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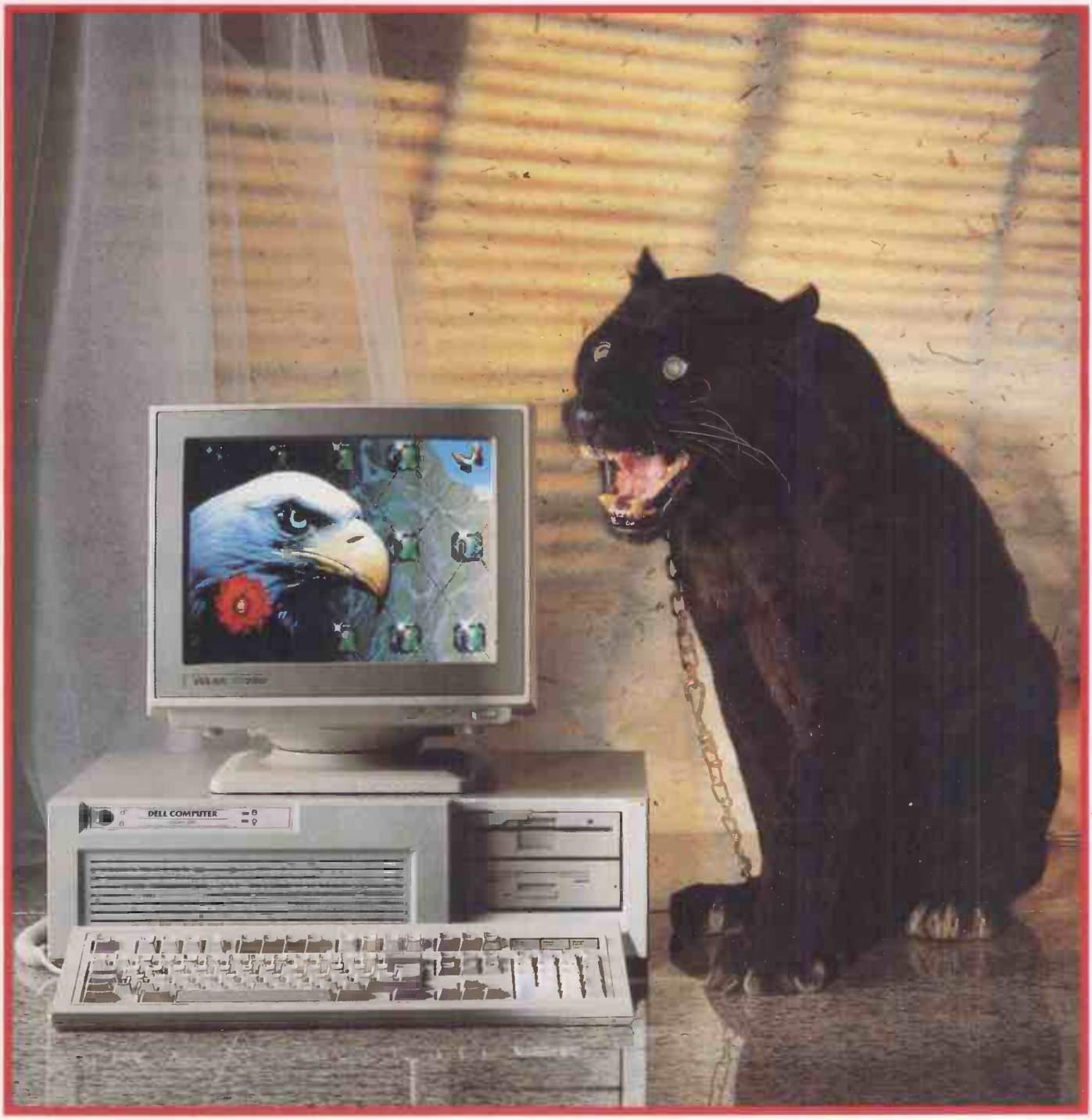

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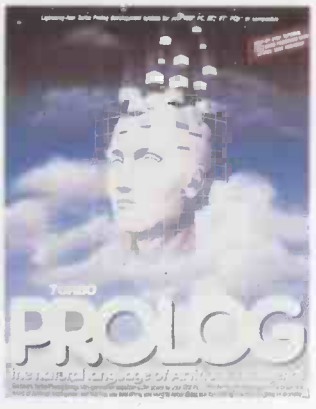

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What Micro? Top Ten, February 1988

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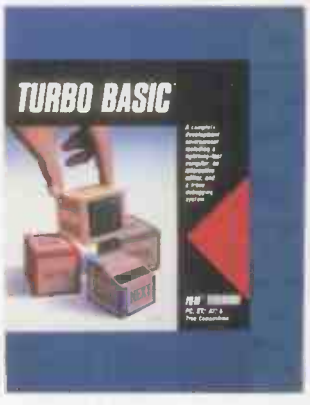

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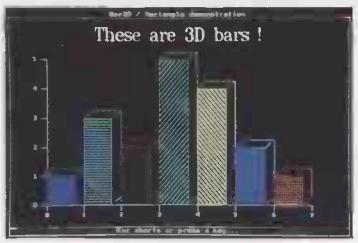

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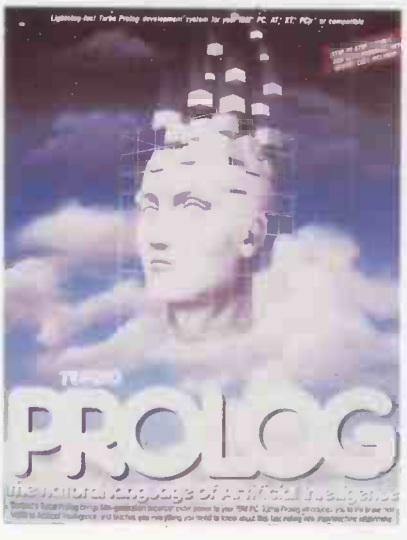

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COVER BENCHTEST

Personal Computer World

MARCH 1988

DELL SYSTEM 200 96

The Dell System 200 might not be the first IBM PS/2 compatible, but it does have a configuration obviously suited to Microsoft's OS/2. Four megabytes of RAM, an incredibly fast hard disk, and VGA graphics — all at an extremely competitive price. Peter Jackson Benchtests the machine which will interest the OS/2 crowd.

Cover photography by Chris Bell
Thanks to Phoenix the Panther

FEATURES AND REVIEWS

MICROSOFT BOOKSHELF 102

How would you like a dictionary, a thesaurus, an almanac and four other reference books all available at the click of a mouse. With Microsoft Bookshelf on CD-ROM, this has become a reality. David Tebbutt explores this first general-purpose compact disc application.

PC/AT TOOLBOXES 108

Peter Jackson takes a look at three very different solutions to the problem of squeezing full desktop AT capabilities into a portable box. The NEC, Sharp and Walters toolbox ATs are put through the paces of a full-blown *PCW* Benchtest.

MICRO MIDGET 116

The Micro Midget must be one of the smallest fully-configured PCs available, and could be the answer for those with no room for a desktop computer. Martin Wren-Hilton clears a square foot of desk space to Benchtest this diminutive, Amstrad-priced PC.

CANON BUBBLEJET 120

Simon Jones looks at a new and promising printer technology in the form of the Canon Bubblejet, which 'boils' the ink onto the paper. For less than half the price of a laser printer, the bubble jet offers better resolution, equal print quality and significantly less cost per page.

WAITING FOR A MIRACLE 124

Dick Pountain discovers the real truth behind the promises of IBM and Microsoft with their new operating system, OS/2. True, it offers multi-tasking and freedom from the 640k DOS barrier, but at what cost? Read this in-depth feature for the full, grizzly facts.

A WINDOW INTO THE BRAIN 130

You don't need a Cray supercomputer to do research into artificial intelligence and pattern recognition. Jack Weber explains how a neutral network pattern recognition can be implemented on most micros,

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Intel's 386/PC, Amstrad's PPC bundle and Turbo Pascal 4 come under Guy Kewney's scrutiny this month.

WEST COAST CONNECTION 85
Reports from MacWorld and CES, and what Steve Jobs is doing NeXT.

LETTERS 91
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Greed is the main driving force in the computer industry, argues Martin Banks.

SCREENPLAY 160
Stephen Applebaum picks the best of this month's games.

BIBLIOFILE 164
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MUSICAL INTERLUDE 170
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MAILBOX 174
Peter Tootill unravels the mystique of modem terminology.

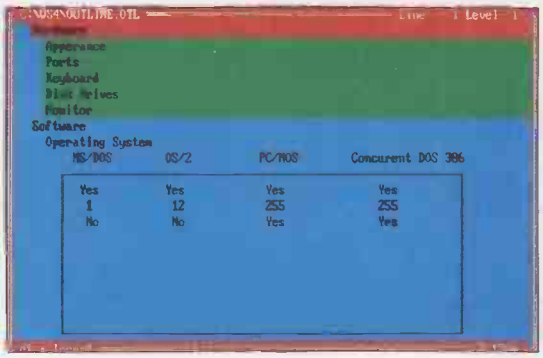
SUBSET 178
David Barrow presents two graphics routines for the 8086/88 processor.

PROGRAM FILE 180
Atari ST Fast Basic is put to use creating astounding graphics in an event-driven program.

END ZONE 210
Directories of user groups, bulletin boards and exhibitions alongside our small ads and problem page.

CHIPCHAT
Who's made a fool of themselves in the industry this month?

FEATURES AND REVIEWS



SIDEKICK PLUS 136
Confirmed SideKick addict Dick Pountain takes a look at the latest 'pop-up' from Borland. Long awaited, SideKick Plus offers so many more features than its predecessor, it is perhaps better considered as a fully-customisable, 'pop-up', integrated software package in its own right.

HOLIDAY IN METROPOLIS 142
It's nice to see that some large and complex programs are still programmed from start to finish by one individual. Graham Devine describes the production of his game, Metropolis, from the original artwork two years ago to the finished product.

JPI MODULA-2 146
JPI Modula-2 compiles at 'Turbo' speed and has a strangely familiar interface. Owen Linderholm takes a closer look at this competitively-priced and very capable implementation.

TALKING PICTURES 150
In this month's Teach Yourself episode, Carl Phillips describes how the WIMP interface is intrinsically part of the Smalltalk system.

STOP PRESS 156
Tired of the dull-looking pages of text that appear from your Amstrad PCW? With AMS Stop Press, you can convert the machine into a low-end but competent desktop publishing system. Ross Blackman put the system through its paces.

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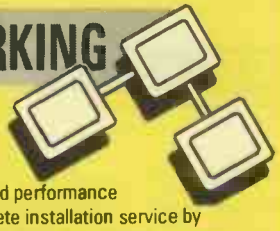

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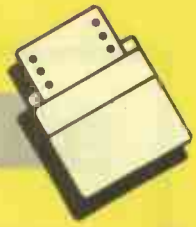

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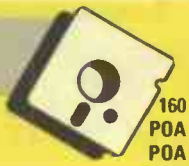

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Turbo Basic	£50.00
Turbo Lightning	£50.00
Turbo Word Wizard	£39.00
Quick Basic Compiler (Microsoft)	£67.00
Learning DOS (Microsoft)	£26.00
Turbo C	£55.00
Turbo Eureka	£55.00
Zorland Powerpack	£52.00

AMSTRAD PROFESSIONAL SOFTWARE

For IBM & PC compatibles

Informaster (database)	£59
SuperCalc 3.2.1	£59
Wordstar Express	£59
Accounts Master	£119
Paymaster	£39

INTEGRATED

Able One	£67.00
Ability	£67.00
Ability Plus	£120.00
Psion-Four	£54.00
Logistix	£67.00
First Framework	£69.00
First Choice	£130.00
ABC	£115.00

RSC SCOOP!!!
Juki 6100 + Sheet Feeder
£399

ACCOUNTS

Sage Bookkeeper	£72.00
Sage Accountant	£110.00
Sage Accountant Plus	£150.00
Sage Payroll	£70.00
Sage Fin. Controller	£240.00
Ability Accounts	£79.00
A.B.C.	£99.00

SAGE NETWORK

Starter pack – connect 2 PC's	£269
Extension pack – add another	£136

DATABASES

Sage Retrieve	£72.00
Tas +	£60.00
VP Info	£67.00
PC Promise	£45.00
Cardbox	£38.00
Suplase Personal	£69.00
PC Masterfile	£49.00

WORD PROCESSING

Sage PC Write	£69.00
Wordstar 1512 (Amstrad)	£46.00
Word Perfect Junior	£73.00
Word Perfect Personal	£155.00
Volkswriter 3 (upgraded)	£99.00
Gem 1st word (Amstrad)	£55.00

SPREADSHEETS

Multiplan Jnr	£30.00
VP PLANNER	£67.00
Words & Figures	£59.00
Microsoft Multiplan	£130.00
Sage PC Planner	£72.00
VP Planner Plus	£99.00
Quattro	£99.00

GENERAL & GRAPHICS

Gem Draw (Amstrad)	£69.00
Gem Graph (Amstrad)	£69.00
Delta Graph	£52.00
Norton Utilities 4.0	£55.00
Gem WordChart (Amstrad)	£69.00
Gem Font Editor (Amstrad)	£73.00
Portex	£82.00
Microsoft Windows	£59.00
VP Expert	£67.00
Copy II PC	£29.00
Microsoft Mouse	£139.00
Sharemaster	£99.00
Sideways	£42.00
Norton Commander	£39.00
PC Tools deluxe	£55.00
PC copy II option board	£65.00

COMMUNICATIONS FOR ALL PC'S

Amstrad Pace Card Modem for PC & Compatible

Datatalk (software included)	£115.00
GemComm (Software)	£58.00
Miracle WS4000 V21/23	£156.00
Sage Chit Chat Software	£69.00
Sage Chit Chat Pack (with Pace modem)	£182.00
Sage Chit Chat Pack 2 (including V22 AA/AD modem)	£475.00
Sage Chit Chat Pack 3 (including V22 Big AA/AD modem	£585.00
Linnet Modem	£129

NEW!! MC2400 3/4 length PC modem from AMSTRAD
* V21, V22, V22 bis, V23-Hayes compatible
* Auto answer/dial
* 5¼-inch + 3½ media incorporated
* Mirror 2 software included

ALL THIS FOR £179

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TDK.

	Per Box	5 or more
TDK M2D D/S D/D	£12.00	£11.50
TDK M2 DD DS/D/D (96tpi)	£15.00	£14.00
TDK M2 HD/DS H/D (1.6M H. Density)	£23.00	£22.00
TDK MF 2HD D/S D/D (3.5 Inch 135tpi)	£24.00	£23.00
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RSC RM4D (H density)	£18.00	£16.00
RSC 3½" D/S (135tpi)	£18.00	£16.00
RSC 3½" D/S HD	£32.00	£30.00

COMPUMART

WATFORD (0923) 55633

END OF YEAR SALE

We must make space in our warehouses for new stock and revised product lines. ALL LISTED ITEMS MUST GO!
Just compare these prices with anything else on the market! (Some items may be slightly shop-soiled but all carry full warranty.)

Only while stocks last

This is just a handful of items picked out at random – check these prices, then believe the rest...

Epson FX80 printer, complete:	£299.00	Displaywrite III:	£250.00
Olivetti M24, Keyboard & Monitor:	£950.00	Firefly Tapestreamer 10Mb:	£700.00
Toshiba T1100 lap-top:	£799.00	PC Paintbrush:	£125.00
Missing Link integral modem:	£370.00	Apple Imagewriter 15" printer:	£360.00

PRINTERS PLOTTERS & SHEETFEEDERS

Apple	Diasywheel Printer	£860.00
Apple	Imagewriter 15" Printer	£360.00
AST	Turbolaser	£2299.00
Brother	EP44 Printer	
Brother	HR25XL Dual I/F	£459.00
Brother	M4018 Ser&/EL	£999.00
Canon	Laser LBP8 A2 Parallel	£2699.00
Epson	FX80 Printer	£299.00
Gram	8k Parallel Interface	£69.00
Epson	JX80 Printer	£320.00
	FX 105 Sheet Feeder	£115.00
Epson	SQ 2000 Ink Jet Printer	£1199.00
	LX80 Tractor Feed	£20.00
	Letter Quality Card for FX80	£99.00
Epson	LX86 Printer	£199.00
Fujitsu	DX2200 Serial Printer	£350.00
Fujitsu	SP320E Parallel Printer	£620.00
Honeywell	34 Printer	£699.00
Integrex	Colourjet 132 Printer	£449.00
Juki	7200 Printer/EL	£1199.00
NEC	P7 Bi-Directional Tractor	£99.00
NEC	P6 Single Bin Cut Sheet Fd	£115.00
NEC	Bi-Directional Tractor	£80.00
NEC	P5/P9 Pin Tractor	£40.00
NEC	P5 Dual Bin sheet Feeder	£299.00
NDR	Printer 8933FT	£1199.00
NDR	18926 Printer	£1299.00
OKI	2410 Printer Parallel	£1499.00
OKI	192 Printer Parallel	£299.00
OKI	Mate 20 Printer Serial	£140.00
OKI	Microline 294 Serial	£699.00
	HP7585B Drafting Plotter AO	£5199.00
IBM	Penman Plotter	£199.00
	Versocolour Plotter C2766-VV	£4599.00
	HP 7595A Draftmaster 1 Plotter	£4599.00
	QUME Sprint 11/40	£999.00
	QUME Laser 10 Model 1	£1999.00
BDT	Dual Bin + Envlp FD QMS LJ	£1005.00
	Ricoh 1600 Printer Serial I/F	£1399.00
Toshiba	Thermal Mini Printer	£399.00
Techtronics	4969 Colour Inkjet	£1599.00
Epson	P80 Transfere Printer	£157.00
Olivetti	DY450 Printer	£899.00
Olivetti	DM 5300 Printer	£799.00
Z1YAD	Paperjet 400	£1140.00
IBM	System 2000 6770/40	£580.00
IBM	6750 Easyfeed IBM2	£200.00
Quietwriter	Sheetfeeder 230	£185.00
Ziyod	M300A Twin Bin S/F	£690.00

TAPE BACKUPS

Olivetti	20MB Tape Backup	£659.00
HP	0.25 Tape Streamer PT9142A	£1050.00
Tecmar	QT125 EXT Tape Streamer	£1200.00
Tallgrass	4060 Tape Streamer	£1050.00
Firefly	XT 10MB Streamer	£700.00
Honey	Twin Drive	£2000.00
IBM	Alloy PC Stor 36	£2700.00
Alloy	PC PC Qicstor 36 Subsystem	£3100.00
Alloy	at Subsystem	£1600.00
Alloy	SL60-51 Subsystem	£2100.00
Alloy	PC Backup	£1300.00
Everex	Stream 20 External	£600.00
Alloy	FTFA Interface Card	£120.00
Honeycomb	Tape Backup (XT)	£2600.00
Sysgen	Smart Image EXT. 20MB	£540.00
Mountain	60MB Internal Backup	£950.00
Irwin	20MB Internal Streamer	£395.00

PERSONAL COMPUTERS

IBM	PCXT-DD 256 (2 360K D/D)	£1100.00
IBM	PCXT-FD 256k (10MB + 360k)	£1300.00
Apple	Macintosh Computer 128k	£1200.00
Amstrad	PC1512 10MB	£599.00
Amstrad	PC 1512 1 X Disk Drive	£299.00
Amstrad	PC 1640 Dual Drive	£720.00
Amstrad	Mono Monitor	£99.00
Olivetti	M24 102 Key Keyboard	£950.00
Olivetti	M19 Dual Floppy 256k	£750.00
Olivetti	M28 20MB/1.2D/D 256k	£1640.00
Olivetti	M19 20MB/360 D/D 256k	£1999.00
Compaq	Deskpro 286 Mod 2 640k	£1900.00
Compaq	Deskpro 286 Model 20	£1570.00
Compaq	Portable II Model I	£1499.00
Dataview	25 Model 2 256k	£1300.00
Toshiba	2100 Lapheld PC	£1299.00
Toshiba	T1100	£799.00

KEYBOARDS

IBM	PC at Keyboard	£125.00
Keytronics	5150 Keyboard	£105.00
Blue Lynx	Keyboard 3270	£260.00
IRMA	3270 Keyboard	£240.00
IBM	3270 PC Keyboard	£120.00
Keytronics	5153 Keyboard	£280.00

SOFTWARE

IBM	Graphing Assistant 2.0	£90.00
Pegasus	U/G Bill of Materials	£350.00
IBM	Basic Compiler V2	£300.00
IBM	APL	£175.00
IBM	C Compiler	£198.00
IBM	Fortran 77	£198.00
IBM	DB III Compiler	£400.00
	Fortran Compiler R.M.	£510.00
IBM	Bonus Payroll	£250.00
Pegasus	Nominal Ledger M/U	£320.00
IBM	Teamwork Sales Ledger	£205.00
	Teamwork Purchase Ledger	£205.00
	Order Processing	£205.00
IBM	Teamwork Nominal Ledger	£205.00
Pegasus	Payroll Multi User	£270.00
IBM	Twork Invcng/sup Pegasus	£260.00
Omicron	Powersales Multi User	£510.00
Tetra	Nominal Ledger	£235.00
Tetra	Purchase Ledger	£235.00
	C-Tools A Prog for D Base	£65.00
	Revelation Database	£415.00
IBM	Delta 4	£325.00
IBM	R Base 5000	£350.00
	DBase III Lanpac	£520.00
Concorde	Image D/B II Euro Ver	£250.00
	MS Fortran Compiler V3.3	£240.00
	R.M. Cobol '85	£550.00
IBM	Professional Fortran V1.3 (D/M)	£300.00
Cobol	Professianal (Microfocus)	£850.00
Cobol	MF Professional ANSI 85	£850.00
IBM	Pertmaster	£455.00
IBM	Sysgen Image 20MG EXT	£540.00
IBM	QED	£200.00
IBM	Javelin	£350.00
	Smart Forcast II	£460.00
Lotus	Manuscript	£250.00
IBM	Pertmaster 250	£570.00
	Report Manager	£320.00
	Crosstalk XVI V3.61	£75.00
Microsoft	RBase System V1.11	£350.00
Fox	Base II	£260.00
	Quicksilver	£260.00

MISCELLANEOUS

IBM	PC Network Adaptor	£300.00
IBM	PC Network Basebank Adapt	£250.00
	AST PC Net II Card	£270.00
Tapestry	Workstation Software	£170.00
	Sumaskdech with 4 button cursor	£350.00
	GTCO 5 8ttn cursor for 5A Type	£275.00
	Sumna Digitising Tablet 18X12	£540.00
	PC Scan with Textpack	£2200.00
	AST Turboscan	£690.00
Cobal	Level 2 High Performance	£1050.00
Cobal	Multi User R.M. (5 User)	£650.00
	5-way Printer Switch + Cables	£130.00
	6-way Switch Box	£299.00
	Rental Research 2370 Sharing	£699.00
	Provector 5604N	£1099.00
Delta Net	Professional 3.5"	£700.00
Sperry	PC IT Display Stand	£199.00
Sperry	Micro IT 20MB D/D 512k	£199.00
Sperry	20MB Drive for HT	£699.00
Tandon	PCX10 CPU	£499.00
Tandon	PCA40 CPU	£1799.00
Concorde	VCN 3.5" DD	£400.00
Olivetti	20MB Hard Disk	£650.00
	Tango Lynk S/W + Printed Circuit	£600.00

