplex asynchronous, synchronous and autosynchronous (AutoSync*) modes.

Another requirement for being the best is that you be better than everyone else. And that is exactly what Smartcom III™ is. As the most powerful communications software available, it has all the standard features you'd expect and more. Such as terminal emulators.

APPROVED
for connection to telecommunication systems specified in the instructions for use subject to the conditions set out in them

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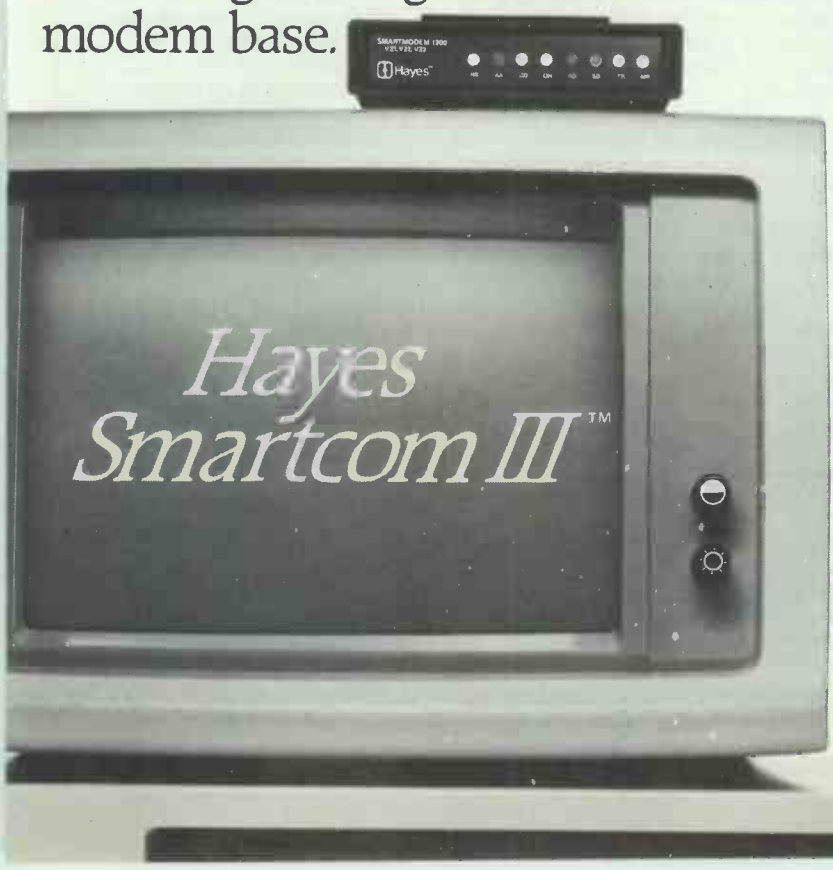
BETTER,

unattended operations, error-free file transfer protocols, a peruse buffer, a full-featured editor, and full-featured videotex (Prestel) emulator.

So whether you're a power user or a complete novice, with Smartcom III you can take full advantage of Hayes' advanced modem technology.

Once you're so good that you're better than everyone else, you're the best. And the best is what you have when you use Smartcom III with our Smartmodem 1200. Together they represent not only the most advanced communications package in the UK today, but also the ability to be fully compatible with the world's largest and fastest growing international PC modem base.

BEST.

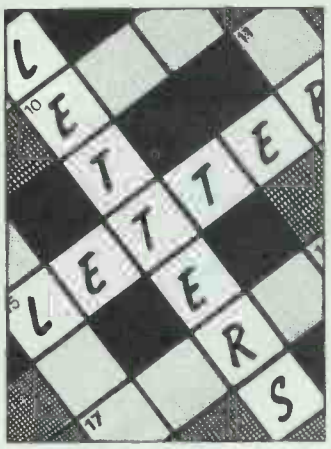


The Hayes Smartmodem 1200, Smartmodem 1200B and Smartcom III are now ready for your perusal. They're worth a look. So take a look. These products are available through Hayes Authorised Dealers only. For one near you, call 01-848-1858.

Hayes™

*Requires software incorporating the Hayes Synchronous Driver (HSD).

LETTERS



This is the chance to air your views — send your letters or contact us on Telecom Gold 83: VNU200. The address to write to is Letters, Personal Computer World, 32-34 Broadwick St, London W1A 2HG. Please be as brief as possible and add 'not for publication' if your letter is to be kept private.

Compaq replies to OS/2 story

I must correct some of the mistaken assertions about Compaq's views on OS/2 contained in your September issue ('Cake eaten, and kept', Newsprint, page 70). While they may have made for a more colourful report, they are factually inaccurate.

Compaq has never described the new Microsoft operating system as 'useless', as your report states, nor refused to support it. Indeed, Compaq president Rod Canion committed the company to making it available to users in a speech delivered on 28 April — barely three weeks after the announcement.

While warning that the market should not expect an automatic and rapid mass migration to OS/2 — because of its cost and heavy memory requirements as well as its late availability — Canion noted that, once large corporations are able to develop special applications around it, 'then we'll see some important problems being solved'.

In the short term, and for some time after OS/2 begins shipping, Canion suggests that DOS 3 and its further extensions will continue to meet the needs of a very large body of personal computer users.

Canion also said on April 28, and repeated on July 6, that Compaq believes its existing products, using a non-Micro Channel bus, will provide better performance under OS/2 than IBM's new PCs. As beta test versions of OS/2 have largely been written on Compaq Deskpro 386s, Compaq could be considered to have a reasonable level of fact on which to base its belief.

In other words, the benefits of OS/2, which have been recognised from the outset, will be available to users of a wide range of industry-standard systems — including the high-performance systems developed by Compaq. Users can, therefore, consider the costs vs benefits of moving to OS/2 quite independently of the costs vs benefits of moving to IBM's new PS/2 architecture.

Peter Bayley,
marketing director, Compaq,
Richmond, Surrey

Service with a smile

Bouquets! Over the last seven years of buying computer equipment and peripherals, I have had atrocious service (mostly from the bigger names in the industry), generally adequate service, and good service from *PCW* advertisers. It is with great pleasure that I write about recent exceptional service from two advertisers.

With some trepidation I bought a daisywheel printer by mail order last year from Computer Express — at a price some 30 per cent below other advertisers in the same issue. As the Express premises are 200 miles away, I shut my eyes to problems of service.

After a year of sterling service the printer went wrong, probably due to switching between computers and printers with everything 'on'! I contacted Express, and after a little difficulty, David Raine talked me through the diagnostics to check that the fault was with the printer and not elsewhere. It was. I was fortunate to be able to drop the printer in on a Monday.

Express rang at the end of the week with a cost, and the following Tuesday the printer was returned to me. An eight day turn-around on repairs, and the best prices advertised! Express deserves to succeed!

My second happy story concerns RSD Connections of Ware. I ordered a printer switch box with cables by phone. When it arrived it had the wrong cables — an easy misunderstanding when trying to communicate over the phone. I rang at 3.30 pm, to which the reply was 'Please return the cables we sent, and we'll get the new ones off to you.'

The cables arrived by post at 9.30 am the following morning — I hadn't even been able to get to our post office to send off the others. For once, even the GPO got it right!

Michael Davis,
Rochdale, Lancs

Mandelbrot algorithms

The opening shot of your review of the Acorn Archimedes (*PCW*, August) showed the machine displaying a Mandelbrot set. Where can I find the formula to produce this type of graphic myself?

Also, I want to produce some vector graphics on my BBC Micro that have been drawn in perspective, but the formulae I use are very long-winded. Can anyone help?

J Smith,
Longtown, Herts

Jack Weber's article 'Fractal sets' (PCW, December 1986) contained some innovative and fast algorithms for drawing parts of the Mandelbrot set. Though written for the Apple Macintosh, they were produced in Basic and you might find it an interesting task to convert them to BBC Basic.

Transputer goes to the wall

I was very pleased to read your article on transputers (*PCW*, August). I'd rather read about advances in technology than about the same old boring PCs that have been around for five years.

I particularly liked the picture at the top of the third page and wonder if it is available as a wall poster?

George McKinlay,
Chorley, Lancs

Inmos has a number of posters of its products and the company can be contacted on (0454) 616616.

Author hits back

Reviewers, and particular book reviewers, are often in a position of commercial power when their reviews appear in print. Not only do their views have a potential effect on the sale of the book in question, but it also invariably looks like sour grapes if the author writes to refute the statements made in the review.

Nonetheless, I'll have to take that risk in commenting on Graham Wood's review of my book, *Mastering DOS Plus*, in the September issue.

Wood claims that it is misleading to represent the book as relevant to the Acorn Master as this machine needs 'an expensive hardware upgrade' to run DOS Plus. This will be news to all Master 512 owners, as their machines are supplied as standard with this operating system. Philips will also be surprised to learn that it has sold no :Yes micros in the UK.

If anything is misleading, it must surely be Wood's comments on the sample 'Expert System' included in the book. Rather than recommending Amstrad machines in 9 out of 10 cases, they are actually mentioned as 11 out of 33 possible options.

Having devoted four months to writing the book, it would indeed be encouraging 'to gain a few bucks', but this is hardly likely to be achieved when potential buyers read such ill-informed and destructive reviews as this within your pages.

Simon Williams,
Beaworthy, Devon

To
Personal Computer World
32-34 Broadwick St.
London W1A 2HG
England

Sir,

Item my reply to your article of july by Nick Walter and Owen Linderholm about the Atari Dtp.

You may think it's a bit late to comment your article about Atari Dtp. I needed time to make, with the help of Publishing Partner, a "Gothic" font in order to show the results of what an individual can get with that program. It is completely untrue that you can't have an automatic kerning adjustment. You won't find how to obtain this in the manual, but it is possible with Ced.Prg., added in the font program of Publishing Partner. You will see the results of a different automatic kerning in the added pages.

Please note that the "Gothic" font is printed with an ordinary 9 pin dot matric printer Epson-800 .

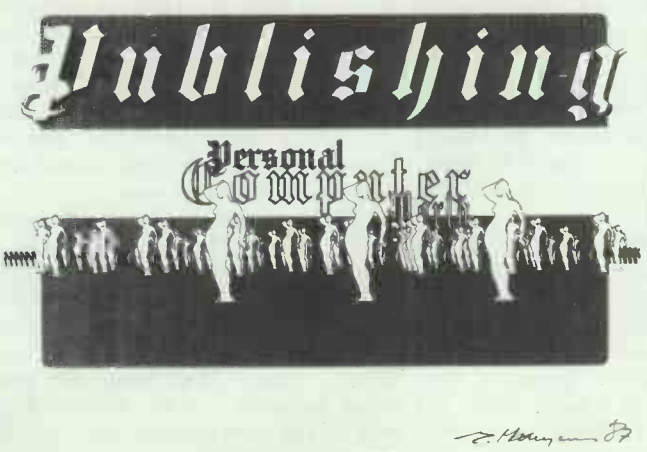
I think we only discover progressively what a powerful computer the ST. really is. For instance look at the drawing I can get with Pubishing Partner.

We are now in an era of this century where each individual can make his own fonts of which the computer can make in his turn a lot of alternatives. This all at the price of a sophisticated typewriter.

I join to this letter a copy in "Gothic" font, which for each paragraph, one of the thousands possibilities.

Yours sincerely,

E Maeyens



Better never than late

I have just finished reading the 'Chip Chat' section of September's *PCW* in which you told how you were unwilling to pass on information on setting up bulletin boards to a reader who wanted to start a computer dealership.

Many people set up in business purely for the money and to hell with the customers afterwards, but I have generally found people in the computer trade to be friendly and helpful. I would have thought that *PCW* would have been pleased to help, as it would have benefited your readers. After all, not everyone is in it purely to make money.

We should be striving to make computing better for *everyone.*

Trevor Monahan,
Skegness, Lincs

There is a difference between asking for information for your own use, and getting help in order to set up a business. Anyone who's knowledge of the computer industry is gained mainly through writing letters to magazines is hardly in a position to offer sound advice to others.

We consider it a service to our readers to protect them from people who think that the business of selling computers can be learned as easily as selling ice cream.

Poor program production

Your magazine's excellent clarity and print quality is often let down by the poor reproduction of the listings in Program File, with some of them being atrocious to say the least.

I appreciate that you are dependent on the actual printer, but surely many readers are sufficiently experienced computer users to know how to obtain good-quality output.

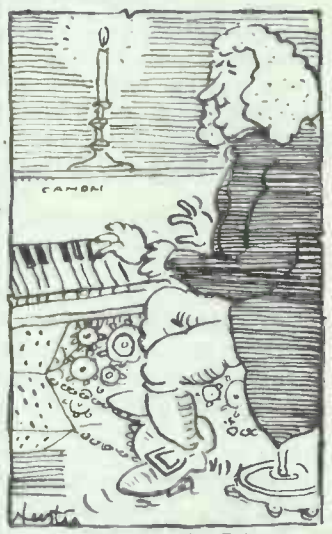
Karaoli & Dimitriou,
Athens, Greece

In order to avoid introducing errors into the programs we receive, we use the printed listings supplied by the program authors. But it does sometimes seem that, however able they are to write complex and fascinating programs, fitting a new printer ribbon is beyond them.

However, with our wonderful Kyocera laser printer, we are often able to reprint the listings, particularly when supplied on PC or ST disks. Sadly, though, doing something with listings printed on silver Sinclair paper is beyond us.

In addition, the reproduction process means that, between an original 80-column sheet and our page-size requirements, some degradation in quality is inevitable. However, last month's PCW *showed how good we can be. And there's always the* PCW *Disk Library to remove the need to type the listing in at all.*

Computer of note



Leafing through the February issue of *PCW*, I was interested to read the article by David Levy about the 'musical dice' method of composing minuets which was published in 1792 and attributed to Mozart. He also mentions a similar system devised by Bach's pupil, Johann Philipp Kirkenberger.

There is a growing body of opinion among music historians that JS Bach himself could not have found time to achieve his vast output of musical compositions — and also to have fathered approximately 20 children — without the help of some form of primitive music computer.

Some device providing a readout from a clavichord-style keyboard has been suggested.

The fact that Bach's third son, the most gifted of all at the keyboard*, should have been christened CP/M Manual (or CP Emanuel) can be no accident, and is obvioulsy a thinly-veiled reference to the user guide for his machine's operating system.

There is a growing body of opinion among music

EJ Chance, St Albans END

BANKS' STATEMENT

Unreal time

A lethal combination of graphics and games is loosening some people's grip on reality and on their own humanity. Martin Banks wonders if the situation is terminal.

You will probably realise that this is not an easy thing for me to admit, but I am very much like everyone else in the world. I eat, drink, hate working and have, at the very least, dual standards.

Even my dual standards are boringly similar to everyone else's. I know that when I want to do something it is OK, but that when someone else wants to do something that sounds reasonably similar, I will often pronounce that it isn't similar at all, is positively harmful and should not be allowed. Everyone, especially everyone who has ever been a parent, will be guilty of such dual standards at least once in their lives.

That is why I have decided to jump in, bite the bullet, run something up the flag pole and see who salutes it. I am going to have a go at something that I feel is bad, even though it is closely related to something else which I feel is perfectly OK.

The overall subject can be covered by two words: graphics and games. Now, I am not the world's greatest fan of computer games, except for one particular sub-species, the flight simulation programs. Whether it comes from growing up in an aircraft-industry family (just as coal miners claim to have mining in their blood) or reading too many *Biggles* books as a child, but I love having a go at them. It is one of the great sadnesses of my life that there are so few simulators available for the MS-DOS environment.

Couple good graphics to a good flight simulator and the effect can be terrific, to the point where a new reality can be created that is good enough to train pilots.

Yet so many computer games now available have, for me at least, an overpowering tendency towards violence. I use the word 'overpowering' specifically, for some recent news from the US is now tending to support a pet theory of mine that was put forward in these pages several years ago. This theory states that young minds can be trained by violent computer games into thinking that this is the way the world works.

I seem to remember that the last time I voiced this opinion, which also touched on the appallingly sexist nature of many of the games as well, it got treated with boredom and mild contempt. Fair enough, I thought, let time see who is right.

Well, I think I might be (which makes a change from most of my predictions). I was listening to the radio some time ago with, I have to admit, only half my brain in gear. I therefore missed some specific details of the news report in question. However, the basic details were unquestioned: psychologists in the US were pinpointing direct relationships between violent computer games — in particular adventure games with a high graphics content — and an increase in both murders and suicides committed by young men. (Young women, for various reasons, rarely play computer games.)

Adventure games, it would appear, have this strange effect on the young mind, the close interaction between the game and the player distorting their conceptions of what is, and isn't, reality. To get whatever prize sits at the end of the particular game's 'rainbow', the player invariably has to perform a variety of anti-social acts. These include entering other people's houses, stealing, carrying offensive weapons with intent and, of course, using those weapons to kill off opponents.

Yes, yes, I know it's only a game, and I know many people as ancient as myself who enjoy them as a genuine intellectual challenge. Such ancients do not, however, have young impressionable minds, and the evidence would seem to be growing that such minds do take the games as the role-model for their approach to life: 'If you want it, steal and fight for it. If someone dies then it is all in the game.'

Adventure games are also brutal with failures. Make a mistake and you can find yourself terminated in a single line message. (You can also get asked if you want another game.) Such a question is not asked of the growing number of young men in the US who, on considering themselves a failure of suitable dimensions, apply the 'game solution' to themselves. Suicides connected to computer games are said to be on the increase.

The unavoidable problem is, the games *are* educational. In another radio report I heard, a Dr Patricia Greenfield, of the University of California at Los Angeles, pointed out their educational qualities. She suggested that they were particularly good for training people to infer a three-dimensional reality from a two-dimensional, screen-based image. This, she suggested, would be good for training people to work in the screen-based environments of the future, where operators of equipment from micro-surgery systems to mega-war machines will be distanced from the reality of their actions.

And once they are trained in this capability, the screen could become their only reality, and the screens themselves are vulnerable, open to (and here comes an emotive word) manipulation. Think about it for a second. The way in which high-resolution graphics are going means you can't tell the difference between a computer-generated picture and a television shot. Couple that hardware capability to the graphics manipulation software now becoming available — applications which let the skilful add, subtract and modify an image at will — and the prospect is positively Orwellian.

Most people already get most of their information from the 2D TV screen. If they can't tell the difference between camera shots and computer-generated images, then the information they receive will open to manipulation, at the mercy of those controlling the generation process. There are armies of people who think *Coronation Street* is real.

To get people really in the swing of things, why not use the educational properties of adventure games, coupled with the best in graphics manipulation, to train everyone into getting used to seeing things in a certain 'way'. That way, we won't know what is reality, and probably won't care until it's too late. END

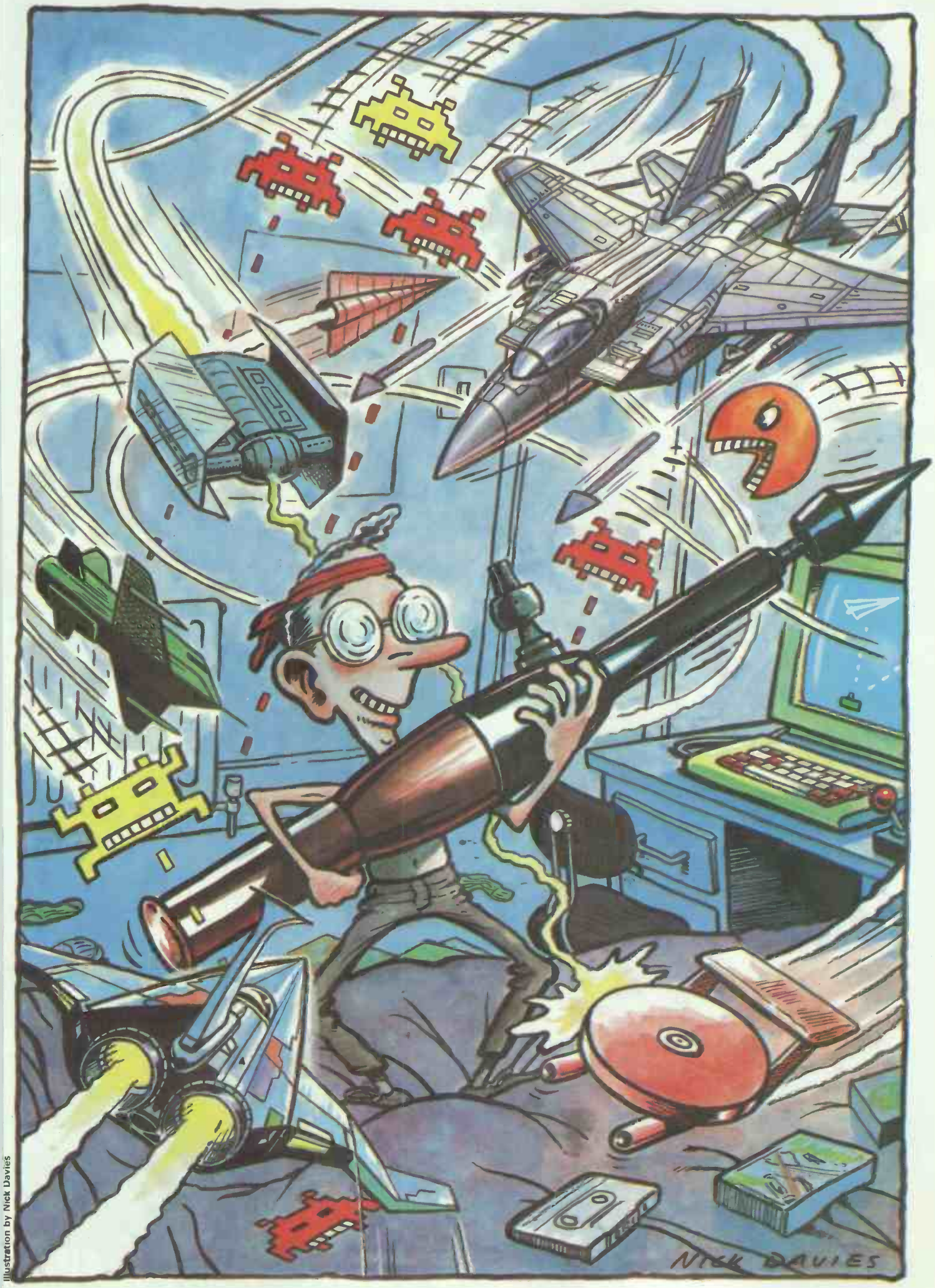


Illustration by Nick Davies

CHUCK YEAGER'S ADVANCED FLIGHT TRAINER

The instinct to survive. Out of control, screaming towards Earth at Mach 3, just 8 seconds and 20,000 ft left! Fly aileron rolls, Cuban 8's, even hammerhead stalls. Simulation so realistic you may just blackout. Remember – test pilots are only wrong once.

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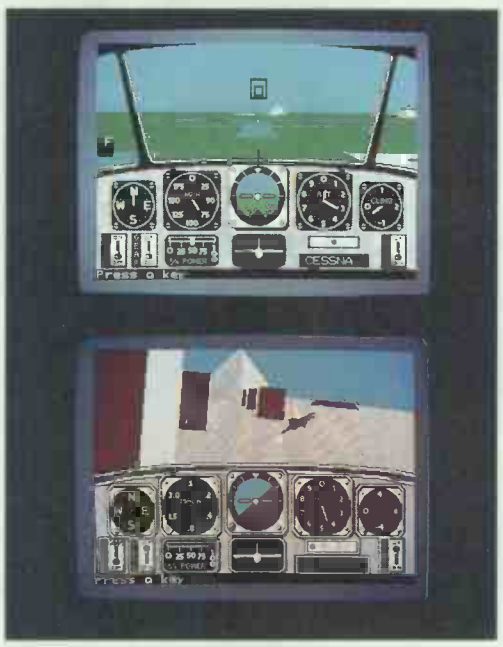

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Compaq Portable 386 vs Toshiba T5100

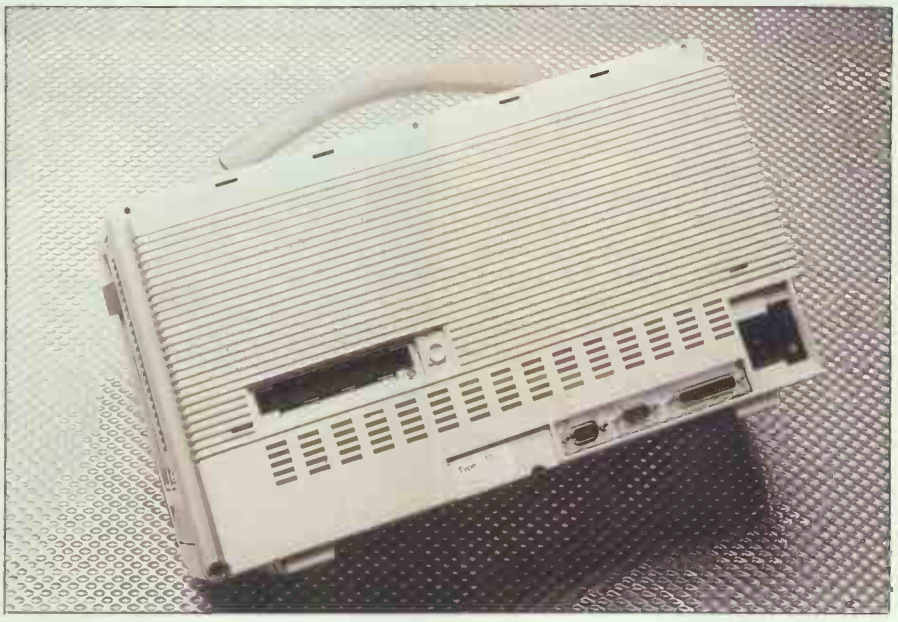
Compaq and Toshiba, arch-rivals in the 286 portables market, now do battle in the 386 field with the launch of their respective Portable 386 and T5100 laptops. Peter Jackson dons his referee's cap to decide the winner.

As the PC-compatible world becomes more and more accustomed to seeing 80386-based machines appearing on their desktops, it is no surprise to find Compaq, which invented PC portability, and Toshiba, which dominates the power PC laptop market, offering 32-bit portables.

It is equally unsurprising to find that they have approached the 32-bit market from different directions, based on what they have done before.

The Compaq Portable 386 is similar to the earlier AT-compatible Portable III, with a 'lunchbox' look and a tendency to go for standards such as 5¼in floppy disks rather than pushing for smaller and lighter systems. And the Toshiba T5100 looks like the earlier AT-compatible T3100, with a laptop-style fold-up display and fixed keyboard, the use of space-saving technologies like 3½in floppy drives, and the use of external, non-portable expansion boxes.

In the new portable 80386 market, it is the form factor that seems to count with Toshiba. The company says that the T5100 can still go into a briefcase; that it has the slim, dark good looks that power-user executives prefer; and that it doesn't bang your knees when you try to carry it with its built-in handle. Compaq points to the no-compromise approach to industry standards; the portable expansion board options; a tape back-up option; and the way that the machine protects software investment with its 5¼in drive.



The centrally-mounted expansion slot takes snap-on boxes: one of which holds a 40Mbyte tape streamer; the other takes expansion cards

Compaq Portable 386

Hardware

Outwardly, the Portable 386 looks exactly like Compaq's lunchbox-style Portable III, or the earlier Sharp PC-7000. The single floppy disk drive and the 40Mbyte hard disk are mounted vertically at the right-hand end, while the keyboard clips on to form the front face of the enclosure. Unclipping the keyboard reveals a plasma display screen, once again identical to the Portable III's.

Opening up the case by removing six Torx star-slot screws reveals a layout also familiar from the Portable III, but with unfamiliar components.

In the Portable III, Compaq had decided to make the system easy to maintain by mounting the main board at the back of the case with its component side facing outwards; this was a trade-off between accessibility and the risk of damage, since the board components are only protected by a single thickness of case plastic. The solution was to make the case from an immensely strong material described by Compaq as 'bullet-proof plastic', and the same design holds with the Portable 386.

At first, the board was obscured by impressive amounts of electromagnetic shielding, comprising pierced aluminium cages and sheets over the high-frequency components. This is necessary if the machine is to pass the Federal Communications Commission's interference tests in the US, and although a label on the review machine stated that certification had not been achieved, it also stated that production machines definitely would be FCC Class B approved.

The first impression of the revealed circuit board was how small it is for what it does. At the top right-hand corner, the unmistakable square block of the 20MHz 80386 and a socket for the optional 20MHz 80387 maths co-processor are to be found. Hens' teeth are easier to come by than reliable 80387 chips, let alone 20MHz ones, so it was a considerable surprise to find a 20MHz chip fitted in the review machine. The 80387 socket is, oddly, too big, leaving a spare row of socket holes around the chip, but this had no effect on performance. The oversized socket is designed to take a Weitek maths co-processor board as well as a standard 80387. This board provides a 10-fold performance improvement.

The main system RAM is at the centre of the board, using single-in-line memory modules (SIMMs) to provide 1Mbyte as standard; there are four SIMM sockets in all, so each SIMM in the base machine holds 256k. The chip configuration of the 2Mbytes of RAM in the review machine was a little strange, with four surface-mount 256kbit chips and two unfamiliar chips on each SIMM; but it is reasonable to deduce that each of the two extras — labelled 2801J-08 — is an unusual 1.5Mbit chip rather than a now-standard 1Mbit chip. There is room on each SIMM for eight of these, which would take the main RAM to 6Mbytes on the main board; and with a Compaq expansion board, the maximum 32-bit RAM capacity of the machine is 10Mbytes.

All the RAM chips are very fast and very expensive 80ns types rather than the cheaper 120ns and 150ns ones used in most PCs, enabling the RAM to keep up with the speed of the 20MHz processor.

The interfaces around the edge of the board include ribbon cables connecting the on-board floppy and hard disk controller to the internal drives, various power connectors, 9-pin and 25-pin D-type connectors connected directly to the RS232 and Centronics interfaces on the board, and a ribbon cable leading to the display daughterboard. This board fits at right-angles to the main board at the bottom of the case, and provides the control circuitry for both the internal plasma display and the external RGB monitor socket. Using this daughterboard design, as in the Portable III, means that Compaq can offer upgrades either for the internal display or the external monitor driver without changing the main board design. At present, the only option is an EGA card that will drive any external EGA monitor — Compaq offers one of its own — as well as the plasma screen.

There are actually two expansion sockets on the main board, impressive for a portable machine but not meeting anybody else's standards. The first, near the centre, is a 96-pin connector designed either for Compaq's 40Mbyte tape back-up unit or for its PC-compatible expansion box, both of which clip onto the back of

the machine. The latter provides sockets for two full-length AT-standard expansion boards at the expense of portability.

The second, smaller, expansion socket provides 32-bit and 8-bit buses for Compaq's own expansion boards. There is space for two of these postcard-sized boards in the Portable 386, fitting at right-angles to the main board in a compartment at the base of the enclosure.

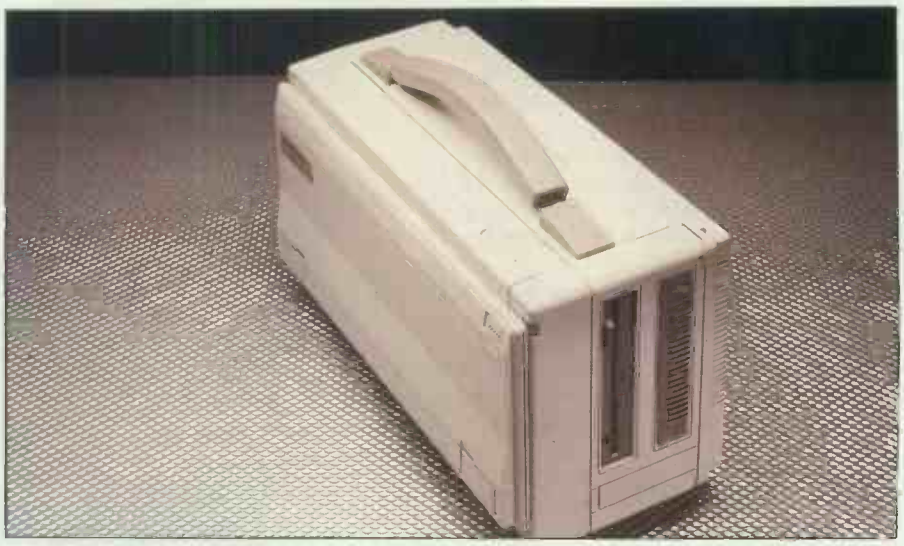
The keyboard interface is also new, and allows any standard PC or AT keyboard to plug directly into the socket if required. Plugging in an XT-compatible keyboard from a Taiwanese XT clone proved that this worked; although the plug was tricky to insert and seemed loose, the keyboard worked fine.

The keyboard itself is new, and intended to be compatible with IBM's now-standard Enhanced keyboard layout. However, width limitations mean that the separate cursor keypad on the Enhanced keyboard has been dropped, and the cursor keys share the numeric keypad — as they do on the old PC and AT keyboard designs. Apart from that, the Compaq board has all the advantages and disadvantages of the Enhanced keyboard in general.

As with all other Compaq keyboards, this one seemed squashy and unresponsive compared with the official IBM model or even Taiwanese clone boards. But that, of course, is a matter of taste and Compaq has certainly sold a lot of keyboards in its time.

The hard disk is a shock-mounted 3½in unit with a capacity of either 40Mbytes with access time below 30ms, or 100Mbytes with access time below 25ms. As with the original 16MHz DeskPro 386, these drives use the SCSI and ESDI controller standards, respectively.

The floppy disk drive is a standard 1.2Mbyte 5¼in unit that can read 360k disks but, like every other such drive, fails to write them reliably. A 360k floppy drive is offered as an option for those who do want to write 360k disks properly.



Compaq maintains that 5¼in floppy drives are the industry standard and so has not been tempted by 3½in ones. The 1.2Mbyte drive can be replaced with a 360k unit

The cantilever mounting of the display, as with the earlier machine, allows the screen to be lifted from the case on a kind of Anglepoise principle, and can be tilted to suit different types of lighting or to fit the user's preferences.

The display itself uses DC plasma technology, and has the usual Compaq display modes: 640×200 and 320×200 for CGA compatibility in monochrome, and Compaq's own 640×400 mixed text-and-graphics standard. The external RGB monitor interface, of course, provides the same modes with colour added.

The advantages of plasma technology are speed, inherent luminescence rather than the reflective operation of LCDs, and the ease of producing high-resolution panels with the same aspect ratio (height to width proportions) as CRT monitors. The disadvantage is the high power consumption, higher than a hard disk drive, which limits any plasma-screen portable to mains operation.

The overall impression of the machine, as with other Compaq products, is that it is a high-quality piece of engineering and industrial design, given the constraints of the system specification. The circuit boards are clear of jumper wires and late additions, and are obviously ready for full-scale manufacturing. The casing is in its final form and material — not surprising, since it is essentially the same as the Portable III's. And Compaq is so confident about the shock-proof mountings of the hard disk that company staff are happy to drop the machine from waist height and demonstrate that it still works.

And as with other Compaq products, the price of this build quality is the high cost of the system compared with comparable hardware from other manufacturers.

System software

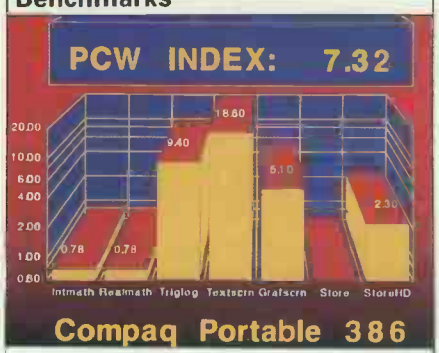
The operating system supplied with the machine is MS-DOS 3.2, with all that entails. Compaq also supplies some extra utilities to handle the special features of the machine.

As with the DeskPro 386, the Portable 386 comes with the Compaq Expanded Memory Manager (CEMM), which is installed as an MS-DOS device driver at boot time. This can be set up to mimic the Lotus-Intel-Microsoft expanded memory specification in 32-bit main RAM, use the memory above 640k as extended memory for Xenix, and set up RAM disks to make full use of the RAM capacity of the machine. And naturally, since the Portable 386 RAM is contiguous, it should run OS/2 straight out of the box once the CEMM driver has been discarded.

A new feature is a RAM cache for the hard disk, which sets aside an area of RAM to buffer data retrieved from the disk and hold copies of the most recently-used disk sectors. When the processor wants disk data it tries the cache first, and if the information is there it is retrieved from the fast 80ns RAM without any mechanical disk delays. The effectiveness of this depends on the amount of RAM allocated to the cache, and on how often the application software needs to go to disk. For big programs like AutoCAD, or for badly-organised programs like WordStar 3.3, overlay files are kept on disk and constantly referred to. Cache RAM, like RAMdisk, can speed these up wonderfully, but without the risk of data loss inherent in RAMdisks.

More RAM is taken up by Compaq software for the BIOS ROMs, which

Benchmarks



See 'Time trials', page 138

are copied into fast RAM to speed up all BIOS calls made by operating system or applications software. Once again, this technique was introduced in the DeskPro 386.

The other two main extras concern the plasma display. The Advanced Display Attribute Programming Tool (ADAPT) allows the plasma display attributes to be changed, often necessary when running CGA applications in monochrome. Some colour combinations in CGA programs — in menu bars and pop-up windows, for instance — just do not show up in monochrome without some alteration in the way the plasma screen displays its text. ADAPT allows the display to be altered so that all the information is visible. And, the ScreenSave utility blanks the screen after a user-selectable time period without any keyboard or computer activity.

Otherwise, Compaq's version of MS-DOS is no different from anyone else's, and there is no point in going into more detail.

In use

The surprising thing in using the Portable 386 is that there is no impression of blinding speed, at least when it is compared with, say, a 12MHz AT clone like Compaq's own. The figures show that this is illusory, since the performance is there. But the difference between a fast AT and a 20MHz 80386 machine is by no means as great as the difference between an old 4.77MHz PC and the fast AT, and it would be necessary to run the Portable III and Portable 386 machines side by side to spot the differences in daily use.

But the Portable 386 is certainly a fast and responsive machine, although it is psychologically difficult to believe that the small plasma-screened brick on the desk is one of the most powerful PCs on the market, and could be sold, if Compaq wished, as a 20-user system. That is a marketing problem for Compaq, and one which the company addresses in its promotional videos.

The *PCW* Benchmark figures show that the Portable 386 is a fast machine indeed, but the performance in real-life applications is just as interesting.

For these tests, AutoCAD and Lotus 1-2-3 were set up on the machine, with test data files. The AutoCAD files were the now-standard Nozzle and Columbia drawings, while the Lotus file was a big 500×500 worksheet with a macro to drive it. The base level for the comparisons was an old 4.77MHz PC clone with no 8087 maths processor to help it out; with this machine the Nozzle drawing took 260 seconds, the Columbia drawing took 111 seconds, and the 1-2-3 macro took 182 seconds to complete.

The greater height of the 5100 accommodates the extra memory and video cards. External keyboard and RGB ports allow it to be used purely as a system unit

On the Portable 386, with both AutoCAD and 1-2-3 taking advantage of the 80387, the times were 7.4 seconds for the Nozzle, 4.4 seconds for the Columbia, and 11.9 seconds for the 1-2-3 macro.

There was one interesting wrinkle on the tests, when the machine was set up without LIM expanded memory. With the expanded memory driver installed, the 1-2-3 macro slowed down from 11.9 seconds to 17.9 seconds, showing that expanded memory management really does impose a performance penalty on 1-2-3, even with LIM emulation in fast 32-bit RAM.

Those figures are a bit misleading, since the 80387 is an expensive option rather than a standard fitting, and it would have been better to remove it. However, that did not seem wise given the rarity of the machine and Compaq's protective attitude towards it.

Another speed test, this one ignoring the 80387, was provided by Landmark Software's useful SPEED.COM program, which runs continually with a variety of tests and gives average performance figures in terms of megahertz and performance multiples of a 4.77MHz PC. For example, if SPEED.COM shows a figure of 16MHz, that means that the machine is running as fast as a 16MHz 80286 machine with one memory wait state. The wait state gives a comparison with the IBM AT, which runs at 8MHz with one wait state.

SPEED.COM for the Portable 386 gave results of 24.5MHz — or roughly that, since it was right at the top of the scale — and a performance multiple of 11 compared with a 4.77MHz PC. The extra 4.5MHz over the rated clock speed of the machine's 80386 is a result of the fast 32-bit memory access compared with the 16-bit, one wait state memory access of the 80286. This once again emphasises the importance of processor-memory bandwidth in 80386 systems.

Toshiba T5100

Hardware

At first sight, the T5100 looks exactly like the 80286-based T3100, which is not too surprising since they are, externally, almost identical. Internally, though, the changes are substantial.

Opening up the case — a tricky procedure, until it is realised that the five screws are only there to back up some tough plastic clips like those on the IBM PC Convertible — demonstrates the simplicity of the internal design. Once again custom chips are used heavily, although this time Toshiba has the advantage of its own massive chip-making facilities, and all the custom circuits feature a Toshiba logo.

The main RAM fits underneath the keyboard, and uses vertically-mounted 1Mbit chips rather than SIMMs to save board space and reduce the vertical space required. The T5100 comes with 2Mbytes of RAM as standard, expandable to a maximum 4Mbytes by plugging in a small expansion card in the space provided next to the main RAM, still underneath the keyboard. The 80386 and its associated 80387 socket are half visible under the disk drive casings, while the back of the box is filled with the line-sensing 110V/240V power supply, running across the full width of the rear. The 80386 runs at 16MHz rather than the Portable 386's 20MHz, which reduces the RAM speed requirements.

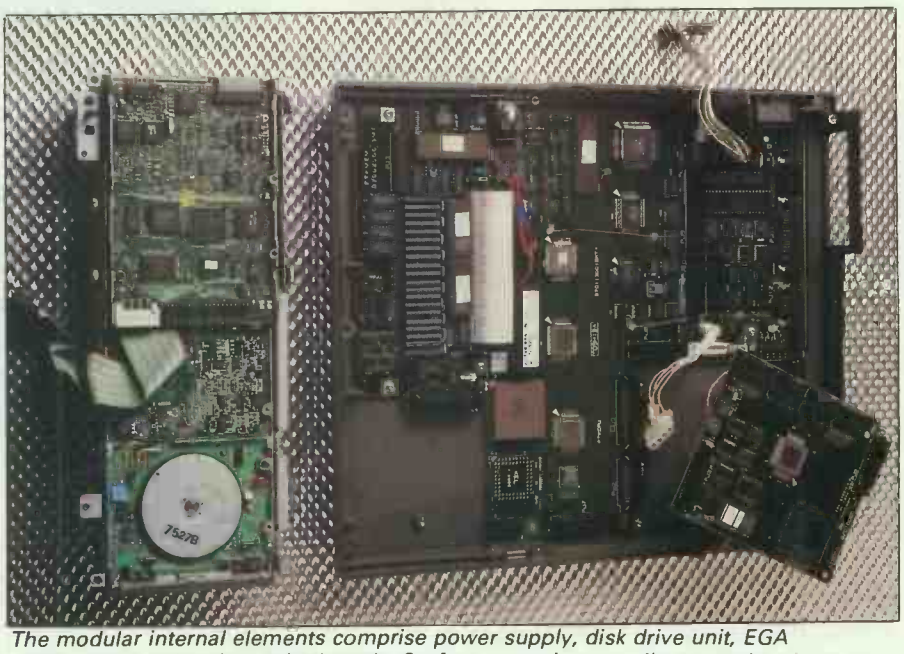
As with the Compaq Portable 386, the 2Mbytes of RAM can be treated as LIM expanded memory, as extended memory for Xenix, or for RAMdisks, using a Toshiba driver provided.

The disk drives provided as standard are a 3½in floppy drive holding the same 1.44Mbytes as the double-sided, high-density IBM PS/2 drives, and also capable of reading and writing 720k disks; and a 40Mbyte, 29ms access time hard disk in a surprisingly small casing. The floppy disk and hard disk controllers are actually attached to the drives rather than provided on the motherboard, meaning that different drives can be installed if standards or user needs demand it.

There is one Toshiba-standard expansion slot, designed to take a BABT-approved Hayes-compatible 1200 baud modem, a bi-synchronous communications board for mainframe links, or an interface board for the Toshiba expansion box that can hold up to five standard IBM expansion boards.

The standard interfaces on the back panel include an external RGB monitor port, a bi-directional Centronics parallel port that doubles as an external floppy disk drive connector, and a 9-pin RS232 serial port compatible with that on the IBM AT. Another connector on the side of the machine, near the front, is hidden behind a break-out cover and is intended for any IBM-compatible keyboard to be plugged in. This makes it possible to use the machine as the heart of a desktop system; a colour monitor and a full-size detachable keyboard can be kept at the office with an expansion box and external floppy drive if desired, and the T5100 can be used with its lid down as though it were just another very small PC system unit.

The display is almost identical to that in the Compaq Portable III and Portable 386, but Toshiba has stolen a march by including hardware and drivers for EGA displays on the plasma panel, as well as the usual 80×25 text, CGA graphics, and Toshiba-specific 640×400 display modes found on previous Toshiba portables. The display is also taller than Compaq's, making the aspect ratio even more compatible with that of conventional CRT screens.



The modular internal elements comprise power supply, disk drive unit, EGA video board and main motherboards. Surface mounting contributes to the machine's low profile

In EGA mode, the display can show 640×350 dots in four 'shadings', which are really different intensities; those intensities comprise black, full on, and two intermediate levels. As we shall see later, this makes it possible to juggle with the screen settings and produce a readable display even with EGA software using the full 16 colours of that mode.

The keyboard is the same as the T3100's, with a couple of exceptions, and has 10 function keys across the top and a full cursor key set at the bottom right. A new function key, Fn, is provided to give compatibility with the IBM Enhanced keyboard layout. Holding down Fn and pressing the '1' or '2' keys on the top numeric row gives the extra two function keys that may be required by software which recognises the full 12 keys of the Enhanced layout.

Attaching an external 5¼in floppy disk — 360k or 1.2Mbyte drives are available — is simply a matter of plugging its cable into the Centronics port, moving a switch on the side of the machine to A or B depending on the drive letter required, and rebooting to give the system a chance to figure out that the drive is attached. All the test software was transferred to the T5100 hard disk using an external drive, and it worked quickly and reliably. Of course, it is impossible to have an external drive and a parallel printer connected at the same time, but the big hard disk capacity means that the floppy will only be needed to transfer software provided by companies which do not yet support the PS/2 3½in floppy standard.

According to Toshiba, its entire range of laptops was designed from the case inwards rather than from the electronics outwards, so that the case size and shape was fixed first and the engineers were forced to design the hardware to fit it. So, the inside of the T5100 is crowded, and maintenance will certainly be tougher than with the Compaq Portable 386; but within the constraints, the use of custom chips makes the electronics board design simple and spacious. The problems of dismantling and servicing will be mechanical ones rather than electronic ones caused by too many hot-running components in too small a space.

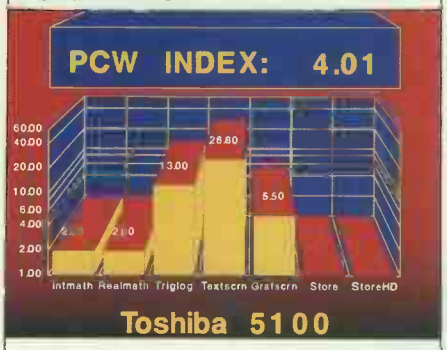
The T5100 is another neat piece of engineering, and again the feeling is one of surprise that so much power can be built into so small a package.

System software

The operating system provided is again MS-DOS 3.2, with some extra utilities to take advantage of the new hardware it is running on. The memory manager driver is installed in a CONFIG.SYS file, with parameters specifying how much RAM is to be used for LIM expanded memory, extended memory, or RAMdisk. Alternatively, the memory configuration can be changed at any time by running a SETUP program and rebooting.

The speed of the processor can be

Benchmarks



See 'Time trials', page 138

changed from the keyboard using a resident program. Holding the Fn key down and pressing the PgDn key takes the speed down to 8MHz for those few programs — such as communications packages — that may have trouble with the 16MHz clock rate. This command can be issued at any time, and the effects are immediately visible in things like a directory listing on the screen, which is noticeably more sluggish at the lower rate.

Another resident utility, this time one loaded from disk, allows configuration of the EGA mode of the plasma display to fit the software that is running. This utility, XCHAD, is like the CHAD software supplied with the T3100, but altered to handle the extra attributes of the EGA mode. XCHAD can also be called up at any time, and simply puts up a list of the 16 colours of the EGA standard with their current plasma intensities next to them. These settings can be changed from the keyboard using the cursor keys, and the changes are immediately reflected in whatever software is currently on the screen. This interactivity means that different settings can be tried to find the best combination.

For example, in Microsoft Windows the menu highlights were invisible thanks to the colour combination, and in Lotus' Freelance Plus graphics package the currently-selected menu item was also invisible. XCHAD allowed that to be fixed by eliminating the colour clashes.

Once again, the rest of MS-DOS 3.2 does not require much coverage.

In use

The T5100 ran everything thrown at it, in EGA and CGA modes, including things like Rix's EGAPaint, Freelance Plus, Windows, GEM, Word Perfect, RapidFile, AutoCAD, 1-2-3, and the rest. No hitches apart from the EGA colour problem, and fast performance as expected.

The fixed keyboard and screen of the machine, necessary because of its laptop design, seemed limiting compared with Compaq's detachable keyboard and more flexible tilt and swivel display. But overall, there is nothing to stop the T5100 becoming a user's only system as long as the plasma display is satisfactory. And the display, even in EGA mode, is fast enough and clear enough to satisfy most users.

The same tests were performed on the T5100 as on the Portable 386, although it is worth emphasising that the Toshiba machine was without an 80387 and that all the T5100 tests were in EGA mode. So, direct comparisons are a little risky to make.

The T5100 took 42.6 seconds to draw the Nozzle in AutoCAD, and 18.9 seconds for the Columbia; while the 1-2-3 worksheet macro took 33.9 seconds without LIM expanded memory, and, oddly, 33.3 seconds with the LIM driver omitted. Toshiba claims that its expanded memory is superior to Compaq's, and these figures seem to back that up.

As with the Portable 386, Landmark's SPEED.COM came up with a 1MHz rate higher than the clock rate of the 80386 chip; this time the machine was shown performing as fast as an AT running at 18.5MHz with one memory wait state. The fast 32-bit RAM access was again responsible. And the SPEED program also showed the machine performing 9.9 times faster than a 4.77MHz PC.

Conclusion

It would be wrong to think that no user will ever need portable machines at this level of performance. In the future, this standard will be the minimum that users require for any job.

What's more, either of these machines combined with an external monitor and a full-size IBM-compatible keyboard would make a fine desktop system with portability thrown in, at the cost of limited expansion options that can only be put right by spending more money.

In terms of performance, these systems are right at the top of any league. In terms of marketing, it was inevitable that Toshiba — which has carved out a market in high-power laptops without having any desktop systems worthy of note — would take this route. It was less likely that Compaq would produce a 32-bit portable, since the company's desktop systems, including the 16MHz DeskPro 386 and the new 20MHz 80386 desktop originally codenamed X-15, are making the company most of its revenue these days.

But with both these machines on the desktop, the Compaq Portable 386 seems too bulky for a true portable, and does not have EGA as standard; while the Toshiba is smaller, easier to carry, has EGA, a better display aspect ratio, and, trivially, a better keyboard feel as far as *this* observer is concerned.

Against that, the missing 4MHz in the T5100 clock speed should not deter those who *must* have an 80386 with portability. If portability is the real concern, then the T5100 is undoubtedly the superior machine.

Compaq is on (01) 940 8860.
Toshiba is on (0276) 62222.

END

Technical specifications

Compaq Portable 386

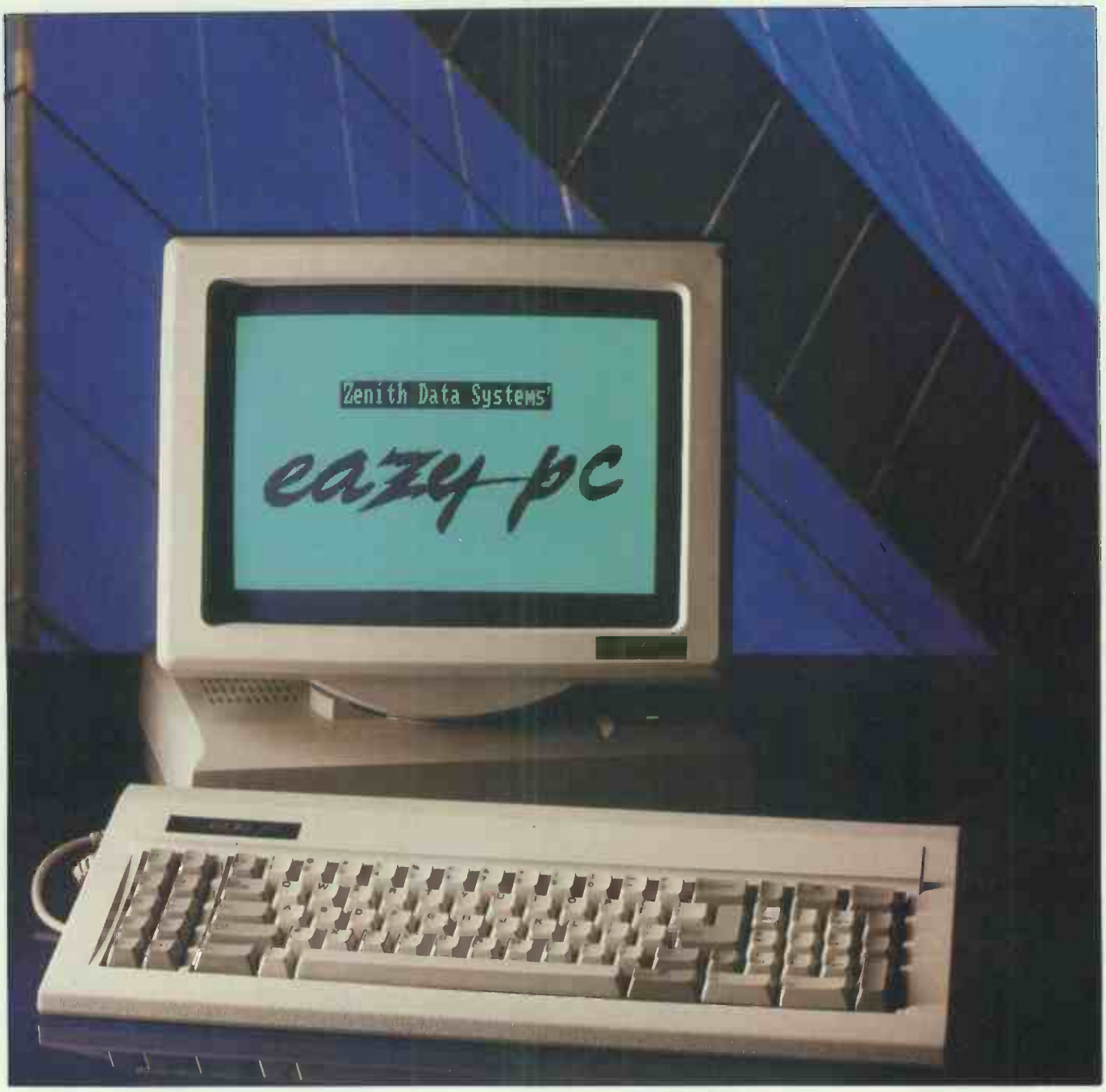
Processor:	Intel 80386, 20MHz
Co-processor:	Optional Intel 80387 or Weitek 1167 floating-point chips
RAM:	1Mbyte expandable to 10Mbytes with LIM support
Mass storage:	Single 1.2Mbyte 5¼in floppy drive, 40Mbyte hard disk
Storage options:	360k 5¼in floppy drive, 100Mbyte hard disk, clip-on 40Mbyte tape back-up unit
Keyboard:	IBM Enhanced keyboard compatible
Display:	Plasma, 80×25 text, 640×400 graphics, CGA-compatible
Standard interfaces:	RGB monitor port, parallel printer port, RS232C, IBM-compatible keyboard socket
Expansion:	One 8-bit and one 32-bit Compaq-specific slots, 96-pin expansion port for clip-on IBM-compatible expansion box
Size:	9.8ins×7.8ins×16ins
Weight:	20lbs
Bundled software:	MS-DOS 3.2, expanded memory manager, cache manager

Toshiba T5100

Processor:	Intel 80386, 16MHz
Co-processor:	Optional Intel 80387
RAM:	2Mbytes, expandable to 4Mbytes with LIM support
Mass storage:	Single 1.44Mbyte 3½in floppy drive, 40Mbyte hard disk
Storage options:	External 360k or 1.2Mbyte 5¼in floppy drive
Keyboard:	82 keys
Display:	Four-intensity plasma panel; EGA-compatible
Standard interfaces:	RGB monitor port, bi-directional parallel printer or external disk drive port, RS232C, IBM keyboard socket
Expansion:	Single internal Toshiba-specific slot, or external IBM-compatible expansion box
Size:	12.2ins×3.6ins×14.2ins
Weight:	15lbs
Bundled software:	MS-DOS 3.2, expanded memory manager, EGA colour editor

eaZy pc

Zenith Data Systems has produced a neat little desktop unit called the eaZy PC. But the machine's non-standard disk size and its lack of growth potential give some cause for concern. Martin Wren-Hilton examines its place in the home market.



Zenith Data Systems is perhaps best known for its range of PC-compatible laptops including the Z-183 and the Z-181. To date, however, the company has not shown much impact in the desktop market despite a broad range of offerings from the Intel 8088-based Z-159 to the recently announced Z-386. With the eaZy pc *(sic)*, Zenith is aiming to attack the Amstrad market and that of the soon-to-be-announced IBM Personal System/2 Model 25.

Four things distinguish the eaZy pc from other machines: its dimunitive size, its sharp display, its quiet operation and its lack of standard PC expansion slots. The machine comes in three models, each one with different storage capacities.

Hardware

The eaZy pc looks neat. A crisp paper-white monochrome monitor is permanently attached to the processor box by its swivelling base. You can't separate the two, and it would be unwise to attempt to do so as the monitor contains the power supply for the system. On the left-hand side of the monitor are two small knobs for altering the contrast and brilliance of the display, while the 3½in disk drives are on the right-hand side. This unusual arrangement is normally found only on laptops; and it makes the insertion of disks awkward — as you can't easily see what is going into where — and has the only advantage of allowing the keyboard to be pushed up against the front of the machine on cramped desks.

On the back of the eaZy pc are three ports: one for a Zenith mouse, one for a parallel printer and one for expansion. The expansion port is interesting as it is the only means of adding extras to the machine. There are no internal expansion slots, and the only internal option is a real-time clock which must be fitted by the dealer. Lack of expansion is the single biggest drawback to the eaZy pc.

Opening up the box — a procedure that is not recommended, as there are no user-serviceable parts inside — is a bit tricky. Because the monitor and processor box are inseparable, getting inside requires some manual dexterity. Lying the machine 'face down', with the glass screen on a work surface, proved to be the easier way. Four screws hold the base of the processor box to the upper half.

Inside, two large metal shields reduce any electromagnetic emissions. The one on the left covers the disk drives while the one on the right conceals the motherboard. Taking this off (having removed the loudspeaker) reveals the processor, memory and support chips.

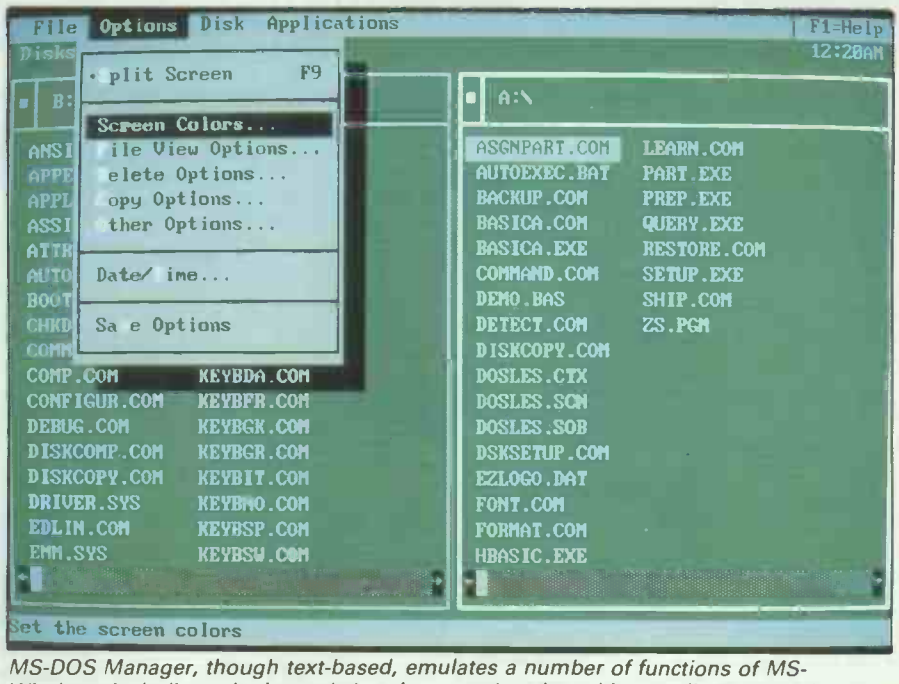
The eaZy pc is driven by an Intel 8088-compatible processor — the NEC V4u running at 7.14MHz. That makes it faster than the original IBM PC, and on a par with most low-cost PC clones. There is no option for running the machine at 4.77MHz (the speed of the original IBM PC). This feature is found on many PC-compatibles for the purpose of running certain copy-protected software, although it is no longer such an important issue as this method of copy-protection is seldom used.

For reasons that I cannot fathom, Zenith chose not to include a socket for an 8087 co-processor. This expensive mathematics chip (£150 or so) is a great boon when using programs such as Lotus 1-2-3 which have been designed to take advantage of it.

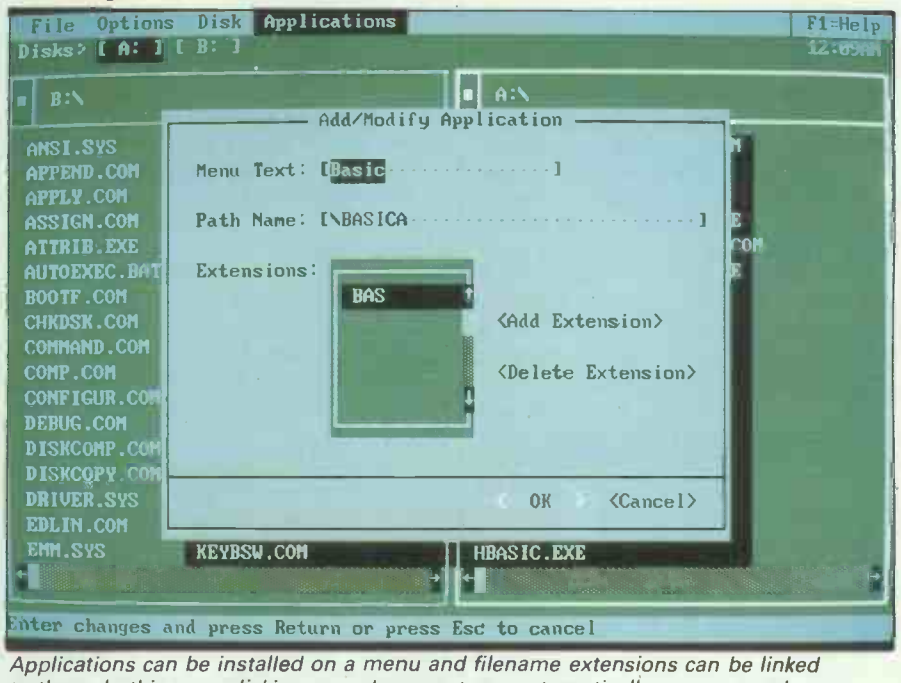
On the motherboard are the CGA (Colour Graphics Adaptor) compatible chips and the disk controller, as well as 512k of RAM. The overall standard of construction is high and the eaZy PC seems well-built — unlike *some* cheap PC clones.

One thing that makes the eaZy pc very pleasant to use is the complete lack of noise (due to the absence of a cooling fan). Despite the Amstrad fan fiasco, I am sure that the eaZy pc doesn't need one. It uses cool running CMOS chips and has ventilation slits all over the top of the processor box.

As mentioned above the eaZy pc comes in three models — the EZ-1, the EZ-2 and (you guessed it) the EZ-3 — with the only difference being storage capacity. EZ-1 has a single



MS-DOS Manager, though text-based, emulates a number of functions of MS-Windows including a 'point and shoot' approach to launching applications and file management



Applications can be installed on a menu and filename extensions can be linked to them. In this way, clicking on a document can automatically open a word processor

720k 3½in disk drive, while EZ-2 has two. For applications where greater capacity and increased speed are required, the EZ-3 has a single 720k 3½in disk drive and a 20Mbyte hard disk. For the purposes of this Benchtest, I examined the EZ-2.

In theory 3½in disks have several advantages over other types of disks. With twice the capacity of the industry standard 360k 5¼in disks, and occupying less space, 3½in disks will doubtless become a standard of the future; and there's the crunch. In practice, 3½in disks are a bit of an anomaly: the software sitting on most dealers' shelves is in 5¼in only and Zenith doesn't offer an external 5¼in to make life any easier.

Of course, you could always buy the combined 128k RAM/modem/serial port and use a serial cable with software such as PCXFER — but it *is* rather like cracking walnuts with a sledgehammer.

If you're considering purchasing the eaZy pc, think carefully whether you could exist in a 3½in world while most people live in a 5¼in world. If you, or a friend, already have a PC-compatible with the larger drives, how will you exchange files?

On paper, the eaZy pc's disk drives should be as fast or faster than their 5¼in counterparts. In transferring data, they probably are, but starting up they seem to take forever. This is common to all 3½in drives, and is not just peculiar to Zenith's.

Zenith *has* indicated that kits will be made available to upgrade from EZ-1 and EZ-2 to EZ-3, although no prices were available at the time of going to press.

The power switch for the eaZy pc is located on the back of the display. Spending hours behind many computer screens can be an eye-watering experience. Not so with the eaZy pc. Its crisp white-on-black display is among the nicest around. With a 25KHz scan rate, this 14in monitor is very pleasant to use. The glass surface has been treated to reduce eye-strain caused by unwanted reflections of light sources and contrast, and brilliance controls allow the display to be altered according to either conditions or your preferences.

The graphics adaptor built into the eaZy pc is CGA-compatible (as far as software is concerned), representing different colours with grey shades. In text mode, characters are formed in 8×16 graphics cells which makes the screen much easier to read than conventional CGA display systems (such as the Amstrad PC1512) where text characters are formed in 8×8 graphics cells.

Similarly, the graphics mode is also an improvement over conventional CGAs. Like the IBM Personal System/2, each line of graphics is scanned twice, giving the clarity of a 640×400 resolution from 640×200 pixels.

Coming back to my previous concerns about expandability, the biggest drawback of the eaZy pc's display and graphics is the lack of growth potential. There is no way of changing to a colour monitor or increasing the resolution beyond 640×200 at a later date. (The same complaint has been levelled at the Amstrad PC1512.)

The review machine was an American model, so it came with an American 84-key keyboard (that is, no pound sign and other keys changed around). Otherwise, the layout was standard with 10 function keys on the left and an integrated numeric/cursor control keypad on the right. I found the eaZy pc keyboard acceptably good with the key 'click' being produced by the machine's internal loudspeaker. For comfort, the typing angle can be altered to one of two positions and LEDs are provided to show the status of NumLock and CapsLock keys.

When using a word processor or navigating through a spreadsheet, the speed of the cursor can be a hindrance on most PC-compatibles. A neat program called Cruise Control from Revolution Software in the States (distributed in the UK by Ctrl Alt Deli) gets round this problem by accelerating the cursor up to a decent speed (see October Newsprint for more details).

However, the eaZy pc gets bonus points by including just such a feature in the firmware. Even at the MS-DOS command prompt A>, the cursor accelerates the longer you hold a key down. In most application programs this should prove a real boon, but I hope that the code in the BIOS firmware doesn't conflict with any software that intercepts the keyboard directly. It didn't on any software I tested.

It is worth remembering that a new 101-key keyboard, as provided with the IBM Personal System/2, is now becoming the new industry standard, although most low-end machines such as the eaZy pc have the smaller keyboard.

Zenith is offering four options for the eaZy pc — a mouse, a real-time clock, a 128k RAM module and a combined 128k RAM module with a modem and serial port. The real-time clock must be fitted by a dealer, while the other two modules plug into the expansion connector on the back of the processor box. According to Zenith, the modem is Hayes-compatible.

The 128k RAM module boosts memory to 640k and the combined 128k/modem/serial port module gives you a 9-pin serial port. Here are three things to bear in mind:

- If you want a serial port, you have to buy the modem and extra RAM.
- The serial port uses the AT-style 9-pin D connector.
- If you buy the 128k RAM module,

Twin 3½in floppy drives, mouse and parallel ports are the minimal external access points available. The expansion port allows for the addition of a serial port and/or modem

Benchmarks

Intmath	5.22
Realmath	5.11
Triglog	38.72
Textscrn	80.30
Grafscrn	28.86
Store	24.06

All timings in seconds. For a full explanation of the PCW Benchmarks, see the December 1986 issue, page 164.

Technical specifications

Processor:	NEC V40 (Intel 8088-compatible) running at 7.14MHz
RAM:	512k
ROM:	32k containing BIOS
Mass storage:	EZ-1: one 720k 3½in disk drive EZ-2: two 720k 3½in disk drives EZ-3: one 720k 3½in disk drive and one 20Mbyte hard disk drive
Keyboard:	84 keys: 10 function keys, 57 alphanumeric keys, 17 keypad keys
Monitor:	14in monochrome, white on black, 25KHz horizontal scan rate
Display modes:	Text mode (8×16 pixels giving 400 scan lines, 16 grey shades). CGA-compatible graphics mode (640×200 double scanned to 400 scan lines, two grey shades)
Standard interfaces:	Parallel printer port, Zenith mouse port
External expansion:	Zenith proprietary expansion port for either a 128k RAM module or a 128k RAM module with a modem and a serial port
Internal expansion:	Real-time clock (fitted by dealer)
Size:	14ins×13ins×13ins
Weight:	EZ-1: 28lbs, EZ-2: 29lbs, EZ-3: 30lbs
Bundled software:	Tutorial, MS-DOS Manager
Operating system:	MS-DOS 3.20

In perspective

Zenith's eaZy pc is very much a low-end machine, aimed at the home market. It is very competitively priced when compared with many of the cost-cutting, corner-cutting clones. Comparisons will doubtless be made with the monochrome Amstrad PC1512; the screen on the eaZy pc is much clearer, however. In both text and graphics modes, it shows 400 scan lines — a great relief for the eyes.

The question of disk sizes is a difficult one. In VCR terminology the 5¼in disks can be thought of as the VHS of the computer world, with 3½in being like Betamax (smaller, more technically advanced and not as popular). Ironically, both 3½in disks and Betamax were invented by the same people, the Japanese giant, Sony.

Both the Amstrad and the Zenith have 512k RAM as standard, expandable to 640k. The Zenith is smaller and quieter, but lacks the expansion slots, and that is its biggest weakness. It also lacks a socket for an 8087 mathematics co-processor that boosts the speed of applications such as Lotus 1-2-3.

The fact that the eaZy pc crashed when attempting to run WordPerfect Executive gave some cause for concern, although all other software seemed to work just fine.

Microsoft's MS-DOS Manager, as bundled with the eaZy pc, is a nice way to get acquainted with the machine. All-in-all, the eaZy pc is a well-polished, if a little unusual, PC-compatible.

you can't add a serial port or modem later.

Clearly, leaving out the industry-standard PC expansion slots from inside the box has made it smaller, but it's quite a price to pay. It means that the eaZy pc can never be hooked up to a network, can't use LIM expanded memory adaptors, can't be used as a 3278 or 5251 terminal and can't take any third-party expansion devices. For many applications, particularly those within companies where comms is an important issue, the eaZy pc is a no-hoper.

For domestic use, the eaZy pc could be a winner. It is low-priced, small, quiet and self-contained — all important attributes in the home.

Software

For the first time, Microsoft's MS-DOS Manager comes bundled with this machine. Two 3½in disks are shipped with the eaZy pc — one contains MS-DOS 3.20 and the MS-DOS Manager, while the other has set-up programs, a tutorial and GW-Basic.

MS-DOS Manager is a friendly front end, much like Microsoft Windows. Unlike Windows, it is character-based only, so does not support the more advanced graphics features of Windows. Also, it does not support multi-tasking or 'cutting and pasting' between applications. What it does is simply show the current directory on the screen, and makes mundane file shunting and deleting a little easier. It looks pretty and is easy to use.

At the top of the screen are the four pull-down menu headings, as well as the current time. Pressing the 'Alt' key activates the menus that can be selected by either pressing the highlighted letter (like Microsoft Windows 2) or by using the cursor keys. The main window shows the current drive and directory. Changing drives is as simple as pressing Ctrl-A or Ctrl-B, and running an application involves moving the cursor to the desired program and pressing Enter. Messages of guidance are shown at the bottom of the screen to help you select the appropriate choices.

I have one minor niggle about MS-DOS Manager. When going through the directory, the screen is completely redrawn for each line scrolled and creates a noticeable and irritating flicker.

The setup programs make backups of the two disks, as well as perform other things such as parking the head of the hard disk on model EZ-3. Also on the second disk is a simple tutorial and GW-Basic for writing your own programs.

For compatibility, I ran Microsoft Works, WordStar 4.0 and WordPerfect Executive. Surprisingly, WordPerfect Executive did not run. After loading, it printed a short, garbled message before crashing the machine. The moral? Test all software on your own machine before buying the program; but if this is not possible, get assurances from your dealer that the software will run correctly — tell them at the time of purchase that you intend to run the software on a Zenith eaZy pc.

I would have run more exhaustive software-compatibility tests, but for the fact that I ran up against the 'disk' problem — all my software is on 5¼in disks and Zenith provides no tools to aid the transition.

Documentation

Zenith's eaZy pc comes with three slim but comprehensive guides and a thicker MS-DOS manual. The three slim guides are: the *Owner's Manual*, which leads you through setting the machine up; the *MS-DOS Quick Reference*; and the *MS-DOS Manager*. The thicker MS-DOS manual gives a detailed breakdown of each command, and all four publications are well laid out.

Prices

Starting at £499 (excluding VAT), the eaZy pc is competitively priced: the EZ-1 costs £573.85, the EZ-2 costs £688.85 and the EZ-3 costs £1033.85 including VAT (£499, £599 and £899 excluding VAT).

Prices for optional extras were not available at the time of going to press.

Conclusion

With a built-in monochrome display and very limited expansion potential, the eaZy pc resembles a laptop PC-compatible — except that it is *not* portable. For lightweight applications such as dedicated word processing, the eaZy pc is ideal. For heavyweight processing, especially with disk-intensive programs such as databases, the eaZy pc begins to slow down. Graphics are very clear, but too low a resolution for serious graphics work.

Is it easy-peasy as the name would imply? Well, setting up the hardware was very straightforward. It is, quite literally, a matter of 'plug in and go'. For first-time PC users and for businessmen and women who want a PC at home, the eaZy pc is worthy of serious consideration.

Zenith is on (0494) 459266. END

386 operating systems

Next year sees Microsoft's OS/2 enter the market, and this is being heralded as the best thing to happen in the world of 386 system software. Some people can't wait, however, so Nick Walker presents a review of four products that utilise some of the 386's more advanced features.

So you have a shiny new 80386-based IBM compatible on your desk. What are you going to do with it? In 90 per cent of cases the answer seems to be run existing MS-DOS applications. True, they'll run lightning fast, but doesn't it seem a waste to use this wonderful 32-bit multi-tasking processor running single 16-bit applications in a restricted 640k of memory? According to the sales literature, the 80386 is capable of multi-tasking while addressing 4 Gigabytes (4000Mbytes) of memory and yet still retains compatibility with existing MS-DOS software.

The problem is lack of software. There are no applications that use the 386 to its full advantage, and until some 286 and 386 operating system standards are set, there won't be any. The operating system we are supposedly all waiting for is OS/2 — the 80286-based operating system from Microsoft. With luck, initial shipments of OS/2 will begin early next year but I doubt it will become truly useful until 1989.

For those who can't wait or have doubts about OS/2, there is some system software that lets you exploit the power of this processor and it's available *now*.

In this review, I'll examine four products that make use of the 386's more advanced features. Two of the products are full-blown operating systems: PC-MOS from The Software Link (TSL) and Concurrent DOS 386 from Digital Research.

The other two products co-exist with MS-DOS 2.11 and enhance its functions — Windows 386 from Microsoft and DESQview from Quarterdeck.

Concurrent DOS 386

Digital Research has offered an alternative to MS-DOS for the IBM PC and its compatibles ever since the PC was launched. The 386 is the latest addition to the Concurrent DOS family — a collection of operating systems that offers a high degree of compatibility with MS-DOS applications and also true multi-user and multi-tasking facilities. To be compatible with Digital Research's previous operating systems, Concurrent DOS 386 also offers data file compatibility with CP/M 86. Concurrent DOS 386 uses the advanced facilities of the 80386 to provide a more secure and more powerful variant of standard Concurrent DOS.

Overview

Concurrent DOS 386 is one of the true operating systems of the products reviewed. It does not totally replace MS-DOS but sits alongside it to be called upon when required. Unlike Windows 386 and DESQview, which use the existing MS-DOS to their advantage, Concurrent DOS 386 makes no use of the MS-DOS system or system files once running. What separates Concurrent DOS 386 from previous versions is the way in which it uses the 386 processor — the processor is constantly switched into virtual 8086 mode. In this mode, it behaves like lots of separate 8086 processors running simultaneously, each in its own memory area.