SOFTWARE

IBM	Multicom Plus	£120.00
	Polycom/220 for PB, XT, AT	£180.00
Hayes	Software	£120.00
Relay	Gold	£250.00
	SPS File Transfer Software	£105.00
IBM	Displaywrite 2	£222.00
IBM	BSC 3270 Emulation Program	£342.00
	Dos 3.1 (UK)	£45.00
IBM	3270-PC Control Program V3	£240.00
IBM	Informix	£735.00
IBM	Taxi	£120.00
IBM	Freelance	£200.00
IBM	Paradox V1.1	£155.00
	Displaywrite III	£250.00
IBM	3270 Emul Prog Ent Lev VI	£105.00
	DR Graph	£175.00
IBM	Grafix Partner	£96.00
IBM	Spotlight	£40.00
	PC Paintbrush	£125.00
	Graphing Assistant	£85.00
IBM	Gemdraw	£125.00
	Gem Prog Toolkit	£340.00
	Borders Collection	£45.00
	Overhead Express	£105.00
	Decision Graphics	£265.00
Concord	Total Graphics V2	£400.00
	Prospect Graphics Library	£75.00
	Gem Presentation Master System	£1200.00
Power Up	The Printing Press	£30.00
Power Up	Business Graphics	£13.50
Sperry	UTS Software	£320.00
Sperry	Xenix for IT	£620.00
Toshiba	Symphony 3.5	£320.00
Infolok		£135.00
Watchdog		£270.00
Wordstar for IBM	V3.4	£150.00
Wordstar Professional for IBM		£199.00
Samna Word III		£386.00
Format PC		£160.00
Presentation Master		£1200.00
Video Show 160		£3500.00

MONITORS

Taxan	Supervision IV Monitor	£350.00
Taxan	Supervision III Monitor	£275.00
Taxan	Supervision 620 Monitor	£245.00
Olivetti	M28 Colour Monitor	£330.00
Hantarex	CT 900 21" Colour Monitor	£450.00
Tandon	Colour Monitor	£399.00
Apricot	12" F1 Monitar	£199.00
	Kaga Vision III Colour Mon	£340.00
Microvitek	20" Monitor 20L629CW2	£1399.00
Aydin	19" Enhanced Colour Monitor	£1599.00

MODEM UNITS

Rocal	MPS 1222-AD Modem (1200)	£599.00
Buzzbox	300 Baud V21 Modem	£760.00
Minimo	Plus 2 Modem External	£199.00
Thorn EMI	VX543 Modem	£129.00
Dacom	Dual Autoans Modem V2123	£179.00
Racal	Lds Sif II 9600BD Modem	£199.00
Racal	CP2123 Miltiple Modem AD	£260.00
Dacom	DSL 2123GT Modified Hays	£299.00
Hayes	Transet 1000 512k	£259.00
Mirocle	WS4000 V2123 Modem	£129.00
Racal	PM2123 Internal Modem	£339.00
Dacom	Internal PC BIS Modem	£499.00
Steebek	2422 Quattro Rackmount	£499.00
Dacom	DSL2123AD-HE Ext Modem	£259.00
	Missing Link Integral Modem	£370.00
	Breakout 2123 Classic PC Comms	£270.00
	PC Comms Quattro Ext No S/W	£550.00
	Breakout 2400x External Modem	£650.00
Epson	CX21 Acoustic Coupler	£270.00

BOARDS &c.

IBM	5520 Attach V2.0 U.S.	£170.00
IBM	5520 Attach Version 3 S/W	£250.00
IBM	Enhanced Emulation Adaptor	£390.00
AST	5251/12 Remote	£370.00
AST	3270 CO-AX W/IRMA	£430.00
IBM	128k PC Express Board	£700.00
Paradise	Multi Display Card	£190.00
PC Express	Board 512k	£760.00
Paradise	Modular Graphics Card	£190.00
Paradise	EGA Autoswitch	£200.00
IBM-Apple	Quadlink Card	£250.00
Sperry	Pep Card UTS 60 Col	£699.00
Quadport	at 1P, 1S, AP1000	£140.00
IBM	Sigma Board	£250.00
STB	RIO Grande Board	£200.00
IBM	Turbo Board 186	£600.00
Ziatech	ZT 1488A	£400.00
STB	286 Express Board	£350.00
Orchid	Tinyturbo 286 15" Cable	£270.00
Orchid	Jet 386 16MHZ	£640.00
Taxan	TIF565 Auto EGA-480 Card	£199.00
Tandon	20MB Business Card	£199.00
	Adamcom CP100 Comms Board	£1200.00
	Coax 3270 PC Emulation	£850.00
	CXI 3270 PC Emulation	£760.00
	CXIP Cox Graphics Board	£1250.00
Ideacomm	3278 Emulation B+S/W	£420.00
Irmaline		£890.00
Ideacomm	5251 Emulation	£450.00
Irmaprint	Serial	£850.00
Irmacomm	H/Ware+3270B BSC S/W	£650.00

EX-DEMO

Please 'phone for details and prices

Details given in this advertisement may be subject to change without notice.

Prices exclude VAT & Delivery

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M240 (8086 Processor)
Options too numerous to mention but here are some examples.
M240 Dual 360Kb 5¼" Drives.
M240 1 × 360Kb 5¼" Drive, 1 × 720Kb 3½" Drive.
M240 20Mb Hard Disk, 1 × 360Kb 5¼" Drive.
M240 20Mb Hard Disk, 1 × 360Kb 5¼" Drive, 1 × 720Kb 3½" Drive.
M240 30Mb Hard Disk, 1 × 360Kb 5¼" Drive.
M240 30Mb Hard Disk, 1 × 360Kb 5¼" Drive, 1 × 720Kb 3½" Drive.

All the above come with 640K RAM, Parallel and Serial Ports and 102-key keyboard.

A wide range of displays and controllers are available. Internal Tape Streamer Systems are also in stock.

ALL PRICES ON APPLICATION.
M28 (80286 Processor)

SPECIAL OFFER
Full 40Mb system including keyboard, 1Mb RAM, Mono monitor & MS-DOS 3.2 £1895.00
As above, 68Mb system £2195.00
For colour system add £210.00

Many other configurations available – prices on application.

NEW
M280 (80286 Processor – 12MHZ)
All configurations now available.
Price on application.

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(80386 Processor)
M380 COMPACT 1.2Mb Floppy Drive, 40Mb Hard Disk, 1Mb RAM.
M380 1.2Mb Floppy Drive, 68Mb Hard Disk, 4Mb RAM.
M380 TOWER, 1.2Mb Floppy Drive, 135Mb Hard Disk, 4Mb RAM.
TOP JOB included in all configurations of M380.
Prices on application.

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PCA20	£1150
PCA20 Plus (10 Mhz)	£1365
PCA40	£1580
PCA40 Plus (10 Mhz)	£1795
PCA70	£1940
PCA70 Plus (10 Mhz)	£2155
TARGET 20	£1220
TARGET 20 Plus (10 Mhz)	£1435
TARGET 40	£1650
TARGET 40 Plus (10 Mhz)	£1865

The above prices include monochrome monitor, (green or amber), keyboard and Ms-Dos.
For EGA colour monitor and card, add £285.

DOT MATRIX PRINTERS

Epson FX800	£295
Epson FX1000	£380
Epson EX800	£375
Epson EX1000	£505
Epson LQ500	£265
Epson LQ850	£430
Epson LQ1000	£410
Epson LQ1050	£575
Epson SQ2500	£940
NEC P6	£370
NEC P7	£435
NEC P5	£725
NEC P2200 NEW	£265

PRINTERS

Star LC10	£170
Star SR10	£325
Star NX15	£265
Star ND15	£330
Star NR15	£385
Star NB24-10	£395
Star NB24-15	£510

DAISY WHEEL PRINTERS

Brother HR20	£325
Brother HR40	£710
Olivetti DY450	£795
Olivetti DY800	£1045
Ricoh 3200Q	£310
Ricoh 3400Q	£695

LASER PRINTERS

Epson GQ3500	£1255
HP Laserjet II	£1575
Canon Series II	£1885
Star Laserprinter 8	£1545

PLOTTERS

HP 7440 (A4)	£895
HP 7475 (A3)	£1275
HP 7550 (A3)	£2995
Roland DXY880A (A3)	£599
Roland DXY980A (A3)	£855

HARD DISKS

20Mb Seagate ST225 & Controllers	£250
40Mb Seagate ST251	£350
WD Controller only	£65
Tandon 20Mb Business Card	£245
30Mb Miniscribe Hard Card (68ms)	£295
30Mb Miniscribe Hard Card (40ms)	£365
40Mb Seagate Hard Card	£395

SOFTWARE

Database

DBase III+	£335
Dataease	£385
Paradox 2	£310
RBase 1.01	£195
RBase System 1.11	£355
Rapidfile	£189
Foxbase +	£285

Word Processors

Multimate Advantage II	£285
Word IV	£235
Wordcraft 3.0	£305
Wordperfect	£235
Wordstar 2000+ R.3	£220
Wordstar Professional 4	£189

Spreadsheets

Lotus 1-2-3	£245
Multiplan 3	£105
Supercalc IV	£189

Others

Lotus Symphony	£335
Smart	£395
Superproject Plus	£275
Microsoft Excel	£235
MS-Mouse	£115
Pagemaker	£420

Special Offers

Pagemaker, MS Windows, and MS Mouse	£550
Pagemaker, MS Windows, MS Mouse, MS Word, and MS Draw	£925

Full range of Dot Matrix, Daisy Wheel and Laser printers – Call for best prices.
Prices for Add on Boards, Hard Disks, Modems and other software available on request.

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All prices include full 12 months warranty but are exclusive of VAT and delivery.
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OPTIMUM TECHNOLOGY

MORE THAN JUST LOWER PRICES

LISTED BELOW IS JUST A SELECTION
FROM OUR WIDE RANGE OF PRODUCTS —
(From legitimate UK sources — no 'grey' imports!)
— PLEASE CONTACT US
WITH YOUR REQUIREMENTS

OPTIMUM

WORD PROCESSORS

GEM 1st Word Plus	£139
Lotus Manuscript	£269
Multimate Adv. II (NEW!)	£289
MS Word V4 (NEW!)	£245
Word Perfect 4.2 (U.K.)	£239
Word Perfect Library V1.1	£124
Wordstar Prof. V4	£199
Wordstar 2000+ R3 (NEW!)	£269

DATABASES

Cardbox Plus V3.5	£245
Dataperfect (NEW!) (from WordPerfect	£445
dBase-III Plus V1.1 (U.K.)	£359
Wide range of dBase/Clipper etc add-on software available - please phone with your enquiries.	
Clipper NEW! (Summer '87)	£369
UI Programmer - Nantucket (NEW!)	£269
Foxbase Plus V2 (NEW!)	£339
Geniffer V1.01 app. gen.	£275
Paradox V2.0 (NEW!)	£369
Q & A V2 (inc. spell. chk.)	£245
Rbase SYSTEM-V	£445

SPREADSHEETS

BORLAND QUATTRO (NEW!)	£125
Excel Microsoft (NEW!)	£325
Logistix V1.2 (NEW!)	£95
Lotus 1-2-3 V2.01 (U.K.)	£245
Lotus HAL/Metro	£98/£65
Lotus Report Writer	£69
Plan Perfect	£295
MS Multiplan	£149
Supercalc-4 V1.1	£225

INTEGRATED PACKAGES

ABC	£139
Ability/Ability Plus U.K.	£79/£149
ENABLE V2 (NEW!)	£425
Framework-2 V1.1 (unprot)	£325
Open Access II	£395
Smart-3.1	£385
Smart Spell Checker	£89
Symphony V2 UK (NEW!)	£335
Pslon Xchange	£245

DTP/GRAPHICS

ALDUS PAGEMAKER (UK)	£495
Autosketch	£75
Byline - Ashton Tate (NEW!)	£195
DAVRELLE	£395
DesignCad-2D (Ex-ProDesign)	£269
DesignCad-3D (NEW!)	£375
GEM 1st Word Plus (NEW!)	£139
Gem Draw Plus	£163
Gem Graph	£145
Gem Desktop Publisher	£275
Graph-in-the-Box (NEW!)	£89
HARVARD GRAPHICS V2 (NEW!)	£369
LOTUS FREELANCE PLUS	£279
LOTUS GRAPHWRITER-II	£345
Newsroom/Newsroom Pro	£49/95
PageAbility from MIGENT	£169
TURBOCAD V1.5 new low price	£99
VENTURA	POA

MISCELLANEOUS

Utilities/Languages/Games etc

COPY II PC	£47
COPY II PC Option Board	£89
Corefast Backup PC (NEW!)	£125
DESQVIEW V2 (NEW!)	£89
FastBack V5.14 (NEW!)	£149
Jet (Sub-Logic Game)	£39
Lap-Link V2 (NEW!) (lap-to-pc)	£89
Mace Utilities V4.1 (NEW!)	£85
MS C Compiler V5 (NEW!)	£249
MS Flight Simulator	£39
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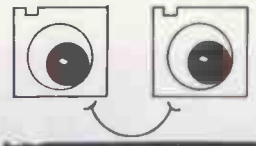

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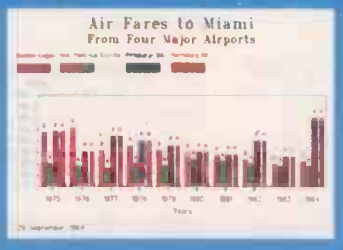

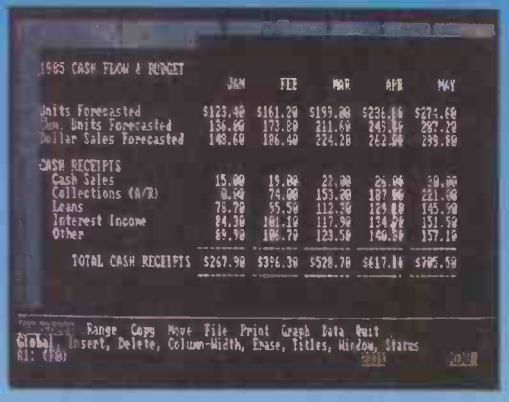

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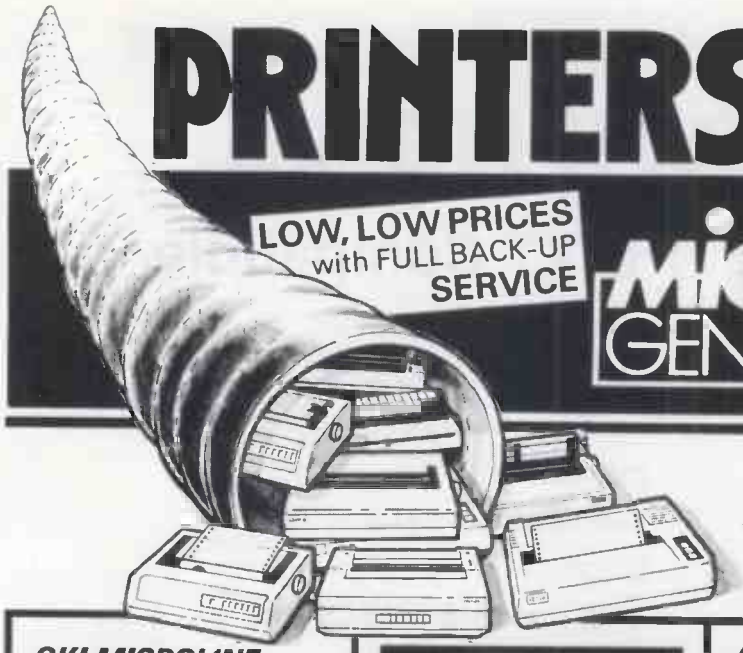

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- PRINT GROUPS OF LABELS SPECIFYING THE NUMBER TO PRINT FOR EACH LABEL
- PRINT ACCORDING TO SEARCH CRITERIA ANY NUMBER OF TIMES
- PRINT ANY LINES OF THE LABELS IN ANY ORDER
- IGNORE ANY LINES OF THE LABEL
- PRINT ONTO ANY SIZE LABEL
- ANY NUMBER ACROSS THE WEB
- ANY MARGIN SPACE AND GAP SETTINGS
- ANY TYPESTYLE YOUR PRINTER IS CAPABLE OF (INCLUDING COLOUR)
- PAUSE PRINTING BETWEEN EACH LABEL
- DIFFERENT TYPESTYLES AND BARCODES MAY BE MIXED ON THE SAME LINE WITHOUT EFFECTING ACROSS THE WEB PRINTING
- PRINTOUTS CAN BE AS LABELS, A COLUMNISED LIST OR COMPRESSED (SCRUNCHED) FORMAT USING ANY LINES OF THE LABEL IN ANY ORDER.
- OUTPUT CAN BE SENT TO A FILE, ANY PRINTER OR SCREEN.

A UNIQUE feature to SUPER LABELLER is the REQUEST command. This allows text to be merged into a label or text file "LIVE" from the keyboard while printing.

BAR CODES

BAR CODES are offered as an option and once again offers TOTAL FLEXIBILITY.

BAR CODE formats can be defined EASILY in a FEW MINUTES and stored on disc for use at any time. An UNLIMITED number of different BAR CODE standards can be created or indeed your own system can be designed.

BAR CODES are printed using the graphic capabilities of your printer and may be positioned anywhere on the label freely mixed in with normal text, WITHOUT effecting across the web printing.

The BAR CODE RATIO is user definable, to give a magnification effect.

MAIL MERGE

As well as addressing your envelopes, SUPER LABELLER incorporates a comprehensive MAIL MERGE facility which will accept ANY standard text file. You can merge in:

ANY LINES OF A LABEL, ANY NUMBER OF TIMES IN ANY ORDER.

DAYS, DATES AND TIMES.

PRE-SET MESSAGES (16).

SERIAL NUMBERS (2).

PRINTER CONTROL CODES (UNLIMITED).

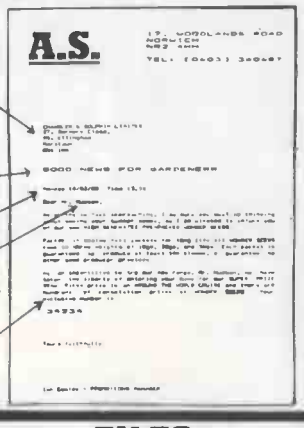
BAR CODES (UNLIMITED).

In fact ALL the advanced features available for use on a label are also available to use with MAIL MERGE.

ANY number of copies of the text file can be specified and output can be sent to the SCREEN, PRINTER or FILE.

Labels for merging can be selected by "WILDCARDS", INDIVIDUALLY or by GROUP allowing for UNLIMITED CATEGORISATION.

Furthermore the advanced SEARCHING FACILITIES allow selected data to be found and merged according to virtually UNLIMITED criteria.



SERIAL NUMBERING

SERIAL NUMBERING is an important feature of SUPER LABELLER and this facility is TOTALLY CONFIGURABLE.

There are TWO INDEPENDENT SERIAL NUMBERS associated with each label file and each can individually be set to have its own characteristics.

- START AT ANY NUMBER
- ANY NUMBER BASE
- ANY INCREMENT (+ or −)
- ANY NUMBER OF LABELS WITH THE SAME NUMBER
- FORMATTED TO ANY NUMBER OF DIGITS BETWEEN 2 AND 12
- LAST NUMBERS SAVED WITH FILE

0012345	ABC00001	00ABC11

FILES

Each group of labels are stored together in a common file and there may be as many files as will fit on your disc.

ANY file can hold up to TEN THOUSAND labels, all held automatically in SORTED ORDER by name.

Typically, even with TEN THOUSAND labels in a file, SEARCHING and SORTING takes no more than a FEW SECONDS.

A new file can be set up in SECONDS and requires NO COMPLEX CONFIGURATION. Indeed you only need to specify the maximum characters required per label and the name you wish to call your file.

All these options are available:

- CREATE FILE
- DELETE FILE
- LIST FILES
- SELECT FILE
- ADD A LABEL
- ADD LABELS IN BATCHES FOR SUPER FAST DATA ENTRY
- CHANGE LABEL DETAILS
- DELETE LABELS
- RENAME LABEL
- RECATEGORISE LABELS

SEARCHING

SUPER LABELLER incorporates an ADVANCED ENGLISH TEXT SEARCH feature allowing for multiple AND OR and NOT (AVOID) operations. Below is an ACTUAL EXAMPLE of this facility to demonstrate the power.

IGNORE CASE
PLEASE FIND HOUSE ON LINES 1, 2
OR FIND BUNGALOW ON LINE 1
BUT AVOID FLAT ON ALL-LINES
AND FIND LONDON ON LINES 1, 6, 8
BUT AVOID CHELSEA AND AVOID ISLINGTON

This can be used both for SELECTIVE PRINTING of labels and MAILMERGE. Furthermore this can be combined with the "WILDCARD" feature to allow UNLIMITED CATEGORISING.

LABEL EDITING

A BARRAGE of editing facilities are available to SUPER LABELLER to ease data entry and modification. It includes features that would compare favourably with many word processors as well as DEDICATED FUNCTIONS designed specifically for use with labels. The list includes:

VISIT A LABEL – Allows you, while editing, to quickly visit another label (for example to view the contents or to cut and pastel and then return to the original.
COPY CURSER – AN EXTREMELY USEFUL aid to editing which allows a secondry curser to move freely anywhere on the screen and "pick-up" characters as though they had been typed. This keeps TYPING TO A MINIMUM by avoiding the need to retype duplicated words or sentences.
It is also used to pick up graphic characters to be used for drawing.
FIND AND REPLACE TEXT – This can be performed by scanning both FORWARD and BACKWARD through the labels.
CHANGE SIZE OF LABEL – The size of the label can be changed at ANY TIME from within the editor at a key stroke.
EXPANSION KEYS – The ten function keys can be set so a single keypress "EXPANDS" into a WORD or SENTENCE again to minimise typing.
QUICK SHOT – Allows the current label being edited to be printed to see instant results.

EMBEDDED COMMANDS

SUPER LABELLER offers many special features by allowing COMMANDS to be embedded within a label or text file. This offers print time facilities of UNRIVALLED FLEXIBILITY. For instance:

- TWO INDIVIDUAL SERIAL NUMBERS
- DATE AND DAY STAMPING
- TIME STAMPING
- REQUEST TEXT FROM KEYBOARD DURING PRINTING
- BAR CODES
- MERGE PRE-DEFINED TEXT
- PRINTER CONTROL CODES

COMPLETE control over the printer is allowed by USER DEFINABLE PRINT CODES. Furthermore, the COMMANDS for each printer function can have any name you choose. This allows customisation of any special facilities your printer provides. If your printer supports colour you could create COMMANDS such as RED, GREEN, BLUE and so on.