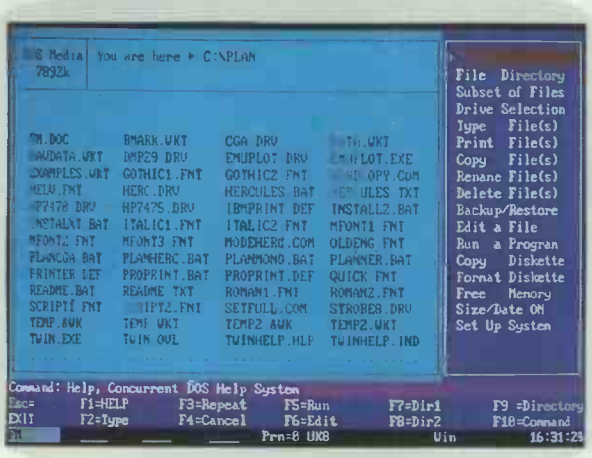
Concurrent DOS 386 is both a multi-tasking and multi-user system capable of supporting up to ten users from a single machine. Each user on the system is assigned to one of the virtual 8086 processors and can run up to four multi-tasking applications, provided they can generate the right command from their terminals. Using hardware rather than software partitions of the users and tasks ensures that all the users are secure from each other and in theory, any user could have a system crash and recover without disturbing anyone else.

As the majority of MS-DOS applications are not written to be used in the multi-user sense, a number of Concurrent DOS specific applications have been developed (multi-user, multi-access databuses, for example). Although Concurrent DOS 386 uses one of the features of the 80386 chip, it sets no standards for running 32-bit native mode software. Using this operating system is, therefore, strictly for running the various varieties of 16-bit software.

Installation

Concurrent DOS 386 has the easiest installation procedure of any operating system I have installed. Booting the system with disk one of the five floppy disks supplied takes you through a menu-driven installation program that copies all the files and determines which facilities are available on the system. Once installed you can choose which operating system, MS-DOS or Concurrent DOS 386, you would like the system to boot up with. If you want the system to start up in Concurrent, an extra command is added to your existing 'AUTOEXEC.BAT' start-up file.

You need a minimum of 512k of RAM and two floppy disk drives,



The file manager included with Concurrent DOS 386 offers features similar to Xtree. New applications can be configured, disks formatted, directories searched and programs launched

A simple windowing system is provided with Concurrent DOS 386. The windows are limited to text-based applications and cannot be re-sized when an application is running

although a hard disk is obviously preferable. If the system has more than 640k of RAM, the virtual 8086 mode of the processor means the extra memory is automatically used when required — there is no need for a page memory scheme such as LIM (Lotus, Intel, Microsoft standard). The 386 uses the entire memory space in an ordinary linear fashion. The speed benefit of any extra RAM is highlighted when using the system multi-user or multi-tasking.

The fact that Concurrent DOS 386 doesn't interfere with MS-DOS means that you can quit Concurrent at any time and return to MS-DOS. After installation the first thing to do is run the 'SETUP' program and configure the system. From here you can inform the system of up to five printers connected to both parallel and serial ports and two other users using terminals connected to serial ports.

In use

Concurrent DOS 386's command structure is very similar to MS-DOS. Commands can be executed directly from the Concurrent DOS A> prompt in the MS-DOS fashion; however, a lot of the commands can also be issued from a number of menu programs. The majority of standard MS-DOS commands are supported.

An Xtree-like program can be invoked by pressing the F2 function key or typing FM at the command line. The screen is divided into three: a main panel listing files, a command panel of commonly used operating system commands, and a prompt panel at the bottom which also lists the current function key designations. From this program, you can perform most of the operations normally issued at the MS-DOS prompt. All the usual features of a file manager program are there including launching programs, specifying wildcards, tagging files and directory management. Its more unusual features include the manipulation of CP/M media and an integral back-up routine.

The control key in combination with the 1 to 4 numeric keys allows you to switch between multi-tasking applications. The first time the command is issued, a new version of the operating system is launched for that task.

Initially, the four multi-tasking applications take over the whole screen when they are invoked. Concurrent DOS 386 has a system of windows which, in theory, allows you to run applications within windows. However, when I attempted this, I ran into many problems. The first problem was the failure of any program that attempted to use EGA graphics. Digital Research assures me that Concurrent DOS 386 should be able to multi-task one EGA application and have others suspended. A window command or window menu program allows you to display all four tasks on the screen simultaneously. Manipulating the window while the applications are running causes screen conflicts, so Digital Research suggests that you first set up the windows you require before running the application within them.

Windows are only capable of handling well-behaved text applications — CGA or EGA graphics need full screen. All this is extremely limiting and seems to defeat the object of windows. My recommendation is to stay with the default of each task occupying its own screen.

Multi-tasking and multi-user systems have to solve the problems of conflicts over access of a device. For example, two tasks and two users may start to print at the same time and it's up to the operating system to sort it all out. Concurrent DOS will support up to five printers and happily have all five printing concurrently. All printing runs via a printer spooler file containing all the text awaiting printing, even if two users want to access the printer at the same time. A printer manager program allows the user of the main screen to control this queue of files to be printed.

There are a number of other features which improve upon the facilities of MS-DOS. These include the three commands EDITMENU, RUNMENU and COPYMENU which allow you to create your own menus to control the system. A macro definition facility allows you to change the commands assigned to the ten function keys and numeric keypad keys. In combination with Ctrl, Alt and Shift, 50 macros of up to 20 characters each can be assigned. Six batch files called STARTUP1.BAT to STARTUP6.BAT replace the single AUTOEXEC.BAT of MS-DOS and are run upon start-up. The first four correspond to the four tasks of the main system user and the last two set up the serial terminals.

I was pleasantly surprised by how compatible Concurrent DOS 386 was with existing MS-DOS applications. The two main exceptions are memory resident and badly-behaved programs that insist on using an EGA screen. Digital Research claims that version 2.0 of Concurrent DOS will be able to support both these and will even run the extremely badly-behaved SideKick from Borland.

In the main, however, Concurrent DOS 386 ran 95 per cent of the software I tried on it, including PC Write, PC Outline, GEM, Lotus 1-2-3, WordStar Release 4.0 and Microsoft Flight Simulator version 2.0. Microsoft Word ran smoothly until it came to the spelling checker which loads memory-resident. CP/M compatibility is limited to data file compatibility — the hard disk utility creates a parti-

tion that conforms to the CP/M standards but this does involve reformatting the hard disk and starting from scratch. Memory schemes such as EMS run perfectly under Concurrent DOS, even when two multi-tasking applications are using it at the same time. I felt sure it would crash.

Very few applications can be made to run on terminals attached to the system, as these have to be strictly text based and use no screen addressing. Even applications requiring the ANSI.SYS screen addressing system will fail when used from a terminal. Release 2 of Concurrent DOS 386 is claimed to support IBM emulation terminals which means that additional users will be able to run straight MS-DOS applications and use multi-tasking.

Concurrent DOS uses the simplest kind of multi-tasking, with each task given 1/60th of a second. The processor just cycles between them in a round-robin fashion: there are no priorities to assign to tasks and the only possible control is to suspend a task. The system seemed quite secure — on a number of occasions, a single task crashed in a way that would normally bring the whole system down but, switching to another task, suspending the crashed one and then relaunching it, rescued the situation.

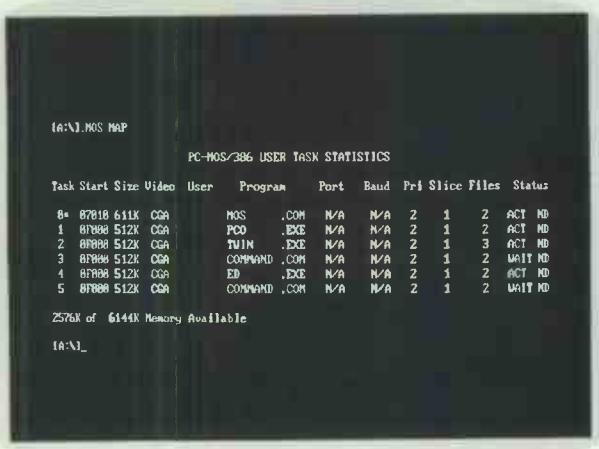
I didn't have the facilities to set-up a true multi-user system so I was unable to test the system in that sense. The version I used was a three-user version which, with extra cost, can be upgraded to accommodate ten users. Looking at the manual gives the impression that there is very little security in the usual multi-user sense. There is no log-in procedure and no user privilege levels — only a password which can be assigned to files or directories.

Two 'applications' are included with Concurrent DOS 386: a text editor to replace and surpass MS-DOS's EDLIN (not difficult) and a simple card file solely for storing names, addresses and phone numbers. Both are adequate for their purpose but are nothing spectacular.

Documentation & prices

The manual included with Concurrent DOS 386 consists of two separate volumes: the *User's Guide* and the *Reference Guide*. Both are bad but the *User's Guide* is truly awful, leaving me more confused than I was before I consulted it. Digital Research should watch a new user installing and using the system and then re-order and re-index the entire manual. My advice is throw the *User's Guide* away and use the on-line help facility and *Reference Guide*.

Concurrent DOS 386 costs £395 for the three-user version, which can be upgraded to a ten-user system for an extra £100.



PC-MOS offers a high degree of control over its multi-user and multi-tasking features. The MOS MAP command, shown here, gives a list of all tasks active, which users they belong to, priorities, and memory allocation

PC-MOS/386

PC-MOS/386 is The Software Link's (TSL) first attempt at a complete operating system and it is compatible with a large number of existing MS-DOS applications. In addition, PC-MOS offers a multi-tasking, multi-user environment and, most surprisingly of all, a standard of its own for the development of native 32-bit 80386 software. It is the most ambitious of the products reviewed here.

Overview

PC-MOS can totally replace MS-DOS. I believe there is no way both operating systems can exist on the same machine, as PC-MOS actually replaces the system files of MS-DOS with its own of the same name. It uses the 80386 processor in a very ingenious way because it not only uses the virtual 8086 mode, but also switches into native 386 mode to run 32-bit software.

PC-MOS is capable of supporting up to 25 users from a single machine. It distinguishes no difference between a task and a user. The main system user must, however, create a task that activates a user's terminal on a serial port. A total of 99 tasks are available providing you have the memory to run them. TSL applied the limit of 25 users just to maintain a reasonable performance.

No multi-user applications have, to date, been written for PC-MOS. It is strictly a case of one task, one program — two users trying to run the same MS-DOS program or edit the same MS-DOS data file would soon encounter file corruption and system crashes.

Installation

Some warning of the difficulties you can experience installing PC-MOS is given when the manual suggests that you should appoint a technically competent system administrator. In theory, on a hard, disk MS-DOS machine, PC-MOS can just be installed 'over' the current operating system.

According to the manual, installating PC-MOS is as simple as booting it from floppy disk and transferring the system using the .MSYS command in a similar way to the MS-DOS SYS command. I've tried this twice on two different machines and both times ended up with a non-booting machine that can't even be returned to MS-DOS. My suggestion for installing PC-MOS is back-up all your important files, do a low-level format on the hard disk and install it from scratch.

PC-MOS needs a minimum 386 configuration of 512k RAM and two floppy disks. However, there is very little you can do with that — in order to start getting the most out of it, you need at least 2Mbytes of RAM and a 20Mbyte hard disk.

Once installed, the first thing you need to do with PC-MOS is create a CONFIG.SYS file to inform it of your computer's configuration. The format of CONFIG.SYS will be familiar to MS-DOS users with such commands as BUFFERS, COUNTRY and DEVICE. Commands that won't be familiar include: SLICE, to define how much time is allocated to each task; SMPSIZE, to change the task supervisor's memory size; and FREEMEM, to inform the system of free memory ranges.

In use

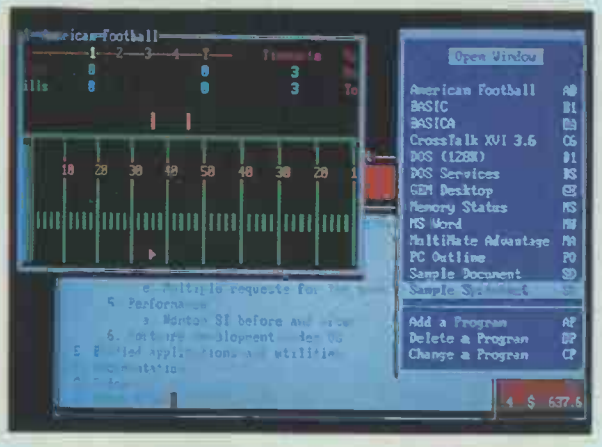
One of the big selling points of PC-MOS is that it uses practically the same commands as MS-DOS — fair enough if you like an operating en-

DESQview 2

DESQview is an application integrator, which means that it is a single-user, multi-tasking environment for existing MS-DOS applications. DESQview works on any ordinary PC-compatible but benefits from running under an 80386-based machine. Before covering the advantages of using DESQview on an 80386 machine, I will briefly address the features of DESQview that all users can access (for a complete review of DESQview, see *PCW* September issue).

DESQview divides processor time between all the applications running on a variable time-slice basis. A basic windowing system means that it is possible for the user to watch all the applications running and act accordingly. One feature unique to DESQview is its use of virtual memory, which means that you can have more programs running than will fit in your computer's memory. When there is no more RAM available of a program, DESQview swaps a program you are not using to the PC's hard disk.

When using an 80386 processor, DESQview automatically invokes the virtual 8086 mode of this processor. This has a number of benefits. Firstly, all the available memory is used before DESQview starts to use the hard disk for program swapping. However, the best aspect of using DESQview with a 386 machine is the autonomy it gives to each multi-tasking program. The separate video memory assigned to each program means that practically everything will run in a window without affecting any other windows — including CGA graphics programs which are normally suspended; the only exception to this being EGA graphics programs which will multi-task but require the whole screen whenever they are accessed. DESQview 2 costs approximately £125.



vironment that dates back to the early 1970s and is probably the single most intimidating aspect to a new computer user. Frankly, I was hoping for something a bit more friendly.

All the old-favourite commands such as DIR, COPY, CD and RENAMED are here, the only difference being that in PC-MOS they should be preceded by a dot (.). There are, however, a few fundamental differences. If you really want to feel at home you can switch off the need for a dot, but this increases the time spent on executing each command.

PC-MOS improves upon the standard MS-DOS commands in a number of areas. One of the useful and yet simple extensions is the ability to scroll through previous commands by using the 'up cursor' key. This allows you to edit and re-issue commands as required. PC-MOS also increases the wildcard function available using the two commands .EXCEPT and .ONLY. For example, to delete all the files except .DOC file, you issue the command '.EXCEPT *.DOC DO .ERASE'.

The PC-MOS multi-tasking facilities are activated via a series of memory partitions set up by users. The command .ADDTASK creates a partition and has parameters to: specify the memory required; give the task a number (defaults to 1 plus the highest task currently running); give a security level to the task; specify a batch file for the task to run upon creation; specify the type of terminal a new user running under the task is using; specify the serial port of a user's terminal; and set the baud rate of a terminal. The Alt key and the numbers on the numeric keypad allow a user to access any task from the main console or from suitably configured workstations. Most parameters are optional — for example, 'ADDTASK 128' is enough to specify a single task of 128k. With each new task, a new version of PC-MOS is launched from which you can run any applications.

PC-MOS offers no windowing system for the display of multi-tasking application, and each task takes over the entire screeen when viewed. Once a task is launched, it is possible to adjust the size of memory allocated to it using the MOS SIZE command. From the DOS (PC-MOS) prompt it is possible to remove the task and get a complete map of all the tasks and what they are running.

PC-MOS offers more control over the multi-tasking environment than any other system I have used. For example, it is possible to adjust the amount of time that each task is assigned. The default value of each time-slice is 1/18th of a second; this can be increased by the command MOSADM to around 14 seconds.

To further confuse things, it is also possible to change the priorities of tasks. The task with the highest priority will always get processing time before any task with a lower priority — of course, when waiting for input or writing to disk, there is plenty of time for the other tasks to run. It is imperative to restrict the access to these task commands, otherwise you will have users locking everybody else out of the system.

As far as MS-DOS applications are concerned, PC-MOS is not as compatible as might be desired. About half of the MS-DOS applications I tried worked satisfactorily, although this does include some notoriously badly-behaved programs. Among the programs that *did* work were Lotus 1-2-3, WordStar Release 4, dBase III, Harvard Graphics and PFS: Write. PC Outline, PC Write, the Microsoft Flight simulator, GEM and Windows proved too much for PC-MOS to handle. There is no support for programs that use the EGA graphics standard, so any EGA cards you have will spend the rest of their lives emulating the lesser CGA graphics standard.

To be fair to both TSL and Digital Research, the problems with EGA cards are not easily solved. Certain registers on the EGA graphics card are write-only (yes, write-only!) so there is no way of returning to a previous state of the card. In the majority of cases, a task could crash and not affect any other task; but even in this case it is hard to get the memory back to relaunch the task without rebooting the entire system.

The most worrying problem, however, is the number of times a single-task crash brought down the entire system (14 times over a period of three weeks). With a possible 25 users, that could be a lot of data lost.

PC-MOS can support a wide range of terminals. By far the most flexible terminal to use is the new Wyse 60 (or similar) which simulates IBM PC monochrome or CGA screens. Using one of these terminals, additional users should be able to run practically all applications. Using straight serial terminals restricts you to strictly text-based applications and then without fancy screen addressing.

As far as printing is concerned, PC-MOS maintains a printer spooler file — a list of everything awaiting printing which it feeds to the printer at a manageable rate. Two programs are used in this operation; a spooler and a print processor. The spooler is invoked in all tasks where spooled output is required; the print processor needs a task of its own dedicated to the spooling operation, and controls printing of spooled files.

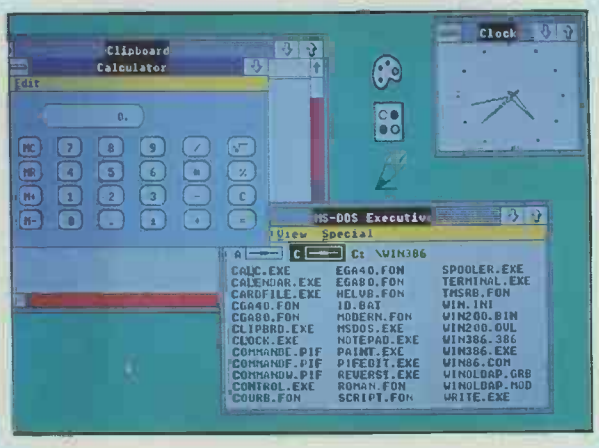
PC-MOS has considerable facilities

Windows 386

Microsoft's first offering to the 386 software scene is Windows 386, a version of its graphics environment. Windows is a single-user multi-tasking environment that is capable of running existing MS-DOS applications but is really designed to run specially-written Windows applications. Windows applications make use of the WIMP (windows, icons, menus and pull-down menus). A variant of Windows will eventually be used as the standard front-end to Microsoft's OS/2 operating system, so if you are considering using OS/2, getting acquainted with Windows will probably ease the transition.

Windows 386 'feels' exactly the same as its lesser sibling, the soon to be announced Windows version 2.0. Release 2 of Windows introduces cosmetic changes to the system in that the 'tiling' system of window management has been replaced by overlapping windows. Under the tiling system, the entire desktop area is always covered by the open window. With Windows 2 and Windows 386, each window is individually resizable and movable in a similar way to the Apple Macintosh. It's surprising just how much easier Windows is to use because of this change.

Windows 386 uses the virtual 8086 mode of the 80386 processor for each task. Not only does this ensure that the full addressable memory space is used without the need for an extended memory scheme, but it should also mean that the failure of a single task is less likely to crash the entire system. Fortunately, I had a beta copy of a Windows application with which I could generate a situation that caused the whole system to crash. Sure enough, with Windows 386, everything else kept going and the application died within its own resizable window — very impressive. I couldn't find any way to close down the crashed window from here, but at least you can save all your other data files before re-booting.



No price had been decided for Windows 386 at the time of writing.

for the setting up of security if needed. You may secure files or entire directories from unauthorised use, and assign your own password and user ID codes. PC-MOS security lets you selectively determine levels of access for users to individual files, directories and multi-tasking partitions. If you are really concerned about the security of your system, however, you can encrypt files using a built-in encryption facility.

PC-MOS includes a text editor and debugger as standard with the system; both are considerable improvements over MS-DOS equivalents DEBUG and EDLIN.

Documentation & prices

One 300-page manual is included with PC-MOS/386 and, considering its size (small by operating system standards), it does a very good job. I was particularly impressed to find a number of occasions where TSL admits the limitations of PC-MOS and offers advice on how to overcome them.

PC-MOS costs £195 for a single-user volume, £595 for a five-user system and £995 for 25 users.

Conclusion

The first question you need to answer when deciding on 386 system software is: Do you want to go the whole hog and use the system as a multi-tasking, multi-user environment? If the answer is yes, then only Concurrent DOS and PC-MOS/386 will be able to provide this. If all you want to do is enhance the machine capabilities as a single-user environment, then both these products represent considerable overkill.

For a single user, the choice is between DESQview 2 and Windows 386. If you already have a collection of MS-DOS software, DESQview offers the best solution for getting the most out of it. Windows 386 is more likely to appeal to a new user who wants to be right up to date with current standards in applications software. When OS/2 finally becomes available, the number of Windows applications will boom.

As for the choice between Concurrent DOS 386 and PC-MOS/386, I reached the following conclusion. PC-MOS/386 is by far the most capable of the two systems. It offers up to 25 users, with each user capable of multi-tasking applications; it also offers a standard for the development of 32-bit software. The problem with PC-MOS/386 is that it's a bit flakey and I certainly wouldn't want to trust 25 users' data to it.

Concurrent DOS 386 is altogether less ambitious but, after years of development, it is a far more robust product. At the moment, my choice is Concurrent DOS 386 because of its reliability, but given another year's development, PC-MOS/386 will probably prove superior. END

Multi-user, multi-tasking and concurrency

One of the most confusing aspects of computing is the definitions of multi-user, multi-tasking and concurrency. This is mainly due to manufacturers' over-optimistic claims, particularly those claiming that multi-tasking programs are, in fact, concurrent.

A **multi-user system** is one where a single processor looks after the activities of two or more users working via terminals. The terminals have little or no processing power of their own and are connected to the main system by a serial link. It is up to the main system to share its processor between all the users — obviously, the more users there are on a system, the more powerful the main system has to be. Multi-user systems are commonly confused with networks; however, a network consists of a number of systems — all with their own processing power — sharing common resources such as a large-capacity hard disk, laser printers and modems.

A system is said to be **multi-tasking** when it gives the impression of running more than one application simultaneously. In fact, the processor is dividing its time between all the applications which are running, with each application waiting its turn to gain a few moments of the processor's time. The simplest form of multi-tasking is *time-slicing*, where each task is given the same amount of time. An alternative system uses priorities, and applications which require a lot of processing power can be given more time than, for example, an application that is busy printing.

With **concurrency**, a number of applications are actually running simultaneously. In order to do this the computer system needs multiple processors, at least one for each application running concurrently. *True* concurrency is still rare among microcomputers.

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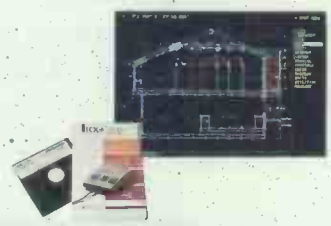

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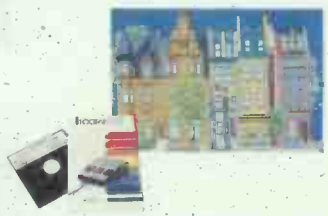

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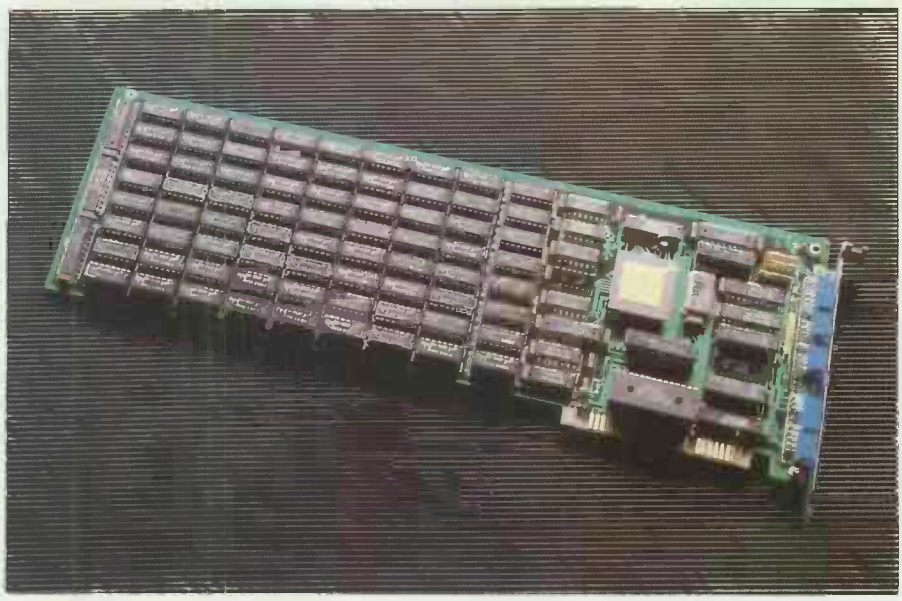
Monoputer

The much-heralded Transputer is at last available on a reasonably-priced PC add-in board from MicroWay. Howard Oakley has become hooked on its speed and power, and describes the hardware and software now available for the more adventurous user.

There can hardly be any computer enthusiasts who have not heard of Inmos' Transputers, and most of us have dreamed hard and waited long to get our hands on one. The original Inmos evaluation board, designated the B004, was relatively expensive — especially when bought with the development system software (TDS) — and can still only support the T414 Transputer rather than its faster and more powerful big brother, the T800.

Earlier this year, the British-based European subsidiary of MicroWay Inc (well-known for its specialist knowledge and support of the 8087 and other co-processors and accelerators) started to market what is essentially a cheaper and improved version of the B004, which can take either the T414 or T800 chips, and bundles an Inmos-written Occam-2 compiler with it. The board fits into any IBM PC, AT or compatible, so offering itself to the widest possible market.

I received my Monoputer board at the end of June, and it has now had over two months of intensive evaluation. Although the hardware — and much of the software — described here has been used in final-release form, they are but the start of a new wave of Transputer-based add-ons. The recent announcement that Atari is to design a whole machine based on the Transputer came as little surprise, and I expect several other manufacturers to follow suit over the next few months. However, this board is available now, at relatively low cost, and could give a taste to developers and others of what this next wave of machines will be like.



Hardware

The Monoputer board is, like most Transputer-based products, a fairly simple piece of hardware. It occupies one long slot in a conventional PC clone, and consists of one Transputer (which can be a T414 or a T800 — they are pin-compatible), 2Mbytes of RAM, and the supporting chips to enable I/O with the host.

The board is designed to act as a prototype card, in that it is normally seen to be at addresses hex 300 to 31F as far as the host PC is concerned. However, the external interface consists of three D connectors, two of which sport jumpers which must be correctly configured to support use of the correct I/O links. In the near future it may be possible to use these to link to other devices (such as Transputers), but this will be of little use unless you buy a special-purpose board (such as MicroWay's graphics board). In its current configuration, the host occupies one of the board's Transputer links.

Installing the hardware is simple, as no hardware or DIP-switch reconfiguration is necessary. The job is made a little more complicated, though, because it is easier to remove the external jumpers before putting the board in, so you should make note of their exact location for replacement purposes.

When the jumpers have been replaced and the machine reassembled, you can power-up and run the Transputer. The only problem that you might experience is at which addresses the file server functions on the PC will look for the I/O links for the Transputer: on IBM PCs, the base is hex 300; on Amstrads, hex 150; and other machines may vary again. If the base address differs from the default, it can be set when you call the host file server (to load and run any Transputer program), and should then be embedded in all batch files which call the server.

The optional upgrade to a T800 is a very important one. The T414, while running at 20MHz clock speed and thus offering the full 10 MIPS (million instructions per second) of

'real' Transputers, was designed as something of a stop-gap. It carries out all floating-point arithmetic routines in software, and has only 2k of fast 'on-chip' memory. The Benchmark timings on page 116 may *look* impressive, but they are only for a T414 running at 20MHz. When you upgrade to a T800 (another £250 or so on top of the cost of the T414, but all prices are likely to keep falling), you have a hardware floating-point unit which accelerates all the maths routines, and 4k of fast memory which can be filled with commonly-used variables and code subroutines. The net effect is to halve most Benchmark times, except for those which involve floating-point maths, which are reduced even more dramatically.

It is puzzling that MicroWay's board appears to be the only cheap board of its kind which supports both the T414 and the T800. Apparently, the design modification to allow this is not major or costly, but the benefit to the user is great: at present, T800s are in short supply and considerably more expensive, so you can start off with a Monoputer board and the T414, upgrading later. However, suppliers are going to be very reluctant to take back T414 chips when there are good supplies of the T800, so do not plan on getting any allowance on your old chip. It would also be worth your while being *very* careful when pulling Transputer chips to do a swap — they break easily!

Software

Operating system

The Monoputer board runs using a file-server program under PC- or MS-DOS. In the case of the bundled Occam-2 compiler, programs run in parallel with a pair of Occam processes which pass messages to and from the links with the host PC. A simple MS-DOS program, AFSERVER.EXE, runs on the host PC to convert these messages into calls to the host operating system. Your Occam-2 program thus calls various file-server functions to read the keyboard, write to the screen, access host files, and so on, by passing messages through Occam software channels to the Occam file server, which then passes the message to the PC, which carries out the action required and returns a result which goes back over the link to the Occam file server, and so to your program.

This means that every program written and compiled for the Monoputer must be linked with two parallel processes and then run under the host file-server program. Unfortunately, this does not make the best use of the Transputer's speed, and the Benchmarks reflect this. Inmos has Benchmarked the T414 using a separate chip to handle the host interface, and reports times roughly half those which I have given here; so, if the server overhead can be reduced, your programs will run much more quickly still. Some users — myself included — are currently examining ways in which this can be achieved (including sequential and asynchronous host access).

However, for someone used to fairly low-level access to the PC's facilities, the file server is almost complete in the support it provides. It allows you to write to and read from host memory blocks, call BIOS and DOS interrupts, and do most tasks short of pushing and popping the stack (required for TopView, for instance). The host server is also 'well-behaved' in that it does not modify interrupt vectors or (necessarily) directly manipulate hardware. Therefore, it will run under TopView, Windows, or other host operating environments, even if it will not actually make the most of their added facilities. Provided that your Occam program does not make too many demands on the host, such host-based multi-tasking can be very useful as it does not slow the Transputer at all.

The greatest problems with the file server become apparent when using an Enhanced Graphics Adaptor (EGA). As you can only write pixels on the EGA by means of interrupts and not (as with the CGA) by writing direct to memory, a program which is graphics-intensive becomes bound by the slowness of the file server. A classic example of this is in displaying the Mandelbrot set, which can be calculated amazingly quickly (typically, times of a couple of minutes for an EGA screen) but then requires, say, four minutes for the pixels to be written to the screen. The answer must lie in using a graphics adaptor in which the screen is mapped into accessible memory, or even a Transputer-based graphics board which bypasses the host altogether.

Accessing the file-server functions from parallel processes is no easy matter. One software channel is provided in each direction to communicate with the Occam server, so only one process at a time can access host facilities. If you allow two or more processes to try access in parallel, disaster soon strikes when messages become confused or deadlocked. On the other hand, it makes a lot of sense to run processes such as reading the keyboard and writing to the screen at the same time, and code for this runs very efficiently on the board.

One answer lies in creating a third process to coordinate server access, as shown in the example program above (reproduced with permission from the compiler manual). This kind of tool could easily be provided within a more sophisticated file server, which could also provide libraries of operating system functions at a higher level and so form a primitive operating system for the board itself — an enhancement which many users would value.

```
PROC tester.program(CHAN OF ANY from.filer, to.filer)
  #USE "C:\OCCAM2\FLIBSTR.OBJ"    -- these are the two file server channels
  #USE "C:\OCCAM2\IOCOMV32.OBJ"   -- and these are library files
  VAL Close.Option IS 0:    -- constant definitions
  VAL f.ok IS 0:
  VAL Read.Key IS 29:
  VAL ready IS TRUE:        -- BOOLs for use in channels
  VAL go IS TRUE:
  VAL stop IS FALSE:
  VAL done IS FALSE:
  VAL err1 IS 1:
  VAL err2 IS 2:
  VAL err3 IS 3:
  INT len, screen.id, keybd.id, result1, result2:
  [1]BYTE outchar:          -- write.block only works on arrays
  BOOL more, running:
  CHAN OF BOOL scwrre, scwrok, kbrare, kbrook,
               cldore, cldook:  -- one CHAN in each direction for each
  CHAN OF INT kbtosc, antoer:   -- PAR process with controller
  SEQ                           -- and INTs to screen & errors
    more := TRUE                -- more keys to read
    running := TRUE             -- program still running
    outchar := " "
    open.output.stream(from.filer, to.filer, 0, screen.id, result1)
    open.input.stream(from.filer, to.filer, 0, keybd.id, result2)
    IF                          -- these open file server streams
      (result1 = f.ok) AND (result2 = f.ok)
        PAR                     -- these are the parallel processes:
          INT keyint:           -- (local variables)
          BOOL fine:
          SEQ                   -- 1. KEYBOARD READ
            WHILE more
              SEQ
                kbrare ! ready  -- to controller, ready to access
                kbrook ? fine   -- wait for go ahead from controller
                IF              -- ( chan ! var outputs var to chan,
                  fine          --   chan ? var inputs from chan to var )
                    SEQ
                      write.integer(to.filer, Read.Key) -- read 1 key
                      read.integer(from.filer, keyint)  -- stroke
                      read.integer(from.filer, result1)
                      kbrare ! done  -- tell controller we've finished
                    TRUE
                      result1 := 1
                IF
                  result1 = 0  -- we have a keystroke, so
                    kbtosc ! keyint  -- send integer value to screen
                  TRUE
                    SKIP
          INT keyint:       -- (next local variables)
          BOOL fine:
          SEQ               -- 2. SCREEN WRITE
            WHILE more
              SEQ
                kbtosc ? keyint  -- get integer from keyboard read
                outchar[0] := BYTE(keyint)  -- convert into byte array
                scwrre ! ready   -- do AFserver controller protocol
                scwrok ? fine
                IF
                  fine
                    SEQ
                      write.block(from.filer, to.filer, screen.id,
                                  outchar, len, result2)
                      scwrre ! done  -- char written to screen
                      IF
                        keyint = 13  -- if return pressed, quit
                          SEQ
                            more := FALSE
                            cldore ! ready
                            cldook ? fine
                            IF
                              fine
                                SEQ  -- close down
                                  close.stream(from.filer, to.filer,
                                               screen.id, Close.Option, result1)
                                  close.stream(from.filer, to.filer,
                                               keybd.id, Close.Option, result1)
                                  terminate.filer(from.filer, to.filer,
                                                  result1)  -- close streams & quit
                                  running := FALSE
                                  cldore ! done
                              TRUE
                                antoer ! err1 -- error message
                        TRUE
                          SKIP
                  TRUE
                    antoer ! err2
          BOOL req:
          SEQ               -- 3. AFSERVER ACCESS CONTROLLER
            WHILE running   -- this is a series of alternative processes
              PRI ALT       -- note priorities in ALT are highest = first
                cldore ? req  -- wanting to do close & terminate
                  IF
                    req
                      SEQ
                        cldook ! go   -- give go-ahead
                        cldore ? req  -- and wait until complete
                    TRUE
                      antoer ! err3
                scwrre ? req  -- wanting to do screen write
                  IF
                    req
                      SEQ
                        scwrok ! go
                        scwrre ? req
                    TRUE
                      antoer ! err3
                kbrare ? req  -- wanting to do keyboard read
                  IF
                    req
                      SEQ
                        kbrook ! go
                        kbrare ? req
                    TRUE
                      antoer ! err3
          INT err, i, j:
          [2]BYTE answer:
          SEQ               -- 4. DEMO ERROR HANDLER
            WHILE running
              SEQ
                antoer ? err
                IF
                  err > 0
                    SEQ
                      -- insert your error handler code here!
                      write.block(from.filer, to.filer, screen.id,
                                  "I've fallen over*N", len, result1)
                      answer := " "
                      INTTOSTRING(len, answer, err)
                      write.block(from.filer, to.filer, screen.id,
                                  answer, len, result1)
                      -- then do close or debug as desired
                  TRUE  -- i.e. if err <= 0
                    SKIP  -- do nothing and then get on with program
                TRUE
                  SKIP
```

Occam-2 standalone compiler

If you wish to access all the facilities of a Transputer, Inmos claims that you should write your programs in Occam. The compiler bundled with the MicroWay board was produced by Inmos and is compatible in almost all respects with the far more expensive TDS. The two main omis-

sions are an editor, something most users will be quite happy with as it enables them to use their own favourite with a clear conscience; and the configurer program which sets up linked code to run on different hardware configurations, and which is irrelevant for programs to run on this board alone.

Occam is a sparse language, not dissimilar from the Pascal family, and has unique features for parallel processing (a cursory glance at the example program in this article will reveal some of its differences). This implementation has some restrictions from the standard language definition, but none that should cause much concern as they can either be circumvented easily (for example, the lack of ports, which can be simulated by channels placed at fixed locations in memory) or prove irrelevant (such as the omission of CASE as a process, as IF can have multiple condition-choices). There are a few rough corners still, such as the fact that segments of arrays must be of a size given by a variable or a constant but not an expression, and problems with word alignment when you retype BYTE variables.

However, when you start to compile an Occam program, you realise that the compiler was not designed for the faint-hearted. In the first instance, every Occam program must run under a 'harness', a short, prefatory section of Occam code which must be re-edited for every new program. You then run a change control utility on that harness source so that library and program files which must be linked together can be identified. Next, you compile your own source, then that of the harness, using different compilation options. Finally, you link all the object files — either using the output from the change control utility (the easy option) or a long and error-prone command line. If this sounds long-winded and unnecessarily unfriendly, it is. Most users resort to a batch file, but this causes problems if errors occur during the initial compilation.

With reference to errors, the compiler unfortunately halts and aborts when it finds your first error. If you are prone to making a few little typographical errors in your source code, or when you are first learning Occam, you might wish that it had the courtesy to inform you about a few more each time. As Occam is very sensitive to little things such as the number of spaces by which each line is indented, and is a heavily type-orientated language, frustration is common during the early learning phase. As you generate less errors, you start to appreciate the fact that in- and out-dentation dictate program structure. You do not have to insert a host of semicolons and dreary ENDs, and the richness of some of the language's unique features will become apparent to you. For myself, it is a relationship which began with hate, but is now approaching something like love.

The machine code generated by the Occam compiler is closely related to its source — indeed, there is a facility for inline assembly (using a subset of the Transputer opcodes) which may prove useful to those prepared to flout the Inmos' ethic that writing assembler is playing with fire.

The documentation for the compiler was initially very poor, but a new version of the manual is now supplied and this should provide almost all the information which you might require in an accessible way.

In summary, although this compiler is rather unfriendly in operation, it is otherwise an ideal bundled compiler if you wish to run parallel processes. If you are reluctant to learn Occam and see no practical use for its features, then this compiler is unlikely to tempt you towards the Inmos camp.

Lattice Logic's C Compiler V1.3

Although originally commissioned by Inmos, Lattice Logic of Edinburgh is now selling a range of other language compilers through MicroWay. This implementation of C has just gone to full release, and supports a full *Kernigham and Ritchie* standard with additional features almost to the level of an established PC standard like Microsoft C Version 4.0. In operation it is very much simpler than the Occam-2 compiler, as in most instances you merely compile your source and link it with the libraries provided, using two simple command-line entries. However, if you are trying more sophisticated things, such as linking your own libraries and using your own harness, or linking object files from other languages, all the complex hooks and options are provided.

'Include' files provided are: ASCII, ASSERT, CHANIO (supporting low-level access to links), CTYPE, DOS (providing compatability with Microsoft C), ERRNO, MATH, SETJUMP, STDIO, STRING, and TIME (to the ANSI standard). No allowance is currently made for Occam-style use of channels to communicate between processes, or parallel processes themselves, except by linking C programs within an Occam harness.

There are a few puzzling omissions from the implementation — for example, the 'rand' and 'srand' functions are still not provided. In general, though, this is a complete and professional version of C. It is remarkable in surpassing Occam in its performance, under certain conditions. Lattice Logic has taken a good deal of time and trouble to optimise use of the fast on-chip memory, and this becomes particularly worthwhile when using the T800. For example, the 'triglog' Benchmark has been reported to run twice as fast under C than under Occam, when using a T800. I suspect that, as there are no such differences on the T414, it shows a deficiency in the Occam compiler for T800 targets too.

Pascal and other languages

Lattice Logic is also supplying a very pleasant implementation of Pascal which is now becoming available in its full release version (1.2) and is conforming to BS 6192:1982, level 1 (which is functionally equivalent to the ISO 7185 standard). For those who wish for a more Modula-like version, it comes with extensions to allow modules, inline assembly, relaxation of type-checking, short (32-bit) reals, and so on. The purist will be pleased that these only operate if you deliberately invoke a compiler option.

I have been particularly impressed with the friendliness of this compiler, as its error messages come close to telling you just what you should correct and are thoroughly documented. The major omission, which I suppose is inevitable in a Pascal centred on the ISO standard, is a complete lack of graphics facilities. I understand that Lattice Logic is addressing this, and graphics modules will probably be placed in the public domain soon.

The Benchmarks for Pascal seem

Benchmarks

	Occam-2	Lattice Logic C	Pascal
Intmath	< 0.01	< 0.01	< 0.01
Realmath	0.09	0.32 *	0.4 *
Triglog	0.53	2.8 *	5.0 *
Textscrn	150	232	232
Grafscrn†	103	150	—
Store	7.6	3.2	—

Notes: * Using 64-bit IEEE floating-point reals
† IBM screen mode 4 (medium-resolution CGA)
For a full explanation of the *PCW* Benchmarks, see the December 1986 issue, page 164. All programs are compiled.

perfectly respectable when you consider the additional run-time overhead that the language demands.

Lattice Logic is also marketing what is claimed to be a full-featured Fortran 77, now on full release too, although I have not had the opportunity to examine that yet.

There are a couple of other C compilers shortly to become available, one from Norway and one from the US. I have looked at a very fast Prolog interpreter, from Coherent Research Inc (US), which offers a good Clocksin and Mellish-style Edinburgh syntax implementation which is the fastest AI language I have ever seen. The machine hardly seems to take any time in backtracking, and always generates output very quickly. Version 0.4 offers 56 predicates, and comes with a lovely display of logic programming in setting a monkey a goal as a task. The result is a blow-by-blow account of the actions required to achieve that goal, generated at lightning speed.

I hope that MicroWay intends to market this interpreter, and that Coherent is going to expand the number of predicates to take it up to a full-blown and user-friendly Prolog implementation, as it alone could be a good reason for filling a lot of PCs with Monoputer boards.

Applications

The only current application which appears to be available for the Monoputer board is Predict, a numerical forecasting package which is claimed to be so number-intensive that it really needs a maths co-processor, an 80386 or a Transputer before it is a practical proposition.

There are a number of demonstration programs available from the Transputer Users' Group or written by MicroWay. These include the inevitable Mandelbrot graphics, Conway's Game of Life (a classical example of parallel programming) and a shareware disassembler.

Benchmarks

Benchmark times are given for three of the compilers reviewed here. They were carried out on a T414 Monoputer board running in a standard IBM PC/XT (4.77MHz) with an IBM Colour Graphics Adaptor, a standard IBM 10Mbyte hard disk, and PC-DOS 3.0. I have not run the other host-bound Benchmarks for Pascal as they are little different from C, using almost identical file-server code.

You may, for interest, like to compare these timings with those for 80386 machines (without a maths co-processor) and the Acorn Archimedes (allowing for its use of interpreted Basic — see *PCW* August). The T414 Monoputer board certainly matches the best, and all indications are that a single T800 will outperform any other microcomputer when compared for 'onboard' Benchmarks. The slowness of the host file server is all too apparent, though.

Documentation

At present the Monoputer board does not come with a hardware manual, but this should be available shortly. The manual for the Occam-2 Standalone Compiler has been rewritten and should now prove thorough and clear, but does not include a tutorial in Occam; I would recommend Dick Pountain and David May's *Tutorial Introduction to Occam Programming*, published by Collins, which may even convert those who see little point to the language. I find the Inmos documentation on Transputers rather opaque, and would like to see a text which covers the chips and their instruction sets in detail but in a lucid way.

Future hardware

MicroWay and other suppliers of Transputer boards are developing more new and potentially revolutionary products than any other sector of the industry. Over the next few months, expect to see a broadcast-quality graphics board, multiputer boards and more, as well as add-ins and add-ons for other machines (Kuma, for instance, is already selling a peripheral for Atari STs). Surprisingly — and thanks to Inmos — British firms lead the world for once.

Conclusion

It's available, it's reasonably cheap, and it's now quite well-supported by a range of languages. But is it useful? As the Monoputer board stands now, it could serve as a specialist accelerator for those who have computation-intensive tasks of any type. It could well have a significant impact on the City, for instance, in providing much faster analysis and forecasting. This board is really the tip of an iceberg, though. When you can push output to a Transputer-run graphics engine, more markets open up — and they should prove market leaders for really fast high-quality graphics.

The two major drawbacks seem to be the host, and the lack of an operating system which can cope with varying hardware configurations. Frankly, PC clones may be the most popular boxes around, but they are too slow and crude to do justice to the Transputer. It is essential that some form of operating system be available soon to cope with the problem of running programs on multiputer boards: at present, any program can only be configured for a specific hardware setup. If I write and compile an application for the T414 Monoputer board, it will not make use of a brace of T800s on someone else's board, say.

If you do decide to go for Transputers, I would recommend that you join the Transputer Users' Group. Topics which I have touched upon in this review are the subject of whole articles in its newsletter, and the group can always put you in touch with someone who can help.

Would I recommend the Monoputer board? If you are a hardware or software developer, and you want to be at the leading edge in a couple of years time, you have to buy one and start learning soon. If you have a vertical-market application which still runs slowly, or could benefit from a lot of processor power, then you will be delighted with one, when your software runs on it. If you are into high-quality graphics, it will be the cheapest professional system. If you're a hacker or techno-yuppie, you should have one already.

Prices

MicroWay Monoputer board T414-20, 2Mbytes RAM, Occam-2 compiler	£1495
MicroWay Monoputer board T800-20, 2Mbytes RAM, Occam-2 compiler	£1750
MicroWay Quadputer board 4×T414, 1Mbyte RAM each	£3690
MicroWay Quadputer board 4×T414, 4Mbytes RAM each	£7440
MicroWay Quadputer board 4×T800, 4Mbytes RAM each	£8700
Lattice Logic C, Pascal, Fortran compilers, each	£475
MicroWay/Inmos Occam-2 standalone compiler, separate	£475
Inmos Transputer Development System	£1500
Coherent Prolog Interpreter	Price to come

All prices are exclusive of VAT.

Technical specifications

Processor:	Inmos T414-20 Transputer
RAM:	2Mbytes, plus 2k on-chip
ROM:	None
Host:	IBM PC, AT or compatible, requires one full-length expansion slot
Host operating system:	PC-DOS or MS-DOS version 2.10 or later
Bundled software:	Occam-2 standalone compiler, file server

MicroWay is on (01) 541 5466.

The Transputer Users' Group can be contacted by sending a reply-paid addressed envelope to: TUG, Brooklands Lodge, Park View Close, Wroxall, Ventnor, Isle of Wight PO38 3EQ.

Howard Oakley is a naval medical officer involved in physiological research, and is a computer addict both at home and at work. END

From chaos to beauty

From the depths of scientific mystery and a basic knowledge of mathematics, weird and wonderful designs can be produced, from a computer with graphical output. Barry Martin and Mike Mudge present a kaleidoscope of patterns and figures.

'Chaos' is a respectable scientific discipline emerging in many areas, ranging from turbulent flow through population dynamics, heart cell dynamics and neurological patterns to the study of lasers. Any readers interested in the underlying theory can refer to the publication, *The Universality of Chaos*, a collection of papers edited by Predrag Cvitanovic and published by Adam Hilger (1984), However, with no knowledge of the theory and only a minimal knowledge of basic mathematics, patterns and designs of breathtaking beauty and intricacy can be produced — all that is required is a microcomputer with graphical output. Colour graphics, although not essential, can be used to produce subtle effects and attractive designs.

The procedure is based on iterations of ordinary real numbers. A starting point (x_0,y_0) is chosen and then successive points (x_1,y_1), (x_2,y_2), and so on, are generated using some mathematical function. A digital computer plots the points so quickly that it appears as if electronic raindrops are falling onto the graphics screen. Eventually, after a thousand or so points have been plotted, a pattern begins to emerge. Patterns can be varied by changing the starting point or by changing numerical parameters in the mathematical function, thus giving infinite variety from any one point generator.

Do not, however, get the impression that the formulae have to be complicated in order to produce exotic patterns. Very simple formulae using, for example, functions such as SGN(x) and SQR(ABS)x)), which are available on all micros, can yield exquisite designs as can be seen from the detailed examples which appear in this article.

Some patterns seem to build up in one area of the screen for thousands of iterations and then, suddenly, the whole process jumps to another region and a further segment of the pattern develops. Obviously, some experimentation with scaling is usually necessary to reveal the full content of a given point generator. Increasing the magnification of an area surrounding a particular point of a pattern will reveal more of the

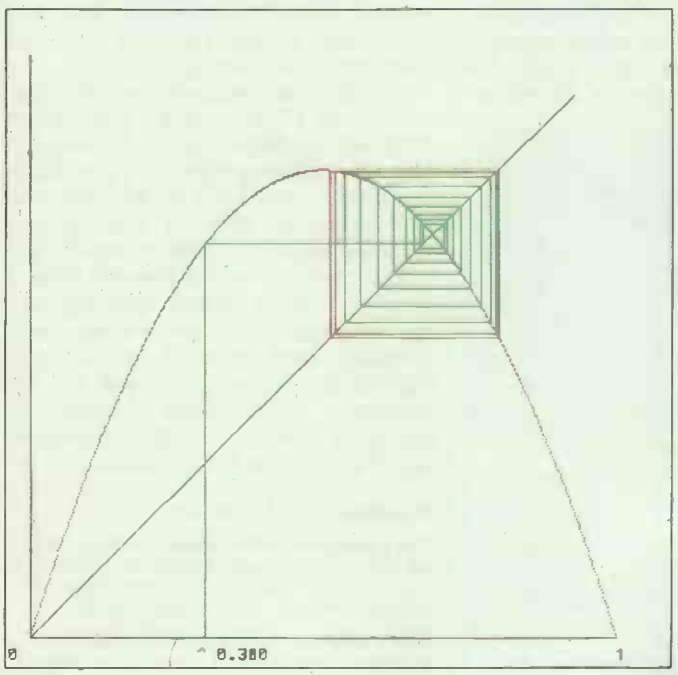


Fig 1

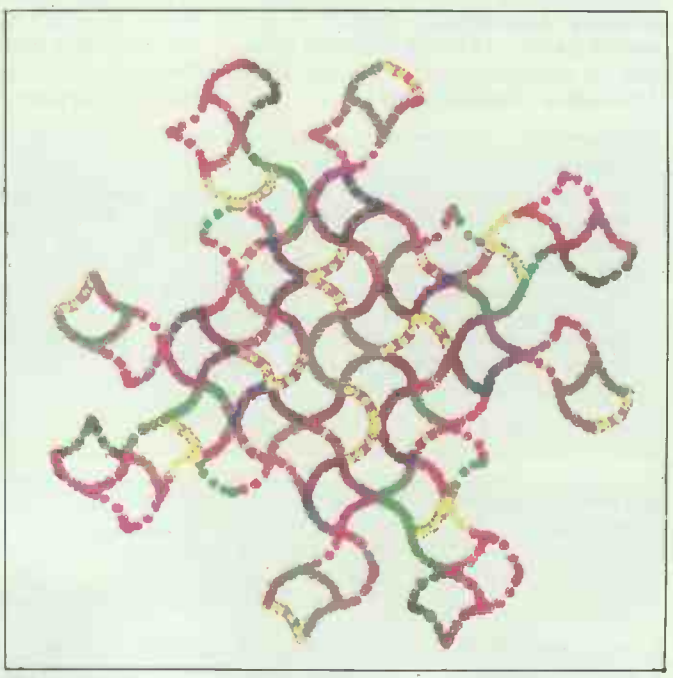


Fig 2

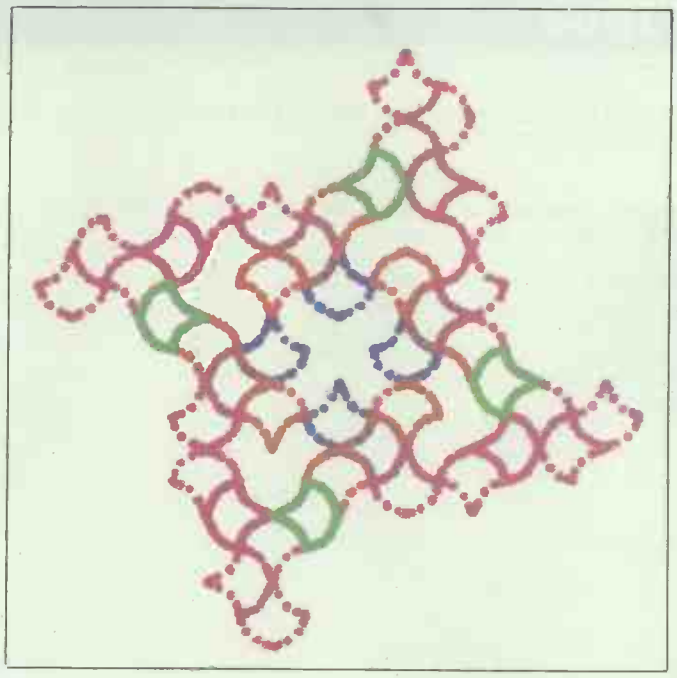


Fig 3

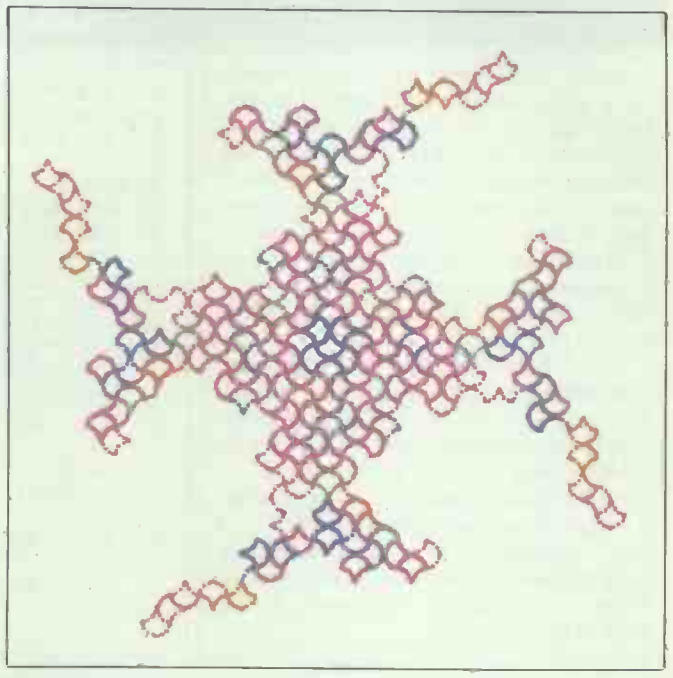


Fig 4

microstructure of the pattern and will probably produce a thing of beauty in itself.

Colours may be used to enhance the artistic appeal of the patterns, for example, by assigning colour according to how far the point being plotted is from the origin of coordinates. Alternatively, you can change colour according to the number of iterations required to compute the position of the point — for example, vary the colour every 100 iterations.

The techniques for developing the patterns described in this article were inspired by the Mandelbrot sets presented by Dr MM Novak and Jack Weber in the article 'Fractal Sets', *PCW*, December 1986. Mandelbrot's patterns emerge from complex numbers (not easy things for many people to manipulate on their computers) and the seeds for the iterative process are the points, infinite in number, found in a region of the plane. For every point on the screen a complicated calculation needs to be done many times over, and the computer generation of a complete pattern may take hours or even days, although Weber does describe ways to reduce this computation time.

Furthermore, to obtain detailed resolution of the final picture, high-powered graphics facilities are required. The process described here, on the other hand, uses only real numbers and the pattern grows from only a single seed, the starting point (x_0, y_0). The pattern begins to appear after a minute or so of computation, and exciting pictures can be produced using nothing more elaborate than the screen of a portable TV set.

Using such pattern-generating techniques, it is possible to design your own personalised wallpaper or textiles so that no-one else in the world would be likely to have the same pattern. Imagine going into a shop, keying a couple of your own secret numbers into a computer terminal, and a computer-based automatic 'pattern designer' then produces rolls of unique personalised wallpaper or even a unique dress fabric.

However, to return to the 'chaos' of reality upon which all of this is based, before you all branch out into computerised wallpaper design, we will look at a one-dimensional case (no pretty pictures) which will illustrate how chaotic phenomena rise from an ordered situation.

One-dimensional chaos

As an example we will look at the equation (known to mathematicians as the logistic equation) **(1)** $\ldots x_{r+1}=4Cx_r(1-x_r)$, where r = 0,1,2 ... successively. We take a starting value x_0 anywhere between 0 and 1 and then compute x_1, x_2, x_3 ... using equation (1).

A procedure such as this is called an 'iterative scheme' and the computation of each successive x — value is called an iteration. Before

```
 10  REM PROGRAM "HOPALONG".
 20  REM THIS GENERATES PATTERNS BY ITERATION FROM "HOPALONG".
 40
 50 MODE1
 60  REM READ IN DATA: CONSTANTS P,Q,R, INITIAL POINT, CENTRE POSITION,
 70  REM SCALE AND NUMBER OF ITERATIONS.
 80 INPUT "CONSTANT P ",P
 90 INPUT "CONSTANT Q ",Q
100 INPUT "CONSTANT R ",R
110 INPUT "X COORDINATE OF STARTING POINT ",X
120 INPUT "Y COORDINATE OF STARTING POINT ",Y
130 INPUT "X COORDINATES OF CENTRE POINT ",XC
140 INPUT "Y COORDINATES OF CENTRE POINT ",YC
150 INPUT "HORIZONTAL SCALE ",XS
160 INPUT "VERTICAL SCALE ",YS
170 INPUT "NUMBER OF ITERATIONS REQUIRED ",N
180 CLS
190 ICOUNT=0
200 T=1/SQR(2)
210
220  REM START ITERATION.
230 FOR I=1 TO N
240 X1=Y-SGN(X)*SQR(ABS(Q*X-R))
250 Y=P-X
260 X=X1
270 ICOUNT=ICOUNT+1
280 PRINT TAB(0,0);ICOUNT
290  REM ROTATE PLOT THROUGH -45 DEGREES.
300 U=T*X+T*Y
310 V=-T*X+T*Y
320 PLOT 69,XC+XS*U,YC+YS*V
330 NEXT I
340 STOP
```

starting, however, we must decide on a value for the constant C, as the behaviour of the iterative scheme is dependent on the constant we choose. Firstly, C must lie between 0 and 1; this keeps the successive iterates within the range zero to one. If C is less than 0.25, the values of x_r as r becomes large approach zero. If C lies between 0.25 and 0.75, the values of x_r approach $1-\frac{1}{4}c$.

For C between 0.75 and 0.9, more interesting features begin to emerge. For example, when C=0.76, x_r alternately approaches the two values of 0.589356083 . . . and 0.730591286 . . . and, as larger values of C less than 0.9 (or, more accurately, 0.8925 . . .) are chosen, x_r simultaneously approaches an increasing number of these 'limit' values, as shown in the box below.

C	Number of 'limit' values
0.2	1
0.24	1
0.76	2
0.87	4
0.89	8
0.892	16

Limit values

The algebraic significance of this phenomenon is well-understood by the mathematical pundits and is, indeed, quite predictable and orderly. However, as C gets closer to the special value 0.8925 . . ., order ceases and chaos takes over. The values of x_r become distributed between 0 and 1 in a thoroughly haphazard way, but order can return as C is further increased towards unity. For example, if you try X_0=0.96, you should find that just three points are visited.

```
 10  REM PROGRAM  "AXHEADS".
 20  REM THIS  GENERATES ITERATES  WHICH "TILE" THE PLANE
 30  REM WITH AXEHEAD LIKE FORMS.
 50
 60 MODE1
 70  REM READ IN DATA: CONSTANT A, INITIAL POINT, 'CENTRE' POSITION,
 80  REM SCALE AND NUMBER OF ITERATIONS.
 90 INPUT "CONSTANT A ",A
100 INPUT "X COORDINATE OF STARTING POINT ",X
110 INPUT "Y COORDINATE OF STARTING POINT ",Y
120 INPUT "X COORDINATES OF CENTRE POINT ",XC
130 INPUT "Y COORDINATES OF CENTRE POINT ",YC
140 INPUT "HORIZONTAL SCALE ",XS
150 INPUT "VERTICAL SCALE ",YS
160 INPUT "NUMBER OF ITERATIONS REQUIRED ",N
170 CLS
180 ICOUNT=0
190 T=1/SQR(2)
200
210  REM START ITERATION.
220 FOR I=1 TO N
230 X1=Y-SIN(X)
240 Y=A-X
250 X=X1
260 ICOUNT=ICOUNT+1
270 PRINT TAB(0,0);ICOUNT
280  REM ROTATE PLOT THROUGH -45 DEGREES.
290 U=T*X+T*Y
300 V=-T*X+T*Y
310 PLOT 69,XC+XS*U,YC+YS*V
320 NEXT I
330 STOP
```

All the various features described above can be displayed using the program 'CHAOSMW' on page 122, which is written in BBC Basic. This first draws the parabola having equation **(2) y=4Cx(1−x)**, together with the straight line having equation **(3) y=x**. It then carries out the iterative process which is illustrated in Fig 1 where, in this case, C=0.8 and x_0=0.3.

CHAOSMW originated from Matthew Wells, who produced it as part of an undergraduate project at the University of Aston, Birmingham in 1986. However, he is making no claims to be the first to write such a program: many mathematicians during the last few years have constructed similar routines.

To help you centre and scale the plots on your own monitor, it will be useful to know that on a screen of 1280 X 1024 pixels, xo = 200, yo = 100, xs = 900 and ys = 900 gives a good picture.

Two-dimensional chaos

The two-dimensional mappings which we will consider are of the

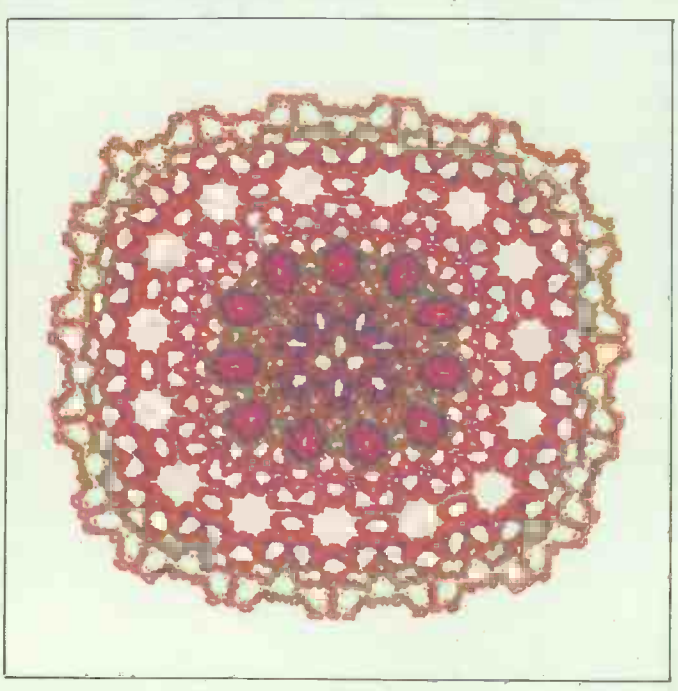


Fig 5

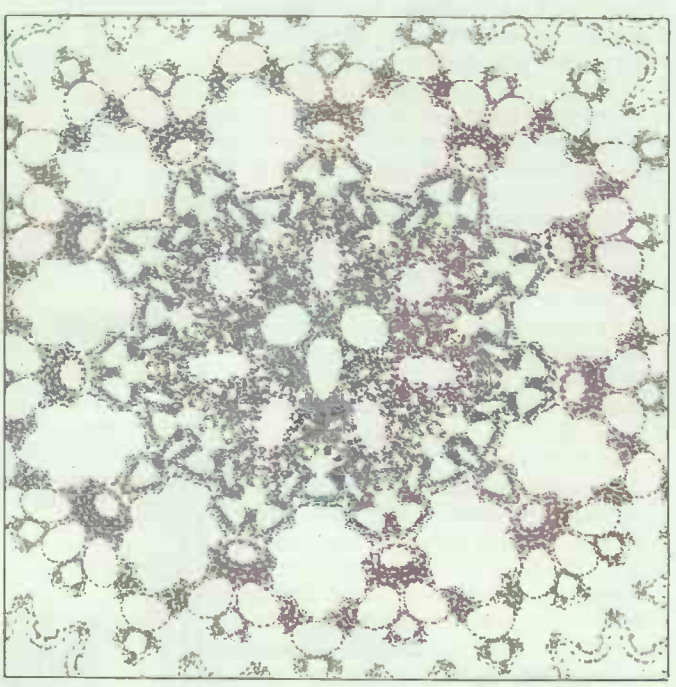


Fig 6

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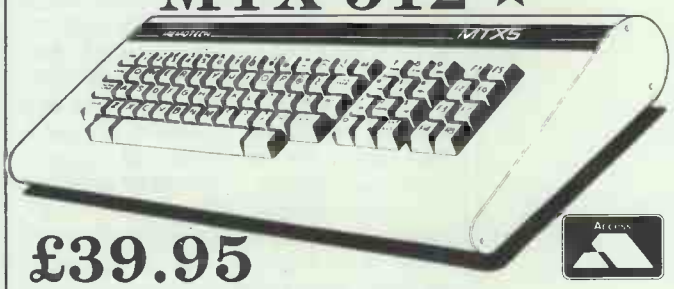

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form (4) $x_r+1=f(x_r+y_r)$, $y_r+1=A-x_r$, where A is a numerical constant, r = 0,1,2 ... successively and starting values (x_0, y_0) are to be specified, and f(x,y) is a non-linear function of the ordered pair (x,y). Readers have the opportunity to investigate the consequences of replacing $y_r+1=A-x_r$ by $y_r+1=g(x_r+y_r)$, a second non-linear function. Brief experimentation within this area, however, suggests that the resulting patterns may be over-elaborate with a consequent loss of aesthetic appeal.

The first family of mappings to be considered is (5) $x_r+1=y_r-\sin(x_r)$, $y_r+1=A-x_r$, where r=0,1,2 ... successively with starting values of (0,0). The necessary program 'AXHEADS', is listed on page 120.

It seems that if $A=\pi=3.1415026$ ..., this program displays a repetition of the four points (0,0), (0,π), (π,π) and (π,0). This phenomenon is somewhat analogous to the predictable and orderly behaviour previously described for the one-dimensional mapping equation (1) when the constant C is less than 0.87 ... We are not, therefore, surprised by the approximation to four-fold symmetry that results from choosing a value for A which is sufficiently chose to π (see Fig 2 referring to A=3.1421).

20,000+ points have been plotted and the colour changed every 50 iterations. However, the results associated with the value A=3.15 and using different numbers of iterations are displayed in Figs 3 and 4. These pictures display some of the infinite variety associated with the point-generator equation (5), as discussed in the introduction.

Scaling with A=3.12, and initial point (0,0) on the screen mentioned above, is reasonable with xc=600, yc=550, xs=10 and ys=10.

A second family of mappings to be considered is (6) $x_r+1=y_r-\text{sign}(x_r) \times |Qx_r-R|$, $y_r+1=P-x_r$, where P, Q and R are numerical constants, r=0,1,2 ... successively and starting values (x_0,y_0) are to be specified.

The case when $x_0=0$, $y_0=0$, R=0 and Q=1 has been discussed by Martin, *The Mathematical Gazette*, volume 70, number 452, June 1986, pages 140-142, for a range of values of P.

The general investigation of the point generator, equation (6), may be carried out using the program 'HOPALONG' on page 119 of this article (the name was coined by AK Dewdney who writes on Computer Recreations in *Scientific American* magazine) for which specimen output is provided in the form of Figs 5 and 6.

History

This approach to pattern generation has been inspired by the analysis of the so-called Hénon Attractor defined by (7) $x_r+1=1+y_r-ax^2r$, $y_r+1=bx_r$, where a and b are numerical constants, r=0,1,2 ... successively and starting values (x_0,y_0) are to be specified (see, for example, M Hénon, *Communications in Mathematical Physics*, volume 50, pages 69-77, 1976). The chaotic situation resulting when a=1.4 and b=0.3 is displayed through four stages of magnification using up to 5×10^6 points with starting values (0,0). The black-on-white pictures presented have no artistic merit, but did prompt considerable mathematical investigations resulting in part from their apparent 'ultimate' simplicity.

Such advantages seem unlikely in relation to the point generators (5) and (6) featured here, although some mathematicians are optimistic. Readers are encouraged to experiment with alternative forms of (4) — that is, to develop new designs rather than to seek underlying advances in the rather difficult mathematical theory.

Barry Martin is a lecturer in mathematics at Aston University, Birmingham. **Mike Mudge** is the author of *PCW*'s regular maths column, Numbers Count (page 211).

END

```
10  REM  PROGRAM   "CHAOSMW".
20  REM THIS PROGRAM DISPLAYS SUCCESIVE ITERATES OF THE LOGISTIC EQUATION
30  REM X(N+1)=4*C*X(N)*(1-X(N)).
40  REM TO START IT ASKS FOR A VALUE OF C BETWEEN 0 AND 1
50  REM AND FOR AN INITIAL VALUE OF X BETWEEN 0 AND 1.
60  REM THIS PROGRAM WAS WRITTEN BY MATTHEW WELLS. 1986.
70 MODE1
80
90 INPUT "CONSTANT 0<C<1 ",C
100 INPUT "STARTING VALUE 0<STARTX<1 ",STARTX
110 INPUT "MAXIMUM NUMBER OF ITERATIONS ",MAXIT
120 INPUT "X COORDINATE OF ORIGIN ",XO
130 INPUT "Y COORDINATE OF ORIGIN ",YO
140 INPUT "LENGTH IN PIXELS OF X-AXIS ",XS
150 INPUT "LENGTH IN PIXELS OF Y-AXIS ",YS
160
170  REM DRAW AXES AND THE PARABOLA 4*C*X*(1-X).
180 CLS
190 PRINT TAB(0,0)
200 PRINT TAB(4,31) "0"
210 PRINT TAB(0,0)
220 PRINT TAB(34,31) "1"
230 PRINT TAB(0,0)
240 PRINT "C=";C
250 PRINT "X(0)=";STARTX
260 PLOT 4,XO,YO
270 PLOT 5,XO+XS,YO
280 PLOT 4,XO,YO
290 PLOT 5,XO,YS
300 PLOT 4,XO,YO
310 PLOT 5,XO+XS,YO+YS
320 X=0.0
330 SCALE=1/YS
340 FOR I=1 TO YS
350 X=I*SCALE
360 PLOT 69,XO+X*XS,YO+YS*4*X*C*(1-X)
370 NEXT I
380
390 M=0
400 X=STARTX
410 PLOT 4,XO+STARTX*XS,YO
420 GCOL 0,1
430  REM START ITERATION.
440 Y=4*X*C*(1-X)
450
460  REM PAUSE TO SEE DEVELOPMENT OF PLOT.
470 FOR N=0 TO 400
480 NEXT
490 PLOT 5,XO+X*XS,YO+YS*Y
500 PLOT 5,XO+Y*XS,YO+Y*YS
510 X=Y
520 M=M+1
530  REM INTRODUCE COLOUR CHANGE AFTER 50 ITERATIONS.
540 IF M<50 THEN GOTO 560
550 GCOL 0,2
560 IF M=MAXIT THEN STOP
570 GOTO 440
```

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PCW 9 11

First impressions

Over 75,000 people attended this year's PCW Show at Olympia from 23-27 September. There were 420 exhibitors and no-one could count far enough to calculate the number of products on show. Even if you were there, it's likely you missed some of the highlights. Our show coverage this month, courtesy of editor Derek Cohen and photographer Tony Sleep, is necessarily brief due to publishing deadlines, but next month will see a fuller report on the very wide range of products and activities that makes the PCW Show the only one worth visiting.

Acorn

For most visitors, the PCW Show was their first chance to lay fingers on Acorn's award-winning Archimedes (it was nominated Home/Small Business Micro of the Year in the British Micro Awards).

The teeming crowds on the Acorn stand were reminiscent of the response that Amstrad usually gets. An auditorium at the front of the stand was used to demonstrate various applications on a bank of monitors. And, to counter the blasts of gunfire cannonning over from the adjacent US Gold stand, Acorn had wisely seeded the whole area with extra loudspeakers to demonstrate the machine's sound capabilities.

One of the more spectacular demonstrations was of the spinning globe used as the BBC TV logo. This image is manipulated in real time, and the globe spinning not just at high speed, but in reverse, demonstrates not just the fast processing speed of the Archimedes, but also Acorn's cockiness at having a machine so good that it might just not need the Beeb's sponsorship.

Also on show was the PC emulator for the Archimedes running an authentic, if a little slow, copy of Lotus 1-2-3.

Atari's CD-ROM

Atari is gaining a reputation for surpassing even the most speculative gossip. Star attraction was this CD-ROM unit which will take compact discs holding 550Mbytes each and interface to Atari STs using the ordinary hard-disk drive port.

What was not expected was that the unit will also function as an ordinary audio CD player, as well as playing the new CD video disks.

And for those with PC-compatibles, Atari will include an interface board which will also function as a standard hard-disk controller.

The price? A ridiculously reasonable £399. Deliveries promised before Christmas.

Commodore Village

Eating facilities at Olympia were rather sparse because Commodore bought up the restaurant. Commodore booked the restaurant and filled it with its dealers and software developers.

Past shows have seen Commodore stands packed with people eager to glimpse the Amiga being put through its paces. It could be that everyone's seen one now, but the crowds were noticeably absent. Interesting new products included a CAD package from UK software house Taurus, and a video-mixing console that looked like it needed three university degrees just to read the screen.

Commodore's own exhibit included a 'Hall of Fame' type display of its long history in computing. Among the market-leading products that there seemed not to be room for in among the products shown, were the C16 and the Plus/4. Perhaps the company just plain sold them all.

British Micro Awards

Few people have ever seen *PCW*'s editor in a dinner jacket. So, if that has been one of your ambitions, cut this picture out and pin it up immediately.

The occasion was the British Micro Awards, and the recipient of this particular award was Anita Sinclair of Magnetic Scrolls whose Guild of Thieves was voted Game of the Year.

Other award winners included Tandon for its PAC286, which was reviewed in the June issue of *PCW*; Adobe Illustrator; and the Acorn Archimedes.

The ceremony was compered by Willie Rushton, whose jokes were far too rude for a family magazine like this. However, worth telling are his stories about Apricot — 'who made their machines IBM compatible just before IBM made *its* machines IBM compatible' and Clive Sinclair, whose C5 came off the worse for a road accident — it drove into a pigeon.

Mac surprise

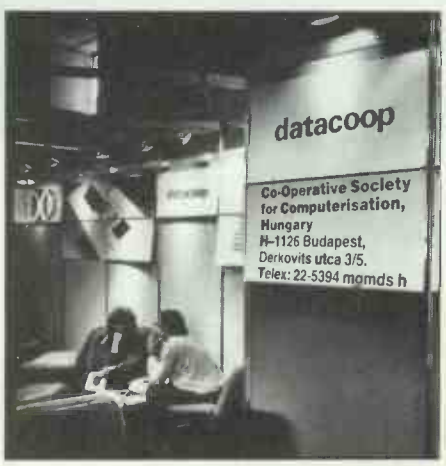
No, it's not an Apple Macintosh. It's not even a Macintosh clone. This is the KS-1000 Transfer computer from KS Brotherbox of Kien Kwo Road, Taipei. Inside you'll find an 8088 CPU running at 4.77 or 10MHz, 768k of RAM, a 132-column Hercules-compatible display, and two 3½in drives plus a hard disk.

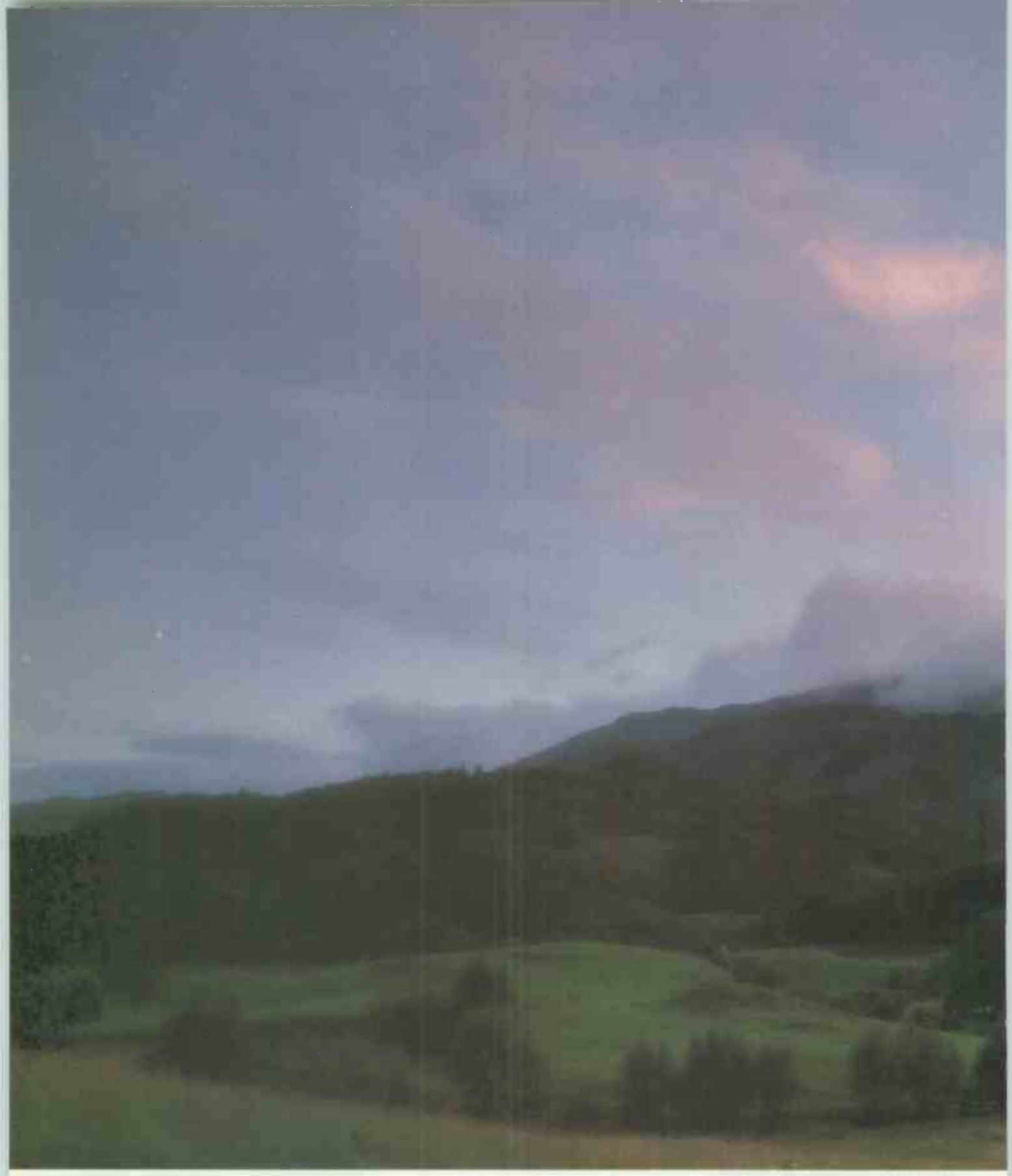
The display is 9in paper white, but I kept expecting to see the 'Happy Mac' smiling back at me. Instead, there was a very dinky AutoCAD demo.