IMPORTANT

SUPER LABELLER is the culmination of TWO AND A HALF YEARS of producing FAST, EASY TO USE, SPECIALIST LABELLING SOFTWARE.

First time users are guided through the program with PULL DOWN MENUS and EXTENSIVE HELP.

Experienced operators have the UNPRECEDENTED opportunity to leave the menu system and PROGRAM DIRECTLY using the powerful MASS-FORTH operating system, allowing new commands to be created at will.

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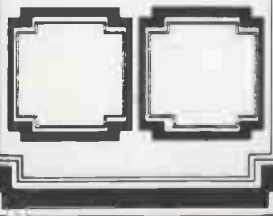

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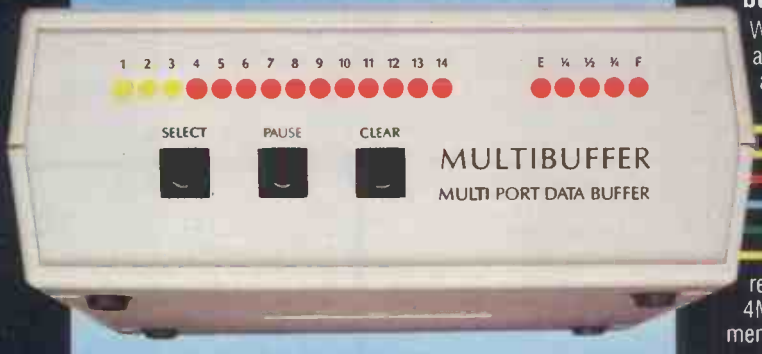
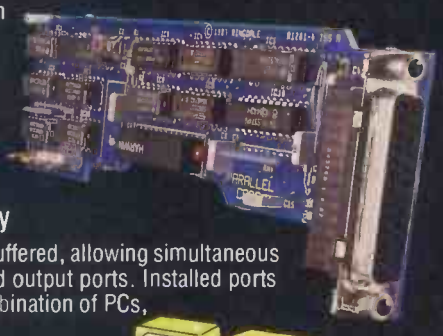


New British-made universal buffered printer/plotter sharer and data switch

- Up to 14 user-installable serial and/or parallel ports.
- ALL INPUT/OUTPUT PORTS CAN BE ACTIVE SIMULTANEOUSLY.
- Up to 4 MEGABYTES of common memory, automatically allocated and deallocated as required on each active port.
- SEVERAL PCs CAN SHARE ONE OR MORE PRINTERS OR PLOTTERS.
- ANY PC CAN ACCESS ANY PRINTER OR PLOTTER.

User-configurable for future requirements

The MULTIBUFFER can be factory- or user-configured with 1-7 plug-in interface cards for up to 7 parallel ports or 14 serial ports, or a combination of parallel and serial. Each serial card provides **two** data ports. Data direction (input/output) of each port is selectable and all common baud rates and handshakes are supported.



All users can send data simultaneously

Each port is separately buffered, allowing simultaneous data flow on all input and output ports. Installed ports can be used for any combination of PCs, printers and plotters.

Up to FOUR MEGABYTES buffer memory

With advanced high-speed algorithms, buffer memory is automatically allocated and deallocated to each user in real time from a common 'pool' of up to 4MB. A limit can be set on maximum memory per user.

Simple but powerful menu-driven set-up

All user-configurable features of the MULTIBUFFER are accessed via a user-friendly menu-driven program running on a PC. No fiddly switches are used. Also, when the MULTIBUFFER is driven from several PCs, each PC user can activate a RAM-resident pop-down menu for printer selection and other useful functions. Setups can be stored in non-volatile memory.

Highest-ever data throughput

State-of the art high speed 16-bit CMOS technology allows up to 13 input ports to receive data simultaneously at a full 9600 baud without slowing-down the PCs – much faster than other printer sharers. Data rates up to 38400 baud (serial) and 30000 bytes/sec (parallel) are possible – ideal for laser printers and DTP systems such as Ventura or Pagemaker. The MULTIBUFFER can often eliminate a much more costly printer-sharing network.

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- Reduces computer waiting time while printing/plotting.
- Allows you to use your PC more.
- New battery backup version.
- Compatible with most computers, printers and plotters.
- Software – Independent.
- Data buffer *and* interface converter.
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MEGASWITCH AS – Serial Data Selector

- Single unit multiplexer and demultiplexer with 2K buffer.
- RS-232 and RS-422 versions.
- Multiplexer – ideal for printer sharing. 4 inputs, 2 outputs. Can automatically select any channel supplying data.
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- Software and manual selection. RS232 version – £169

MEGASWITCH AP – Parallel Data Selector

- Connects any of 4 inputs to one of 2 outputs.
- Can *automatically* switch to any channel supplying data.
- Ideal for laser printer sharing.
- Universally compatible – works with all standard Centronic computer and printer interfaces.
- Use it with a Megabuffer for additional time saving – £169

The perfect choice for CAD

The MULTIBUFFER can allow THIRTEEN PCs to share a plotter – or 10 PCs to share 4 plotters, and so on. You can now optimise the utilisation of a single high-performance plotter with AutoCAD, Robocad, Redboard and most other popular CAD programs.

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When IBM set out to make the new computers, we could have simply installed a more powerful chip into our top PC performer, as some computer companies are doing.

To us, that's just pushing an older technology to its limits.

Instead, we broke ground with a new technology. One that would maintain links to earlier PCs, meet our customers' needs for more power and performance, and serve as a platform for future growth.

For instance, you wanted us to give you more standard features, and we did, but not by plugging cards into the machine.

Instead, we came up with a quieter, more reliable, more compact solution – a single board with printer, communication and mouse ports, even advanced graphics, built in.

In fact, the entire technology was developed from a "total system" philosophy – using IBM components, and IBM chips, specially designed and integrated to send overall performance and reliability up, and costs down.

We could even have been content to direct information through a traditional "single bus" highway. Instead we created a superhighway called MicroChannel™ Architecture in Models 50, 60 and 80, a much more efficient method of sending and receiving information.

We also introduced a new version of DOS which taps into the power of the new systems and runs current applications software better. And we unveiled a new operating system; IBM Operating System/2™ that opens up a world of possibilities.

For starters, it's compatible with today's DOS, protecting your investment in hardware and software.

It works beautifully with MicroChannel, making it easier to do many jobs at once. What's more, OS/2 establishes a consistent look for virtually all software and systems, part of a blueprint for the future we call Systems Application Architecture.

Even IBM's experienced dealer network has been improved. Extensive education and training on both PS/2 and OS/2 ensure service and support are even stronger.

In fact, support comes from many sources, right now hundreds of outside developers are creating new cards, software and peripherals.

So you see, the world of the Personal System/2 is far greater than any single computer or chip or component.

And if you try taking apart a system like this, please remember that only one company can put it all together.

For more information, please write to Rosemary Gold at IBM United Kingdom Limited, FREEPOST, London W4 5BR, or telephone her on 01-578 4399 during working hours.

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LIFETREE SOFTWARE. HARD WORKING BUT NOT HARD LABOUR.

We believe powerfully featured programs shouldn't be hard to use. That's why we always create products with a single set of design rules in mind. Simplicity, safety, and power.

Volkswriter 3 and Volkswriter Deluxe, for example, require the fewest keystrokes per function of any word processors. Quick reference on-screen menus ensure you can be confident about every step. While you can feel safe from risking valuable data should you hit a wrong key.

Both Volkswriter 3 and Volkswriter Deluxe may be simple to use, but they have features that make more expensive word processors seem inadequate.

Similarly, Words & Figures is our Lotus 1-2-3 compatible spreadsheet with built-in word processor that the experienced will find both easy to use and powerful, while the new user will enjoy the nationwide backup that compatibility with the industry standard allows.

And we believe our three tutorial programs, Learn to Type, Learn to Use Your PC, and Learn to Use DOS are a must for all first time computer users.

With prices ranging from £24.95 up to £199 (ex VAT) getting value for money couldn't be simpler.

And we don't sell you short on backup either.

All our products come with full lifetime telephone support, not the usual 90 days.

To find out more, talk to your local dealer. Or complete and return the coupon today. And discover software that'll take the hard labour out of your working day.

WORDS & FIGURES™ £99 + VAT; VOLKSWRITER DELUXE™ £44.95 INC VAT; VOLKSWRITER 3™ £199 + VAT; TUTORIALS £24.95 INC VAT EACH. LOTUS 1-2-3 IS A TRADEMARK OF LOTUS DEVELOPMENT CORP.

Yes, I would like to find out how to avoid hard labour. Please send me further information on the following products:

Volkswriter Deluxe ☐ Volkswriter 3 ☐ Words & Figures ☐

The "Learn to . . ." Tutorials ☐ All products ☐

Please send details of my nearest dealer. ☐

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Address _____

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PCW1

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Make it Simple

Lifetree Software (Europe), Adsol House, Asheridge Road, Chesham, Bucks HP5 2PY. Tel: 0494 772422.

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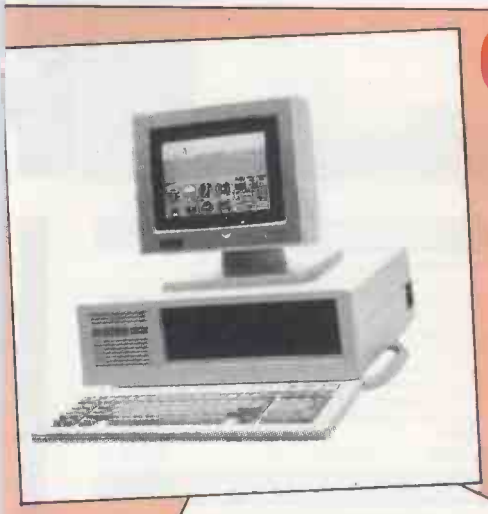

Designed for Business that accepts no compromise on quality or reliability. Every CL Personal Computer is built to last by unhurried manufacture, strict quality control and extensive checking of final product. Development, while on-going is never dictated by 'fashion'. The robust construction is evident, the subdued hum of the CL Computer is reassuring, **pride of ownership knowing that you have the best money can buy is priceless.**

CL-D DESKTOP PC/XT

● Robust stylish metal outer casing ● 8088-2 Turbo CPU ● 4.77/8 MHz Clock Hardware selectable ● 640K User Ram ● Legal Bios Rom ● 360K Floppy Disk Drive ● 3 spare drive cavities ● Hard Disks from 20-40MB ● 84 Key Professional keyboard ● 12" High Res Amber Mono Monitor on swivel/tilt base ● 8 Expansion slots ● Printer and RS232 Ports ● Real time clock and battery backup ● Hercules compatible ● Options of CGA/EGA ● MS-DOS/GW BASIC v3.3 included.

1 Year on-site maintenance included

CL-1D SD PC	£475+VAT!
CL-2D DD PC	£575+VAT!
CL-2D XT 20MB	£799+VAT!
CGA Colour	Add £199+VAT!

CL-28 HI SPEED DESKTOP AT

● Robust stylish metal outer casing ● 80286-10 16/24 Bit CPU ● 6/12 MHz Clock Hardware Selectable ● 1MB User Ram ● ZERO WAIT STATE ● 1.2MB Floppy Disk Drive ● 20MB Winchester Hard Disk expandable ● 102 Key enhanced AT Keyboard ● 12" High Res Amber Mono Monitor ● Option for 14" mono or CGA/EGA displays ● 5 Expansion slots ● Fast slot for Ram Board ● Real Time clock with battery backup ● Printer and RS232 Ports ● 180W Power supply with cooling fan ● 110/220V ● MS-DOS/GW BASIC v3.3 included

1 Year on-site maintenance included

CL-28 AT 20 MB	£1195+VAT!
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CL-28 AT 40MB	£1395+VAT!
CGA Colour	Add £199+VAT!
EGA Colour	Add £399+VAT!

CL-38 BABY DESKTOP AT

● Tiny footprint measuring only 16" x 14" x 5" ● 80286-10 CPU ● 6/8 MHz Clock Hardware Selectable ● 6/10 MHz Clock option ● 1MB User Ram ● ZERO WAIT STATE ● 1.2MB Floppy Disk Drive ● 20MB Winchester Hard Disk Drive expandable to 40MB ● 102 Key enhanced AT professional keyboard ● 12" High Res Amber Mono monitor on swivel/tilt base ● Options for 14" Mono monitor or CGA/EGA displays ● 5 expansion slots ● Printer and Serial Ports ● Real time clock with battery backup ● MS-DOS/GW BASIC v3.3 included.

1 Year on-site maintenance included

CL-38 20MB AT	£1099+VAT!
CL-38 40MB AT	£1299+VAT!
CGA Colour	Add £199+VAT!
EGA Colour	Add £399+VAT!

CL-SERIES TRANSPORTABLE PC/XT/AT

A blend of incredible Portability and Desktop Power. Out and Out best sellers in their class and price. On-Site Maintenance included free for First Year!

PC - Specifications per CL-D but with dual drives. 9" high resolution monitor built in. Provision for external monitor.

XT - Specification per CL-D plus 20MB Hard Disk

AT- 80286 CPU 6/8/10 MHz clock. 1.2MB Floppy Drive. 20/40MB Hard Drive. 1MB RAM. Zero wait state expandable to 4MB!

CL-2P DD PC	£699+VAT!
CL-20P 20MB XT	£899+VAT!
CL-68P 20MB AT	£1299+VAT!
CL-68P 40MB AT	£1499+VAT!

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CL SERIES

XEROX VENTURA DESK TOP PUBLISHER (VERSION 1.1)

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.

£469.00

WESTERN DIGITAL 32MB HARD DISK CARD

This hard card 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. Comes with the famous X-Tree organizing software which normally sells for £42. You won't find this top product selling anywhere cheaper. Hurry while stocks last!

£239.00

EXPRESS PC

This Taiwanese-built clone is manufactured for our Holland branch, where it has been so successful that we are introducing it here. Featuring AT-style keyboard, 640k, Hercules monochrome graphics and monitor, MS-DOS 3.2, 8088 Turbo processor and IBM-style box, its a classic design at a classic price.

Double floppy.....£599.00
32mb version.....£799.00

EPSON GQ3500

Now at last there is a quality laser almost anyone can afford, from a name-brand manufacturer at the lowest price on the market! Six pages per minute, wide choice of fonts, great print quality, cheap consumables! We're really shipping these out fast!

£1275.00

BORLAND QUATTRO

Is this the spreadsheet that will finally de-throne Lotus and SuperCalc? With this spec and price, maybe. It sold 50,000 copies in the first two weeks after its release in the U.S.

Special Introductory Offer £129.00

EXPRESS AT

Manufactured by Supercom of Taiwan, this 8MHz 80286 comes with a choice of classic or mini box with plenty of slots, parallel and serial ports, Real Time clock, MS-DOS 3.2, Hercules style monochrome graphics and monitor, AT keyboard. With this machine we break the psychological £1200 barrier on hard disk AT's (though not by much!)

32mb Express Mini AT.....£1250.00
32mb Express AT.....£1299.00

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 (led by us!) 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! Has helped to up Panasonics' U.K. market share greatly!

£142.00

EPSON PC RANGE

This range is robust and sets the standard for design and style, while remaining easy on the pocketbook. The PCe is a turbo 8088 which comes complete with AT-style keyboard, DOS and monitor. The AT-style AX range comes with keyboard and MS-DOS, but you need to pay extra for the monitor and graphics adaptor board of your choice. The AX is a popular item for power users on a budget, such as local authorities!

PCe.....£925.00
AX20 mk II.....£1299.00
AX40.....£1629.00

SHARP PORTABLES

This is the range that is going to give overpriced Toshiba a run for their money. The Laptop 4500 series offers excellent value and 4 hour battery life, while the hard disk 7100 and 7200 remain tied to the mains. All sport excellent back-lit supertwist LCD screens. The 4500's are 8088 turbo based with 3.5in floppies, while the 8086 7100 has a 20mb hard disk and single 5.25in floppy, as does the 80286 AT 7200.

PC-4501.....£699.00
PC-7100.....£1399.00
PC-7200.....£2099.00

AMSTRAD 1640

No listing would be complete without mention of this machine. The shortcomings of the 1512 have been rectified and the 1640 is excellent value for money, coming as it does with an 8086 8MHz chip, 640k RAM, mouse, Gem, MS-DOS and choice of hercules mono, full colour or EGA screen. The old 1512 was selling massively in this country, and the successor 1640 is having similar success. For real value buy the single drive version and add a 32mb FileCard!

Single Floppy ECD.....£749.00
Single Floppy Mono.....£465.00
20mb Hard Disk ECD.....£1099.00

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.

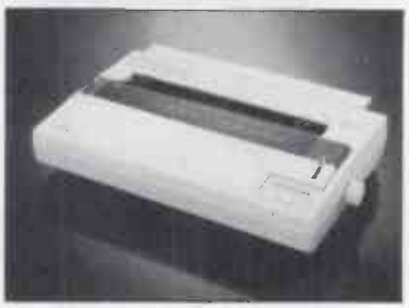
£441.00

EPSON LX800

Although previous LX series printers were considered under-specified compared to the NL10 and others and tended to sell more on name than on spec, the range continues to be the best seller ever, and the LX-800 not only outsells everything in sight but offers a specification that is better than most competitors at this price. 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.

£179.00

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. 24 pin printing, 132 column with built-in tractor feed.

£699.00

COMPUTER EXPRESS GOLD

This special value added service which includes delivery, installation, training, hot-line support and on-site maintenance is now available. Ask for details when placing your order.

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. The absolute top sellers in the world at this time.

FX800.....£294.00
FX1000.....£380.00

LOTUS 1-2-3 (VERSION 2.01)

Although imitated by half a dozen cheaper workalikes, 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. No one undercuts us on this.

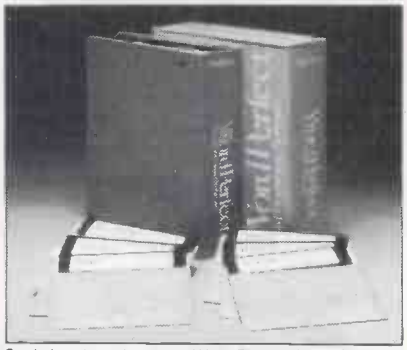
£218.00

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!

£189.00

WORD PERFECT (VERSION 4.1)



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

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. It retails at £695, but we sell it at nearly half that!

£359.00

MIRACLE WS4000 V21/V23 Modem

This is the most popular Modem in the country today 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 (£69.00) because that package also allows you to access Prestel. Most others don't.

£139.00

STAR LC10

Brand new! This is the successor to the NL10, which was the best-selling printer Star ever made. Although a 9-pin, it features a super dense matrix spread which gives it the best ever quality on a printer in its price range. Not only that, but you can print on single sheets without having to remove your continuous paper!

£189.00

EXPRESS TOWER 386

This price doesn't include monitor or hard disk, but 16MHz 80386, mono graphics card, 1.5mb RAM and one 1.2mb floppy. This has to be the cheapest 386 around. Perfect for networking!

Express Tower 386.....£1799.00

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The leading mail order computer firm in the UK.

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Epson LX800 - The Brand New Best Seller!	£179
Star LC10 (including interface) The New Number 2	£189
Panasonic 1081 -120cps & 80 col - A winner!	£142
Epson FX800 -Brand New! 240cps! Wow!	£294
Epson EX800 - 300cps & 80 column-Super Fast!	£372
Seikosha MP1300AI -300cps!	£299
Seikosha SP180 - 100cps Bus a Great Price!	£149
Seikosha SP1200 - 120cps (Seiko-Epson owns Seikosha)	£189
MP 165 - Cheap Fast And Good Quality 180cps	£169
Oki Microline 182 - The Number 2 Brand	£185
Oki Microline 192 - Perennial Favourite	£280

WIDE DOT MATRIX PRINTERS

Star NX15 - The New Wide-body NL10!	£270
Star NR15 - Replaces the SR15-A Great Mover	£395
Panasonic 1592P - A Real Bargain, Mate!	£330
Panasonic 1595 - The Panasonic Favorite	£448
Epson FX1000 - A Very Popular Selection	£380
Epson EX1000 - 250cps & 136 column-Super Fast!	£509
Seikosha MP5300AI - 132col Version of MP1300	£389
Seikosha BP5420 - 420cps Draft - 106 in NLQ	£999
MP 200 - 200cps! 132 column!	£233
MP 201 - 132 column 200cps	£273
Oki Microline 193 - Worth A Look	£357
Oki Microline 293 - Worth A Long Look	£608

24-PIN DOT MATRIX PRINTERS

Epson LQ2500 - This one is really good!	£699
Epson LQ850 - Brand New 24-Pin. Due Out Soon	£429
Epson LQ1050 - Brand New 132 Column 24-Pin LQ	£589
Seikosha SL80 - 150cps Draft -50cps LQ	£280
Star NB15 - The big, up-market Star 24-pin 300cps	£619
Star NB24-15 -Similar to above, but 216cps	£517
Star NB24-10 - 80 column 24-pin winner	£410
NEC P6 - Good Buy	£375
NEC P7 - One of the Best Sellers Ever - 24 pin	£441
NEC P220 new! 56 cps in 24 pin LQ mode	£339
Cut Sheet Feed	£65

DAISY WHEEL PRINTERS

Juki 6100 - 20cps -Very Popular, still no. 1	£265
Juki 6200 -30cps -Still Popular	£393
Panasonic KXP-3131 -18cps - Cute & a Good Smile!	£233

COLOUR AND INK JET 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!	£745
Epson LQ2500 Colour Option/Makes LQ2500 Colour	£55
Seikosha MP1300 Colour Kit/Makes MP1300 Colour	£87
Epson SQ2500 - Ink your jet with this one!	£983

PLOTTERS, DIGITIZERS & LASERS

HP LaserJet II - Newer, Better, Cheaper!	£1935
Cherry A3 Digitizer Tablet	£454
Roland DXY-880A Plotter -Best Value A3 Plotter	£599
Roland DXY-990A Plotter	£859
Roland DPX-2200 A2 Flat-Bed Plotter	£2800
Epson GQ3500 - Brand new with free HP Emulation!	£1275

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)	£13.50
BBC Centronics Parallel Cable (Ribbon)	£8
Two-Way Printer T-Switch	£29
80 Col Printer Stands	£21
SpaceBase Adjustable Floor-Standing Printer Stand	£83

AMSTRAD PC

Amstrad Portable PPC - Brand New Winner!	call
Amstrad 1512 Single Floppy/Mono Monitor	£385
Amstrad 1512 Double Floppy/Mono Monitor	£489
Amstrad 1640 Single Floppy (Colour Monitor 640k)	£610
Amstrad 1640 Double Floppy (Colour Monitor 640k)	£699
Amstrad 1640 20mb Hard Disk (Colour Monitor 640k)	£949
Amstrad 1640 Single Floppy ECD (EGA Colour 640k)	£749
Amstrad 1640 Double Floppy ECD (EGA Colour 640k)	£799
Amstrad 1640 20mb Hard Disk ECD (EGA Colour 640k)	£1099
Amstrad 1640 Single Floppy (Mono Monitor 640k)	£465
Amstrad 1640 Double Floppy (Mono Monitor 640k)	£560
Amstrad 1640 20mb Hard Disk (Mono Monitor 640k)	£840

EXPRESS & MACDOUGALL PC's

Express PC-88 32mb Hard Disk (640k, Turbo, mono monitor)	£799
Express PC-88 Double Floppy (640k, Turbo, mono monitor)	£599
Express Mini AT 286 32mb Hard Disk (1mb RAM 8MHz, mono monitor)	£1155
Express AT 286 32mb Hard Disk (1mb RAM 8MHz, mono monitor)	£1199
Express Tower 386 (1.5mb RAM 16MHz, single 1.2mb floppy, MGA)	£1799
MacDougall 286 AT (512k 10mz, 20mb HD, mono monitor)	£999

EPSON PC's

Epson PC AX-20 Mark II (640k RAM, 20mb HD & EGA)	£1259
Epson PC AX-40 AT (640k RAM, 1.2mb Floppy, 40mb HD)	£1629
Epson PCe (20mb XT with keyboard, DOS & mono monitor)	£925

TANDON

PCA 20mb Hard Disk AT (1mb RAM Keyboard DOS Monitor)	£1250
PCA 40mb Hard Disk AT (1mb RAM Keyboard DOS Monitor)	£1725
Target 20mb Mini AT (Complete mono system)	£1350
Target 40mb Mini AT (Complete mono system)	£1814
PAC-286 (complete EGA AT with removable 32mb hard disk)	£2050

OLIVETTI PC's

Olivetti M240 (20mb hard disk, Monitor, Keyboard, MS-DOS)	£1430

SHARP PORTABLES

Sharp PC-7100 20mb Hard Disk Super Twist Screen	£1399
Sharp PC-7200 20mb 80286 AT (Super Twist & Super Fast!)	£2099
Sharp PC-4501 Single 3.5in Floppy, 256k, Super Twist	£699
Sharp PC-4502 Twin 3.5in Floppies, 256k, Super Twist	£875
Sharp PC-4500 Series External 5.25in Disk Drive	£250

TOSHIBA

Toshiba T3100 20mb 80286 Portable	£2600
Toshiba T1100 Plus	£1359
Toshiba T1000	£810
Toshiba T1200	£2100

CAMBRIDGE COMPUTERS

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Eizo ER8042H 14in Ultra-High Res EGA Colour Monitor	£336
ADI 14in Mono Monitor with Tilt/Swivel Stand	£120
NEC Multi-sync EGA monitor	£459

ATARI

Atari 520STFM 512k RAM, disk drive, mouse	£225
Atari 1040STF 1mb RAM, disk drive, mouse, no monitor	£380
Atari 1040STF with Mono Monitor, 1mb RAM, disk drive	£460
Atari 1040STF with Atari SC1224 Colour Monitor	£670
Atari Mega ST 2 with SM125 Mono Monitor	£792
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ATARI TOP SELLING SOFTWARE

Cyber Studio Cad 3D ver 2.0 - It's Super!	£64
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Superbase Personal - The Relational Database	£73
PC Ditto - The IBM Emulator	£66
Easy Draw II - Great With DTP-Great With Everything	£56
Mark Williams C Compiler - The Best in C	£90
TimeWorks Desk Top Publisher - The Ventura DTP Clone	£69

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Mouse Systems Serial or Bus Mouse with Pop-Up Menus	£125
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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	£1.85 each
Computer Express Branded 3.5in DS/DD diskettes	£1.99 each

COMMUNICATIONS

Linet V21/V23 Autodial/Autoanswer	£129
Miracle WS4000 V21-V23 Modem	£129
Miracle WS3000 V22 Professional Modem	£385
Sage Chitchat Comms Pack (Modem/Software/Cable)	£181
Crosstalk Mark IV Comms Software	£99
DataSoft DataTalk Software	£89
Sage Chitchat Comms Software	£69
One-To-One Electronic Mail Subscription	£20
RS232 serial modem cable	£15

HARD DISKS

Western Digital 32mb FileCard (with X-Tree software)	£239
Seagate ST225 20mb Hard Disk w/WD controller & cables	£225
Seagate ST358 30mb Hard Disk w/WD controller & cables	£249
Seagate ST251 40mb Hard Disk 40ms Access (Drive Only)	£350
Plus HardCard 20mb	£499
Plus HardCard 40mb (the quality leader)	£850
Newbury Data Full-Height 55mb Hard Disk (30ms)	£460
Newbury Data Full-Height 87mb Hard Disk (30ms)	£599

SPECIAL OFFERS

FX-85 Auto Sheet Feed	£99
FX-85 Tractor Feed	£49
LQ-1000 Tractor Feed	£40
Kaypro 2000 Base Unit (New)	£250
Qume Profeeder (Wide)	£150
AST 3G EGA Card	£175
Olivetti MS-DOS 2.11	£15
Olivetti M28, M24 and M240 Keyboards and Monitors	Call

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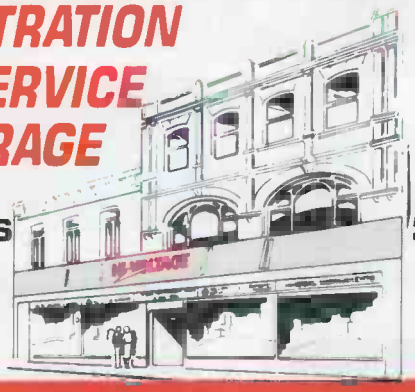

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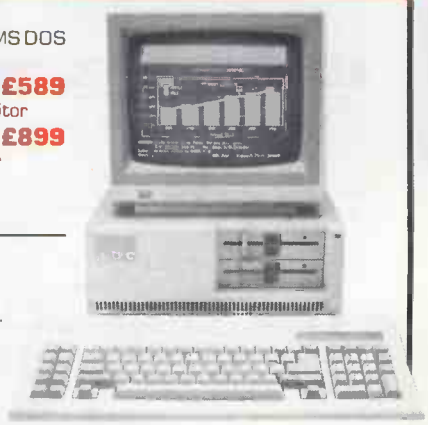

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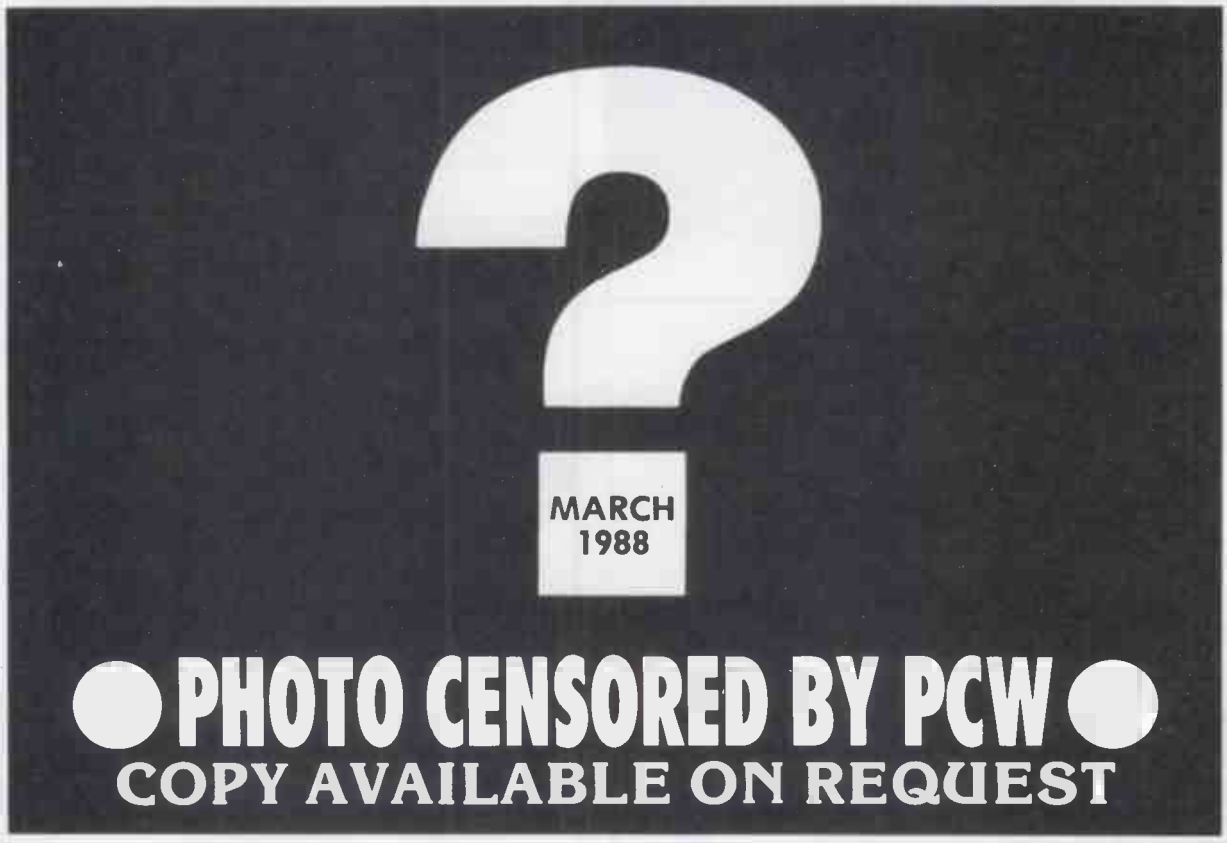

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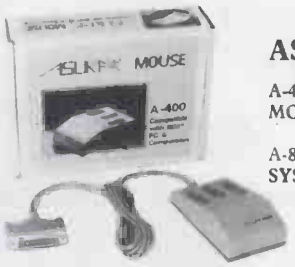

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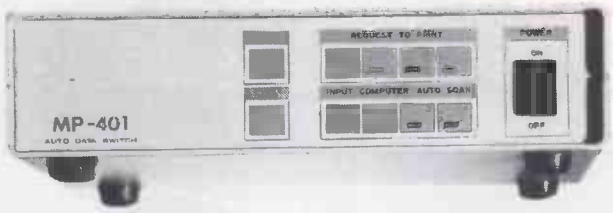

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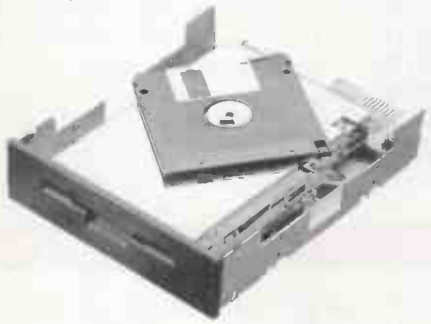
To read by the stream of press releases that come into the PCW editorial office, you'd think that making a PS/2-compatible machine required no more than taking an ordinary PC-compatible and fitting it with 3½ disk drives.

To our rescue has come a wonderful product from Citadel — a £129 3½in floppy disk drive in a 5¼ format chassis that slips into a spare drive slot on a PC and uses standard power and data cables.

Fitting the drive into my AT-compatible proved to be no problem. Getting the machine to format disks correctly proved more difficult. Although DOS said that there was 720k of available space on a newly-formatted disk placed in what I referred to as drive B: no other 3½in disk drive would recognise the disk.



To the rescue came Citadel, who gave the following explanation:

When you format a disk under DOS, the program looks in the BIOS to see what format the disk should be. Even altering the CMOS set-up on an AT doesn't affect this process. The default for drive B: is 360k and this is what it happily does.

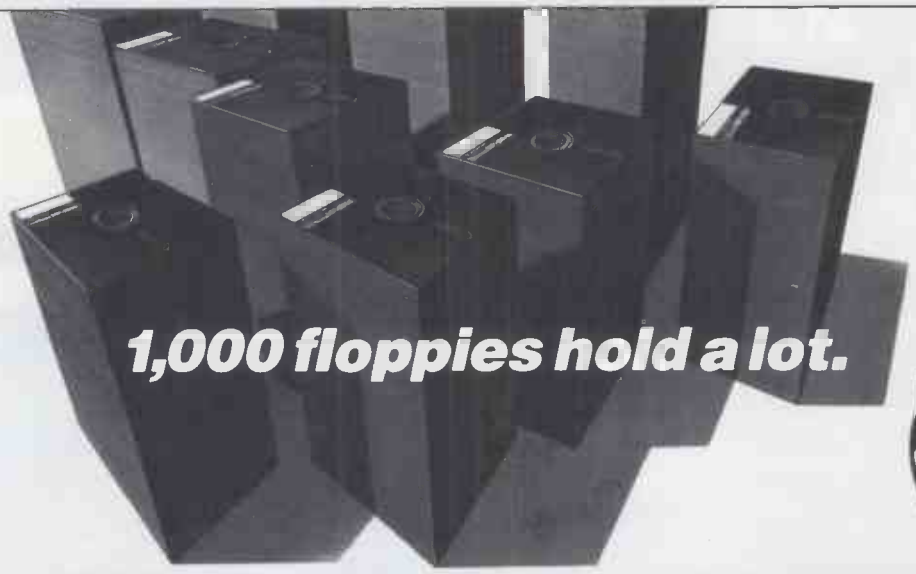
Using a program like PC Tools to format disks shows what is really going on as, for my newly-installed drive, it only gave 160k, 180k, 320k and 360k as possible capacities.

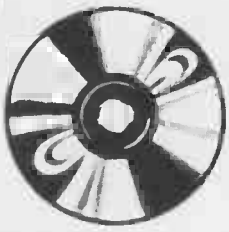
The trick is to use DRIVER.SYS which is supplied with DOS versions 3.2 onwards. This installs extra 'logical' drives whose parameters can be specified in your CONFIG.SYS file.

Inserting the line 'DEVICE=DRIVER.SYS/D:1' into my CONFIG.SYS produced a message at boot-up time to the effect that external drive E: had been installed. I then loaded up PC Tools and it informed me that drive E: can be formatted in just one way — to 720k. As long as I access the 3½in drive as E: rather than B: I now have no problems with any DOS operation.

D. COHEN

(Reprinted from PCW December 1987)





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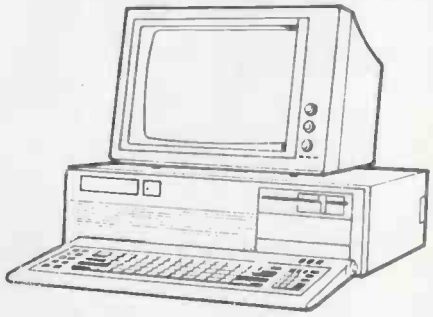

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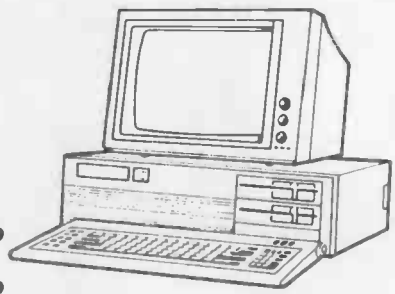

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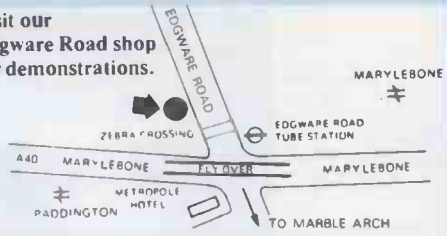

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(2 × ATR001 + 1 × ATR002)	
ATR Utilities Disc	£59(c)
TRANS-NET	
1 Megabit/sec, 254 users, 1.2Km spread	
TR001 Trans-Net Adaptor	£179(b)
TR002 Cluster Kit	£29(c)
TR003 Starter Kit	£389(a)
TR006 Bus Repeater	£45(c)
Filer Server Software	£95(b)

Full details and specifications on request

MONITORS

Monochrome 12" Composite Input

Philips 7502 Green	£69(a)
Philips 7522 Amber	£75(a)

Monochrome TTL Input

Philips 7513 12" Green	£85(a)
Samsung MD1252 12" Green T/S	£95(a)
Samsung MD1258G 12" Amber T/S	£95(a)
VM1400 14" Amber T/S	£115(a)

RGB

Philips (Acorn) ADF32 14"	£195(a)
Philips 8833 14"	£249(a)
Taxan SuperVision 620 12"	£269(a)
Taxan SuperVision 625 12"	£309(a)
Sanyo CRT70 Hi Res 14"	£225(a)

EGA

ECM5400 14" Monitor	£299(a)
Taxan SV 1V12" (inc controller)	£329(a)
Taxan SV 760 14"	£439(a)
Taxan SV770+ 14" Multiscan TS	£539(a)
Taxan SV860 16" T/S	£675(a)
NEC Multisync 14" T/S	£489(a)
Mitsubishi 1440 14"	£399(a)

T/S indicates Tilt & Swivel stand

DTP MONITORS

Wyse 700 (1280 × 800)	£775(a)
Genius A4 (736 × 1008)	£1519(a)
Viking I 19" (1280 × 960)	£1895(a)

PRINTERS

DOT MATRIX RANGE

EPSON

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FX800	£299(a)	EX1000	£549(a)
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LQ800	£399(a)	LQ1050	£589(a)
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Roland DXY880A A3 8 pen	£599(a)
Roland DXY980A A3 8 pen	£875(a)
PC Parallel Printer Lead (2m)	£9(a)
(Longer Lengths available)	

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TSB 256 Auto Sharer/Buffer
256K buffer with 3 input ports. Back port scanned automatically every 10 secs until data found. PAUSE, COPY and RESET Facitilies. Full spec on request. £179(a)

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(All lines are switched).	Parallel	Serial
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3 computers to one printer	£39(c)	£39(c)
4 computers to one printer	£45(c)	£45(c)
2 computers to 1 or 2 printers	£49(c)	£49(c)

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Seagate ST238 30Mb + Kit (XT)	£279(a)
Miniscribe 3425P 20Mb 55ms	£199(b)
Miniscribe 3425 30Mb + Kit (XT)	£279(a)
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Seagate ST251 40Mb (40ms)	£349(b)
Hitachi DC521 40Mb (24ms)	£479(b)
Seagate ST4096 70Mb (f.ht/28ms)	£789(a)
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Hard Drive Cable set (XT or AT)	£12(c)
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Everex Stream 2020Mb int.	£585(b)
Everex Stream 6060Mb int.	£839(b)

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3M 747 96TPI DSDD	£13.00(d)
3M 1.6M HD *for AT*	£22.00(d)
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Dysan 48TPI DSDD	£11.00(d)
Dysan 96TPI DSDD	£14.00(d)
Dysan 1.6Mb HD *for AT*	£16.00(d)

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3M 135TPI DS	£18(d)
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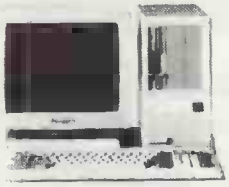

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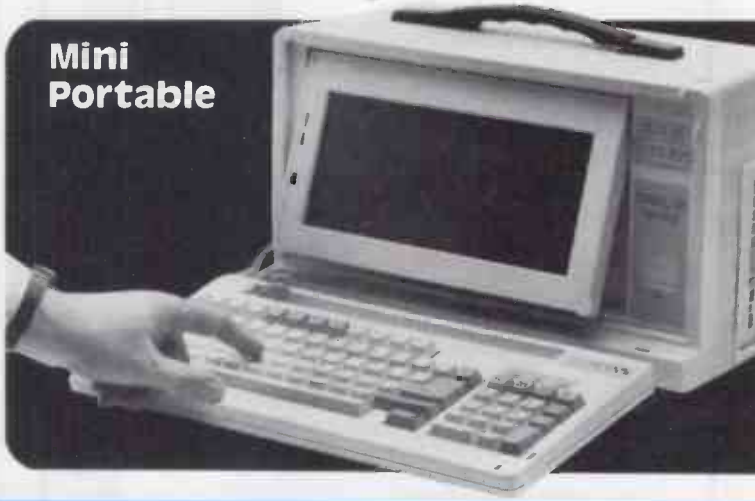

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- Clock, games port and light pen interface

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80287 Maths Co-processor 8MHz	—	£220
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M1509 136col 180cps 45NLQ F/T P & S	495	353
M1709 136col 240cps 65NLQ F/T P & S (dual interface) IBM/FX	595	419
CITIZEN		
120D 80col 120cps 25NLQ F/T P	245	149
MSP-10 80col 160cps 40NLQ F/T P	349	259
MSP-15 136col 160cps 40NLQ F/T P	449	325
MSP-50 80col 300cps 60NLQ T P	525	387
MSP-55 132col 300cps 60NLQ T	695	512
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FX-800 80col 200cps 40NLQ F/T P	430	294
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FX-1000 136col 200cps 40NLQ F/T P	550	380
LQ-800 80col 180cps 60NLQ F P 24 pin head	625	399
EX-1000 136col 300cps 50NLQ T P	745	509
LQ-1000 136col 180cps 60NLQ F P 24 p h	835	559
P-80 XS PORTABLE 80col 45cps		250
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DX2100 80col 220cps 44NLQ F/T P (S OPT)	435	293
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DL3300 80col 324cps 24 p h BI-T P IBM/EPS/D630 Compatible	710	545
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MICRO-P MP201 132col 200cps 40NLQ F/T P	399	273
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P7 136col 216cps 72NLQ F P 24 p h	649	437
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EPSON LQ2500 136col 270cps 90NLQ T P 24p h	1045	675
EPSON SQ2500 Ink Jet	1345	983
OKI ML84 80col 200/400cps NLQ F/T P	779	618
OLIVETTI DM600 132col 200cps 70NLQ P & S	1179	929
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STAR NB 24-10 80col 216cps 72NLQ F/T P 24 p h 360d.p.i.	599	410
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CANON 1X-12 SCANNER (Without Interface)	850	702
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OKI LASERLINE 6 6pm LJ/FX/ Diablo/Qume/NEC	1899	1370
CITIZEN OVERTURE 110 10pm FX/Diablo	1995	1460
QUME LASER 10+10pm LJ+ FX/ Qume/IBM	2683	2216
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OLIVETTI PG101 8pm Diablo/Epson/LJ	3209	2499
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6300 132col 40cps F P	899	629
6500 132col 60cps F P	1299	935
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DY450/1 132col 45cps F P Diablo compat	1140	799
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FUJITSU		
SP 320E 48cps P Diablo compat quiet	999	766
QUME		
11 80col 40cps (without i/face) P OR S	1210	956
12 80col 20cps	450	355
RICOH		
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DM 590/1 132col 192cps 120NLQ F P JX/Qume/Diablo compat	1137	846
TOSHIBA 351C 136col 288cps 100NLQ F P & S IBM compat	1475	1130
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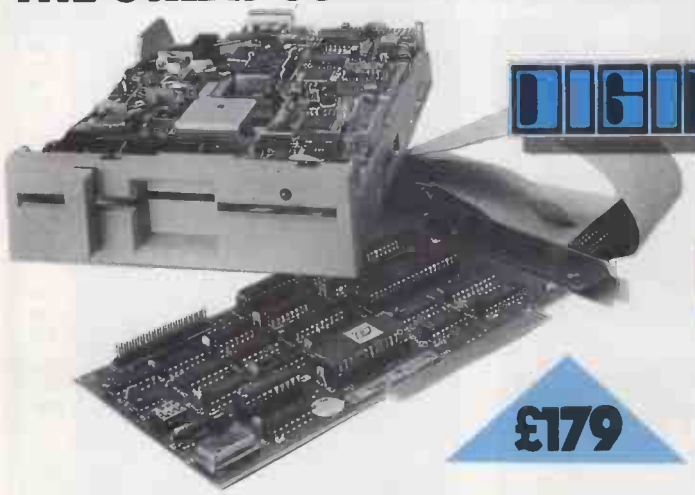