The KS-1000's big brother, the KS-1050 Transfer Computer, is the AT-compatible equivalent. Strangely, RAM starts at 512k expandable to a meagre 1Mbyte, which means that this won't be the smallest OS/2 machine to date.

In case you were wondering, each machine contains four expansion slots, although the AT version has an extra bulge on the back to accommodate longer cards.

Brotherbox was at the show looking for dealers and distributors, so its prices are quoted for importers rather than end users. And $750 for the 1000 and $1300 for the 1050 seemed rather high when that might translate to £1000 as a street price.





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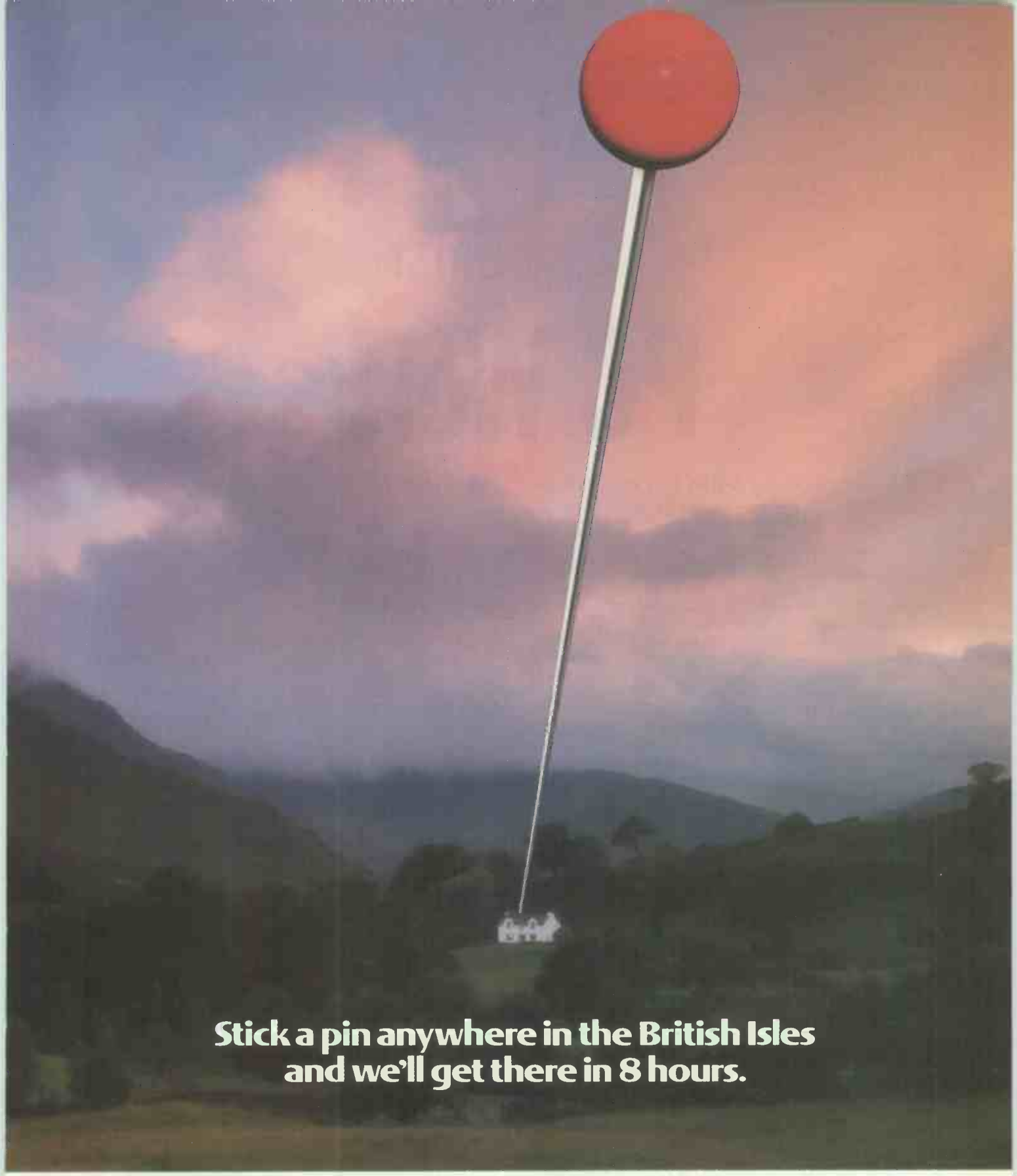

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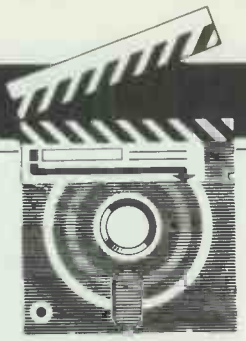


SCREENTEST

PC Works

Going down but not quite out, the line of MS-DOS applications is sustained by Microsoft's PC Works, a basic integrated package for the PC and compatibles. But is it too little, too late? Owen Linderholm finds out.

Although Microsoft is trying to lead the PC market into a new age with the OS/2, Windows and Presentation Manager programs, it still has a commitment to the old world of MS-DOS. I am sure, however, that we will be seeing fewer and fewer of the old-style text-based programs from Microsoft. PC Works could thus be described as the first of the last MS-DOS programs: the process will take years but is beginning now just the same, a decline equivalent in style but not scale to that of the Roman Empire.

PC Works is a fairly simple text-based integrated package consisting of word processor, spreadsheet, database and communications programs. It is aimed at the cheap compatible market and those users who don't want to move on to Windows.

In keeping with the new Microsoft style of a standard user interface across its range of products, PC Works uses a common menu interface with a single splittable window, very similar to Microsoft's programming products. The window takes up most of the screen and has horizontal and vertical scroll bars, making it a virtual window onto a much larger area.

There are two ways to do almost everything in the program. One is to select commands and move the cursor around using the mouse. This works speedily and seems to be the way the program was intended to be used. You can also move around and select items with the keyboard and, although this is often as fast, it is much slower in some cases (scrolling through a document, for example).

Menus are drop-down and show an unusual level of design. They have 'shadows' — the latest fashion trend in WIMP design — but the shadows are 'real'. You can see through them to the underlying text. This holds true for every sort of display the program can use except LCD on portable machines, where the shadows are dappled but do obscure the underlying text. It's a shame that the design of PC Works features and power isn't quite on the same level as the design of the program's interface and functionality.

Installation

Installing PC Works is an intelligent, semi-automatic process. The program will install itself automatically onto a working disk — an extremely sensible practice because this makes using and, therefore, damaging your master disks difficult. The installation program automatically recognises the configuration of your machine and then pops up a menu of additional information for you to alter. This involves display types and monitor types you want to use, printers for text and graphics, file organisation, whether to use Help or not, whether to include graphics printer fonts, which country defaults to use, which mouse driver to use, and whether or not to delete unwanted printer drivers, and so on.

When an application is open, two of the menus that appear are common to all of the applications. These are the File and Window menus. The File menu is used to launch new applications in new windows, to save the current file, to exit PC Works or to switch to a DOS shell to temporarily run other applications. The Window menu allows you to call Help or consult the tutorial (two features I was unable to test at the time of the review), to change the settings or to switch to a different open window (you can have up to eight of these).

Word processor

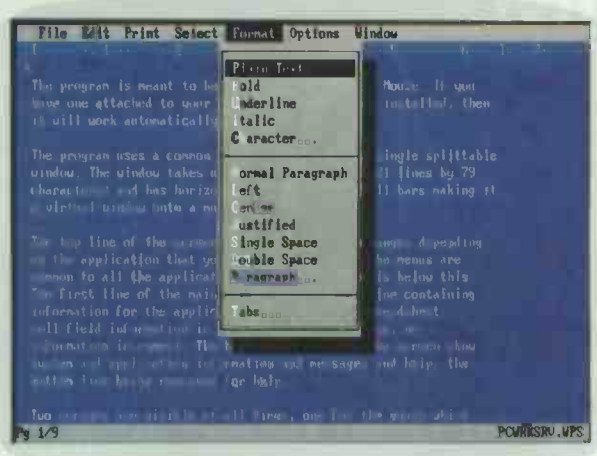
This is a fairly basic-level word processor, as you would expect in an introductory integrated package. It is essentially a straightforwad WYSIWYG program, but not on the same level as the Macintosh-based Microsoft Works program which provides the usual onscreen Macintosh fonts and bit-mapped display.

At the top of the applications window is a ruler bar showing character positions and left and right margins. You can scroll through the document using the scroll bars at the bottom and right of the screen window, or cursor keys. Text is entered as usual by typing it in, with all the standard editing keys (delete, backspace, insert, and so on) operational. Editing also works on selected pieces of text which can be marked using the F8 key and the cursor keys or by using the mouse.

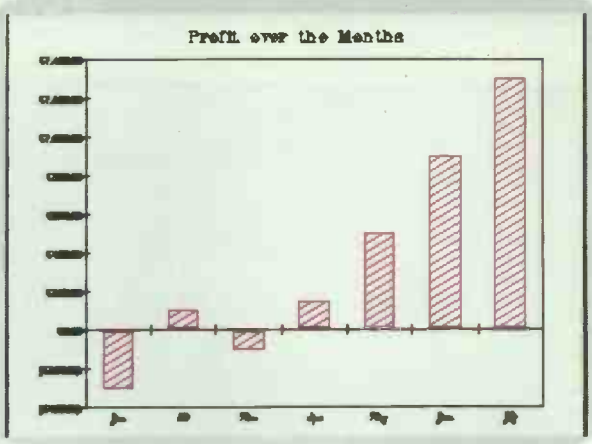
I found the word processor pleasant to use for entering and editing text. The response to typing is very good and mouse-based editing is a pleasure after the rigours of WordStar. It can be hard to force your fingers not to push Control-K, but once you get used to the mouse, what a relief!

The menu options available in the word processor, apart from File and Window, are: Edit, Print, Select, Format and Options.

Edit is used for standard editing



The PC Works word processor. This is a typical PC Works screen with the standard menu interface; notice the shadows 'underneath' the menu. Formatting options are shown



A screen view of the chart shown in the diagram on page 131. You can see that although the lettering is almost illegible on a CGA, it matches the printout in terms of style

functions like Undo, Move, Copy and Delete, with the last three referring to marked blocks of text and the first to the last editing command performed. Other editing options allow character or paragraph formats, special characters, dates and times, insertion of fields from a database file or charts from a spreadsheet file.

The Print menu allows you to select the text printer you want to use, although the default will be assumed if you don't want to choose one. You can also use a database file for mailmerge printing and for label printing. The other options are to set up the page layout for printing and to print and select which pages should be printed.

The Select menu is used for search and replace and for going directly to a specified page in a document.

The Format menu allows you to specify text formats like bold, italics, and so on. You can also specify paragraph formatting, including spacing and justification. This menu is also used for setting tabs and for setting the global paragraph style (indenting, alignment, spacing and paragraph gaps).

The final menu is for miscellaneous options. This lets you split the document window into two for separate views of a single document (and more convenient cutting and pasting), display or hide the ruler, special characters (hard carriage returns, soft spaces, and so on) and the complex headers and footers, alter pagination and perform a spell check.

The spelling checker is a fairly typical American phonetic spelling checker. I used it to spot my mistakes and then often had to enter the replacement myself. As an example (which many other spelling checkers also get wrong), I mistyped database as 'daabase'. The spelling checker suggested the following alternatives: debase, debaser and Tabasco. More thought to people who make *typing* mistakes as well as spelling mistakes and less concentration on pepper sauce, please!

The rest of the word processor operated as expected — I had a little trouble getting printer drivers to work correctly, but nothing like I've had with printer drivers on *some* programs.

Spreadsheet

The basic form of the spreadsheet is similar to that of the word processor — a window surrounded by scroll bars and data lines of information — but there are the expected differences in organisation. At the top is an editing line which displays spreadsheet cell contents and allows values or formulae to be edited. The rest of the window holds the usual spreadsheet cells, with the top line and left most four columns used to show cell labels.

'PC Works . . . is aimed at the cheap compatible market and those users who don't want to move on to Windows.'

A cell-sized cursor is used rather than the usual character-sized cursor, and the contents of the cell over which the cursor is resting are displayed in the editing line above the spreadsheet window. To enter data, simply move the cursor to the desired cell and start typing. The data will appear on the editing line and, when you press Return, the correct value will be transferred to the cell.

Superficially, the menus are almost the same in the spreadsheet as in the word processor; the only difference is that there is a menu called Chart. However, the items selectable under each menu are different.

The Edit menu has the standard options: 'move', 'copy', 'clear' (the value), 'delete', 'insert' and 'copy special'. This last option lets you copy values only, add values to destination or subtract values from destination.

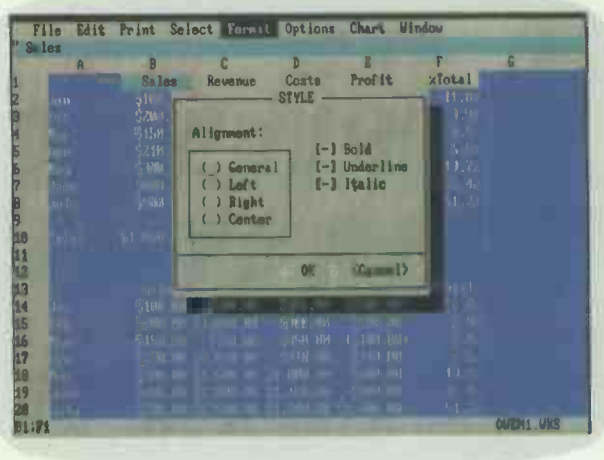
Some new items are also on the Edit menu: Fill Right, Fill Down and Name. The Fill options let you copy a cell into a range of cells that have been marked below it or to its right. If these have formulae, then the cell references will be adjusted accordingly. Name is used to provide a specific name for a cell.

The Print and Select menus operate as expected, with modificiations for their use within a spreadsheet program.

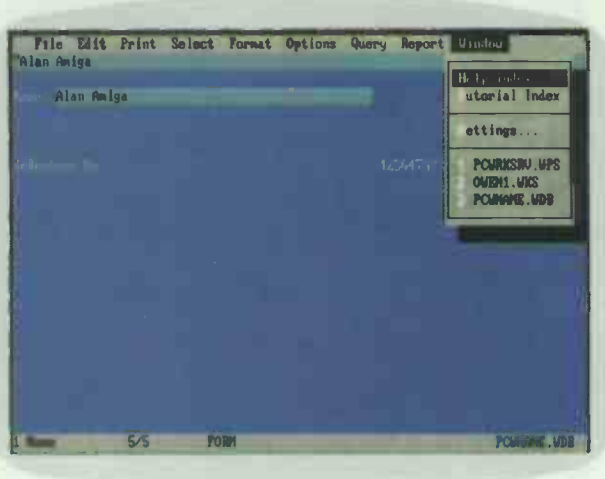
The Format menu is essentially used for formatting cells. The available display/data formats are: general, fixed, dollar, comma, %, exponential, logical and time/date. Other entries in the menu are for style (bold, italic and justification) and cell width.

The Options menu, as with all the options menus in PC Works, is a mish-mash of miscellaneous features. You can freeze or unfreeze titles, split a display into two, show formulae rather than results, protect cells from being changed inadvertently, and switch between manual and automatic recalculation.

The final menu is the new one, Chart. This is a gateway to the second dimension of PC Works' spreadsheet, the Chart Window. The menu lets you define a set of cells for a chart, create a new chart, view a chart, or select any one of the currently-defined charts (if any). The first two take you into the Chart Window, while the third will display the chart if one is currently defined. This



The PC Works spreadsheet is data format compatible with Lotus 1-2-3. As you can see, the basic layout of the screen is the same as that for the word processor



The PC Works database in form view mode with a record consisting of two fields visible. The menu on the right is the Window menu which lets you switch between applications

is done in the best colour-graphics mode available and is diplayed full-screen.

The onscreen charts are generally as good as they can be and PC Works knows enough to make full use of any graphics mode it is in. I tried it on screens ranging from LCDs on portables through to a VGA display using one of the new VGA-compatible display cards with a new high scan-rate monitor. It worked fine on every single one, although the pie-chart labelling could have been done considerably more intelligently: overlapping text is hard to read.

I found the spreadsheet very functional and easy to use. The formats and commands available are similar to those in other Microsoft spreadsheets such as the Mac version of Works and Excel, although they are much less powerful than in the latter program. I used it for various businesslike things such as graphing Benchmark results and averages, and checking the disastrously low figure at the end of my payslip. I'm quite sure it would be up to checking the comparative yields of the various share portfolios that I don't own!

Database

The database is the most complex-looking part of PC Works but is in fact the simplest, especially since it is a flat-file database rather than a relational one. It is obviously a database that was designed to integrate with a word processor — the report and export facilities are *very* good. These features are all, however, carry-overs from the Macintosh Microsoft Works program. PC Works tries to cover much the same ground.

For new files, the database opens up in the 'forms designer' where you set up the way you want the input form for a single record in the database to look. The forms designer is simple and only has two menus for editing and field formats. You simply move the cursor to where you want the fields to be, and enter the field name, and format and size. Once this is done, you leave the forms designer and enter the main viewing window of the database.

The database has three further modes; 'form view', 'list view' and 'report designer'. The form view presents records in the format designed in the forms designer and lets you step through records with Ctrl-PgUp and Ctrl-PgDn. The forms view window looks like a word processor window except that the cursor highlights a whole field and you can't do anything with the blank areas where no field is defined.

'PC Works may seem to have more disintegration than integration, but its cut-and-paste facilities are very powerful.'

At this point you are ready to enter information into the database or edit information. This is straightforward. Simply move the cursor (which in form view highlights the data part of a field) to the correct field using the mouse or the cursor keys, and then type in the information.

The database forms view has the widest range of menus available of any of the parts of PC Works. Besides the usual ones, there are menus for formatting fields in the same manner as the spreadsheet, setting up queries using the Query Define window, and obtaining getting reports using the Report Define window. The Options menu switches from form view to list view, lets you redesign forms and protect fields from modification.

All the other menus and options are the usual ones that crop up throughout PC Works for printing, editing, selecting, and so on.

The list view window is essentially the same as the spreadsheet view in the spreadsheet module of the program except that each column corresponds to a field of the database and each database record appears on a row below this. The field names are displayed at the top of columns and lets you see a great deal of information from the database at once and for tabular data can be an easier way to enter or analyse data.

The Query menu lets you define a query by entering search criteria into fields in a Query Design window that is almost exactly the same as the Forms Design window. Other options on the menu then let you apply the query to your data, show and hide records, and also sort the database on any combination of the various fields.

The Report Menu is simpler, but its main function is to take you into the Report Design window which is almost as complicated as the rest of the database program. The options available let you look at and edit old reports you have set up, create new reports, view the text output from the report generator, save the output as a text file, and load in and switch reports around.

The Report Design window displays the database in list view.

However, in the Report Design window, no values are displayed, nor are the field names given at the top. Instead, you are able to design a report format that consists of any of the fields from the database displayed in any format you like, with any of the query criteria already applied. In addition, you can enter new titles and fields containing additional information to make a more comprehensive report.

The database is a fairly simple one, with nothing like the programming power or functions of standalone database programs. Nevertheless, it is useful in conjunction with the spreadsheet and word processor, especially for presenting reports. A finished report can be exported to the word processor for embellishment with explanations, sample data and charts.

Communications

This is *always* the weak link in integrated software. Comms is a specialised field, and it often isn't worthwhile for an integrated package to devote too much of its available room and functionality to comms since it is probably the least-used of the main applications.

Even to look at, the communications window is the simplest of all the applications. The communications program is the only PC Works window without scroll bars. All it has is the menu bar across the top and the two program information lines along the bottom. There is no option to load standard settings from disk: you will have to keep a separate PC Works communication file for each communications service you access.

Firstly, you go to the Options menu to set up terminal information like baud rate and emulation type, communications information such as port settings, phone information such as the number to call, and the type of dialling (tone or pulse) to use. The range of options available in each of these sections is very small and is evidence of the application's limitations.

The communications program can manage all the usual baud, parity and data settings, and can connect via all the usual ports. However, you can only emulate an ANSI or a VT52 terminal with limited settings and you can only use one modem initialisation string. This leads to questions about hanging up the modem, and access to other modem functions. The answer is that they aren't available unless you have a Hayes-compatible modem and, even then, only limited access is possible. Of course, you *could* enter the complex and weird modem commands manually. . .

The only two menus available apart from File and Window are Connect and Transfer. Connect lets you dial, redial, hang up, pause or break. You can also record or replay one — and only one — sign-on sequence.

The Transfer menu lets you capture or send text (ASCII) files and also transmit or receive files in Xmodem format.

And that is *all* PC Works' communications program does. The acid test for comms is what happens when you try to access online services. The good news is that I had no problem with Telecom Gold and, in fact, PC Works would be perfectly capable if that was all you wanted comms for. I was also able to access various UK bulletin boards with reasonable success except that I wasn't able to use the best transfer protocol for files, Kermit.

However, when I tried to access the Source via PSS and IPSS, I had a rude shock. I couldn't even log on to PSS. Almost immediately, I received pop-up messages saying 'parity error' even though I was at the correct parity. Not surprisingly, the messages stayed when I tried again at a different parity setting. I was also given the more mysterious message of 'frame error'. I gave up.

Integration

The integration between the different programs within PC Works is mostly done on a cut-and-paste basis with marked data from window to window. This always works, and allows you to extract data from the various programs and send it to any other program within PC Works. The exception to this is the communications program which can only export information as text files and cannot accept any input information.

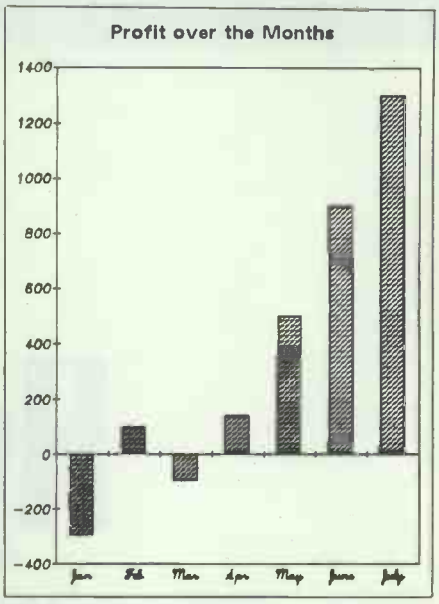
In addition to the cut-and-paste functions, some of the menus include items for transferring information. Specifically, graphs can be included in text files, as can database fields for mailmerge facilities. These are the only 'live' data-transfer facilities, where data values change in the copy when they are changed in the original. Otherwise the cut-and-paste facilities are 'dead', in that once data has been transferred, it is immutable. This is a shame since programs like Ability, which have been around a long time, have fully live integration.

PC Works may seem to have more *dis*integration than integration, but its cut-and-paste facilities are very powerful. It is easy to take a paragraph from the word processor and drop it into the spreadsheet, or take a set of fields from the list view of the database and put them into the word processor.

In perspective

The major competitors to PC Works are Ability, Ability Plus, PFS: First Choice and Open Access II. PC Works falls somewhere near the top of this list in terms of power and functionality, and also in terms of price.

In the end, however, since PC Works is neither outstandingly better nor considerably worse than any other programs, you are going to have to make a choice based on personal preference. As Microsoft is slowly rationalising its user interface and the presentation of its programs, you will be fairly happy with PC Works if you like other Microsoft applications programs.



A piece of sample output from the Chart area of PC Works' spreadsheet

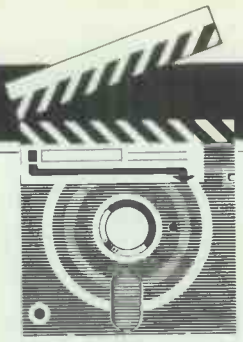
Conclusion

PC Works is a reasonably well put together program. It has arrived rather late on the integrated software scene, coming very much after programs like Framework, Symphony and even Ability or Open Access II. If the company producing it had been smaller or less well established, I would say that this program stands little chance in an increasingly powerful and sophisticated market — regardless of how good the program is. However, Microsoft has the clout and power to push PC Works very hard and is likely to make a reasonable success of it.

The word processor is fairly good and integrates well with the other parts of the program. The spreadsheet is also good and is easy to use. The database is a bit simpler and is acting purely as the database part of an integrated program; it wouldn't stand up on its own. The communications program is barely adequate — it's just OK if you only want basic email facilities.

PC Works certainly isn't my favourite integrated program, but neither is it anything like my most hated.

PC Works costs £145 from Microsoft on (0734) 500741. END



SCREENTEST

HyperCard

Apple's latest trump card is HyperCard — a toolkit of many talents which allows Mac users to write their own programs. It also turns information storage and retrieval from a chore into a challenge, as Robin Webster found to his delight.

When Apple launched the Macintosh back in 1984 the system came with two bundled software packages — MacWrite and MacPaint. Although there's no denying that MacWrite played its part in selling machines, there is also little doubt that Bill Atkinson's MacPaint application was the one that convinced most early users to open their wallets.

MacPaint came with unique features such as onscreen palettes that let you select different painting tools and patterns with the click of a mouse. And, while it didn't necessarily turn ham-fisted klutzes into creative artists, it did allow the average person to produce professional-looking graphics in a fraction of the time taken before. After MacPaint's success, however, Bill Atkinson seemed to disappear into the woodwork. The only sign that he was still active came with a trivial database application called Rolodex that could be found on Macintosh-orientated bulletin boards in the US.

Although MacPaint and the tiny Rolodex seem to have no logical connection, Atkinson has spent the last three years or so developing a hybrid of the two: an extraordinary Macintosh application called HyperCard.

What exactly *is* HyperCard? Apple calls it a 'personal toolkit for information', which may seem to be deliberately vague, but is understandably so. The problem is that HyperCard defies easy classification. You can view it as an extremely flexible database system that can store and organise written information and graphic images, or you can look at it as an elegantly simple Macintosh programming environment. In reality, it's both these things and more. It can store and retrieve information, perform mathematical tasks, play sounds, and even produce animated effects.

Capabilities

HyperCard is a real colossus, requiring a minimum of about 700k of RAM to work properly. The minimum configuration required is 1Mbyte of memory and two 800k floppy disk drives, but you'll need more memory and a hard disk to really put the system through its paces. This review was carried out mainly on a Mac Plus with 1Mbyte of memory and an attached Apple HD20 SCSI hard disk, although I was able to spend some time working with HyperCard on a Macintosh II.

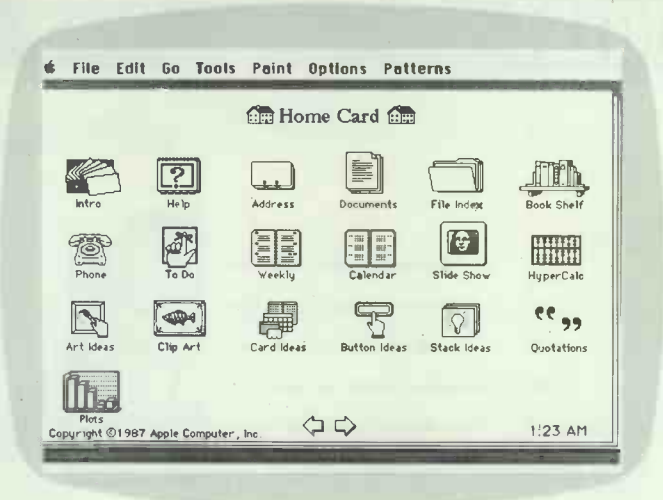
Here's the bare bones of HyperCard's structure. Information is stored on what are called 'cards': at the simplest level, you browse through these cards as you might through the records of any conventional database system. At the highest level, you can search any card, anywhere, for any value. There is support for CD-ROM, videodisc and network access as well as standard Macintosh disk media. One card may contain up to 30,000 characters, although it's unlikely that this amount of elbow room will be required.

A collection of cards is known as a 'stack'. A single HyperCard stack may be a staggering 0.5Gbytes in size and contain up to 16 million objects — for example, text fields and buttons. Text fields are used when you wish to enter information or have HyperCard display the result of some calculation. Buttons, as in dialogue box buttons, can also be placed on cards, and programs known as 'HyperTalk scripts' can make them do rather amazing things at the click of the mouse. A button might jump you from one card to the next; it might take you to another stack; it might play a melody; it might produce a pie chart based on a group of entered values . . . the list is endless.

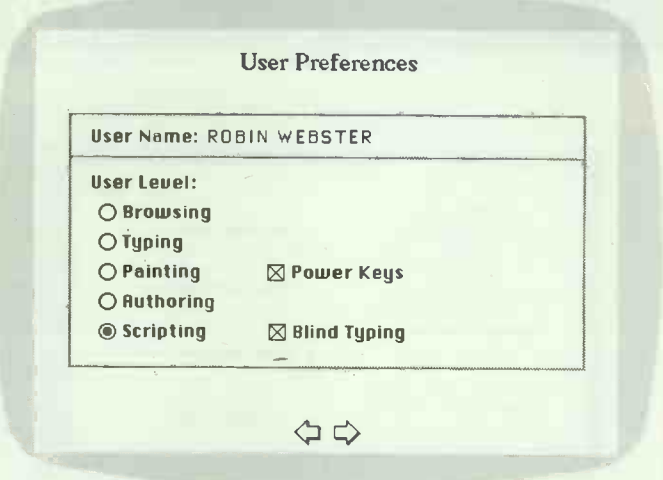
HyperTalk was created by Bill Atkinson and Apple software developer, Dan Winkler. The syntax is so simple, it's virtually guaranteed that within the first few days of using HyperCard you'll be writing useful scripts. Indeed, Apple is praying that those Mac users who never dreamed they could write their own program for the machine will use HyperCard to develop 'StackWare' (the Apple-trademarked term for HyperCard-developed applications).

HyperCard is like any other Macintosh application in that it has an icon which may be double-clicked or, alternatively, can be chosen as the startup application for automatic launching. Since Apple provides two application disks — HyperCard & Stacks (which appears as any other disk on the desktop) and HyperCard Startup (which automatically launches the application when used as the Macintosh startup disk) — users can choose which they prefer.

There are a couple of interesting points about the startup disks. Firstly, although you require a System file, a Finder file isn't necessary. If there is no Finder present, there will be no 'About the Finder' option contained in the Apple menu; when you quit HyperCard, the Macintosh 'Shutdown' dialogue box will be displayed instead of the desktop.



The Home Card is like the opening menu of a HyperCard application. It is not a replacement for the Mac's Finder but offers many similar features



Among the User Preferences available is 'Blind Typing' which allows a sequence of commands to be typed from the keyboard without the actual text appearing on the screen

Secondly, you can launch other Macintosh applications on the disk — such as MacWrite or MacPaint — from within HyperCard, even if no Finder file is available. When this is the case, quitting a standalone application will automatically return you to HyperCard.

Mac memories

Having booted HyperCard, the first thing you will see is the 'Home Card'. This will remind many Macintosh users of the standard Finder environment, as it displays what appears to be a variety of named icons which are obviously meant to be clicked on. While you can launch other Macintosh applications with Hypercard, the Home Card should not be thought of as a replacement Finder — it's only one of a number of special cards that make up what is called the 'Home Stack'. The Home Stack's cards (excluding the Home Card) allow you to set up such things as user access levels and folder pathnames that should be followed when loading specific stacks.

There are a number of ways in which you can access the 'User Preferences' card in the Home Stack; one of the simplest is to click on the left arrow along the bottom of the Home Card. On the User Preferences card there is a place to enter the user name — HyperCard uses this to communicate with you on a personal basis via a dialogue box or a card field at some point. Below the user name lines there are five user-level options:

● **Browsing** A limited range of menus are displayed. Users can search for and display information in stacks but are not allowed to enter or edit that information. This setting will be used primarily when a HyperCard developer doesn't want any alterations made to his stack application.

● **Typing** Using this option, users can enter new information and edit existing information.

● **Painting** Users can take HyperCard's palette of MacPaint-style tools to create and edit graphics images on cards.

● **Authoring** Users can create new buttons and fields and edit existing ones. At this level you can also choose whether or not to activate the so-called 'Power Key' commands (commands issued using the Command key in combination with some other key).

● **Scripting** This is the highest user level. All menus and menu options are available, and users can create HyperTalk scripts or edit existing ones. You can also choose whether or not to activate the 'Blind Typing' option, which allows you to enter short commands without any visual feedback on what you've typed.

As mentioned earlier, Hypercard comes with a basic set of stacks all ready to go — these are provided on two additional floppy disks. The user selects and views a stack of cards by clicking once on the relevant icon. For example, if you need to summon help information, you click once on the question-mark icon named 'Help'. In reality, the icon has a HyperTalk script 'behind' it.

The Help icon script is:

```
onMouseUp
  visual effect zoom open
  go to stack'Help'
end Mouseup
```

As you can see, HyperTalk's syntax is quite straightforward. In English, you would interpret this script as saying: 'When the user clicks on this icon, go load the stack named "Help" and show the first card in that stack.'

The only line in the script that may seem a little unusual is 'visual effect zoom open'.

Commands starting with 'visual effect' or 'visual' are used to produce a special effect on the Macintosh screen as you move between cards and stacks. In the Help script example, 'visual effect zoom open' suggests that the first card of the Help stack zooms open instead of just being suddenly dumped into view. This may seem trivial, but I found that the special effects lessened the tedium of navigating around card stacks.

Traditionally, people who want to store information on a computer system have found it extremely difficult to find the appropriate database. The quick-and-dirty approach to storing data as a collection of flat-file records may seem fine until you come to sophisticated data analysis or preparing detailed reports. And, while relational databases may seem to offer all the sophisticated searching capabilities anyone could want, they are often difficult to use: you may have to acquire some heavy-duty programming skills before they provide any discernible benefits.

Also, information often has to be restructured to meet the requirements of the relational data model. If your information doesn't fit, you're out of luck.

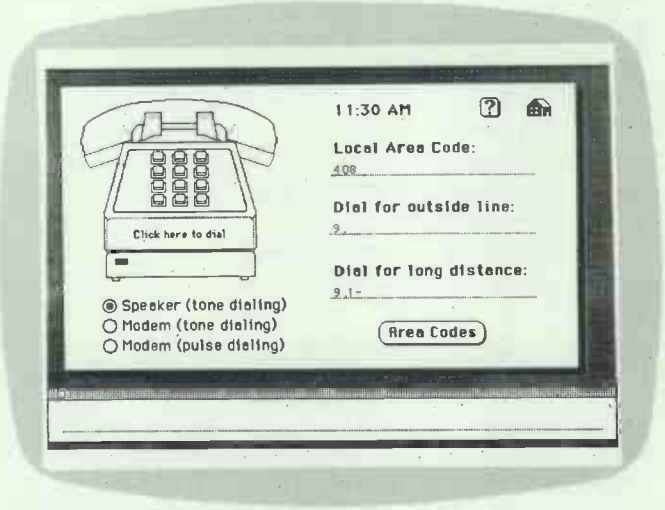
Atkinson's law

Bill Atkinson designed HyperCard around a much more informal notion: why not let users store information on the computer equivalent of filecards and let them link a card to any other by means of script-driven buttons. HyperCard provides ways of linking cards and, therefore, by association, the information they hold. There is no rigid data model to grapple with, no formal rules for linking this card with that. You either:

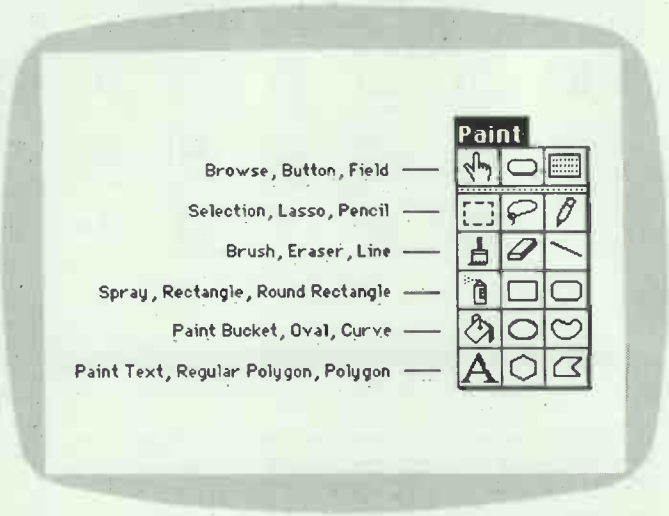
● Use HyperCard's guided 'LinkTo' option to automatically link cards and stacks; or

● Write your own script to do the linking.

One word of caution — if you change the name of any card in-



The user has a choice of methods for auto-dialling a telephone. The message box at the bottom is where further HyperCard commands could be issued one at a time



The Paint toolbox, like many of the pull-down menus, can be 'torn off' and positioned where the user wants on the screen. The familiar tools add borders and other enhancements

volved in a link, you will be responsible for updating the linking script. HyperCard won't do this for you. There isn't much to this procedure, however: just re-use the LinkTo option or type the new card name into the old button script.

When you've entered a stack, pretty much anything is possible. The first card can be an index, a map, or any other type of guide to the rest of the stack contents. Alternatively, the first card may be some kind of main 'function' card which is then backed up by other types of reference cards (for instance, a telephone dialler backed up by an area code list). Each card occupies all of the standard 9in Mac screen. On Macs equipped with larger screens, cards are not scaled up in size: users just see more space around each card. The rationale behind this was to keep the HyperCard environment consistent from machine to machine.

A card, technically speaking, is really only an empty screen. You must add the graphic images, text fields and buttons that make the card work for you in storing or manipulating information. To do this, you have to understand how to use the card's 'layers'. Normally, database records have only a single layer that contains a number of fields for data entry. A card, however, can have a 'Background' layer and a 'Card' layer.

The Background layer is where you normally put graphics, buttons, and fields when you want every card in a stack to share them. If you place a picture of a standard 3x5in index card in the Background layer of a name and address stack, each card created in that stack will look like a 3x5in card. If you place 'Next Card' and 'Previous Card' buttons in the background later, each card will have those buttons. And if you put a text field in the Background layer, each card will have an equivalent field. To create one or more unique cards in a stack, however, you have to place any of the above into the Card layer.

A good example of how to use the Card layer is HyperCard's Clip Art stack. Although each card has the same Background layer design (a border with a group of buttons), the Card layer contents are quite diverse. Some cards have a picture only, while others have both a picture and a button. New users should look carefully at how all the stacks provided are put together — especially the Introduction to the HyperCard stack — before designing their own. There are many readily available building blocks that can be copied and used in your own applications.

'HyperCard can store and retrieve information, perform mathematical tasks, play sounds and produce animated effects.'

When you start to create StackWare applications, you'll need to familiarise yourself with the items from the 'Tools' menu. This menu is unusual in two ways. First, instead of a list of commands, it contains tool icons. The top three are the 'Browse' tool, the 'Button' tool, and the 'Field' tool.

You select Browse when you want to navigate from place to place within HyperCard stacks. It's chiefly for clicking on buttons and selecting/editing text in text fields. Choose Button when you want to create or edit a button. HyperCard will automatically highlight all buttons on the current card with a black outline so that they are clearly visible. A selected button is surrounded by a moving dotted line.

The Field tool is used when you want to create or fit a text field on a card. Fields may be resized by dragging on the bottom right-hand corner and they can display any installed Macintosh font. Remaining icons are readily recognisable as MacPaint-style drawing, editing and selection tools, but these are enhanced versions of the originals.

The other unusual feature of the Tools menu is that you can 'tear' it off from the menu bar aross the top of the screen. To tear, all you have to do is click on the menu and then drag past the bottom edge or beyond either side while holding the mouse button down. Once torn from the menu bar, the Tools menu takes the form of a window and will remain in view until you click on the close box in the top left corner. This feature is a good combination of the pull-down and pop-up menu concepts and I used it frequently.

The only other tear-off menu is the 'Patterns' menu, which contains fill patterns for use with the painting tools. Otherwise, all the other HyperCard menus are of a conventional design.

Communication

There are two ways of communicating with HyperCard; via the menus across the top of the screen, or via a special window called the Message box. If you only have browsing access, all you'll see will be the 'File', 'Edit' and 'Go' menus and you won't

be able to modify cards or stacks. If you have authoring or scripting access, though, you'll see every available menu and you can make whatever changes you feel are necessary.

The menus may be too slow, but you can always use the Message box — just select the 'Message' option from the Go menu (or use the Command-M key combination). The Message box is used to issue one-line commands which are then carried out immediately by HyperCard (as opposed to HyperTalk scripts which are activated only by specific events occurring within HyperCard). The one-line constraints on commands naturally limits the extent of their power, but they are definitely an excellent way to move around quickly within HyperCard or test portions of HyperTalk scripts.

Here's how you would retrieve a card from the address stack using the Message box. First, click on the address stack icon on the Home Card. The first card of that stack will be displayed. Choose Find from the Go menu and you'll notice that when the Message box appears, it already contains a 'find' command template. All you have to do is enter the text string HyperCard should look for. After entering the text, you press Return and HyperCard then locates the first relevant card. While it is looking for a match, the cursor takes on the shape of a beachball that spins while the search progresses.

When a target card has been found, HyperCard displays it and places an outline around the text you are looking for. If more than one card meets the specification, all you have to do is hit Return to view them in turn. The data retrieval algorithm is quite fast — I never really felt I had to wait too long for a search to be completed. In addition, the Message box can be used as a calculator. You type in the values you wish to have evaluated and press Return — the answer will appear immediately in the Message box.

If you find that the Message box gets in the way of some activity, select the 'Blind Typing' option on the User Preferences card. This arrangement traps keyboard commands even when the Message box is not displayed. And, when you get used to the idea of not seeing on the screen what you're typing, it's not really that hard to do — the only problem is when you make typing mistakes. If this happens it's not a catastrophe — just show the Message box and edit the command in the normal manner. I didn't encounter any real problems here and was quite happy keeping the blind typing option turned on all the time.

HyperCard's printing capabilities are not only quite sophisticated, but are also surprisingly easy to use. If

HyperTalk let loose

HyperTalk allows the average Macintosh user to develop his own applications in an elegant way. Its syntax is quite easy to follow and there are few major rules that must be observed. If you try to do something you're not allowed to, HyperCard's error dialogues are usually very helpful in pinpointing the problem.

There are two places in which you can enter HyperTalk commands: one is in the Message box; the other is in the scripts that make card buttons come alive. Be aware that short commands entered in the Message box are acted upon as soon as you hit Return, while commands stored in the form of scripts can be much longer and will only be activated when a particular event takes place (for example, a button being clicked). Also, scripts can do some pretty sophisticated things like automatically selecting any HyperCard menu command, or selecting all or part of a card graphic and moving it around on the screen.

Animation

As an example, let's take the Clip Art stack provided by Apple. One card has a picture of a car and a button marked 'Drive the car'. If you click on the button, the car image will be dragged backwards and forwards across the screen. Here's the script behind the button:

```
onMouseup
  put the userLevel into saveLevel
  if the userLevel < 3 then set userLevel to 3 — 'Painting'
  if the userLevel < 3 then exit mouseUp
  choose select tool
  doMenu 'Select All'
  doMenu 'Select'
  set dragSpeed to 100
  drag from 256,171 to 150,171
  drag from 150,171 to 350,171
  drag from 350,171 to 256,171
  doMenu 'Select All'
  doMenu 'Revert'
  choose browse tool
  set userLevel to saveLevel
end mouseUp
```

All pretty-self explanatory, as you can see.

Sound generation

Commands are provided for producing sounds. The simplest sound that can be made is the system 'beep'. Beeps are of a fixed pitch and the only variable is the number that can be made. The command 'beep 10', therefore, would produce ten system beeps. If, on the other hand, you want to compose some reasonable-sounding music, you would use the 'Play' command instead. A sound script using Play might look like this:

```
play 'Boing' 120 e c d g3h gq d4 e cw
```

The word between quotes is the musical voice of the sound to be made — in this case, a 'boing' type of sound. The '120' is the tempo. The letters and numbers are the list of notes to be played. To play sounds other than 'boing', it's up to you to make the data for the new sound available. The actual data for sounds are stored as resources and you can use an application such as ResEdit to move sounds (resource type 'snd') among stacks.

Visual effects

HyperCard's visual effect commands have been based on the kind of special effects used in film and television. The commands — all must be preceded with the words 'visual effect' or just 'visual' — are:

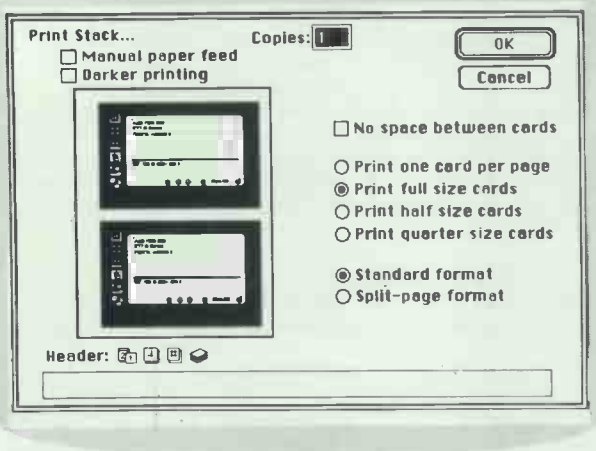
zoom out/zoom in	iris open/iris close
dissolve	wipe left/wipe right/wipe up/wipe down
checkerboard	barn door open/barn door close
venetian blinds	scroll left/scroll right/scroll up/scroll down

The speed at which these effects occur when moving between cards and stacks can be set by using them in conjunction with the adverbs fast, slow, slowly, very fast, very slow, or very slowly. Be warned, though — it can be addictive fooling around with these particular commands.

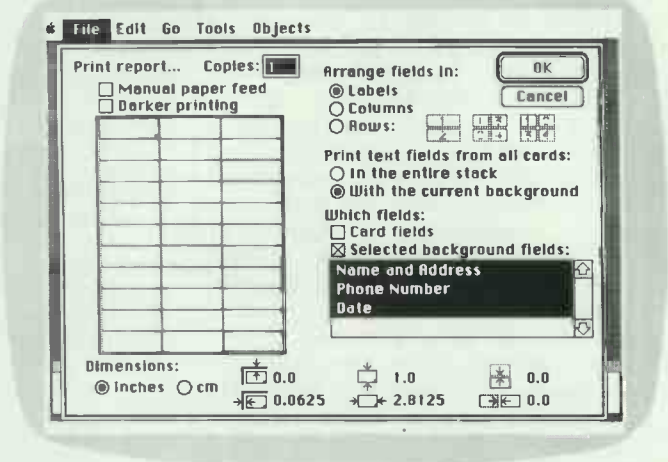
HyperTalk command list

A full list of HyperTalk commands is given below:

add	divide	multiply	set
answer	do	open	show
ask	doMenu	printing	sort
beep	drag	play	subtract
choose	edit script	pop	type
click	find	print	visual effect
close	get	push	wait
convert	global	put	write
delete	go	read	
dial	hide	reset Paint	



Print options allow for the selection of a number of ways of arranging the cards on the printed page. The usual header icons for date, time and page number are included



Fine control is provided over how each card is printed, with the possibility of specifying certain fields and selecting cards with a common background

you want a hard-copy of a single card, all you need do is choose the 'Print Card' option from the File menu while that card is displayed. This works more or less like a snapshot capability. When it comes to printing whole stacks, though, there are quite a few options for page arrangement, card sizes, and header text.

Undoubtedly the slickest HyperCard print dialogue is the one devoted to printing reports and labels. 'Print Report' essentially lifts all the text from user-specified fields on cards in a single stack (you cannot merge fields from different stacks) and prints that text out according to the layout you specify in the Print Report dialogue box. Fields may be printed on labels, or on full sheets of paper in column or row format.

As far as labels are concerned, you can change the number of labels per page, their size, and the spacing in between by dragging on the images in the 'minipage'. Any changes you make update the measurements displayed along the bottom of the dialogue box. The minipage can also give visual feedback on the space taken up by each selected card field on a full-page report. If you wish to alter the default space taken up by a field, drag the relevant column guide to one side or the other.

HyperCard supports both the Apple Imagewriter and LaserWriter printers, but there are some limitations to the latter. When you select the 'Landscape Printing' option on the LaserWriter Page Setup dialogue, printing can take longer than you might expect. Make sure you select the 'Faster Bitmap Printing?' option to avoid the frustration of hearing the laser printer chugging away but not receiving any hard-copy for what the HyperCard manual itself describes as an 'extremely long time'.

Documentation

The 200-plus page manual is of the usual Apple style and quality in that it covers all the basics and offer hints for further exploration. If you use it in conjunction with the online Help system, you shouldn't have any trouble finding your way around the application. If you're looking for good coverage of the HyperTalk language, however, you'll be disappointed.

'Traditionally, people who want to store information on a computer system have found it extremely difficult to find the appropriate database.'

At the time of writing the only source for HyperTalk info were the Help stack that comes with HyperCard (only a basic overview of commands and functions), and *The Complete Hypercard Handbook* by US computer journalist, Danny Goodman, the first major book on the application. In production is a more technical document called the *HyperCard Script Language Guide* which will be made available in the US via the Apple Program Developers' Association. The release of this document should give would-be StackWare developers everything they need.

Price

HyperCard will be shipped free with all new Macintosh systems. If you already have a Mac, it will cost $50 for a shrink-wrapped copy including four disks and a manual.

Conclusion

There is so much that is open-ended about HyperCard that it can be a real problem trying to focus on its major features. Certainly, it is an unique environment which makes the task of information storage and retrieval less of a chore and more of an adventure. It is also the first tool that non-technical Macintosh users can use to develop practical applications.

Already, commercial StackWare products are surfacing. While writing his book, Danny Goodman also found time to develop two StackWare applications called Focal Point and Business Class. The former is a time and information management system that includes a daily appointment calendar, address cards, phone conversation logs, a spreadsheet, and an invoice and graph generator. The latter is a travel planning tool that provides information on international currency exchange rates, transportation schedules, local customs, time differences, and so on. They are priced at about $100 and $70 respectively and will be distributed in the UK by Activision.

Dialog Information Services is said to be working on ways to use HyperCard as a front-end to its online database offerings. And many libraries are considering converting their tired, old card file systems to HyperCard format.

Apple, meanwhile, intends to cultivate the education sector. It's already offering financial incentives to educational establishments and students to upgrade their old 512k Macs to Mac Plus status so that they can use HyperCard. Also, a number of important educational organisations have been chosen as early test sites for the application.

HyperCard will be available in the UK from Apple Computers on (0442) 60244. END

Psion PC-Four. Very serious software. Very silly price. £69.

(exc VAT)

Psion PC-Four. A word processor, spreadsheet, database and graphics designer. All well tried and trusted. All four £69 (exc VAT).

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You might think, at such a low price, that the programs don't have all the features that you'd expect or want. You'd be wrong.

Take PC-Quill. 'Which Computer' called it "...the best general purpose word processor on the market". With good reason. It has full editing, text and page formatting facilities, automatic page numbering and word count, headers, footers, glossaries and so on. It incorporates mail merge from the keyboard or saved files. And the display reflects the print-out – with type emphases. So you can see what you're getting.

The spreadsheet, PC-Abacus, can handle 999 rows and 255 columns, and uses memory efficiently. Its numerous features include identification of columns, rows and cells by textual content (so formula can be entered in English, not computerese), split window displays, automatic replication of formulae, format control, merging from different spreadsheets simultaneously, and a full range of functions and conversions – with string handling and condition testing. PC User called it "extremely versatile."

Then there's PC-Archive. This powerful database can handle a number of huge files (up to 64k records each) at a time. It can be used direct from the keyboard, or through its comprehensive interactive programming language – which is structured so that it can be extended. And it has a built in 'forms' designer to format the screen display and print-out. "Its degree of usefulness is extraordinary" said PC User. We're not surprised.

It's the same story with the graphics creator, PC-Easel. This gives a wide choice of 3D, line and pie chart displays with interactive entry and design. Data can be entered direct or from a saved file and manipulated by formulae, or it can be created by manipulation of existing data. It provides user positioned vertical and horizontal annotations, keys and labels, and automatic scaling of the axes. And it allows multiple representations on one display. Micro Decision referred to it as "an extremely flexible graphics package".

On top of all this, remember, there is a tutorial disk, to show you how to use the more important elements of each program. And of course, there is a comprehensive manual.

PC-Four is designed for all IBM* PC compatibles, including the new low priced clones. Now you know what it does and what it runs on, take another look at the price. Twice.

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Time trials

It is now one year since we launched our new PCW Benchmarks and thanks to input from readers, they have proved most successful. More developments are planned and Nick Walker looks at some of the new innovations in our rating system.

The *PCW* Benchmarks are one year old and to celebrate, we have included a poster with this issue listing around 150 machines tested so far. In the past year, I have received over 1000 letters about these Benchmarks: of these, approximately 95 per cent were in favour and 5 per cent were against.

Thank you for your response so far, but there is still a number of gaps to be filled. If your machine isn't on the poster then please test it and send in the results; even results for machines we've already covered will help to confirm their accuracy. Another area in which your help would be much appreciated is in the production of Benchmark listings for languages such as Cobol, Lisp, Smalltalk, Prolog and BCPL.

Introducing the Index

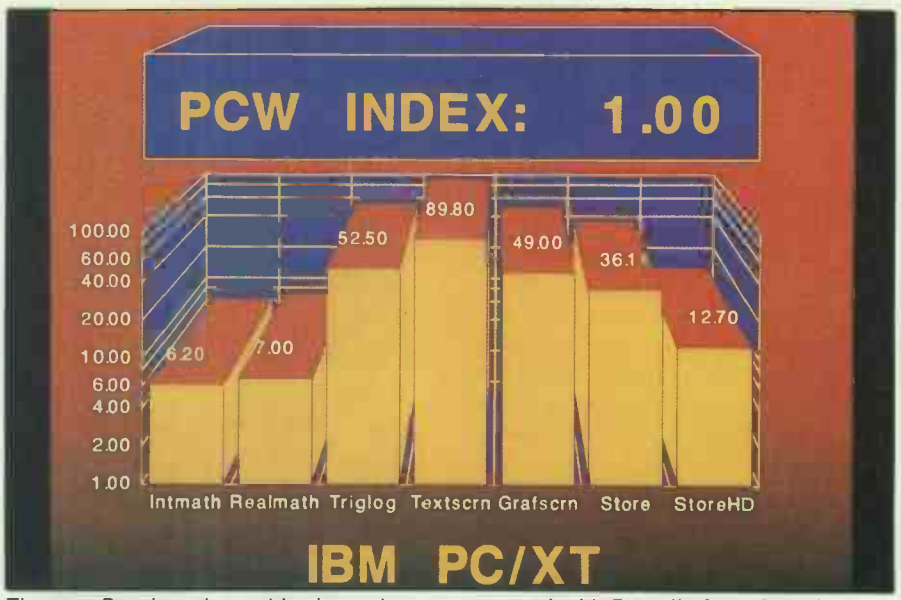
Two new features have been added to the *PCW* Benchmarks — the *PCW* Index and a new graphic way of displaying the Benchmarks in the magazine. One major gripe that came through in your letters is that you miss the average figure that used to accompany the old Benchmarks. In response to this we have introduced the *PCW* Index.

A straight average is even more meaningless with the new Benchmarks than with the old ones because the actual timings for one machine can easily span a range of between 0.03 and 150 seconds for the various tests.

Instead we have used a geometric mean which gives each result equal weight in the final value. Rather than give this value straight, we thought it more useful to express a machine's performance in relation to the ubiquitous IBM PC.

In order to do this, we very carefully produced a set of timings for an IBM PC/XT with 20Mbyte hard disk, IBM colour monitor, PC-DOS 2.11 and an IBM CGA graphics card. Using these timings as a standard, a *PCW* Index of 8 means that the machine is eight times faster than an IBM PC. Similarly, a *PCW* rating of 0.2 signifies a machine that is a fifth of the speed of the IBM PC.

If any statisticians out there can think of a better scheme, please let



The new Benchmark graphic shown here was created with Davrelle from Soft Image Systems, and then exported to a 35mm slide camera

Charting the Benchmarks

We had a number of criteria when looking for a presentation graphics package to display the *PCW* Benchmark timings.

Firstly, it had to interact with a Lotus-compatible spreadsheet. *PCW*'s Benchmark timings are stored in Sagesoft's PC Planner (alias The Twin). Secondly, it had to be capable of producing high-quality full-colour graphics that could be output to a camera or printer. And finally, once we had established a standard style for the chart, we wanted to be able to run off old or create new charts simply and quickly without having to start from scratch each time.

Davrelle from Soft Image Systems met all these criteria, though we had some problems finding our way through the program. Despite running under GEM, some of Davrelle's methods are far from intuitive; but, once some of the omissions and anomalies are ironed out, it will be a first class product.

One of Davrelle's most endearing features is that it draws its data directly from an original spreadsheet file. A nifty set of sliders allows the user to specify exactly which rows and columns in the spreadsheet hold the data. Once the 'data windows' have been set, a couple of keystrokes produces a chart in the default style and colours. In addition, if the spreadsheet should later change, a process called 'Davrellating' allows you to automatically update all the charts.

Finally, Davrelle allows us to define a standard chart format through which different sets of data can be passed.

Once the charts have been created, they are 'printed to disk'. We take our disk to a London company called Neville Computer Graphics, which runs the GEM output files through a 4000-line resolution Honeywell camera to produce the final 35mm slides. All future *PCW* Benchmark timings along with the *PCW* index will be presented in this graphic form.

IBM PC or compatible Turbo Pascal Benchmarks.

```
program intmath;

var i,x,y : integer;

begin
      x := 0;
      y := 9;
      writeln ('Start');
      for i := 1 to 1000 do
      begin
            x := x + (y * y - y) div y
      end;
      writeln ('Finish',x); end.


program realmath;

var i : integer;
    x,y : real;

begin
      x := 0.0;
      y := 9.9;
      writeln ('Start',x);
      for i := 1 to 1000 do
      begin
            x := x + (y * y - y) / y;
      end;
      writeln ('Finish',x); end.


program triglog;

var i : integer;
    x,y : real; begin
      x := 0.0;
      y := 9.9;
      writeln ('Start');
      for i := 1 to 1000 do
      begin
            x := x + sin( arctan( cos( log (y))));
      end;
      writeln ('Finish',x); end.


program textscrn;

var i : integer;

begin
      writeln ('Start');
      for i := 1 to 1000 do
            writeln ('1234567890qwertyuiop',i);
      writeln ('Finish'); end.


program grafscrn;

var x,y : integer;

begin
      writeln ('Start');
      GraphMode;
      for x := 1 to 100 do
            for y := 1 to 100 do
                  plot (x,y);
      TextMode;
      writeln ('Finish'); end.


program store;

var i : integer;
    testfile : text;

begin
      writeln ('Start');
      Assign (testfile,'test.$$$');
      Rewrite (testfile);
      for i := 1 to 1000 do
            write (testfile,'1234567890qwertyuiop');
      Close (testfile);
      writeln ('Finish'); end.
```

me know. However, please don't complain to me that a single rating figure is meaningless — I already know.

The other new feature of the Benchmarks is a new graphical form of displaying them. The graph is produced using a presentation graphics package from Soft Image Systems called Davrelle.

Benchmark design

One of the reasons for the success of the old Benchmarks was that they were short and easily understood. Users of any machine, even if it hadn't been Benchtested in *PCW*, could type in the Benchmarks and get a measure of how fast the machine was compared with its rivals. To make it easy for the Benchmark listings to be used, we have kept them as short as possible. Only a few of the letters objecting to the new Benchmarks suggested an alternative and those that did almost all fell down on this score.

Another problem the new *PCW* Benchmarks had to overcome was that of different machine architectures. We believe there is more to microcomputing than the IBM PC and its many clones, so it was imperative that the new Benchmarks would run on as many machines as possible. While considering the different machines the Benchmarks were going to run on, it became apparent that all machines had a Basic language available. As languages other than Basic often run the Benchmark programs considerably faster, we have compiled our Top Ten list on the basis of the Basic timings only.

In order to be totally fair, we also insist that the Basic supplied with the machine is used. If no Basic is supplied as standard, the most popular interpreted Basic for the machine is run. However, we did want to include comparisons in performance between different languages running on the same machine. To help the writing of Benchmark programs in different languages, the actual Benchmark tasks are specified in language-independent form.

Having decided that the Benchmarks should be short and independent, the most difficult decision was determining which features to test. After much consideration, the following were chosen:

- Two separate Benchmarks (Intmath and Realmath) to test integer and real arithmetic. Integer arithmetic gives a good indication of the general processor speed, whereas real arithmetic speed depends on the quality of the algorithms in the software, unless a numeric co-processor is used.
- A separate Benchmark to test logarithmic and trigonometric functions, as these are primarily of interest to scientific users and certain heavy number-crunching business applications.
- Two separate Benchmarks (Textscrn and Grafscrn) to test the speed of text and graphics screen I/O. The graphics screen I/O test uses nothing more complex than Plot (i,j) to enable it to run on as many machines and languages as possible.
- A Benchmark that measures the disk drive speed; this is by far the most controversial of the six Benchmarks as disk speed is affected by so many factors. For example, an old hard disk will perform more slowly than a new one, due to file frag-

BENCHMARKS

Microsoft Basic benchmarks for the IBM PC and compatible.
Should also work unaltered with GWBasic, Turbo Basic,
Quickbasic and any other Microsoft compatible Basic for the
PC.

```
100 REM intmath
110 PRINT "Start"
120 X% = 0
130 Y% = 9
140 FOR I% = 1 TO 1000
150 X% = x% + (Y% * Y% - Y%) \ Y%
160 NEXT I%
170 PRINT "Finish",X%
180 END
```

```
100 REM realmath
110 PRINT "Start"
120 X! = 0
130 Y! = 9.9
140 FOR I% = 1 TO 1000
150 X! = X! + (Y! * Y! - Y!) / Y!
160 NEXT I%
170 PRINT "Finish",X!
180 END
```

```
100 REM triglog
110 PRINT "Start"
120 X! = 0
130 Y! = 9.9
140 FOR I% = 1 TO 1000
150 X! = X! + SIN(ARCTAN(COS(LOG(Y!))))
160 NEXT I%
170 PRINT "Finish",X!
180 END
```

```
100 REM textscrn
110 PRINT "Start"
120 FOR I% = 1 TO 1000
130 PRINT "1234567890qwertyuiop",I%
140 NEXT I%
150 PRINT "Finish"
160 END
```

```
100 REM grafscrn
110 PRINT "Start"
120 SCREEN 2
130 FOR X=1 TO 100
140 FOR Y=1 TO 100
150 PSET (X,Y)
160 NEXT Y
170 NEXT X
180 SCREEN 0
180 PRINT "Finish"
190 END
```

```
100 REM store
110 PRINT "Start"
120 OPEN "test.$$$" FOR OUTPUT AS £1
130 FOR I%=1 TO 1000
140 PRINT £1,"1234567890qwertyuiop"
150 NEXT I%
160 CLOSE £1
170 PRINT "Finish"
```

The slowest machines

MACHINE	PCW INDEX
Casio PB-700 pocket computer	0.1
Texas Instruments TI99/4A	0.16
Sharp PC1600	0.27
HP 71B pocket computer	0.29
Memotech MTX512	0.35
Sinclair Spectrum	0.36
Atari 800/130XE	0.47
Commodore Plus/4	0.47
Apple II/IIB	0.69
Coleco Adam.	0.72

All timings were run in interpreted Basic supplied with the machine.

Fastest in any language

MACHINE/LANGUAGE	PCW INDEX
PD11-44/Fortran 77	71.58
Prime 550/Prime Fortran	36.45
RM Nimbus PC1+8087/ Zorland C	14.29
RM Nimbus PC1/Pro Pascal	14.15
Acorn Archimedes/Basic V	13.82
Atari 520ST/Fig Forth	12.60
Inter-Orient AT/ Turbo Pascal	11.72
Apricot Xi/DeSmet C	9.99
Apple Macintosh II/MBasic	9.14
Apricot PC/Pro Pascal	8.93

The fastest IBM compatibles

MACHINE	PCW INDEX
Mission 386	7.27
Compaq Portable III	6.21
RM VX386	6.19
Dell 286[12]	4.54
IBM PS/2 Model 50	4.22
ITT Xtra XL	3.77
Wyse PC286	3.76
IBM PC/XT286	3.71
Citadel PC/AT	3.67
Apricot Xeni	3.52

All timings were run in interpreted Basic supplied with the machine.

The fastest 68000-based machines

MACHINE	PCW INDEX
Apple Macintosh II	9.14
Apple Macintosh SE	5.00
Commodore Amiga 1000	2.16
Atari 520ST	1.74
Sinclair QL	1.10

All timings were run in interpreted Basic supplied with the machine.

mentation. The Benchmark doesn't attempt to overcome these problems, but it is simple and our subsequent experiments have proved it to be a reasonable index when compared against far more complex disk test procedures. Most users don't start with a fresh disk every morning, and the aim of this Benchmark is to reflect the real world, albeit at the cost of strict scientific comparability.

We realise that not all machines and/or languages are able to run all the Benchmark programs. Some machines do not have graphics, some languages do not support floating-point arithmetic. To be fair, in compiling the various Top Ten tables printed here and on the accompanying poster, we have excluded from consideration those machine/software combinations not capable of running at least five of the seven programs; and, unless stated, all timings were conducted using the Basic supplied as standard with the machine.

The future

There are two areas where we'd like help in further developing the *PCW* Benchmarks. Firstly, we'd like to receive listings of the Benchmark programs in other languages — Prolog and Lisp are two that immediately spring to mind.

Secondly, we'd like to extend the Benchmark programs to test performance on other tasks. The advent of graphic co-processors, blitter chips and other hardware enhancements means we need some way of testing specifically the contributions these features make to machine performance. Any English language algorithms will be most welcome, though to maintain compatibility, it must be possible to write the programs in a standard interpreted Basic.

Finally, we'd like to thank you for your contributions. END

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Soft 50015	DMP 4000	£8.04

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Machine vision

The human visual system is a complex and sophisticated one but there are severe limitations on what the eyes and brain can take in. Nick Hampshire examines the development of computer vision systems which could enable us to see things never before seen.

The human eyes and their associated areas of brain form a visual system of amazing complexity and sophistication. Let's take a fairly simple scene such as a pile of books on a wooden desktop; on top of the books is an orange and a tennis ball, and beside the pile of books is an old-fashioned alarm clock. The eye and brain are unable to analyse and understand such a scene in an instant. We recognise the books as being books, we do not think that perhaps they may be blocks of wood or plastic. We do not confuse the orange and the tennis ball, and attempt to eat the ball and play tennis with the orange. We know the position of everything in the scene, and can reach out and pick up the orange or select a book from the pile.

The visual system formed by the brain and the eye is capable of performing this visual analysis in just a fraction of a second. If we look at the scene for a slightly longer period, perhaps as little as one second, we are able to gain more information. We can analyse the position of the hands on the clock and from that information determine the time. We can analyse the writing along the spines of the books and from that information determine the contents of the books.

In as little as one second, the human eye and brain have gained enough information to be able to answer such questions as 'What time is it?' or 'Is the blue book on top of the pile a dictionary?' or even 'Is the orange ripe?' In a very short space of time, the human visual system has acquired a lot of knowledge about a scene.

The visual process is thus concerned with the conversion of an optical image into knowledge about the world as it is perceived in that image. It is a process which we all take for granted — we do not have to *think* about seeing, we just *see*. Yet the process is so complex that it is unlikely that computers will be endowed with any but the most rudimentary visual capabilities until well into the next century.

Blind spot

The human visual system, despite its enormous sophistication, does, however, have severe limitations. Foremost of these is its very limited spectral response. The unaided human eye can not see images in the far ultraviolet, or infra-red areas, neither can the human eye perceive X-rays or microwave radiation. It is also very difficult for the human eye to differentiate between subtle variations in light intensity. With 200 different shades of the same colour, ranging from full intensity to totally colourless, the human eye will fail to distinguish between adjacent shades.

It is these limitations in human visual capabilities which have been the primary target for development by researchers into machine vision. The result of this work has allowed computer vision systems to see things which mankind has never seen before, from the moons of Jupiter to the metabolism of chemicals deep within a living human body. These developments have considerably augmented the human visual capability, and are proving to be of enormous scientific and economic value.

Given the current state of development, the subject of machine vision can thus be divided into three areas of development. The first of these is the technology of visual input, and involves the sensing of an image and its conversion into digital form. This data can then be utilised by the second area of development which is image manipulation. This involves performing mathematical operations upon the image to change it or extract more information from it. The third and last area of development is image analysis and recognition — in other words, the extraction of knowledge about the world from visual information. The first two of these areas of development are now well understood; the third area is still a long way from being even remotely solved and, if you excuse the pun, is the subject of much academic groping in the dark.

Image input

The most obvious means of placing a visual image into a computer's memory is to use a conventional TV camera. The camera can be colour or monochrome, even infra-red, and equipped with lenses to allow it to view microscopic objects or objects at great distances. To make it sensitive to selected wavelengths of light, it can be fitted with filters, and it is even possible to use filters to input a colour image with a monochrome camera. The TV camera can be connected directly to the computer or located at the far ends of our universe and linked by radio communications.

A TV camera's output contains information about the image as a measurement of the light intensity at every point in the image. This image can be considered as being divided into a grid which, on a standard TV camera, is scanned line by line in about forty milliseconds. During this period, 625 lines are scanned with each line containing the equivalent of over 1000 image points. This stream of data is in analogue form and has to be converted to digital format by a very high speed analogue to digital converter before it can be put into a computer.

Each picture element, or pixel, can have a varying intensity value which depends on the amount of light hitting that point on the image detector. In digitised form, each pixel thus requires between 4 and 8 bits to represent the intensity value, and a standard black and white TV image is represented by between two and four million bits of data — this translates into a data rate of 50 to 100 million bits per second. If the image

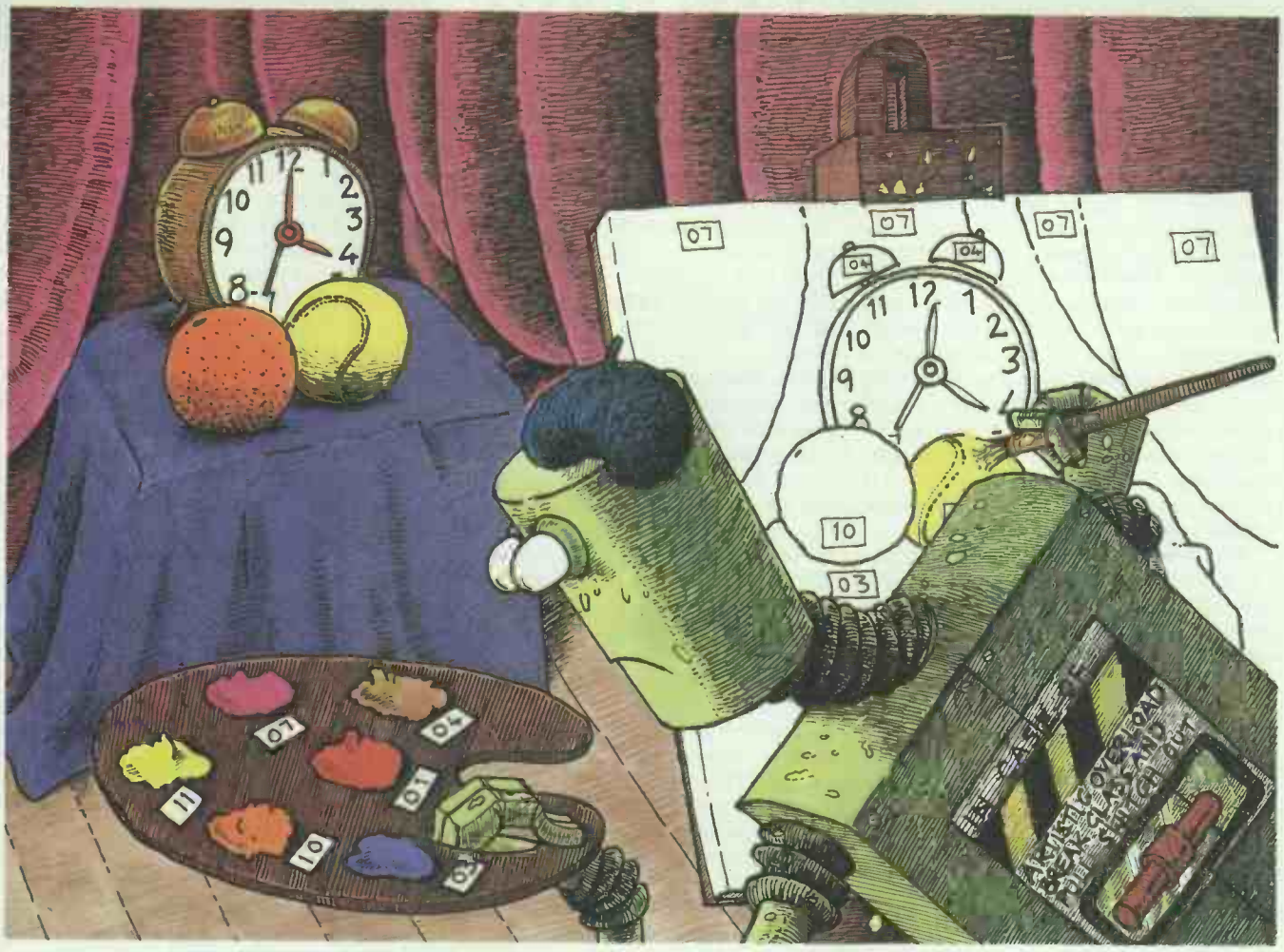

Illustration by Mark Hackett

is derived from a colour TV camera then the data rate is even higher.

In practical computer image processing systems, the high data rate is overcome by analysing just a single image rather than a flow of images. The high data input rate can be slowed down to a manageable level by a special piece of hardware called a frame grabber. As its name suggests, this device takes a single frame from the TV camera, digitises it and then stores it in memory. The data output does not necessarily have to be an array of 625x1000 pixels: the frame grabber hardware can produce a scaling of this image by sampling every other line and every fourth pixel as well as omitting the top and bottom 30 lines — this would produce a digitised image of 256×256 pixels square. When the image data has been acquired by the frame grabber, it can be accessed by the computer at a much slower rate.

The data provided by a frame grabber is simply an array of values stored in memory. If the frame grabber digitises an image into a 256×256 array of pixels with 64 levels of intensity, or 'grey scales' as they are usually referred to, then the image will occupy just under 50k of memory. This is quite a modest image digitisation and is typical of some of the frame grabber systems which can be purchased for use with desktop computer systems. Professional high-resolution systems, such as those used on spacecraft, will digitise images with a resolution several thousand pixels square and perhaps a thousand grey scale levels. Whatever the resolution of the digitised image, the data store in memory can then be analysed and manipulated by the computer.

Medicinal purposes

Image data need not necessarily be derived from a TV camera — indeed, some of the most exciting work on machine vision has used totally non-visual imaging systems. Perhaps the best known of these is the medical CAT scanner. The term CAT stands for Computerised Axial Tomography; this refers to the mathematical techniques which are used to construct an image of a slice through a living body and which, unlike conventional X-ray pictures, shows all the soft tissue locations as well as the location of the bones.

The data required to construct the image is obtained by taking a series of about 300 measurements at regular intervals all around the patient. Each of these measurements produces a series of values indicating reflections, refractions or intensities, typically giving a total of over 100k of data. This data is then used by the computer to construct an image of the slice through the patient defined by the plane of rotation of the detector. The mathematics used are quite complex and involve extensive use of Fourier analysis.

Space-based remote sensing and medicine have both been the major driving forces behind the development of computerised imaging and machine vision systems. They have made enormous advances since 1964, when many of the foundations for this work were laid down by Dr Robert Nathan at the Jet Propulsion Laboratory in California for the Ranger 7 moon probe. There are now a whole range of imaging techniques which rely on computers to build images which would be impossible to obtain by any other means.

Image manipulation

When it has been digitised and stored within the computer's memory, an image can be manipulated to improve and extract more information from it. The image will be stored as an array of pixels, with each pixel having an intensity value. Thus, each pixel might be stored as a single byte which would allow it to have up to 2^8 or 256 grey scale levels of brightness. With colour images this would be repeated three times — once for red, once for green and once for the blue component of the image. The number of grey scales

and the resolution of the digitised image would depend on the frame grabber or image capture hardware.