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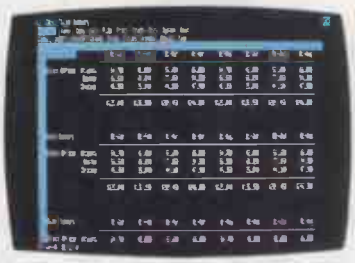

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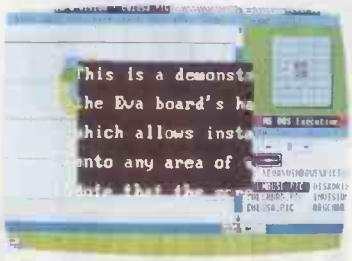

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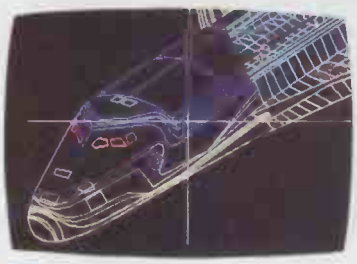

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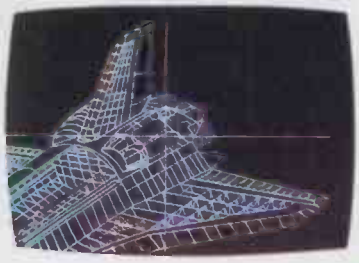

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	DACOM	DSL21236T	V21, V23	Fully buffered to 9600	Y	Y	Y	Y	Y	BOTH	419	359
	DACOM	DSL123	V21, V22, V23	Triple speed intelligent modem	Y	Y HAYES		Y		PULSE	399	319
	DOWTY	DUO	V21, V23	Dual speed modem	Y	Y HAYES	Y	Y	Y	AUTO	340	295
	DOWTY	TRIO	V21, V22, V23	Triple speed modem	Y	Y HAYES	Y	Y	Y	BOTH	595	489
	DOWTY	QUATTRO	V21, V22, V22bis, V23	Multispeed sync/async/modem	Y	Y HAYES	Y	Y	Y	BOTH	795	639
	DOWTY	MINIMO+2	V21, V23	Auto/manual direct connect modem	Y				Y	PULSE	245	205
	DOWTY	SB1212	V22	Top selling V22 modem	Y					BOTH	495	449
	DOWTY	SB2426	V26bis	PSTN or LL synchronous modem							317	287
	DOWTY	TRAILBLAZER	V22, V22bis, V23	Latest technology upto 18,000 BPS	Y	Y HAYES	Y	Y	Y	BOTH	1795	1595
	MIRACLE	WS2000	V21, V23	Low cost manual modem							109	89
	MIRACLE	WS4000	V21, V23, (V22 OPT)	Automatic multi-speed modem	Y	Y HAYES				PULSE	170	133
	MIRACLE	WS3000 2123	V21, V23	Automatic dual speed modem	Y	Y HAYES		Y	Y	BOTH	295	205
	MIRACLE	WS3000 V22	V21, V22, V23	Automatic triple speed modem	Y	Y HAYES		Y	Y	BOTH	495	385
	MIRACLE	WS3000 V22bis	V21, V22, V22bis, V23	Top of the Miracle range	Y	Y HAYES		Y	Y	BOTH	650	499
	MODULAR TECH.	5022	V22	Low cost direct connect	Y						295	269
	RACAL MILGO	CP2123	V21, V23	Dual speed modem with software	Y	Y		Y		AUTO	250	218
	RACAL MILGO	MPS1222	V22	Professional V22 modem	Y						625	575
	RACAL MILGO	VI 1222PA	V21, V22	New addition to the Racal range	Y	Y HAYES				AUTO	595	499
	RACAL MILGO	VI 2422PA	V21, V22, V22bis	High specification multi-speed	Y	Y		Y		AUTO	775	726
	RACAL MILGO	MPS24	V26bis	Synchronous PSTN modem	Y						530	496
	TANDATA	TM512	V21, V23	Dual speed professional modem	Y	Y HAYES		Y	Y	AUTO	255	195
	TANDATA	TM722	V22, V22bis	Latest Rockwell technology modem	Y	Y HAYES		Y	Y	AUTO	499	419
	THORN EMI	DATATECH VX543	V21, V23	Low cost dual speed modem	Y	Y			Y	BOTH	195	165
	THORN EMI	DATATECH VX512	V22	Automatic/manual V22 modem	Y	Y HAYES	Y	Y	Y	BOTH	399	335
	THORN EMI	DATATECH VX524	V22, V22bis	Automatic/manual dual speed modem	Y	Y HAYES	Y	Y	Y	BOTH	499	459
INTERNAL CARD MODEMS	AMSTRAD	PC MODEM	V21, V23	Pace modem on a card with s/w	Y	Y HAYES		Y	Y	PULSE	150	129
	DACOM	UNITY	V21, V23	Dual speed modem card	Y	Y HAYES		Y	Y	BOTH	299	235
	DACOM	UNITY GOLD	V21, V22, V23	Triple speed modem card	Y	Y HAYES		Y	Y	BOTH	399	310
	DACOM	UNITY QUAD	V21, V22, V22bis, V23	Multi-speed modem card	Y	Y HAYES		Y	Y	BOTH	599	490
	DATAFLEX	STRADCOM	V21, V22	Internal modem card with S/W	Y	Y HAYES		Y	Y	BOTH	195	136
	DATAFLEX	TRICOM	V21, V22, V23	Internal modem card with S/W	Y	Y HAYES		Y	Y	BOTH	249	189
	DATAFLEX	BISCOM	V21, V22, V22bis	Internal modem card with S/W	Y	Y HAYES		Y	Y	BOTH	299	209
	DOWTY	TRIO CARD	V21, V22, V23	Triple speed modem card	Y	Y HAYES	Y	Y	Y	BOTH	595	495
	DOWTY	QUATTRO CARD	V21, V22, V22bis, V23	Multispeed sync/async modem card	Y	Y HAYES	Y	Y	Y	BOTH	795	639
	LION SYSTEMS	ORATOR	V21, V22, V22bis, V23	Data and voice synth modem system	Y	Y	Y	Y	Y	BOTH	795	630
	MIRACLE	KEYCARD 2123	V21, V23	Automatic dual speed modem card	Y	Y HAYES		Y	Y	BOTH	275	229
	MIRACLE	KEYCARD 1200	V21, V22, V23	Automatic triple speed modem card	Y	Y HAYES		Y	Y	BOTH	425	345
	MIRACLE	KEYCARD 2400	V21, V22, V22bis, V23	Top of the range modem card	Y	Y HAYES		Y	Y	BOTH	545	440
	PC COMMS.	BREAKOUT 2123	V21, V23	Dual speed modem card	Y	Y	Y		Y	BOTH	399	316
	PC COMMS.	BREAKOUT 1200	V21, V22, V23	Triple speed modem card	Y	Y HAYES	Y	Y	Y	BOTH	499	399
	PC COMMS.	BREAKOUT 2400	V21, V22, V22bis, V23	Multi-speed modem card	Y	Y HAYES	Y	Y	Y	BOTH	945	819
	RACAL MILGO	PM2123	V21, V23	Dual speed modem card	Y	Y HAYES	Y			AUTO	295	221
	RACAL MILGO	PM22	V22	2400/2400 internal card modem	Y	Y HAYES				AUTO	450	337

KEY: V21 = 300/300 V22 = 1200/1200 V22bis = 2400/2400 V23 = 1200/75

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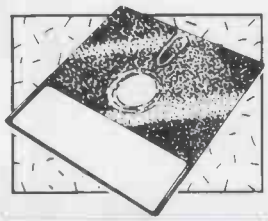

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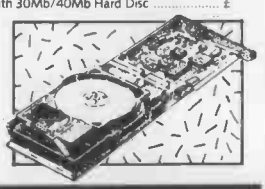

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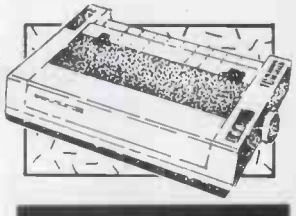

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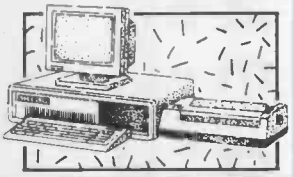

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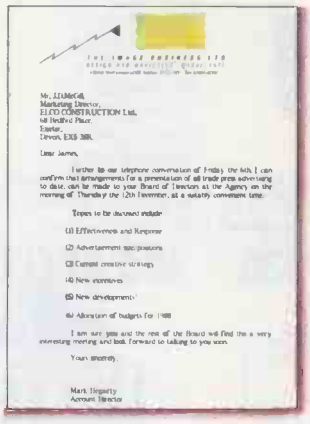

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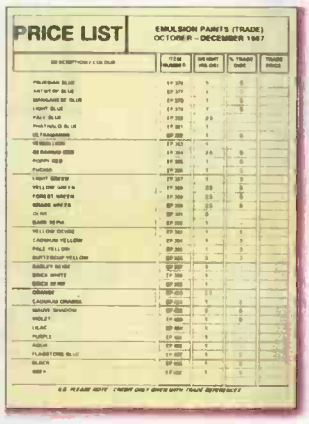

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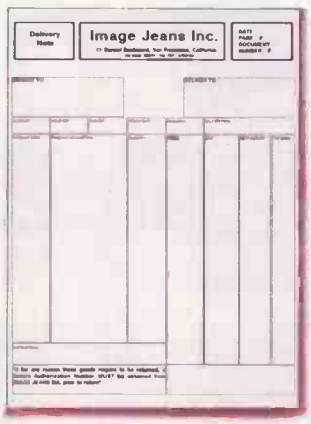

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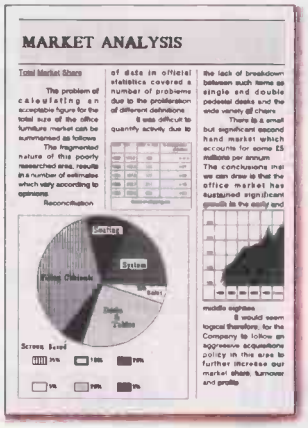

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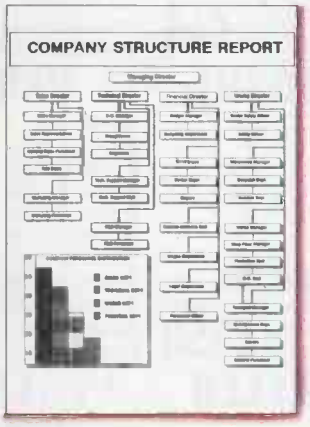

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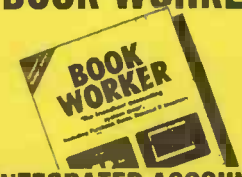

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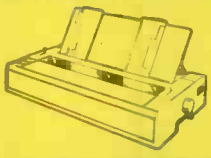

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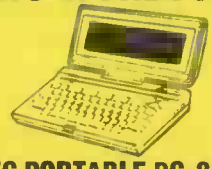

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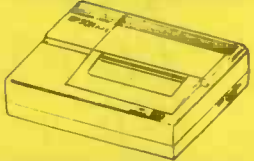

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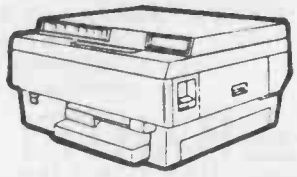

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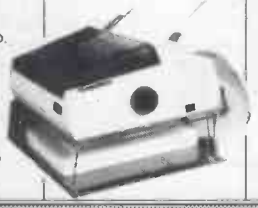

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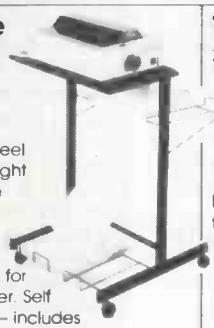

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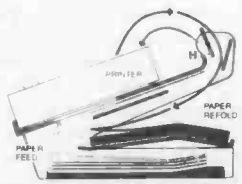

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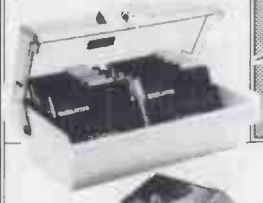

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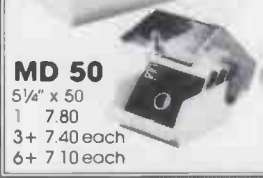

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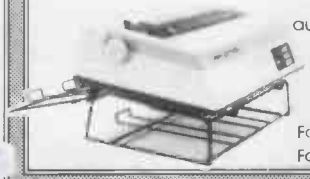

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Time out for sloppy assistance

Those of you living in the London area will be able to get a genuine, independent look at the local computer dealer population when *Time Out* publishes its next guide to shopping in London. I was asked to produce a recommended list of shops for this guide.

The news isn't exactly encouraging. I can best sum it up with the following riddle: What's the difference between a used car dealer and a computer salesman? Answer: The used car dealer knows when he's lying.

I've often been amused and appalled by the standard of 'service' to be obtained across the counter of the typical computer store. I've had occasion to repeat some of the sillier tales in this column, but I had never realised just how typical these anecdotes really are.

On this occasion, the editor of the guide suggested that we visit each store individually, and mark them out of ten. I added up the cost of doing so, and the accountants at the guide suggested an alternative — put a member of *Time Out*'s staff on the job.

This was a brainwave, because we found a reporter who knew nothing — literally — about computers, who was able to keep a straight face when his questions were answered, simply because he had no idea how funny the answers were.

Buy the guide if you can, by all means, for a laugh if nothing else. It ranges from the unbelievable 'You'll have to make an appointment with one of our directors' to the ridiculous 'Copying software from Commodore tape to disk? You'll need a disk costing £800, or we could do it for you, for a price . . .'

I do know one or two stores where the staff know what they are selling, why you should buy it, and what else you might consider. By far my favourites are Pilot Software and Personal Computers, both in London, where I know the people who run the stores, and go to them for advice and help when stuck. Pilot is best known for its games floor, but it does have a business computing department downstairs in its Rathbone Place premises, where database software is written and business systems are supplied.

The only reason I get annoyed about the inadequacies of computer stores is the irritating way they have (many of them) of justifying high prices by talking about how wonderful is the service they provide.

My experience is that they either provide a service as an extra, at a price (and not a low one, either — a £200 fee for a two-day training course is keen!) or they don't provide much of a service at all.

In fact, I seriously doubt that this will ever change.

When one takes a far less complex beast like a motor car and visits a sales garage, one knows that the over-dressed idiot who will collect commission on the car you're going to buy is someone knowing nothing — and caring less — about the internal details of the vehicle. When the time comes to get the thing fixed, one talks to a mechanic. Strangely, the more different sorts of cars the mechanics know about, the lower their fees.

Expecting a Ford mechanic to fix a Ferrari is, however, a much more sensible attitude than expecting an IBM sales executive to know what is going on with the screen of a Macintosh, or an Amiga seller to understand the Atari ST. So one shouldn't get upset when they turn out to 'know' things that aren't true.

But I *do* get upset. If stores really did use their profits to pay better-qualified staff reasonable wages when they learned their trade, those staff would stay on board and help expand the business. Instead, more dealers pinch pennies to feed their own image of themselves and the standard of living they think they deserve. This approach to business is what killed off the British corner store until the Indian shopkeepers took over and turned it back into the goldmine that it once was.

You can't become rich from a computer store — or anything else — until you have built it up. Until our store-keepers understand this, we buyers will have to make sure we know exactly what we want, what it will do, and just need someone to hand it over.

Just when you thought your PC with its NEC Multisynch colour EGA screen was fit to show to the neighbours, NEC appears with the Multisynch GS. You can't go one better than this — it shows colour graphics in black and white.

It's incredibly high-resolution. It is supposed to work not only at ordinary monochrome standards, but also at Hercules, CGA and EGA, as well as the new IBM MCGA and VGA standards. It will show colour displays in up to 65 different shades of grey. And it costs only £200.

Of course, if you really *must* have colour, there's still the Multisynch. Except it's now joined by the Multisynch Plus. Only 1024x768 pixels. A trivial £930.

IBM approves Dixons as dealers

You can now buy an IBM machine from Dixons. Admittedly, not just any Dixons branch, but the chain does have six (at the last count) stores fully-approved to sell the PS/2 Model 30.

This has caused no end of irritation among other computer dealers, who had been told that this was the first step in a relaxation of the rules about who can sell IBM hardware.

The plan was originally sold to IBM's distributors as a way of appointing more distributors who would, in turn, 'carry the can' of servicing dealers. And they would appoint new dealers themselves.

As finally announced, however, the only rule that has been relaxed is financial. To qualify as a dealer's agent, a computer store has to pass every single test that an IBM Approved dealer has to pass — bar one. It has to have the level of staff, the shop front, the square footage and all. But it doesn't have to pass the same financial stability tests.

I have to say that I wonder what the point of the change might be. The distributors are very, very annoyed. At least one of the eight names who are selling IBM computers to dealers has already been contacting non-approved dealers and saying: 'You can now apply for approval by us, without going through IBM.' IBM will say they jumped to conclusions.

In passing, you have to be amazed at Dixons' decision to sell the Model 30 — unless, that is, you think it is a machine worth buying.

The Model 30 is not really a PS/2 family machine, but an 8086-based box with 3½in disks. It has many similarities to Apricot's now-defunct PC, with the sole advantage of being much more compatible with PC-DOS software and being able to run MGA graphics.

In New York, all the advertisements for the machine offer it at $1086 (around £600) including two disks, a screen and a keyboard. Dixons has promised that 'as usual, Dixons' prices will be highly competitve, and will start at around £2000 for a package comprising the twin-diskette computer, printer, software and on-site servicing.

That software had better be *amazing* software.

Making silk purses from sows' ears

The arrival of a single plug-in card with an Intel 80386 chip in it has transformed a heap of junk in the back of a store into the most sought-after piece of hardware around. Total cost? £800 plus VAT, plus whatever value you put on your old PC.

The 'piece of junk' is the original IBM PC, now celebrating its fifth birthday in the UK. (It's older than that in the US, of course.)

The card is the Intel-produced Inboard 386, which fits inside the original PC and replaces the slow, old 8088 chip. The effect is astonishing, and not just in speed terms.

The bad news is that it's only speed you get. The card doesn't (yet) have available a version of OS/2 that will work on it, nor yet a version of Windows 386. Intel hopes to have these available after May. 'We're working on it,' the company promised.

In speed terms, the old PC is one of the least impressive machines on the market. With the 386 brain transplant, a rough workload Benchmark put it ahead of a 12MHz Dell 286 — even using the disk, which rather surprised me until I noticed that I'd been using an ultra-fast Priam RLL drive.

What really surprised me, however, was how the machine appeared to its owner, a computer dealer. I rang him up to borrow it for the test. 'Have you got an old PC, genuine original?' I asked. 'Oh, yes,' he replied vaguely, 'one or two that don't work properly and we can't bother to have fixed. I'm afraid it's useless. It's one of the original PCs, you know, with 16k on the motherboard, and a cassette port, and only five slots.'

It turned out that the 'fault' was a colour monitor set to conflict with a monochrome monitor, and removal of the mono card fixed that.

The machine actually requires you take out the 8088 chip. A short cable connects the board into the old chip slot, which means it will only fit into machines where the chip is in exactly the same place relative to the slots — the IBM PC and XT, the original Compaq and the Tandy 1200, apparently. You can't change the cable because its length is crucial to the timing of the signals.

After running my tests, I showed the machine to its owner. His eyes widened progressively during the demo of how easy it was to fit; and, at the end, he suddenly found that he wanted it back, 'just to try out one or two things. Oh, and could I borrow the Intel board for a week?'

He has one problem: shortage of slots. With the Inboard in one, a floppy disk drive and a display card, there is no room for things like a clock if you want a serial port and a hard disk — unless you buy multi-function cards.

Most multi-function cards for the PC include added memory. The Intel Inboard includes 1Mbyte of its own, fast 32-bit memory, and it ignores all the PC's own memory entirely.

So, a new multi-function card has to be provided. My friend was last seen on the track of an IdeAssociates card which does both floppy and hard disks, plus display and printer port.

Price turned out to be an issue. The card sells for $999 in the States, so you can imagine my amusement to be told that it would cost £999 in the UK.

Both Intel and First Software, the importer, blamed each other for this discrepancy. A couple of hours later, they rang to announce a 'reduction' to £799 plus VAT. My tactful observation that $999 equalled around £550 at today's rates seemed unwelcome.

Still, even at that price, I suspect a lot of 'defunct' PCs may suddenly be pulled out of cupboards. It does make for a fast machine.

I will believe in these tower systems which are so convenient (because they save space on your desk) when the manufacturers notice that you have to crawl on the floor on your hands and knees to plug peripherals in and out.

This is Jarogate's latest 386-based box, and the interesting thing to this company is the fact that it is fault-tolerant. It actually keeps a log of every key that is pressed at any terminal, it has two disks which duplicate all disk operations, and it has an uninterruptible power supply.

What I noticed, at once, was the fact that I'd have to unplug every cable in every socket before I could pull the thing out as shown, and stick a new card in. OK, it's nice to have that little foot sticking out so that it doesn't fall over, but I'll be really impressed when the slots are put in back to front so I can reach them from where I sit.

This box, by the way, is for eight users. It costs a cool £22,000 plus. No, I didn't think you'd want the phone number.

GUY KEWNEY

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Arthur sheds its nappies

Acorn is reported to have 'finally finished Arthur', the operating system for home users of its Archimedes super-micro.

To support this achievement, more applications software is starting to appear.

Most eyecatching of the last batch: a podule for the machine called Chromalock, from WildVision. This is described as 'a low-cost genlock and full-colour video overlay system which allows the spectacular graphics of the Archimedes to be superimposed onto a video picture.'

Details from 6 Jesmond Road, Newcastle-upon-Tyne NE2 4PQ. ▶

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‘A considerable bargain...’

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PCW9

Amstrad's Organiser will travel for Triangle

Amstrad has decided to give away, free with its PPC portable, a piece of general-purpose travelling software called PPC Organiser. After some time struggling with it, I produced the following:

DLe000001E-GGf) Peter Mackeonis Founder
Triangle Publishing,
Fictitious Street,
London ERR3 9AM.
17 January 1988

Dear Peter,
This is a pretty strange user interface. It works, but it is totally unlike anything else I've ever used. Is it seriously possible that one can use it without the manual?

For a start, I do expect the 'menu' to show all possible options. In fact, the manual always seems to know more — two or three (not trivial, but crucial) — operations which are available through hitting functions keys, such as function key F12 doing the dialling of a modem.

Putting the Help onscreen is a good idea. I'm less certain about the wisdom of putting it underneath the window I'm working on. Oh, I realise it comes up if you press 'Help', but when the Help screen is already on show (partially obscured, yes, but on show) one feels instinctively that one *shouldn't* press Help.

Similarly, having twelve function keys is a great idea, but showing only ten of them on the menu bar is less obviously wonderful. Also, the Help screen, which pops up all by itself if you seem to be stuck, appears to have the wrong information on it occasionally. Correct me if I'm wrong, but was this version put together in something of a hurry for the Amstrad launch at the Which Computer? Show, perhaps?

Some of the controls are weird. I mean, take the 'Editor Setup' menu. How do I get to it? Why, naturally, press the 'Insert' button. Obvious. There I am, typing away, and the Help screen says that function key F2 will flip the window, and INS is Underline-Bold and so on. In fact, to get the Editor Setup menu, you press the Insert button! And function key F7 is Variable insert . . . 000001. Well, that's the cardnum variable (whatever that is).

The idea of reading data in from the database cards is nice, except you seem to have to remember what you called the cards. I know you can call up the database separately, but by that stage I had such a confused chain of commands and escapes and cancellations, that I had a template which included three other templates. All I could do was save it (it wouldn't let me abandon it).

The problem, I suppose, is that this is really a mail-merge operation — *never* simple. But I do think it could be more intuitive than it seems to be at the moment.

And the 'ESCape' key . . . well, I have to admit that I've always thought of that as an *escape* key, for when you had made a mistake and wanted to cancel what you'd done. Your program uses it as a sort of 'OK, go ahead' button.

The program includes a calculator, a card index, and a text editor which produces the funny non-standard control codes which you see at the top of this document. Well, some of them. There were lots of others, which made it difficult to edit documents with WordStar and totally impossible to edit them with WordPerfect.

Not that it's easy to find these documents, as the system gives them arbitrary names. Letters are all named with a number, starting with LE and ending in .DOC. Memos are all named with a similar number, starting with ME and ending in .DOC.

I found that if you'd been interrupted in a letter, the thing was pretty hard to find as a result. You had to abandon hope and start again. It then warns you: 'This letter already exists!' and dumps you back into it.

My judgement: a nice concept, very clever of you to make it 'pop-up' software, and it will succeed. That is, it will make the portable look like a better deal. At £60 for the Organiser, however, I think I'll recommend my readers not to get too involved with this software until it has been around for a while and had the corners knocked off it.

You will forgive me, I know, but I have to say that most of Alan Sugar's users will end up paying money for something like WordPerfect Executive which includes a spreadsheet and word processing, and which, of course, Sugar was hoping to be able to wrap up in the bundle instead of this.

Oh, yes, I know you will forgive me. Simply, the bundle with the Amstrad will sell thousands of copies of the Organiser. After all, you have copy-protected it in a sense, because only Amstrad users will be able to run the Amstrad version. The rest of the world will have to buy the normal version.

And, if Amstrad's name could sell a dung-stuffed turkey like WordStar 1512, it will certainly make your Triangle Publishing company famous. By which time, I hope that this early version will be forgotten and superseded, a sensible upgrade policy will have been offered to victims, and you and your partners will be wealthy.

Yours sincerely,
Guy Kewney

Succinctly, Ambitron describes this beast as follows: 'Its mother was a plotter, its father a graphics terminal.' What you are looking at is liquid crystal 'light valve imaging technology.'

You would use it with the sort of software that writes to screen in colour, on the occasions when you wanted to see the complete picture of a CAD output. It can display (Ambitron assures me) 16 million colours at very high resolutions on a 22in×34in screen.

Details on (0635) 36555 at 13 The Paddock, Hambridge Road, Newbury, Berks RG15 5TQ.

Making a good thing better

One of the best utility programs for the PC, PC Tools, has just been made even better. Central Point Software, the US publisher, has released a new version called PC Tools Deluxe. Existing features include hard-disk backup, disk optimisation, protection against accidental hard-disk formatting, rebuilding damaged data, easy disk and file management (including undeleting), and so on.

The new version also includes: a new format program which can be recovered from and UNformatted if you make a mistake; a disk cache program for increasing speed; and a flexible file editor that can be used memory-resident and which will edit *any* kind of file. On top of all this, all the old functions have been speeded up and improved.

I find PC Tools Deluxe invaluable for all sorts of filing functions. It is far easier to use and more reliable than Norton's Utilities, which is its only close competitor.

PC Tools Deluxe costs £69.95 and is available from Evesham Micros on (0386) 765500.

Owen Linderholm ▶

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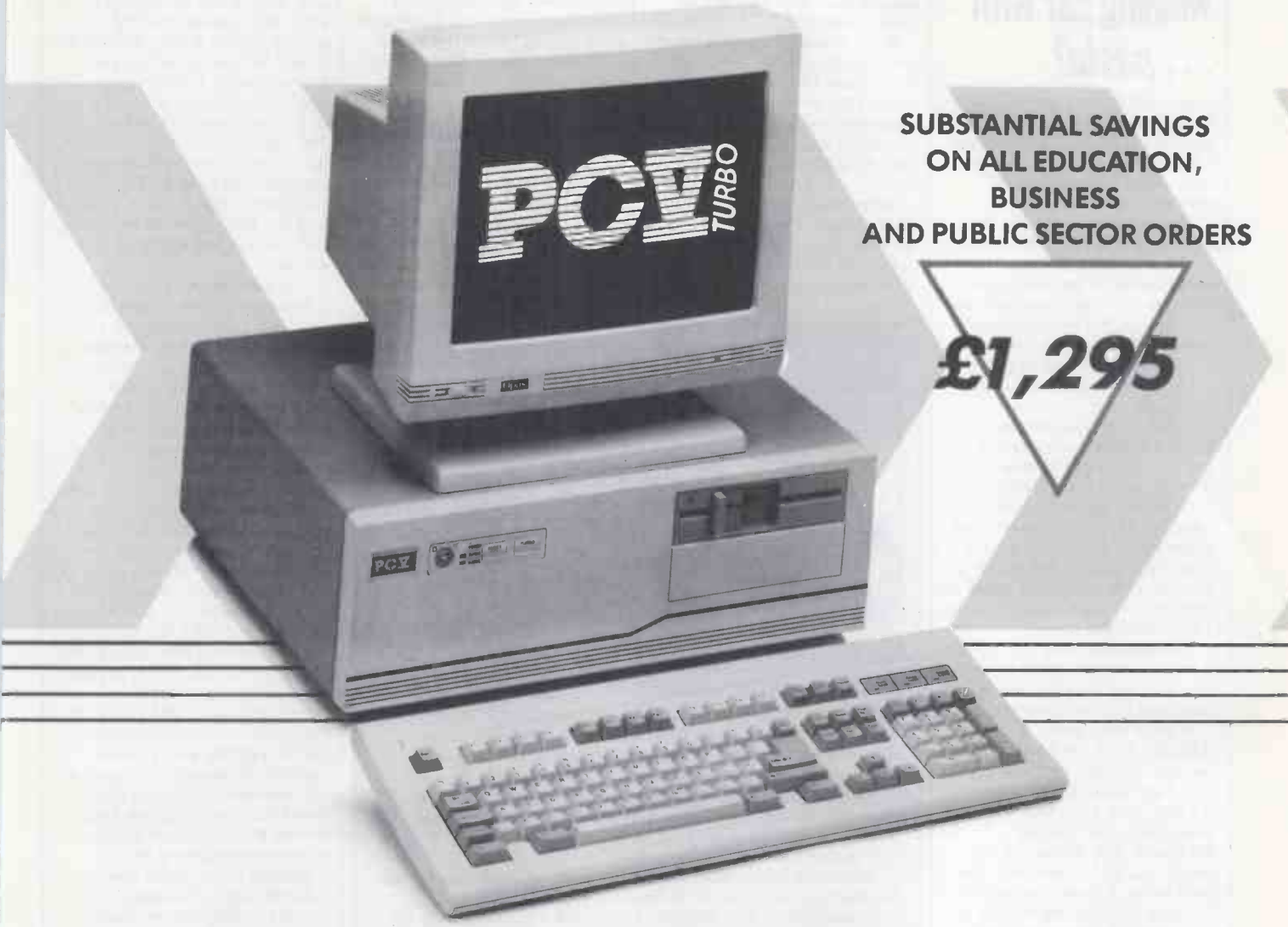

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Toasting the winning car with . . . *pasta*?

Super Sprint was already the favourite multi-player arcade game in the *PCW* office, when I discovered that it is also a very good way of making toasted pasta.

The original game can be seen in any arcade, but since half my readers are too respectable to go into games arcades and the other half are too young, the game is easily described. There is a race track, and you have to get around it by steering a little image of a car.

PCW's editoral assistant, Chris Cain, assures me that the game is better with steering wheels (as in the arcade) than with joysticks. On the other hand, at 17, he's relatively old. Eleven-year-olds kids tell me that the arcade game is out of date and not nearly as good as the Electric Dreams re-creation. They also beat me.

It's addictive, and the reason it makes good toasted pasta is that you get very excited when you beat the computer car.

In each race there is a different track, with different bends, hazards, jumps and the like. Two players on an Atari ST can have a joystick each; one player can use the keyboard, and the computer plays too. If the computer car gets home before you, you're out and have to restart. But if you beat the computer, then Wow! You keep your points, and you can soup up your car.

The computer doesn't drive very fast, so you can beat it quite easily. As you would expect, the computer gets around this by cheating. For example, after the first few tracks, the computer starts introducing patches of mud, oil slicks and gusts of wind into the game.

Drive into an oil patch, and your car will go into a random spiral. At the other end, you may be pointing in *any* direction — including back into the oil. It can take several long seconds to get out.

Strangely, when the computer car hits a mud slick, it spirals through it and emerges at the other end pointing in the right direction.

Ah, well, that's artificial malevolence for you. So is the bug which occasionally turns your steering wheel into little clouds, and pushes you into the barrier to explode in flames. And so is the bug which means that if you get the highest score and then try to restart, the computer won't record your score on the all-time greats list.

What makes the game worth playing, of course, is that you don't have to play on your own; and, more to the point, you don't have to wait for someone else to finish with the computer before it's your turn.

What makes it fun are all the little details: the crowd, waving flags which are the colour of the winning car; the little animated cartoon of the driver who came last, vainly trying to repair his heap of junk; and the rescue helicopter, which cloppers overhead when you crash and puts a new car on the track.

Toasted pasta? Well, all you need is a pot filled with hot water, and enough pasta to feed whoever is going to eat. Put it on a low gas to simmer and, while it is cooking, go and have just one quick game of Super Sprint.

Miraculously, just as you are about to break the all-time high score, the smell of toasted pasta will reach your nostrils.

This year's highly successful Which Computer? Show failed in one vital requirement: it introduced me to no new companies, and very few new products which had not been fully previewed before the show.

Atari stayed away — for its own reasons which have little to do with a general assessment of the show. But Bob Gleadow, head of Atari in the UK, did offer a criticism. It was one I found damning.

'What the show lacks,' Gleadow summarised, 'is a place for startups to show what they've got.'

A trade show like this one attracts the big corporate DP buyers, the dealers, and OEM customers. They come to see what their normal suppliers are offering, and to collect on offers of a friendly drink and a chat about problems.

A small, penniless whizzkid firm with a half-complete piece of brilliant software, a prototype add-in board, or a design for a new computer, could catch the eye of the head of DP for Glaxo, say, or the Department of This and That, or the Institute of The Other. And, within a year, that product could be a market leader.

'That is the ideal way of getting the seeding,' said Gleadow, 'which a new company needs to grow its ideas.'

It would cost the Which Computer? Show's organisers, Cahners, nothing to have a little — or not-so-little — section of those enormous halls at the Birmingham National Exhibition Centre, where, for a flat fee of £100, partners, single-trader consultants, programmers and engineering startups could hang a board up with their names on, and give out typed sheets with their phone number and details of their new idea.

Cost, nothing — no, it might well make money. There was unused space at the show. Personally, I'd like to see some of that space given over to people called journalists. I have seen systems for distributing press information that were more like a dog's dinner, but not often. And I know that the organisers have seen how it ought to be done, because their publicity adviser has seen the Comdex system in the States.

But personal, selfish, needs apart, I think Cahners owes the industry this in exchange for the money it is making from the show. If you wish to join the lobby, the company is on (01) 891 5051.

Chips for all

Last April there circulated a story that one of the first people to buy a new IBM PS/2 Model 50 was an employee from Chips & Technologies (C&T), the company whose chips have made PC/AT and 386 clones possible. Supposedly, this person took the machine back to the company's Silicon Valley labs, and the hard work of analysing and reverse engineering started.

The story was true.

Now, some nine months later, C&T is ready to start producing its Micro Channel Architecture chip set. When used as part of a suitable motherboard, which C&T has also designed, it should be possible for manufacturers to launch their PS/2 clones.

Chips & Technologies is now three years old, and though vice president, Dado Banatao, is too bashful to admit it, the company taught IBM a thing or too about system integration.

The first IBM PCs and ATs used masses of TTL chips and the like, so that the component count on the motherboard was huge. C&T made some presentations to IBM about its own methods of partitioning the AT system into a small number of discrete, integrated components. Ironically, the new PS/2 range typifies and refines this approach so that reverse engineering the machines is no trivial task.

According to Banatao, anyone could reverse engineer a PC or XT in a garage in a month, but it needs the resources of a semiconductor company to reverse engineer custom chips. From his point of view he's bound to say that, but his warning does suggest that there won't be a flood of PS/2 chip sets from other manufacturers.

At the Which Computer? Show last month, Western Digital also showed its PS/2 chip set on a prototype motherboard together with the requisite new-style bus connectors. And alongside was a Mission prototype Model 30 clone, also based around a Western Digital chip set.

On present showing C&T looks like delivering its chips first, but the fact that graphics card manufacturer, Paradise, is a subsidiary of Western Digital may mean that a fully-integrated Micro Channel/VGA system will come from that quarter first. Either way, the move to match IBM's PS/2 offerings is now under way.

Derek Cohen ▶

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Pirates back in the real world

'Software pirate goes to gaol', say the headlines. What in fact happened was that a crooked computer dealer went a step too far.

It's a very strange business, talking to one of these pirates, because they live in a totally artificial reality. And it's impossible to know how much of the real world they can actually see.

Recently, I found a communications program on a bulletin board. It had been recommended as 'excellent shareware — and British to boot' by another board prowler.

It was in fact an American program (and not a very good one, either) which a well-known crook had attempted to get distribution rights for. It was his own decision to make it into software, not the author's. Copies of it are now being distributed, in good faith, by users who believe they are legally entitled to make copies and give them to friends, who are obliged to 'register' the software only if they decide to keep it. Registering involves sending money to the pirate.

All is being done for the best, and when the money comes in, naturally some will be sent to the author; although to be frank, the author has conned the pirate so badly that he will be obliged to retain quite a lot of the revenue. In fact, the author probably owes him a quite substantial sum for marketing costs . . .

This man is still unprosecuted, although a court injunction prohibits him from keeping the software on his bulletin board.

The other pirate (who got caught) was Gerhard Martens of Torquay, who was more blatantly selling illegal copies of software. He was also selling fake clothes with fake labels in, so his operation had a wider scope than many computer shops. And one of his titles for his business was Second Hand Software — a strange concept indeed.

But he is not unique. Many computer dealers in the UK, forced by their own incompetence to spend too long on each sale, make up the difference between profit and loss by adding illegal software copies to the deal.

'Here is your Korwan clone, your Okson printer, and the bundled copy of 1-2-3 and WordStar,' they say to their customers. Bundled? Only because they are illegal copies.

Martens was sentenced to 12 months in gaol. It can happen to other such pirates but, of course, they will carry on doing it because that's what they are good at — and at justifying their actions.

And, of course, when caught, these people are ace at accusing journalists of running scurrilous hate campaigns against them.

Joining hands to outwit IBM

Everyone is supposed to raise a cheer at the sight of Apple teaming up with DEC, the world's second largest computer builder, in an attack on the dominance of IBM.

Not so.

An observation: if Apple and DEC break the 'dominance' of IBM, they will treat the market in exactly the same way as IBM does, only more so, because IBM has, over the years, learned to live within the law which has tamed it.

Another observation: Burroughs and Univac formed a joint company last year. The result: Univac customers are on the point of shooting their new supplier, which (they say) isn't treating them like the old one did.

A prediction: if the strategic alliance between Apple and DEC achieves anything at all, it will be a situation where each company suppresses inventions that conflict with the partner's current milch cow.

I'm sure I've said this before: why do the computer builders who are not IBM believe that we want *them* to be IBM instead of IBM being IBM? Our complaint about IBM is not that it is *called* IBM, but that it dominates the market and thereby makes innovation difficult. *Any* dominant company is likely to be as suppressive of good ideas.

And, judging by Apple's past record, I suspect it would be a lot more suppressive of ideas than IBM has ever thought of being.

Upstart gets started

For people who like the idea of the NExT machine which Steve Jobs (founder of Apple) is reported to be building in secret splendour in the US (see 'West Coast Connection', page 85), here is news of something more modest which aims to do something similar.

The idea is to use a PostScript driver to run the screen of a computer.

The company is Upstart Corporation, founded by a name of equal note in the micro business, Lee Felsentein, who originally became famous as the designer of the Osborne 1 portable CP/M micro.

His new machine, called Nomax when I saw him recently in Berkeley, is based on an Intel 80386 chip and has a high-resolution screen. The clever part is that, since the screen is generated by PostScript, a simple dump of the screen image to the printer is all you need for typesetting.

Well, it isn't quite that simple because, for a start, no screen will have the 300 dots per inch of most laser printers. But, since PostScript is resolution-independent, the same data that produces the screen will be fed to the printer, and the only difference will be that the printer is better quality.

As Felsenstein put it when pre-launch demonstrations were on in California recently: 'This removes the WYSIWYG issue.' What you see is *exactly* what you get.

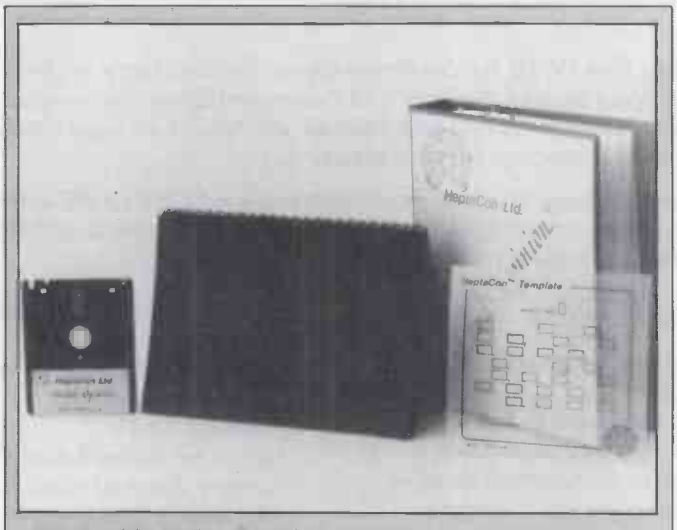
What makes this startup Upstart company worth reporting is simple. When Felsenstein starts talking about new technology, it isn't because he has met some plausible engineer who has sold him on an idea (a dig at Steve Jobs — sorry, Steve) but because he has built a working prototype.

Backing him, Lee has several names worth the venture capital in their own right. Arvind Patel, who founded Paradise Systems, among five others — he is chairman. John Simpson, VP of marketing, was founder of Reflex orignator Analytica Corporation after his time with DEC and Burroughs. Charles Woodford, product development VP, was founder of Selfware and author of WordFinder, the leading thesaurus product.

Felsenstein (here, let me quote from his press release): 'Felsenstein contends that Nomax will attract a large number of PC users who are reluctant to buy a Macintosh, but who want the benefit of Mac-like features and performance in their desktop publishing systems.'

With the Nomax box, Upstart will give away Windows 386 as an operating environment, making the beast perfectly capable of running any standard DOS program.

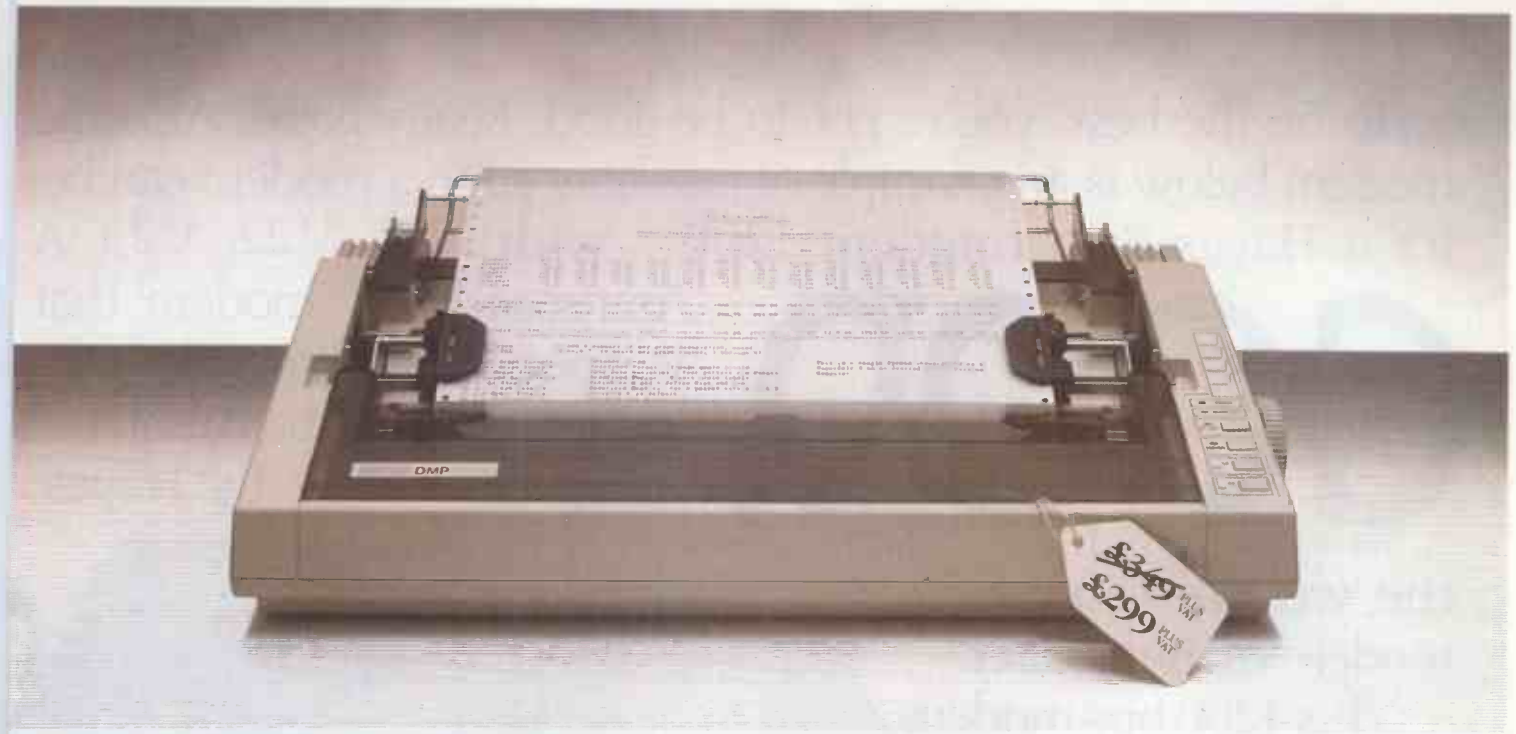
Anyone interested should contact Simpson in California on (415) 652 5393. Upstart is at 2200 Powell Street, Suite 880, Emeryville, California 94608. ▶



Presumably having traced an annoying source of sales (customers), Heptacon has found a way to prevent them from getting their fingers on software: a brilliantly irritating new copy-protection scheme. The manual cannot be photocopied, and each time you load a program, you have to put a template on a special code book and work out a startup code.