One of the first things which can be done with such an image is to remove any 'noise' which may have been introduced into the image by the imaging hardware or in its transmission. These are things like the 'snow' or regular interference patterns often seen on TV screens when reception is bad or the antennae is faulty. The 'snow' in an image can be easily removed by locating individual pixels whose brightness shows an abnormal variation from those surrounding it. It can then be reset to a brightness level equal to the average of the surrounding pixels.

The image can also be corrected for faults or inadequacies in the image capture system. Many TV cameras have a tendency to have a non-uniform response to light across the tube's surface, so an object may appear brighter in the centre of the tube than at the edge. This effect can be measured with the camera aimed at a uniformly-lit plain surface. This measured variation in intensity can then be used to correct the intensity of any image by adding a correction factor to every pixel's intensity.

Another correction which can easily be performed is to rectify distortions created by the lenses of a camera. Many low-price TV cameras use cheap lenses which often give rise to geometric distortions at the edge of the image. By measuring these distortions against a reference grid, it is possile to use a 'rubber banding' technique to remove this distortion from the received image.

The computer can also be used to alter the brightness in an image which is either too dark or too light. This is done by first drawing a histogram of the intensities of all pixels in the image. In a properly exposed image, this histogram should form a standard bell-shaped distribution curve centred in the middle of the intensity range. If the histogram shows that the intensity is weighted too heavily towards either the light or dark ends of the intensity scale, then it is a simple matter to adjust this by adding or subtracting a correction value to the intensity of each pixel.

The contrast within an image can also be altered using the histogram analysis of pixel intensities. If the histogram shows a very narrow bell curve with the majority of pixels having very similar intensity values, then the computer can be used to adjust these values in order to improve the contrast, so broadening the spread of values in the histogram. This can be done by multiplying each pixel's intensity value by a constant in order to produce the required contrast, and then adjusting the position of the histogram in order to ensure its location in the centre of the intensity range. The manipulation of image contrast and brightness should be compared to the controls on a TV set which allow the same type of manipulation.

Since the human eye is not very good at discriminating between very slight variations in light intensity, it is possible to use contrast manipulation to show detail in an image which would not otherwise be visible. It is this ability to manipulate an image in order to extract the maximum information from that image which is one of the most powerful features of computerised image processing.

One form of such manipulation is the process of 'pseudo-colouring'. This technique can be used to identify certain light intensities by displaying them in colour. For example, a user might be interested in examining all pixels with the intensity range 30 to 35. By assigning these with the colour red on a colour monitor, they can then be immediately identified from pixels with other intensities. This form of pseudo-colouring has been used with great effect in the display of many satellite images or in CAT scan images. It has also been used recently to add colour to old black and white movies — thanks to computerised image manipulation, you can now see Laurel and Hardy in full colour.

Computerised image manipulation also allows portions of an image to be extracted, masked out, rotated, magnified or even be replaced by portions of other images. It is these techniques which are currently revolutionising sections of the printing and advertising industry. It is now possible to electronically retouch and amend photographs or film with such precision that it is impossible to detect where any changes have been made — a technology which means that photographs can now lie very convincingly.

Another form of image manipulation which is finding considerable use in industry is image comparison. This technique compares a reference image with the image which is being input, and checks to see if they match.

This process is done by comparing each pixel and calculating the absolute value of the difference between the two intensity values. This process can be used to automatically check that complex products such as printed circuit boards are complete. Any difference between the reference and test image will stand out on the resulting comparison image as bright areas, whereas all the rest will be a very dark image.

These examples show a set of full-colour photographs input to the computer by means of a video camera. As well as the main picture, up to 15 windows can be displayed holding, among other things, user-generated graphics, images being digitised in real time, text or, as here, a set of freeze frames. These frames can be moved around independently.

Image processing is performed using a co-processor board based around the Intel 82786 chip. First, the main picture is

Image recognition

As can be seen from the example at the beginning of this article, the process of image analysis and recognition is an exceedingly complex one. It is a process which involves the analysis of a visual scene and the extraction of information from that analysis in order to build a knowledge base about the environment within the image. This visual process not only creates new knowledge but also utilises existing knowledge in order to carry out the visual analysis. This places image recognition firmly into the domain of artificial intelligence — indeed, some researchers consider that it is one of the main foundations upon which AI will develop.

Image recognition techniques have been developed from early work on recognition of printed text, work which has now resulted in a range of commercial products such as the Kurzweil Discover which was reviewed in the September issue of *PCW*. Compared with the analysis of real world images, character recognition is relatively easy. Characters are fixed, 2D and black and white, whereas the image of a machined metal part will have many levels of light intensity which will vary according to the attitude of the part in space and the distribution of light sources. Many of the problems encountered in machine vision are the result of trying to reduce such complex images to the simplicity of a black and white character. Machine vision thus draws together the three related fields of image processing, pattern recognition and scene analysis.

A typical example of the capabilities of current image recognition systems is a robot which visually selects the correct component from a box of assorted components, and then orientates the component correctly so that it will fit into the object being assembled. For a human this is a very simple task; for a computer using the latest machine vision techniques, it is a task of enormous complexity.

The first problem is one of inputting the image and converting it to a form in which it is possible to perform object recognition on the various components in the image. A TV camera is normally used and the resulting image is then processed to identify the edges of the various components in the image. However, the simple detection of the edges is insufficient for any pattern recognition process to be performed, as objects may be touching or on top of each other. Similarly, variations in light intensity, object surface reflectivity and shadows cast by one object over another, all complicate the problem.

The only way to overcome these problems is to give the vision system some degree of knowledge about the objects which it is trying to recognise — knowledge about the various shapes which make up the images of the various components, plus knowledge about the lighting and the surface reflectivity of the various objects. With this level of knowledge, the system can be designed to refine the raw edge image and give each of the components in the image a more solid shape and definition.

Simple components can be recognised at this stage from an outline since there are probably a limited number of ways in which they can be orientated. Thus a bolt has just two orientations, lying on its edge and standing up on its head, and both have easily identifiable outlines. Components with complex shapes are, however, much harder to recognise and usually require an analysis of their component shapes and surfaces — a task made much harder by the 2D nature of the input image. Again, the system must utilise a knowledge of shapes in order to deduce information about the depth and spatial positioning of objects in the image. Programs which perform this task usually have as their output a line drawing of all the objects in the image.

This type of image analysis is usually sufficient to ensure recognition of components by a robot. The line drawing will be compared to images of known objects stored in a database, with the computer making full allowance for size normalisation and object orientation. This will usually ensure successful recognition in most cases, although difficulty will be encountered where different objects are identical at certain angles of viewing.

In order to progress beyond the recognition of an object from a small universe of different objects, and for the computer to analyse unknown objects and acquire knowledge about the relationship between objects, it is necessary to apply artificial intelligence techniques to the problem. It is at this stage that the image recognition process splits into two separate areas — on the one hand there is pattern classification, and on the other there is scene analysis.

Pattern classification is concerned with the mapping of feature vectors containing measurements of the objects, and grouping them into classes. This is important because it defines the physical shape and size of an object. In the example at the beginning of this article, pattern classification would be concerned with the spherical nature of the ball and orange, the rectangular surfaces of the books, the circular face of the clock and the angular association of

pseudo-coloured and displayed on a standard EGA screen before being modified with standard paint-type software. Individual areas of the image can be selected and enhanced

using edge-detection techniques. When the area around the eye has been enlarged, it can be used to analyse and classify certain features

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the hour and minute hand; it would also be concerned with the 'orangeness' of the orange and the 'blueness' of the book. Scene analysis is concerned with building up a description of the objects in an image in terms of 3D solids and how they relate spatially. Thus scene analysis would be concerned with how the orange and the ball were placed upon the book, their relative positions and sizes.

With these two analyses of the image, it is then possible to build up a knowledge base about the visual scene. The knowledge base can then be interrogated about relationships between objects, object sizes and positions, and even about the nature of objects. Only when the computer has built up such a knowledge base does it become possible to successfully interact with the objects which have been perceived. A full knowledge of the scene with the orange, the ball, the books and the clock is essential before any attempt can be made to remove the orange from the books and place it upon the table. Armed with this type of visually derived knowledge, a computer can use a robot arm to not only select the required object, but also calculate the required set of movements in order to orientate the object correctly and put it in the required place.

The future

Machine vision covers a range of different subjects, most now quite well developed — the exception being the area of true machine vision with its recognition of objects and scene analysis. So far such systems have been limited to very simple worlds containing toy blocks or a small number of different components. This is a long way from a practical, general-purpose machine vision system.

Part of the problem lies in our lack of understanding about the way in which biological vision systems work, particularly the way that information is extracted from an image. The other problem is that standard general-purpose computers are not necessarily the best devices for performing the computation required by machine vision. Indeed, the computational power required for machine vision has been estimated at between 1 and 100 billion instructions per second. To put this into perspective, a supercomputer like the Cray 2 is only capable of working at a maximum speed of half a billion instructions per second. Even the extraction of fairly low-level features from an image requires in excess of 10,000 operations per pixel.

Improvements in our understanding of biological vision systems and the need to reduce the computational overload in image analysis are leading scientists towards the development of new architectures for vision systems. It is these new architectures which offer the best chances of overcoming many of the problems currently facing researchers.

Most of these new architectures are based around special-purpose parallel systems. This is a logical choice since a visual image is a truly parallel set of data. For fast preliminary feature extraction, each pixel should, in theory, have its own processor. This is not really practical, but the development of special-purpose visual signal processors has shown considerable improvement in operational speed, particularly when used in parallel or in pipelined structures. The purpose of these processing chips is to perform all the low-level feature extraction and, in the process, reduce the quantity of image data to manageable quantities.

Some success is also being shown in the application of array processing systems. An example of this is the Wisard adaptive image classifier developed by Professor Igor Aleksander of Imperial College, London. This is a deceptively simple system which uses RAM chips to emulate a neural network. The system has shown itself to be very good at performing image recognition, particularly on such complex images as the human face. It has proved very tolerant to wide variations in the image's orientation compared to the training images, and will even successfully recognise a partial image. There has been considerable interest in this system for security applications as well as the more conventional machine vision applications.

Conclusion

The ability to be able to put an image into a computer opens up the possibility of a whole range of fascinating applications. General-purpose machine vision may require special, very powerful computers, highly complex programming techniques and may take another 50 years to develop, but most image processing can be performed with a desktop computer. Frame grabbers are available for machines like the Amiga or the IBM PC for as little as £400, including a black and white TV camera.

One such system is the NewTec Digi-View for the Amiga, which will give a 320×200 resolution image with 16 grey scale levels. (It should be noted that the Amiga is a very good machine for image processing since it combines an excellent display with a fast processor and does not suffer from the 640k maximum memory size of the IBM PC.) Another system which is available for the PC is the more expensive but more sophisticated Microsight II from Digithurst which costs just over £1000 but produces a 512×512 image with 63 grey scale levels.

With image input devices such as these, it is possible to do a whole range of image manipulations — even image analysis and recognition with a standard PC.

Images courtesy of Digithurst, (0763) 42955.

The mathematics of image manipulation

Most of the simpler image manipulation techniques, such as contrast or intensity enhancement, can be performed by simple calculations on individual pixels. However, the more complex operations such as edge detection or convolution are area processes which use comparisons between the pixel whose intensity value is being calculated and its neighbouring pixel's intensity values. These calculations are usually performed using blocks of nine pixels, thus:

A	B	C
D	X	E
F	G	H

where X is the pixel being calculated and A to H are its surrounding pixels. Every pixel in the image will need to be calculated in this manner, with the result being stored as a new image in another part of memory.

The convolution and edge detection algorithms are virtually the same and are 2D adaptions of linear processes which were developed for signal processing. The basic calculation is as follows. Where p is the named pixel's intensity value and K is the value of a kernel for that pixel; the kernel is a 3×3 grid of values which determines the nature of the filtering operation:

$$p(X)=p(A)*k(A)+p(B)*k(B)+p(C)*k(C)+p(D)*k(D)+p(E)*k(E)+p(F)*k(F)+p(G)*k(G)+p(H)*k(H)$$

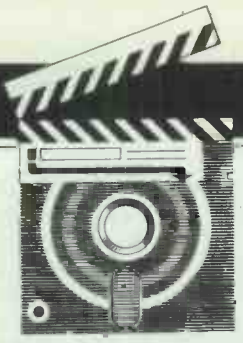
A typical kernel to detect edges would have the following values:

−1	−1	−1
−1	8	−1
−1	−1	−1

This is known as a Laplacian area filter. To convolve an image and make it 'sharper', use a similar kernel but with the centre value increased to 9. Particular features can be detected by using a matched filter kernel. The following kernel will enhance only the vertical edges of the image:

−1	0	1
−1	0	1
−1	0	1

All these techniques are computationally very intensive — it takes over half a million calculations to detect the edges in a 256×256 resolution image using the above technique, whch is one of the simplest and least computationally intensive. END



SCREENTEST

Spellmaster

The BBC Micro's software base now includes Spellmaster from Computer Concepts, an easy to use but impressive spelling checker designed for much more than BBC word processors. Ian Waugh has words with it.

There can be few professional writers who have not yet succumbed to the charms of a word processor. Even the occasional letter writer, the budding novelist and the scribbler can benefit in many ways from using a computer to produce their writings.

Of course there is no point in using a computer for its own sake, and word processors need to offer significant advantages for it to be worthwhile the writer learning the new skills required. Spell checking is one of the most common advantages to computer-based writing. Whether you are a bad speller or a bad typist, a spelling checker can take the tedium out of producing clean copy.

It simply checks the words in your text against a master dictionary. If it finds the word it moves on; if it doesn't find it, it lets you know.

A spelling checker cannot tell if a word is used correctly in a particular context. For instance, it would pass this rather laboured example: 'Eye sore write threw there evil planes'. It is excellent, however, for spotting typing errors and letter transpositions 'Ikie thsi'.

The two major problems with spelling checkers are their slowness and often inconvenient method of operation. It is essential, too, to be able to add your own words to the dictionary. Computer Concepts' Spellmaster for the BBC Micro sets out to rectify these problems.

The most popular word processors for the BBC are View, Interword, Wordwise and Wordwise Plus which account for around 95 per cent of those in regular use. Spellmaster was designed specifically to work with these programs but it can check spooled ASCII text from other word processors and large files on disk — such as those created with a second processor.

Setting up

Spellmaster is now supplied on one 128k EPROM. Because of a shortage of chips, early versions were supplied on two chips. Both versions are functionally the same, however, although you can trade in your two chips for one for £25.

The EPROM is mounted on a piggy-back board which allows switching to take place between the eight 16k banks. The Spellmaster program occupies one bank and the other seven hold the master dictionary — over 59,000 words.

The EPROM will plug comfortably into any ROM socket in any BBC Micro (B, B+ and Master) although it is slightly longer than the more usual 16k EPROM. It won't fit into a normal Master cartridge because of its height and you will need a tall cartridge such as the Care Master which holds the EPROMs above the computer's casing.

In use

Spellmaster has four methods of operation. Its most powerful and convenient is that of immediately checking each word as it is typed in without noticeably slowing down the typing rate.

From View, Interword and Wordwise(+), Spellmaster can check the text currently in memory. It also has its own editor into which text can be loaded, checked and saved and it can check large files on disk.

*SPELL takes you into the Spellmaster language. The main menu is similar in design to that of Wordwise and Interword. The first two options let you save and load a file. They give you a Y/N prompt if you are about to save and overwrite an existing file or if you are going to load a file and one already exists in memory. Option three lets you load text to the cursor position.

Most checking will be done directly from a word processor but some facilities are only available from Spellmaster itself. It's a straight ASCII editor and can be used to build *EXEC and !BOOT files. Movement around the editor uses keys similar to those used by Wordwise and, to some extent, Interword. You can move, copy and delete sections of text and change screen mode.

If a file contains control codes, these are shown as full stops. After checking, you should be able to save the text and load it back into the word processor it came from.

Option four is used to check files too large to fit into memory. You will only need this option if you have created a very long file on a second processor or if you are using a word processor other than View, Interword or Wordwise(+). It checks the file word by word and outputs a new file, marking any words it cannot find in its dictionary.

Two file names are requested. If the second one is omitted, the new file overwrites the old one and the first letter of any unrecognised word is replaced with a backslash (\). This ensures the new file is no longer than the original one, as some word processors (such as Scribe) do not like their file lengths changed. If a second file name is given, then unrecognised words are prefaced with '#!'. All unrecognised words are

stored in Spellmaster's own editor.

Option five is Search and Replace which prompts for a Global or Selective replacement. Wildcards are not supported.

Option six simply prints out the text held in the editor in 80-column format.

Options seven and eight are concerned with creating and editing user dictionaries. This is a vital aspect of any spelling checker, as no matter how large the master dictionary, you will always want to add words and proper nouns.

Option eight produces a list of any currently resident user dictionaries and lists those ROM sockets which contain sideways RAM. The list includes sockets which may already contain data, and installing a dictionary there will completely overwrite the contents.

You can install as many dictionaries as you have RAM banks. Each could probably hold around 3000 words but unless you are writing a medical text book or a scientific thesaurus, you will probably only build up a dictionary of a few hundred words.

Option seven reads a user dictionary into Spellmaster's editor. If there is more than one it will list them and ask you for the appropriate ROM socket number. You can add, delete and edit dictionary words in the editor using the normal editing functions. New words need not be inserted in alphabetical order as the program will sort them when installing the dictionary with option eight.

*DSAVE and *DLOAD are used to save and load user dictionaries. If no filename is given, the dictionary will be saved with the name USERDIC.

When in View or Wordwise(+), the Spellmaster menu is activated by pressing CTRL/J. Interword has a special menu option devoted to Spellmaster which is activated with CTRL/f8. The menu is the same in all cases — a window appears at the top of the screen and lists five options:

1: Check entire text
2: Check marked section
3: Browse
4: Check from cursor
5: Turn immediate check on/off

Options one, two and four (CTRL/V also activates a Check from cursor) move through their designated area of text and highlight each word not found in a dictionary.

Option five toggles the immediate check option on and off. This checks each word as it is typed and beeps if it is not found in any of the dictionaries. If you don't want to stop typing — you'll probably not want to ruin a good train of thought — you can go back to the word when you've finished the sentence or section of text. If it is noticeably wrong, you can correct it and Spellmaster will check it again after editing as you move off it.

You can check the word at the cursor by pressing CTRL/C. You will hear a beep if the word has been recognised, otherwise the window appears at the top of the text, displaying the word in question. This also happens with options one, two and four when a word is not recognised. The window offers the following choices:

1: Ignore
2: Add to dictionary
3: Correct word
ESC end check

Option one ignores the word but only on that one occurrence, and it will flag the same word if it meets it again in the text.

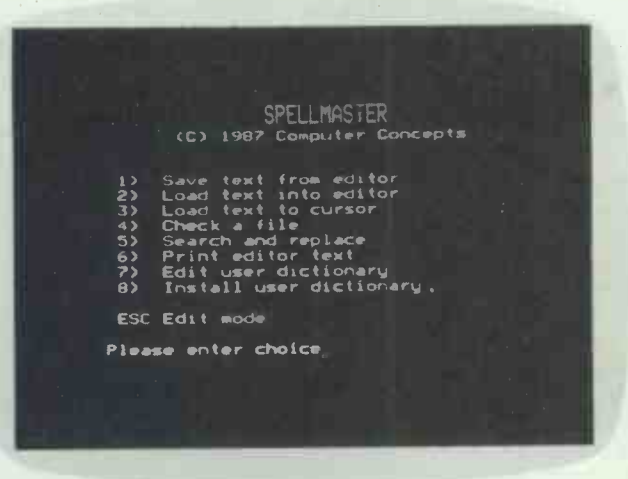
Option two adds the word to the user dictionary. It's wise to check that the word is spelled correctly, otherwise you could continue your writing career with a particular misspelling as your trademark.

If a user dictionary has not been installed or if the RAM bank has been write-protected, you will receive a 'Can't add word' error.

Option three lets you correct the word. The lower part of the window displays the suspect word on the top line. A number of words closest alphabetically to the suspect word appear beneath, and you can scroll through them forwards and backwards with the cursor keys to find the correct spelling. If you find it, pressing RETURN will correct that word along with every subsequent occurrence of the word in the text from that position onwards. Spellmaster makes no pretence at any artificial intelligence for making correct guesses at words.

Occasionally when checking a section of text, the program may flag a word it does not recognise and when you try to correct it, you realise that it is indeed misspelled but the correct spelling is not in the dictionary. When you exit the check routine, you may either be at the top of the text (when checking the entire text or marked text) or where you left the cursor (when checking from cursor). Escaping from the routine, unfortunately, does not leave you at the suspect word. You must find the incorrect word manually or with search and replace, correct it and add it to the dictionary.

You can jump through the dictionary using SHIFT, CTRL and the up and down cursor keys. SHIFT moves you by the first letter, CTRL moves you by the third letter. Alternatively you can type in the first letter or letters of the word. As you do so, you move through the dictionary towards the word. In fact, rather than type '3' for option three, you can simply start to enter the word. If you want to look for a different word, you must scroll by at least one word or press the space bar. ESCAPE will take you to the previous three-choice menu.



The Spellmaster main menu gives access to a simple text editor, allows modification of user dictionaries, loading and saving of text from the editor, and access to all the 'star' commands

Pressing Ctrl-C in any application that uses standard ASCII files activates the spelling checker, from where you can add words to the dictionary and activate the 'guess correct spelling' feature

Correct context

To know that a word is correct it must seen in context. In Interword, the entire screen is displayed with the word highlighted. In View and Wordwise(+), the word is shown surrounded by three lines of text and, although the formatting may not be the same as that in the editor, it is more than enough to identify the word in context.

Spellmaster ignores all one and two-letter words which prevents it beeping at post codes and simple abbreviations, although it means it doesn't pick up things like 'ot' and 'lm'. It's generally the longer words which have 'hidden' errors.

Option three (and CTRL/B) lets you browse through the dictionary using the same keys you use when looking for a correct spelling. When a word has been located, pressing RETURN will place it in the text at the cursor position.

Interword is unique in having a built-in menu devoted to Spellmaster. In order for Spellmaster to work with Wordwise(+) and View, it needs to claim 256 bytes of workspace. In a model B, PAGE is set 256 bytes higher; but in the Master computers, the wordspace is claimed elsewhere and will not affect PAGE or any application ROMs. You can prevent the workspace being claimed with *WORKOFF and let Spellmaster reclaim it with *WORKON.

Spellmaster has several additional * commands. *BROWSE duplicates the Browse option from the Spellmaster menu. *CHECK must be followed by a string of at least two characters. It can accept a trailing wildcard (*) to represent a group of characters and a single character wildcard (#) which cannot be placed within the first two characters. The routine will list any group of words which conform to the string pattern: for example, *CHECK PERSON* would list all words which begin with 'PERSON', and *CHECK COM#U* would list all words beginning with COM which had 'U' as their fifth letter. You can use this to check the spelling of a word — for example, *CHECK SEP#RATE would reveal that it's 'separate' and not 'seperate'.

*CROSSWORD is similar to *CHECK but it can only use the single wildcard character (#) and not the asterisk (*). To help solve a crossword, you would replace each unknown letter with a #.

*ANAGRAM expects a string of letters and will list all words in the dictionary which contain only those letters. This, too, can be used to help solve crosswords.

Finally, one of the most interesting commands is *FUZZY which lists all words which are approximately similar to the string parameter. It has a crude 'sound-alike' check but words like THREW and THROUGH don't turn up in each other's lists. In most cases, however, the word you require will show in the list.

*Spellmaster has a number of additional functions. Here you can see the *ANAGRAM command finding all the anagrams of AETL. Other commands include *BROWSE, which enables you to use Spellmaster like a dictionary; and *CHECK, which can help solve crossword puzzles*

'Whether you are a bad speller or a bad typist, a spelling checker can take the tedium out of producing clean copy.'

Don't use *CHECK or *FUZZY without a string parameter from a word processor (not even Spellmaster itself) or you may lose your text.

For technical reasons of speed, it apparently was not practical to make *ANAGRAM, *CROSSWORD and *CHECK search through the user dictionaries and, consequently, they are restricted to words in the master ROM. This isn't much of a loss with *CHECK as the Browse and Check word options let you sort out most queries from within a word processor. As crosswords are often full of unusual words, it's a pity that the *CROSSWORD command cannot search the user dictionaries, too.

Conclusion

In practice, Spellmaster is unbelievably easy to use. No other spelling checker for the BBC can check text from within a word processor (other than ROMspell in check on entry mode) and, as the dictionaries are in ROM and RAM, checking is amazingly fast. It checked 4000 words in Wordwise Plus in 25 seconds — a speed of 9600 words per minute. It is generally at least ten times faster than existing spelling checkers and often much faster than that. It even outperforms spelling checkers for the Apple Mac, the IBM PC and the Atari ST by at least a third.

Spellmaster's dictionary size of over 59,000 words is second only to Viewspell which has around 77,000 words. Spellmaster, however, allows the use of several user dictionaries automatically, whereas Viewspell needs prompts for any more than one user dictionary and is considerably more clumsy in operation.

Spellmaster is also the only BBC spelling checker which can check text on entry, check text held in RAM and check files on disk.

Spellmaster is a pretty impressive piece of software. You really do need at least one bank of sideways RAM to make full use of its potential but whatever activity you're involved in, you should acquire the tools of the trade.

It's rather amazing to see a program for the BBC outperform those for the bigger machines — and by such a large amount. Spellmaster is a credit to Computer Concepts' programming ability and any writer will soon find it an indispensable and invaluable aid to their writing. If you're looking for a spelling checker, there simply is no other choice.

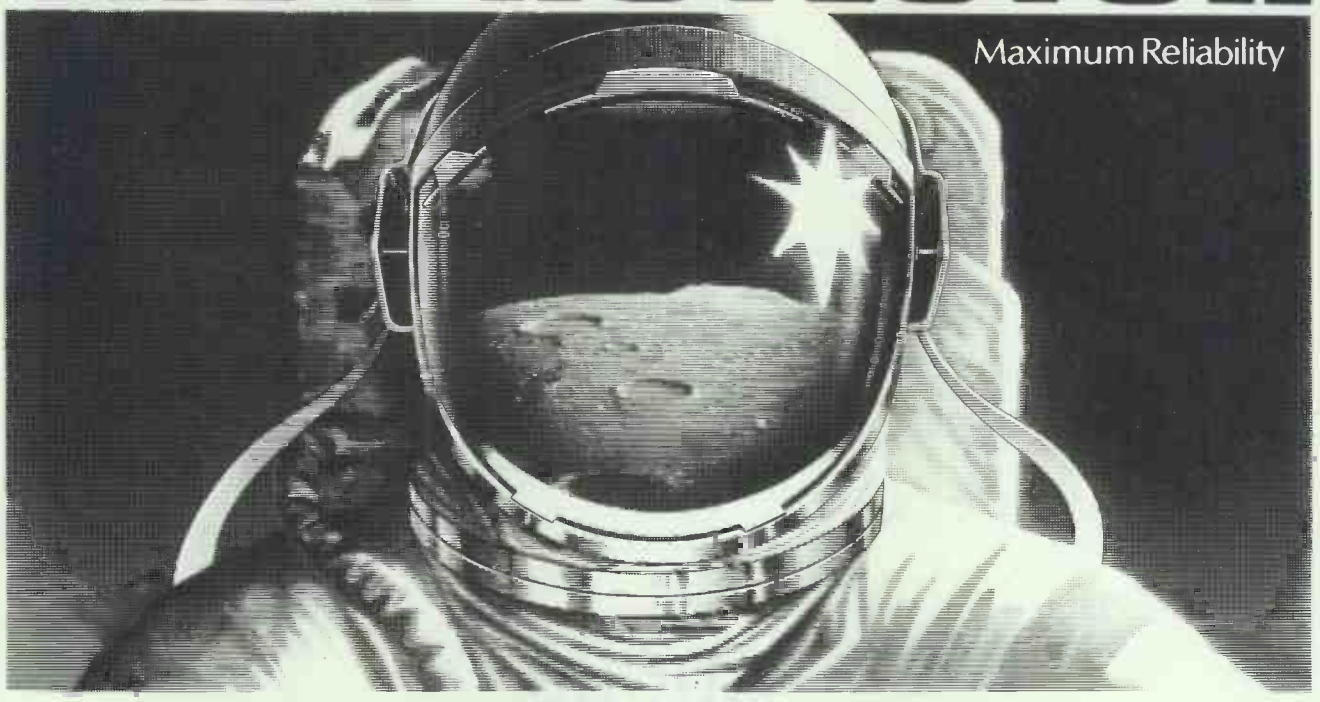
STOP PRESS

Computer Concepts is developing a version of Spellmaster for use with the Acorn Archimedes, which will be combined (hopefully) with a thesaurus and CC's new WYSIWYG word processor. This should be available towards the end of the year.

Spellmaster costs £59 (incl VAT) from Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts HP2 6EX. Tel: (0442) 63933.

END

THE PROTECTOR



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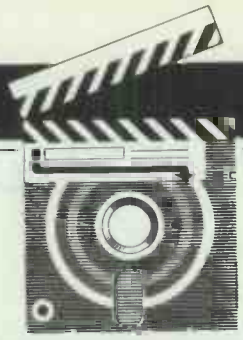


SCREENTEST

VIP Professional

For those people who don't own a bona-fide PC-compatible, VIP Professional is a versatile, advanced spreadsheet which serves admirably as a Lotus 1-2-3 clone for the Atari ST, the Commodore Amiga and the Apple IIGS. Geof Wheelwright tests an ST GEM version.

Serious software support for small-business computing is once again stepping out from under the wing of the IBM PC and Macintosh hardware designs. New business applications for the likes of the Atari ST, the Commodore Amiga and even the little-seen (at least in the UK) Apple IIGS have started to timidly make their way forward onto the software shelves of the nation's retailers.

One of the most popular applications among all manner of business microcomputer users has always been the spreadsheet — the classic financial 'what-if?' tool that allows users to conduct complex extrapolations with electronic versions of their ledgers. It should, therefore, be heartening to users of those machines to see the recent releases of Logistix (a spreadsheet-based integrated package for the Amiga), K-Spread (a spreadsheet from Kuma for the ST) and AppleWorks 2.0 (the latest version of an integrated package for the Apple IIGS that includes a spreadsheet).

Unfortunately, all of those applications still shut these users off from the main body of work written about this subject, as most books about spreadsheet design use the PC-based Lotus 1-2-3 spreadsheet as their starting point. Such applications also generally cut off Amiga, ST and Apple IIGS users from sharing spreadsheet files with PC users operating under Lotus 1-2-3.

There is, however, a solution at hand. It is called VIP Professional, from VIP Technologies, and comprises a fully Lotus-compatible spreadsheet which is available in versions for the Atari ST, the Commodore Amiga and the Apple IIGS.

Overview

The most popular current version of VIP Professional is for the Atari ST. This is sold in the UK by longtime Atari boosters Silica Shop, and will cost you just a shade under £200 for the version that provides full support to the ST's Macintosh-like GEM interface (although you may be able to buy early text-only versions a little cheaper). VIP Professional is also one of the few full-range spreadsheets available for any of these machines (with the possible exception of the IIGS, which can run the full range of Apple II software — including the original VisiCalc software which started the popularity of spreadsheets in the first place).

In my view, it is the latter point which is of more immediate concern. Despite the dominance of Lotus 1-2-3 in the PC world, a spreadsheet for the ST, Amiga or IIGS will have to stand or fall on its own merits for the users of those machines. After all, each of the buyers of those systems had the choice to buy a PC-compatible system and did not: therefore, any software they use for it has to be judged on how well it exploits that machine, as opposed to how well it helps to turn their micro into a PC clone.

Indeed, impressive hardware and software emulators now exist for all three of these machines which permit them to run full-blown PC software. And, in most cases, these emulators cost little more than VIP Professional.

So, if someone is looking at VIP Professional, they should judge it entirely on its own merits — although comparisons with Lotus 1-2-3 may be useful in context-setting.

The first question we must thus address is just how useful VIP Professional is for the first-time spreadsheet user on the Amiga, ST or IIGS. I'll deal with this question mainly in terms of the ST, as that is the machine I primarily used to review the software. Not surprisingly, I would say that, overall, VIP Professional is no easier or harder for the novice ST user to learn than it would be for that person to start with Lotus 1-2-3 on a PC.

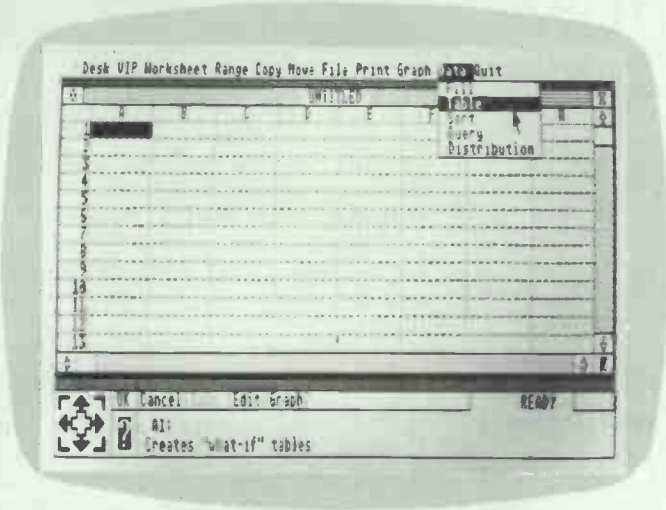
Setting up

VIP Professional comes with two floppy disks: one containing the software itself; and the other being used for context-sensitive 'help' files, and some sample spreadsheets and macros. These are configured such that you can run the system off a single drive if necessary; the entire application loads into memory from disk one (after double-clicking the mouse on the filename 'PROFESS.PRG'), then you can stick disk two into the drive to gain access to help and example files.

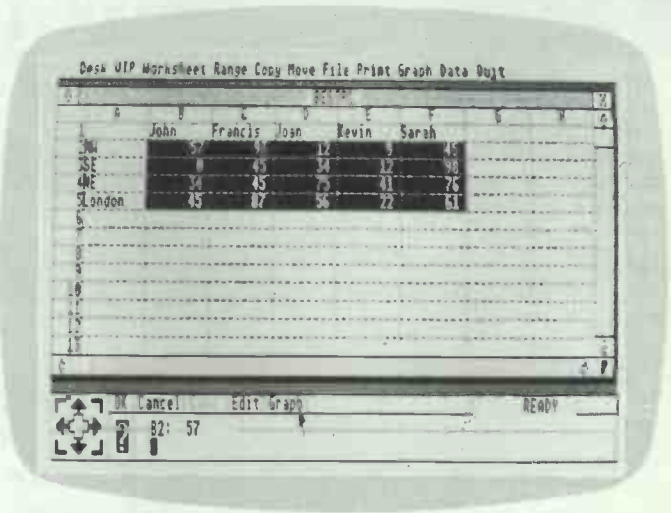
I found that by placing the help disk in drive A after loading up the software and using the 'Directory' command to set the directory to C (as in MS-DOS), I was able to save and load files from the hard disk while obtaining help files from the A drive.

In use

There are several important innovations within VIP Professional that make the package somewhat simpler to use than the software it is trying to copy. First and foremost, the version I tested uses the Atari's GEM



The VIP Professional blank screen looks much as you would expect from a Lotus-compatible spreadsheet, but with pull-down menu titles and a graphic-enhanced command line



VIP Professional uses the GEM interface properly. The mouse is used to highlight figures that are to be cut, pasted or used for a graph

interface to the full. This means that when you start up the application, it provides you with the same kind of consistent look and feel that you will have become used to in other Atari applications.

The main spreadsheet grid dominates the middle two-thirds of the screen, with pull-down menus running across the top, a pointer (which changes shape from a thick cell indicator to a regular pointer icon, depending on where it sits on the screen) somewhere in the middle of the screen, and a large graphics-driven 'status box' runs along the bottom.

The graphics-driven status box along the bottom of the screen allows you to enter data in the form of commands to move about the spreadsheet using the mouse. There is a large cursor cluster at the far bottom left-hand side of the screen which can be used to 'page up' and 'page down' quickly around the spreadsheet (all controlled by the pointer), and a question-mark icon which brings up the help menu as opposed to obtaining it by pressing the F1 key.

There is also a series of action boxes above and to the right of the question mark which allow you to confirm or cancel a command using the pointer, as well as give recalculation, editing and graph commands. The rest of this box is dedicated to telling you which cell you are editing and allowing you to enter data into it.

I would suggest that for a user new to spreadsheets and only recently acquainted with GEM, these commands are by no means intuitive. In addition, the documentation I was sent for the GEM version refers almost exclusively to the text version of the software, with mention in the first few pages only of any pull-down menus and icons. There was, however, a brief introductory booklet which did address this version and seemed to provide all the help I needed — although that may be small comfort to a novice.

At any rate, the main data entry section of the VIP Professional spreadsheet looks exactly as you would expect it to, with the names A through H running across the top to show initial names of columns (the vertical portions of the electronic ledger) and the numbers 1 through 12 providing the same for the rows (horizontal references for the spreadsheet).

Along the top is a set of pull-down menus that should be familiar to all ST users. The left-most of these is the 'DESK' menu, containing any desk accessories you may have installed in the machine; while immediately next to it is a menu entitled 'VIP'. This menu offers the choice to GOTO a named cell immediately, get context-sensitive help, construct a database query, build a table, or switch the background grid of the spreadsheet on and off.

All the other menus are exact replicas of the menus contained in the Lotus 1-2-3 spreadsheet. For non-Lotus users, these are:

● **Worksheet** The menu title for a series of options which govern large-scale changes of a spreadsheet model you have loaded in from disk or created in memory from the keyboard. This is where you would insert and delete cells, change the size of cells, and change the 'format' of the data contained within the cells.

● **Range** The commands under this menu title are designed to allow control over a specific group of cells or 'range'. Using the options under this range, you can carry out operations such as erasing specific cells, change the way in which some are displayed, and 'name' a range for later operations on that 'named range'.

● **Copy** Allows you to duplicate the contents of a cell or range of cells to another cell or range of cells. This is a particularly useful function when dealing with formulae that you might wish to repeat throughout a spreadsheet model.

● **Move** This performs the same function as copy, but moves the cell or cells rather than simply making a duplicate of them and placing this in another area of the spreadsheet.

● **File** You use this menu to carry out all file operations, such as saving files and retrieving them. This menu is also used to change the name of the directory from which VIP Professional will draw data files, and to allow parts of files to be imported and exported to disk.

● **Print** This menu does what you would expect — it allows you to print a VIP Professional spreadsheet to paper or to disk. It also allows you to control the way in which information is sent to the printer, particularly with regard to headers, footers, margins and page length.

● **Graph** This menu allows you to use the data you have already entered into VIP Professional to create and add to graphic representations of that data. The system supports bar, pie, stacked bar, line or XY graphs and, when used with an Atari colour monitor, also provides a choice of colours for the graphs.

● **Data** You use this menu command to carry out VIP Professional's limited database operations. These allow database tables to be queried, sorted and redrawn in accordance with any changes that may have been made to the information contained in them.

● **Quit** Leaves the program when you reply with a 'yes' to the 'Yes/No' question that this command generates. If you haven't saved your file, VIP Professional will give you a chance to say whether or not you wish to do so when you use the Quit command.

Those are the basic menus and their functions, and you can access

these menus in one of two ways. You can either use the mouse and pointer to point to the pull-down menu in question and then use the mouse button to select your choices; or you can use the traditional Lotus 1-2-3 '/' command key to invoke the 'Command' mode, and then use the cursor keys to access the menu of your choice.

Some confusion does arise, however, which is inherent in the way that VIP Technologies has implemented this laudatory choice of command keys. The command choice is structured in such a way that if you start by selecting menus using the '/' key and the first letter of each command (that is, '/' and the 'F' key would select the File menu), you cannot easily switch over to issuing commands with the mouse again. You need to press the Esc key a couple of times to get the system back to having a mouse 'pointer', and then you will be able to issue commands from the mouse.

In that sense, VIP's attempts to be more user-friendly than Lotus do not work so well, as you can either use the spreadsheet like a Lotus user or an ST user, but not like a mixture of both.

It is, however, praiseworthy that VIP has tried to ensure that every command you could issue via the keyboard using normal Lotus commands in VIP Professional, can also be issued via the mouse for those ST users who may know nothing about Lotus 1-2-3 and who have just bought VIP Professional as a high-powered spreadsheet.

Suitability

In terms of how well VIP Professional satisfies the needs of the first time user, I have to admit that it is no easier to use for the novice than Lotus 1-2-3. While VIP Technologies has made every attempt to make use of the ST interface and make the system more friendly, you can see that the company has always been held back (in terms of how far it can go with this approach, that is) by the fact that it is committed to the program being fully 1-2-3 compatible.

'. . . a spreadsheet for the ST, Amiga or IIGS will have to stand or fall on its own merits for the users of those machines.'

This gives VIP Professional some disadvantages when compared with other 1-2-3 spreadsheets such as Kuma's K-Spread, which is dedicated solely to providing spreadsheet power under GEM (on both the PC and the ST) and makes none of the compromises in the interface that are necessary to keep VIP compatible.

This leads me to the next question — whether or not VIP Professional is an acceptable Atari substitute for Lotus 1-2-3 among experienced Lotus 1-2-3 users who perhaps have a PC at the office and an ST at home.

The major advantage of the ST version of VIP Professional for this job — and the reason why the ST implementation currently scores over that of the Amiga and the IIGS — is that the ST's disk drives can read from and write to file formats from most compatible computers which use 3½in disks. Such machines include the entire Toshiba range of desktop portable computers and the new IBM Personal System/2 range.

In theory, this also means that anyone running Lotus 1-2-3 on a PS/2 or Toshiba portable can take their 3½in disk with Lotus data files on it, stick that disk in an Atari ST running VIP Professional, and expect VIP to read all the data and formulae without any problems. At least, that's the theory . . .

I discovered something slightly different. Yes, the ST could easily read data files from both DOS 3.3 and Toshiba DOS 2.11 without any problems, and could even import Lotus .PRN files as ASCII. But, I did have problems with spreadsheet files.

The problem may well have been with my software, but it is not likely to have been unique. I tried taking a file saved under Lotus 1-2-3 version 2.01 for the Toshiba 1100 series, and reading that file into VIP Professional. I encountered two problems. The first revolved around the fact that my version 2.01 of Lotus 1-2-3 saves files with the extension .WK1, while VIP Professional expects the older .WKS extension on its Lotus 1-2-3 files. Thus, the first thing I had to do when trying to read my Lotus files into VIP Professional was change the file extension on my file from .WK1 to .WKS. This was carried out without any problems. But, when I tried to then load the file into VIP Professional, I was still faced with the dreaded 'Not a valid worksheet file' message.

Undaunted, I tried to create an 'exported' version of my Lotus 1-2-3 file on the Toshiba and found that it would read into VIP Professional without any problems as an ASCII file — stripped of formulae and proper cell placement.

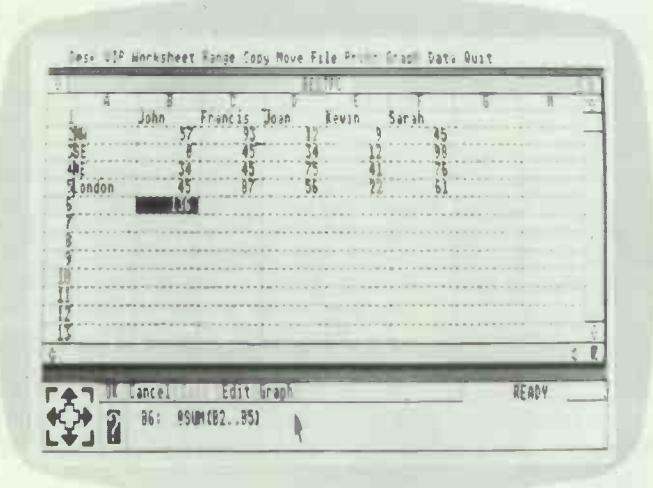
To try and see where the problem was, I then created a new spreadsheet file under VIP Professional, and tried saving that to my Toshiba disk and loading it up under Lotus 1-2-3. To my joy, the file created under VIP Professional worked without any trouble under Lotus 1-2-3 — formulae and all.

Whatever the reasons for this, it seems that, at least in my test version of the software, VIP Professional has still not quite got the business of bringing data in from Lotus 1-2-3 down pat, although it does seem that it can get information back out to Lotus 1-2-3 without troubles.

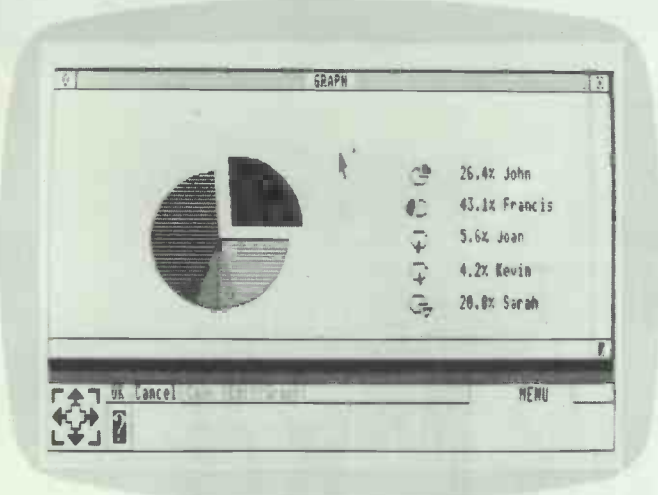
Comparison

It would be interesting to conduct a little comparison between Lotus 1-2-3 and VIP Professional — and I think even the most hardened Lotus enthusiast will find it hard to fault the ST software.

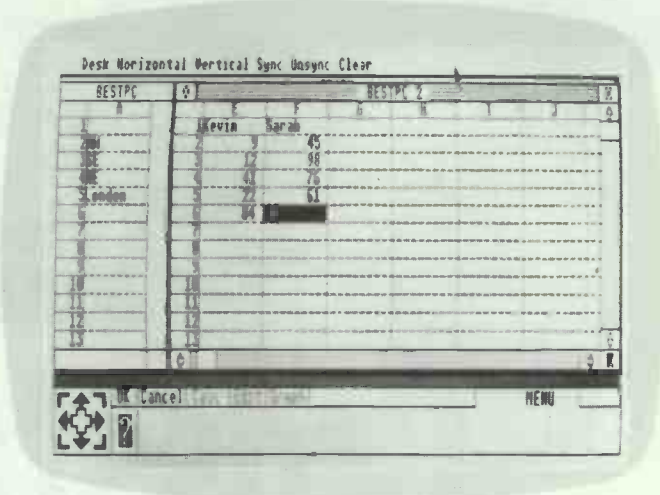
To start with, VIP is huge. It operates in an 8192-rowx256-column mat-



You can see from the entry format of this formula that it is identical to what you would use in Lotus 1-2-3 and, therefore, that everyone familiar with 1-2-3 should have few problems with VIP Professional



VIP Professional offers essentially the same graph types as 1-2-3, including the fairly standard pie chart. Unfortunately, it also requires the same degree of complexity



The Split Windows function of 1-2-3 is mimicked to great success within VIP Professional, and uses GEM to make the most of resizing and scrolling around windows

rix, using sparse memory management. This latter point is important as it means that VIP will only ever map the data that's in its cells, rather than having to keep track of the empty cells. On some spreadsheets, for example, placing a single number in the last cell of the spreadsheet (commonly somewhere like IZ8192) will cause the whole spreadsheet to be filled up, as it has been designed to fill all the cells upwards and to the left of IZ8192 with zero values.

But, sparse matrix spreadsheets such as VIP Professional and Microsoft Excel merely remember the cells that have data in them, and where those cells are located in the spreadsheet. All the remaining cells are assumed to be blank and, therefore, VIP Professional doesn't have to bother remembering them.

Another feature offered by VIP Professional that you won't find in Lotus 1-2-3 is the use of multiple windows. You can, for example, have a spreadsheet in one window, a database in another and a graph in a third, with the graph updated each time you change the data linked to it and then click on the graph window to redraw it. In this respect, VIP Professional is more like Symphony than 1-2-3.

Movement around the spreadsheet is also a lot easier than it is in 1-2-3. In a large spreadsheet, where you might well have a vast amount of data spread out on a large worksheet, you can use the 'express' icon to move around quickly. This is the cursor key icon I mentioned earlier which sits at the bottom left-hand corner of the screen. By pointing to any one of the four corners of this icon and clicking on the mouse, you can control movement to the four corners of your current worksheet. You will note here that I use the word 'current' — the express icon will only move as far out in the spreadsheet as you have placed data, and no further. Consequently, there is no chance of 'over-shooting' the end of the spreadsheet.

You will also find that the arrows in this iconic key cluster provide you with much finer control than the horizontal and vertical slider bars at the bottom and side of the main data entry screen — these move around the spreadsheet a little too quickly for my liking.

With regard to spreadsheet functionality itself, you'll find nothing missing from what you would expect in a Lotus 1-2-3 clone. There are keyboard macros (although with no facility yet for including mouse movements in the macros), a vast range of '@' functions (including PMT, IF, TRUE, SUM, DATE and others) and, in the version I looked at, even local currency support for the pound sterling symbol (£).

Unfortunately, that attention to detail extended to neither the documentation nor the example files that come with VIP Professional. Although pound sterling is supported in the software, the manuals refer to dollar signs ($) as the currency format. And, in an example on disk of how to use VIP Professional to fill in your tax return, it is a 1984 US Internal Revenue Service form that you find yourself staring at.

These quibbles aside, however, the examples are generally quite helpful and should provide both novice and intermediate users with a good idea of how to go about developing macros for specific jobs.

Documentation

Getting VIP Professional up and running is a fairly simple task, although I could not give VIP Technologies high marks for the installation section of the documentation. The information on how to install VIP Professional to run on my ST hard disk was buried obscurely in an introductory update booklet, so that I ended up conducting part of my test from floppy disks.

Frankly, VIP Professional's documentation lets the package down. While it is excellent as a minimalist reminder for existing 1-2-3 users, it is definitely not aimed at first-time spreadsheet users. These users may obtain some help from the onboard example files, but I suggest that any novice who seriously wants to get to grips with VIP Professional will have to buy a book on 1-2-3 and learn the rudiments from that.

Conclusion

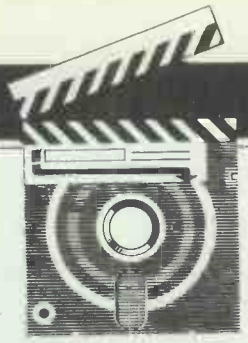
For the first-time spreadsheet buyer, whether you're using an Amiga, an ST or an Apple IIGS, there are easier spreadsheets that you could buy than VIP Professional. There are, however, few that would be more powerful or as well-supported in third-party documentation (via the vast library of training books which are available for 1-2-3 users).

For experienced PC users who run STs, Apples or Commodores as their home systems and want to have a Lotus 1-2-3 clone for those machines, give VIP Professional a careful look before considering full-blown PC emulation and a real copy of Lotus 1-2-3 (or one of its many PC clones).

While ST users should look carefully at any disk compatibility problems they might have in reading PC files directly, users of all the machines should be able to get Lotus 1-2-3 files onto VIP Professional and back using a modem and communications software, so this is not an insurmountable problem.

If you don't own a PC clone and want to run Lotus 1-2-3, this is probably as close as you'll ever get. And, given the better user interface on the GEM edition I tested — along with the large worksheet and easy navigation — some may even find it better.

VIP Professional (GEM) costs £199 and is available from Silica Shop, 1-4 The Mews, Hatherley Road, Sidcup, Kent DA14 4DX. Tel: (01) 309 1111. END



SCREENTEST

Crosstalk Mk 4 vs Smartcom 3

Commercial communications packages are being used more and more by businesses wanting to streamline their telephone operations. Crosstalk Mk 4 and Smartcom III are two such packages on the market and Robert Schifreen has been using both to see which he prefers.

I've been using a wonderful communications package for 18 months now, on my PC at home and at work. It's called Procomm, and you get it free by asking a friend for a copy. If you like it, you send the American author $25 to ease your conscience. If you don't, you reformat the disk.

Procomm is written and marketed not by highly paid programmers and business people, but by comms hobbyists who add to the software the features that *they* want. It shows.

Crosstalk and Smartcom aren't written for a hobby. They are commercial products, aimed at businesses which want to connect to Telecom Gold, Prestel, the company's mainframe and more. They offer full built-in programming languages that allow a company's DP department to set up customised front-end systems so that operators can log in and use the system without having to know how it works. It's understandable that few large companies will trust their communications software to a spotty American bedroom-ridden teenager, but I feel, after using Crosstalk and Smartcom, that these packages could learn a thing or two from their users.

Crosstalk Mk. 4

Crosstalk Mk. 4 is supplied on two 360k 5¼in floppies. Installing the software is just a matter of copying these disks to an XTALK directory on the hard disk (you can run it from floppies if you must).

Having copied the software, the next step is to configure it for your particular needs and preferences.

The hard way to do this is to issue a series of commands from the Crosstalk command line, to tell the system about your RS232 ports, modem, phone numbers and so on. The easy way is to type DO CONFIG and let something called a 'script' guide you through the procedure. The menu script is a program written in CASL — Crosstalk's built-in programming language of which more later. I opted for the easy route.

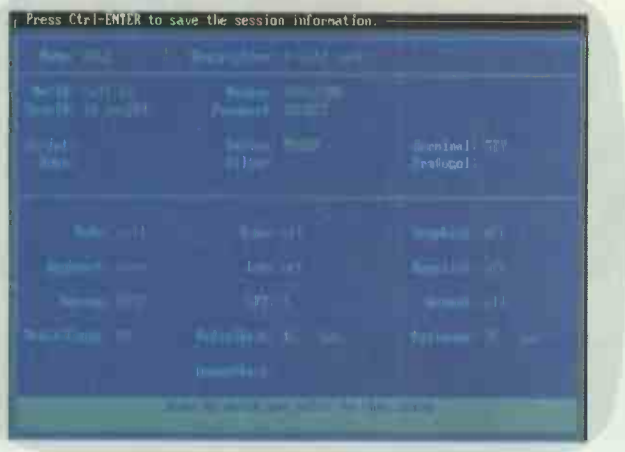
Having typed XTALK and received the quote of the day (pearls of wisdom from the likes of Einstein, displayed while the rest of the program loads) and started the menu, the first piece of information you are asked for is whether you are using a colour monitor. You can also specify whether you are using a graphics adaptor that flickers and, if you are, Crosstalk will stop it flickering by slowing down screen output. Problem: it slows it down so much that you'll soon want the flickering back.

The CONFIG menu allows you to specify the name of a script that will automatically run as soon as you load Crosstalk. This can be the MENU (which guides you through the dialling and connecting process) or CONFIG script, none at all, or one that you write yourself to provide a unique front-end for you or your company.

You are also asked to specify two numbers known as the Outnumber and the LDnumber. The Outnumber is what you have to dial to get an outside line from your switchboard (usually 9, if anything at all) while the LDnumber is the code to get you into your favourite long distance telephone company. This is designed for American users, though Mercury subscribers in the UK may find it useful. (Don't put your Mercury ID in there, though.)

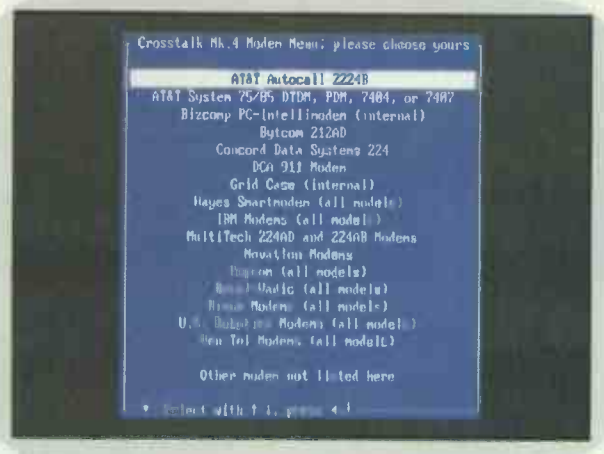
The program then scans your PC's hardware looking for valid COM ports and presents you with a list of them, from which you choose the one that your modem will be connected to. My PC at work had an internal Hayes 1200 baud modem which was recognised, correctly, as being COM2. At home, I have a WS4000 plugged into COM1. The port you specify will be the default for all communication sessions with Crosstalk.

Crosstalk comes installed for 16 modems, all of which are American. However, the list lacks popular UK models like those from Pace, Miracle Technology, Dacom and Dowty. This is not as serious as it seems, though, as you can select the 'none of these'



CROSSTALK MK 4

Crosstalk's 'phone book' entry system for Telecom Gold. The ID and password can be automatically transmitted if commands to do this are inserted in a script file



CROSSTALK MK 4

Crosstalk supports 16 types of modem, compared with Smartcom which works properly only with Hayes kit. The list is mainly American, but you can create your own definition

option from the list of modems and enter details by hand. The information required is the dialling prefix (ATDP on Hayes-ish modems), the dialling suffix (normally just a carriage return), the commands string to put the modem into speed-seeking host mode and the string to initialise the modem before each call.

With these details recorded, you can start using Crosstalk to connect to remote systems. If you've still not learned the commands (I had, but still preferred the menu system), you can type DO MENU and another script springs into action.

Calling up

The philosophy that Crosstalk uses to make calls is similar to the way that you normally use the phone to call people. The program creates and lets you maintain a file on disk called the phone book.

Like most of Crosstalk's functions, the phone book can be edited and accessed using menus, commands or Alt keys. The menu lets you create, edit and use entries, though there's nothing to stop you enhancing the menu as its source code is included. To create a new card, you have to supply a number of pieces of information about the service. To save time, you can select from a number of American database systems (The Source, OAG, CompuServe, MCI Mail, and so on) and a number of characteristics are then extracted and put into the card for you. You still have to specify the phone number and other personal details. Some people will, I'm convinced, still insist on supplying the software with IDs, passwords and so on. If you ask me, software should not even ask for such details, but should make you enter them by hand.

Each card has its own local definition of the terminal type and modem to be used with that service. These details are copied from the initial settings you specified when installing the software, so if you started off by saying that your modem was a Hayes connected to port COM2, then all your cards will contain the same details by default. Unfortunately, if you re-run the configuration menu, the new settings are not copied to existing cards. This proved inconvenient for me, as my PC at work has the modem on COM2 while at home I use COM1. Having suffered for a week, and being forced to maintain separate phone books, I came across a script called FIXBOOK that would do just what I wanted.

Crosstalk will support up to 115,200 baud (sorry, bits per second), but few RS232 ports will operate at much above 19,200. Unlike Procomm, you can't change the PC's baud rate or other settings while online.

The card is also the place where you specify the default file transfer protocol and instructions about dialling, redialling and waiting. Incidentally, Crosstalk does nothing to stop you getting the system to keep redialling an engaged number up to 99 times automatically, despite British Telecom's regulation of four, spread over a couple of hours.

Crosstalk will also act as a host system, allowing you (or anyone else) to dial up your computer and issue most Crosstalk commands remotely. This is set up by creating a special card called ANSWER that tells the system how to greet the caller, what he or she is allowed to do, what password (if any) is required and, optionally, which script to run.

Crosstalk is a modular system. The main program consists of a 155k file, and drivers for specific modems, terminals are separate files that are loaded according to the configuration details that you supply. The advantage of this method is that support for new modems and so on can be added by distributing new driver files and not whole new versions of Crosstalk. As well as modem device drivers, the terminal drivers support straight TTY, ANSI, DEC, Televideo, Esprit II and IBM3101 emulation.

Other modules provide filters for converting, removing or analysing incoming characters and support for file transfer protocols.

Making the connection

Having set up the phone book, you can use one of the cards to make a call. For a number that you only dial occasionally or on impulse, there's no need to add it to the phone book if you don't want to — you can just dial manually by entering terminal mode and issuing AT commands to the modem from the keyboard.

Assuming that you have set up everything properly, you should be able to select the 'dial a number from the phone book' option on the menu and get straight through to your chosen service. However, talking to something through an RS232 connection has never been one of the most error-free areas of computer science and, as someone's law probably says, if something *can* go wrong, it probably *will*.

In my case, I had been too clever with the modem initialisation string. Normally when I talk directly to a modem, I type AT to get an OK message, followed by ATZ to reset everything. I had entered this into Crosstalk's modem 'init' string, using the vertical bar character as a carriage

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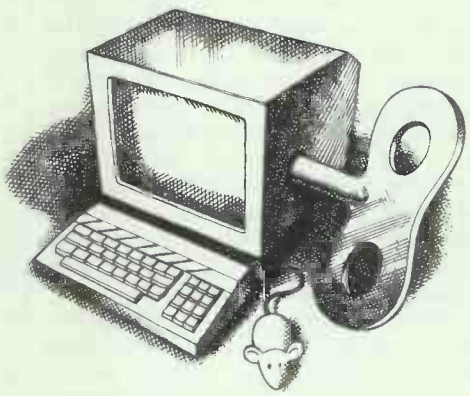

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pular Computing Weekly, 22 28 May 1987 †*Personal Computer World*, February 1987 ** *Subject to availability.*

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return as the manual told me. I discovered, after much tearing of hair, that Crosstalk was stopping at the first carriage return and assuming it had found the end of the string.

The moral here is that you won't get very far unless your modem has a built-in speaker so that you can hear what's going on, if anything.

File transfer

Modules are currently provided for Xmodem, Ymodem, Kermit (not sliding window), Dart, Xtalk and CompuServe B file transfers. Uploading or downloading a file is a matter of pressing Alt-F10 while online to obtain a menu, and making the correct selections from one or more menus to specify the name of the file and the required protocol.

I had no problem in transferring files to *PCW*'s own bulletin board system, and was impressed with the way the program gave an often-updated characters-per-second throughput. At 1200 baud, using Ymodem, this hovered between 112 and 114 throughout; it acted firstly as a reassurance that everything was working, and also allowed me to experiment to find which of the transfer methods was best for certain jobs and from certain systems.

Another option on the file transfer menu allows you to turn on Capture mode, which simply spools all incoming text to a file or to the printer, or both. You can also press Alt-G to grab the current screen image and put it in the spool file.

Macros

Crosstalk contains a macro facility that lets you create your own Crosstalk commands. A macro has to be a word, of up to 16 characters, and that word then becomes a Crosstalk command that can be used from the command line or within a script until you delete its definition with the Forget command.

There are good and bad points about the way macros work. First, the bad news. You can't set up shorthand macros that can be called by pressing just, say, an Alt key combination. You can't embed function keys in there either, though you can use the equivalent command instead. The good news is that you can create a macro with the same name as an existing Crosstalk command and your macro will be given priority. Although this can be potentially dangerous (like if you create a macro called MACRO, thus removing the macro command) it does mean you can disable some of the more powerful of Crosstalk's commands or rename them to something that others won't know.

To execute a macro, you either type its name from the command line, or you can produce a menu of them with the LIST MACROS command. You can then select the one you want and execute it by pressing Return.

Scripts

MS-DOS contains a wonderful facility called 'batch files'. This allows you to create a text file containing a number of MS-DOS commands and then, by typing the name of the batch file from the command prompt, MS-DOS will execute the list of commands one by one as though you were actually typing them.

Crosstalk takes this a number of steps further. It allows you to create an ASCII text file containing not just commands that can be typed at Crosstalk's command line (like those to access the phone book and make calls), but a number of other Basic-

```
assume device     "MODEM"
assume terminal "DEC"

   repeat
        if speed = 2400 then reply p2400; else reply p1200;
        wait 2 ticks
        reply
        print #w, ".";
        wait 1 second
   until timeout = 0
   track clear

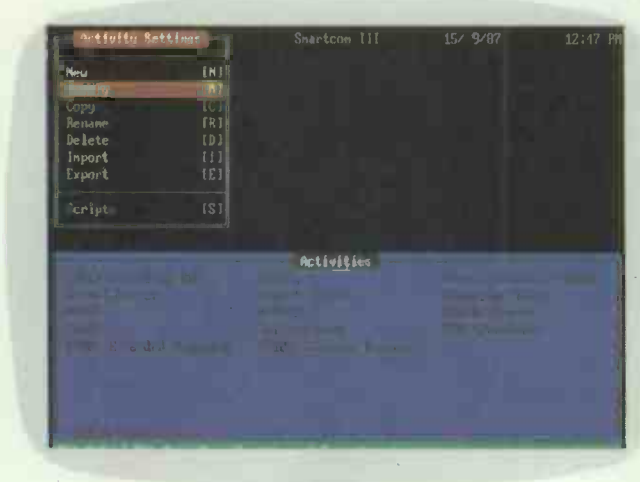
   while online

        watch for
             case "NAL"      : wait 5 ticks : reply "D1"
             "@"        : wait 5 ticks : reply "C " + NetID
             case "CONNECT" : END
             "illegal" : wait 5 ticks : bye
             "rejecting"     : wait 5 ticks : bye
             space "not re" : wait 5 ticks : bye
        endwatch

   wend

   end
```

This extract from the Telenet log-in script illustrates the look and feel of Crosstalk's language



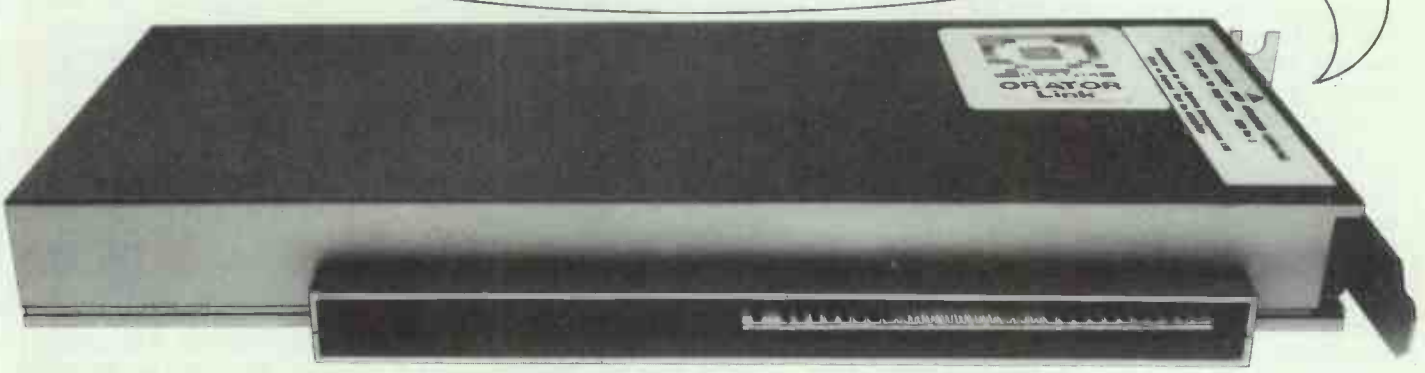
SMARTCOM III

Smartcom has 14 predefined activity settings which can be used as they are or customised by the user. A script associated with a particular activity can be exported

SMARTCOM III

There are 13 connections as standard in Smartcom. These allow you to connect to a service via PSS, the normal telephone network or via direct connection without a modem

Orator's unique power leaves even the most sophisticated modems speechless.



Orator is much more than a sophisticated multi-speed modem.

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like commands that deal with windows, graphics, sound and maths.

The manual states that in-house programmers have even written database systems and arcade games in CASL. In addition to being able to define its own variables, a script has access to a number of predefined system ones. These include the data from the phone book card so that the script can transmit the user's ID and/or password when the remote system is asking for it.

CASL even allows inline machine code subroutines, like Turbo Pascal.

Documentation

Such a complex piece of software takes time to get used to, and the longer this takes, the more hostile you will feel towards it. The Crosstalk manual starts with a good tutorial about setting up and accessing a phone book entry, which allowed me to make my first call within half an hour or so. Over half the manual is taken up with a detailed reference section about the CASL commands, though there is no tutorial here and unless you've used a high-level language like Basic or C before, you will be lost. There is a whole disk of sample scripts supplied, though, which acts as a good starting point. All the examples are comms-related but I'd love to have seen the arcade game.

Incidentally, if you're just discovering comms in a big way, bear in mind that Crosstalk's manual has a pocket at the front with discount vouchers for all sorts of American databases, including CompuServe.

Smartcom III

Opening the Smartcom III box reveals three 5¼in disks and, thoughtfully, a couple of 3½in ones as well, none copy protected. The 30 per cent increase in disk space might prompt you to think that Smartcom's program code is slightly larger than Crosstalk's. That's an understatement. It's massive, weighing in at some 700k, split into one EXE file and two overlay programs.

As if being forced to have a 640k machine to use the program was not enough, there is also a distinct lack of sample script files on the disk. You can't beat learning by example, especially with the manual's lack of a tutorial, which makes Crosstalk start to emerge as the better package with the contest hardly into the opening round.

Those Hayes people obviously realized that the large manual looks fairly daunting to the new user, and helpfully included a 'get you started' card at the front of the manual. Following this, I managed to dial into Telecom Gold within a couple of minutes by calling up the menus and hitting the keys that I was told.

Pleased with my initial speedy progress, I took the package home for the weekend to introduce it to my WS4000. As soon as I started Smartcom, I was informed that the modem 'was not responding' and the software refused to go any further. I knew full well that the modem was responding perfectly as its lights flickered when Smartcom started, and also because Procomm still worked perfectly.

By Sunday afternoon, having kicked everything in sight and even having resorted to reading the manual, I was no better off so I called Hayes the next day. I realised that the fault lay in one or more of the AT commands that Smartcom was sending to the modem to initialise it, but a search through the program's code with my best debugging tools failed to find the commands (they are encrypted, for security and speed).

According to Hayes, the actual command that is sent to initialise the modem (and which you can't change) is as follows:

AT E0 V1 Q0 S0=0 S3=30 S4=31 S5=255 S12=10 T (return)
ATHII4 (return)
ATX3 TMI L1 &Q N2 B &K S7=60 S8=4 S9=6 S10=14 S11=90 (return)
ATS6=4 D; S6=2 (return)

This explains why the software sits around for six seconds saying 'initializing modem' before every call. Like the proverbial watched pot, it probably wouldn't take so long if I didn't stare and make faces at it.

The interesting command here is ATHII4. This is an undocumented Hayes command that returns a three-digit number. This tells the software what type of Hayes modem it is talking to and — very handy this — being undocumented, it's only Hayes who knows about it. And who wrote Smartcom? Right.

The upshot of this is that, unless your modem is *really* made by Hayes, it's possible that it won't work properly, or at all, with Smartcom III. My WS4000 didn't, but the office Pace Series 4 and Quattro card did, though they must have been returning slightly non-standard codes to Smartcom as the software refused to hang up the modem after a call. This indicated that the modem was not the modem that the software thought it was.

There is no easy way out of this situation. The software doesn't have a list of modems for you to choose from — though considering the software is made by Hayes, it's not surprising. The only way I could use Smartcom on my WS4000 was to use the software's direct connect method, which links you straight to the computer's COM port without interrogating the modem. I had no further problems using this method. However, I have a feeling that Hayes's support desk may not pull out as many stops to help the Dowty user as they would a Hayes user.

Getting involved

Having followed the getting started card a few times and managing to call Telecom Gold, I decided it was time to stop entering the phone numbers manually and, instead, set up a database of services and numbers that the software would dial automatically.

Treating the electronic dialling directory in the same way as you treat your address book may seem like a great idea to Crosstalk's designers, but Hayes takes a different view. It sees its average user wanting to call a large number of different services, and probably having more than one way of calling each service. For example, they may call Telecom Gold via direct dial, or through PSS.

Smartcom works on the principle of the activity and the connection. To make a call, you then select one of each. Personally, I found this rather hard to grasp at first, as Hayes seems to have gone out of its way to confuse people. An example will probably clarify things — the default list of activities include Kermit Host, Prestel, Gold, Direct Connect and so on. Defined in the activity setting for Prestel is the type of emulation required, the size of the receive buffer, the screen colours and keyboard definitions. In the connection part goes which COM port you want, whether the modem is in answer or originate mode, the phone number, baud rate, parity settings, whether to pulse or tone dial, whether the modem's speaker should be on or not, and so on.

With everything set up properly, you then call a service by selecting from a menu the desired activity and connection. I can see only one major use for having separate activity and connection settings. If you use networks like PSS, you can have one connection to define the logging in to PSS, and then separate activity settings to decide what service to call once connected to the network.

One interesting thing that you notice, though, when setting up all this data is the facility for key redefinition. You can redefine just about any key on the keyboard for use when connected to that particular service. To achieve such a level of customisability, the program takes over not just the keyboard but most of the rest of the machine, too. Not only does it take over KEYBUK and

force your quotation marks to be over the '2' key whether you want them there or not, but it takes over the memory of the machine and will work with very few resident programs, SideKick thankfully being one exception.

Redefining a key doesn't just mean replacing it with another character. Actually, you can replace it with a string of up to 32, so you could make Alt-Y become Yours Sincerely to aid in finishing letters.

The other point of note is that Prestel appears on the list of settings at all. Smartcom's biggest selling point over and above Crosstalk is that it supports Prestel graphics (in all eight colours, though yellow shows as brown) on a CGA or EGA monitor. This is not as easy as it sounds, as neither of these two graphics adaptors should be able to do it. On the EGA, Hayes admits that it manages to do the emulation by totally reprogramming the card's registers and character set. How it gets eight colour block graphics in text mode on a CGA isn't documented, though I'm sure that certain other software companies are studying Hayes' code as you read this.

Admirable as all this sounds, there are problems with the Prestel emulation. All the text (on a CGA or EGA) is spread over all 80 columns, so every character has a space next to it and slows reading by half. You also have to wait for a full frame to be displayed on the screen — you can't interrupt it by pressing a route number before the display has finished.

File transfers

Like Crosstalk, Smartcom has a number of ways of sending a file automatically. One is autotyping, which sends an ASCII file to the modem character by character, as though you were typing it yourself. The benefit of not actually typing the text is that autotyping is faster, but no error checking takes place so keep an eye on the screen to ensure that line noise doesn't reduce the text to garbage.

In case the remote system can't accept autotyped characters as fast as Smartcom can send them, you can put in delays between every line, character or both. The Smartcom manual recommends changing the delay between characters from 0.00 to 0.01 seconds. There's accuracy for you.

For error-checked and/or 8-bit files, Smartcom supports Xmodem, Ymodem and Kermit protocols. To download or upload a file, you call up the session menu by pressing F3 while online, and prompts appear to gather the file name to be sent or received. My only criticism about the file transfer system, apart from the lack of sliding window Kermit, is that the only protocol appearing in the session menu is the one you specified as the one to be used when the connection was defined. It's possible to change this but it takes time. I'd rather be presented with the list of available protocols, like Procomm does for me, and be able to choose one.

```
        CALL check_drives[ arg1 , i ] ;
        IF i THEN GOTO main ;
        START DIRECTORY arg1 , count ;
        IF ERROR_NUMBER <> 0 THEN GOTO got_err ;
        i   = 0 ;
        eol = 0 ;
do_dir0:IF ( i >= count ) THEN GOTO do_dir1 ;
        IF ( rx_break ) THEN GOTO do_dir3 ;
        NEXT DIRECTORY ENTRY name ;
        fn = name ;
        IF VALID_NAME( name ) = NAME_IS_PATH THEN
           name = concat( "[" , name , "]" ) ;
        IF detail THEN GOTO do_dir2 ;
        eol = ( i MOD 5 ) = 4 ;
        IF ( NOT eol ) THEN
           name = MID( CONCAT( name , "                " ) , 1 , 16 ) ;
        IF eol THEN TYPE LINE name ;
        IF ( NOT eol ) THEN TYPE TEXT name ;
        i = i + 1 ;
        GOTO do_dir0 ;
do_dir2:j = CREATED( fn ) ;
```

This example is taken from the Smartcom program that provides you or others with remote access to your PC

Scripts

Like Crosstalk, Smartcom has a programming language. The snazzy acronym this time is SCOPE, which is Simple Communication Programming Environment. What the word 'Simple' applies to, I have no idea. Certainly not the learning process, as you don't get an example script disk (with Crosstalk you do) and you don't get any documentation apart from a reference guide that lists all the commands in alphabetical order.

Multiple sessions

It's a sad fact that computers are so unsuited to doing the one thing that we all expect of them — making light work of performing more than one task at a time. Both Crosstalk and Smartcom allow you to have a number of active sessions running, but you need a separate communications port (and modem) for each one.

Assuming you have these, both programs will perform a sort of multi-tasking, in that characters coming down a line will be recognised and stored even if that port is not the one being displayed on the screen. This means you can be downloading your mail from Gold and downloading some data from the company mainframe at the same time.

Conclusion

I don't really like either of these two packages. From the start, I felt that they were far too complex for the basically simple job they were trying to do, that of sending characters to, and reading characters from, the RS-232 port. My opinion didn't change that much over the couple of weeks I used them.

Even now, when I know the packages well enough to use them without referring to manuals, I still find myself reverting to Procomm to check my Gold mailbox before returning to Smartcom or Crosstalk to finish researching this review.

I suppose there are a couple of advantages that these programs have over Procomm. The programming languages are wonderful, though I don't think I could learn either of them to a reasonable standard in less than two months. And if I did want to learn one of them, I'd go for Crosstalk because of the example script disk. To be fair to Hayes, apparently there is a similar disk for Smartcom on the way but I have yet to see it.

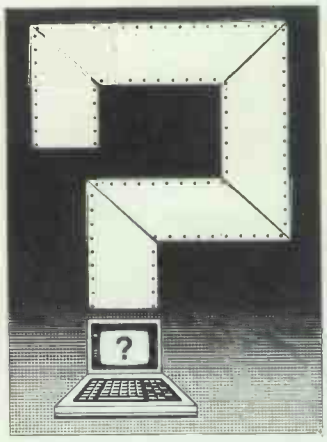
Smartcom has two plus points. Firstly, its learn mode which lets you use a service and, as you do, it creates a script file to recreate in the future what you are doing now. For example, if you log on to Gold, read and download your mail, then log off, the program will create a script for you which will do the same thing for you again at a later date. It also scores on the Prestel emulation. It's hard to read and very slow, but at least it's there. Its only real competitor is Datatalk but this only gives four colours on a CGA. ChitChat, from Sage, gives no graphics at all.

Personally speaking, I'm sticking with Procomm, though I may brush the dust off Smartcom occasionally if Prestel ever gives me back my account. If I had to set up a custom front-end to a remote system, I'd rather stick with a language I know well, as opposed to learning a new one. Therefore, I'd stay with Turbo Basic and Borland's almost-ready-now Turbo Basic Telecom Toolbox.

Smartcom III costs £149 and Crosstalk Mk 4 is £155, both excluding VAT. These packages should be available from dealers. If you don't have a friend who owns Procomm, look in *PCW*'s Bulletin Board listing for a local IBM PC bulletin board — most have a copy for downloading. The latest version is 2.4.2. END

COMPUTER ANSWERS

Steve Gold takes his toolkit to your problems. The address to write to is: Computer Answers, PCW, 32-34 Broadwick Street, London W1A 2HG.



Computer Answers is PCW's help column. We offer advice about all kinds of specific hardware and software problems through the pages of the magazine. We also welcome further information in response to published queries.

Received wisdom

I recently received a summons to attend the local magistrates court for not having a valid TV licence.

During the period involved I used the colour TV only for use with my computer and not, as alleged, as an 'apparatus for wireless telegraphy'.

I am a self-employed computer programmer — can I get off the charge?
(Name and address supplied)

In an ideal world, yes, you could — and should — be found 'not guilty'.

Unfortunately, the excuse of 'computer use only' has been tried before and many hopeful computer users' hopes have been dashed by busy magistrates.

Contesting the case will cost you a lot of money (for legal representation). Defending yourself in court is admirable, but in practice often backfires, leaving the magistrate to pick up the pieces.

My experience of cases such as this leads me to believe that the only way to avoid paying a TV licence fee is to (a) totally disable the tuner in your TV — namely, convert it wholly into a computer monitor, and (b) remove any outward sign of TV usage, TV aerials, for instance.

Such is the level of penetration of TVs into households (98 per cent), that the authorities take the view that the onus of proving that you don't watch TV in your own home rests on the defendant. It's not fair, but that's life, I'm afraid.

Memory lapse

I own a Tandy 1000 with a third-party RAM expansion card to take it to 640k. My problem is that I think I have 16k of RAM unaccounted for on my machine. When I execute CHKDSK, the computer returns a total of 638,976 bytes in RAM. Shouldn't I have 655,368 bytes total memory?

My Tandy dealer says that a Tandy-supplied RAM board will solve the problem, but the official Tandy product costs a lot of money. Do I have a bad RAM chip?
Adrian Freeman, New Southgate, London

Your Tandy salesman is wrong. The official Tandy RAM expansion on the Tandy 1000 will give the same results with CHKDSK as your existing board does.

Unlike the vast majority of PC compatibles on the market today, the Tandy 1000 uses 16k of RAM, normally used as system memory, as video memory. Therefore, no matter how much you expand your machine, you will always be 16k short, so to speak.

A touch of typing

I am considering buying one of the Amstrad PCW range with a view to teaching myself touch-typing. Are there any programs available for this?
Jane Carter, Nottingham

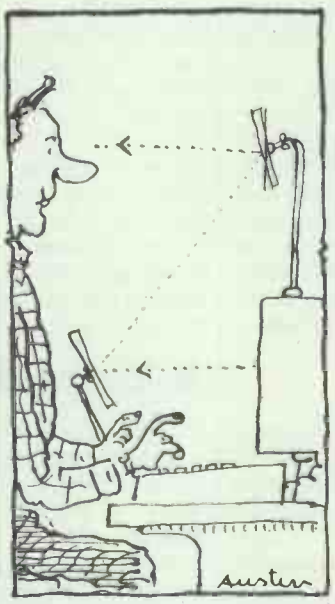
There most certainly are! The PCW is one of the most popular machines for DIY touch-typing courses, perhaps due to its amazing price/performance ratio.

Most touch-typing courses for computers we've seen have been excellent, but are not necessarily as interactive as they might be. This is a shame, so you may be as well to go ahead and buy your PCW, but consider investing in a book on the subject. Most of the books are considerably cheaper than the touch-typing tutors found on the PCW and also include many more tutorials.

There is, however, no substitute for the real thing, so consider typing your correspondence, for example, on the machine as often as possible. Regular practice with real applications is often a better way to learn than by typing examples from a book.

Having learned touch-typing 'the hard way' myself, my main problem was looking at the keyboard when typing — try not to do this. Look at the screen, and you'll learn a lot faster.

On the tilt



Having seen a tilting screen available for my brother's BBC Micro monitor (a Kaga Taxan) I wonder if there is anything similar available for my Amstrad PCW8512 monitor? If there isn't, are there any other options? Being fairly tall (6 feet 3 inches) I find myself having to crick my neck looking down at the monitor.
S Davies, Tarporley, Cheshire

You have my sympathy. Unfortunately, as far as I am aware, there is no screen tilt unit available for the PCW series. But there are simpler — and equally inexpensive — solutions to your problem.

Firstly, your problem seems to be limited to the PCW screen unit itself. Your height means that you are probably looking down, instead of horizontally across, at the PCW monitor. On an average desk I calculate that this will involve raising the PCW screen unit about four inches at least.

You may try one of the open frame printer stands currently available for Epson-style printers. Instead of raising the printer, however, use it to raise the PCW monitor unit. As well as raising the monitor several inches — albeit not as elegantly as a swivel stand — the open space under the monitor could be used for parking your PCW keyboard when not in use.

The second solution is far from elegant, but very cheap. Try placing a book under the monitor to tilt the screen upwards — not too far, or it will slip.

The third solution is a little more unusual. There are a number of special seats available which allow you to kneel with your legs tucked — but fully supported — under the chair. This arrangement — an alternative to sitting upright — is considered by many to be a much more relaxing and a healthy alternative to conventional chairs.

Such chairs don't come cheaply, however — £50 is a typical price. Some Health Authorities will supply orthopaedic chairs of this nature free of charge if you are unusually small/tall and/or physically handicapped.

A colleague of mine obtained just such a chair (costing over £130) from the NHS because of her small size (5 feet). If you use your computer at work, this will add considerable weight to your case for obtaining a special chair free of charge.

Sharetime

Is it possible to extract share prices from the Prestel Citiservice and use them in a spreadsheet such as Lotus 1-2-3? Also, is it possible to automate this process?
M Wilson, Aberdeen

With a little careful planning, yes, it's perfectly possible. The package you need is called Datatalk from Datasoft. Available for the IBM PC and close compatibles, Datatalk is capable of automated logon and frame saving.

Once offline, Datatalk has a specific utility which will

convert the viewdata frames of Prestel into normal text (7-bit ASCII). The resultant files can then easily be loaded into 1-2-3 or almost any other database/word-processing program.

Greek translation

I have bought an Amstrad CPC6128 for use here in Greece. Would it be possible to use the machine properly in the US?
George Gerontzis, Athens, Greece

Greek televisions are much the same as those here in the UK in that they work to a derivative of the PAL colour standard. The difference between Greece and the UK is in the frequency used by the sound carrier on TV signals.

While there should be no problem when using your Greek CPC6128 with a UK colour TV, you cannot do so with a US set. This is because the US television network works to 525 lines on the NTSC standard — totally different to the 625 lines PAL standard used in Europe. You will also experience problems in that the US mains work to 110 volts, while Europe and Greece work to 240 volts at a different frequency.

Your best solution — assuming you wish to use the machine in the US — would be to take your own monitor to the US and use a voltage transformer (costing about £30) to feed power to your CPC computer. The monitor may not be so easy to use with a US power supply, but your local TV stockist in the US will be able to advise on a power supply unit once you get there.

Hot and bothered

I bought a VIC 20 in a local sale to use as a second machine to my C64. When I power-up the VIC 20, it becomes very hot indeed during the first 15 minutes, but then cools off. Is there something wrong?
J Easterbrook, Bridgwater, Somerset

The temperature rise is normal and is no cause for concern. The VIC 20 contains several large-scale integrated (LSI) circuits that become quite warm in use. Like other Commodore machines, it uses a convection design to dissipate the heat. In the VIC 20's case, however, it can take up to 20 minutes for the air to begin circulating effectively.

NEC portable has the killer touch

I inadvertently named a file KILL"T when prompted for a file name on my NEC laptop. The file was placed in the menu as KILL"T.DO and I can't seem to remove it, no matter what I type. I've tried KILL"KILL"T.DO", but the machine refuses to accept nested quotation marks. Help!
P Madden, Leicester

The solution to your problem — which is often encountered on similar machines such as the Tandy Model 100/200 series and the Olivetti laptop — is simple. Type KILL "KILL" + CHR$(34)+ "T.DO" and the file will be removed from the menu. Basic's KILL command is more flexible than the MS-DOS DEL command.

Glaring error

I work with a computer for several hours a day and find the colour display on an Amstrad PC1512 gives me a headache. I wear glasses, but VDU shields don't seem to help. Is there another solution?
Peter Redfern, Manchester

Spectacle wearers have particular problems with colour computer monitors. The image of the screen is reflected across the lens in such a way that the eye has difficulty focusing on the main image. While your brain interprets the image, your eyes are becoming strained when looking at the screen — hence the headache.

You have two options to alleviate your problem.

First, consider switching to contact lenses — the multiple image and/or glare effect is considerably diminished with contact lenses — particularly with the softer lenses now coming on the market.

Second, spectacle lens coatings have improved dramatically over the past year or so. The latest spectacle lens coatings include a quartz derivative which diffuses reflections on the surface of the lens, while allowing incident (direct) light straight through.

The effect of this quartz coating is dramatic — my own optician quotes a 90 per cent reduction in glare and internal lens reflections. Consult your optician — the cost is about £20 above that of normal spectacles. The coating is not, sadly, available under the NHS free or reduced rate scheme.

No entry

I recently upgraded my PC/XT compatible to an AT compatible, retaining the 20Mbyte hard disk for use with the AT. Despite my following the hard disk manufacturer's installation procedure, the AT does not seem to recognise that the hard disk is present. Is this a DOS problem?
I Hoffman, London

One reason for your difficulty is that the XT looks for a hard disk at address 0, while the AT looks at address 1. You will need to move the jumper block (located on the back of, or underneath, the drive) from position 0 to 1.

You will also have to reformat your hard disk using both high and low-level format procedures. This will allow the AT disk controller to read and write to the disk. For information on this, you should refer to the instructions which came with your hard disk controller — not the XT's hard disk.

Double deadlock

I'm having problems with my 64k Atari 600XL. When I enter a line of Basic, the machine locks up. Short of powering down the machine, the only way out is to use the system reset key. But, even when I press reset, the computer locks up again on the next line. What's wrong?
Dave Green, Sheffield

This is not a hardware fault — it's a known bug in Atari Basic. The bug affects two versions of Atari Basic — Revision A, as found in the cartridge for the old 400, 800 and 1200XL. machines; and Revision B, built into the 600 and 800XL computers.

The problem usually occurs when corrections are made to a line *before* a carriage return is entered on the machine. As I understand it, the bug locks the machine up when an exact multiple of 256 bytes of data is entered on a single line of Basic which has been edited before the Return key has been pressed.

The bug has been fixed in Revision C of the Basic ROM which is fitted to the 65XE and 130XE machines. Your local Atari dealer should be able to order Revision C for you for about £10.

Side issues

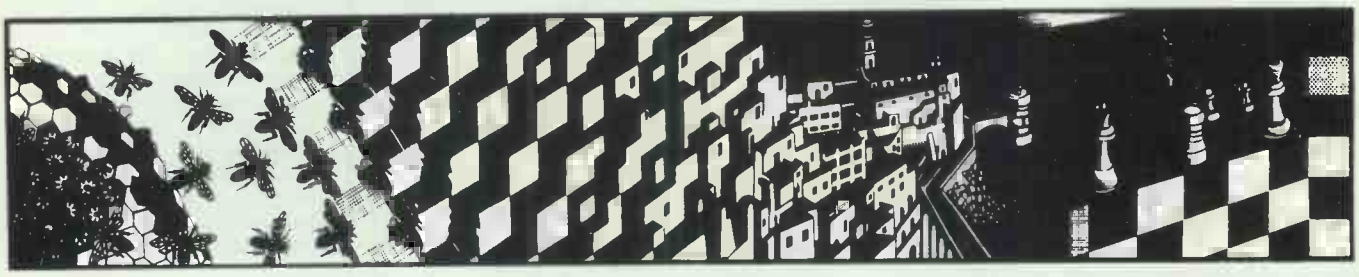
Now that the BBC Model B is getting a little long in the tooth, I've noticed several firms advertising sideways RAM units for the machine very cheaply. Leaving aside 16k units which I can use for images of ROMs, what use is a 32k or above capacity SWR?
Phil Rose, London

Some BBC Model B ROMs come as part of a set — for instance, the AMX ROM set — and require each other to interact. This is why 32k and 64k SWR units were first marketed for the Model B. However, when cheaper RAM chips arrived, some manufacturers started producing 128k and even 256k SWR units with software to use the sideways RAM as a disk drive.

Most driving software I've seen for SWR units takes up at least 14k of the sideways RAM — on a 128k unit that leaves you with 114k for data, which is a 40-track disk drive's capacity.

128k SWR units cost as little as £50 at the moment. If you use software that requires a lot of disk accesses, an SWR unit as a RAM disk is probably a useful investment. END

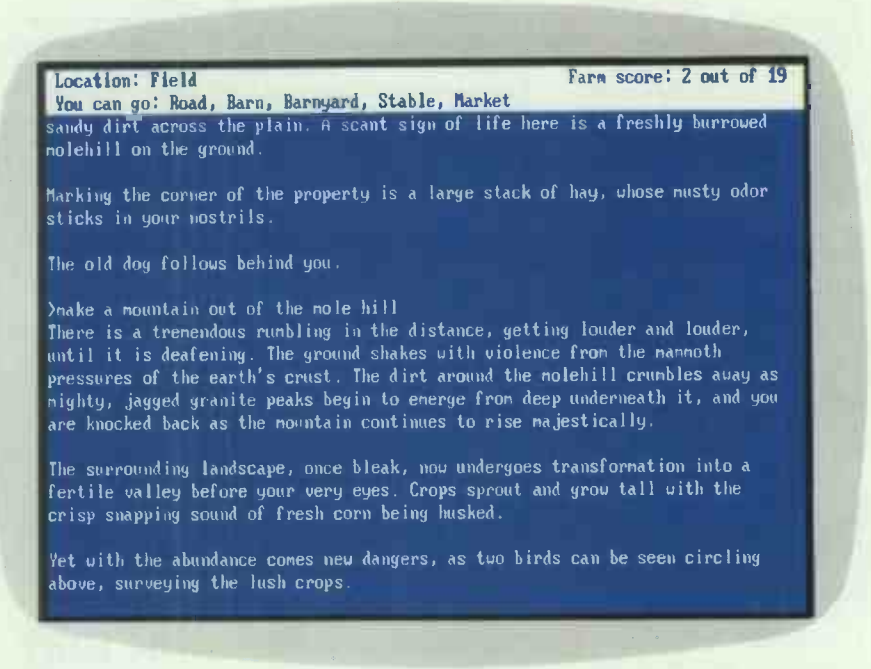
SCREENPLAY



Confusion rains on Stephen Applebaum as he grapples with figures of speech, walks like an orc and serves time as a sorcerer's apprentice in the search for this month's rippingest yarns.

Language barriers

Title: Nord and Bert Couldn't Make Head or Tail of It
Computer: IBM PC; Apple II series; Apple IIGS; Atari ST; Amiga; Macintosh; Commodore 64/128
Supplier: Activision
Format: Disk
Price: all versions £24.99, except C64/128 £29.99



Although unmistakably an Infocom product, Nord and Bert is quite different from any of the company's previous adventures. Although it retains nearly all the Infocom characteristics, it diverges from the norm with a subtly different mode of gameplay.

Nord and Bert Couldn't Make Head or Tail of It is a collection of eight, tenuously linked, mini text adventures involving various forms of verbal trickery. To play, you should be *au fait* with the homonym, oxymoron, spoonerism, cliché, idiom and pun. Prior knowledge of these forms of linguistic gymnastics is helpful, though not essential, as the program's manual explains most of their meanings.

As in Knight Orc (reviewed alongside) there is no need to make a map. Because, unlike previous Infocom adventures, Nord and Bert displays the locations you can move to in a status line along the top of the screen. To move, all you do is type the name of your desired destination. This takes the emphasis away from having to learn the adventure's topography and leaves you free to think through the many puzzles that have to be solved in order to complete all eight episodes.

Another new and welcome feature is a hint facility. When you get stuck, you just type 'HINT' for a list of items about which information is available. Selecting the item pertinent to your current predicament produces a number of useful tips on how to get out of it.

The game's action begins in Punster, a small town whose community has been riven by a strange and inexplicable phenomenon: people, objects and animals are mutating into completely different forms; and furthermore, actions that were once simple to perform now require the use of old, time-worn phrases. It would appear that Punster has been hit by a plague which attacks language itself.

Your objective is to reverse the changes that have occurred in Punster, so that the town can return to its 'happily mundane condition'. How you go about it is entirely up to you. The eight stories comprising the adventure can be assayed in any order, though the eighth can be played only after completion of the first seven, since they each reveal part of a password necessary to enter the concluding scenario in which you meet the Mayor of Punster.

There are just too many stories to mention them all here, so I will just pick out my favourites.

The first tale, called Go to the Shopping Bizarre, is based around homonyms. These are words which are pronounced the same but are spelt differently and have totally unconnected meanings. In this weird episode, you have to reverse the strange changes that have come over some of the people and goods in Punster's main shopping mall, in the hope that your handiwork will rebuild the store's damaged customer confidence.

Nothing in the story is quite what it seems. Take, for instance, a young girl wearing a ribbon with the words 'Worst Brat' embroidered on it, who jumps from a shelf in the meat aisle. The idea is to transmute her back into her true form. In this case you type 'Examine Bratwurst', at which she 'tumbles head over heels to the floor in a blur' and then turns into a sausage.

Buy the Farm is a bucolic tale of simple, if slightly odd, country folk. Ever since the plague hit Punster, farm owners have been too ill to go about their daily chores. Consequent-

ly, once highly productive land has become barren waste, echoing the early dust bowls. So, much as in the previous tale, your objective is to return one of Punster's run-down farms to its former glory.

Idioms are the main verbal device in Buy the Farm. These are quirky expressions peculiar to a particular language, in this case English, and include such sayings as 'you can't teach an old dog new tricks' and 'a rolling stone gathers no moss.'

Although only normally meant metaphorically, idioms such as those just given are acted out literally in Nord and Bert. Making a 'mountain out of a mole hill' actually causes 'jagged granite peaks to emerge from underground' and the barren farmland to become a 'fertile valley'. And what is more, the only way to get to a nearby market is to visit the farm's stable, find a cart and put it before the horse.

Personally, my favourite story is Act the Part, where you get to play a character called Sammy in a 1950s sitcom. In the episode featured, you are all set for a peaceful evening when a knock at the door heralds the arrival of Bob, your obnoxious brother-in-law. Bob would not be so bad if it were not for his practical jokes, the ones that you always seem to be the butt of. Since the script says you cannot just throw him out, you play him at his own game.

There are some wonderful touches in Act the Part. When you move to one of the locations in your flat, the screen displays the message: 'You move across the stage'. And when you don a pair of rubber washing-up gloves to pick up a live electrical cord, the audience 'sucks in its collective breath' in anticipation. Touching Bob with the live end sets the audience alight and gains you a point to boot. As the game progresses, the tricks you play on Bob become more outrageous.

Nord and Bert couldn't Make Head or Tail of It is unlike any other adventure you have played. It is not as difficult as most other Infocom products and could be completed within a day, quite easily. Nevertheless, if you enjoy wordplay, then Nord and Bert is an entertaining challenge.

Orc talk

Title: Knight Orc
Computer: Atari ST; Commodore Amiga
Supplier: Rainbird
Format: Disk
Price: £19.95

Orcs are notorious for their bad manners, evil smell and penchant for attacking humans. Unlikely though it is, however, orcs may just possibly be the victims of bad PR. It is difficult to tell, when every programmer depicts them as a *bête noir*. But all that is set to change. Because, after years of suffering at the mercy of sword-swinging machismos, the orc's day has finally come. Level 9 has buried the hatchet (and this time not between an orc's ears) and produced Knight Orc, an outstanding graphical adventure which casts the player in the role of an orc.

Knight Orc is the best graphic/text adventure to come out of Level 9 so far. The company's other attempts at putting pictures into its programs have, on the whole, been extremely poor.

The graphics on the disk version of Knight Orc are a far cry from the crude line drawings of the Silicon Dreams trilogy. Instead of using a computer to draw the program's pictures, Level 9 employed an artist to paint some original designs, which it then digitised. This process has a mellowing effect on the 'paintings', so that they look as if they have been photographed with a soft focus lens. Although not as arresting as the graphics in 'The Pawn' and 'The Guild Of Thieves', they make an interesting *divertissement* from the game's mammoth chunks of text.

Ironically, Knight Orc is distributed by Rainbird, which also handles Magnetic Scrolls, the company responsible for The Pawn and Guild Of Thieves. This could be auspicious for Level 9, because I think people will be judging adventures produced in the next few months against Knight Orc, and not its two highly-rated and much vaunted stable-mates.

The game follows the trials and tribulations of a particularly — even by orc standards — ugly character called Grindleguts. At the Orc's Head Inn Grindleguts is volunteered as the orc's champion by his friends, whereupon he is tied to a horse in readiness to joust a human knight. The adventure begins the following morning when you, Grindleguts, awake from your drunken stupor and discover the not so jolly prank you have been dupe to.

Grindleguts' adventures are told in three episodes. In Loosed Orc, the first chapter, you must collect pieces of rope and tie them together to make a single rope long enough to enable you to cross a broken viaduct and return home to your friends.

The second and third parts, A Kind of Magic and Hordes of the Mountain King respectively, are linked and can be passed between at will. Your objective in these two phases is to learn 21 magic spells, recruit other characters and solve the secret of your true persona. The game's *dénouement* is truly unique, and makes for one of the weirdest and most imaginative final twists I have seen in a computer game to date.

In Knight Orc, Level 9 has departed dramatically from the conventional style of adventure gameplay. Mapping, for instance, is normally a beneficial, if tedious, exercise. In Knight Orc, you are actually advised not to make a map, because, unlike the majority of adventures on the market, Knight Orc features a system whereby it is possible to move to a location, object or character simply by typing GOTO <place>. And if an object has been moved by another character, then you need only type FIND <object> to locate it. Similarly, you can follow characters about, wait for them and even ambush them, just by using a few simple built-in commands.

If all this sounds too simple, I can assure you that it is not. Such commands are necessary because of the way the game's 70 characters operate. While you are moving about the world of Knight Orc, performing deeds of violence and cowardice, so too, are they. Treasure secreted about the game is not there simply for your benefit: the inhabitants, too, want a cut of the profits and they are not above killing an orc, particularly one as gruesome as Grindleguts, to get it.

In Loosed Orc you have a helper named Denzyl. He is a bit dim-witted but on the whole does what you ask. Denzyl, like the other characters, can be spoken to using multi-clause sentences. You can ask him to go and perform a task, such as finding and bringing back a specific object. While he is off doing your bidding, you can continue on your way, since he will usually find you wherever you are.

Denzyl and everyone else in Knight Orc has their own personality and

purpose in life. It is not rare to come across someone drunk from having spent too long at the local tavern. There is even the possibility that Denzyl might bungle a task set him because he decides to pop in for a few jars on the way back to you. Nothing is certain in Knight Orc.

Death in Knight Orc is more embarrassing than tragic. When you croak, a Valkyrie descends and carries you into the clouds where you are sneered at for your ugliness and sent directly back to earth, dispossessed of everything you accumulated before passing over. All is not lost, though, because you need only return to the spot where you died to reclaim your belongings.

Level 9 has lived in the shadow of Magnetic Scrolls for the past year or so, but has finally emerged, looking much better for the experience. Never mind the challenge from Infocom — there's now a stronger, home-grown rival nipping at Magnetic Scrolls' heels.

Wizard wheeze

Title: King's Quest III: To Heir Is Human
Computer: Apple II series; Apple IIGS; Macintosh; Atari ST; Amiga; IBM PC
Supplier: Activision
Format: Disk
Price: all versions £24.99, except for IBM PC £19.99

Sierra On-Line's latest 3-D adventure, King's Quest III, follows hot on the heels of parts I and II, both of which were extremely popular. If you read the small print on the game's packaging, though, you will find the sentence 'Completion of King's Quest I and/or II not required'.

If you take it on its own merits, and ignore the fact that it is little more than a variation on 'parts' I and II, King's Quest III is actually one of the most technically accomplished and challenging arcade adventures to surface in a long time.

King's Quest III differs considerably from conventional graphic/text adventures such as The Pawn since it is played by moving an animated character about the game's locations using a joystick rather than typed movement commands.

Only when you want to interact with people or objects do you have to type anything. Actions such as examining an object, communicating with other characters and buying and selling all require the keyboard.

Although billed as '3-D', King's Quest III is really nothing of the sort, because scant attention was paid to perspective. When the hero walks into the distance, he does not appear to get smaller, as in the real world. Instead he remains the same size.

In the adventure you play an enslaved youth named Gwydion. For 18 years he has been in the thrall of Manannan, an evil wizard who presides malevolently over Llewdor, a small fishing community.

Early in the adventure, Manannan announces that he intends to take a trip. This provides you as Gwydion with your chance to learn Manannan's spells, escape from the house which has been your prison for the past 18 years and lift the evil spell hanging over Llewdor.

The game begins in Manannan's mountain-top retreat. The evil wizard has not yet departed and so you are expected to perform some menial chore such as clean his study or dust the kitchen.

The inside of the house, like all the game's many locations, is portrayed in stunning detail: candles flicker in sconces attached to the walls and a mirror on a dressing table actually reflects whatever is placed before it. There is a great deal to see, although most things remain tantalisingly out of reach until after Manannan has started his journey. Before he goes you must play at being his abject servant.

Attempting to learn the secret of Manannan's magic or simply just neglecting your duties can result in humorous, if often tragic, consequences. If you are caught trying to learn spells, Manannan 'zaps' you with a well-aimed bolt of lightning from his finger, reducing you to a pile of dust.

The punishment for the second offence is a session of exercises. Gwydion is forced to perform a series of sit-ups, press-ups, star jumps and twists with greater alacrity than Jane Fonda.

Boredom is the arcade adventure's greatest enemy. Where text adventures allow the player to move quickly on from locations where nothing much happens, King's Quest III requires the player to guide Gwydion across the full width of the screen before the program will load the next scene, a process which takes several seconds and seems increasingly long as the game progresses. A facility for speeding up Gwydion's movement is included in the program, but even so, some scenes are tortuously long in comparison with their text-based counterparts.

As well as a great deal of patience, King's Quest III also demands a degree of proficiency with a joystick. When Gwydion leaves Manannan's house, if possible having collected several of the ingredients necessary for some of the wizard's spells, he must be guided along a winding path flanked on either side by a steep drop. One wrong move sends Gwydion to a painful death.

Mastering Manannan's magic is of prime importance if you are to defeat the evil wizard and liberate Llewdor. There are seven spells to be learned, including ones for causing deep sleep, making Gwydion fly like an eagle or a fly, and for brewing a storm. Each spell is cast using a potion made up from ingredients scattered throughout the wizened wizard's house and Llewdor. To make a potion, you simply mix the correct ingredients following instructions outlined in a small booklet packaged with the program.

If you are willing to put up with the breaks between scenes, King's Quest III provides a fresh and distinctly different kind of adventure. Most of the locations are beautifully drawn and well worth the wait. My favourite scene is one with a small cottage complete with smoke billowing from its chimney. If you tell Gwydion to open the front door and enter the house, he is quickly kicked out again by an irate bear. Some of the other locations include a small waterfall, skittering squirrels, flying seagulls and a nasty-looking Medusa.

King's Quest III is a refreshing break from normal run-of-the-mill text adventures. Despite its rather simple appearance, it is actually quite challenging and will baffle even experienced adventurers. If you are looking for something new, make sure King's Quest III is near the top of your list. END

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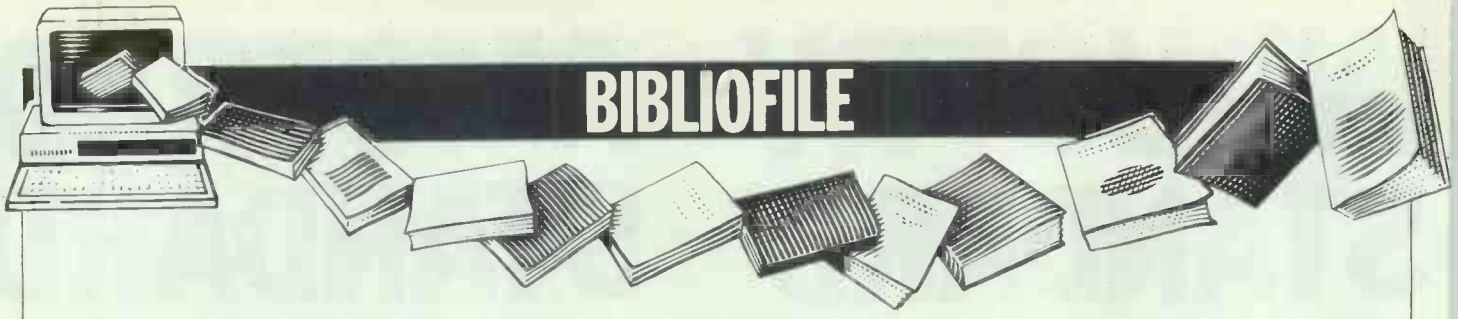


BIBLIOFILE

For readers with storage and retrieval problems, our specialist subject this month is database management; while those of you seeking a lighter load may be interested in our stories of computer crime and nocturnal programming.

Introduction to dBase III Plus Programming

Publisher: Ashton-Tate
Authors: Ashton-Tate Training Department
Price: £31.30 (includes disk)

There are two good ways to learn programming: one is by experience and the other is by having an experienced person to guide you. This teach-yourself workbook, prepared by Ashton-Tate's own training department, appears to offer the best of both worlds.

It's written and published by the company that wrote dBase III Plus — so the authors should know what they're talking about — and provides a gentle introduction to one of the more complex areas of any database system — its inbuilt programming language.

Right from the start, the book makes it clear just at whom it is aimed. It will teach you to write programs to access and maintain a database *'in such a way that an employee who knows nothing about dBase III Plus can enter and locate data and produce reports by following simple onscreen instructions and pressing the appropriate keys'.*

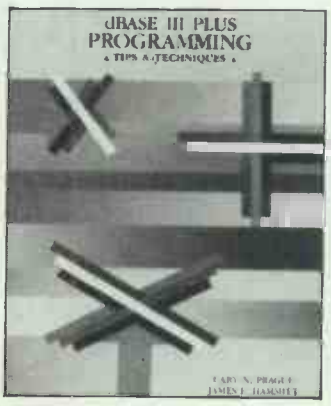
This book is a follow-up to an earlier one about using dBase III Plus. This first book covers the creation and maintenance of a database, indexing, sorting and creating a command file. Although it's not essential to have completed, or even seen, the earlier course, you are advised that, unless you know these subjects, you will find it difficult to jump in at the deep end and start programming.

Having started by explaining the benefits of using programs at all, the first pages guide you through entering (and editing, if you get it wrong) a simple program to print out the records in a database. By the end of the book, you will have designed a complete inventory system for a fictitious company, debugged it, created custom input and output screens, and included error trapping in case the operator makes a mistake when using the program.

This book, along with the example programs on the bundled disk, provides a good introduction to dBase III Plus programming. It is aimed at someone in a company's computing department who is setting up systems to be used by other employees. As such, it assumes that the reader is not totally new to programming in some high-level language, even if not specifically a dBase command language.

There's a lot of waffle and non-essential information in here, but someone who perseveres and works through the complete course, including the exercises, should find the effort amply rewarded. You can even send off to Ashton-Tate for a certificate after you've completed the course.

Roger Dalton



dBase III Plus Programming: Tips & Techniques

Authors: Cary N Prague & James E Hammitt
Publisher: Ashton-Tate
Price: £19.95

dBase III is not the most friendly database generator to use and the manuals included with the product are even less friendly. Probably the most difficult aspect of using dBase III is adding the finishing touches to make the database easy and enjoyable to use.

This book attempts to help in that area. The authors, Cary Prague and James Hammitt, are experienced dBase programmers and *dBase III Plus Programming* offers some of their work for use in your dBase programs; the detailed descriptions that accompany every dBase listing make it easy to modify the routines for your own system.

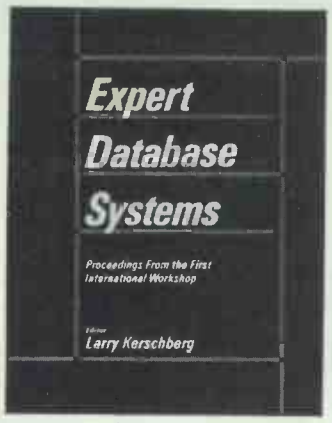
The book begins with a lengthy chapter on the differences between dBase III and dBase III Plus, most of which is devoted to the Ashton-Tate 'easy to use' dBase front-end — Assist. Although the authors do their best to cover the features of Assist, it is obvious that they *don't* use it. The overriding message of chapter one is that 'Real programmers don't use Assist' and you will never get the most out of dBase until you starting using the programming language.

From here onwards, *dBase III Plus Programming* really starts to prove interesting. Despite being aimed at existing users of dBase III, the authors devote a lot of space to consideration before creating a database under it. This includes descriptions of normalisation, structured database design, data dictionaries and the user interface. I was particularly pleased to see that the authors acknowledged a situation in which dBase III *wouldn't* be the perfect product to use, considering that this book is published by Ashton-Tate!

The rest of the book sums up the collected discoveries of the authors after many months of dBase III programming. Among the most interesting were: a routine for creating graphs under dBase III; a search program that will work off phonetics if no perfect match is found; how to create a system tutorial for new users of your system; and an algorithm for generating large letters on the screen up to full-screen size.

Overall, then, this book is a must for all dBase III programmers. My only questions are: Why doesn't Ashton-Tate bundle this book with dBase III? And why wasn't it available a year ago when I was wading through the convoluted dBase programming manual?

Barbara Gaskell



Expert Database Systems

Editor: Larry Kerschberg
Publisher: The Benjamin Cummings Publishing Company Ltd
Price: £42.95

'An Expert Database System (EDS) involves a combination of Expert System (ES) and Database Management System (DBMS) technology. EDSs will be used for developing applications requiring knowledge-directed processing of shared information.'

Seems quite a good idea, doesn't it? However, unless you have an uncontrollable urge for reading conference papers or, conversely, are genuinely researching the subject, then *Expert Database Systems: Proceedings from the First International Workshop* is really a bit too highbrow for us ordinary mortals.

These published papers are the result of 110 researchers and practitioners from 13 countries congregating at the University of South Carolina *'to present their research work and to discuss the issues related to Expert Database Systems'.*

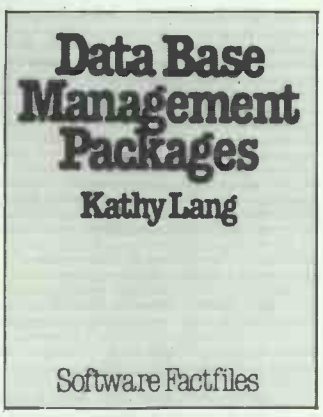
Of the 96 papers submitted to the workshop this volume contains: the keynote address, given by Dr John Miles Smith of the Computer Corporation of America, and entitled 'Expert Database Systems: A Database Perspective'; three working group reports (some working group meetings ran well past midnight, we are told); and 37 full-length papers.

It's all serious stuff, and if you think that you can manage 'Semantic Retrieval and Levels of Abstraction' or 'Interactive Classification of Conceptual Knowledge', you're a better (wo)man than I.

I'm all for conference papers being published as long as it is appreciated that they do reach out to only a very small section of the public, notably those with strong arms and a healthy bank balance.

Think about it if you're on friendly terms with the purchasing power of your local library, otherwise spend your money elsewhere.

Lorna Kyle



Data Base Management Packages

Author: Kathy Lang
Publisher: Ashford Press Publishing
Price: £85 including quarterly update bulletin for one year

The question for many would-be system managers must be: 'How do I know that this package is the best/most suitable for me?' To purchase a reference book of reviewed software products, therefore, can only be thought of as helpful.

Former *PCW* database reviewer Dr Kathy Lang has collected together her reviews and articles (some old, some new) of database management packages and published them in this 'factfile' to that end. She intends that this file should provide *'a survey of the more popular data management systems on the market'.*

It's a ring-bound manual, very similar to the documentation of some of the software products that it describes. The author states that the manual will be updated twice yearly (only to those who subscribe, of course) and that in between the major updates, a bulletin will also be issued covering all relevant changes since the previous edition.

We're not told, however, how much this subscription will cost. It's quite a money-oriented enterprise if you also consider that suppliers were invited to contribute a synopsis on their own products, 'for a modest fee'. Five suppliers took up the gauntlet.

The book is split into five sections dealing respectively with 'Starter/Powerful/System Development Packages', 'Overall Comparisons' of products reviewed and 'Comparisons' with other packages. The number of products reviewed in each of sections 1–3 ranges from which is a good enough sample, and each review is split into subsections such as 'Screen Display', 'Selection and Sorting', and 'Calculations', although these subsections are not always strictly adhered to.

I was absolutely horrified by the amount of spelling mistakes present; the odd one or two can always be blamed on the typesetter, but misspelling a product name really cannot be excused: File became Filer; dBase II became Base II; poor File also lost its screen displays on page 35 — one nice blank empty page! These mistakes really should have been spotted; they do give the impression that the book was rushed together with no thorough re-reading or checking.

There also seemed to be an awful lot of 'very easy to learn and use' and 'powerful and flexible' statements floating about but that could be me nit-picking too much.

In general I liked it, and any book that aims to sort out the wheat from the chaff, at least has its priorities — if not its orthography — right.

Lorna Kyle

General

Data Theft

Author: Hugo Cornwall
Publisher: Heinemann
Price: £12.95

Everyone knows that this decade's huge increase in the use of computers has produced a massive growth in computer crime.

What has not increased is the awareness and acceptance by most companies that their own system is potentially vulnerable. Although a number of official reports on the subject have been available for some time now, these have usually been very specialised, very expensive, and rather hard to obtain.

Now, though, Hugo Cornwall, author of *The Hacker's Handbook*, seems to have changed sides. Drawing on the best examples from reports already published, and from his quite substantial experience that made his first book a best-seller, he has put some good advice into this guide. It should fast become required reading in every computer department in every company the country.

The title of the book says it all. These days, information is not only easier to steal than physical equipment, but its loss is also often infinitely more damaging and much harder to spot, let alone detect.

Data Theft doesn't concentrate solely on huge mainframe computers, nor does it concentrate just on telephone lines as the weakest links in a system. One example Hugo Cornwall gives reinforces the fact that it's the people who run computers that are always the weakest link.

He tells how he arrived outside the computer department of a company, carrying a large piece of British Telecom equipment. He said he'd come to repair the company's data lines, and the doorman summoned a computer operator who immediately led him to the computer room and left him to it. His identity was not checked out at all.

Cornwall (it's a pseudonym) was now in a position to bug any terminal he wanted, or to borrow some floppy disks from nearby PCs and copy them overnight before returning to the building with parts he had to 'return to the depot' for.

In reality, he did nothing more than cover some of the cable junction boxes with stickers advertising the security consultancy that had hired him.

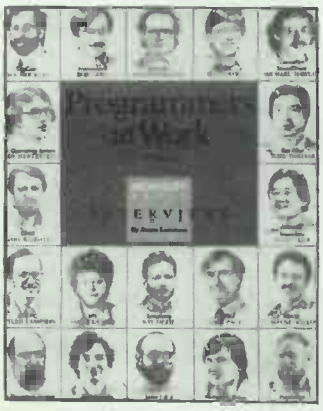
This book is packed with useful tips for everyone who works with computers that handle potentially sensitive or confidential data. It mentions dozens of real incidents, not least the *'complete mishandling and extreme carelessness'* on the part of Prestel's security staff that led to the Prince Philip hack a couple of years ago and the recent acquittal of the two hackers concerned.

A good read. This book is highly recommended.

Roger Dalton

Turn the page for more reviews of database management books.

BIBLIOFILE



Programmers at Work

Author: Susan Lammers
Publisher: Microsoft Press
Price: £12.95

When you slave away in front of the monitor at midnight, compiling and recompiling with the occasional break for more coffee, have you ever felt yourself to be part of a mystical network of hacker programmers united by insomnia and coding brilliance? If you have, then this book is not for you. Normal human beings, however, can get a fascinating glimpse into this nocturnal world from its pages.

Susan Lammers sets out to interview a wide cross-section of programmers who worked on many of the major PC software packages. Almost all the interviewees are American and all but one are based in the US. This, unfortunately, gives the book a bit of an exclusive American Silicon Valley 'yuppie' feel. The interviews are basically question-and-answer sessions and have been extensively edited to produce a coherent piece which allows the programmer's personality to show through.

Also included are a short biographical note on each programmer, a sample of their work in design or coding and a glossary for the non-technical reader.

I found the whole book a fascinating insight into the attitudes and personalities of a wide range of brilliant programmers. Anyone interested in the creative process and the psychology of creating programs would love it (yes, that *is* how they talk!).

Finally, I'll let the programmers speak for themselves.

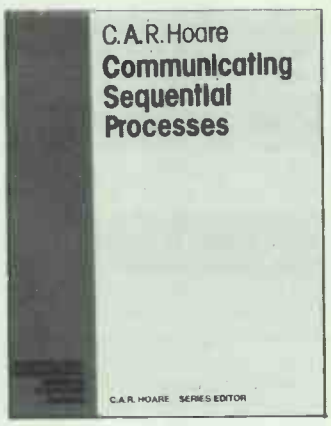
Gary Kildall (author of CP/M): 'It's fun sitting at a terminal and letting the code flow.'

C Wayne Ratcliff (author of dBase II): 'My job title was computer. Other people have programmed computers, but I have been one.'

Bob Carr (designer of Framework): 'We all know sensual pleasures taken to excess are a curse . . . it's the same with menus.'

Michael Hawley (programmer for SoundDroid): 'There's a dark side to every powerful technology.'

Alan Douglas



Communicating Sequential Processes

Author: C A R Hoare
Publisher: Prentice-Hall
Price: £29.95 (hardback) £14.95 (paperback)

Are you fed up with the usual programming fare of Basic, C and Pascal? Do you want to find out how to unleash the power of parallel computers? If so, this may be the book for you. The language of *Communicating Sequential Processes* (CSP) was designed for specifying and implementing parallel systems and leads directly to Occam, the programming language for the Transputer.

Tony Hoare is Professor of Computation at Oxford University and one of Britain's foremost computer scientists. He is the inventor of the quicksort sorting routine. Much of his work has been devoted to specification of parallel systems and to proving, mathematically, that programs are correct.

The fundamentals of CSP are: sequential processes (which perform a sequence of actions, one at a time); composition of these to form parallel processes (which may perform many actions simultaneously); communication between processes (sending data back and forth); and, nondeterminism (in which the behaviour of a process is not completely predictable).

The book introduces each of these concepts informally, with excellent running examples. It then goes on to give mathematical laws describing their properties and, for the adventurous, a Lisp implementation of CSP. In keeping with the author's interest in correctness, he gives methods for specifying the behaviour of a system and then proving that a program meets that specification.

Professor Hoare has a well thought-out, lucid style which has been honed through use in many courses and seminars on CSP. Readers with little mathematical knowledge will find that side of the book heavy-going, but it repays study, since it shows CSP to have many beautiful properties not found in other languages.

This book won't make your computer of today any faster but, if you want a glimpse into the computers of tomorrow, the state of the art in understanding parallelism and the workings of one of the finest minds in computing, read it.

Nicolas North

Supercharging MS/DOS

Author: Van Wolverton
Publisher: Microsoft Press
Price: £17.95

Introductory books on either operating systems or actual computers have always seemed to me to represent pretty easy money for an author. All you have to do is take the original documentation and re-write it so that it can be understood by human beings, add a few examples (usually variations on the original manual again) then retire to a tax haven! Well, not quite, but the average text entitled 'Understanding/Using/Running CP-M/MS-DOS (select appropriate parameters) doesn't look as if it represents a lifetime's devotion to the task in question.

Mind you, at least you get what you pay for — unless, that is, you're expecting a lot more. This is what usually happens when you buy a book beginning with the word 'Advanced'. What you want is a guide to the more powerful features of the system and also lots of tips on getting it to perform clever tricks which might even turn out to be useful. What you often get is a book which devotes a lot of time and space to describing the basic system commands all over again.

Supercharging MS-DOS does, in fact, live up to its title. Although written as continuous narrative (actually, quite a good read) and not in reference-book style, it is really what used to be called in computing a 'cook book'. That is, it provides lots of short examples of commands and command files to, for example, make complex system-prompt definitions or time and date stamp files, or use 'Debug' as an editor. But much of the book is devoted to learning the advanced batch-file techniques necessary to design a complete interactive menu system using DOS commands. Now, you may not actually want a complete menu system but it's certainly true that, if you learn how to create one, you'll learn a lot about MS-DOS in the process. Thus you learn all about ANSI.SYS and extended key codes, about CONFIG.SYS and using a RAM disk, about controlling the display and printer so that they do what you want them to do rather than what the system in its default state does. Wolverton takes the reader through the use of IF, GOTO and FOR and all of his batch files lay heavy emphasis on the importance of error trapping.

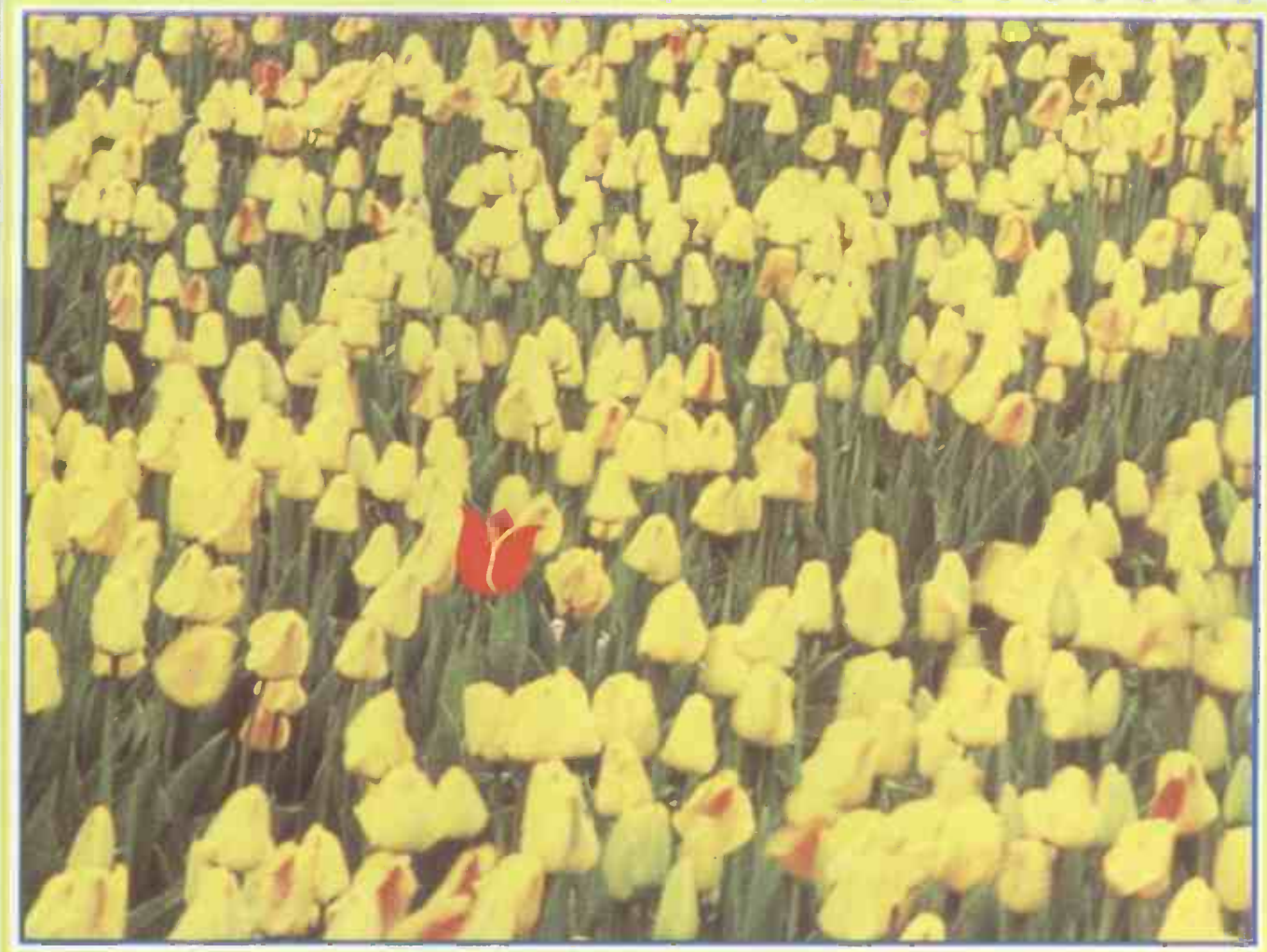
It is a tribute to the book that you're left at the end feeling that there can't be much more left to say about MS-DOS — at the command level at least. If you want anything further, and the brief flirtation with Debug may well whet the appetite of more than one reader, then you need a text on 8086 Assembler and a Programmer's Guide to MS-DOS — and then you're in a different league.

Jeff Wells

Roger Dalton and **Barbara Gaskell** are freelance computer journalists. **Lorna Kyle** is a systems analyst/programmer. **Alan Douglas** is a non-nocturnal programmer hacking away during the day on a PC. **Nicolas North** is a computer science researcher at the National Physical Laboratory. **Jeff Wells** is a teacher of Computing at Haringey College, London.

***Next month**: Desktop Publishing*

Pick the one that stands out from the rest



In recent years the microcomputer market has been flooded by countless different products, many of which have disappeared as quickly as they came. There is, however, one exception - Tulip Computers. This is an idea which germinated in Holland and is the result of years of intensive research. Tulip Computers puts performance and value first, quality not quantity is their motto, and that is the way they have established the firm root they now have in the European market. They are the largest producing computer supplier in the Netherlands and their success is now flourishing all over Europe.

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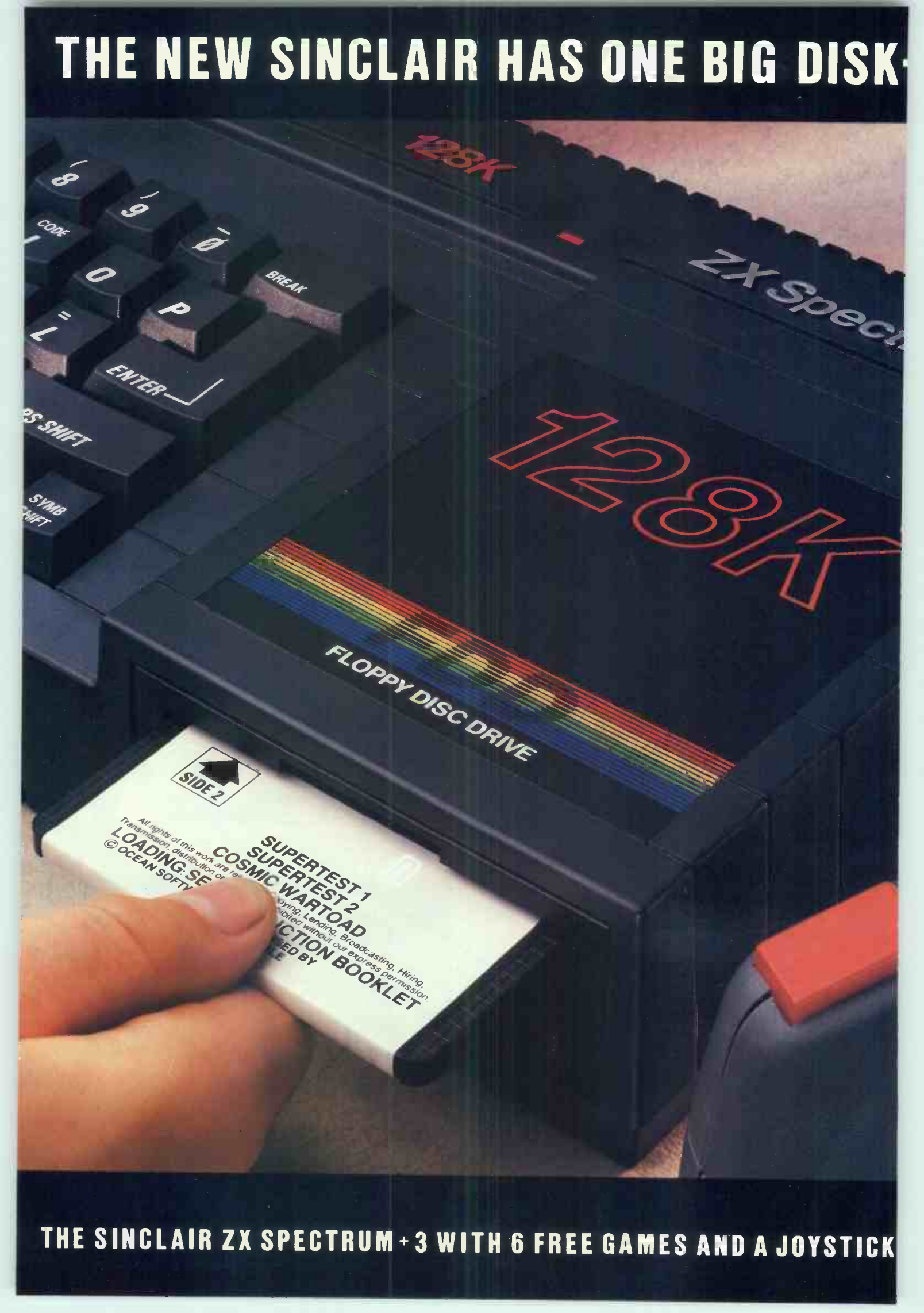
THE NEW SINCLAIR HAS ONE BIG DISK



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Recommended retail price Sinclair ZX Spectrum +2 £139 including VAT, Sinclair Spectrum +3 £199 including VAT at 1.10.87. Prices subject to change without prior notice.

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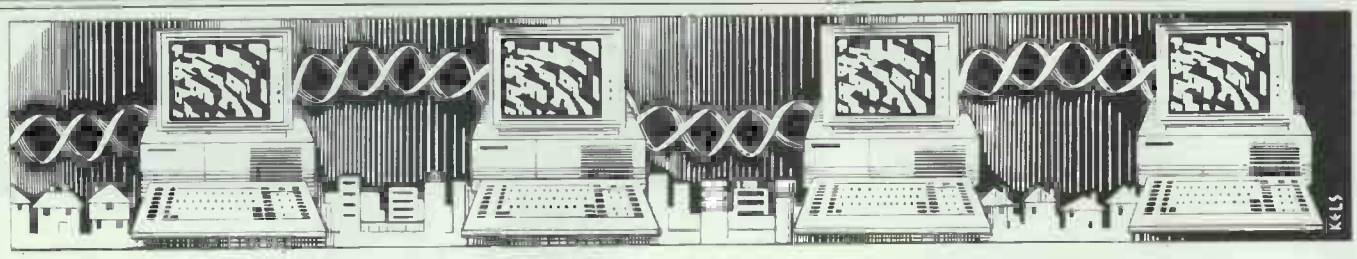


Message for Fido

Fido Net started as the plaything of two comms enthusiasts. Today it's a worldwide electronic mail system linked to 2000 users. Peter Tootill charts the rise of this professional network still run by 'amateurs'.

Most bulletin board users know that there is some sort of link-up between Fido bulletin boards — but many don't realise that Fido Net (as it's called) is now a fully-fledged electronic mail system.

These days, too, Fido Net covers a lot more than just Fidos: other bulletin board systems (BBSs) such as Opus, TBBS and Wildcat can join in too and there are even some standalone electronic mail systems that use Fido Net protocols and can link into the system.

Worldwide network

Technically, Fido Net is a non real-time packet switching message system — in simple terms it is a sophisticated international electronic mail system.

However, instead of using a small number of mainframe computers like the commercial systems do, it runs on a large number of microcomputers which are all independently operated. There are currently about 2000 nodes on the world list — and I do mean *world list*. There are participating networks in North America (of course), most Western European countries, Australia, Singapore, Malaysia, Indonesia and the Southern and Western Pacific ocean area.

You can send a message to anyone using any of these systems simply by entering it on your nearest participating bulletin board system. The cost is very reasonable as well. A message can be sent to the US for not much more than the cost of an airmail letter (the actual costs vary because they are set by the sysops of the individual BBSs themselves).

Fido was the brainchild of an American called Tom Jennings. He and a friend, John Madill, lived on opposite sides of the United States and wanted a straightforward way of communicating with each other. This was in June 1984 and the first Fido Net messages were soon bouncing across the country.

Other bulletin board operators became interested and joined in. By August 1984 there were 30 nodes and in the Spring of 1985 nearly 200. The network has spread widely since then. Today there are over 2000 nodes of which about 1600 are publicly accessible. The rest are private systems that are members of the net for some particular reason.

The basic concept of Fido Net is very simple. Each participating BBS closes down at a set time (usually 3.30 am local time) and assembles any outgoing messages into packets. It then dials other nodes and sends the packets, waiting between calls for incoming messages from other systems.

This process continues for about an hour, with systems alternately dialling and listening, after which they turn back into ordinary BBSs. The receiving system unpacks the messages and stores them in the bulletin board's message area ready for the addressee(s) to call in and read them.

In the early days, each node simply dialled other nodes direct and sent the messages. This soon became unworkable because of the number of systems trying to call each other and more complex structures were devised as a result.

The world was divided into three zones. Each zone is divided into regions and these are divided into nets. Nets usually consist of a dozen or so systems within the local call area of their host system. Messages are all routed via these hosts. This has several advantages: it cuts down on congestion and makes for more economical operation — the only long distance calls are between hosts and this mail is usually compressed and sent using high speed modems. The whole system is designed to keep the actual online time, and hence running costs, to an absolute minimum.

Fido Net is operated entirely by amateurs. The node list is maintained by a group in St Louis and there are a series of levels of co-ordinator: one international co-ordinator, then three zone co-ordinators, about 30 regional co-ordinators and probably over 100 net co-ordinators. The whole set-up is overseen by the International Fido Net Association (IFNA). Despite the amateur nature of the system, it all appears to be run in a very professional and businesslike manner. Indeed it has to be, with 2000 participating systems there is no room for sloppiness!

Echomail

A recent enhancement to Fido Net is called Echomail. This adds conferencing to Fido Net's electronic mail capabilities. Until the introduction of Echomail, Fido Net was just a point-to-point system, in which a message was addressed to a node and then sent to that node.

With Echomail, several BBSs join together to carry a conference on a particular topic and all messages that are entered in the relevant section of each BBS are echoed to all the participating BBSs. This means that an individual can take part in an electronic conference that spans a number of systems simply by calling his or her local BBS. Echomail also has the ability to work on an international level.

Costs

Who pays for running the net and all the telephone calls involved in transferring messages? The cost of sending a message is usually borne by the sender. Fido Net has simple cost tables built in and these indicate the approximate cost of sending a message to any other node on the list.

The accounting system is relatively unsophisticated, making no allowance for the length of message or any attached files. If you want to use net mail, you send the sysop of your chosen BBS a few pounds which are then credited to your account. The cost of any message you send is then deducted from your remaining credit. Echomail costs are borne by the sysops of the participating BBS, but they may charge a small subscription to use the feature.

How to join

The main problem if you want to join the net (assuming that you are running a suitable BBS) is that there is a huge array of new concepts to learn. Also, some of the documentation is not very good. This is compounded by the fact that much of the software is public domain or shareware and there seems to be no single source of supply. You are dependent on another more experienced sysop to tell you what software you need and to help you get started.

Another thing you need, at least if you are going to use the world nodes list, is plenty of disk space. The list is about 150k in length and it is updated every week. This is done by means of a clever routine which uses a file containing the differences between last week's node-list and this week's.

If you're careful and keep backups before updating, and ask for too many sets of reports, the process can really gobble up disk space. I had over a megabyte free on a hard disk recently and ran out during the update. I was, however, applying two weeks' worth of updates and asked for a complete list of all nodes with their locations, phone numbers, sysops' names, and so on. The list when printed currently runs to 54 pages.

If you want to join the net, you need to be running a BBS that uses one of the software packages that can support net mail. Fido and the newer versions of Opus have net mail options built in. TBBS requires the addition of a package called Seadog. This is a standalone electronic mail system but it has no BBS features of its own — messages can be entered at the keyboard or received over the net but no-one can dial in and leave a message to be forwarded as they can with a Fido system.

As well as Seadog, TBBS needs a set of programs that extract messages from the net mail area and pass them to Seadog, and vice versa. Seadog can also be used with Fido and Opus as it gives extra features such as the ability to receive mail at any time (crash mail), not just during pre-defined mail slots.

If you are going to use the world node list you need a program that processes it and turns it from the format issued by the St Louis group into a form that can be used by Fido, and the others. A popular one is called XLATLIST, which also updates the list using the current NODELIST file and the latest difference file (called NODEDIFF).

Incidentally, XLATLIST has the most sweeping disclaimer I have ever seen: 'We accept no responsibility for anything at all'! After it has been processed, Fido 'compiles' the list. In effect this means constructing an index and a list of nets to speed up access. Some systems (Seadog included) have problems with large nodelists and another shareware package called NLBUG has to be used.

Seadog is a commercial program but there is a public domain equivalent called Dutchie, which was written by Henk Wevers, a Dutchman, who is also the European Fido Net co-ordinator.

Dutchie is strictly shareware but, for the benefit of the ordinary amateur user, has the most generous level of user contribution I have come across — the author justs asks you to send him a postcard.

The main problem with Fido Net is that all the relevant software runs on MS-DOS systems. There are implementations for DEC Rainbow, Sirius and Sanyo as well as the PC but, as far as I know, none for any British BBS systems.

There is no reason why they shouldn't be developed, though, as the protocols are in the public domain and should be available from many participating systems — see 'Further reading', below.

Perhaps some enterprising BBC programmer will produce a Fido Net compatible system for the BBC-based bulletin boards — there are quite a few around.

Telecom Gold introduces Xmodem protocols — at a price

At long last Telecom Gold supports Xmodem file transfer protocols. In fact, it has gone one better and added Ymodem and Ymodem batch as well. This means that you can now send messages without the fear of line noise making unwanted changes to your text.

Various types of file can be sent, including 8-bit binary files. However, if you want to send them to other people, binary files must be converted to a format that can be handled by a mailer which can only cope with 7-bit data. This is done automatically for you by the system.

The new feature (called FT — for file transfer) supplements RAP which has been available on Gold for some time.

The introduction of FT couldn't have come at a better time for Gold, and you can't help wondering if its timing wasn't a total coincidence. Gold has recently been losing revenue because of its pricing policy of charging by the minute. With its new pricing structure that charges you for every character sent or received, offering file transfer makes real commercial sense for Gold but can be crippling on the user.

As of October, it costs 6.5p per minute during the day to be online to Gold, and 2.5p after 7pm. In addition, it costs 4p for every 512 characters sent or received during the day, and 1p in the evening. So, think carefully before you use Gold to transfer huge files, and remember that your average Fido bulletin board often offers more transfer protocols (including Kermit) and is free. Xmodem has the advantage of being an almost universal standard and is built in to most programs that provide file transfer facilities.

I'm surprised that Kermit has not been included, because it is designed to be used over packet networks such as PSS that use 7 data bits. Indeed, Kermit has been available on some Gold computers for a while, but it has been kept very low key. The new system has to do clever things to the network to make it accept the full 8 bits used by Xmodem to transfer binary data (technically, it switches the PAD to transparent mode).

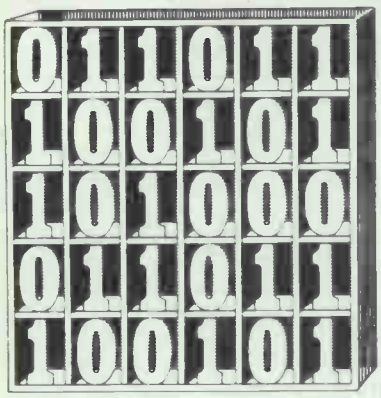
Further reading

Further background information is contained in the following items which should be available from a number of Fido Net systems and will be on this month's *PCW* disk. (Files are given in brackets, but these vary, so you may have to do a bit of detective work if you are trying to track them down on a BBS.)

Specification of Fido packet protocols (20 October 1984) (FIDOMAIL.DOC)
Fido Net protocols in OSI format (1987) (FCS001.PRN)
Early history of Fido Net (8 February 1985) (FIDOHIST.DOC)
IFNA policy (24 October 1986) (POLICY3.DOC)
Useful background article by Steve Townsley (Log On the Tyne) (1987) (ROUTING.TXT)
Fido's complete operating manual — Fidonet section (undated). (FIDONET.DOC)

You can contact Peter Tootill electronically on: Telecom Gold 83: VNU202, Prestel 219991119, or CompuServe 72746,3202. END

SUBSET



David Barrow presents more machine code routines and information for assembly language programmers. All helpful programming hints and short, useful new routines are welcome, as are improvements to or conversions of those already printed. Submissions must be printed or typed clearly and be documented to the SubSet standard, although documentation may be amended for publication. Send your contributions to SubSet, PCW, 32-34 Broadwick Street, London W1A 2HG.

Wipeout challenge results

There was a good response to the memory-clearing challenge I set in July. Except for a lone 8080 routine, all the attempts received so far are in Z80 code. I am still waiting for solutions in 6502, 68000, 8086 and any other codes.

The problem was to write a short code sequence that would clear any programs or data from user memory and return control to the operating system. There were four conditions:

1 The program must overwrite all user memory and terminate with a warm boot, or reset.
2 After overwrite, entry at any point in user memory must cause only a warm boot or reset.
3 Either the start or end address of user memory (or both) must be read from system parameters.
4 The program must originally reside in user memory but not necessarily at any specific address.

Most contributors appear to have invested a major part of their programming effort in a semantic quest to find as liberal an interpretation of the rules as English will allow. This accords well with the old programmer's maxim: if you don't like the solution, change the problem!

Nevertheless, I have managed to select three Z80 routines that do more or less what was asked and which typify the varied approaches to the problem. But it is the 8080 routine which deserves the laurels for sheer ingenuity.

Pushing restarts

WIPOTA (Fig 1) is from Kim Bastin of Stockholm whose difficulty in removing encyphered files from memory prompted the challenge. WIPOTA assumes user memory to extend from 100H to one byte lower than the address held in locations 0006 and 0007.

Kim's routine set the Stack Pointer at the top of memory and loads DE with two 'RST 0' instruction codes. It then writes a two-byte subroutine at locations 100H and 101H, points HL at the subroutine and jumps to it.

The subroutine iterates, using a 'JP (HL)' instruction, and uses a 'PUSH DE' instruction to push a pair of 'RST 0' instructions repeatedly down through memory until the subroutine is overwritten. After the subroutine is overwritten the next instruction fetched is a 'RST 0' — causing a warm boot.

Kim has included a check for user memory being an odd byte length. In this case the routine writes a 'RST 0' instruction in the highest location and adjusts the SP.

For an even TPA size, the six instructions between asterisks may be replaced by the single instruction 'LD SP,(6)'.

FIGURE 1

```
;================================================================
;
;       WIPOTA: Fill user memory with "RST 0" instructions.
;
;       Length: 22 bytes
;       Timing: 92 + bytes cleared * 7.5 c.cycles.
;
RST0    EQU   0C7H              ;Code for "RST 0".
PUSHDE  EQU   0D5H              ;Code for "PUSH DE".
JPHL    EQU   0E9H              ;Code for "JP (HL)".
;
WIPOTA  LD    DE,RST0*256+RST0  ;D & E <-- "RST 0" code.    11 C7 C7
;
;       **********************
        LD    HL,(6)            ;HL <-- TPA top + 1 from    2A 06 00
        BIT   0,L               ;BDOS. If TPA has even      CB 45
        JR    Z,EVEN            ;number of bytes then skip  28 02
;
        DEC   HL                ;else even up HL & write    2B
        LD    (HL),E            ;"RST 0" to top byte.       73
;
EVEN    LD    SP,HL             ;SP <-- (adjusted) TPA top. F9
;       **********************
;
        LD    HL,101H           ;Now write instructions     21 01 01
        LD    (HL),JPHL         ;"PUSH DE" & "JP (HL)"      36 E9
        DEC   HL                ;to locations 100H & 101H   2B
        LD    (HL),PUSHDE       ;leaving Hl = 100H.         36 D5
;
        JP    (HL)              ;Exit WIPOTA code by jump   E9
;                                to location 100H.
;
;... 2-byte sequence "PUSH DE: JP (HL)" at 100H, with HL = 100H,
;... causes pairs of "RST 0" code bytes to be pushed repeatedly
;... from the TPA top to all user memory, including locations
;... 100H,101H. When 100H,101H is overwritten by code 0C7C7H the
;... loop terminates in a warm boot (restart 0).
;
;================================================================
```

FIGURE 2

```
;================================================================
;
;       WIPOTB: Fill user memory with "RST 0" instructions.
;
;       Length: 25 bytes.
;       Timing: 152 + bytes cleared * 21 c.cycles.
;
BASE    EQU   8                 ;User memory start - change to suit
;                                your requirements.
;
WIPOTB  LD    HL,(6)            ;HL <-- TPA + 1.            2A 06 00
;                               (This address also marks the start
;                                of BDOS. If the instruction here
;                                is executed with register C = 0
;                                then a warm start is effected.)
;
        DEC   HL                ;Lower HL to leave space    2B
        DEC   HL                ;for an LDIR instruction.   2B
        LD    SP,HL             ;Set SP = location where    F9
        PUSH  HL                ;LDIR will be & push that   E5
;                                address as return address
;                                after exit from WIPOTB.
;
        LD    (HL),0EDH         ;Store 2-byte LDIR instr.   36 ED
        INC   HL                ;to top of user memory.     23
        LD    (HL),0B0H         ;                           36 B0
;
        LD    DE,BASE           ;DE <-- address of lowest   11 08 00
;                                byte to be wiped.
;
        SBC   HL,DE             ;BC <-- (HL <--) number of  ED 52
        LD    C,L               ;bytes to overwrite.        4D
        LD    B,H               ;Note that the unknown      44
;                                state of Carry flag in
;                                "SBC HL,DE" will result
;                                in one or both of LDIR
;                                code bytes being finally
;                                overwritten.
;
        LD    L,E               ;HL <-- lowest byte of      6B
        LD    H,D               ;memory to overwrite,       62
        INC   DE                ;DE <-- lowest + 1.         13
        LD    (HL),0C7H         ;Write "RST 0" to lowest    36 C7
        RET                     ;and exit to "LDIR" instr.  C9
;
;... RET from WIPOTB transfers control to the LDIR instruction
;... at the top of user memory, with HL = lowest address = 0C7H,
;... DE = lowest address + 1 and BC = bytes to transfer. This
;... causes "RST 0" instructions (code 0C7H) to be written from
;... BASE up to the 1st or second bytes of the LDIR instruction
;... when a warm boot (restart 0) occurs.
;
;================================================================
```

Block transfer

WIPOTB (Fig 2) is from Bob Andersson of the delightfully named village of Bourton-on-the-Water in Gloucestershire.

The routine writes an LDIR instruction to the location below BDOS and uses it to fill user memory with 'RST 0' opcodes at 21 clock cycles per memory byte. This is far slower than the PUSH method used by WIPOTA.

The Z80 re-fetches the LDIR instruction on each iteration. When the first byte of the LDIR opcode is overwritten, a 0C7H code is fetched and an 'RST 0' occurs. However, there is the possibility that Z80 compatible CPUs may store rather than refetch LDIR for the duration of its execution.

In this case an 'RST 0' does not occur but at termination of the LDIR, control passes to the following instruction which is assumed to be the jump into BDOS.

Relative restart

WIPOTC (Fig 3) from Martin Simmons of Cambridge is far shorter than the previous two routines at 11 bytes. It could be only 10 bytes (and so equal shortest with WIPOTD) but Martin has disabled interrupts 'just in case'.

The routine fails the challenge on two of the stated conditions. It has to reside at the bottom of user memory but this address is not limited in any way by the operation of the routine (compare Fig 4) and can be anywhere in the Z80's 64K memory. It is also left mostly intact on termination.

Luckily, the remaining parts of the routine are quite innocuous when entered at any point if the SP is initialised from location 0006.

Like WIPOTA, WIPOTC pushes instructions — in this case, alternating 'NOP' and 'RST 0' opcodes — down through memory until overwrite of the iterative PUSH loop causes termination and forces an 'RST 0'.

Interestingly, the overwrite can have two different effects depending on whether the SP is initialised to an address that is odd or even, relative to the routine.

Should the 'JR WOCLP' instruction be entirely overwritten by the last 'PUSH HL', the next instructions to be executed are 'NOP: RST 0'. Alternatively, only the displacement byte of 'JR WOCLP' could be overwritten by the 'NOP' half of the pushed values. Then the relative jump would be executed with a zero displacement to the following 'RST 0' instruction.

FIGURE 3

```
;=============================================================
;
;       WIPOTC: Fill user memory with "NOP: RST 0" instructions.
;
;       Length: 11 bytes.
;       Timing: 45 + bytes cleared * 11.5 c.cycles.
;
WIPOTC DI              ;Disable interrupts              F3
;                        (just in case).
       LD   SP,(6)     ;SP <-- top of user memory.      ED 7B 06 00
       LD   HL,0C700H  ;HL <-- "NOP: RST 0".            21 00 C7
;
WOCLP  PUSH HL         ;Repeatedly fill user memory     E5
       JR   WOCLP      ;with NOP: RST 0 instructions.   18 FD
;
;... Execution of the two instructions in WOCLP causes a series
;... of "NOP: RST 0" instructions to be written from top of user
;... memory down to and including the second or both bytes of
;... the "JR WOCLP" instruction. Execution terminates in a warm
;... boot (restart 0).
;
;=============================================================
```

Sign comparison

Two's complement signed integers of any length are far easier to compare than other common signed formats such as sign and magnitude. This is particularly so when using a comparison instruction that can compare only unsigned byte values in the range 0–255.

The sign byte (high order byte) of a two's complement number has the range 80H to 7FH. 80H to 0FFH expresses ascending negative values and 00H to 7FH expresses ascending positive values.

Such a number may be converted to a simple magnitude value, with a range of 00HH to 0FFH, for the purposes of comparison, by the addition of a single bit in the highest order position. Only when the two adjusted sign bytes are equal do the unadjusted lower order bytes need to be compared.

Comparing values expressed as sign bit plus magnitude first requires the sign bit of each number to be isolated from the magnitude. If on comparison the sign bits differ, the magnitudes can be ignored.

Only if the sign bits are equal do the two stripped magnitudes have to be compared. This introduces a problem since a greater magnitude expresses an arithmetically higher value for positive numbers but a lower value for negative numbers. The problem must be resolved by giving special treatment to negative integers — this can be done either by negating the complete multi-byte magnitudes before comparison or by complementing the result flag after comparison. END

Return address trick

The most interesting solution to the problem came anonymously with an Earl's Court postmark and signed simply 'Bruno'.

WIPOTD (Fig 4), is 10 bytes long in both its original 8080 version and in the Z80 translation I have provided. The Z80 code uses the slightly faster but no shorter method of loading the Stack Pointer from memory, rather than through HL, by a non-8080 compatible instruction.

The routine itself may reside anywhere in memory — particularly in user memory where it will be totally overwritten by its eventual effect. Nevertheless, it is even more limited in practice than WIPOTC because the method used restricts the effective start of user memory to one of the four locations: 0008, 0018, 0028 or 0038.

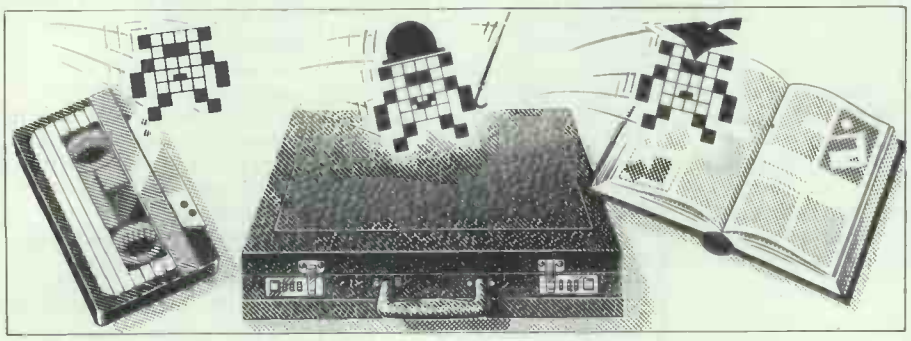
WIPOTD writes the shortest possible recursive program: a one-byte self-referential restart instruction. This causes the return address, which is one byte higher than the restart address, to be pushed down through memory until the restart instruction is overwritten. At only 5.5 clock cycles per byte, this must surely be the quickest way to destroy the contents of user memory short of a blown fuse.

The return address that is repeatedly pushed also happens to be the codes for the two single-byte instructions 'DAD B/D/H/SP: NOP' (Z80: 'ADD HL,BC/DE/HL/SP: NOP'). When the original restart instruction is overwritten, the program shoots up through memory alternately executing 16-bit additions and NOPs until it reaches the jump instruction at the bottom of BDOS, hopefully resulting in a warm start.

The only problems with this clever method are that the return journey more than doubles the time taken to clear memory and that the last byte of the preceding restart block will be corrupted if the top-of-user-memory happens to be at an odd address.