It's bound to work. I seem to remember losing my temper with programs which simply required me to have the original diskette as a 'key'. This thing ought to have even the most patient user in fits by the third day.

Brilliant!



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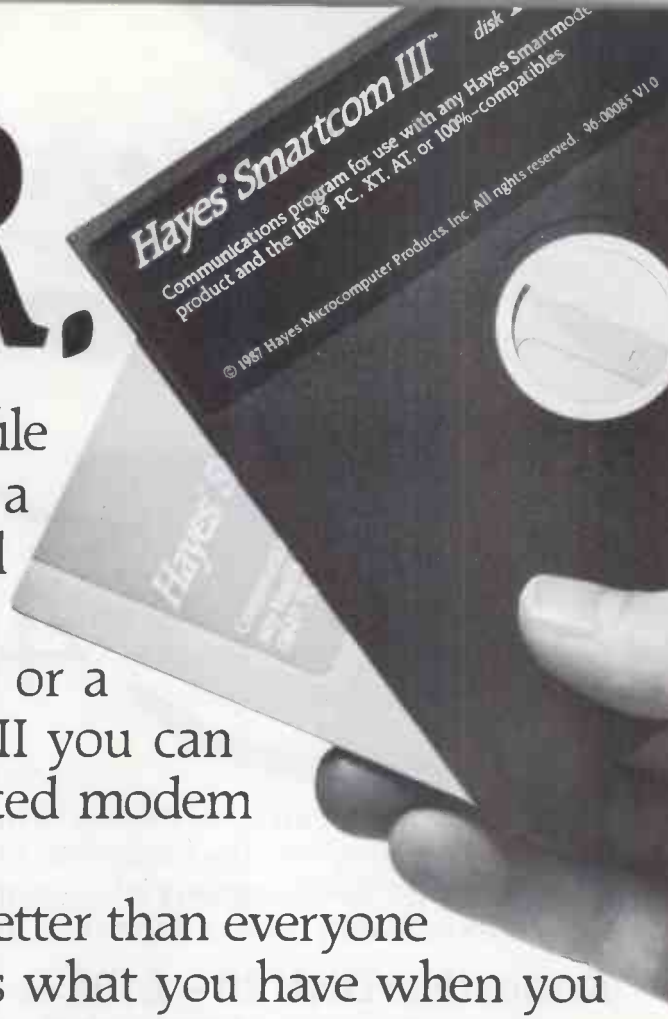

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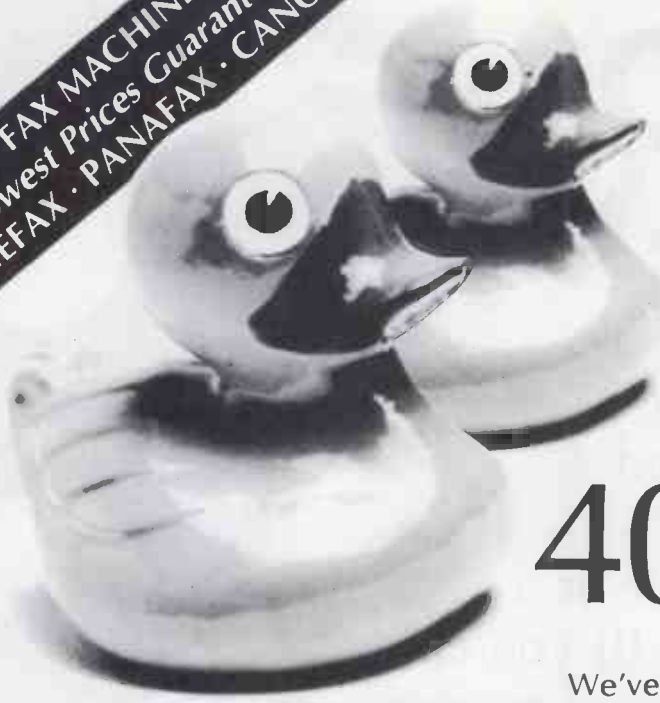

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Pie in the sky

One of the best-kept secrets 'which everyone knows' last year, was the fact that Sir Clive Sinclair was working on a Transputer-based super-computer.

What no-one knew, of course, was exactly who the machine was for, and what it would look like.

The explanation for this has now emerged: Sinclair is probably *not* going to use the Transputer chip in his super-processor. Instead, he has discovered a new silicon design, in Cambridge, and proposes to use that instead.

Details of exactly who is doing the design, what it will look like, and whether it will ever be built, are available only in contradictory fragments.

Sinclair himself refused to be drawn in any way, except to admit that there was 'a real chance' that he wouldn't be using the Inmos parallel chip originally planned. Mainly, he says, this is because it doesn't understand memory management.

An ideal chip for multi-processor operations is one which absolutely and physically refuses to let data into a memory cell which is being worked on by another process. This kind of memory protection of cells in large or small banks is the one feature missing in the Inmos Transputer.

Talks between Sinclair and Inmos have, apparently, produced the admission that 'a piece of hardware to do that could perhaps be designed', which is not good enough for Sinclair Research, which needs to run Unix on the beast it is planning.

'It can be done — memory protection — in software, but it's very messy, with lots of overhead,' was how Sinclair himself summarised the problem. 'And you're right, it doesn't look as if we will be able to go with Inmos unless they do something new in hardware. And I admit it seems unlikely that they would have such a thing and not tell us about it. And they haven't told us about it.'

The attention focuses on the new superchip from this anonymous Cambridge guru. One source insisted that the design was actually Sinclair's own, from a subsidiary company. Another said that the inventor (unnamed) had been seen talking to electronics giants like STC and ICL, looking for finance. Still another ale house oracle insisted that the machine was capable of 20 million instructions per second.

It's a safe bet that all this is pie in the sky. Next year, perhaps, something may come of it. But, for the time being it's probably something best relegated to the back of our minds, to await firm developments. Be sure *PCW* will let you have them as soon as they develop, er . . . firmly.

Meanwhile, back in Cambridge, at Sinclair's other company, it turns out that the folk at Cambridge Computer were every bit as aware as the rest of us of shortcomings in the PC Link software which connects the Z88 laptop to a standard IBM family machine, for swapping data.

Anyone who was encouraged by our little item last month, suggesting ways of producing an alternative, should be warned: Sinclair was proposing to demonstrate a plug-in ROM chip of his own, come the Which Computer? Show (just after this column went to press).

'Just to let you know that we're working on it, and it will be out by May,' said one of the designers. Sinclair himself expects the price to be 'much the same, plus the cost of the ROM chip. Say, around £30.'

Grapevine

ST assembler: a new version of Metacomco's macro assembler has been announced, 'providing a complete development system for 68000 assembly language programs.' The company says that it has bundled all the development tools from its Lattice C compiler into this product. Details from Metacomco at 26 Portland Square, Bristol BS2 8RZ, tel: (0272) 428781.

IMS on micros: Micro Focus has taken the natural step from Cobol to IBM's biggest, oldest and most unwieldy database, IMS (Information Management System) and has produced an emulation of IMS for the PC. It provides Cobol programmers with 'a complete IMS development system in which to code, test and run mainframe IMS applications on a standard PC.' Details on (0635) 32646.

From trauma to tower: the Apricot Xen-i 386

Showing encouraging signs of having recovered from the trauma of its collapse two years ago, **Apricot** has launched the ten-slot 386 system shown above. For £4000, you get a 49Mbyte disk system; for £5000, a 100Mbyte box. Included is high-resolution VGA standard graphics (no, I don't know if they are hardware-compatible or just BIOS compatible), 'Apricot fault-tolerant software' and 2Mbytes of 32-bit memory with Windows 386 running. It's called the Xen-i 386 Tower.

Not all DTP software comes from the States. **TypeCast**, from Unified Technology, is unusually fast, well spoken of, and comes from Manchester. It is now available in a new version (release 1.6) with 'greatly increased WYSIWYG accuracy and user-defined keys.' What it still doesn't do, apparently, is proof-reading: the company suggests a possible headline for this item of 'Martians land in Machester'. Details from Unified Technology at 8 Canal Street, Manchester M1 3HE, or tel: (061) 236 8406.

LocoScript spelling: One of the great unnoticed smash hits of last year was LocoScript 2, a successor to the standard software in the Amstrad PCW word processor, at a piffling £20. Locomotive has followed this up with a spelling checker and corrector at the same price — LocoSpell. Special offer: buyers of both products pay £35. And LocoMail 2, the 'mailshot and arithmetic package' for LocoScript 2, will now cost £30, which is £10 cheaper than the original product. For those who can't find a dealer, Locomotive (software goes like a train) is on (0306) 887902

Motorola is putting a brave face on the fact that one of its biggest customers, Sun, is now building its own processors (the Scalable Processor Architecture, SPARC) using reduced instruction set technology; but panic is setting in at the Texas chip maker. It is reported to be linking up with Edge Computer of Arizona, a company which has made ultra-fast 68020 clone chips for its own computers. Motorola will sell these, which run at up to 16 million instructions per second, until its 68040 is ready. When? Some optimists say samples will be out this year. I'm not an optimist.

Lotus has a second Symphony, version 2.0 (price, £550). It includes 'extensive enhancements,' says the company, 'a direct response to our customers' requests.' Most, it adds, are go-faster improvements; others are done by including things (text outliner, spelling checker, terminal emulator, network filelock utility) which were previously sold separately. END

Have you got what it takes?

PCW is on the hunt for two new members of staff. One will be a staff writer, the other will fill a more senior post.

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2. A description of the computer hardware and software you own/regularly use.
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Applications should be sent to the editor, Derek Cohen, at Personal Computer World, VNU House, 32-34 Broadwick Street, London W1A 2HG, to arrive by 10 March 1988.

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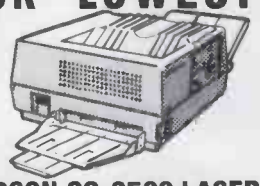

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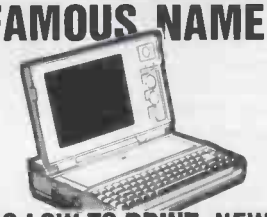

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Towards the NeXT generation of high-power PC graphics

Steve Jobs: set to dazzle the computing world with a new-generation PC woven with 'incredible technology'. Will it be tomorrow's trend?

Over the past two years, the personal computer has become a very powerful machine.

Fifteen years ago, a computer the size of a 10ft×15ft room would have been needed to give the same computing power as today's desktop 80386 PC. One of the economic principles that drives the industry is that 'the more computer literate the user, the more power they will demand.'

This alone should give you a hint of what future PCs will be like, and 1988 is the year the personal computer will be transformed Soon, Steve Jobs, founder of Apple Computer and now president of NeXT Inc, will unveil his new personal computer

This machine, originally thought to be just a high-powered workstation for the education market, is actually a computer that could push PC technology to its limits and define the design of the next generation. And sources close to Jobs say that it will be available for the business community as well.

Steve Jobs has already given the world two computing standards in the Apple II and Mac lines. His associates confirm that he really believes he is a technological messiah who will bring the world the next generation of PCs.

According to sources close to NeXT, Jobs' new machine will bring high-power graphics workstation capabilities to a personal computer costing less than $10,000. This machine will bring the personal computer and graphics workstation even closer.

Much of this technology has come from Jobs' 1987 acquisition, Pixar. This company sells high-end graphics workstations and was founded by George Lucas, director of *Star Wars*. It produced much of the computer-aided graphics in his films.

Now Jobs has taken part of this incredible technology and woven it into his new-generation PC design. Using his own windowing front end to Unix with Display Postscript, he will, in essence, give us a personal computer workstation more dazzling than anything else for the same price

Although many people question Jobs' ability to succeed at this venture, most people are convinced that his machine will push technology forward and cause major ripples in the world of computing.

At the same time, traditional high-end workstation companies like Sun Microsystems and Apollo are bringing their prices down and adding more graphics capabilities to these low-end workstations: PCs and workstations are quickly becoming one. In fact, Sun will very soon introduce an 80386-based system that has its SPARC RISC chips integrated into a standard PC configuration.

And, if you take a close look at Apple's Mac II, you can see how it could quickly grow up into a serious workstation and eventually compete with Sun, Apollo and NeXT.

Take a good look at the serious graphics workstation. This will be the PC of 1990.

TIM BAJARIN

This month's American news showcase features details of Steve Jobs' plans for his NeXT generation; who showed what at Macworld: and news of home rule at CES.

Joint Apple/DEC announcement at Macworld

This year's Macworld (San Franscisco, January) was overshadowed by the announcement that Apple and Digital Equipment would enter into a joint technology agreement, thus allowing the two companies and their technologies to be part of a powerful global computing solution.

This announcement came hot on the heels of a similar agreement between AT&T and Sun Microsystems, as AT&T has agreed to purchase 20% of Sun's stock. We now have quite a battle shaping up between Apple/DEC, Sun/AT&T and IBM for the dominant position in the PC/workstation market.

The important part of the Sun/AT&T alliance will be that Sun will have access to the merged Unix 4.2 and 5.0 as much as 18 months before the competition. But, Apple's own AUX (Unix) system will be out soon, and when the Apple/DEC technology links into DEC's OSI, Apple and DEC will become a powerhouse to be reckoned with

As for the show itself, it had few surprises. The most interesting rumour on the floor was that Ashton-Tate had bought the long-awaited FullWrite package from Ann Arbor Software. This was confirmed by two Ashton-Tate sources who asked not to be identified; and, according to these sources, Ashton-Tate will finish some housekeeping on the project and release it under its own label in the Spring. A pre-release copy will be shipped to those who have already bought the product, but it is not in any way the finished version.

The most exciting game at the show was Silicon Beach's Apache Strike Force. This drew a rave response from the crowd, and those who have played it say it is the most addictive action game they have ever seen.

Claris, Apple's software spin-off, showed one product that really drew a lot of attention. Besides upgrades of MacPaint, MacDraw, MacWrite and MacProject, the company's new forms package, SmartForms, showed the true flexibility of a dedicated forms design tool and its interactive nature.

Many companies like E/Machines and SuperMac showed their new colour screens, but RasterOp showed the only 24-bit colour screen and dazzled attendees with its incredible visual effects.

Although there have been great breakthroughs in colour displays, colour output is still far behind. The one machine that did show promise came from Maris Technology. This company is backed by Apple's Venture Capital fund and makes a high-resolution slide-making device. The unit is half the size of Presentation Technologies' Imagemaker, and can produce slides of up to 8000-line resolution.

Another item that attracted a lot of interest came from Orchid Technologies. Its ColorView/SE card fits into the one open slot in the SE, and allows the user to then plug in a separate colour monitor like the Mac II colour monitor, an IBM VGA monitor, or another compatible monitor. The price of the board will be around $695, and with a colour monitor would likely be under $1000.

Another product of interest came from Radius Inc, the company that produced the first large-screen display for the Mac. Its SE accelerator card, with a Motorola 68881 co-processor, makes the SE run as much as 10 times faster than it presently does, with just a 68000 chip. It will retail for around $1000, and should be available now. ▶

CES, Las Vegas: highlighting the slumbering home scene

The winter Consumer Electronics Show, held in early January in Las Vegas, saw many new products for the home market. During the early eighties, this was the dominant show for home computing. But, when the home computer market dried up around 1984, so, too, did this part of the show.

Although the home market has not recovered by any means, there is a glimmer of hope for those whose main interests lie there. Here are some highlights.

Home work

If Japan's biggest computer company, NEC, has its way, the next trend in the US will be the home office, as the company made plain at this year's show.

The home office should have a personal computer, copier, facsimile machine, modem and two-line cordless phone. Although this may seem like the system for the workaholic, it will soon be the basic standard for corporate executives who want the convenience of working at home, and small businesses that operate from the home.

And the prices of the individual components have come down in the past year: a good PC can be bought for under $1000, and personal copiers are now about $695; modems can be as little as $50, and Murata has just introduced the personal fax/phone for $895. This looks very much like a standard telephone, but includes the fax modem and paper in its design.

The bill would be £3000.—an exciting prospect for manufacturers and consumers alike.

Although the electronic cottage has only been a dream, at these prices and with technology becoming more portable, it could soon be a reality.

Real frightening . . .

Those of you who are Flight Simulator fans get ready for the ultimate Flight Simulator. This product has been so popular on the PC that it is used as a compatibility test for clones.

There has been a flood of flight-simulator type products, the best-selling being Chuck Yeager's. Most recently, Falcon for the Mac has been released. There is also Dam Busters, F-15 Strike Eagle, Jet, Apache Strike Force and others.

The ultimate, though, may be one from Electronic Arts. Code-named Interceptor, this is the best flight simulator I've seen yet on just about any machine, except a giant Evans or Southerland machine used by NASA to simulate the space shuttle.

The first version is in full colour and runs on the Amiga. Developed by Intellisoft, and arms treaties notwithstanding, the program puts you in the seat of a jet fighter loaded to the gills with weapons. You have lots of assignments to fly and hold the lives of everyone, from the President to the troops, in your hands.

This is by far one of the most realistic games I have ever seen. I had the task of saving the President from a couple of incoming MIGs about to attack Air Force One. Just as well it wasn't for real: they blew up the President's jet and I had to run for my life.

Another scenario had me fighting off incoming MIGs which were going to attack San Francisco, and I accidentally blew up the Golden Gate Bridge.

Believe me, the realism of this game is frightening, and addictive. Initial release will be on the Amiga, but PC and Mac versions are close behind. Expect the price to be somewhere in the $39-$49 range.

. . . just for fun?

360 Software, a new firm founded by Tom Frisina, former president of Accolade, has just bought the rights to the popular Dark Castle game for the PC from Mac developer, Silicon Beach Software.

But the game which the company will release soon will be an electronic version of the popular board game, Harpoon. Developed by Larry Bond, this board game was the inspiration for the best-selling Tom Clancy novel, *Hunt for Red October*.

So, 360 Software will soon have a very life-like game that has you chasing a Russian sub as it tries to defect from the Soviet Navy fleet, and you must protect it and get it to a US port safely.

The PC version will be out in March, with the Mac and Atari versions available in May. Frisina is a kid at heart, and you can always count on him to produce the best games software you can buy.

360 Pacific Inc is on (408) 879 9144 (US).

Kids' stuff

Although many hardware manufacturers attended CES, including British giant, Amstrad, PCs have become more like appliances so similar to each other that pricing becomes the most important part of a company's marketing programme.

With Korean and Taiwanese manufacturers taking a very aggressive profile, you can expect to see some real price wars in 1988. In fact, some analysts believe that we will have 8088-2 based systems with monochrome monitors and dual disks for as low as $499 by the end of 1988.

But when it comes to hardware and software trends at this year's show, you had only to go to the Nintendo booth to see what is happening. It was the largest there and showed some 23 new software developers.

According to a Nintendo spokesman, by the end of the year there will be more than 300 games available for the company's machines.

And traditional software developers like Broderbund, Mindscape and Activision used the show to announce that by mid-1988, they would each have at least three of their popular titles available for the Nintendo games machines.

In Silicon Valley the Nintendo machines are the latest craze, especially when the home already has a PC and parents buy a games machine to keep the kids off their own computers. I bought my nine-year-old a Nintendo for his own use after he wiped out two mice on my Mac and one keyboard on my PC while he was playing games.

These dedicated games machines seem destined to be the main medium for home computer entertainment.

Casting light on handheld spell-checking

Spelling checkers and thesauruses are now a basic part of most word-processing technologies. It is very easy, even in the middle of a document, to call up the RAM-resident spell checker for something you're unsure of.

The most impressive spell-checking technology available comes from Xerox' Palo Alto Research Center (PARC), one of the most innovative research centres in the world.

Sold by Microlytics, an entrepreneurial off-shoot of Xerox, this spelling technology is finding its way into many word processors. It may also be found in a new device from Selectronics that even non-computer owners can use.

The handy WordFinder

Incorporating powerful compression technology developed at PARC, Microlytics and Selectronics have together developed a small hand-held computer which will check the spelling of 100,000 words and 220,000 synonyms in its comprehensive thesaurus.

According to Mike Weiner, president of Microlytics: 'Now writers, especially those who don't use a word processor, can have immediate access at any time to the most advanced spelling verifier and the most widely used electronic thesaurus available.'

The 6oz, battery-operated WordFinder uses two microprocessors for instant response, and comes with 4.5Mbytes of information compressed on a 256k chip.

With the spelling checker you can leave as many as three letters out of a word, and it will still find the word and spell it correctly. It will be a great companion to those who love crossword and word puzzles. It easily fits into a pocket and will cost $99. A UK English version should be available by early summer.