FIGURE 4

```
;=============================================================
;
;       WIPOTD: Fill user memory with "DAD: NOP" instructions.
;
;       Length: 8080: 10 bytes.  Z80: 10 bytes.
;       Timing: 8080: 46 + bytes cleared * 12.5 c.cycles.
;               Z80: 44 + bytes cleared * 13 c.cycles.
;
RSTADR EQU  8               ;Address of RST 8 location.
;                     (Could also be 18H, 28H or 38H - see RSTOPC.)
;
RSTOPC EQU  0CFH            ;Opcode for RST 8 instruction.
;                    (Could also be 0DFH, 0EFH or 0FFH for
;                     RST 18H, 28H or 38H but must match RSTADR.)
;
; 8080 version.
;
WIPOTD LHLD 6               ;Set SP to top of memory        2A 06 00
       SPHL                 ;via HL.                        F9
       LXI  H,RSTADR        ;Address RST 8 location and     21 08 00
       MVI  M,RSTOPC        ;write "RST 8" to it.           36 CF
       PCHL                 ;Jump to RST 8.                 E9
;
; Z80 version.
;
WIPOTD LD   SP,(6)          ;SP <-- top of memory.          ED 7B 06 00
       LD   HL,RSTADR       ;Address RST 8 location         21 08 00
       LD   (HL),RSTOPC     ;and write "RST 8" to it.       36 CF
       JP   (HL)            ;Jump to RST 8.                 E9
;
;... The routine terminates by passing control to the "RST 8"
;... instruction at the RST 8 location. This shortest of all
;... possible recursive programs causes the return address,
;... 0009H, to be pushed down through memory until the RST 8
;... instruction is overwritten. The CPU then executes the
;... resultant sequence of "DAD B: NOP" ("ADD HL,BC: NOP")
;... instructions up through user memory until the jump at the
;... bottom of BDOS.
;
;=============================================================
```



Games

Scientific/mathematic

Business

Toolkit/utilities

Educational/Computer Aided Learning

Borrowing time

Feel like sharing your software with other readers? Programs which have been published in the magazine will form the basis of the PCW Disk Library. Owen Linderholm outlines how it will work.

The box on this page gives details of the *PCW* Disk Library. This new service provides disk copies of selected programs from Program File and also disks to accompany some of the articles featured in this issue of the magazine.

At present we can provide only disks of programs for the IBM PC or compatibles, the BBC Micro, the Atari ST, the Apple Macintosh, the Commodore Amiga and the Amstrad CPC and PCW ranges. Because considerable effort is involved in producing the disks, we cannot put every program published in the magazine on to disk. We will endeavour to put all the long programs that are difficult to type on to disk, but shorter programs will be left out. This shouldn't be too much of a problem since these are the ones that are easiest to type in.

All disks will cost £5, the price of which will include return postage and packing and a royalty to the original author of the program. It is important to realise that these disks are copyright. They are *not* public domain and may not be copied at will. If you order one and a friend wants a copy, they will have to order their own.

Disks with the programs for a current issue will not always be available immediately. There may be a delay of a month or two until we are able to provide disk versions of some programs. However, if a program is going to go into the disk library at some point, the *PCW* Disk Library logo will appear by it. This will let those who would want a disk version save their fingers until the program is available. As soon as a program *is* available, it will appear in the catalogue list in the magazine.

No documentation is provided on the disks, so don't order one unless you have the corresponding issue of *PCW*. Of course, if you have committed the sacrilege of throwing away an issue of *PCW*, you can always order a copy from our Back Issues department. Either write to the Back Issues department at our Broadwick Street address or telephone (01) 439 4242 and ask for the Back Issues department. Please have ready the issue date(s) you want.

The list of programs currently available is shown in the box on the opposite page.

The cryptic number before each disk is the order number which you will need to quote to order a disk. If you haven't got an order number, you won't be able to order a disk! So please don't ring with enquiries about whether or not a particular program is on disk: if it's not in the catalogue which will be in *PCW* each month, then it's not available on disk. If a program you want is not in the catalogue, then please write

Guidelines for program listings

PCW is interested in publishing quality programs written in any of the major programming languages for all popular home and business micros. When submitting your programs, include a disk or cassette version of your program, comprehensive documentation and a clear, dark listing on white paper.

The listing should be no more than 80 characters wide and, if possible, sample output from that program should be included. Ensure that you have marked the software, listing and documentation with your name and address, program title, machine (along with any minimum requirements) and a daytime telephone number.

We will be including some of the programs published in Program File in the *PCW* Disk Library. If you have any objections to your program being included, please indicate them, otherwise it will be assumed that the program can be included in the Disk Library. A total royalty of 50p is paid per disk sold from the disk library. The sum is shared among the authors of the programs on the disk.

Here are some guidelines for submitting programs. Check through previous Program Files to see the sort of programs we prefer. Original ideas are always welcome, as are good implementations of utilities and applications. Obviously the programs should be well-written, easy to understand and preferably not too long. All programs should be fully debugged and must be your own, original, unpublished work.

We will try to return submissions if they are accompanied by an appropriate stamped, addressed envelope , but please keep a copy of everything. Programs are paid for at the rate of £50 per page of published listing, plus a £50 bonus for Program of the Month.

Send your contributions to Owen Linderholm, Program File, *PCW*, 32-34 Broadwick Street, London W1A 2HG.

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IBM PC    5.25 inch 360K
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IBM5-OCT87-0001     Oct 87    MBasic Molecular Models
          Create and display correct 3D molecular models

                    Sept 87   MBasic MSDOS File Manager
          Access files via a menu system with password protection

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---------------------------------

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```

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PROGRAM FILE

Angus wrote in with a method for increasing the speed of the multiplication routine. This essentially involves finding the degree of precision to which your computer's Basic calculates. You can then use several at a time instead of using single digits.

For example, if your computer can calculate up to nine digits of precision, you can use four-digit chunks for the multiplication. Multiplying two 8-digit numbers in this way would take 8/4 times 8/4 = 4 multiplication operations, whereas my published method would take 8 times 8 = 64 multiplications. There is of course an overhead in organisation, but LV Angus's method is obviously faster.

I also received a modification to one of the binary tree algorithms given in June 1987's Program File. NC Duncan spotted a way to improve the unloading routine when finding data in the tree in alphabetical order. Essentially, the improvement is that the upward pointer for each element in the tree is signed according to its direction — positive from the left, negative from the right. This information has to be included when constructing the tree.

The unloading routine then works as follows. If you go up from the left, you reach the next entry to be printed, so print it and look to its right. If you go up from the right, you reach an entry that has already been printed, so go up again. An indicator is used to control the direction of movement down the tree.

This method takes very slightly longer for entering data into the tree but is 25 per cent quicker at accessing the data. It also saves memory space in that the array GOT% is no longer needed.

Finally, I received from C Semmens a program to perform indefinite precision division properly. The program takes division back to its basics. Multiply the denominator (divisor) by what you guess is the first digit of the answer (quotient). Align this result (trial product) under the numerator (dividend) and see if the trial product is the largest that can be subtracted from the dividend without giving a negative result.

Adjust the guess up or down as necessary to get the correct trial product. When you have the right digit, subtract the product from the dividend, bring down the next digit of the dividend (zero if necessary) and repeat the process with whatever is left of the dividend after subtracting the product.

There are only 10 products of one digit with any given denominator, two of them trivial. In multi-precision arithmetic where any given digit is likely to occur many times in the result, it makes sense to calculate all 10 products once and keep them rather than recalculating them all the time. (Note: this technique could be used successfully with multiplication as well.)

The first part of the program standardises the format of the number,

```
10REM  * * * * * * *   LONGDIV   * * * * * * *
20REM  * * * * (C) 1987  Clive Semmens * * * *
30
40REM DIVISION ROUTINE - PRECISION LIMITED BY PERMISSIBLE STRING LENGTH -
50REM    255 IN THE CASE OF THE BBC MICRO USED
60
70REM ALTHOUGH THIS IS WRITTEN AND DEBUGGED IN BBC BASIC, LONG MEANINGFUL
80REM    VARIABLE NAMES HAVE BEEN AVOIDED, AS HAVE VARIOUS USEFUL
90REM    FACILITIES OF BBC BASIC'S, SUCH AS PROCEDURES AND
100REM   MULTI-INSTRUCTION LINES, TO ALLOW FAIRLY EASY CONVERSION TO
110REM   OTHER DIALECTS.
120
130REM VARIABLES USED:
140REM N$ IS THE NUMERATOR
150REM D$ IS THE DENOMINATOR
160REM R$ IS THE REMAINDER
170REM S$ IS THE SIGN, IF ANY
180REM X$ IS LOCAL ONLY - USED FOR BUILDING NEW REMAINDER AFTER SUBTRACTIO
N
190REM     OF PRODUCT OF CURRENT ANSWER DIGIT AND DENOMINATOR
200REM A$ IS THE ANSWER
210REM T$() ARE THE TRIAL PRODUCTS
220REM A IS A DIGIT OF THE ANSWER
230REM B,C,G,H,I ARE LOCAL ONLY
240REM D IS THE NUMBER OF DECIMAL PLACES REQUIRED
250REM F IS A FLAG INDICATING WHETHER WE HAVE YET REACHED THE DECIMAL POIN
T
260REM L IS THE NUMBER OF SIGNIFICANT FIGURES IN THE DENOMINATOR
270REM N IS INITIALLY THE NUMBER OF PLACES BEFORE THE POINT IN THE ANSWER
280REM N LATER BECOMES THE NUMBER OF DECIMAL PLACES REQUIRED
290REM P IS THE PLACE VALUE OF THE CURRENT ANSWER DIGIT
300REM X IS THE NUMBER OF PLACES BEFORE THE POINT IN THE NUMERATOR
310REM Y IS THE NUMBER OF PLACES BEFORE THE POINT IN THE DENOMINATOR
320
330 REM ENTRY SECTION * * * * * * * * * * * * * * * * * * * * * * * * * * *
*
340
350INPUT "How many places? "D
360PRINT
370INPUT "Enter the numerator: "N$
380PRINT
390INPUT "Enter the denominator: "D$
400
410 REM STANDARDIZE FORMAT * * * * * * * * * * * * * * * * * * * * * * * *
*
420
```


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PROGRAM FILE

```
430REM STRIP AND SAVE SIGNS
440
450S$=""
460IF LEFT$(N$,1)<>"-" THEN 490
470S$="-"
480N$=RIGHT$(N$,LEN(N$)-1)
490IF LEFT$(D$,1)<>"-" THEN 550
500IF S$="" THEN S$="-" ELSE S$=""
510D$=RIGHT$(D$,LEN(D$)-1)
520
530 REM STRIP LEADING ZERO(S)
540
550IF LEFT$(N$,1)<>"0" THEN 580
560N$=RIGHT$(N$,LEN(N$)-1)
570GOTO 550

580IF LEFT$(D$,1)<>"0" THEN 640
590D$=RIGHT$(D$,LEN(D$)-1)
600GOTO 580
610
620REM LOCATE AND REMOVE DECIMAL POINTS - IF ANY
630
640X=0
650IF X=LEN(N$) THEN 700
660IF MID$(N$,X+1,1)="." THEN 690
670X=X+1
680GOTO 650
690N$=LEFT$(N$,X)+RIGHT$(N$,LEN(N$)-X-1)
700Y=0
710IF Y=LEN(D$) THEN 760
720IF MID$(D$,Y+1,1)="." THEN 750
730Y=Y+1
740GOTO 710
750D$=LEFT$(D$,Y)+RIGHT$(D$,LEN(D$)-Y-1)
760N=X-Y
770
780REM COUNT AND REMOVE PLACE-VALUE ZEROES BETWEEN POINT AND FIRST SIG. FI
G.
790
800IF LEFT$(N$,1)<>"0" THEN 840
810N$=RIGHT$(N$,LEN(N$)-1)
820N=N-1
830GOTO 800
840IF LEFT$(D$,1)<>"0" THEN 910
850D$=RIGHT$(D$,LEN(D$)-1)
860N=N+1
870GOTO 840
880
890REM ALIGN FIRST SIG. FIGS. ACCORDING TO RELATIVE SIZES
900
910IF N$<D$ THEN 940
920N=N+1
930N$="0"+N$
940R$=N$
950D$="0"+D$
960L=LEN(D$)
970
980REM TEST FOR OVERFLOW. LIMIT No. OF DECIMAL PLACES IF NECESSARY
990
1000IF ABS(N)>252 THEN 2050
1010IF N+D>253 THEN D=253-N
1020
1030REM EXTEND REMAINDER OUT TO LENGTH OF DENOMINATOR, IF NECESSARY,
1040REM      WITH TRAILING ZEROS
1050
1060IF LEN(R$)>L THEN 1120
1070R$=R$+"0"
1080GOTO1060
1090
1100 REM SET UP TRIAL PRODUCTS * * * * * * * * * * * * * * * * * * * * * * *
*
1110
1120DIM T$(9)
1130
1140REM FIRST PRODUCT IS 1 * DENOMINATOR!
1150
1160T$(1)=D$
1170
1180REM REPEAT FOR EACH PRODUCT 2 * DENOMINATOR TO 9 * DENOMINATOR
1190
1200FOR B=2 TO 9
1210T$(B)=D$
1220T$(B)=""
1230H=0
1240
1250REM STEP BACKWARDS ALONG THE DENOMINATOR MULTIPLYING. H IS CARRY DIGIT.
1260
1270FOR C=L TO 2 STEP -1
1280G=(ASC(MID$(D$,C,1))-48)*B+H
1290H=G DIV 10
1300G=G MOD 10
1310T$(B)=CHR$(G+48)+T$(B)
1320NEXT C
1330T$(B)=CHR$(H+48)+T$(B)
1340NEXT B
1350
1360  REM GENERATE LEADING ZEROS IF ANY * * * * * * * * * * * * * * * * * * *
*
1370
1380F=0
1390A$=""
1400IF N>0 THEN 1550
1410A$="0."
1420IF N=0 THEN 1460
1430FOR P=1 TO -N
1440A$=A$+"0"
1450NEXT P
1460N=D+N
1470F=1
1480
1490 REM MAIN LOOP * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*
1500
1510REM HERE WE CALCULATE EACH DIGIT OF THE ANSWER BY LOOKING THROUGH THE
1520REM      TRIAL PRODUCTS IN DESCENDING ORDER UNTIL WE FIND ONE WHICH IS
1530REM      SMALLER THAN THE CURRENT REMAINDER
```

PROGRAM FILE

```
1540
1550FOR P=1 TO N
1560
1570REM TRY EACH TRIAL PRODUCT
1580
1590A=0
1600IF R$<D$ THEN 1640
1610A=10
1620A=A-1
1630IF R$<T$(A) THEN 1620
1640A$=A$+CHR$(48+A)
1650
1660REM SUBTRACT PRODUCT FROM REMAINDER
1670
1680IF A=0 THEN 1940
1690I=LEN(R$)-L
1700
1710REM IF THE CURRENT REMAINDER IS LONGER THAN THE DENOMINATOR, JUST COPY
1720REM      THE EXCESS DOWN
1730
1740IF I>0 THEN X$=RIGHT$(R$,I) ELSE X$=""
1750H=0
1760
1770REM AFTER EACH STAGE THE LEFTMOST DIGIT WILL BE ZERO AND BE DROPPED
1780

1790FOR C=L TO 2 STEP -1
1800G=ASC(MID$(R$,C,1))-ASC(MID$(T$(A),C,1))-H+48
1810IF G>47 THEN 1850
1820G=G+10
1830H=1
1840GOTO1860
1850H=0
1860X$=CHR$(G)+X$
1870NEXT C
1880
1890REM ADD A ZERO ON THE END OF THE REMAINDER TO GIVE SOMETHING FOR THE
1900REM      LEAST SIG. FIG. OF THE NEXT PRODUCT TO BE SUBTRACTED FROM
1910
1920R$=X$+"0"
1930GOTO1950
1940R$=RIGHT$(R$,LEN(R$)-1)+"0"
1950NEXT P
1960
1970REM INSERT DECIMAL POINT IN ANSWER AND RETURN TO MAIN LOOP, OR END.
1980
1990IF F=1 THEN 2030
2000A$=A$+"."
2010N=D
2020GOTO 1470
2030PRINT S$+A$
2040END
2050PRINT "OVERFLOW"
2060END
```

although it won't accept exponential form.

This month's programs

Program File in recent months has contained mostly very long programs, so this month I am concentrating on shorter programs. Program of the Month is for the Amstrad PCW range. It is a simple but well-programmed version of that favourite arcade game Kong where a gorilla runs around dodging things. The screens are held as data statements and can be easily edited to create new ones.

Other programs this month include a directory lister for the Psion Organiser, a program to provide menu control for MS-DOS, written in Turbo Pascal, a neat disk label printer in Microsoft Basic for the PC, two very useful BBC utilities and several other high quality programs for different machines.

Program of the Month
Amstrad PCW Kong
by Robert Cornwell

This program is a platform-style arcade game reminiscent of Donkey Kong. You have to manoeuvre your little man around screens full of ladders and walls, dodging rolling fireballs and picking up umbrellas for points.

The program uses Basic and a machine code subroutine, and has five playing screens. When all seven umbrellas have been collected, the man should be moved to the highest point of the screen and a new screen will appear. When screen five has been completed, the program loops back to screen one.

The control keys are: Z – left; X – right; J – jump; U – up.

The screens are stored as data statements, making it easy to edit them and allowing the user to add more screens by merging them in. The user-defined graphics are also held in data statements and can be changed.

```
10 REM KONG
20 :
30 REM by Robert Cornwell
40 :
50 REM user defined graphics
60 DATA 24,56,8,28,58,24,20,52
70 DATA 24,28,16,56,92,24,40,44
80 DATA 90,126,126,90,90,126,102,66
90 DATA 66,126,66,66,66,126,66,66
```


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PROGRAM FILE

```
100 DATA 255,1,1,1,1,1,1,255
110 DATA 255,128,128,128,128,128,128,255
120 DATA 255,0,241,17,31,0,255,0
130 DATA 255,0,17,170,68,0,255,0
140 DATA 255,195,165,153,153,165,195,255
150 DATA 60,30,15,15,23,35,65,96
160 DATA 24,126,102,219,219,102,126,24
170 DATA 231,153,153,255,255,153,153,231
180 :
190 REM Set up machine code
200 MEMORY &HCFFF
210 RESTORE 430
220 address=&HE000
230 FOR i%=1 TO 31
240   sum=0:READ code$,check$
250   FOR j%=1 TO 21 STEP 2
260     byte = VAL("&H"+MID$(code$,j%,2))
270     POKE address,byte
280     sum=sum+byte:address=address+1
290   NEXT
300   IF sum<>VAL("&h"+check$) THEN PRINT "Error":STOP
310 NEXT
320 ;
330 REM set pokes
340 screen=&HE000
350 print1=&HE003
360 udgs=&HD100
370 pen=&HD001
380 paper=&HD000
390 double=&HD006
400 GOTO 750
410 :
420 REM Machine Code
430 DATA c306e0c35be0cd29e01198,626
440 DATA 2c2100b60168013e20f5d5,395
450 DATA 3e0873237223133d20f8d1,3aa
460 DATA eb09ebf13d20ecc9c1cd5a,6ca
470 DATA fce900c9661a6f2202d00a,49b
480 DATA 3210d0030a6f030a67ed4b,33a
490 DATA 10d006001113d0edb02a02,3a3
500 DATA d0cdfce02204d02113d022,595
510 DATA 11d0c9cd30e0cd29e0f32a,67a
520 DATA 11d07e232211d0cdeae011,52d
530 DATA 4fe1010800edb0dd2a04d0,4b1
540 DATA 0e08fd214fe12a00d07d06,3e1
550 DATA 08fdcb000638 0d07ddcb08,3d2
560 DATA 16ddcb001607c3a4e0cb04,4f1
570 DATA ddcb0816ddcb0016cb04dd,530
580 DATA cb0816ddcb001610d7fd23,4ae
590 DATA 3a06d0a7cad1e0dd7e08dd,672
600 DATA 7709dd7e00dd7701dd2379,4a9
610 DATA fe05c2d1e001c802dd094f,576
620 DATA dd2300dc282e02a04d00110,440
630 DATA 00092204d02110d035c262,359
640 DATA e0fbc91100b8fe20300311,4cf
650 DATA 00d16f260029292919c95c,31f
660 DATA 260054cb25010fe1094e23,2d5
670 DATA 46eb29292909c93059005c,363
680 DATA d05ea06170644067106ae0,504
690 DATA 6cb06f907250752078f07a,544
700 DATA c07d9080608330860089d0,53f
710 DATA 8ba08e709140941097e099,5ae
720 DATA b09c809f50a220a5f0a7c0,679
730 DATA aa90ad60b0000000000000,2f7
740 :
750 REM initialise
760 PRINT CHR$(27)+"f"
770 score%=0:level=1:lives=3
780 DIM a%(45,31),bx%(2),by%(2),bd%(2),sp$(2)
790 POKE paper,0
800 POKE double,0
810 POKE pen,255
820 s$=" ":sp$(1)=s$:sp$(2)=s$:st$=s$
830 bx%(1)=2:by%(1)=3:bd%(1)=1
840 bx%(2)=82:by%(2)=3:bd%(2)=2
850 :
860 REM Set up graphics
870 RESTORE 60
880 FOR i=0 TO 95:READ j:POKE udgs+i,j:NEXT:ml$=CHR$(0)
890 ml$=CHR$(0):mr$=CHR$(1):mu$=CHR$(2):l$=CHR$(3):b1$=CHR$(4):br$=CHR$(5):p1$=C
HR$(6):p2$=CHR$(7):el$=CHR$(8):u$=CHR$(9):b$=CHR$(10
)
:e2$=CHR$(11)
900 CALL screen
910 :
920 REM Set up Screen
930 IF level=1 THEN RESTORE 1920:pl$=p2$:e$=el$
940 IF level=2 THEN RESTORE 2260:pl$=pl$:e$=e2$
950 IF level=3 THEN RESTORE 2600:pl$=p2$:e$=e2$
960 IF level=4 THEN RESTORE 2940:pl$=p1$:e$=el$
970 IF level=5 THEN RESTORE 3280:pl$=p2$:e$=e2$
980 PRINT CHR$(27)+"E"+CHR$(27)+"H"
990 POKE double,1:a$="SCORE="+STR$(score%):scx%=2:scy%=29:CALL print1(scx%,scy%
a$):POKE double,0
1000 FOR y%=0 TO 31:READ t$:FOR x%=0 TO 45:t%=VAL(MID$(t$,(x%+1),1)):a%(x%,y%)=t
%
1010   x1%=x%*2:IF t%=0 THEN GOTO 1080
1020   IF t%=1 THEN CALL print1(x1%,y%,pl$):GOTO 1080
1030   IF t%=2 THEN CALL print1(x1%,y%,b1$):GOTO 1080
1040   IF t%=3 THEN CALL print1(x1%,y%,br$):GOTO 1080
1050   IF t%=4 THEN CALL print1(x1%,y%,e$):GOTO 1080
1060   IF t%=5 THEN CALL print1(x1%,y%,l$):GOTO 1080
1070   CALL print1(x1%,y%,u$)
1080 NEXT:NEXT
1090 mx%=10:my%=27:d%=1:CALL print1(mx%,my%,mr$)
1100 m$=mr$:par%=0
1110 y1%=30:FOR x1%=0 TO (lives-1):x%=x1%*2+40:CALL print1(x%,y1%,mr$):NEXT
1120 x%=35:y%=1:a$="LEVEL"+STR$(level):CALL print1(x%,y%,a$)
1130 ;
1140 REM start loop
1150 a$=INKEY$:IF a$="z" THEN GOSUB 1340:GOTO 1220
1160 IF a$="u" AND a%((mx%/2),my%)=5 THEN CALL print1(mx%,my%,l$):my%=my%-1:CALL
 print1(mx%,my%,mu$):IF a%((mx%/2),my%)=0 THEN CALL
print1(mx%,my%,m$):IF mx%=76 AND my%=1 THEN GOTO 1880
1170 IF a$="j" THEN GOSUB 1610:GOTO 1190
1180 IF a$="x" THEN GOSUB 1410:GOTO 1220
1190 z%=a%((mx%/2),my%):IF z%=5 THEN st$=l$ ELSE st$=s$
1200 IF m$=ml$ THEN j%=-j%
1210 z%=a%(((mx%+j%)/2),(my%+1)):IF z%=0 OR z%=6 THEN CALL print1(mx%,my%,st$):m
y%=my%+1:mx%=mx%+j%:CALL print1(mx%,my%,m$)
1220 j%=0:z%=a%((mx%/2),my%):IF z%=5 THEN st$=l$ ELSE st$=s$
1230 IF a%((mx%/2),my%)=6 THEN par%=par%+1:GOSUB 1750
1240 n%=n%+1:IF n%=3 THEN n%=1
1250 bx%=bx%(n%):by%=by%(n%):IF mx%=bx% AND my%=by% THEN GOSUB 1920
1260 IF bd%(n%)=1 THEN GOSUB 1480
1270 IF bd%(n%)=2 THEN GOSUB 1550
```

PROGRAM FILE

```
1280 bx%(n%)=bx%:by%(n%)=by%:IF a%((bx%(n%)/2),by%(n%))=5 THEN sp$(n%)=l$ ELSE s
p$(n%)=s$
1290 IF mx%=bx% AND my%=by% THEN GOSUB 1820
1300 GOTO 1150
1310 REM subroutines
1320 :
1330 REM move right
1340 IF m$=mr$ THEN CALL print1(mx%,my%,ml$):m$=ml$:RETURN
1350 q%=a%(((mx%/2)-1),my%):IF q%=4 OR q%=2 OR q%=1 THEN RETURN
1360 IF q%=0 OR q%=5 OR q%=6 THEN CALL print1(mx%,my%,st$):mx%=mx%-2:ELSE RETURN
1370 w%=a%((mx%/2),(my%+1)):IF w%=0 OR w%=6 THEN my%=my%+1
1380 CALL print1(mx%,my%,ml$):RETURN
1390 :
1400 REM move left
1410 IF m$=ml$ THEN CALL print1(mx%,my%,mr$):m$=mr$:RETURN
1420 q%=a%(((mx%/2)+1),my%):IF q%=4 OR q%=2 OR q%=1 THEN CALL print1(mx%,my% st$
):GOTO 1440
1430 IF q%=0 OR q%=5 OR q%=6 THEN CALL print1(mx%,my%,st$):mx%=mx%+2:ELSE RETURN
1440 w%=a%((mx%/2),(my%+1)):IF w%=0 OR w%=6 THEN my%=my%+1
1450 CALL print1(mx%,my%,mr$):RETURN
1460 :
1470 REM move ball
1480 c$=sp$(n%):q%=a%(((bx%(n%)/2)+1),(by%(n%)+1)):IF q%=0 OR q%=5 OR q%=6 THEN
CALL print1(bx%,by%,c$):bx%=bx%+2:by%=by%+1:CALL pri
nt1(bx%,by%,b$):RETURN
1490 q%=a%(((bx%(n%)/2)+1),by%(n%)):IF q%=0 OR q%=5 OR q%=6 THEN CALL print1(bx%
,by%,c$):bx%=bx%+2:CALL print1(bx%,by%,b$):RETURN
1500 q%=a%((bx%(n%)/2),(by%(n%)+1)):IF q%=0 OR q%=5 OR q%=6 THEN CALL print1(bx%
,by%,c$):by%=by%+1:CALL print1(bx%,by%,b$):RETURN
1510 bd%(n%)=2
1520 IF n%=1 AND bx%=86 AND by%=27 THEN CALL print1(bx%,by%,s$):bv%=3:CALL print
1(bx%,by%,b$)
1530 IF n%=2 AND bx%=86 AND by%=27 THEN CALL print1(bx%,by%,s$):by%=3:bx%=4:CALL
 print1(bx%,by%,b$)
1540 RETURN
1550 c$=sp$(n%):q%=a%(((bx%(n%)/2)-1),(by%(n%)+1)):IF q%=0 OR q%=5 OR q%=6 THEN
CALL print1(bx%,by%,c$):bx%=bx%-2:by%=by%+1:CALL pri
nt1(bx%,by%,b$):RETURN
1560 q%=a%(((bx%(n%)/2)-1),by%(n%)):IF q%=0 OR q%=5 OR q%=6 THEN CALL print1(bx%
,by%,c$):bx%=bx%-2:CALL print1(bx%,by%,b$):RETURN
1570 q%=a%((bx%(n%)/2),(by%(n%)+1)):IF q%=0 OR q%=5 OR q%=6 THEN CALL print1(bx%
,by%,c$):by%=by%+1:CALL print1(bx%,by%,b$):RETURN
1580 bd%(n%)=1:RETURN
1590 :
1600 REM Jump
1610 q%=a%((mx%/2),(my%+1)):IF q%=0 OR q%=6 THEN RETURN
1620 j%=2:q%=a%((mx%/2),(my%-1)):IF q%>0 AND q%<5 THEN GOSUB 1820
1630 CALL print1(mx%,my%,st$):IF m$=ml$ THEN m%=-2:ELSE m%=2
1640 my%=my%-1
1650 CALL print1(mx%,my%,m$)
1660 IF a%((mx%/2),my%)=6 THEN par%=par%+1:GOSUB 1750
1670 IF a%((mx%/2),my%)=5 THEN st$=l$ ELSE st$=s$
1680 q%=a%(((mx%+m%)/2),(my%-1)):IF q%>0 AND q%<5 THEN GOSUB 1820
1690 CALL print1(mx%,my%,st$):mx%=mx%+m%:my%=my%-1:CALL print1(mx%,my%,m$)
1700 IF a%((mx%/2),my%)=6 THEN par%=par%+1:GOSUB 1750
1710 IF a%((mx%/2),my%)=5 THEN st$=l$ ELSE st$=s$
1720 RETURN
1730 :
1740 REM Hit parasol
1750 a%((mx%/2),my%)=0:PRINT CHR$(7);CHR$(7);:score%=score%+100
1760 POKE double,1:a$=STR$(score%):scx%=14:scy%=29:CALL print1(scx%,scy%,a$):POK
E double,0
1770 ox%=86-(par%*2):oy%=30:CALL print1(ox%,oy%,u$)
1780 POKE double,0
1790 RETURN
1800 :
1810 REM end game
1820 PRINT CHR$(7):CALL print1(mx%,my%,st$):mx%=4:my%=20:CALL print1(mx%,my%,m$)
1830 lives=lives-1:IF lives=-1 THEN x%=40:y%=17:a$="GAME OVER":CALL print1(x%,y%
,a$):RUN
1840 x1%=40+(2*lives):y1%=30:CALL print1(x1%,y1%,s$)
1850 RETURN
1860 :
1870 REM Next Screen
1880 IF par%=7 THEN level=level+1:IF level=6 THEN level=1:GOTO 800 ELSE GOTO 800
1890 GOTO 1150
1900 :
1910 REM Screen 1
1920 DATA 44444444444444444444444444444444444444444444444444
1930 DATA 40000000000000000000000000000000000000000000000004
1940 DATA 40000000000000000000000000000000000000000000500004
1950 DATA 40000000000000000000000000000000000000000000500004
1960 DATA 40000000000000000000000000000000000000000000500004
1970 DATA 41111111111111111111001111111111111111111111111114
1980 DATA 40000000000000000000000000000000000000000000000004
1990 DATA 40060000000000001111111511111111111111111111111114
2000 DATA 40000000000000000000000500000000006000000000000004
2010 DATA 41111111111111100000005000000111111111111000000004
2020 DATA 40000000000000000000000500000000000000000000000004
2030 DATA 40000000000000000000001111111100000000000000000004
2040 DATA 40000000000000000000000000000000000000000000000604
2050 DATA 42323232323232323232320000000000000000323234
2060 DATA 42323232323232323232320000000000000000323234
2070 DATA 42323232323232323200001111111511111100000004
2080 DATA 42323232320000000000000000000000500000000604
2090 DATA 42323200000000000000000000320050000000000004
2100 DATA 40000000000001111111111111111111000000000004
2110 DATA 40000000000000000000000000000000001111111114
2120 DATA 46000000000000000000000000000000111000000004
2130 DATA 42323232000000000000000000000500000000000064
2140 DATA 42323232000000000001111111111050000000003234
2150 DATA 42323211111111151110000000000500000000323244
2160 DATA 42323200000000050000000000000323232323234
2170 DATA 42323200000000500000000000000060323232324
2180 DATA 42323200000111111111111111111001111323232324
2190 DATA 40000000000000000000000000000000000000000004
2200 DATA 41111111111111111111111111111111111111111114
2210 DATA 40000000000000000000000000000000000000000004
2220 DATA 40000000000000000000000000000000000000000004
2230 DATA 44444444444444444444444444444444444444444444
2240 :
2250 REM Screen 2
2260 DATA 44444444444444444444444444444444444444444444
2270 DATA 40000000000000000000000000000000000000000004
2280 DATA 40000000000000000000000000000000000000500004
2290 DATA 40000000000000000000000000000000000000500004
2300 DATA 40000000000000000000000000000000000000500004
2310 DATA 42323232323232000011111111111111111111111114
2320 DATA 42323232323232000000000000000000000000000064
2330 DATA 42323232323232001111111111111111111111100004
2340 DATA 42323232323232000000000000000000000000000004
2350 DATA 42323232323232000000111111151111111111111114
2360 DATA 42323232320000000000000000500000000000000004
2370 DATA 42323232600000000000000000500000000000000004
2380 DATA 42321111115111111111111111111001111111111114
```


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2390 DATA 420000000005000000000000000006000000000000004
2400 DATA 400000000005000000000000001111111111000000004
2410 DATA 411111111111115111111110000000000032323234
2420 DATA 400000000000005000000000000000000000032324
2430 DATA 400000000000005000000000006000011110006034
2440 DATA 411111111111111100000000000000000000000004
2450 DATA 400000000000000001111000000000000000000004
2460 DATA 406000000000000000001111111111151111114
2470 DATA 400000000000000000000000000000000500000004
2480 DATA 411111111111151100000000600000000500000004
2490 DATA 400000000000050000000000000323232323232324
2500 DATA 400000000000050000000000000000323232323234
2510 DATA 411111111111111111111111111000000323232324
2520 DATA 400000000000000000000000001151100000003234
2530 DATA 400000000000000000000000000500000000004
2540 DATA 411111111111111111111111111111111111111114
2550 DATA 400000000000000000000000000000000000000004
2560 DATA 400000000000000000000000000000000000000004
2570 DATA 444444444444444444444444444444444444444444
2580 :
2590 REM Screen 3
2600 DATA 444444444444444444444444444444444444444444
2610 DATA 400000000000000000000000000000000000000004
2620 DATA 400000000000000000000000000000000005000004
2630 DATA 400060000000000000000000000000000005000004
2640 DATA 400000000000000000000000000000000005000004
2650 DATA 400000000000000000001111111111111111111114
2660 DATA 432323232111111115111100000000000000000004
2670 DATA 423232320000000050000000000000000000003234
2680 DATA 432323200000000050000000111111111151132324
2690 DATA 423232321011111111111110000000600050000324
2700 DATA 432000000000000000000000000000000050000324
2710 DATA 400000000000000000000001111111111111111114
2720 DATA 411110111111111111111115111000000000000064
2730 DATA 400000000600000000050000000000000323232324
2740 DATA 400000000000000000005000000000000323232324
2750 DATA 400000000000000011111111111111111132324
2760 DATA 432323232323232000000001000600000000003234
2770 DATA 423232323231111111100000000000000000000004
2780 DATA 432323232000000000000000000000000000000004
2790 DATA 400000000000006000011111111111111111151114
2800 DATA 400000600000000000000000000000000000050004
2810 DATA 400111100000000000000000000000000000050004
2820 DATA 400060000111111111511111111111111111111114
2830 DATA 400000000000000050000000000000000000000004
2840 DATA 400000000000000005000000000000000000000004
2850 DATA 411111111111111111111151111111111111111114
2860 DATA 400000000000000000000050000000000000000004
2870 DATA 400000000000000000000005000000000000000004
2880 DATA 411111111111111111111111111111111111111114
2890 DATA 400000000000000000000000000000000000000004
2900 DATA 400000000000000000000000000000000000000004
2910 DATA 444444444444444444444444444444444444444444
2920 :
2930 REM Screen 4
2940 DATA 444444444444444444444444444444444444444444
2950 DATA 400000000000000000000000000000000000000004
2960 DATA 400000000000000000000000000000000005000004
2970 DATA 400000000000000000000000000000000005000004
2980 DATA 400000000000000000000000000000000005000004
2990 DATA 411111115111111111111111111111011111111114
3000 DATA 460000005000000000000000000000000000000064
3010 DATA 411111111111111111000000000000003232323234
3020 DATA 400000000000000000000000000000000063232324
3030 DATA 400000000000000001111111111115111323234
3040 DATA 432323232323232320000000000000500000032324
3050 DATA 423232323200600000000000000111111111323234
3060 DATA 432320000000000000115110000000000000000004
3070 DATA 400000000000000000005000000000000000000004
3080 DATA 411111115111000000005000000000000011114
3090 DATA 400000005000000011111111111111111111000004
3100 DATA 400000005000001110000000000000600000000004
3110 DATA 400001111115100000000000000011100000000064
3120 DATA 400000000005000000000000000000000000000004
3130 DATA 400000000005000000000011111100000000000004
3140 DATA 400000011111111111115111000000000003232324
3150 DATA 400060000000000000005000000000000323234
3160 DATA 400000000000000000005000000000000000000004
3170 DATA 400000000011111111111110000000000000000004
3180 DATA 432323232320000000000011111111115111114
3190 DATA 423232000000000000000000000000000500000004
3200 DATA 432320000000000000000000000000000500000004
3210 DATA 400000000000000000000000000000000500000004
3220 DATA 411111111111111111111111111111111111111114
3230 DATA 400000000000000000000000000000000000000004
3240 DATA 400000000000000000000000000000000000000004
3250 DATA 444444444444444444444444444444444444444444
3260 :
3270 REM Screen 5
3280 DATA 444444444444444444444444444444444444444444
3290 DATA 400000000000000000000000000000000000000004
3300 DATA 406000000000000000000000000000000005000004
3310 DATA 400000000000000000000000000000000005000004
3320 DATA 400000000000000000000000000000000005000004
3330 DATA 411111111511111111111101032323232323232324
3340 DATA 400000000500000000000000000000003232323234
3350 DATA 411111011111111111111110000000003232323234
3360 DATA 400000000000000000000001111111115111116323234
3370 DATA 400000000000000000000000000000500000000324
3380 DATA 411111111111151111100000000000050000000004
3390 DATA 400000000000005000000000011111111111111114
3400 DATA 423232000000050000000010000000000000000004
3410 DATA 432321111111111111511100000000000000000064
3420 DATA 423200000000000005000000000000003232323234
3430 DATA 432000000000000005000000011111113232323234
3440 DATA 411111111111111111110000000000003232323234
3450 DATA 400000000000000000001111511100000000000004
3460 DATA 400000000000000000000005000000000000000064
3470 DATA 411111111111111100000000050000000003232324
3480 DATA 400000000000000001111111111111111100323234
3490 DATA 400060000000000000000000000006000000000004
3500 DATA 400000000001115111000000000000000011111114
3510 DATA 400000000000005000000000000000000000000004
3520 DATA 411111101111111111111111111111111000000064
3530 DATA 400000000000000000000000000000000003232324
3540 DATA 411111111100000000000000000000011103234
3550 DATA 400000000000000000000000000000000000000004
3560 DATA 411111111111111111111111111111111111111114
3570 DATA 400000000000000000000000000000000000000004
3580 DATA 400000000000000000000000000000000000000004
3590 DATA 444444444444444444444444444444444444444444
```

PROGRAM FILE

Psion Organiser Directory Utility

by Lawrence Blanchard

When I first bought my Psion Organiser, the one thing that really frustrated me was the fact that the manual states that there is a file called 'MAIN' on each DataPAK, but I couldn't find one. Nor could I see any subsequent files which I created.

The following is a DIR utility which will allow a user to see all the files on a specified DataPAK.

How to create DIR

1) Select the PROG option from the main menu.
2) Select NEW from the programming sub-menu.
3) Type the name of the procedure you are going to enter (that is, MAIN followed by <EXE>).
4) Type the procedure as it is listed, but without the line numbers or comments (it may all be entered in upper case if that is more convenient).
5) When the procedure has been entered, press the <ON> key. Select TRANS and SAVE the procedure.
6) Follow steps 1 to 5 for each of the procedures listed below.

How to install DIR

1 With the cursor, move to the place within the main menu where you would like to insert DIR.
2 Press the <MODE> key.
3 Type DIR and press <EXE>.

How to use DIR

1) Select DIR from the main menu.
2) It should display DIR A:. Press the <Mode> key until the correct DataPAK is selected, then press the <EXE> key.
3) Each time <EXE> is pressed, the next file will be displayed along with the number of records within that particular file.
4) When there are no more files to be displayed, the 'END OF PAK' message will be displayed; <EXE> will redisplay the files; and <ON> will terminate the listing and return to the main menu.

DIR:	The Main Program segment
NDEVICE:	Return the number of the next DataPAK
STRIP$:	Strip all the white space from a string
GETKEY:	Fetch a key, exit program if it is <ON>
WAIT4:	Wait for the specified key to be pressed
ERROR:	Perform required error-handling
EOP:	Display the 'END OF PAK' message

NB: $A2 stores the current DataPAK reference

```
01      DIR:
02              Local C%,D$(1),K%,P$(16),N$(1),B%,B$(5)
03              Onerr ERROR::
04      start::
05              C% = Peekb($A2)
06              N$ = ""
07              Cls
08              Cursor ON
09              Do
10                      D$ = Chr$(%A + C%)
11                      At 1,1
12                      Print "DIR ";D$;":";
13                      K% = GETKEY:
14                      If K = 2
15                              C% = NDEVICE:(C%)
16                              Pokeb $A2,C%
17                      Endif
18              Until K% = 13
19              Cursor OFF
20      loop::
21              Cls
22              P$ = DIR$(D)
23              Do
24                      Open P$,A,F%
25                      B% = COUNT
26                      Close
27                      B$ = STRIP$:(GEN$(B%),4))
28                      P$ = P$ + REPT$(" ",16-Len(P$)-Len(B$))+B$
29                      Print P$
30                      GETKEY:
31                      P$ = DIR$(N$)
```


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PROGRAM FILE

```
32              Until P$ = ""
33              EOP:
34              Goto loop::
35      ERROR::
36              ERROR:
37              Return

01      EOP:
02              Cls
03              At 1,1
04              Print "******************END OF PACK***"
05              GETKEY:
06              Cls
07              Return

01      GETKEY:
02              Local K%
03              K% = GET
04              If K% = 1
05                      Stop
06              Endif
07              Return(K%)

01      ERROR:
02              Cls
03              Print Chr$(16)
04              At 1,1
05              Print ERR$(ERR)
06              At 1,2
07              Print "press space key"
08              WAIT4:(" ")
09              Return

01      WAIT4:(W$)
02              Local K$(1)
03              Do
04              Until Chr$(GETKEY:) = W$
05              Return

01      NDEVICE:(C%)
02              Local B%,D$(1),M$(5)
03              M$ = ":MAIN"
04              B% = C%
05              Do
06                      B% = B%+1
07                      If B% > 2
08                              B% = 0
09                      Endif
10                      D$ = Chr$(%A + B%)
11              Until Exist(D$ + M$)
12              Return(B%)

01      STRIP$:(IN$)
02              Local OUT$(255),L%,C$(1),C%
03              L% = Len(IN$)
04              While L% > 00
05                      C$ = Mid$(IN$,L%,1)
06                      C% = Asc(C$)
07                      If C% <> 00 And C% <> 09 And C% <> 32
08                              OUT$ = C$ + OUT$
09                      Endif
10                      L% = L% - 1
11              Endwh
12              Return(OUT$)
```

Turbo Pascal Menus for the IBM

by Simon Maneggio

This is a menu control program for the IBM, this time written in Turbo Pascal. It is simpler than the Basic program XT Manager (Program File, *PCW* September) but uses graphics in a neat way for making selections. The two programs make a good contrast in programming styles and

PROGRAM FILE

approach, especially since they have been written in different languages.

When the program is run, you can set the title of the whole menu, save the current menu, delete an entry or quit. You can also insert new menu entries by selecting an entry (press one of the function keys or move to the entry using the cursor keys). The screen changes to allow you to enter a name for the menu item and the command which the menu item is to perform; this can be any one-line DOS command. In practice it would be sensible to use a batch file name, so that the batch file can then issue a series of commands.

Remember that the batch file must return to the menu directory and run the menu again before ending. The final decision is whether or not to return to the menu on ending — *not* returning is a sensible way to terminate use of the menu.

When a menu created in this way is saved, you are asked to supply a menu name. Two files are then created, 'menuname' .mnu and 'menuname'.bat. The second of these actually runs the menu and the first holds details of the choice. To use a created menu, simply type 'menuname' then select items using the cursor keys or function keys.

To enter the program, type it in and compile it to a COM file using Turbo's options menu. The compiled file MENU.COM should be kept in the same directory as the menus and batch files.

```
program MenuGenerator;

{ By S.Maneggio 06/06/87                                              }
{ Compile this file to a COM file called menu.com                     }
{ To execute a menu you have created type the name of the menu.       }

type
MenChoiceRec = Record
                  Title       : string[11];
                  command     : string[70];
                  ReturnToMen : boolean;
                  Defined     : boolean;
               end; { record }
MenDetRec = Record
              MenuTitle : string[40];
              Choices : array[1..10] of MenChoiceRec
            end;
var
   MenuDetFile : file of MenDetRec;
   MenuDetails : MenDetRec;
   BatchFile   : text;
   MenuName    : string[8];
   FileName    : string[12];
   MenuTitle   : string[30];
   Choice      : char;
   DispStat    : 0..1;
   CurrentChoice, LastChoice, KeyChoice : 1..10;
   QuitGenerator, QuitMenu, Generate, SelectedChoice, FileExists : boolean;

procedure InitializeChoices; { Mark all choices undefined }
var i : integer;
begin
   for i := 1 to 10 do
      MenuDetails.Choices[i].Defined := FALSE;
   MenuDetails.MenuTitle := '';
end;

procedure DrawBox(x, y, width, height : integer);
begin
   draw(x, y, x + width, y, DispStat);
   draw(x + width, y, x + width, y + height, DispStat);
   draw(x + width, y + height, x, y + height, DispStat);
   draw(x, y + height, x, y, DispStat);
end;

procedure DrawFrame(x, y, width, height : integer);
begin
   DrawBox(x , y  , width , height);
   DrawBox(x + 2, y + 2, width - 4, height - 4);
end;

procedure displayMenu;
var x, y, sx, n : integer;

begin
   DispStat := 1;
   graphcolormode;
   graphbackground(lightblue);
   palette(2);
   textcolor(3);
   gotoxy(20 - (length(MenuDetails.MenuTitle) DIV 2), 1);,
   writeln(MenuDetails.MenuTitle);
   sx := 2;
   n := 1;
   for x := 1 to 2 do begin
      for y := 1 to 5 do begin
         gotoxy( sx, 2 + y * 4 );
         textcolor(1);
         writeln('F',n);
         textcolor(3);
         gotoxy( sx + 6, 2 + y * 4);
         if MenuDetails.choices[n].Defined = TRUE then
            writeln(MenuDetails.choices[n].Title);
         DrawFrame((sx * 8) - 16, (( 2 + y * 4 ) * 8) - 12, 40, 14);
         n := n + 2;
      end; { for }
      n := 2;
      sx := 22;
   end; { for }
   if generate then begin
      gotoxy(1,25);
      write('T(itle)    R(emove)    S(ave)    Q(uit)')
   end
end;
```


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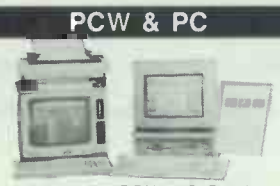

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PROGRAM FILE

```
procedure DisplayChoiceFrame(num : integer);
var x, y:integer;
begin
   if num mod 2 = 0 then
      x := 206
   else
      x := 46;
   y := ( 6 + ( ( num - 1 )  div 2 ) * 4 ) * 8 - 16;
   DrawFrame(x, y, 108, 24);
end;

function DetectKey( var Key1, Key2 : char) : boolean;
begin
   Key1 := £0; Key2 := £0;
   if keypressed then begin
      DetectKey := TRUE;
      read(kbd,Key1);
      if (Key1 = £27) and keypressed then
         read(kbd,Key2);
   end
   else
      DetectKey := FALSE
end;

procedure GetChoiceDetails;
var TempRetMen : char;
begin
   clrscr;
   writeln('CHOICE F-',CurrentChoice);
   writeln;
   writeln;
   writeln('Title of choice (Maximum Length of 11) >>');
   writeln;
   writeln('Command (Maximum Length of 80) >>');
   writeln;
   writeln('Return to the menu after executing command (Y/N) >>');
   gotoxy(42,4);
   readln(MenuDetails.choices[CurrentChoice].Title);
   gotoxy(34,6);
   readln(MenuDetails.choices[CurrentChoice].command);
   repeat
      gotoxy(52,8);
      read(TempRetMen);
      TempRetMen := upcase(TempRetMen);
   until TempRetMen in ['Y','N'];
   MenuDetails.choices[CurrentChoice].ReturnToMen := ( TempRetMen = 'Y');
   MenuDetails.choices[CurrentChoice].Defined := TRUE;
end;

procedure GetMenuTitle;
begin
   clrscr;
    write('New Menu Title (Maximum Length 40) >>');
   readln(Menudetails.MenuTitle)
end;

procedure CreateBatchFile;
var i: integer;
Stri : string[2];
begin
   filename := menuname + '.BAT';
   writeln('Creating File ',filename);
   assign(BatchFile, filename);
   rewrite(BatchFile);
   writeln(BatchFile,':start');
   writeln(BatchFile,'echo off');
   writeln(BatchFile,'Menu ',menuname);
   for i := 10 downto 1 do begin
      if i = 10 then
         Stri := '10'
       else
          Stri := chr(i + 48);
      if menuDetails.choices[ i].defined = TRUE then begin
         write(BatchFile,'if not errorlevel ' ,stri,' goto NotF');
         writeln(BatchFile,stri);
         writeln(BatchFile,menuDetails.choices[i].command);
         if MenuDetails.Choices[i].ReturnToMen = FALSE then
            writeln(BatchFile,'goto quitmenu')
         else


            writeln(BatchFile, 'goto skip');
         write(BatchFile,':NotF');
         writeln(BatchFile,stri);
      end; { if }
   end; { for }
   writeln(BatchFile,':skip');
   writeln(BatchFile,'goto start');
   writeln(BatchFile,':quitmenu');
   close(BatchFile);
end;

procedure GetMenuName;
begin
   clrscr;
   write('Name of menu (Maximum Length 8) >>');
   gotoxy(1,50);
   readln(Menuname);
end;

procedure SaveMenuDetails;
var i: integer;
begin
   assign(MenuDetFile,filename);
   writeln('Saving to file ', filename);
   rewrite(MenuDetFile);
   write(MenuDetFile, MenuDetails);
   close(MenuDetFile);
end;

procedure SaveControler ;
begin
   clrscr;
   if choice = 'C' then begin
     GetMenuName;
     FileName := MenuName + '.MNU'
   end; { if }
   SaveMenuDetails;
   CreateBatchFile;
end;
```

```
procedure LoadMenuDetails;
var i: integer;
begin
   assign(MenuDetFile,Filename);
   {$i-} reset(MenuDetFile) {$i+};
   if IOresult = 0 then begin
      read(MenuDetFile, MenuDetails);
      close(MenuDetFile)
   end { if }
   else
      FileExists := FALSE;
end;

procedure LoadControler;
begin

   GetMenuName;
   Filename := MenuName + '.MNU';
   LoadMenuDetails;
end;

procedure GetCommand;
var
   Key1, Key2 : char;
   ValidCommand : boolean;
begin
   ValidCommand := FALSE;
   while not(ValidCommand) do
      if DetectKey( Key1, Key2) then begin
         ValidCommand := TRUE;
         if Key1 = £27 then begin
            if ( ord(Key2) >= 59 ) and ( ord(Key2) <= 68 ) then begin
               CurrentChoice := ( ord(Key2) - 58 );          { function key }
               SelectedChoice := TRUE
            end { if }
            else begin
               case key2 of  { Check keypad cursor keys }
                  £77 : if CurrentChoice < 10 then              { cur right }
                           CurrentChoice := ( CurrentChoice + 1 );
                  £75 : if CurrentChoice > 1 then               { cur left }
                        CurrentChoice := ( CurrentChoice - 1 );
                  £72 : if CurrentChoice > 1 then               { cur up   }
                           if CurrentChoice = 2 then
                              CurrentChoice := 9
                           else
                              CurrentChoice := ( CurrentChoice - 2 );
                  £80 : if CurrentChoice < 10 then              { cur down }
                           if CurrentChoice = 9 then
                              CurrentChoice := 2
                           else
                              CurrentChoice := ( CurrentChoice + 2 );
               end { case }
            end { else }
         end { if }
         else
            if upcase(Key1) = £13 then          { Return pressed }
               SelectedChoice := TRUE
            else
               if generate then
                  case upcase(key1) of
                     'T' : begin                { Change Menu Title }
                              GetMenuTitle;
                              DisplayMenu;
                           end;
                     'S' : begin                { Save Menu }
                              SaveControler;
                              DisplayMenu;
                           end;
                     'R' : begin                { Remove choice }
                              menudetails.choices[CurrentChoice].defined := FALSE;
                              DisplayMenu;
                           end;
                     'Q' : QuitMenu := TRUE;    { Quit Menu Generator }
                  end; { case }
      end; { if }
   if SelectedChoice then
      if menudetails.choices[CurrentChoice].defined = TRUE then
         KeyChoice := CurrentChoice;                          { Chosen }
end;

procedure AmmendOrNewPrompt;
begin
   textmode;
   textbackground(black);
   clrscr;
   writeln('Do you wish to (C) Create a new menu');
   writeln('                (A) Ammend an existing menu');
   writeln('                (Q) Quit');
   writeln;
   repeat
      read(kbd,choice);
      choice := upcase(choice);
until choice in ['C','A','Q'];
end;

procedure OperateMenu;
begin
   DispStat := 1;
   LastChoice := CurrentChoice;
   DisplayChoiceFrame(CurrentChoice);        { Display choice Frame }
   GetCommand;
   DispStat := 0;
   DisplayChoiceFrame(LastChoice);           { Delete choice Frame }
end;

begin
  if paramcount = 1 then begin          { Use menu }
     KeyChoice := 0;
     CurrentChoice := 1;
     Generate := FALSE;
     Filename := paramstr(1) + '.MNU';
     LoadMenuDetails;
     displayMenu;
     repeat
        SelectedChoice := FALSE;
        OperateMenu;
        if SelectedChoice then
           if menudetails.choices[CurrentChoice].defined = TRUE then
              KeyChoice := CurrentChoice;   { Chosen }
     until keyChoice <> 0;
```


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```
        clrscr;
        halt(KeyChoice);      { Return choice to batchfile as an msdos errorlevel}
    end { if }
    else begin                                  { Generate Menu }
        Generate := TRUE;
        QuitGenerator := FALSE;
        repeat
            FileExists := TRUE;
            InitializeChoices;
            AmmendOrNewPrompt;
            if choice <> 'Q' then begin
                if choice = 'A' then
                    LoadControler;
                if FileExists then begin
                    displayMenu;
                    CurrentChoice := 1;
                    QuitMenu := FALSE;
                    repeat
                        SelectedChoice := FALSE;
                        OperateMenu;
                        if SelectedChoice then begin
                            GetChoiceDetails;           { Change choice }
                            DisplayMenu;
                        end; { if }
                    until QuitMenu;
                end { if }
                else begin
                    writeln; writeln('Menu File Does not exist. Press any key');
                    repeat until keypressed;
                end { else }
            end { if }
            else
                QuitGenerator := TRUE;
        until QuitGenerator;
    end; { else }
end.
```

MBasic Disk Labeller

by Ken Smith

Disk Labeller prints out small, label-sized lists of the files on a floppy disk for use as disk labels. It also prints the disk's volume name, and the date and information about the space left on a disk. (See the example which appears *before* the program listing.)

The program has no 'bells or whistles' but does have enough comments to enable readers to get a vague idea of how it works. It requires an Epson printer but could be altered for use with other printers. The listing as it stands will run on any set-up consisting of 256k of RAM, a hard disk and an Epson, but the following notes should help you to convert it to run on other configurations.

The program assumes that access to COMMAND.COM is available either on the default drive or via the PATH command. It also assumes that the same is true for SORT.COM and LABEL.COM. There should be a minimum of 2k of free space on the default drive.

The disk to be labelled should *not* be placed in the default drive: if you want to use the program on a single-floppy system, load it into a RAM disk.

```
No 2

MENU     .EXE  MENU     .TXT  PC-FILE .BAT  PCDEF    .EXE
PCDOC    .EXE  PCEXPOR .EXE  PCFILE  .EXE  PCFILE   .PIF
PCFILE   .PRO  PCFILE  .XXX  PCFIX   .EXE  PCIMPOR .EXE
PCLABEL .EXE  PCOVL   .EXE  PCPRINT .EXE  PCSETUP .EXE
PCSORT   .EXE  PCUTIL  .EXE

06-10-1987  18 files.  348239 bytes  2048 free
```

```
10 REM DISK LABELLER
11 REM By Ken B Smith.  York, 25 April 87
12 REM 75 minutes to running and an hour to comment
13 REM Nasty BASIC - all gotos and repeats - but it is a QADLP for sure
14 REM QADLP = Quick And Dirty Labelling program
20 CLS
22 PRINT "              DISK LABELLER (A4) Labels"
24 PRINT "              ========================="
26 PRINT:PRINT:PRINT:PRINT
30 PRINT:PRINT:PRINT
32 REM Here lie the printer codes used by an Epson
34 ESC$ = CHR$(27): ' ESCAPE
35 PINIT$ = ESC$ + "@" : ' Initialise
36 PEMPH$ = ESC$ + "E" : ' Emphasised
37 PBIG$  = CHR$(14) : PSMALL$ = CHR$(15) : ' Big and Small Characters
38 PCOMP$ = ESC$ + "3" + CHR$(18)  : ' Line Compression The 18 gives rgstrtion
39 PCBIG$ = ESC$ + "F"
40 PSUB$ = ESC$ + "S" + CHR$(1) : ' Suscript on
42 WIDE = 54 : ' How wide is the label print area in condensed
44 WIDE$ = STRING$(WIDE,"-") : ' Underline sequence
46 ACROSS = 4 : ' How many entries across
48 DOWN = 11 : ' How many lines down of entries
50 ONLABEL = ACROSS * DOWN : ' How many entries per label
52 FBYTES = 0 : ' Total of File sizes
54 LCOUNT = 1 : ' Line Counter
55 FCOUNT = 1 : ' File Count
56 PCOUNT = 1 : ' entries per line counter
58 DNUM = 1 : ' label Number counter
```

PROGRAM FILE

```
60 TOTLABS = 0 : ' Total number of labels from a disk (Total files / onlable)
62 BLEFT = 0 : ' Remaining space on Disk
64 X = 0 : '  The dreaded X counter
97 ' Now we can start the program with a request for a drive letter
98 ' Since hard disks would use a lot of labels and they would be tricky to see
99 ' we will restrict ourselves to A and B for now
100 INPUT "Drive Letter ";DL$
101 ' Since someone is bound to put in lower case we shall convert
102 ' Take the ASCII value and see if it is over 90 (Z) is so lower case
103 ' To get an UPPER CASE equivalent take 32 from the ASCII value
105 IF ASC(DL$) > 90 THEN DL$ = CHR$(ASC(DL$)-32)
108 ' Now see if it is A or B and produce a suitable SHELL command to DIR
109 ' the disk with a PIPE (¦) to SORT (must be available) to LABFILE.DAT
110 IF DL$ = "B" THEN SHELL "DIR B: ¦ SORT > LABFILE.DAT":GOTO 130
120 IF DL$ = "A" THEN SHELL "DIR A: ¦ SORT > LABFILE.DAT":GOTO 130
124 ' We didn't get A or B so try again
125 GOTO 100
128 ' Open up a file called "LABFILE.DAT" for Input by lines
130 OPEN "i",1,"LABFILE.DAT"
138 ' Gosub to get a line from the file into A$
140 GOSUB 5000
148 ' If the line is Blank get the next one (Initial lines are often so)
150 IF A$ = "" GOTO 140
155 ' Tricky bit of MID$ to get the File Count and REmaining bytes
160 FCOUNT = VAL(A$):L% = INSTR(A$,"(s)"):BLEFT = VAL(MID$(A$,L%+4))
162 TOTLABS = FIX(FCOUNT/ONLABEL) + 1  : ' The FIX + 1 makes the numbers crrect
164 ' get two more lines and see if we have a label by looking for "no"
165 GOSUB 5000:GOSUB 5000: IF INSTR(A$,"no") > 0 THEN GOTO 190
168 ' We have a label - search for its position using the "is"
170 I% = INSTR(A$,"is") + 2
178 ' but it could be blank so watch out
180 L% = LEN(A$) : IF L% > I% GOTO 200
188 ' Get the disk label name.  DOS 3.2 will not hack the SHELL LABEL sequence
190 INPUT "Disk Name ";DN$:SHELL "LABEL "+DL$+":"+DN$:GOTO 210
198 ' The name is on disk so pull it to DN$
200 DN$ = RIGHT$(A$,L%-I%)
208 ' Printer sequence.  Watch the semi colons for spacing et al
209 ' repeated out of laziness on lines 520-560
210 LPRINT PINIT$;PEMPH$;PBIG$;: ' Initialise, Emphasis and Large letters
220 LPRINT DN$; : ' Print the Label
230 LPRINT PCBIG$;PSMALL$;PCOMP$ : ' Cancel BIG get to small and Condensed
240 LPRINT PSUB$;WIDE$ : 'Pull into subscript and print the line
248 ' get a disk entry
250 GOSUB 5000
258 ' Add the size to FBYTES counter
260 FBYTES = FBYTES + VAL(MID$(A$,14,8))
268 ' print the entry adding the DOT that is NOT on the DIR listing
269 ' the spaces at the end can be changed to vary width of label see WIDE
270 LPRINT MID$(A$,1,8);".";MID$(A$,10,3);"  ";
278 ' if we are upto ACROSS across then line feed and reset counters
280 PCOUNT=PCOUNT+1:IF PCOUNT>ACROSS THEN PCOUNT = 1:LCOUNT = LCOUNT + 1:LPRINT
288 ' if we are up to DOWN lines do another label
290 IF LCOUNT > DOWN THEN GOTO 500
298 ' Go back and get the next one
300 GOTO 250
396 ' Now we are at the end of the run and this label needs finishing
397 ' So line feed to DOWN lines and throw in the final message
400 FOR X = LCOUNT TO DOWN: LPRINT:NEXT X
410 LPRINT WIDE$
420 LPRINT DATE$;" ";FCOUNT "files. ";FBYTES;" bytes ";BLEFT;" free"
428 ' The 3 line feeds clear the labels to the next one
430 LPRINT:LPRINT:LPRINT:CLOSE 1:GOTO 10
496 ' Here we have a continuation problem.  The label is full so just at the
497 ' trailer and a slightly different message on the tail
498 ' line feed to the next label and reset counters before going back
500 LPRINT STRING$(WIDE,"-")
510 LPRINT DATE$;" ";"End of Label ";DNUM;"of ";TOTLABS;" - CONTINUED ":
    DNUM = DNUM + 1
520 LPRINT:LPRINT:LPRINT: LCOUNT = 1:PCOUNT = 1
530 LPRINT PINIT$;PEMPH$;PBIG$;: ' Initialise, Emphasis and Large letters
540 LPRINT DN$;
550 LPRINT PCBIG$;PSMALL$;PCOMP$
560 LPRINT PSUB$;WIDE$
570 GOTO 260
4000 STOP
5000 IF EOF(1) GOTO 400 ELSE INPUT £1,A$
5010 RETURN
```

BBC *HELP Command

by Chris Bowerman

Users of programs often lack access to a command that will provide them with various levels of help and information. *USE provides a user-oriented information system which can be used in any application that involves searching through or displaying ASCII text information files on screen. An example of this recently was in an educational program to page through a 'textbook' held on disk. I also have a copy of *USE on all my disks to provide program LOAD and other information in moments of amnesia.

Enter the program as shown and RUN it (having saved a copy in case of bugs). Enter a pathname or directory and (by means of A or D) the type of filing system in use (DFS or ADFS). The pathname or directory indicates the directory in which the program will look for the information text-files. The pathname should not terminate with a dot. The *SAVE line needed to save the utility to disk will also appear.

First, the facilities provided: the utility creates a new command *USE. Typing

*USE <RETURN>

displays the default text-file (called I-MAIN) on screen and typing

*USE <filename> <RETURN>

displays the named text-file on screen. The cursor keys are used to move the files (Fig 1) which are displayed a text-windowful at a time.

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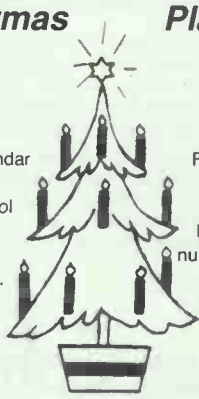

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PROGRAM FILE

The search option automatically looks for the next occurrence of the searchword in the file. The searchword is given by hitting COPY, entering the searchword in response to the 'seek' prompt and then hitting RETURN. If no searchword has been entered, then the search option prompts for one.

To test the utility we need some text-files (untokenised files in GSREAD format) about 60 lines long. The default file is always called I-MAIN. No name restriction is placed on other file names, of which there must be at least one — let's call it TEST. Any file produced by a word-processor will do (as will those produced for *SPOOL and *BUILD).

Typing *USE <RETURN> (or hitting f0) will subsequently cause the default file (I-MAIN) to be displayed. Typing *USE TEST will produce the named file TEST on screen as explained above.

To use the utility as an information-providing facility, the default file I-MAIN should consist of general information indicating the names of files containing more detailed information (which may be accessed by typing *USE <file name>). These files in turn refer to other files, creating a hierarchy of information.

You must ensure that the appropriate mode and text window for the format of the text-file to be displayed are selected before calling USE. The line length of the screen mode must be considered when preparing text-files: the maximum line length which can be displayed in any mode is 20 characters.

As USE is loaded from disk it must be saved on all disks with which you wish to use it. Note that I have deliberately not prescribed a certain directory for the USE file so that several copies can be held on disk in different directories, each of which can access different information files.

The program is fairly well supplied with comments so I'll just mention the basic stages of operation. First, the command line, which will hold any filename, is retrieved and the appropriate file is opened. The height of the window is then checked to ascertain the length of a screenful and the main loop, which checks for keypresses and executes the appropriate options, is entered.

Because of the program's use of memory (&884 to &AFF and &C00 to &CFF), the following facilities may become corrupted while using the utility: sound, printer, serial port, cassette, speech, user-defined characters, Econet. Should this be a problem the code can be assembled for another address by altering C% in line80 and P% in line 980. Zero page locations &70 to &7C are used as in Fig 2.

Key	Effect
↓	move down file
↑	move up file
←	move to start a file
→	search for given word
DEL	quit
COPY	enter new search word

Fig 1

Location	Description
70-73	DFS Parameter block
74	file handle
75-76	counter of lines displayed
77	value to be subtracted
78	number of lines to be decremented
79	height of window in lines
7A	top of window
7B	value of character from file
7C	store for Y in search and input

Fig 2

```
   10REM > > > >   *USE   < < < <
   20REM (c) Chris. Bowerman 1987
   30CLS
   40PRINT''"          > > > >   *USE source code   < < < <"
   50INPUT"Pathname for ADFS or directory for DFS "P$
   60INPUT" A)DFS or D)FS ? "F$:P$=P$+"."
   70IF F$="A" THEN length=10 ELSE length=7
   80C%=&884
   90FORZ=0 TO 1:P%=C%:[OPTZ*2
  100.pn EQUS P$ \ pathname
  110.eop EQUD 0:EQUD 0:EQUD 0 \space for filename given after *USE or defau
lt one
  120:
  130.setup LDA£4:LDX£1:JSR&FFF4 \setup cursor keys
  140:
  150LDA£160:LDX£&B:JSR&FFF4:STX&7A:LDA£160:LDX£9:JSR&FFF4:TXA:SEC:SBC&7A:ST
A&79 \ get height of text window
  160.file LDA£1:LDY£0:LDX£&70:JSR&FFDA \retrieve any filename after *USE
  170LDY£0:LDA(&70),Y:CMP£13:BNEyfn \if FILENA given GOTOyfn else...
  180LDA£fn MOD256:STA&70:LDA£fn DIV256:STA&71 \use default one
  190.yfn LDY£0
  200.l1 LDA(&70),Y:STAeop,Y:INY:CMP£13:BNEl1
  210STAeop+length\ terminate filename 6 DFS, 8 ADFS
  220:
  230.start LDX£pn MOD256:LDY£pn DIV256 \open the file
  240.open LDA£64:JSR&FFCE:STA&74:CMP£0:BEQnormalise:JSRscreen
  250:
  260.l2 JSRgetkey \get a key and branch to the appropriate routine
  270.j0 CMP£136:BNEj1:LDA£0:STA&70:STA&71:STA&72:STA&73:JSRwriteptr:JSRscre
en:LDA£136
  280.j1 CMP£139:BNEj2:JSRupscroll:JSRscreen:LDA£139
  290.j2 CMP£138:BNEj3:JSRscreen:LDA£138
  300.j3 CMP£127:BNEj4:JMPclosedown:LDA£127
  310.j4 CMP£137:BNEj5:JSRsearch:JSRscreen:LDA£137
  320.j5 CMP£135:BNEj6:JSRinput:LDA£135
```

PROGRAM FILE

```
330.j6 JSRneof:BEQ12 \check for end of file
340:
350.closedown \exit cleanly
360LDA£0:LDY&74:JSR&FFCE
370.normalise LDA£4:LDX£0:JSR&FFF4
380RTS
390:
400.screen LDA£12:JSR&FFEE \display a text-window-full of the file
410.l3 JSRgetchr
420CMP£13:BNEj7:JSR&FFEE:JSRincr:LDA£10
430.j7 JSR&FFEE
440LDA£134:JSR&FFF4:CPY&79:BNEj8:RTS
450.j8 JSRneof:BEQ13:RTS
460:
470.incr INC&75:BEQj9:RTS \count the number of lines displayed
480.j9 INC&76:RTS
490:
500.getchr LDY&74:JSR&FFD7:RTS \get next character from file
510:
520.upscroll LDA&75:CMP&79:BCSok2:LDA&76:BNEok2:LDA£0:STA&75:STA&76:LDA£0:
STA&70:STA&71:STA&72:STA&73:JSRwriteptr:RTS \move back through file in scree
nfulls
530.ok2 JSRreadptr:LDA&79:STA&78:SEC:LDA&75:SBC&78:STA&75:LOA&76:SBC£0:STA
&76
540.l4 JSRback:DEC&78:BNE14
550RTS
560:
570.back LDA£2:STA&77:JSRreduce:JSRwriteptr \used by "upscroll" to move ba
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TA&70:STA&71:STA&72:STA&73:PLA:PLA:JSRwriteptr:RTS \used to move PTR backwar
ds
670.ok1 SEC:LDA&70:SBC&77:STA&70:LDA&71:SBC£0:STA&71:LDA&72:SBC£0:STA&72:L
DA&73:SBC£0:STA&73:RTS
680:
690.getkey \get keyhit
700.l5 LDA£129:LDX£255:LDY£127:JSR&FFF4
710CPY£&FF:BEQ15:TXA
720RTS
730:
740.neof \check for not end of file
750LDA£127:LDX&74:JSR&FFF4
760CPX£0:RTS
770:
780.search LDAword:CMP£13:BNE16:JSRinput:JMPsearch \search for a given wor
d - if none is supplied get one
790.l6 LDY£0:STY&7C
800.l7 JSRgetchr:STA&7B
810JSRneof:BNEnope
820LDY&7C:LDA&7B:CMPword,Y:BNE18
830LDY&7C:INY:LDAword,Y:CMP£13:BEQfound:DEY
840LDAword,Y:CMP&7B:BEQ19
850.l8 LDY&7C:CPY£1:BCS16:JMP17
860.l9 LDY&7C:INY:STY&7C:JMP17
870.nope JSR&FFE7:LDA£7:JSR&FFEE:LDY£255 \not found so say so
880.110 INY:LDAmessg,Y:JSR&FFEE:CMP£13:BNE110:JSR&FFE7:JSRgetkey:PLA:PLA:L
DA£136:JMPj0
890.found LDA£7:JSR&FFEE:JSRreadptr:LDA£1:JSRreduce:JSRwriteptr:JSRback2:R
TS \found so display
900:
910.input JSR&FFE7:LDY£255:.111 INY:LDAprompt,Y:JSR&FFEE:CPY£6:BNE111 \inp
ut searchword
920LDY£255:STY&7C
930.112 LDY&7C:INY:STY&7C:JSRgetkey
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:DEY:STY&7C:JMP112
950.j11 LDY&7C:STAword,Y:JSR&FFEE
960CMP£13:BNE112:LDA£135:RTS
970:
980]:PS%=P%:P%=&C00:[OPTZ*2
990.messg EQUS"Not found (<RETURN>)":EQUB 13 \store prompts at &C00
1000.prompt EQUS"Seek :-"
1010.fn EQUS "I-MAIN":EQUB 13 \default filename if none given
1020.word EQUB13\STRING TERMINATED BY 13
1030]:NEXT
1040:
1050REM Print out SAVE and other information
1060PRINT"Code ends at &";~P%
1070PRINT"Max. search word length =";&FF-(word AND&FF)''
1080PRINT" *SA. USE ";~C%;" ";~P%;" ";~setup;'"     or :-"'" CALL&";~setup
1090PRINT"    or :-  <fo>":OSCLI("K.0CALL"+STR$(setup)+";M")
```

BBC Empty Drive Tester

by John Tissandier

Many packages require two disks and dual drives to operate. Normally the system disk is placed in drive 0 and the data disk in drive 1. However, even sophisticated packages do not seem able to detect when there is no data disk present. The second drive continues to spin in vain.

This utility checks to see if a drive is empty when accessed and, if so, returns control to the program. An instruction to insert the data disk in the drive is displayed. Once you have tried the simple demonstrations you will be able to incorporate this check into your own programs.

Run 'DEMO1' without a disk in drive 1. The message 'Insert data disk and press RETURN' should appear on the screen. Now insert any disk in drive 1 and press RETURN. The disk will be catalogued.

The command *CAT 1 in line 110 could be replaced by another com-

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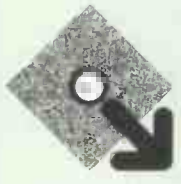

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PROGRAM FILE

mand: for example, *LOAD :1.file. Any drive can be tested — no other change is required to the program. So, in the rest of the documentation where it refers to 'drive 1' read 'any other drive'.

If the utility fails to work (that is to say, drive 1 continues to spin and the message does not appear) then you must increase the values of two user parameters 'delay' and 'start_delay' at lines 200-210. Note that values are expressed in seconds.

The start_delay was introduced after testing the utility on a Master. I discovered that the 1770 DFS behaves differently from the original standard DFS. With the former it is necessary to allow drive 0 to stop before the utility tests drive 1, otherwise it does not work. The problem is apparent only if the utility is chained rather than loaded, and run.

On my standard Model B using Pace drives, this delay is unnecessary and 'start_delay' can be made equal to zero.

Similarly, I can reduce the value of the other parameter 'delay' to two seconds. This delay determines the amount of time allowed to access a disk in drive 1 before the effort is abandoned (see below for a more detailed explanation). Lowering the values of 'delay' and 'start_delay' to their minimum working values will make the utility more efficient, so be prepared to experiment.

Note that if the utility works consistently with 'start_delay' equal to zero, then lines 210, 310-450 can be deleted from DEMO1. Similarly, line 170, 270-410 can be deleted from DEMO2.

Incidentally, the third user parameter 'code' determines where the machine code is assembled and can be changed to any other convenient value.

A second version of the demonstration program is included. It is similar in every respect except that the machine code is loaded indirectly rather than being assembled. This makes the program shorter. In this case first run the source program 'SOURCE' which assembles and automatically saves the object code as 'm/c'. The code occupies 93 bytes from &0C00 to &0C5C.

Before running SOURCE do remember to change the values of 'delay' and 'start_delay' if you found this necessary using DEMO1.

To include the routine in your own programs study DEMO2 or follow the instructions below:

- use the ON ERROR command to point to the error-handling routine
- disable escape (*FX200,1)
- load the code (*LOAD m/c)
- give the start address (code=&C00)
- before accessing a drive CALL code
- immediately after the drive has been accessed disable event (*FX13,5)
- set up the error-handling routine
- the details of this, such as where the message appears on the screen, may be altered
- the last line of the error-handling routine should be a GOTO jump to the line that called the code.

Since the BBC system does not have a built-in way of coping with the problem, the solution is to use an interrupt routine. This is fairly easy as the operating system has a number of events available. If an event is enabled and it occurs, then control passes to the user's own code. The event vector (evntv) at address &220 must point to this code.

In this utility, event 5 is used. This occurs when the interval timer crosses zero. It is enabled with the command *FX14,5, or an OSBYTE call with A=14 and X=5. The initial value of the timer has to be stored in five bytes and addressed by the X and Y registers. A call to OSWORD with A=4 will write this value to the timer. After this, the value will be incremented 100 times every second.

Since the timer is incremented and the event occurs when it reaches zero, we give the timer an initial negative value. The utility converts the delay in seconds set by the user at line 200 to the appropriate value.

The value of the delay must be such that the minimum time is wasted before the user is informed that a drive is empty. But there must be enough time to allow the operating system/disk filing system to access the drive. In the demonstration program an attempt is made to catalogue a disk but, whatever the disk command, as soon as it is completed the event must be disabled with *FX13,5.

When called, the machine code does the following. There is an initial delay as determined by the value of start_delay. The event vector is given the address of the event-handling routine. The timber is set to its initial value and the event is enabled. Control returns to the Basic program.

The program then tries to access drive 1. If successful, the disk is catalogued, the event disabled and the program ends.

If, however, there is no disk in drive 1, then after four seconds the timer crosses zero, which causes a jump to the event handling routine. This is very simple. Apart from saving and restoring the registers, all it consists of is an OSBYTE call with A=&7D, which sets the Escape condition. This is partially equivalent to

pressing the Escape key. The disk access is interrupted and, because of the ON ERROR command, control now passes to the error routine.

This checks to see that the error is not 17 (Escape), in which case it is reported in the usual manner. Otherwise a message to insert a data disk is displayed.

It is necessary to disable the Escape key at the beginning of the program in order for this strategy to work. Otherwise pressing it would cause the message to be displayed in appropriately. Note that the *FX200,1 command used does not stop the OSBYTE call from working.

To test if the utility is compatible with your disk filing system try *CAT with no disk in drive 0 and press Escape. If the drive fails to stop, then the utility will not work. The Watford DDFS is the only one I know of that behaves in this manner. Apart from this, the program should be compatible with most systems. It has been tested with the following:

BBC Model B
BASIC 1 & BASIC 2
Acorn DFS & Watford DFS
Pace 40k dual drives
Cumana 40k dual drives
Viglen 40/80k dual drives

Master 128
Acorn 1770 DFS
Viglen 40/80k dual drives

Explanation of DEMO1 by line number

60	If error jump to special error handling routine
100	Call empty drive check routine
110	Simple example of disk access for demonstration
120	Disable event 5
170	Disable Escape key
200	Set main delay
210	Set start_delay
220	Start address of code
250	Address of event vector
310-450	Delay start of main routine
460	Start of initialising phase
460-490	Write address of event handling routine to event vector
500-570	Set up initial value of timer in 5 byte data section
580-590	X & Y registers set to address of value
600-610	Write value to interval timer
620-640	Enable event 5
650	Return from initialising phase
660	Start of event handling routine
670-720	Save registers
730-740	Set Escape condition
750-800	Restore registers
810	Return from event handling routine
830-870	Data area for initial value of timer; also used as workspace
930	Disable event 5
950	Deal with other errors
960	Instruct user to insert disk in drive
980	Jump back to check routine until instruction carried out

```
10 REM Empty drive utility
20 REM Demo 1
30 REM John Tissandier
40 REM July 1987
50 :
60 ON ERROR GOTO 920
70 MODE 7
80 PROCinit
90 PRINT'CHR$(131);"DEMO 1"
100 CALL code
110 *CAT 1
120 *FX13,5
130 END
140 :
150 DEF PROCinit
160 LOCAL d,delay,evntv,osbyte,osword
170 *FX200,1
180 :
190 REM User parameters
200 delay=4
210 start_delay=1
220 code=&C00
230 :
240 d=&10000-delay*100
250 evntv=&220
260 osword=&FFF1
270 osbyte=&FFF4
280 FOR pass=0 TO 2 STEP 2
290 P%=code
300 [OPT pass
310 LDA #start_delay*5.5
320 BEQ skip
330 STA data
340 .loop1
350 LDX #&FF
360 .loop2
370 LDY #&FF
380.loop3
390 DEY
400 BNE loop3
```


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410 DEX
420 BNE loop2
430 DEC data
440 BNE loop1
450 .skip
460 LDA £interrupt MOD 256
470 STA evntv
480 LDA £interrupt DIV 256
490 STA evntv+1
500 LDA £(d MOD 256)
510 STA data
520 LDA £(d DIV 256)
530 STA data+1
540 LDA £&FF
550 STA data+2
560 STA data+3
570 STA data+4
580 LDX £data MOD 256
590 LDY £data DIV 256
600 LDA £4
610 JSR osword
620 LDX £5
630 LDA £14
640 JSR osbyte
650 RTS
660 .interrupt
670 PHP
680 PHA
690 TXA
700 PHA
710 TYA
720 PHA
730 LDA £&7D
740 JSR osbyte
750 PLA
760 TAY
770 PLA
780 TAX
790 PLA
800 PLP
810 RTS
820 .data
830 NOP
840 NOP
850 NOP
860 NOP
870 NOP
880 ]
890 NEXT
900 ENDPROC
910 :
920 REM Error routine
930 *FX13,5
940 VDU 7
950 IF ERR<>17 REPORT:PRINT " at line ";ERL:END
960 PRINTTAB(0,2);CHR$(134);"Insert data disc and press RETURN"
970 REPEAT UNTIL GET=13
980 GOTO 100
```

```
10 REM Empty drive utility
20 REM Source code
30 REM John Tissandier
40 REM July 1987
50 :
60 MODE 7
70 PRINT'"Assembling..."
80 PROCassemble
90 PROCoscli("SAVE m/c "+STR$~code+" "+STR$~P%)
100 PRINT "Machine code saved as";CHR$(131);"m/c"
110 END
120 :
130 DEF PROCassemble
140 :
150 REM User parameters
160 delay=4
170 start_delay=1
180 code=&C00
190 :
200 d=&10000-delay*100
210 evntv=&220
220 osword=&FFF1
230 osbyte=&FFF4
240 FOR pass=0 TO 2 STEP 2
250 P%=code
260 [OPT pass
270 LDA £start_delay*5.5
280 BEQ skip
290 STA data
300 .loop1
310 LDX £&FF
320 .loop2
330 LDY £&FF
340.loop3
350 DEY
360 BNE loop3
370 DEX
380 BNE loop2
390 DEC data
400 BNE loop1
410 .skip
420 LDA £interrupt MOD 256
430 STA evntv
440 LDA £interrupt DIV 256
450 STA evntv+1
460 LDA £(d MOD 256)
470 STA data
480 LDA £(d DIV 256)
490 STA data+1
500 LDA £&FF
510 STA data+2
520 STA data+3
530 STA data+4
540 LDX £data MOD 256
550 LDY £data DIV 256
560 LDA £4
570 JSR osword
580 LDX £5
590 LDA £14
600 JSR osbyte
610 RTS
620 .interrupt
630 PHP
640 PHA
650 TXA
660 PHA
```

```
670 TYA
680 PHA
690 LDA &&7D
700 JSR osbyte
710 PLA
720 TAY
730 PLA
740 TAX
750 PLA
760 PLP
770 RTS
780 .data
790 NOP
800 NOP
810 NOP
820 NOP
830 NOP
840 ]
850 NEXT
860 ENDPROC
870 :
880 DEF PROCoscli(com$)
890 oscli=&FFF7
900 $&900=com$
910 X%=0:Y%=9
920 CALL oscli
930 ENDPROC
```

```
10 REM Empty drive utility
20 REM Demo 2
30 REM John Tissandier
40 REM July 1987
50 :
60 ON ERROR GOTO 210
70 MODE 7
80 PROCinit
90 PRINT"CHR$(131);"DEMO 2"
100 CALL code
110 *CAT 1
120 *FX13,5
130 END
140 :
150 DEF PROCinit
160 *FX200,1
170 *LOAD m/c
180 code=&C00
190 ENDPROC
200 :
210 REM Error routine
220 *FX13,5
230 VDU 7
240 IF ERR<>17 REPORT:PRINT " at line ";ERL:END
250 PRINTTAB(0,2);CHR$(134);"Insert data disc and press RETURN"
260 REPEAT UNTIL GET=13
270 GOTO 100
```

MBasic Number Pursuit

by David Aitken

This program was written in BasicA on a standard IBM PC with a double-sided disk drive but should work on any machine with a version of Microsoft Basic.

Converting the program to run on other computers

All graphics are produced by printing strings to the screen locations using the LOCATE command. This is unusual in any experience in that it uses coordinates as (y,x): that is, it counts down and then counts across with position (1,1) at the top left of the screen rather than (0,0).

Other commands which may be unfamiliar to home machine users could be:

WIDTH 40/80 — which sets screen to 40 or 80 characters per line.

SCREEN — which is used in this case to turn on the colour mode.

PLAY"MB T string" — play music in background at a tempo and with the notes given as letters.

STRING$(length,ascii code) — makes a string of characters in this case usually square to clear an area of screen.

KEY — there are a number of variations of this command in the program and their function is described there. They are all concerned with the use of the function keys and could be omitted with the subroutines.

The game is loosely based on trivia board games, but with number calculations as the questions — a page of help instructions is included at the beginning and can be called up during the game using a function key.

The screen is divided into four windows during play. The largest window contains the game board and is at the top left of the screen. It is four-sided and four tokens must be collected before returning to the centre to win.

In a strip across the bottom of the screen are two windows. To the right-hand side is a small window containing a die to give each player their move. The rest of the strip on the left-hand side is used for input/output. Prompts are given here to tell the player what they should do next to continue. The player's answers to the calculations are also entered in this space.

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PROGRAM FILE

double window. The first time it is used it gives a list of the possible places to which the player can move, and the sort of calculation which they will be asked to do. This is later covered by the actual calculation required, and these two displays alternate as required.

Scoring

The introductory pages to the game ask for the number of players and their names. At this point each player is asked for a difficulty level — 1, 2, 3, 4. This difficulty level is used to increase the complexity of the calculations asked and also to decide the number of points a player earns. The number is increased for every correct answer and decreased for each error.

In addition, each token receives a bonus and the first person home to the centre with four tokens receives another bonus. Because of the weighting effect of starting at a higher level of difficulty, it is quite possible (though a little unlikely) for the first person back *not* to have the highest total of points. This is one of the reasons why the function key to call up a display of points was included.

Typing in the program

Apart from the function key interrupts in which the routines have to call the board drawing subroutine, only the footnote subroutine is called by other subroutines. All other routines are called from the main loop of the game — lines 900 to 1100. It is therefore possible to type and debug each routine separately if the footnote routine is entered first, or immediately after the initialisation and instructions routines.

REM statements are not called at any point and can be omitted to reduce typing. The routines to use and alter the function keys can be omitted or included last.

```
1 WIDTH 40:KEY OFF:SCREEN 0,1,0,0:GOTD 900
2 REM ************************************************************************
4 REM **                    Mathematical Pursuit  (IBM)                     **
5 REM **                       by D. Aitken                                 **
6 REM **                                                                    **
7 REM ************************************************************************
8 REM
17 REM  **********************************************************************
18 REM **         FUNCTION KEY 1 - SCORES                                    **
19 REM **********************************************************************
20 KEY(1) STOP:KEY(2) STOP
21 COLOR 0,1:FOR J = 1 TO 20:LOCATE J,2:PRINT STRING$(25,219);:NEXT
22 COLOR 7,0:LOCATE 1,5:PRINT"   POINTS SCORED.":PRINT
24 FOR L=1 TO NP:LOCATE 2*L+1,3:LP=INT(WT(L)*50+.5):LB=LEN(SC$(L))*100
26 PRINT NM$(L);" has scored";LP+LB:PRINT:NEXT
27 LOCATE 9,5:PRINT "   TOKENS GAINED"
28 FOR L=1 TO NP:LOCATE 3*L+8,3:PRINT NM$(L);" has these -":S$=""
29    FOR M=1 TO LEN(SC$(L)):T$=MID$(SC$(L),M,1)
30       IF T$="1" THEN S$=S$+" blue,"
31       IF T$="2" THEN S$=S$+" green,"
32       IF T$="4" THEN S$=S$+" red,"
33       IF T$="6" THEN S$=S$+" yellow,"
34    NEXT M:IF S$<>"" THEN S$=LEFT$(S$,LEN(S$)-1):REM ** removes last comma **
35 LOCATE 3*L+9,3:PRINT S$:NEXT L
36 XX=-99:FT$="Press ENTER to continue ":GOSUB 500:GOSUB 9010:KEY ON:RETURN
37 REM **********************************************************************
38 REM **         FUNCTION KEY 2 -  instructions/help                        **
39 REM **********************************************************************
40 KEY(1) STOP:KEY(2) STOP:GOSUB 10200:CLS:GOSUB 9000:KEY ON:RETURN
58 RETURN
197 REM **********************************************************************
198 REM **                    rolls the dice for moves                       **
199 REM **********************************************************************
200 COLOR 4,1:FOR J = 20 TO 24:LOCATE J,34:PRINT"▀▀▀▀▀▀":NEXT
205 XX=0:FT$=NM$(PL)+"'s move ":GOSUB 500:FOR J=1 TO 400:NEXT
210 XX=-99:FT$="Press ENTER to roll dice":GOSUB 500:MO = INT(RND(1)*4)+1
220 SP$=CHR$(1):FOR J = 1 TO MO:REM sp$ is spot on dice - a face  character
230 IF (J=1) THEN DI$(1) = "▀▀▀":DI$(2)="▀"+SP$+"▀":DI$(3) = DI$(1)
240 IF (J=2) THEN DI$(1) = "▀  "+SP$+"  ▀":DI$(2)="▀▀▀":DI$(3) = DI$(1)
250 IF (J=3) THEN DI$(1) = "▀  "+SP$+"  ▀":DI$(2)=DI$(1):DI$(3) = DI$(1)
260 IF (J=4) THEN DI$(1) = SP$+"▀ "+SP$:DI$(2)="▀▀▀":DI$(3) = DI$(1)
270 COLOR 7,1:FOR K= 21 TO 23:LOCATE K,36:PRINT DI$(K-20);:NEXT K:
    FOR I = 1 TO 90:NEXT I,J
280 FOR J =1 TO 500:NEXT:RETURN
297 REM **********************************************************************
298 REM **                    offers the choice of moves                     **
299 REM **********************************************************************
300 COLOR 5,1:FOR J = 1 TO 19:LOCATE J,29:PRINT STRING$(12,219);:NEXT
305 XX=0:FT$="You may move to these places":GOSUB 500:RESTORE 12000:LM=0
310 COLOR 0,5:LOCATE 1,29:PRINT "No  Subject":PRINT:J=(PO(PL)*4)+MO:
    REM no of data items to read
312 FOR K=1 TO J:READ MO$:NEXT K
320 FOR J=1 TO 5:L=J*2-1:MV$(J)=MID$(MO$,L,2):REM seperates single moves******
322   IF MV$(J)="EE" THEN LM=LM-1:GOTO 340:REM  LM counts no. possible moves
323   IF J>1 THEN COLOR 0,5:LOCATE 4*J-3,35:PRINT "or"
324   TP=VAL(MV$(J)):IF CA(TP)=BL THEN TP$ = "   ADD"
326   IF CA(TP)=RE THEN TP$ = "SUBTRACT"
328   IF CA(TP)=GR THEN TP$ = "MULTIPLY"
330   IF CA(TP)=YE THEN TP$ = " DIVIDE "
332   IF CA(TP)=FR THEN TP$ = " FREE GO"
334   LOCATE VE(TP),HO(TP):COLOR 0,CA(TP):PRINT STR$(J);:
    REM ****   SHOWS POSSIBLE MOVES ON BOARD   ****
336   LOCATE 4*J-1,29:PRINT J;" ";TP$:REM *** LISTS POSSIBLE MOVES ****
340 LM=LM+1:NEXT J
350 XX= -99:FT$ = "Input number of move wanted ":GOSUB 500:REM footnote
360 Z= VAL(Z$):IF Z<1 OR Z>LM THEN FT$="ERROR IN INPUT":GOSUB 500:PLAY "p5":
    GOTO 360
365 LOCATE VE(PO(PL)),HO(PO(PL)):COLOR CA(PO(PL)),0:
    PRINT "▀"+CHR$(31)+CHR$(29)+CHR$(29)+"▀":
    REM ***  BLANKS OLD POSITION ****
370 XX=0:PO(PL)= VAL(MV$(Z)):GOSUB 9240:REM *** new position marked  ****
390 RETURN
397 REM **********************************************************************
398 REM **                  offer choice of question routine                 **
399 REM **********************************************************************
```

PROGRAM FILE

```
400 COLOR 7,1:FOR J = 1 TO 16:LOCATE J,30:PRINT STRING$(10,219);:NEXT
410 COLOR 9,7:IF CA(PO(PL))=BL THEN QQ=1
420 IF CA(PO(PL))=RE THEN QQ=2
430 IF CA(PO(PL))=GR THEN QQ=3
440 IF CA(PO(PL))=YE THEN QQ=4
445 IF CA(PO(PL))=FR THEN GOSUB 6000:GOTO 490:REM *** FREE MOVE
450 ON QQ GOSUB 2000, 3000, 4000, 5000:REM ADD, SUBTRACT,MULTIPLY, DIVIDE
460 XX=-99:FT$="INPUT YOUR ANSWER ":GOSUB 500
470 Z=VAL (Z$):IF Z$<>RIGHT$(STR$(Z),LEN(STR$(Z))-1) THEN FT$="ERROR IN INPUT":
    XX=0:GOSUB 500:PLAY "P5":GOTO 460
480 XX=0:IF Z=AN THEN AN$="TRUE":FT$=" CORRECT":GOSUB 500:GOTO 490
482 AN$="FALSE":FT$="You are WRONG !":PLAY"MF O1;GAG":GOSUB 500:PLAY"P1 GAG O4"
490 FOR J = 1 TO 16:LOCATE J,30:PRINT STRING$(10,219);:NEXT:RETURN
497 REM ************************************************************************
498 REM **              footnotes of assorted kinds                           **
499 REM ************************************************************************
500 COLOR 7,1:FOR J = 21 TO 24:LOCATE J,1:PRINT STRING$(34,219);:NEXT
510 FOR J=0 TO 6:LOCATE 22,1
520 X=INT(LEN(FT$)/2):COLOR J,7:PRINT STRING$(17-X,219);FT$;STRING$(17-X,219);
530 FOR Y = 1 TO 60:NEXT Y,J:BEEP:COLOR 6
540 IF XX=-99 THEN LOCATE 23,4:PRINT NM$(PL)+"  ";:INPUT;Z$
550 RETURN
897 REM ************************************************************************
898 REM **            main program starts here                                **
899 REM ************************************************************************
900 GOSUB 10000:REM ****  initialisation of variables *****
910 GOSUB 10100:REM ****  get names of players ******
920 PL= INT(RND(1)*3+1):REM PL is current player. This decides who will start.
930 IF PL<1 OR PL>NP THEN GOTO 920
997 REM ************************************************************************
998 REM **                        main LOOP of game                           **
999 REM ************************************************************************
1000 CLS:WIDTH 40
1005 CLS:GOSUB 9000:REM ***** draws board *****
1010 GOSUB 9220:REM ***** updates game board  - start of each move ****
1015 KEY(1) ON:KEY(2) ON:KEY ON:REM ***** turns on function key interupts ****
1020 GOSUB 200:REM  ***** rolls dice for moves ****
1030 KEY(2) STOP:GOSUB 300:REM  **** offers choice of moves ****
1040 IF LEN(SC$(PL)) = 4 AND PO(PL) = HOME THEN GOTO 8000:REM *** winner ***
1050 KEY(1) STOP:GOSUB 400:REM ***** QUESTION AND ANSWER ***
1055 KEY(1) ON:KEY(2) ON: REM *** FUNCTN KEYS BACK ON ***
1060 IF AN$="TRUE" THEN WT(PL)=WT(PL)*1.1:REM **** increase for right ***
1070 IF AN$="TRUE" AND (PO(PL)=13 OR PO(PL)=17 OR PO(PL)=21 OR PO(PL)=25)
     THEN GOSUB 1200:REM ******* TOKEN GAINED ROUTINE *********
1080 IF AN$="FALSE" THEN WT(PL)=WT(PL)*.8:REM ***  DECREASE FOR WRONG *****
1090 PL=PL+1:IF PL>NP THEN PL=1:REM *** NEXT PLAYER ***
1100 KEY(1) STOP:KEY(2) STOP:GOTO 1010 REM **** DISABLE FUNCTN KEYS ****
1197 REM ************************************************************************
1198 REM **                  TOKEN GAINED ROUTINE                              **
1199 REM ************************************************************************
1200 KEY(1) STOP:KEY(2) STOP
1205 Z$=RIGHT$(STR$(CA(PO(PL))),1):REM *** single character to add to score **
1210 FOR X=1 TO LEN(SC$(PL)):IF MID$(SC$(PL),X,1)=Z$ THEN Z$="":X=5
1211 NEXT X:IF Z$="" THEN 1250:REM *** to return if already have token  *****
1220 PLAY "MB T255"+A1$:REM background music tempo fast+tune
1230 XX=0:FT$=" YOU HAVE WON A TOKEN ":GOSUB 500:PLAY A2$:SC$(PL)=SC$(PL)+Z$
1240 FT$=NM$(PL)+" you have "+STR$(LEN(SC$(PL))):GOSUB 500
1250 KEY ON:RETURN
1997 REM ************************************************************************
1998 REM **                  CREATES ADDITION QUESTION                         **
1999 REM ************************************************************************
2000 LOCATE 1,30:PRINT"    ADD":A=INT(RND(1)*20*WT(PL)):B=INT(RND(1)*20*WT(PL))
2020 LOCATE 3,33:PRINT USING "££££";A:LOCATE 4,32:PRINT USING "_+££££";B
2030 LOCATE 5,32:PRINT"_____":AN=A+B:RETURN
2997 REM ************************************************************************
2998 REM **                  CREATES SUBTRACTION QUESTION                      **
2999 REM ************************************************************************
3000 LOCATE 1,30:PRINT" SUBTRACT"
3010 A=INT(RND(1)*20*WT(PL)):B=INT(RND(1)*20*WT(PL)):IF B>A THEN 3010
3020 LOCATE 3,33:PRINT USING "££££";A:LOCATE 4,32:PRINT USING "_-££££";B
3030 LOCATE 5,32:PRINT"_____":AN=A-B:RETURN
3997 REM ************************************************************************
3998 REM **                  CREATES MULTIPLICATION QUESTION                   **
3999 REM ************************************************************************
4000 LOCATE 1,30:PRINT" MULTIPLY"
4010 A=INT(RND(1)*20*WT(PL)):B=INT(RND(1)*10*WT(PL)):IF B>12 THEN 4010
4020 LOCATE 3,33:PRINT USING "££££";A:LOCATE 4,32:PRINT USING "_x£££";B
4030 LOCATE 5,32:PRINT"_____":AN=A*B:RETURN
4997 REM ************************************************************************
4998 REM **                  CREATES DIVISION QUESTION                         **
4999 REM ************************************************************************
5000 LOCATE 1,30:PRINT"  DIVIDE"
5010 A%=(RND(1)*24*WT(PL)):B%=(RND(1)*8*WT(PL)):IF B%>12 OR B%=0 THEN 5010
5020 LOCATE 3,33:PRINT USING "££££";A%*B%:LOCATE 4,32:
     PRINT "_____":LOCATE 5,33:PRINT USING "££££";B%:AN=A%:RETURN
5997 REM ************************************************************************
5998 REM **                  FREE MOVE CONDITIONS                              **
5999 REM ************************************************************************
6000 PL=PL-1:AN$="FREE":FOR J=1 TO 4:LOCATE 2*J,31:PRINT "FREE GO":NEXT:RETURN
7997 REM ************************************************************************
7998 REM **                  winner found routine/new game offered             **
7999 REM ************************************************************************
8000 COLOR 6,3,14:CLS:PRINT STRING$(40,"*")
8010 PRINT NM$(PL);" IS TOO FAST FOR YOU ALL":PRINT STRING$(40,"*")
8020 FOR X=2 TO 6 STEP 2:PLAY A1$:FOR Y=1 TO 15:A=INT(RND(1)*15+5):
     B=INT(RND(1)*26+6):LOCATE A,B
8030 COLOR 21,X:IF Y/2=INT(Y/2) THEN PRINT " FIRST " ELSE PRINT "VICTORY"
8040 NEXT Y,X:COLOR 6,3:LOCATE 2*J,1:PRINT STRING$(40,"*")
8050 PRINT "  £££££££  BUT ARE YOU THE WINNER  £££££££"
8060 FOR X=1 TO 2500:NEXT X:COLOR 14,2,10:CLS
8080 PRINT SPC(12);"THE POINTS SCORED":PRINT STRING$(40,"-")
8090 FOR X=1 TO NP:PRINT NM$(X):PRINT STRING$(12,"*")
8100 PRINT SPC(8) "POINTS SCORED" TAB(24) ;INT(WT(X)*50+.5)
8110 B=LEN(SC$(X))*100:IF (B=400 AND PO(X)=0) THEN B=600
8120 PRINT SPC(8) "BONUSES SCORED" TAB(24) ;B
8130 NEXT:LOCATE 20,1:PRINT"    The WINNER is
8140 W=0:T=0:FOR X=1 TO NP:P=LEN(SC$(X))*100:IF P=400 THEN P=600
8150 P=INT(P+WT(X)*50+.5):IF P>T THEN T=P:W=X
8160 NEXT:PLAY A1$+"P2"+A2$:COLOR 22:LOCATE 20,23:PRINT NM$(W);:PLAY A1$+A2$
8197 REM************************************************************************
8198 REM**          NEW GAME OFFERED                                          **
8199 REM************************************************************************
8200 COLOR 7,1:CLS:PRINT "     DO YOU WANT A NEW GAME?":PRINT
8210 PRINT "To play with the same players enter ...1":PRINT
8220 PRINT "To play with new players enter.....2":PRINT
8230 PRINT "To end the game enter.....3":PRINT:PRINT
8240 COLOR 23:PRINT"     PRESS THE NUMBER OF YOUR CHOICE"
8250 Z$=INKEY$:IF Z$="" THEN 8250
8260 IF Z$<"1" OR Z$>"3" THEN 8250
8270 IF Z$="2" THEN RUN
8280 IF Z$="3" THEN CLS:LOCATE 20,10:PRINT "THANK YOU FOR PLAYING":PLAY "P3":
     WIDTH 80:COLOR 7,1:CLS
8290 IF Z$="3" THEN KEY 1,"list ":KEY 2,"run"+CHR$(13):KEY 3,"load ":
     KEY 4,"SAVE ":KEY 5,"cont"+CHR$(13):KEY 6,",lpt1":KEY 7,"tron"+CHR$(13):
     KEY 8,"TROFF"+CHR$(13):KEY 9,"key ":KEY 10,"screen":END
```

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PROGRAM FILE

```
8300 FOR X=1 TO NP:SC$(X)="":PO(X)=0:NEXT:GOTO 930:
     REM **** WT(X) HAS NOT BEEN RESET YOU MAY WISH TO DO SO ***
8997 REM ************************************************************
8998 REM **                draws game board and marks positions      **
8999 REM ************************************************************
9000 COLOR 0,1:FOR J = 1 TO 20:LOCATE J,1:PRINT STRING$(28,219);:NEXT
9010  COLOR 7,0:LOCATE 1,1
9020 PRINT"
9030 PRINT"
9040 PRINT"
9050 PRINT"
9060 PRINT"
9070 PRINT"
9080 PRINT"
9090 PRINT"
9100 PRINT"
9110 PRINT"
9120 PRINT"
9130 PRINT"
9140 PRINT"
9150 PRINT"
9160 PRINT"
9170 PRINT"
9180 PRINT"
9190 PRINT"
9200 PRINT"
9210 PRINT"
9220 FOR PP=0 TO 28
9230 LOCATE VE(PP),HO(PP):COLOR CA(PP),7:
     PRINT"  "+CHR$(31)+CHR$(29)+CHR$(29)+"  ";:NEXT PP:
     REM *** forms 2X2 square **
9240 FOR PP=1 TO NP
9250 COLOR 0,CA(PO(PP)):LOCATE VE(PO(PP)),HO(PO(PP)):PRINT SY$(PP);:PLAY "AC"
9260 NEXT PP:COLOR 7,1,0:RETURN
9997 REM ************************************************************
9998 REM **              initialisation and variable list            **
9999 REM ************************************************************
10000 COLOR 0,5,4:CLS:REM BLACK ON PINK
10002 FOR X=1 TO 10:LOCATE 13,1:PRINT SPC(X);"NUMBER PURSUIT";
10004    P=X/3:IF INT(P)=P THEN PLAY "MB"+"T255ABCEB2"
10006 NEXT X:RANDOMIZE(VAL(RIGHT$(TIME$,2)))
10010 HOME=0:NP=0:PL=0:BL=1:RE=4:GR=2:YE=6:FR=7:
      REM  start,num. of players, current player,  colours codes of catagories
10012 A1$="GABDDEDBGABBAGAGABDDEDBGABBAAG":
      A2$="GAGBBCBGGGGGGGEGAGBBCBGGGGGEG":REM  ****   music strings *******
10020 DIM DI$(4),MV$(5):REM  dice scores,possible moves each throw
10022 DIM HO(28),VE(28),CA(28):REM  X,Y coordinates, catagory of question
10024 DIM NM$(3),SY$(3),SC$(3),PO(3),WT(3):
      REM  names,symbols,scores,positions, difficulty level of players
10030 KEY 1,"SCORES":KEY 2,"HELP":REM *** REDEFINE FUNCTION KEYS ****
10032 FOR X=3 TO 10:KEY X,"":NEXT:REM *** TURNS OFF OTHER KEYS ***
10034 ON KEY(1) GOSUB 20:ON KEY(2) GOSUB 40:REM *** functn key interupts ***
10060 FOR X=0 TO 28:READ HO(X),VE(X),CA(X)
10062    IF X=10 THEN LOCATE 21,17:PRINT "by      D. Aitken"
10068    P= X/5:IF INT(P)=P THEN PLAY "T255ABCEG2"
10070 NEXT:PLAY "t255ABCEGA2"
10080 FOR X=1 TO 3:READ SY$(X),PO(X),WT(X):
      Y$=SY$(X)+CHR$(31)+CHR$(29)+CHR$(29)+SY$(X):SY$(X)=Y$:
      REM **** FORMS A 2X2 SYMBOL *****
10090 NEXT:RESTORE:NM$(0)="new":RETURN
10097 REM ************************************************************
10098 REM **              find names of players and offer rules       **
10099 REM ************************************************************
10100 COLOR 7,1,1:CLS:INPUT "How many players ";J$:J= VAL(J$):
      PRINT STRING$(39,"-")
10120 IF J < 1 THEN BEEP: PRINT:PRINT:COLOR 4,7:PRINT"Error in input ! !":
      BEEP:GOTO 10140
10130 IF J > 3 THEN BEEP: PRINT:PRINT:COLOR 4,7:PRINT"Too many players! !":
      BEEP:GOTO 10140
10140 IF (J > 3) OR (J < 1) THEN FOR X = 1 TO 1000:NEXT:GOTO 10100
10150 FOR X = 1 TO J:INPUT"NAME OF PLAYER ";NM$(X):PRINT:
      PRINT"You are player ";CHR$(64+X):PRINT
10152 INPUT"what difficulty level do you want -      ENTER 1, 2, 3 or 4";WT$:
      W=INT(VAL(WT$)):PRINT STRING$(39,"-")
10154 IF W<1 THEN W=1 ELSE IF W>4 THEN W=4
10160 WT(X)=W:IF LEN(NM$(X))/2<>INT(LEN(NM$(X))/2) THEN NM$(X)=" "+NM$(X)
10170 NEXT:NP=J
10172 PRINT STRING$(39,"*"):LOCATE 23,3:COLOR 23:
      REM *** color 23 white foreground letters flash ****
10174 PRINT"If you wish instructions PRESS Y or N"
10176 Z$=INKEY$:IF Z$="" THEN 10176
10178 IF Z$="Y" OR Z$="y" THEN GOTO 10200
10180 IF Z$="n" OR Z$="N" THEN COLOR 7:RETURN
10190 GOTO 10176
10197 REM ************************************************************
10198 REM **                instructions and rules                    **
10199 REM ************************************************************
10200 COLOR 0,6,14:CLS:REM BLACK ON brown
10210 PRINT "This game is like Trivial Pursuit with"
10220 PRINT "addition, subtraction, multiplication "
10230 PRINT"and division questions.":PRINT
10240 PRINT"You win a token if you answer questions"
10250 PRINT"correctly in any of the four corners."
10260 PRINT"Collect one from each corner and return"
10270 PRINT"to the centre square to be first.":PRINT
10280 PRINT" HOWEVER, YOU MIGHT NOT BE THE WINNER.":PRINT
10290 PRINT"You gain points for each correct answer"
10300 PRINT"and bonuses, 100 points for each token"
10310 PRINT"and 200 points for being first.":PRINT
10320 PRINT"THE WINNER IS THE PERSON WITH THE MOST"
10330 PRINT"POINTS AFTER THE FIRST PLAYER REACHES "
10340 PRINT"THE CENTRE.":PRINT
10350 PRINT"Beware the more answers you get correct"
10360 PRINT"the harder the questions become!"
10370 COLOR 16: LOCATE 24,1:INPUT"       press ENTER to continue";Z$
10371 REM ****   color 16 makes the foreground black flash  *****
10380 COLOR 0:RETURN:REM *** to switch off flashing black *****
10997 REM ************************************************************
10998 REM **              data for positions and player symbols       **
10999 REM ************************************************************
11000 DATA 14,10,7,17,8,4,20,6,1,23,4,2,17,12,6,20,14,4,23,16,1:
      REM 7 positions so far
11010  DATA 11,12,2,8,14,6,5,16,4,11,8,1,8,6,2,5,4,6:REM 13 so far
11020 DATA 1,1,4,8,1,1,14,1,7,20,1,2,27,1,6,27,6,4,27,10,7,27,14,1,27,19,2:
      REM next is 23
11030 DATA 20,19,6,14,19,7,8,19,4,1,19,1,1,14,2,1,10,7,1,6,6
11049 REM **** data for players ****
11050 DATA "AA",0,1,"BB",0,1,"CC",0,1,"DD",0,1:
      REM *** LETTERS PRINT ON BOARD TO SHOW POSITIONS OF PLAYERS
11999 REM ****          data for moves offered          ****
12000 DATA 01040710EE,02050811EE,03060912EE,17212513EE:REM position 0 ie HOME
12110 DATA 1210EEEEEE,1300EEEEEE,2814010407,1527020508:REM positn 11 ie GREEN
12010 DATA 0200EEEEEE,0304071OEE,17050811EE,1816060912:REM position 1 ie RED
12020 DATA 0301EEEEEE,1700EEEEEE,1618050710,1519050811:REM position 2 ie BLUE
12030 DATA 0217EEEEEE,181601EEEE,151900EEEE,1420040710:REM position 3 ie GREEN
12040 DATA 0500EEEEEE,06071001EE,21081102EE,2022031209:REM positn 4 ie YELLOW
```

PROGRAM FILE

```
12050 DATA 0604EEEEEE,2100EEEEEE,2022011007,1923021108:REM positn 5 ie RED
12060 DATA 2105EEEEEE,202204EEEE,192300EEEE,1824011007:REM positn 6 ie BLUE
12070 DATA 0800EEEEEE,09040110EE,25110205EE,2624120603:REM positn 7 ie GREEN
12080 DATA 0907EEEEEE,2500EEEEEE,2624040110,2723110205:REM positn 8 ie YELLOW
12090 DATA 2508EEEEEE,242607EEEE,232700EEEE,2228040110:REM positn 9 ie RED
12100 DATA 1100EEEEEE,12010407EE,13020508EE,2814030609:REM position 10 ie BLUE
12110 DATA 1210EEEEEE,1300EEEEEE,2814010407,1527020508:REM positn 11 ie GREEN
12120 DATA 1311EEEEEE,281410EEEE,271500EEEE,2616010407:REM positn 12 ie YELLOW
12130 DATA 142812EEEE,152711EEEE,162610EEEE,172500EEEE:REM positn 13 ie RED
12140 DATA 1513EEEEEE,162812EEEE,172711EEEE,182610EEEE:REM positn 14 ie BLUE
12150 DATA 1416EEEEEE,1317EEEEEE,28121803EE,27111902EE:REM positn 15 ie FREE
12160 DATA 1517EEEEEE,141803EEEE,131902EEEE,28122001EE:REM positn 16 ie GREEN
12170 DATA 160318EEEE,151902EEEE,142001EEEE,132100EEEE:REM positn 17 ie YELLOW
12180 DATA 1719EEEEEE,162003EEEE,150221EEEE,14220106EE:REM positn 18 ie RED
12190 DATA 1820EEEEEE,1721EEEEEE,16032206EE,15022305EE:REM position 19 ie FREE
12200 DATA 1921EEEEEE,182206EEEE,172305EEEE,16032404EE:REM position 20 ie BLUE
12210 DATA 202206EEEE,192305EEEE,182404EEEE,172500EEEE:REM positn 21 ie GREEN
12220 DATA 2321EEEEEE,242006EEEE,192505EEEE,26091804EE:REM positn 22 ie YELLOW
12230 DATA 2422EEEEEE,2521EEEEEE,20062609EE,27081905EE:REM positn 23 ie FREE
12240 DATA 2325EEEEEE,222609EEEE,212708EEEE,20062807EE:REM positn 24 ie RED
12250 DATA 242609EEEE,232708EEEE,222807EEEE,211300EEEE:REM positn 25 ie BLUE
12260 DATA 2527EEEEEE,280924EEEE,130823EEEE,14122207EE:REM positn 26 ie GREEN
12270 DATA 2826EEEEEE,2513EEEEEE,24091412EE,23081511EE:REM position 27 ie FREE
12280 DATA 2713EEEEEE,261412EEEE,251511EEEE,24091510EE:REM positn 28 ie YELLOW
```

C Batch File Input

by Andy Lawrie

This program is for any MS-DOS computer running DOS versions 2 or 3. It provides simple single key input for batch commands and so can be used with menus, and so on.

```
/*
batchin.c

A program, written in C, to allow the flow of a batch file to be influenced
by keyboard input at run time.

For the IBM PC, XT, AT and compatible computers, and other MS DOS machines
running DOS version 2 or 3.

Usage
-----

Syntax : batchin <valid reply string> <prompt string>

<Prompt string> will be output to the screen, followed by a space, after
which batchin will wait for one of the characters in <valid reply string>
to be entered from the keyboard. Characters both from the keyboard and in
<valid reply string> are converted to upper case.

Batchin returns a code to the batch file which can be tested by the 'if
errorlevel x' batch command. A return code of 0 means that <valid reply
string> and/or <prompt string> was omitted from the command line,
otherwise the position within <valid reply string> of the typed character,
starting at 1, is returned.

Note that the batch file must test first for the characters at the end
of <valid reply string> as 'if errorlevel x' will regard as true any
code equal to or greater than x.

Notes
-----

The program as listed was compiled by Zorland C.


Library functions
-----------------
exit(code)              As K & R
getch()                 In Zorland C, this function waits for a char to
                        be entered from the keyboard and returns it
                        immediately without an echo. Here lies a possible
                        incompatibility if you use a different compiler.
printf(string,args)     As K & R
strpos(string,char)     Returns the position within string of the first
                        occurrence of char, or -1 if char not in string
strupr(string)          Converts string to upper case
toupper(char)           Returns upper case char

*/

#include <stdio.h>

main(argc,argv)
int argc ;
char *argv[] ;
{
 int argnum,keypress,position ;

/* check that we have sufficient arguments */
 if(argc<3) exit(0) ;

/* print prompt to stdout */
 for(argnum=2;argnum<argc;argnum++) printf("%s ",argv[argnum]) ;

/* convert <valid reply string> to upper case */
 strupr(argv[1]) ;

/* fetch characters until we get one that is in <valid reply string> */
 do {
  keypress=toupper(getch()) ;
  position=strpos(argv[1],keypress) ;
 } while(position==-1) ;

/* echo it to the screen with a cr/lf */
 printf("%c\n",keypress) ;

/* exit with the appropriate return code */
 exit(++position) ;
}
/* end of batchin.c */
```


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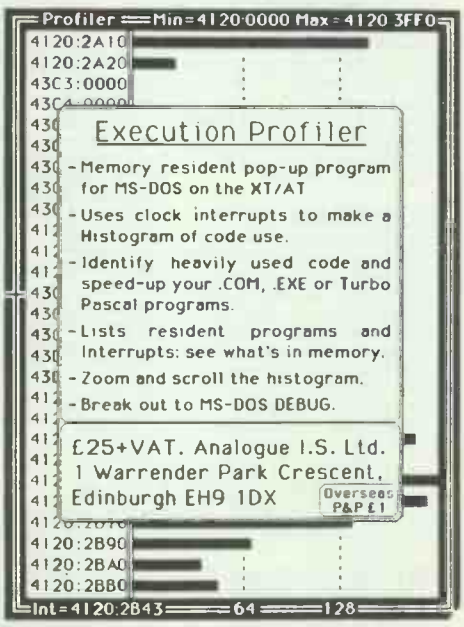

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● SOLARTON DIGITAL VOLTMETER. Maestro 7075 High accuracy sampling. With BCD output module. Ideal for data logging applications £1600. (under half price) or exchange for IBM-XT. & Software. Fleet (0252) 623316.

PERIPHERALS

● MODEM CASE 400/213 300 and 1200/1275 Baud. Auto dial, Auto answer. Ideal for Prestel and Bulletin boards, £125. Tel: Steve on Orpington 57433 after 7pm.

PORTABLES

● IBM PORTABLE PC + cable, 256k, Asynch, comms card, DOS, one careful lady owner, £600 ono. Lamorna Lee, Tel: (0256) 56144 ext 5625 or (0962) 67476 evenings and weekends.

● NEC PC8201A LAPTOP PORTABLE, 24k ram, full manuals, application software. All in good condition, £150 ono. Tel: Peterborough (0733) 253331 eves.

● COMPAQ 2 PORTABLE. 640K, 10Mb hard disk and 1 floppy. As new with software. And Fujitsu printer, cables etc, £2127 ono. May separate. (021) 382 7389 day (021) 308 1807 eve.

● GRID COMPASS 1100 16 BIT PORTABLE. Bright display, bubble memory etc. Built-in modem. Cost £4750, accept £1,000. Grid 2202 disk drive double sided. New, £300. (021) 382 7389 day (021) 308 1807 eve.

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● EPSON PX-b 120K RAM. Including Wordstar, Calc, Cardbox, Schedule, Basic manuals plus RS232 cable and Epson LX80 matrix printer. £445. Tel (043685)

TRANSACTION FILE

238 (near Glasgow).
● EPSON PX-8 120K, ROM/ Basic, Wordstar, Supercalc, Cardbox, Scheduler, all manuals, 2-chargers, 200V, 110V, P40 Epson printer, all for £450. Tel (01) 272 7538 Don or Mal.
● NEC PC8201A. As new complete with Wp and comms. software. Cassette recorder included, Only £180. (0293) 25067 after 7.00pm.
● EPSON PX-8 PORTABLE. 120K RAM, P-80X printer, usual software and manuals, original boxes and numerous tapes. £650. Tel (061) 928 0998 to ask owner to return your call.

PRINTERS AND PLOTTERS

● MICROLINE 192T PRINTER. 80 col, tractor or friction, boxed, as new with spare ribbons, £225. Wannit? Tel: Steve on Orpington 57433 after 7pm.
● IBM COLOUR INKJET. Unused, £295. EGA Quad ram + 256k, £95. Mono card, £49. Original IBM software packages. BBC model B + disc drive, as new, offers invited. Tel: (01) 388 1620 after 8pm.
● NEC PRINTER, PC8023 BE-C. In excellent conditon, boxed with manual. £78. Tel: London (01) 751 2262 after 6pm.
● EPSON GQ3500 LASER PRINTER, with 1.5Mb ram and HP + emulation card. Just a few weeks old, as new, £1699. Tel: (0943) 816133.
● SILVER REED EXP 500 PRINTER, with tractor feed, £95 ono. Opus printer stand with base unit for computer mounted on castors, £100 ono. Tel: (01) 449 9751 (Barnet).
● NEC SPINWRITER 5530 DAISYWHEEL. 136/163 Column, 3 font, automatic sheet feeder, manuals, heavy duty professional printer. Bargain £550. Tel Brighton (0273) 32369.
● SANPLE DAISY STEP 2000 FOR SALE. Plus spare diasywheel and ribbons. 18cps letter quality. Little used. Connects (parallel) to PCXT etc. £95. Tel John Coward at Parsons, (01) 352 0651.

SINCLAIR

● SPECTRUM 48K PLUS with Interface I + Microdrives + Joysticks + cartridges + games + books + instructions. Cost £890, sell £250. Total cash or will split. No time wasters. Tel: (01) 452 4076. Rohit, evenings only.
● QL 640k. CST disc interface, 80 track DSDD 5¼ drive. Microvitec monitor. Metacomco C, BCPL Pascal, Assembler, GST-ASM, CP/ Mulator, Toolkit II, books and discs. Offers around £500. Hopkins (01) 388 6561 ext 225 9-6pm.
● SINCLAIR QL. Ferguson green monitor. Epson RX80 with interface. Includes Pyramide software and cartridges, books and magazines £225 o.n.o. Tel: Martin on (01) 435 2468.
● SINCLAIR QL. With serial 8056 printer, ICE ROM, Psion software 2.3, cartridges, books, magazines, 11 months old. Excellent condition, £85 o.n.o. Tel Graham (061) 799 0635 after 6pm.
● SINCLAIR QL. 640K. Colour monitor disc drive, colour printer, plus 10 books, Pascal, Q-Liberator, Graphic QL and V-2.3. Psion software. Bargain at £400. Tel (0623) 513887 after six pm Edwin.
● QL. 512K, 2 × 720K 5¼" drives, parallel printer adaptor microvitec colour monitor. ICE ROM and manuals. Plus a myriad of software. Excellent condition. £450. Tel: Harlow (0279) 20789.

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● FOR SALE Complete software and manuals. DBase III plus, £400 ono. Tel: London (01) 897 3679.
● USED IBM SOFTWARE. DBase III plus, Ventura Publisher and Autocad 2.52. Willing to exchange other IBM software. Write to Tom PO Box 80029, Cheung Sha Wan, Hong Kong.
● LOTUS 123 for Apricot 3.5" machines. Unused, seals still unbroken. Costs £300 new (incl VAT + delivery. Anyone wanting to buy it for £150. Tel: Des (0242) 583502 eves (0452) 711480 days.
● MICROSOFT PASCAL COMPILER V3.3. Unused. With all original documentations. Good reason for sale. £80. Tel (01) 794 2373 ask for Mr Nam.
● DATAMASTER.V2.11. Menu driven relational database for IBM PC or compatibles. Brand new and unused. Still with registration card. £100 o.n.o. (£250+ new). Tel (0679) 63258 evenings and weekends.

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● TANDY 200 PORTABLE. Fully expanded ram. Combined modem. Includes Word processor, Spreadsheet, Diary, Address and comms. With diskdrive, manuals, cables and PSUs, £575. Interested? Tel: Steve on Orpington 57433 after 7pm.
● TRS-80 MOD III 48k. Green screen, 80trk disk drive. RS-232 board fitted, manuals and lots of software, £200. Tel (0732) 844633 evenings.
● TRS-80 MODEL 1. Comprising keyboard unit (16k), expansion interface unit (32k), two 5¼ inch floppy drives and monitor. Also Visicalc and profile software, manuals and all connection cables. Spare keyboard unit too. Any offers. Neil, (01) 894 4328.
● TANDY 1000EX COMPUTER, Colour monitor, joystick, printer, cable, basic manual, £460. J Price, 18 Garrett Close, Chartefields Estate, Kingswinford, West Midlands DY6 7FR. Tel: (0384) 279687.

WANTED

● DOES ANYONE KNOW of an independent users group for the Epson PX-8. Please contact Mr Tebb, 102 Keldregate, Bradley, Huddersfield HD2 1TB.
● LYNX CAMPUTER 48k CIRCUIT DIAGRAM AND MEMORY MAP. Also Centronics printer interface and disc drive controller. Mr A Warren, 8 Brooklyn Road, South Norwood, London SE25 4NH.
● WANTED URGENTLY. Matmos PC 64K Z80A based computer made by TA alphatronics with d/drive (s) to run CP/M 2.2. Will pay upto £250. Tel (0602) 760006 after 6pm Mondays to Thursdays.

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All Transaction File ads must be submitted by readers on this form or a photocopy of this form. Maximum 30 words. Print one word per box, very clearly. Name, *full* address and/or telephone number must be included in the 30 words. All ads must be accompanied by a flat fee of £5. Make cheques or POs payable to *Personal Computer World*. Ads accepted from private readers only. Ads cannot be repeated (unless sent in on another form) and we cannot guarantee to print an ad in any specific issue. Please help our typesetter to help you by writing your ad very clearly. Send your completed form to: Chris Cain, Transaction File, *PCW*, 32-34 Broadwick Street, London W1A 2HG.

Please find enclosed my cheque/PO for £5, together with details of my name, address and telephone number.

Please tick the appropriate category for your ad from those listed below:

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END ZONE

MUSICAL INTERLUDE

Roger Howorth is our resident keyboard wizard with his finger on the pulse of computer music. This month he looks at sampling, which is used to produce those s-s-silly noises.

Sampling is one of the basic methods of sound production using computers. It involves digitally recording a sound into RAM, perhaps editing it in some way and finally playing it back, either as a rhythmic effect, or as a musical note.

The theory of digital recording is fairly straightforward: a sound is presented as an electronic signal to an analogue to ditigal converter (ADC) — think of this as a camera continually taking snapshots of the voltage present at the input. These snapshots, or samples, are in fact numbers which are directly related to the input voltage.

Sampler quality is defined by three things:

- the number of snapshots that can be taken per second: the more taken, the greater the accuracy of the recording (a good analogy is the number of dots your computer display uses per line);
- the range of numbers that can be output by the ADC — again, the greater the range the better; and
- the amount of RAM available for sample storage.

Putting all this into more quantitative terms, the number of samples taken is expressed in KHz. Fig 1 shows that the highest frequency a sampler can accurately record is govened by the number of samples taken per second. That's why this figure is often referred to as 'bandwidth'.

A compact disk machine runs at 44.1KHz or 44,100 samples per second: this is pretty good, but some digital tape machines work at 48KHz, and expensive keyboards go well beyond 50KHz.

Fig 2 shows how the wave from Fig 1 is distorted as it is reconstructed by the sampler, due to the sample rate being too low.

The range of numbers a sample must fall within is measured in bits, with systems currently using either 8, 12 or 16 bits. There is talk of 24bit chips being just around the corner; that's good news, because the wider the chip, the better the sample.

Clearly, as the quality of samplers increases, so does the amount of data they produce, but home computer sampling packages are seriously limited in this respect. The computer is usually quick enough at gathering and organising this data within its RAM; but, unless you're prepared to dedicate a hard disk drive for sample storage, you'll end up with samples that last only a few seconds sampled at more than 8bits/20KHz.

Editing tools

Software aids vary between systems, with some having no facilities for editing or indeed any permanent storage. Others only allow the front and end of your sample to be moved to make the sample shorter. More exotic systems, though, allow for amplitude changes and merging of different samples, the list of options growing with the system's cost.

One editing tool considered vital is the 'loop', which allows you to make a short sample play for a variable period, and can even make one that was sampled with a sharp cut-off fade away gently. Looping is good for both memory consumption and the playability of the sample, as the looped sound can be replayed for as short or long a time as is required (see Fig 3).

Voice counts

Most cheap add-on samplers only function monophonically: that is, they can only play one sample at a time. This is all very well for effects such as Paul Hardcastle's famous 'N-n-n-nineteen' vocal, but it's only just short of useless in musical terms where, in order to play a chord made up of five notes, the sampler would have to play five sounds at once.

Some samplers can of course do this and they are known as 'polyphonic'. They are attributed with a number of 'voices', which is the maximum number of sounds that can be played at once. They don't necessarily use more memory but they do require a more sophisticated digital to analogue converter (DAC) — sometimes one for each voice. Naturally you have to pay for these extras.

Playing time

When you've worked out how a sample is recorded, the playback technology is quite easy to grasp; the sample data being fed to a DAC which converts the computer's binary numbers into your hi-fi's volts.

The mechanisms used to tell the sampler which sample to play at what volume, pitch, and so on, are a subject unto themselves. Often, though, samplers are linked via a Musical Instrument Digital Interface (MIDI) to either a set of drum pads, keyboard or sequencer.

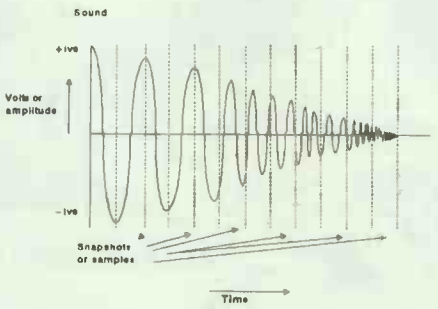


Fig 1 The frequency of the sound wave is increasing with time, yet the sample rate shown can only accurately record the first few wavelengths. The diagram also clearly shows that a sample is needed at both +ive and −ive peaks in order to record the wave's frequency correctly; therefore, the highest frequency that a sampler can record is half the sample rate.

These two factors force samplers into a vicious circle of producing more data in the quest for better sounding samples. This in turn demands massive amounts of storage, such as hard disk drives, which make the cost of such systems too expensive for most people

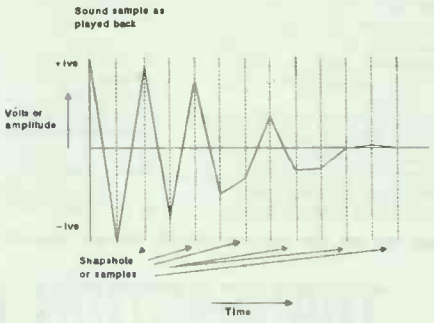


Fig 2 The lower frequencies are reproduced quite accurately, but the later higher ones are distorted beyond recognition by the low sample rate

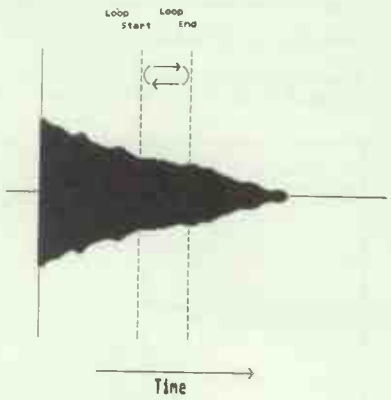


Fig 3 The 'looped' section of the sample is replayed as much as necessary in order to vary the 'length' of the sample

MUSICAL INTERLUDE

Controlling your sampler

Innovative Software, which makes the IS Digitiser sampling board for the Atari ST, has released a new piece of software to run alongside the Digitiser, providing control of samples via the Atari's MIDI port. Multiple keyboard splits can be set up, which means that providing you have enough RAM, you can assign a different sample to every note on your MIDI keyboard. Remember, though, that the digitiser itself is a monophonic device, so you can only play one sample at a time.

The sampler, which retails for £99.95, includes variable sample rate from 4 to 25KHz, along with effects such as echo and reverb as well as a real-time oscilloscope and reasonable editing facilities. An unusual feature is that as well as outputting sampled sounds to your hi-fi, it can also send them to the monitor or TV loudspeaker, without necessarily using either the hardware interface or the main software package. The various source files supplied by Innovative allow you to play back samples from your own Basic, C or machine code programs.

The IS Digitiser and new MIDI software, which costs £19.95, are available from Chips Data Direct on (0903) 40509.

Hybrid Arts' ADAP SoundRack represents the ultimate 'add on' sampler. Besides some sophisticated software you get a 16-bit linear stereo sampler that runs at up to 44.1KHz, which is identical to the CD format, giving 10 seconds stereo (or 20 seconds mono) in 8-voice polyphony.

Being based around the Atari ST means that all editing, looping, and so on, is done in colour with your mouse. SoundRack is disk compatible with Akai S900, Emax, Ensoniq Mirage, Korg DDS1, Prophet 2000/2002 and the Roland Sampler.

It also boasts several real-time digital effects such as DDL, reverb, chorus, and so on, and with a 4Mbyte machine could give over a minute of sampling, dumping onto hard disk. Currently it's limited to a stereo output, but before long someone will hopefully offer a modification that routes the eight voices to separate outputs. At entry level SoundRrack will set you back £19.99. Further details from Syndromic Music on (01) 444 9126.

Roger Howorth is a freelance computer journalist and sound recording engineer who owns and experiments musically with an Atari ST. If you would like to share your musical experience with Roger or you would like to pass on any interesting snippets, why not write to him care of *PCW*, VNU House, 32-34 Broadwick Street, London W1.

NUMBERS COUNT

Mike Mudge juggles with positive integers, is spellbound by powerful numbers and wonders, is this a case for geometric analysis?

Consider the n-digit positive integer, N, expressed in base 10 in the conventional manner: that is, $N = a_0 + a_1 \times 10 + a_2 \times 10^2 .. + a_{n-1} \times 10^{n-1}$ where $0 \leq a_i \leq 9$.

Given N, the idea is to construct a related positive integer, $F(N) = P_r(N)$ where r = 2,3,4,5 . . . , defined to be the sum of the r^{th} powers of the digits of N.

Thus $P_2(123) = 1^2 + 2^2 + 3^3 =$ 14sp, while $P_4(423) = 4^4 + 2^4 + 3^4 =$ 353.

Now, if $P_r(N) = N$, then N is defined to be a 'powerful number' of degree r, to base N.

Some examples of powerful numbers to base 10:

Degree 3. $P_3(153) = 1^3 + 5^3 + 3^3 =$ 153.

Degree 4. $P_4(1634) = 1^4 + 6^4 + 3^4 + 4^4 = 1634$.

Degree 5. $P_5(4150) = 4^5 + 1^5 + 5^5 + 0^5 = 4150$.

Degree 6. $P_6(548834) = 5^6 + 4^6 + 8^6 + 8^6 + 3^6 + 4^6 = 548834$.

Problem (i) Construct an efficient algorithm to 'dissect' a given positive integer, base 10, into its constituent digits base b.

Problem (ii) Generate all the powerful numbers of degree r to base 10 up to a given N_{max}.

Problem (iii) Provide a theoretical and/or empirical argument to define *all* the powerful numbers of degree r to base 10. Hint: how large can a powerful number of degree r to base 10 be? There are only finitely many for a given r. Is there always at least one?

Problem (iv) Generalise the results of (i) and (ii) to base b not equal to 10.

Is it possible to have a positive integer which is a powerful number (albeit with different degrees) in more than one number base? Furthermore, is there a possible geometrical interpretation of the above transformation?

If the two-digit integer, to base 10, a_1a_0, is regarded as representing (or being represented by) the point in the x,y-plane with coordinates $x = a_0$, $y = a_1$; and, similarly, in three-dimensional space for $a_2a_1a_0$ where $z = a_2$ is there a geometrical interpretation of the mapping defined by $P_r(N)$?

(1,5,3) is in some sense a 'fixed point' for the mapping defined by $P_3(N)$. The points (1,3,5), (3,5,1),(3,1,5),(5,1,3) and (5,3,1) can be regarded as joined to (1,5,3) by 'unit arrows' corresponding to one stage in the mapping: that is, geometrically $P_3(1,3,5) = (1,5,3)$.

Has this picture any physical significance?

When the numbers N involved have more than three digits, the geometry is in an n– dimensional hyperspace. Although this is difficult (if not impossible!) to visualise, the set of points associated with powerful numbers may be open to some interesting interpretation.

Readers are invited to suggest functions $F(N) = F([a_0,a_1,...a_{n-1}])$ other than $P_r(N)$ that may generate interesting results when iterated on the set of positive integers base b. Reference to Numbers Count, *PCW* November 1983 ('The Persistence of an Integer') will provide one example of such an extension.

Send your attempts at this project to Mike Mudge, 'Square Acre', Stourbridge Road, Penn, Staffordshire WV4 5NF, tel: (0902) 892141, to arrive by 1 February 1988.

It would be appreciated if such submissions contained a brief summary of results obtained, in a form suitable for publication in *PCW*. These submissions will be judged using subjective criteria, and a prize will be awarded by *PCW* to the 'best' contribution received by the closing date.

Please note that submissions can only be returned if a stamped addressed envelope is provided.

Review: W-sequences, April

W_1

W_2 W_3

W_4 W_5 W_6 W_7

The basic binary-tree structure exhibited by the terms of a W-sequence will interest programmers:

NUMBERS COUNT

This structure leads directly to certain generalisations concerning junction points: thus if Z is a junction point of $W(a,b,c,d_1,d_2)$ then all members of $W(a,b,z,d_1,d_2)$ are also junction points of that sequence.

Computation and counting of terms of W-sequence involves no essential difficulty, efficient sorting is merely needed at the final stage. Determination of a particular term, for example the 2157th in a particular W-sequence such as W(2,3,1,1,1), can be readily carried out by repeated division of 2157 by 2 noting the presence of a non-zero remainder. (Answer, 30646.)

Junction points for W(2,3,1,1,1) start with $Z_1 = w_{11} = w_{16} = 31$, $Z_2 = w_{22} = w_{32} = 63$, $Z_3 = w_{23} = w_{33} = 94...w_{271} = w_{191} = 2551.,...w_{383} = w_{543} = 7654...$

Some combinations of parameters which do not yield junction points were discovered, including (i) a & b both even, +(ii) d_1 and d_2 one odd and the other even.

An analysis of W(2,3,1) and W(2,3,2) shows that the terms are divided between the residue classes 3,1,2 and 0 modulo 4 in ratios 5:2:2:1 within 'very small' error.

Thus for the first 1303 terms of W(2,3,2) (those less than 20000) the ratios are 49.58:21.03:20.18:9.21. If this process is repeated for sets of terms within each interval of 20000 up to 680000, the corresponding intervals are (48.77-49.80):(20.86-21.23):(20.18-20.95):(8.65-9.21).

Note that apart from $c = w_1$ itself, all terms of W(2,3,c) are congruent to 1,3,4 or 5 modulo 6. Further, apart from $c = w_1$ and possibly w_2, w_3 and w_4, every term in W(6,9,c) is congruent to 7, 10, 37 or 43 modulo 54 (except when c is congruent to zero modulo 18, when W_n is congruent to 1 modulo 54).

This month prizes go to Gareth Suggett of 31 Harrow Road, Worthing, Sussex BN11 4RB for a combination of theoretical observations and computation, and also to Philip Newton Webb of 83 Sopwith Crescent, Merley, Wimborne, Dorset for considerable analysis and flow-charting relating to W-sequences.

Mike Mudge welcomes correspondence on any subject within the areas of number theory and other computational mathematics. Particularly welcome are suggestions, either general or particular, for future Numbers Count articles; all letters will be answered in due course.

Isolated readers can be put into contact with others sharing the same interests. However, greater efficiency regarding published problems should result from contacting the prizewinner directly.

USER GROUPS

Rupert Steele looks at a user group service, run on Prestel, and has news of a mini-revival among local clubs.

The sophistication of user groups is increasing. Many are sending me newsletters produced on laser printers, or distributing on disk — often with useful little utilities thrown in. Others are running bulletin boards or areas on Prestel. Perhaps the most important is ClubSpot 810, run by the Electronic Publications Committee of the Association of Computer Clubs.

This database has consistently been one of the most accessed areas on Prestel. It contains information on a variety of machines, as well as a general hobby area. You can see it on Prestel by keying *810# or using keyword search *clubspot# — although if you really want to get into the computer details, you will have to become a member of Prestel Microcomputing. This gives you access to the closed-off pages for a relatively modest fee. And while you are on Prestel, you can of course take advantage of its other facilities, such as the national electronic mail service. For more information, contact Andy Leeder, secretary of the Electronic Publishing Committee, ClubSpot 810, Church Farm, Stratton St Michael, Norwich NR15 2QB.

Directory enquiries

Recently I have received interesting letters from two directory stalwarts, the 1512 Independent Users' Group and BOOG.

The 1512 Group is taking an interest in Amstrad's PC1640, and has devised a part exchange scheme for members who want to upgrade. They can do so by selling their machine at a suitably low price to somebody outside the group who can't afford a mint condition 1512. Details are available from The 1512 Independent Users' Group, PO Box 55, Sevenoaks, Kent TN13 1AQ. Tel: (0732) 63157.

BOOG meanwhile has changed its contact point — you should now address enquiries to Jeremy Browne of BOOG Ltd, 102a Aldershot Road, Fleet, Hants GU13 9NY. Tel: (0252) 621745. He adds that the group is offering assistance not only for the Osborne machines, but also for other CP/M micros. Some BOOG members are also upgrading to MS-DOS machines, and they are being supplied with relevant material.

Local clubs latest

Local clubs were the backbone of the hobby computing movement before (almost) everybody could afford their own machine, but are now generally operating on a rather smaller scale. However, there are a few groups which continue to thrive, and the Association of Computer Clubs has sent me some details. The Harrow Computer Group, for instance, meets regularly in the Harrow Arts Centre; meetings alternate between the hardware subgroup and a general get-together, which often features a lecture. As with all Association of London Computer Clubs, membership of the Harrow Group entitles you to visit other ALCC groups. Contact Norman for details at 4 Tapley Court, St Johns Road, Harrow HA1 2HZ. Tel: (01) 863 5241. Harrow's activities are also available on Prestel page *81021254#.

Moving west, I have been contacted by the West Herts Micro Users Association, which meets fortnightly on Tuesday evenings at St Stephen's Parish Centre, Station Road, Bricket Wood, St Albans, Herts. Its special interest subjects are networking, hardware and computer-aided engineering. Details from Brian Larkin, 82 Church Street, Leighton Buzzard, Beds LU7 7BT, or call Terry Bradbury on (0727) 73633.

The Huntingdonshire Computer Club draws its members from the St Neots, Huntingdon and St Ives districts. It meets on the morning of the second Sunday of each month in the St Ives Centre, IVO Centre, St Ives, with an additional informal meeting on the evening of the last Thursday of the month in the lounge of the Horseshoes public house, Offord D'Arcy. John Childs is the secretary, at 57 Manor Gardens, Buckden, Huntingdon PE18 9TW.

If you would like your user group or club to have a mention in this column, or you wish to be considered for the Directory of User and Support Groups, please write to Rupert Steele, 12 Philbeach Gardens, London SW5 9DY.

DIRECTORY OF USER GROUPS

GROUP	CONTACT	NOTES
● MACHINES 68 Microgroup	J Turner, 63 Millais Road, London E11 4HB	Hardware/software for 68000/6800
Apricot File	Apricot File, TP Group, PO Box 509 London N1 1YL (01) 833 3501	Detailed technical Apricot newsletter
Atari National User Group	N Lewis, 13 Weavers Walk, Courthouse Green, Coventry CV6 7LG	Newsletter; SAE please
Atari ST-Club	Paul Glover, ST-Club, PO Box 20, Hertford	PD software available
Basug	Sheila Hurst, PO Box 177, St Albans, Herts AL2 2EG (0727) 73990	Apple systems
BOOG	Victor Nollen, 38 Rocks Lane, Barnes, London SW13 0DA (01) 833 2526	Osborne support group
Commodore Plus 4	Steve Kent, 203 Wolverhampton Road, Pelsall Walsall, West Midlands WS3 4AW	SAE please
Compucorp University Users Group	c/o Compucorp, Cunningham House, Westfield Lane, Kenton, Middx HA3 9ED	
HICUPS	Bruce Ainge, Foxberry House, 16 Foxberry Road, London SE4 2SP (01) 691 5202	Hitachi MBE 16002 PC group
IBM PC User Group	Ian Fraser, PO Box 830, London SE1 0DB (01) 620 2244	Covers IBM PCs and all compatibles
ICPUG	Jack D Cohen, ICPUG, 30 Brancaster Road, Newbury Park, Ilford IG2 7EP (01) 346 0050 (home); (01) 579 1229 (day)	Commodore machines from PET to Amiga. £10 subs + £1 entry fee
Independent Psion Organiser User Group (IPSO)	Mike O'Regan, 130 Stapleford Lane, Beeston, Nottingham NG9 6GB	SAE please. Monthly newsletter IPSO FACTO
IOUG	Gary Ramsay, 1 Kingsway Crescent, Burnage, Manchester M19 1GA	Oric users; newsletter IOU
IQLUB (renamed QUANTA)	Brian Pain, 24 Oxford Street, Stoney Stratford, Milton Keynes MK11 1JU	Sinclair QL and compatibles
Jupiter Ace User Domain Resource Centre	Ian Jones, 21 Dene Street, Pallion, Sunderland SR4 6JB (091) 565 2833	Software/hardware ideas exchanged. SAE please
MacTel	David Nicholson-Cole, 15 Elm Tree Avenue, West Bridgeford, Nottingham NG2 7JU Board (0602) 817696 or (0742) 350319	Bulletin board for Mac users 300/300; 1200/75; 1200/1200
Macintosh User Group UK	John Lewis, 55 Linkside Avenue, Oxford OX2 8JE. (0865) 58027	£25 subscription: professional group
Memotech Owners Club	Phil Eyres, 23 Denmead Road, Harefield, Southampton SO2 5GS	SAE please
NATGUG (National Amstrad, Tandy and General Users Group)	Brian Pain, 24 Oxford Street, Stony Stratford, Milton Keynes MK11 IJU (0908) 564271	Tandy, Genie, MS-DOS, Amstrad
NBUG	Gerald McMullon, 36 Armitage Way, Cambridge CB4 2UE	NewBrain SAE please
OPEN#STREAM	1 Ranelagh Road, Deal, Kent CT14 7BG	NewBrain group
Research Machines National User Group	Steve Burrows, Wirral CAE Services Ltd, Gorsey Lane, Wallasey, Wirral L44 4HE (051) 639 8237	RML 380Z, 480Z, Nimbus and 80286/80386 machines
Sanyo MBC-550	Mr M H Syed, Wistaria, 53 Acacia Grove New Malden, Surrey KT3 3BP (01) 942 9009	Informal group
Sharp User Group	Andrew Fergusson, 11 Harcourt Close, Henley on Thames, Oxon RG9 1UZ (0491) 574 850	£6 Subscription. Newsletter (60 pages) & software library
SORD/PIPS	Mr B Nicholson, 5 Brunton Place, Edinburgh EH7 5EG (031) 556 2340	Informal group for UK users of SORD M-23
Tangerine	David Cawthorne, 40 Westbourne Road, West Kirby, Wirral L48 4DH (051) 625 7311	Informal info sheet and newsletter; £2/copy
The One And Only	Neil Smith, 42 Hayes Road, Bromley BR2 9AA	ZX Spectrum software exchange. SAE please
T199/4a EXCHANGE	Clive Scally, 40 Barrhill, Patcham, Brighton BN1 8UF (0273) 503968	Subscription £6; quarterly newsletter
Transputer Users Group	Dr Howard Oakley, Brooklands Lodge, Park View Close, Wroxall, Ventnor, Isle of Wight PO38 3EQ	£5 subscription
UK Amiga Users Group	66 London Road, Leicester LE2 0QD. (0553) 550993 voice; 550893 BBS	
UKAS (UK Adam Subscribers)	Keith Marner, 33 Homer Road, Croydon CR0 7SB (01) 654 2184	Coleco Adams. Journal every 2 months; SAE please
UK Einstein User Group	Graham Bettany, UKEUG, 80 Dales Road, Ipswich IP1 4JR	£15 subscription. Monthly newsletter. SAE please
West Midlands & Oxon TI User Group (International)	Gordon Pitt/Peter Brooks, 259 Sneyd Lane Bloxwich, Walsall WS3 2LS Bloxwich 476373	National TI99/4 group Subscription £12.50; monthly newsletter

END ZONE

UK BULLETIN BOARDS

An up-to-date list of UK bulletin boards, compiled by Peter Tootill.

London

Airtel - TBBS (01) 200 3439
24 hrs; 3/1275; Pilots' area
Brixton ITeC (01) 735 6153
24 hrs; 1275
Communitel (01) 968 7402
24 hrs; 1275v
Crystal Tower (01) 886 2813
24 hrs; 3-24
Gen interest; Apple & IBM
CyberZone (01) 638 2034
24 hrs; 3
Dark Crystal Fido
(01) 207 2989; 24 Hrs; 3-12
Distel (01) 679 1888
24 hrs; 300; Display electronics- Commercial 3/1275 on 01 679 6183
Gnome at home (01) 888 8894
24 hrs; 1275v
Hackney BBS (01) 985 3322
24 hrs; 1275v
Health data (01) 986 4360
24 hrs; 1275v
Hendon Fido #1 (01) 200 7577
(01) 220 8281 24 Hrs; 3/1275
Opus system
ITCU Training (01) 960 4742
24 hrs; 1275v
Lots of ITeC training materials
Link Fido (01) 659 6992
24 hrs; 3-12
London U'qnd (01) 863 0198
24 hrs;3-24 Wildcat BBS
Marctel (01) 346 7150
24 hrs; 3/1275 FBBS system
MBBS Mitcham (01) 648 0018
24 hrs; 3/1275
Metrotel (01) 941 4285
24 hrs; 1275v
NBBS London (01) 883 5290
24 hrs; 3/1275
NNBBS London (01) 455 6607
24 hrs; 3/1275
OSI Lives (01) 429 3047
24 Ring back; 300
Owltel (01) 927 5820
24 hrs; 1275v
PC Access (01) 853 3965
24 hrs; 3-24 For PC users
Poly Fido (01) 580 1690
24 hrs; 3-12
Taecom (01) 573 8822
MF: 7pm-8am; WE:all day Sun
300 Interak micro section
TBBS Rovoreed (01) 542 4977
24 hrs; 3-24
TBBS London (01) 348 9400
24 hrs; 3-12
Techno Line (01) 450 9764
24 hrs; 1275v; Commercial
Techno-line 2 (01) 452 1500
MF: evenings; WE:24 hrs
1275v Commercial
The Star BBS (01) 586 6882
24 hrs; 3/1275; Atari ST area
The Village (01) 464 2516
24 hrs; 3-24
Atari 520ST based
Twighl't Phone Fido
(01) 624 5338 24 hrs; 3
Typnet (01) 676 0283
24 hrs; 300; Budget Typsetting
WBBS Wimbledon (01) 542 3772
Sat 7pm - Mon 8am; 3/1275

The Midlands

CBABBS; Birmingham
(021) 430 3761 24 hrs
(not Thurs); 300 Atari based
can send mail to Canada
Digital Matrix Fido
Birmingham (021) 705 5187
24 hrs; 3/1275
Compu-store on-line
The City; Birmingham
(021) 353 5486 24 hrs; 300
Atari 8 bit & ST; Lonely Hearts
TUG II; Birmingham
(021) 444 1484; 24 hrs; 3/1275
Amstrad;Tandy;online Adventure
Wolverhampton BBS
(0902) 745 337; 24 hrs; 3/1275
MS-DOS; CP/M; Commodore areas

The North East

49'ers; Cleveland
(0287) 43 920 MF:10pm-4am
WE:10pm-4am; 3/1275
FBBS colour for BBC users
Avon Fido; Weston Super Mare
(0934) 29 570 24 hrs; 3/1275
Forum-80; Hull (0482) 859 169
MF:7pm-11pm; WE:1pm-11pm
3/1275
Midnight-8am on Bell 103 tones
LEMS Fido; Leeds
(0532) 600 749 Daily 10pm-8am
3/1275
Hamnet; Hull (0482) 465 150
MF:6pm-8am; WE:24 hrs; 3/1275
Radio Hams
Key Board; Milton Keynes
(0908) 668 398
8pm-8am exc Tues and Thurs
12h Runs on a Spectrum.
Log On Tyne Fido; Tyneside
(091) 477 3339 24 hrs; 3/1275
MacTel Sheffield
(0742) 350 319 24 hrs; 3-24
For Macintosh Users
MacTel HQ; Nottingham
(0602) 817 696 24 hrs; 3-12
Macintosh Users
MacTel Green Box; Nottingham
(0602) 811 950 24 hrs; 3-24
For Macintosh users
MBBS Leconfield (0401) 50 745
24 hrs; 3/1275
Norview; Northants
(0604) 20 441; 24 hrs; 1275v
OBBS Bradford (0274) 480 452
24 hrs; 3/1275
Colour for BBC users
On-Line Systems; Cleveland
(0429) 234 346; 24 hrs; 3-24
Viewdata/scrolling
PD-Sig Fido 1; Warwicks
(08926) 61 149 24 hrs; 3/1275
PD software interest group
Stockton Fido; Teeside
(0642) 605 838 Daily 6pm-6am
300; MSX
The Sharrow BBS; Ripon
(0765) 707 887 24 hrs; 3/1275
Viewdata & scrolling BBC based

The North West

Bolton BBS (0204) 43082
MF:8pm-8am; WE:24 hrs; 3-24
8am-8pm on ring back
CNOL; Lancaster (0524) 60 399
24 hrs; 300
Clinical BBS for medics
Fido Compulink North; Liverpool
(051) 220 3761 24 24 hrs
3/1275
Fido Manchester (061) 773 7739
24 hrs; 3/1275
Mektronic Electronic design cons
Intel-Ace; Oundle
(0832) 73 003 MF:6pm-8am
WE:24 hrs; 1275v
Liverpool Mailbox
(051) 428 8924 24 hrs; 3-24
UK TBBS HQ system
Matrix; Liverpool
(051) 737 1882; 24 hrs; 3/1275
Multi-user games; 4 lines
NBBS Cheshire (0936) 77 025
24 hrs; 3/1275
OBBS Manchester
(061) 427 1596 24 hrs; 3/1275
Portal; Wirral (051) 355 0911
MF:8pm-6am; WE:24 hrs; 3/1275
Pyramid; Leigh; Lancs
(0942) 609 611 24 hrs; 3
Stoke ITeC (0782) 265 078
24 hrs; 1275v
TeePee Link; Manchester
(061) 494 6938 24 hrs; 3-24
Telemac 15; Macclesfield
(0625) 33 703 24 hrs; 3/1275

The South East

Acorn BBS; Cambridge
(0223) 243 642 24 hrs; 1275v
ARCNET; Colchester
(0376) 518 818 24 hrs; 300
3ABBS; Felixstow
(0394) 276 306 24 hrs; 3-24
Banat Board; Oxford
(0865) 882 872 24 hrs; 3-24
FidoNet UK coordinator
BBSO9; Portsmouth
(0705) 736 025 MF:7pm-7am
WE:24 hrs; 300 OS9; Sci-Fi
Dragon; CoCo sections
BITEC; Basildon (0268) 22 177
24 hrs; 1275v
BITEC; Basildon
(0268) 25 122 24 hrs; 300
Bloxam; Banbury (0295) 720812
Daily 10pm-1am; 300
C A T S Fido; Maidenhead
(0628) 824 852 24 hrs; 3/1275
V22/bis coming
C View Rochford; Kent
(0702) 54 6373 24 hrs; 1275v
CIX; Guildford (0483) 573 337
or 338 24 hrs; 3-24; multi-user
CP/M User Group; Windsor
(0753) 868 196 24 hrs; 3-24
CP/M and MS-DOS software
Datasoft Opus; Ilminster
(04605) 4615 24 hrs; 3-24
Inc Datatalk Support area
Dr Solomon's Fido; Amersham
(02403) 4946 24 hrs; 3-24
mostly for IBM programmers
Fido PD Software; E Grinstead
(0342) 315 636 24 hrs; 3-24
PD software database
Gosport Apricot BBS
(705) 524 805; 24 hrs; 300
LABBS; Surrey (0883) 844 164
24 hrs; 3/1275; The Prisoner
Lasermail Fido; Worthing
(0903) 212 552 24 hrs; 3/12
Maptel; Southend (0702) 552 941
24 hrs; 300; commercial system
NBBS Essex; Brentwood
(0277) 228 867 24 hrs; 3/1275
subscribers only
Patnet; Colchester
(0206) 844 813 Daily 8pm-8am
12h; runs on a Spectrum
PD-SIG System; Uxbridge
(0895) 420 164 24 hrs; 3-24
also on 0895 52685
Pete's Place; Colchester
(0206) 862 354 24 hrs; 3-24
good IBM SIG
RICBBS; Basildon (0268) 710 637
MF:5pm-10pm; WE:24 hrs
RSGB; London (0707) 52 242
24 hrs; 1275v
SBBS - Watford (0923) 676 644
9pm-11am plus 11pm-6am daily
3/1275
TBBS Gamlingay; Sandy; Beds
(0767) 50 511 24 hrs; 3-24
Trinity 3; Reading
(0734) 484 847 24 hrs
3/1275 TBBS system

The South West

BOOG BB; Fleet; Hants
(0252) 626 233 24 hrs; 3/1275
Osborne; MS-DOS; CP/M areas
CBBS South West; Exeter
(0392) 53 116 24 hrs; 3/1275
Jersey Fido (0534) 39 389
24 hrs; 3/1275
QMC Viewdata; Basingstoke
(0256) 471 757 24 hrs; 1275v
Queen Mary's College
TBBS Blandford; Dorset
(0258) 54 494 24 hrs; 300
Blandford Computers
Trinity 1; Exmouth
(0395) 272 611 24 hrs; 3-12
Trinity 2; Faringdon
(0367) 81 507 24 hrs; 3/1275
Sponsored by Courier Consultancy
Vampire's Coffin; Weybridge
(0932) 245 593 24 hrs; 1275v
Viewdata & scrolling

The West

Access Fido; Worcester
(0905) 52 536 24 hrs; 3-24
midi section
Octopus Bristol (0272) 421 196
MF:6pm-6.30am; WE:24 hrs; 3/1275

Scotland

Aberdeen ITEC (0224) 641 585
24 hrs; 1275v
Aberdeen Commodore
(0224) 781 919 24 hrs; 300
Commodore 64 based
Betelgeuse 5; Inverness
(0463) 231 339 24 hrs; 3/1275
Kirklees ITeC; Batley
(0924) 442598 24 hrs; 1275v
Information Technology Centre
Livingstone BBS; Livingstone
(0506) 38 526 24 hrs; 300
People's Palace; Glasgow
(041) 956 6537 Daily 6pm-8am
3/1275 Colour

Wales

Bulletin AI Fido; Swansea
(0792) 297 845 MF:6pm-9pm
WE:24 hrs; 3-12
Capital Data Line; Cardiff
(0222) 461 824 24 hrs; 300
computer repair company
Cardiff ITeC (0222) 464 725
24 hrs; 1275v
Communitree; Powys
(0874) 711 147; 24 hrs; 300
Cymrutel; Colwyn Bay
(0492) 49 194; 24 hrs; 1275
FBBS Swansea (0792) 203 953
24 hrs; 3
MGBBS Mid Glamorgan; Ferndale
(0443) 733 343 6pm-1am daily
300
Proteus Opus; Porthmadog
(0766) 4154 24 hrs; 3-24
ANSI colour graphics

Northern Ireland

Deep Thought Fido; Bangor N1
(0247) 467 863 24 24 hrs; 3-24
PC-DOS; CP/M; BBC; Tech help Sigs
PBBS 1 Portadown (0762) 333 872
Daily 10pm-1am; ring back; 300

Eire

DUBBS; Dublin (0001) 885 634
MF:8pm-8am; WE:24; 3-24
Amiga based; astronomy SIG
Dublin Fido; Dublin
(0001) 854 522; 24 hrs; 3-24
IACCBBS; Eire
(0001) 903 341 24 24 hrs; 300
Irish ACC Runs on Commodore 64
Infomatique; Dublin
(0001) 764 942 MF:10pm-6pm
WE:10pm-6pm; 3/1275 Amiga based

Peter Tootill can be contacted electronically on the numbers which appear on page 179.

LEISURE LINES

Brainteasers courtesy of JJ Clessa.

Quickie
No prizes, no answer published, but you can easily check if you have a bible (Matthew 16:23) — you may be surprised if you do.

To whom did Jesus say 'Get thee behind me . . .'?

Prize puzzle
Mary, Sally and Jane share the same birthday, although their ages are different. In fact, at this year's birthday party it was realised that:

- Three times Mary's age plus Sally's age equal twice Jane's age.
- Twice the cube of Jane's age is equal to three times the cube of Mary's age plus the cube of Sally's age.

There are no common factors between any of the three ages. What are the ages?

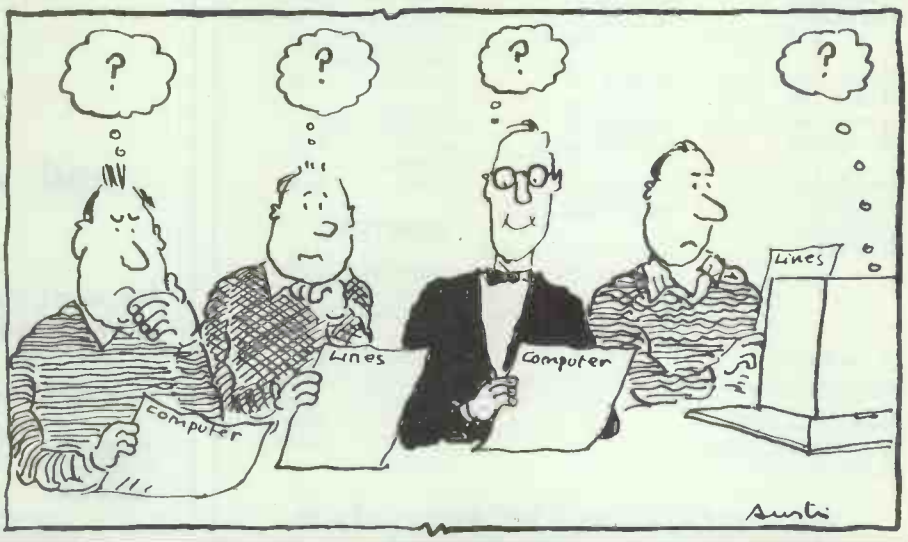
Solutions on postcards or backs of envelopes only to reach *PCW*, Leisure Lines, Prize Puzzle November, VNU House, 32/34 Broadwick Street, London W1A 2HG, no later than 30 November.

August prize puzzle
Tougher than usual this month — although we did give a clue by advising lateral thinking.

The answer is: $(4\frac{1}{6})^2$
When 20 is added, $(4\frac{9}{6})^2$ is the result;
When 20 is subtracted, $(3\frac{1}{6})$ is the result.

There's no need to resort to base 12 arithmetic or use complex numbers, as most entrants did. Anyway, of the 70 entries, only 17 had the correct solution — and the winning card came from P G Spain of Glasgow. Congratulations Mr Spain, your prize is on its way.

To all the rest, keep puzzling.



DIARY DATA

A look ahead at computer shows to April 1988. Readers are advised to check details before setting out on their journey.

AMSTRAD COMPUTER SHOW G-Mex, Manchester — Database Exhibitions (061) 456 8383	**23-25 October 1987**
SOFTEACH Heathrow Penta Hotel, London — Softsel (01) 568 8866	**24-25 October 1987**
MAC USER SHOW '87 Business Development Centre — Montbuild (01) 486 1951	**10-12 November 1987**
ELECTRON & BBC MICRO USER SHOW New Horticultural Hall, London — Database Exhibitions (061) 456 8383	**13-15 November 1987**
COMPUTERS IN THE CITY Barbican, London — Online International (01) 868 4466	**17-19 November 1987**
COMPEC Olympia, London — Cahners Exhibitions (01) 891 5051	**17-20 November 1987**
COMPUTER RECRUITMENT FAIR Novotel, London — Intro UK Ltd (0491) 681010	**27-28 November 1987**
OFFICE UPDATE NEC, Birmingham — Andrew Centre (01) 891 5051 Ext 285	**19-22 January 1988**
WHICH COMPUTER? SHOW NEC, Birmingham — Cahners, Belinda Caver (01) 891 5051	**19-22 January 1988**
COMPUTERS IN RETAIL AND RETAIL TECHNOLOGY NEC, Birmingham — Focus Events (01) 834 1717	**15-17 March 1988**
ELECTRONIC PRINTING AND PUBLISHING EXHIBITION Olympia, London — BED Exhibitions (01) 647 1001	**March 22-24 1988**
COMPUTERS IN TRANSPORT AND DISTRIBUTION Wembley Conference Centre, London — Computers in Transport and Distribution (0303) 45979	**April 19-21 1988**

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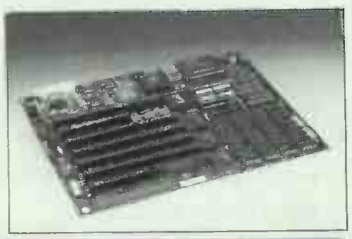
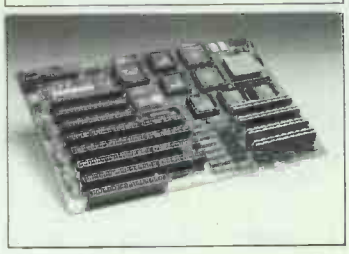


PLASTOW 386.
31cm x 35cm (12.2" x 13.75")

- 8 CHIPS SET.
- 16 MHz 0 WAIT STATE.
- 2 MRAM MODULE ON BOARD.
- 6 LAYERS BOARD.



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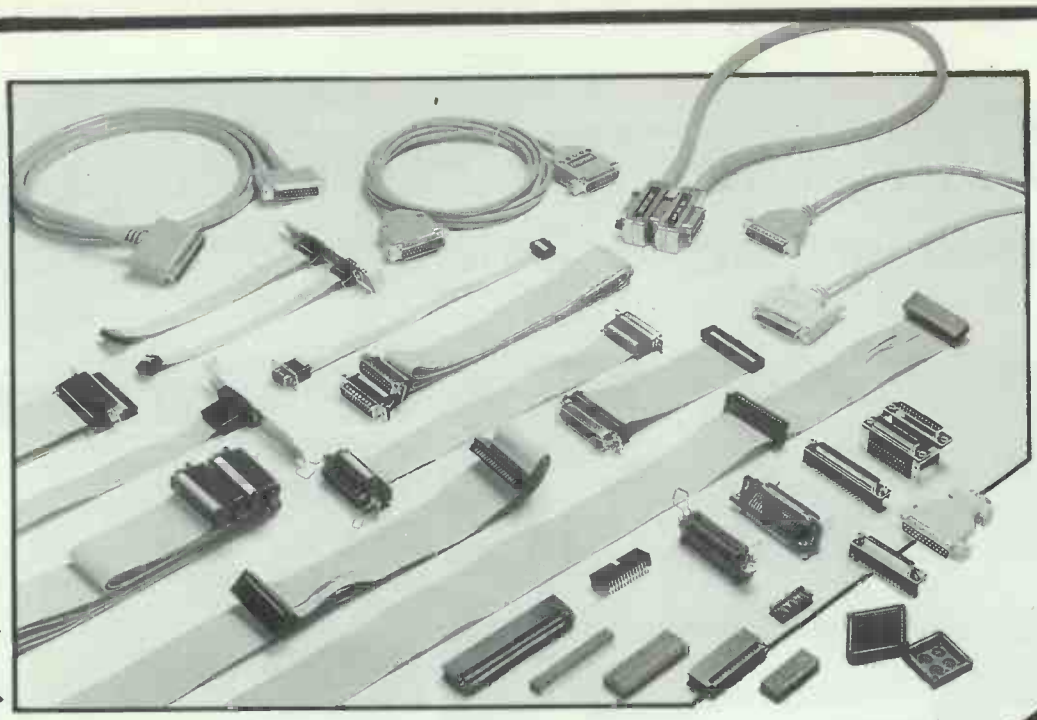

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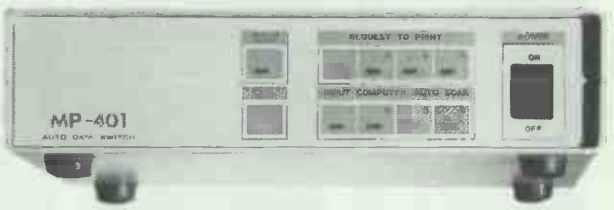

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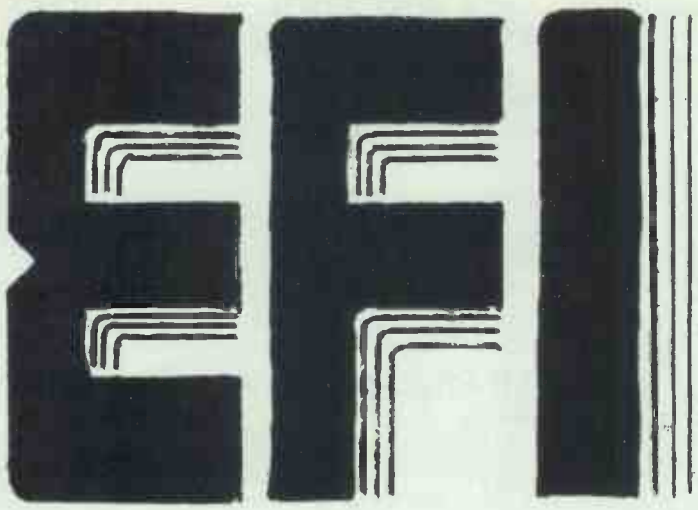

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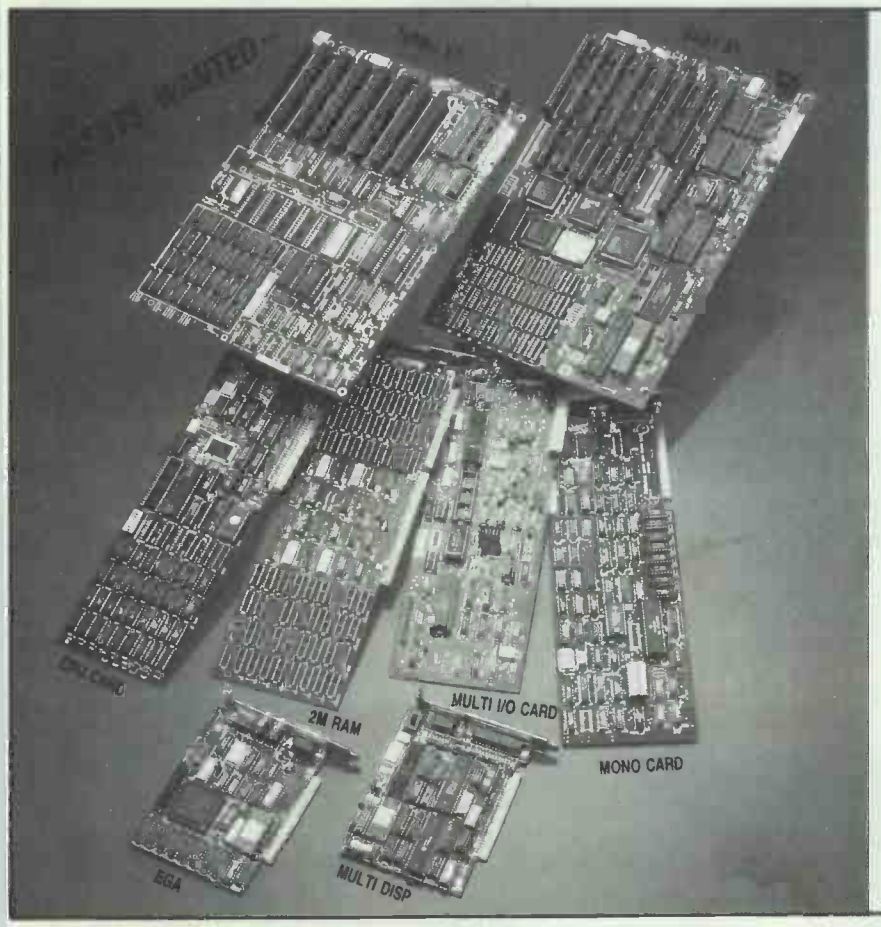

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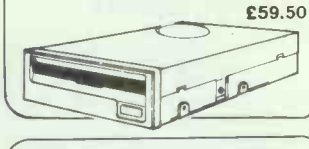

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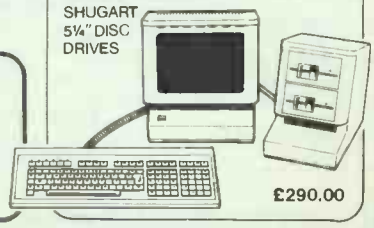

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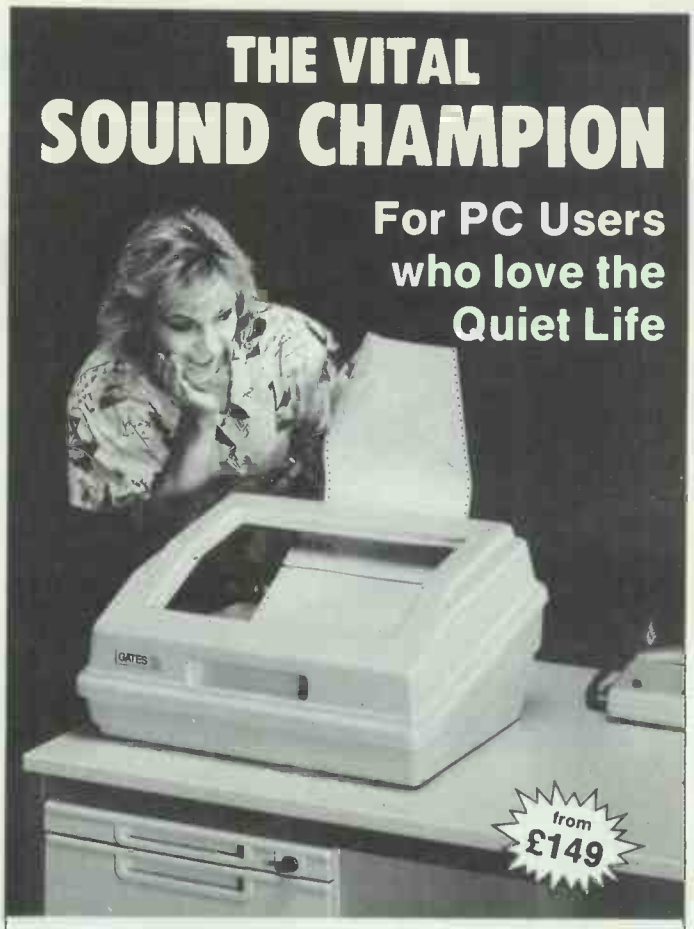

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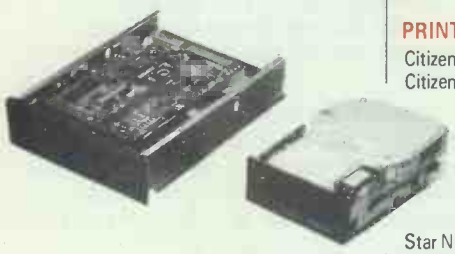

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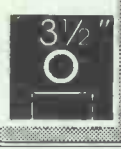

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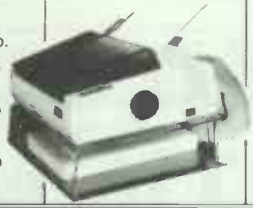

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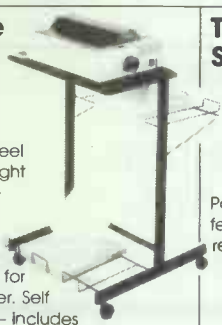

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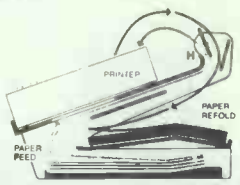

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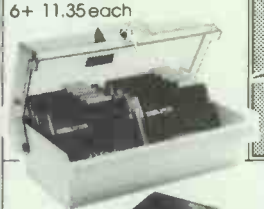

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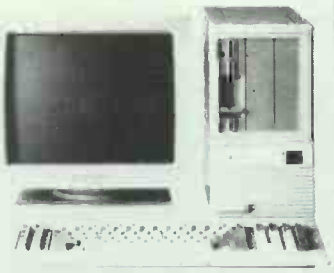

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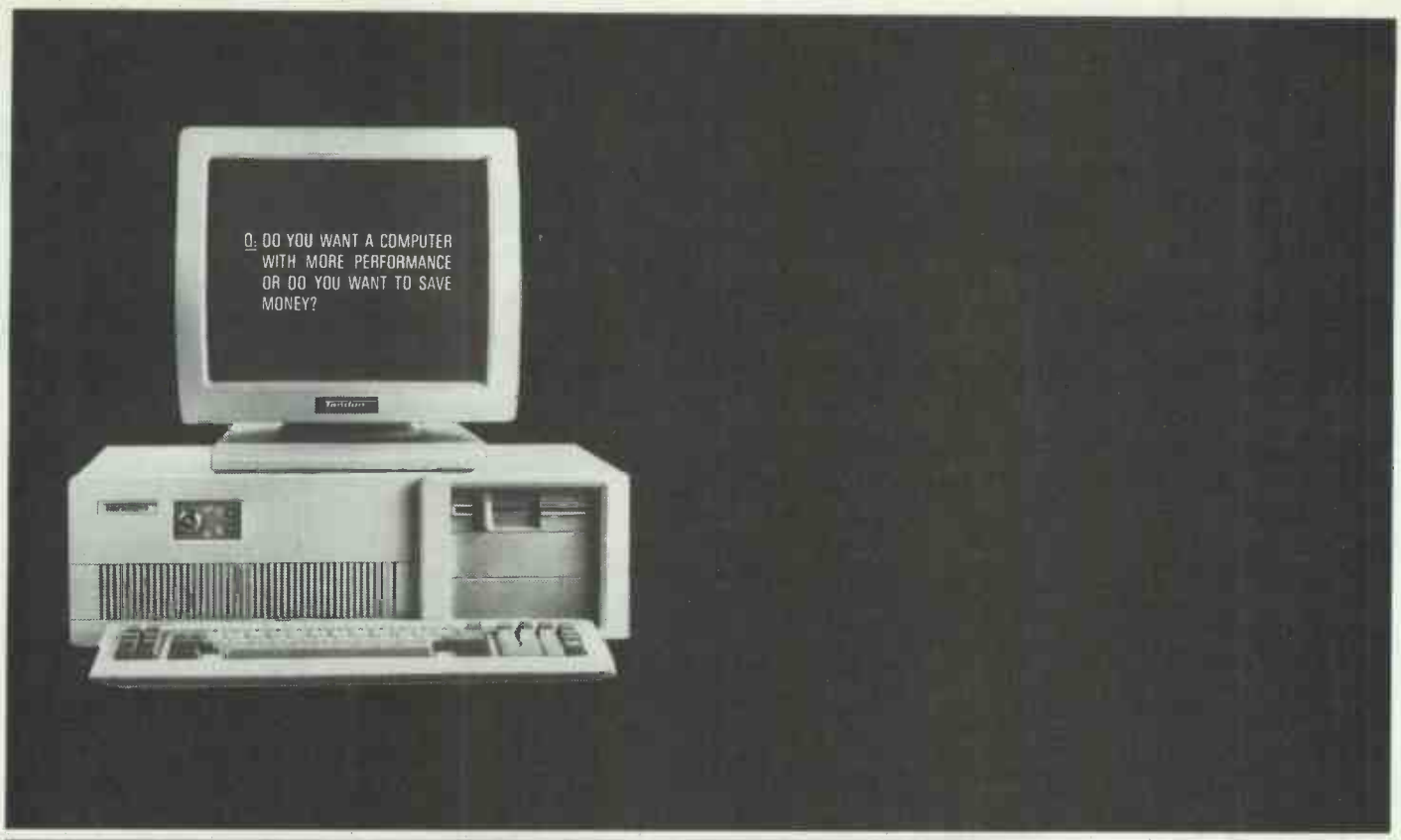

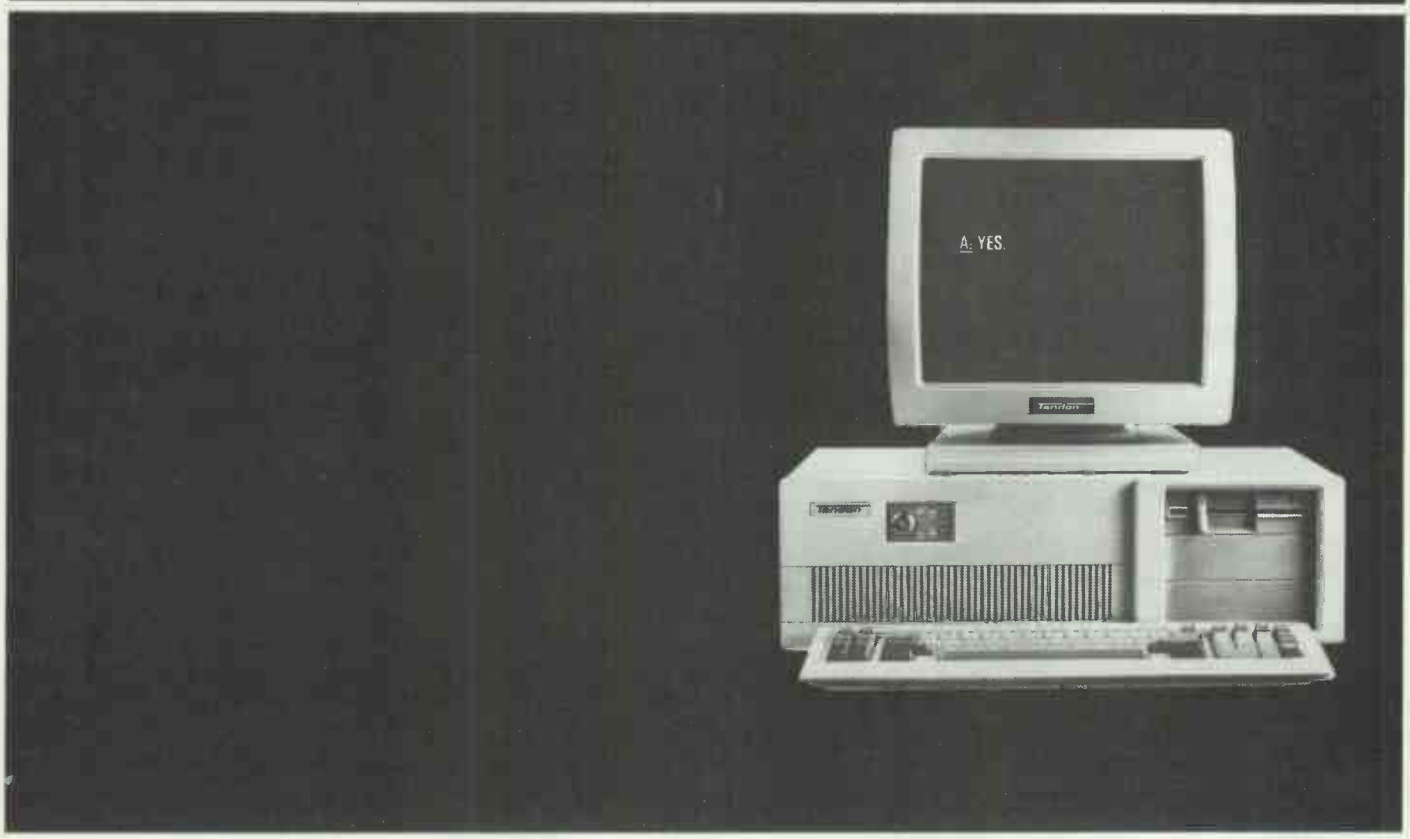

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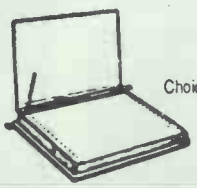

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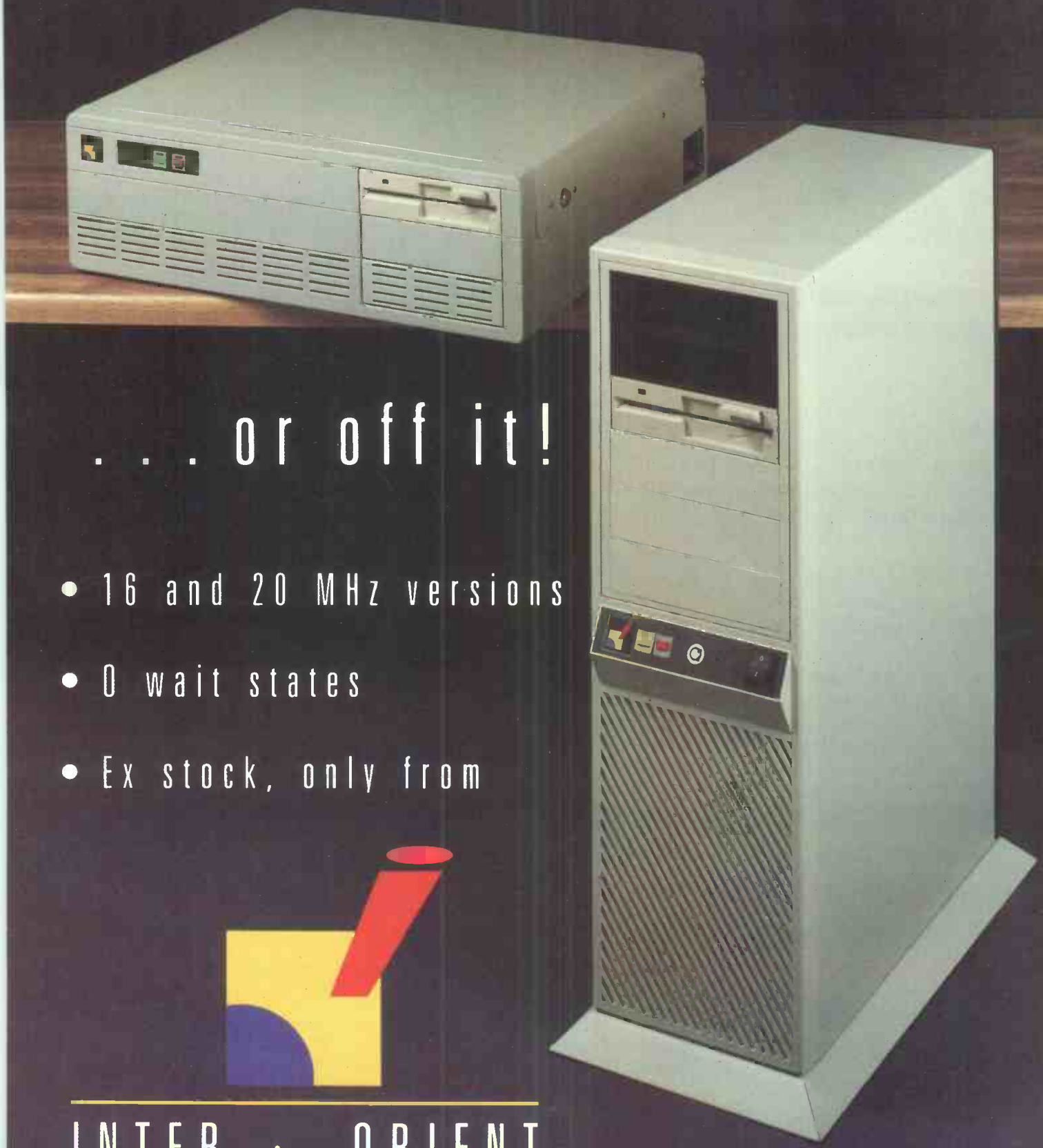

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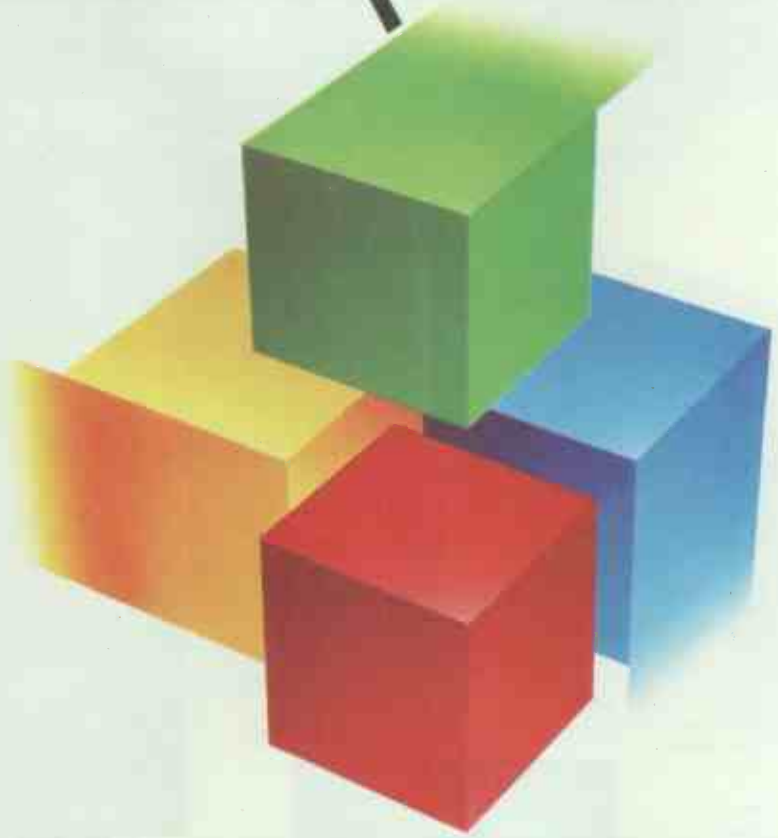

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Product Function	Genius Mouse GM6 Genius Microsoft PC Mouse	Logimouse C7 Logi Mouse
Interface	Serial	Serial
Power Supply	Internal	Internal
Resolution (dot/inch)	22-200 dpi programmable	200 dpi
Button clicks	1 million	0.3 million
Menu maker	YES	NO
Driver	YES	YES
Palnt software	DR. HALO III	NO
Slide show	DR. HALO III	NO
Pad	Mouse/cutting pad	NO
pocket	YES	NO

Click a button, flip a switch and your Genius Mouse GM-6 Plus is compatible with PC Mouse and Microsoft Mouse. It compares favorably with other in its category, even with Logitech Mouse.

A house for your mouse, makes it more practical, more convenient to use. When the surface is not smooth, it has its own running pad. Flip the pad, and you have a very convenient cutting board.

Genius Mouse Pocket and Pad

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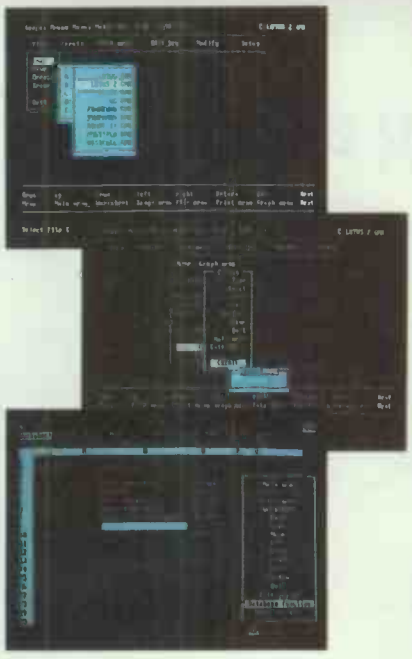

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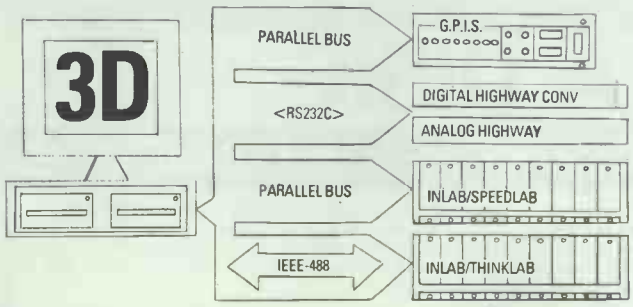

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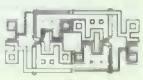

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5	Enhancing your Amstrad 1512 Newtech	£14.95
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7	Using Wordstar 1512 Newtech	£9.95
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9	dBase III Plus handbook 2nd Edition Que	£18.95
10	Amstrad PC Owners Handbook Newtech	£19.95
11	Advanced MSDOS Microsoft	£19.95
12	Advanced disk user guide BBC Cambridge Micro	£16.95
13	Running MSDOS 2nd Edition Microsoft	£19.95
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15	Programming the 8086/8088 Sybex	£16.95
16	Programming the Psion Organiser II Kuma	£9.95
17	Programmers Guide to IBM PC Microsoft	£16.95
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22	CashTrack	7.99	Personal fincances organised
26	Retail Point of Sale	7.99	PC-Sell handles stock/sales ledger/invoices at the counter
21	Time & Money	7.99	The best of our personal finance programs, ok for small business. Does more than just accounts.
1A	FREEWAY UK Sales Purchase/Payroll	15.00	This software is supported by registration by Free way in UK. Counts as 3
48	The Front Office V5.1	15.00	Prospecting, Sales Management, Sales Order Processing, Job costing & Profit Analysis. Needs Hard disk. Counts as 3.
78	Automotive Accounts	7.99	Maintain sales ledger & inventory system for car repair (or other small) business. Produce invoices. Twin floppy ONLY!!!

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419	PC-Dial	7.99	Buttonware comms. program
10	Procomm V2.42	7.99	Famous COMMS program
29	Q MODEM	7.99	
74	PC-Board	11.99	Public Domain bulletin board system. Easier to set up than Fido or Opus.

DATABASES

700	U-Mind	7.99	Generates (GWBASIC) programs. A bit like The Last One
14	Geneology	7.99	Graphical representation on screen & printer. Program runs alone tutorial needs Basic. Counts as 2.
701	Wampum/Wampum docs.	11.50	Menu driven dBase III clone. Counts as 2
703	PC-File Plus	11.50	Paint screens 5 times faster than PC-File, 175+ helps, on screen tutorial, inbed & nest calculations, sophisticated report writer. Works with PC-Type Plus. Easy. Supported by us. Counts as 2
24	Instant Recall	7.99	Unique memory resident free-form database.
70	Boblical Quotations	11.50	Huge database of Biblical quotes. Min. 2 drives.

GAMES (please note that your need a CGA card. All Amstrads ok)

800	PC-Chess	7.99	2 games. Graphical simulation.
802	PINBALL	8.99	9 Pinball machines emulated. Fast!
803	Bushido	7.99	As good as most other Martial Arts games
806	Fun Music Programs	7.99	A jukebox of medleys. Needs Basic.
807	Games III	8.99	Backgammon/Strategic US War Game (Maps etc.)/Big Rig
801	Games I	8.99	Frogger, Digger, Parotroo, Willy Rogue, Sopwith.
804	Games II	7.99	Golf, American Football, Blackjack, Archery & much more.
53	Adult Trivial	7.99	
65	Games VIII	7.99	Backgammon, Hangman
61	Games VI	7.99	Casino Games: Bandit, Blackjack, Poker, Roulette, Sub-chase, Stock Exchange.
47	Sleuth	7.99	Great detective adventure with graphics.
64	Cavequest	7.99	Graphical adventure. Eminds me of Elite with castles!
52	Games IV	7.99	Mahjong, Backgammon, Spaceware, Flightmare, Dragons
55	Games V	7.99	Monopoly, Kong, Golf, Striker.
60	Pianoman	7.99	Play music on keyboard. "record" it on disk, play it back!
81	Card Games I	7.99	Bridge, Canasta, etc.

GRAPHICS

903	PC-Key-Draw	8.99	CAD/Animation/Graphics/Scale/Rotate/Slides/Text More facilties than ProDesign & PC-Paint. Represented by us in UK
900	Dancad 3D	7.99	Drawing, Animation, Wire Frame, Graphs, Needs 640k.
901	Draftsman	7.99	Produces pie, exploded pie, stacked bar, line & scatter charts
19	PC-Demo	7.99	Produce graphics display screens for presentations.

LANGUAGES

408	Fig-Forth	7.99	Very good implementation
409	Small "C"	7.99	With primer
502	P-Basic/PC-Prof	8.99	GWBasic clone with hands-on Basic tutorial.
501	Mini Ada	7.99	(Now compiled)
503	Pascal Compilers	7.99	One a subset of Turbo (everything but disk I/O); One Tiny Pascal; One Visible Pascal – built in editor/debugger.
63	Lisp/XLisp	7.99	
7	PD-Protog V1.85c	7.99	Latest version with expert systems demo.
25	Macro Assembler (A86)	7.99	Probably the best 8086 assembler in the world. With debugger. We are the UK agents for this superb product. Version 3.07.
59	Expert System	7.99	This one works well and is straightforward to set up. See also PC-Prolog
83	"C" Tutorial	7.99	
84	TASM	7.99	Table driven cross-assembler. Set up for 6502, 8048 8051 but configurable for Z80 etc. (who's volunteering?)
406	CHASM	7.99	CHeap ASseMbler. Compried version of old standby. Retained mainly for the tutorial – otherwise use disk 25. (Now compiled)

WORDPROCESSING

6	PC-Outline V3.15aw	7.99	Famous memory resident outline processor a la Brainstorm form Brown Bag Software.
16	PC-Style V1.2	7.99	Graphic reports on your writing readability, style, personal tone etc. Works hand-in-hand with PC-Type Plus even while working on a document. Supported by us.
3	PC-Write V2.6	7.99	Maths/Foreign chrs.Edit two docs. Brilliant help screens. Memory residency. 300 printers supported (incl. Laser) etc. Simple graphics. This is the version prior to that marketed by Sagesoft for £99.
8	Galaxy V1.2	7.99	Perhaps the fastest WP in the world. Wordstar keys. Pull down menus.
31	Qwerty Wordprocessor	7.99	Probably the best one for novices. Includes comprehensive hands-on training course.
17	EZ-Spell	7.99	Spell-checker. Works with PC-Write.
18	Foglin/Tally etc	7.99	Various programs to analyse text, workd counter, indexer etc.
82	Freeword	7.99	

NEW PRODUCTS (Please note these include updates).

86	Greycom	7.99	Prestel comms. program from Paul Fletcher. All speeds to 9600 baud. CGA/EGA cards required (OK all Amstrads). Most modems. Save frames then carousel. Download Telesoftware. Easy to use.
87	Help DOS	7.99	On-line help of all the DOS commands.
89	Newfonte	7.99	Tool for creating new screen fonts in Turbo Pascal.
90	ZAXXON	7.99	The famous game from SEGA, EGA (PC1640) only.

NEW PRODUCTS (Please note these include updates).

92	Bermuda Triangle	7.99	A sort of yacht simulator with a quest
93	Sam Spade	7.99	Text adventure on the steamier side of town.
94	Home Budget Management Sys.	7.99	Useful nominal ledger.
95	Stock Inventory	7.99	(Not stocks and shares).
96	MACREAD	7.99	Various programs for reading MAC pictures on PC's. Includes naughty pictures. Suitable EGA/CGA.
97	Commando	7.99	DOS Shell program.
98	Critical Path Management	7.99	Limited facility scheduler/Unlimited facility Gantt charts.
99	HI-RES	7.99	Super painting program. Works with mouse. Lots of facilities but no text on Shareware version. OK single drives. Similar to GEM paint without the hassle. CGA in colour/EGA in mono.
100	Computer Pranks	7.99	Lots of high jinks to play on your friend's computers!
101	Family Tree	7.99	Genealogy program.
102	Screen Write	7.99	Special wordprocessor for script-writers. Unique formatting features.
103	Utils IV	7.99	
104	Statistical Analysis	11.50	Kwikstat (counts as 2).
106	Mr. BILL	11.50	Billing system for professionals (i.e. accountants, solicitors etc.) (counts as 2).
108	DROEGE	11.50	CAD for printed circuit design (counts as 2).
400	Z80 Emulators	7.99	Run your CP/M software (if on IBM format disks).
414	Function Key Editor	7.99	

Please note that we are authorised representatives for various authors so we get the latest versions first!

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39	Foreign Languages I	7.99	French, German, Spanish, Italian, Needs Basic.
1025	Educate I	8.99	High quality programs incl. Maths, Analogies etc, Needs Basic.
51	Educate II	8.99	Quality young children's games.
68	MS-DOS Tutor	7.99	Tutorial for learning about MS-DOS!
85	Fastype	7.99	At last a decent touch typing course from beginner to advanced under ShareWare.

SPREADSHEETS AND STATISTICAL

600	Turbo-Calc	7.99	20,000 cells, bar graphs (poor). Also features Galaxy-style text editor!
601	AS-EASY-AS	7.99	Amazing Lotus feel-a-like spreadsheet with numerous facilities, including decent graphics, macros. Has it's own text-editor. No documentation but gives examples.
401	Sideways Print	7.99	Menu-driven. Ok for Lotus/ASCII files.
4	PC-CALC V3.0	7.99	Relational spreadsheet. Take data from other spreadsheets or from PC-File Plus databases. Supported by us.
20	Statistical Analysis	7.99	SPC-Professional. Beautifully complex graphic output
72	Express Graph	7.99	Very easy to use colour business graphics. Pie, Exploded Pie, Segmented Lines, 3D bars etc, from typed data or imported.
80	Goal Seeker	7.99	Memory resident, works with Lotus, SuperCalc, Multiplan etc, to enable user to seek end result (goal).
82	Curvefit	7.99	Performs least squares curve fit on x, y data. Curves for 25 equations fitted. Equation co-efficient, Correlation co-efficient & Best fit are computed. Predictions for y can be calculated. Imports from Lotus possible.

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27	Critical Path Management	7.99	IPM Project Management
420	Hard Disk Utils.	7.99	Includes disk space optimiser, diagnosis etc
9	Deskmate	7.99	Memory resident clock, calendar, notepad etc
415	Utilities I	7.99	Many useful utilities but including a super disc-doctor program
11	Critical Path Management	7.99	PCPM, Gantt charts, 1000 tasks.
422	PC-Tickle	7.99	Reminds you of appointments, has simple maths which allow it to report on expenses or hours utilised at certain activities.
403	Screens Creation	7.99	Set up entry screens for Basic & other programs. This saves worrying about field names & screen editing. Handles data entry. Brilliant!
413	Utilities II	7.99	Undelete/unerase/sector editor/partition
421	XD-Extended DOS	7.99	Utility tools from Buttonware.
34	Multi-tasking utils.	7.99	Dosamatic enables up to 7 programs to run together. Othe programs thrown in.
46	PC-Stock	7.99	Graphical analysis of Stocks & Shares.
30	Print Enhancers	7.99	3 programs to get NLQ fonts from non-NLQ printers
28	File Encryptor	7.99	Secure your data. Prize if you can beat it!
423	Make Menus	7.99	Utils. to make menus on hard disks
35	Micro-Cache	7.99	Working copy of a commercial program. Limited features. UK product with full support
57	Homebase	11.50	Brown Bag's famous competitor to Sidekick. Best with Hard-disk. Counts as 2
44	Astronomy	11.50	Relational statistics of planets, sun & moons. Counts as 2
69	DOS Shells	7.99	For those who don't like GEM. Still River, WFU, T-Shell.
73	Baker's Dozen	7.99	13 useful utilities from Buttonware incl. mini-spreadsheet, calendar, sideways print (large/small), sort text files, redirect printer to disk, snapshot, undelete & more.

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418	Estibid	25.00	Estimating & Job Costing package. Counts as 5 disks.
33	Estate Agent	7.99	American but realistic. For residential agencies.
23	PDS*Quote	7.99	Quotation system
12	Surveysoft	7.99	Surveyors measurement and calculation program.
67	Supernews	7.99	Well proven newsagency software written by our associates. This version is complete but is limited to 50 customers. On registration this limit is removed.
76	Make My Day	7.99	Time Management + Programs suitable for financial calculations for loans, savings etc. Time management includes Appointment calendar, Job scheduler, Expense Accounts plus TIME LOG for solicitors, accountants etc.
79	Portfolio Maintenance	7.99	PFROI addresses the problem of "Return on investment" of shares held.

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How to write your own software without the help of a programmer !

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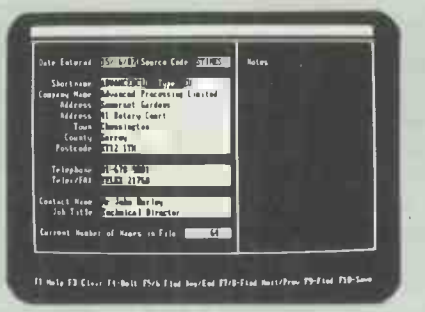

Entry Screen

Print out to Screen

Develop your first application on day 1.

With TAS you can take any type of information like names and addresses or stock records and design an entry form by simply "painting" the screen. TAS then writes the data entry program for you.

When you run this program you enter your information and store it on disk. This is a database. And you can create as many as will fit on your disk. With another function, the "database browser" you can display this information on the screen and browse through it and change it.

Reports are just as easy. You tell the report generator which file you want to report from and then simply answer the questions it asks you.

When you've finished, TAS will generate a program that produces the report you want and you can run that report time after time.

A Relational Database.

You may know that with any database application you enter, store, retrieve and manipulate data. "Relational" means that you can simultaneously "relate" more than one file to another.

For example a sales order "relates" to both stock records and a customer record. The resulting invoice "relates" to the customer record and a sales daybook record. With TAS you can simultaneously access and relate more files than any other database package and do so with ease.

"How not to do it".

One thing is certain. After you finish a database application, you usually know exactly what's wrong with it. With TAS it is easy to subsequently change and modify both your files and your applications without having to re-enter your data.

Excellent documentation and on-screen help will show you how to use the 4th generation language, add more powerful features which include extensive calculations, pull down menus, multiple windows, business graphics, 128 colour combinations and much more.

Result . . . your applications are more user-friendly, easier to use, look better and have more "polish" than some of the very expensive "professional" packages. And YOU have written them.

We use it ourselves.

Our in-house fully integrated sales order processing and financial accounting system (yes it is for sale) was developed using TAS. Running on a multi-user network we can provide instant answers to such questions as "who bought what, when and at what price". And that's only part of it.

"Excellent value for money, especially for novices wanting to learn and developers wanting economic runtime systems." **Personal Computer World Magazine**

"There is no doubt that TAS is a very capable product. It handles serious sized applications and does so with speed." **What Micro Magazine**

"TAS manages to pack plenty of power into its small price." **PC Magazine**

"On a value for money basis this must be one of the most attractive databases on the market." **Accountancy Age**

"If you cannot find a commercial package to suit your organisation then most certainly this must be one of the first places to start looking in order to produce a system of your own." **Personal Computing with the Amstrad**

Never run out of steam.

TAS is so fast and powerful that most of the TAS utilities are developed in TAS itself. No other database is remotely capable of doing this. And that is exactly where you benefit. It's simple enough for the first timer but powerful enough for the professional software developer. So you have little to worry about whether TAS is suitable for your particular application or not.

As PCW Magazine said in their review of TAS Plus: "Excellent value for money, especially for novices wanting to learn and developers wanting economic runtime systems."

Build a reputation for efficiency.

TAS is for people like you. You like using a computer. You know that it is vitally important to have accurate, up-to-date information instantly available. You also know of many applications that can be done easier, better and quicker with a computer. Cut down on shuffling bits of paper. Cut down repetition. Everyone performs better because the job is more interesting and more fun. That's what TAS is all about. With TAS you can make a computer do what you want it to do.

Nothing else needed.

At £99.00 TAS-Plus is complete. It consists of the Relational Database, Screen Painter, Program Generator, Report Generator, Database Browser, 4th Generation Language, "Idiot Proof" (no disrespect) drop-down menu-driven Command Editor, Runtime Compiler for fast program execution, Tutorial and Manual.

Simultaneously access up to 16 files, each with 16 indices. Each file may have 65,000 records of up to 10,000 characters each. Import and export data with other software packages including dBase-III, wordprocessing packages and spreadsheets.

Multi-User Version Available.

This version supports full file and record locking and works on all MS-Net compatible networks. Software you develop now will run without change if you upgrade to TAS Plus Multi-User later on.

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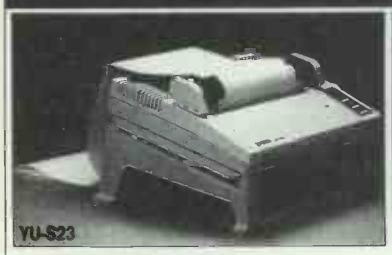

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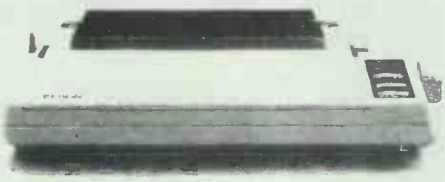

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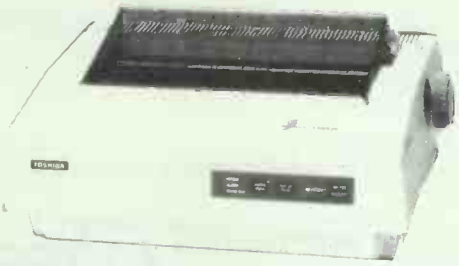

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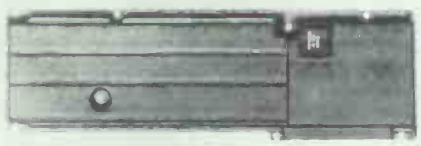

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286¹² with 40 Meg, 28 MS hard drive **£1,799**
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*The 150 Meg system has a separate ESDI hard disk controller and four available slots.

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☐ Please send me details of the following Dell Computers ☐ 286[8] ☐ 286[12] ☐ 386[16]
All models are supplied with mono or EGA monitors.

☐ Please send me a complete and unabridged copy of the PCW Review of the 286[12].

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No. of employees using pc's_____

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PCW 8

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8087-2 co-processor socket	\	\			
Parallel centronics port	\	\	Expansion slots	3	4
RS232 serial port	\	\	EGA graphics option	No	\
Power supply rating	200W (approx)	135W	CGA graphics output	No	\
Power supply location	In monitor Case	In Main CPU	Mono/colour changeover switch	No	\
Twin 360K floppy drives	\	\	Dual speed processor	No	\
Mouse and controller	\	No	640K RAM as standard	No	\
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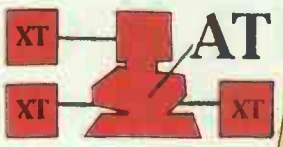

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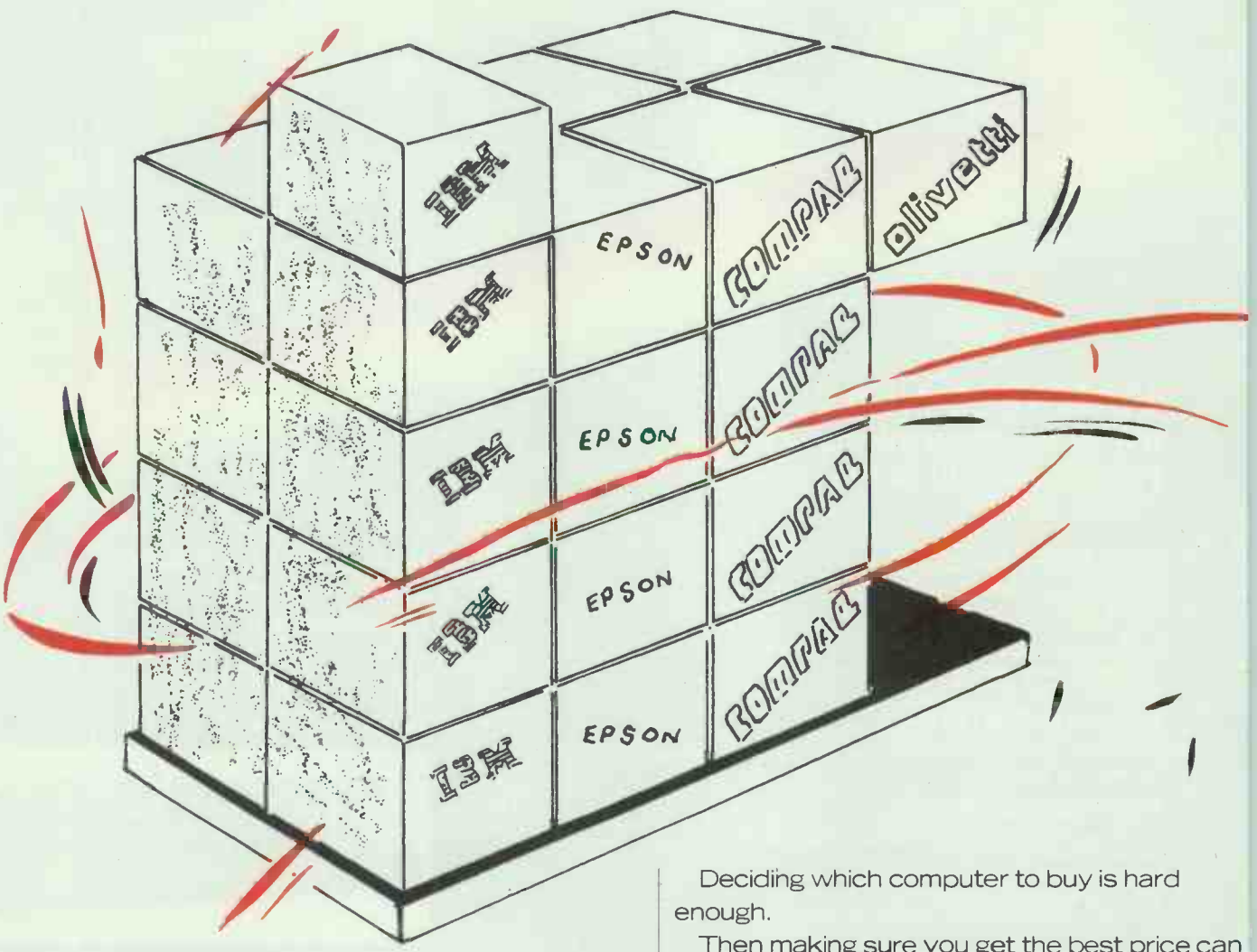

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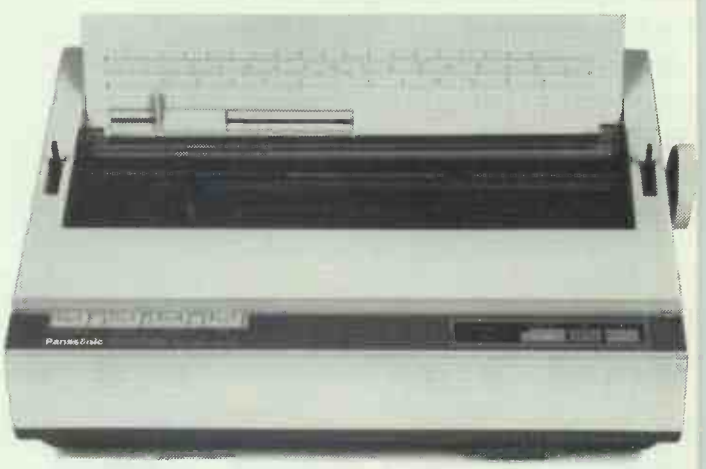

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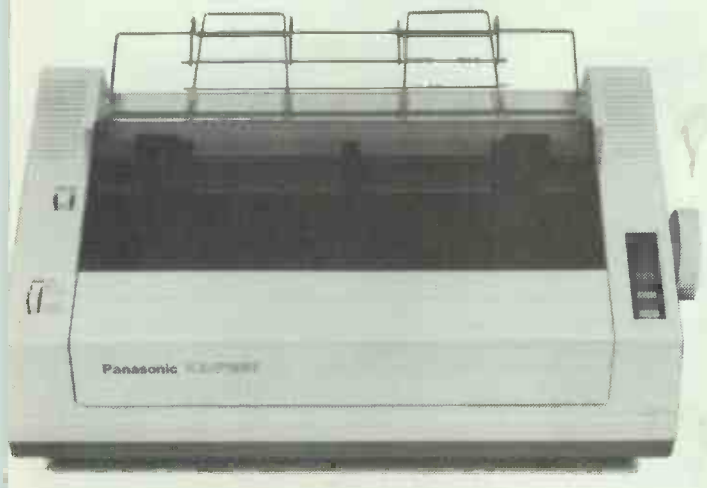

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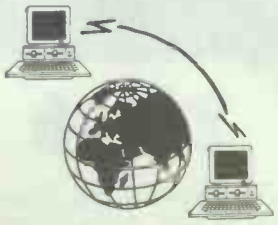

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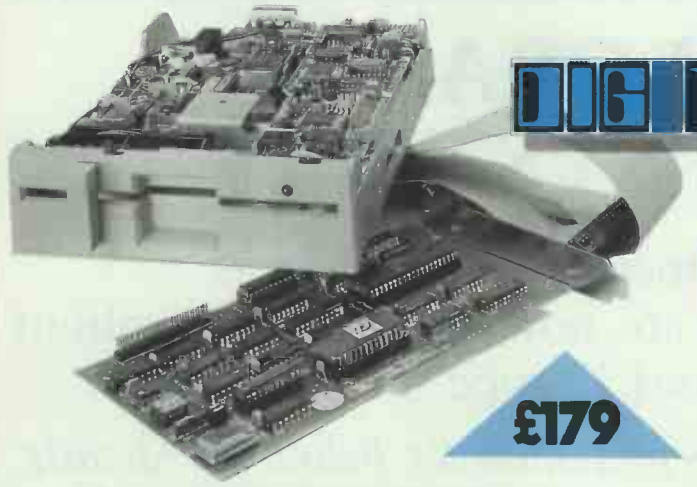

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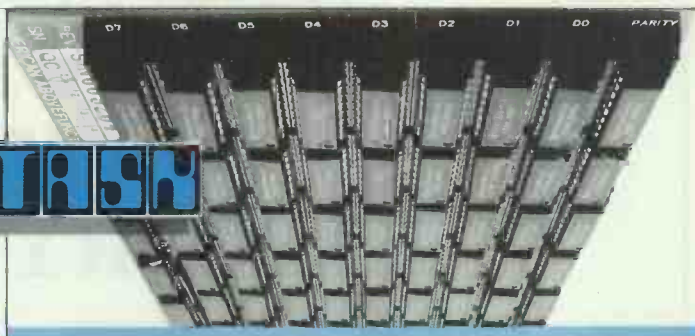

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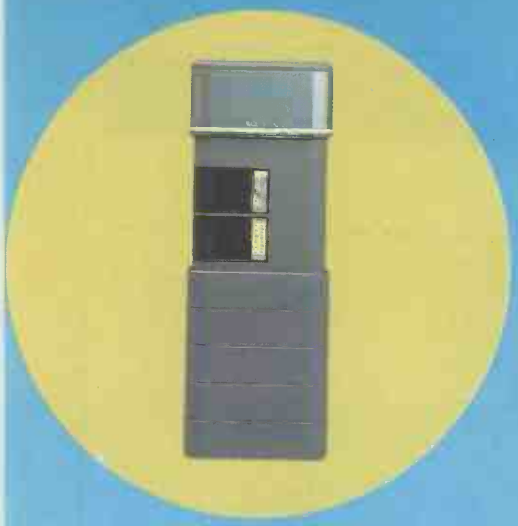

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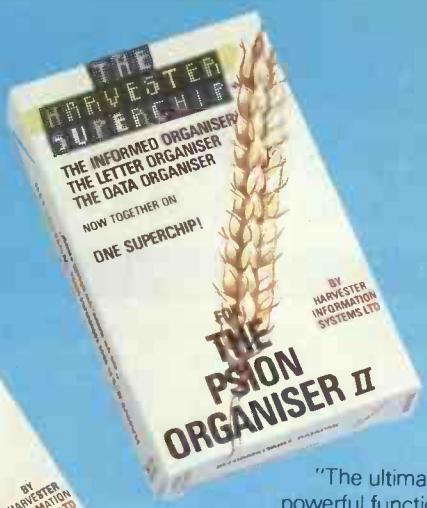

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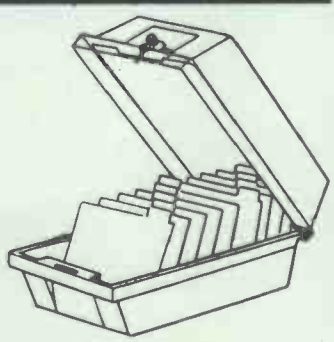

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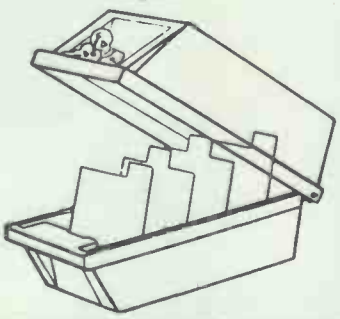

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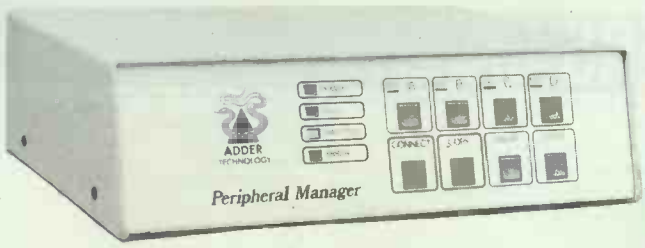

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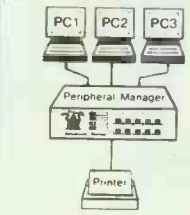

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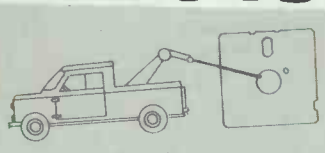

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BASIC LANGUAGE

New Quickbasic V3.0 uprates the competition with TURBO-BASIC.

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Microsoft MBASIC	CP/M-80	£ 60
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CADSAM (source code)	CP/M-80	£ 75

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Halo	MS-BASIC + MS-DOS	£175
GSS Graph.Dev:Tkt	PC-DOS	£335

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Not all assemblers are supplied with a linker. Check before ordering.

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PASCAL LANGUAGE

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CHIP CHAT

A new keyboard — the KB 102 — from Emco Electronics has been developed 'specifically to suit the demands of the UK market'. The photo accompanying the press release shows otherwise — not a '£' sign in sight.

'Our press release about the new multifunction keyboard was unfortunately sent out with the wrong photograph,' claimed the next missive from Emco.

At last, we thought: a '£' sign.

Nope. Just twelve function keys instead of ten. We're still trying to figure out what the UK-specific angle was . . .

You have to admire the cheek of Sentinel Software, UK distributor of WordPerfect. At the PCW Show the company was selling, for a mere £1, a $12.95 book entitled : *A WordStar Survivor's Guide to WordPerfect.* In response to the question: 'Isn't changing over to WordPerfect hard?' the book's authors reply: 'You've already learned one of the hardest-to-learn word processors around . . .' It is, of course, a matter of argument whether WordPerfect's Shift-F10 is any easier to remember than WordStar's Ctrl-KR for pulling text into a document. Personally, I find PC-Write's Ctrl-F3 far more logical . . .

Dire warnings have gushed forth about formatting disks in the new 1.44Mbyte 3½in disks as found on IBM's Model 80 and Apricot's VX series. As with 5¼in disks, high and low-density drives don't like swapping disks. But we can't understand what all the fuss is about. Cleverly, when the high-density 3½in disks were designed, an extra notch was added which could be detected by the drive mechanism to ensure that the disk was formatted and written on in the correct manner. No manufacturer seems to have taken this up. Must be too easy for them . . .

Talking of disks, thanks must go to Ashey and Shane of Amersham, Bucks, who sent in the ultimate in vapourware: a perfectly manufactured floppy disk without any disk in it — just the black sleeve and paper pocket. 'Is this the new IBM DOS 3.3 system disk to accompany the abridged manuals?' they asked . . .

People in the computer industry move around pretty fast, but they don't all want to have the stories of their lives re-told every time their photo is circulated to the press.

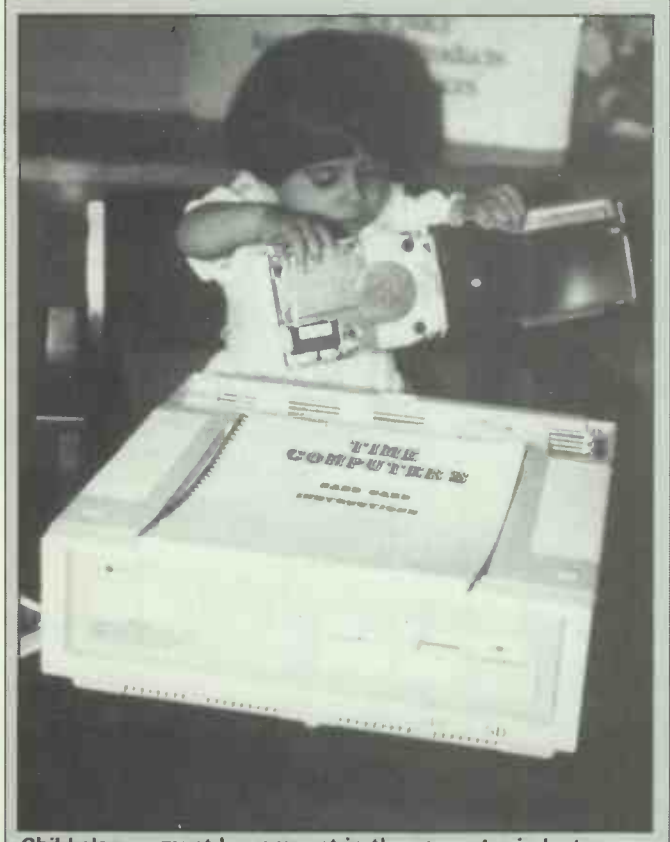
Pity poor Helen Johanssen of Rapid Solutions, who has moved 'from invoice clerk to marketing services manager in nine years'. Helen's spare-time activities include sailing and music, it says. Next they'll be sending round pictures of new managing directors in their nappies . . .

Victor Technologies and Sentinel Software are planning to save the Korup Rain Forest in Africa by organising a cricket league. They could have saved a couple of rain forests by wasting less paper with the length of their press release . . .

PCW staff writer Robert Schifreen doesn't have the muscles of an Arnold Schwarzenegger. You may have wondered how he continually carried around the '211b' Cambridge Computer Z88 he reviewed in our September issue. He didn't — it was a typo. Sorry, Uncle Clive . . .

Walters has proudly announced that its XT and AT compatibles will run Lotus 1-2-3. That the company is announcing the fact at all does make one wonder whether in the past, 1-2-3 *didn't* run on them. Walters is, after all, one of the oldest survivors of the clone wars. If you own one of its earlier models, load 1-2-3 and WAIT now before it's too late . . .

NEC laid on a day at Goodwood for press and distributors to drive round the circuit in Formula 2 racing cars. One chap got a specially-battered cup for being the person 'most likely to have an accident on the way home'. Seems he drove round the circuit in second gear all the time . . .



Child slavery must be rampant in the computer industry. Sales manager Tahir Mohsan of Time Computers in Blackburn sent us a photograph of his daughter Sadia being forced to work in his company's spares department fitting its £249 hard cards into single-drive Amstrads. But at least she's getting on with the job.

Alan Sugar's son Daniel spent two days pestering the life out of three busy editors at VNU. He phoned, at hourly intervals, insisting that we fax him the pages in our current issues covering Amstrad products. All the issues were on sale at his local newsagent.

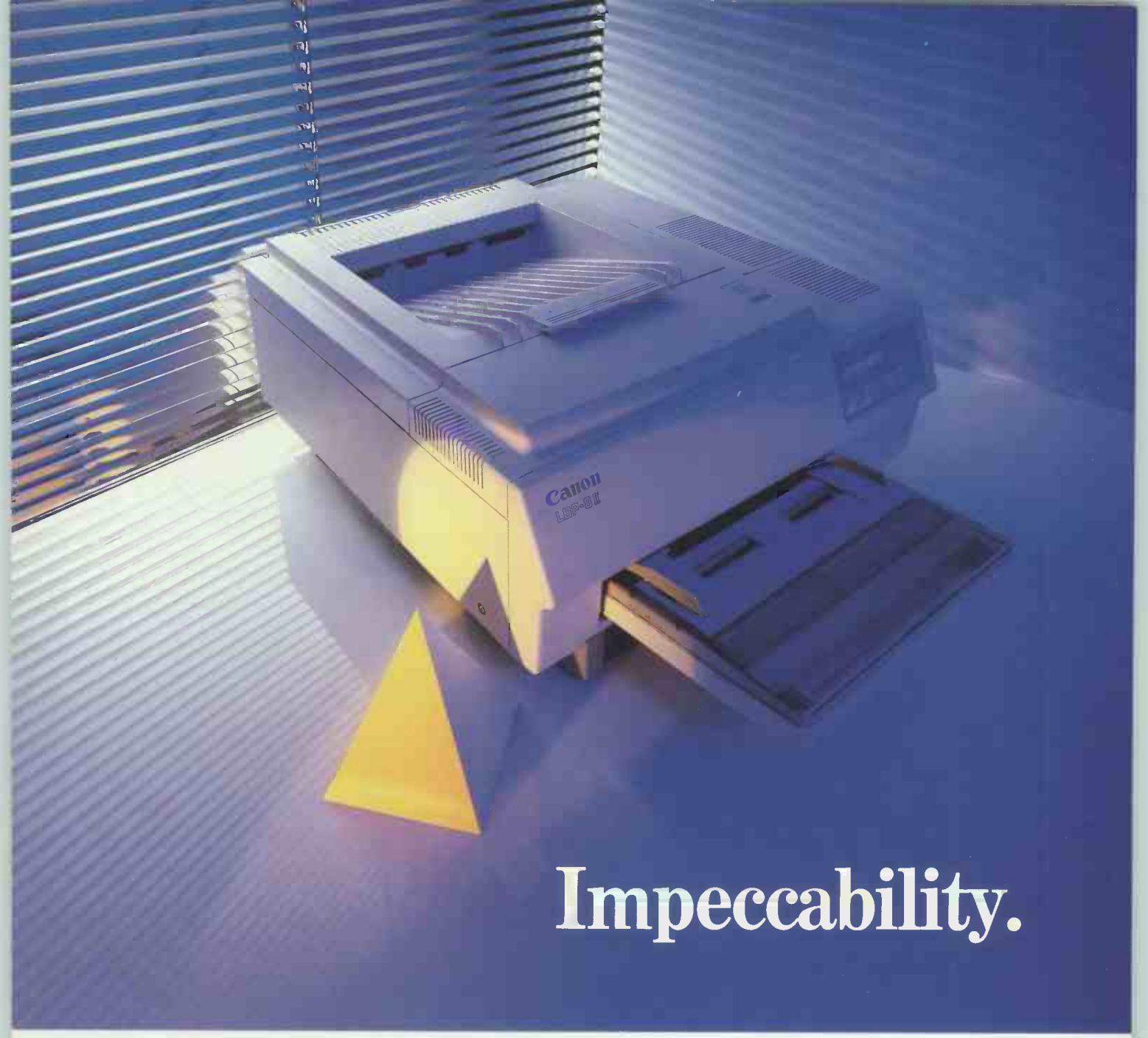
Perhaps he could get a job with Time Computers fitting disk drives into his father's machines.

This month

We had to smile at the *very* close timing of the launches by Compaq and Toshiba of portable 386 machines. Already, these two companies are fighting hard for the yuppie and power corporate users' custom, and the new machines will escalate the battle. Which one is the winner? Find out on page 98.

Big companies don't always get it right, and Robert Schifreen's review on page 158 of two major communications packages reveals how little major commercial products sometimes score over low-cost shareware products.

Finally, you may notice some small changes in this issue of *PCW*. We're trying to make the layout and typography of the magazine more logical. Above you can see editor Derek Cohen and art director Martyn Rowbotham wielding 386 portables at five yards to settle a minor artistic disagreement.



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Yet another great achiever capable of producing terrific word processing, quality output. **Speed:** 200cps draft, 100cps NLQ, 34cps WPQ.
Columns: 80. **Compatibility:** IBM or Epson. **Price £478.**

PW-1080A
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Price: £349.

PJ-1080A
The ideal presentation printer where colour graphics are required. It even prints on overhead projection film. **Speed:** 37cps. **Columns:** 80.
Compatibility: Epson. **Price:** £499.

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Why are PC users from New Zealand to Norway changing over to PCL?

PCL (Personal Computer Language) is the ideal language for beginners and experts alike. It is easy to learn and offers much greater practical programming power than either BASIC, Pascal or C.

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*Calend is an independent UK software house.

Any **PCL** program can call on the interpreter itself at run time and pass source code for immediate execution. Useful for self-modifying, intelligent programs, spread-sheets, data dictionaries, AI applications etc.

Description	BASICA	MS-BASIC	C	PASCAL	**PCL**
Empty loop x 10000	4.6	.23	.09	.25	.04
BYTE Magazine decimal arithmetic benchmark:	252.5	17.32	39.4	31.88	14.82
With 8087:				6.29	6.09
Display 24 lines of 80 characters on standard colour display:	3.62	4.00	4.6	2.70	.15
Mono or EGA display:	3.40	3.40	3.8	2.45	.04
Format & display 100 decimal numbers:	6.95	2.02	2.6	1.51	42
With 8087:				1.35	.25
Convert 1000 decimals to character strings:	22.0	3.56	6.5	3.89	3.17
With 8087:				2.87	1.04
Convert 1000 character strings to decimals:	50.7	3.92	13.1	8.18	2.43
With 8087:				3.48	1.12
Catenate two 10 byte strings x 1000:	3.2	.65	.32	.58	.32
Sequential write, 1000 × 90 byte records	18.3	9.0	11.2	7.5	2.9
Sequential read, 1000 × 90 byte records	18.2	8.6	9.2	7.4	2.5

All timings are in seconds. They were taken on a standard IBM PC with PC DOS 3.1, a real-time clock and a 10MB hard disk. BASICA is the PC-DOS interpreter, MS-BASIC is Microsoft's compiler (version 2.0), C is the Digital Research version 1.1, PASCAL is Borland's Turbo Pascal 3.0

Minimum system requirements: IBM PC/XT/AT or compatible, 256k RAM, mono or colour monitor, PC DOS or MS DOS version 2.1 or later. **PCL** comes on a 5¼ diskette (not copy protected) with 16 sample programs. It is accompanied by a 255 page manual. The manual covers all aspects of **PCL** programming, is well structured and has a sensible index. 30 days money back guarantee for single copy prepaid UK orders.

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