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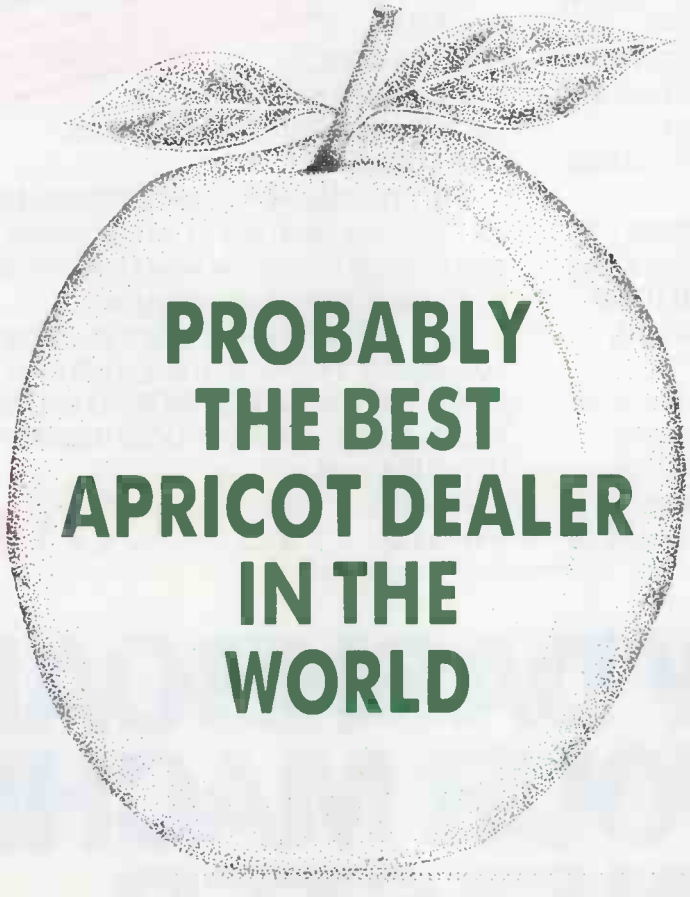

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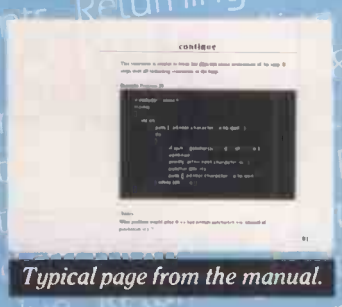

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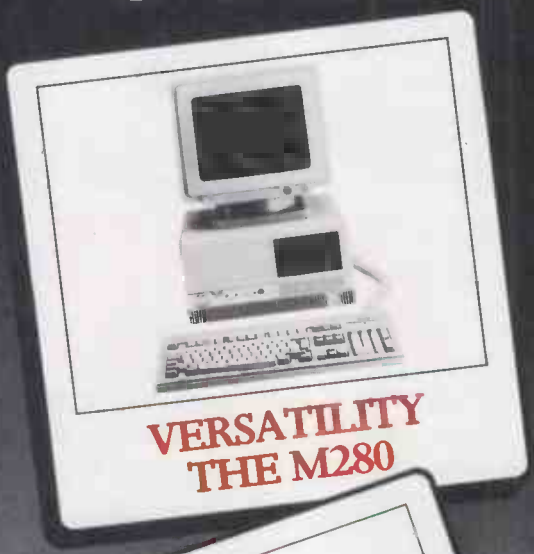

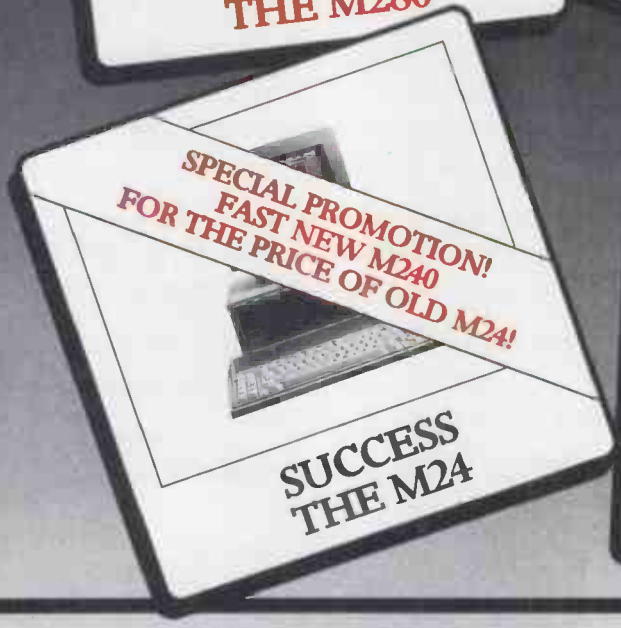

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Riding the hobby-horse to nowhere

The advert on the page next to Martin Banks' 'Unreal Time' piece (*PCW*, November 1987) should make his heart leap with joy and cause a little earth to move around Biggles' grave.

As he is addicted to simulated flight programs, the warning in this game's advertisement will be branded on his heart: 'REMEMBER — TEST PILOTS ARE ONLY WRONG ONCE!'

What if the same warning applied to feature writers? The sobbing millions that filtered past Lenin would be nothing to the queue applying to replace Mr Banks.

His is the first page I turn to in *PCW*. He consistently exercises a mastery of the chosen subject that fits exactly into the limits of his space.

The reasons for the article's bellyflop are obvious. He has built a hobby-horse out of a gut prejudice, harnessed it with sellotape and stamp edging, and tried to ride it without a saddle to nowhere in particular.

There is a problem in responding to people who have intestinal hunches that sex crimes would stop if extra-marital cinematic mammalaria were denied us; that knife-aided mugging would disappear with Sylvester Stallone; and that murder would nearly cease with the return of the gallows.

These cheap excursions into cause and effect produce neat, apparent solutions tailored by demagogues for the mass market, that match the craving for simple answers. They are seldom thought through. The effort towards birth control in India has revealed the existence of a number of rural people who were unaware of a relationship between copulation and babies. In the UK, it has taken more than 90 years for it to be popularly understood that there is a relationship between sugar consumption and bad teeth. Dentistry cannot compete for column inches with rape, but for many of those 90 years the popular villain was nuts.

Yes, I know Banks' subject was computer games and not hanging or cinema/TV, but is the difference vital? He suggests that prolonged exposure to computer games can alter the values and so, presumably, the behaviour of people so 'addicted'. The thought is perhaps less simple and more revolutionary than he imagined. If our would-be guardians have stumbled upon a real cause of change in human behaviour, the process can be developed and refined. Factors will be isolated and the intractable, inconvenient human being will disappear in a monthly dose of educative screening. Oh, brave new world!

Gordon West,
Tavistock, Devon

Martin Banks replies: Gordon's letter was, sadly, too long to be included in toto, *for it made a fascinating read based upon a veritable cornucopia of ideas.*

Gordon commits considerable effort to demonstrating that people are not affected by the images continuously thrown at them by the media and, more recently, by the arrival of the computer game, then seems to use the (to me, contradictory) evidence of the manipulation and distortion of impressionable minds by religious sects to show that it doesn't happen.

While I acknowledge immediately Gordon's observation that the points I raised in 'Unreal Time' will be an obvious focus for the jingoists and mega-moral and self-righteous tub-thumpers, this does not mean that they are consequently invalid. Even though evidence exists which proves that images have no effect as role models, as Gordon points out, there has to be some doubt.

Take just one area I have a little knowledge of. There is a welter of evidence to suggest that soft-pornography has no effect on men and their attitudes to women. There is also no evidence to the contrary. QED, *and so on.*

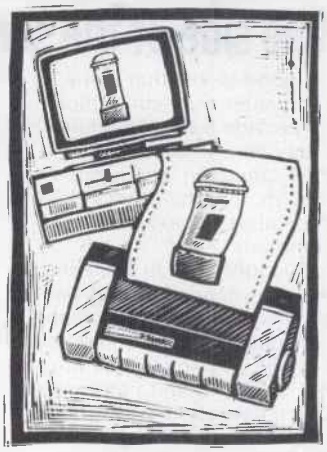
However, ask American author, Andrea Dworkin, about the obstacles to getting such contrary evidence actually published and out into the public domain. Not being in the library is no guarantee that it is not there, somewhere.

All I would say is that, if the manipulative power of images does not exist, then the likes of Saatchi and Saatchi have built more than a sizeable fortune out of . . . what?

If the effect of such power on younger minds is a figment of my jingoistic mind, then why do psychologists and the like now refer to a new phenomenon, the Wannabees — young children overly affected by those same images.

If, as has happened, a man can, while raping a woman, blithely tell her that she should appear on Page 3 of the Sun, *then surely there has to be scope for the question to be asked.*

And the question? Simply that, given the evidence that any image can have an effect on its recipient, and that that effect can have a negative impact (especially on other people with whom the recipient interacts), then shouldn't those responsible for the images seriously examine all the consequences of using them and temper such utilisation accordingly?



Send your letters to Derek Cohen, 'Letters', *Personal Computer World*, VNU House, 32-34 Broadwick Street, London W1A 2HG or contact us on Telecom Gold 83:VNU200.

Wij hebben de ij

We, the Dutch, think our language deserves to be included in the 'quite extensive research' Mr Quirke has conducted ('Ever been had?', Letters, *PCW*, January).

The ÿ is a composition of the letters i and j and is pronounced somewhere between 'ai' and 'ei'.

We think, in fact, that IBM has not gone far enough, as we would have liked our 'ij' as a unique character rather than borrowing a 'y' and putting two dots on top.

We flatter ourselves into thinking we influence IBM's decisions.

HM van Binsbergen, Swindon

Dozy processor

I'd like to congratulate Robtek on admitting that it made a mistake with the dreadful PC emulator for the Atari ST, MS-DOZ, and replacing my copy with the much superior PC-Ditto for just the difference in price.

MS-DOZ promises only 70% IBM compatibility, and some of its functions only work some of the time. To execute 'Flipmode', for example, you have to press the required key many times. Would *you* buy a word processor that expected you to press a key a number of times before the character appeared on the screen?

Jesus Consuegra, Barcelona

Mouse trap

Nearly every PC machine is sold with a mouse. Because the mouse works by clicking buttons and needs a lot of desk space, it is frustrating for drawing free-hand. The Light Pen by Electric Studio, designed for the Amstrad PC1512, has a major limitation: the mouse is still required to click buttons when using the light pen.

Light pens with built-in clicking buttons would make things very easy. I hope someone is working on this.

Manoj Nathani, London

I hope someone is working on this.

One side of the service coin . . .

It's good to see that some companies marketing micros do provide a decent service ('Service with skill', Letters, *PCW*, January). I suspect, though, that the other side of the coin is a good deal more common.

I bought a QL in 1985 and always intended to upgrade it. By this year the memory and disk upgrades had come down in price, but so had the price of PC clones; and I discovered that a new clone with 640k and twin floppy disks was about the same price as the QL upgrade.

To cut a very long story short, I bought an SBC FD which uses the NEC V40 chip. The dealer, Regent Computers, was told that I wanted to write numeric applications in Fortran and so needed to install an 8087 chip. To save other readers the agonies I have suffered, they should be aware that fitting an 8087 into an SBC FD is not easy because the socket on that machine is for NEC's own version — the μPD72191. However, NEC has never produced that chip, and it took weeks of pestering the Spectrum Group headquarters to get the converter board so I could fit an 8087.

I played with various 8087 chips running at various speeds, and discovered that one running at exactly 8MHz was the only one that would work, though it did start disabling the real-time clock and sometimes needed the hardcard I had installed to be removed and replaced before it would function properly.

Finally, I discovered that the Fortran package I wanted to use would not work.

Regent is still trying to configure a fully-working 8087-equipped micro for me.
KJ Vines, Altrincham, Cheshire

If your Fortran and 8087 were working properly, you can count your blessings that you were knowledgeable enough to know who to contact and where to get the expert advice you needed.

. . . and here's the other side

I must say I agree with Christine Argyle's letter about the poor quality of service from computer dealers. ('Letters', *PCW* January). The general trend of salesmen within the computer industry is verging on the abysmal.

It's so bad that although my company started off as an aviation consultancy, we kept the original name when we moved into computing. To quote one customer: 'When I want a computer, the last place I need is a computer shop.'

It is frustrating for a customer to go into a shop with a simple computerisation problem, only to find costs escalating as a keen salesman goes off at several tangents.

I waste so much time unravelling other dealers' handiwork that I would like to say one thing to them: if you are a box shifter, please say so. Don't disguise yourself as someone who knows what he is talking about and give the rest of us a bad name. Then maybe we won't have to apologise for being in the computer trade.
Phil Croucher, managing director, Air Movements, Warrington, Cheshire

Z88 wish list

Guy Kewney's problems with the import/export utility on the Cambridge Computers' Z88 (*PCW*, September 1987) were somewhat exaggerated. If he has such problems typing IMPEXP88, then he can rename the EXE file to something more memorable.

On the version I have, files transferred between the Z88 and PC default to the same file name if at all possible, including the directory. So, having the same directory structure on both machines saves wondering where the files end up after transfer.

Having said all that, it would be nice to be able to mark a group of files for batch transfer.

There are two spare slots in my machine waiting for someone to tempt me to part with some money. Here are my suggestions.

I have become used to a spelling checker on my PC. I am sure that my limited vocabulary would fit into 128k when suitably compressed.

Even though Pipedream is acceptable as a word processor, I would probably invest in a better one especially if it had some outline processing facilities. The most necessary extra would be a decent manual.
AR Hapson, Tonbridge

Having just taken a Z88 round the world, I too have a love-hate relationship with it. I can't get the space bar to work properly, so an improved keyboard would be on my *list. And it bombed out on me, thus losing an article, so an external disk drive, or a more secure form of mass storage, would featyre prominently. Using battery-backed RAM packs, like those on the Psion Organiser, also seems like an obvious enhancement.*

A woolly blanket over software piracy

Martin Banks' defence of copyright (*PCW*, December 1987) atoned for a previous piece (*PCW*, October 1987) which was equivocal, to put it generously, about software piracy.

He referred to software developers as an 'unscrupulous bunch of self-interested thieves'. This is a much more cynical view than that held by those who are working hard for an environment in which the creation of a wide choice of cost-effective software is worth the necessary investment of skill, time, money and effort.

Being woolly about piracy costs the consumer both money and choice. If a significant proportion of the *computers* we use had been stolen rather than bought, fewer machines would be developed and marketed, and the reduced financial return would inflate the price of every computer sold.

There is no way that computer *programs* can escape this same reality.
Donald MacLean, chairman, Confederation of Information Communication Industries

I suppose if few people bought PCW *and most people photocopied their friends' copies, the only people to gain would be the photocopier manufacturers.*

Politics out of touch, and out of place

Resident guru Guy Kewney seems to believe that the worst thing about Toshiba executives selling prohibited technology to the Soviets is the politicking in Washington over the affair ('Toshiba, treachery and the American way', 'Newsprint', *PCW*, October 1987). Instead of heaping scorn on those who would sell out the Western world for a few yen, Kewney casts aspersions on congressmen who call for a ban on Toshiba products. Furthermore, he attempts to dissuade Britons from taking similar action against Toshiba by presenting the feeble argument that US weapons sales to Iran equals treason against the Free World

Fear not, would-be traitors. Not enough people understand what is happening for this matter to affect the supply of computers to the UK. Now, if only our misguided souls worried as much to protect our freedom as they do the supply of computers . . . In all, bad one, Kewney. Keep your political opinions to yourself.
Alan Thibideau, Apricot Preserve (user group), New York

We could, of course, take the British line of fair-mindedness and sell computers (and arms) to both sides and sit back to reap the profits.

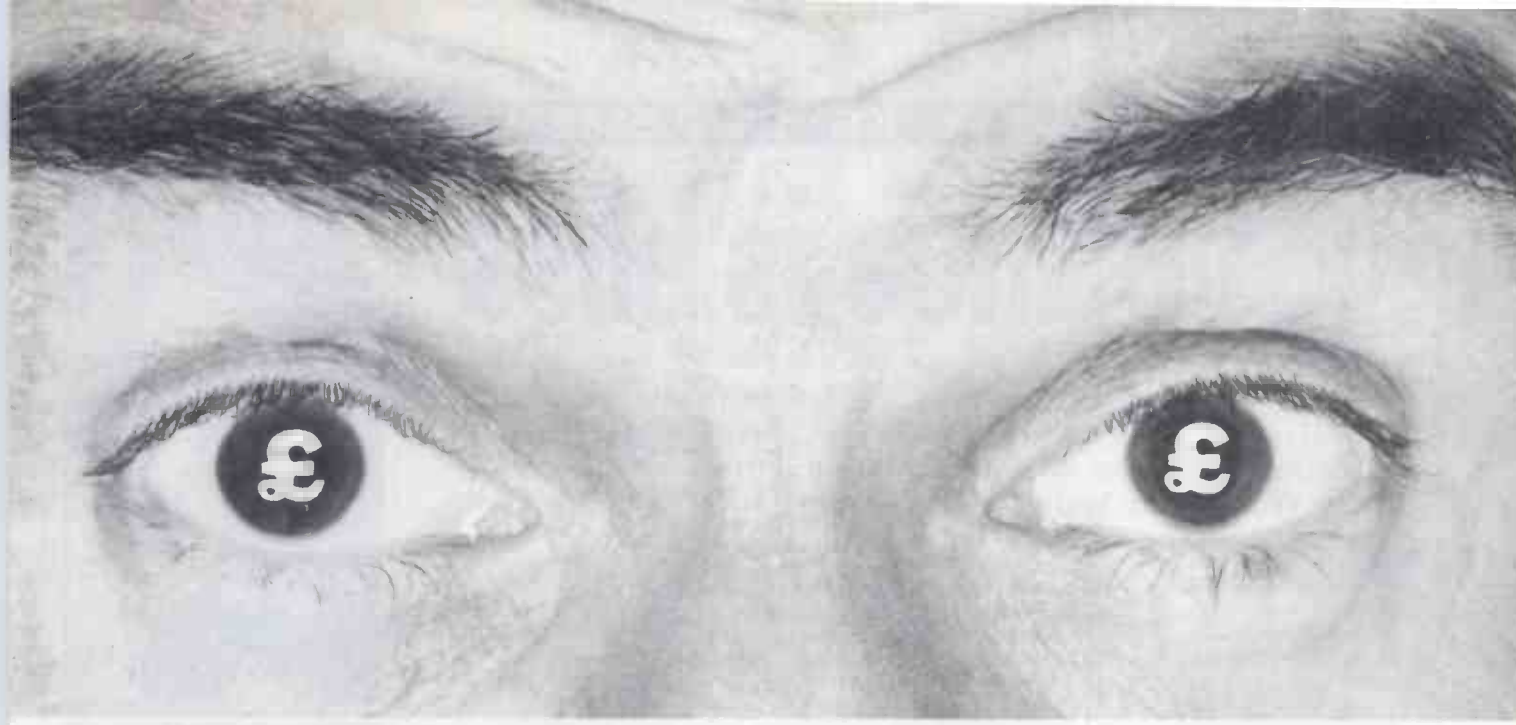
PCW9512 — not perfect quality

I'd like to comment on John Donaldson's review of the Amstrad PCW9512 (*PCW*, October 1987).

The new daisywheel printer is good for letter quality but does restrict users to text only. This is a pity, as the original PCWs were some of the best CP/M Plus machines available. Amstrad could have offered a dual-function printer.

The use of a daisywheel also creates difficulties for those users like myself who need access to non-English character sets. Previously, some clever programming could produce the desired characters but this is no longer possible.

Some future developments that Amstrad might like to consider include offering a hard-disk expansion for the machine, an 8256/8512 dot-matrix printer with the 9512; and the daisywheel printer as an option for the earlier models.
Jaroslaw Mlodzski, Warsaw, Poland END



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Ignorance is bliss

Confusion! What will users do with all this Transputing? Can they afford it? Do they need it or could they make do with something less sophisticated? Would they know? Martin Banks racks his brains.

MARTIN BANKS

The brain is all a bit of a jangle today. Lots of different ideas and notions are banging around in there, bumping up against one another and not reaching any clear conclusion.

This is partly because the signals are really quite conflicting, yet I feel I should be able to resolve them into some sort of coherent whole. For example, I get the feeling that there ought to be a direct and obvious connection between the pace of technological development and the apparent fact that many users are 'selling' themselves extremely complex 'pups' that they do not really want.

The only conclusion I come to, however, is one for which some readers have remonstrated with me; namely, the apparent suggestibility of the human race. Tell a human being in a suitably convincing way that it needs something and said human will not only need it *but demand it*, regardless of the often self-evident fact that it is the last thing on this foresaken earth that it actually requires.

Just for the moment, however, let us focus on the other theme for this month — technological development. I have recently had the opportunity to hold in my hand two interesting add-in boards for the PC XT or AT. One comes from the UK company, Gemini, and the other from Definicon in California. Both add Transputer-based processing power coupled to vast amounts of memory, all packed into the few square inches of a PC expansion board.

One tends to look at these things and think '.....!' (well, this *is* a family magazine). Anyway, one is impressed. Vince Williams, Definicon's founder, put it into perspective with the throw-away line: 'You are holding in your hand the equivalent of one twentieth of a Cray supercomputer.'

At about £4000 per board, compared with, say, $25 million for a reasonable Cray supercomputer (not to mention the cost of the plumbing to get the watercooling system fixed up), one can see the awesome potential that is being made available, and work out the relative costs. It is possible to see why boards like this are generating a great deal of interest among the *cognoscenti* of personal computing.

So, we can sit and marvel at the wonders of technology, and make all sorts of assumptions about how, where and when it could be exploited. But the question must then be posed: the *cognoscenti* might love the technology, us clever-dick pundits will love prognosticating about it, but is it where the users are going? Are they, indeed, shooting off down a blind alley, as often seems to happen?

'. . . whole sections of British industry . . . are buying up high-technology gizmos in the belief that they are extremely clever solutions to something or other.'

Two recent occurrences propose the thought that this is what might be happening. One comes from a conversation, while the other comes from a survey of information technology users.

The conversation was between yours truly and a consultant (yes, yes, consultants know nothing, I am aware of that). Said consultant, however, was making an interesting point. In his experience (and he'd had a bit, selling PC-based software for a good many years) many customers would not accept a simple solution to their business problems. They would not, for example, accept the fact that actually getting their paperwork systems working properly would be a jolly good starting point.

They would also have grave doubts about obvious solutions to simple communications problems. Where, for example, only a weekly update on sales and prices between a branch office and HQ was needed, the obvious solution would be to buy the same make of PC for each location and send a disk through the post or by courier once a week.

Instead, according to the consultant, the users would complain that such solutions were obviously too simple, and that what they wanted was a 'hi-tech' system with lots of different machines and a fearsomely complicated network operating over leased lines. That, as they say, would do nicely.

In other words, if the users can understand the solution, it can't be hi-tech; and if it isn't hi-tech, then it can't be a good enough solution. I would venture to suggest that the underlying cause of this thought-process can be found in the advertising the computer industry puts out, but others would counter by saying I am once again underestimating the intelligence of the perceivers of such advertising.

I might even have thought that it was just the whinging of a frustrated consultant had it not been for a survey published by the Kobler Unit at Imperial College in London (I do hope nobody will draw a relationship between the unit's name and the veracity of its survey). This showed, in essence, that UK companies investing heavily in information technology are not necessarily gaining any business advantage from the process. In particular, it suggests that they are failing to make effective strategic use of IT, and are not applying sufficient quality control to their investments in the technology. It would not be going too far over the top to say that, maybe, they are not thinking about their investments too carefully. Surely it couldn't be that they are buying gear that is enormously clever, but which they do not understand?

If such a thing were true, then whole sections of British industry (and no doubt industries around the world) are buying up high-technology gizmos in the belief that they are extremely clever solutions to something or other. The trouble is, they are not quite sure what that something or other actually is, nor whether the high technology is any good at solving it. All they know is that it must be right because it's high technology, and anyway, the advertisements say it is the answer.

It all seems rather sad somehow. Here we sit with a technology blooming and growing around us that does have tremendous potential, if used right. Yet we seem to have rapidly moved into a situation where one word, 'judicious', is rarely found in close relation to some others, such as '. . . use of technology'.

And so back to the beginning. The Transputer has a great deal going for it, but just think about what might happen if users start demanding it as a solution to whatever it is that they think might corporately ail them. Some users are going to end up with the most comprehensively complicated dog's breakfast the world has ever seen. Worse, however, is that they are going to be appallingly smug about it. END

BANKS' STATEMENT

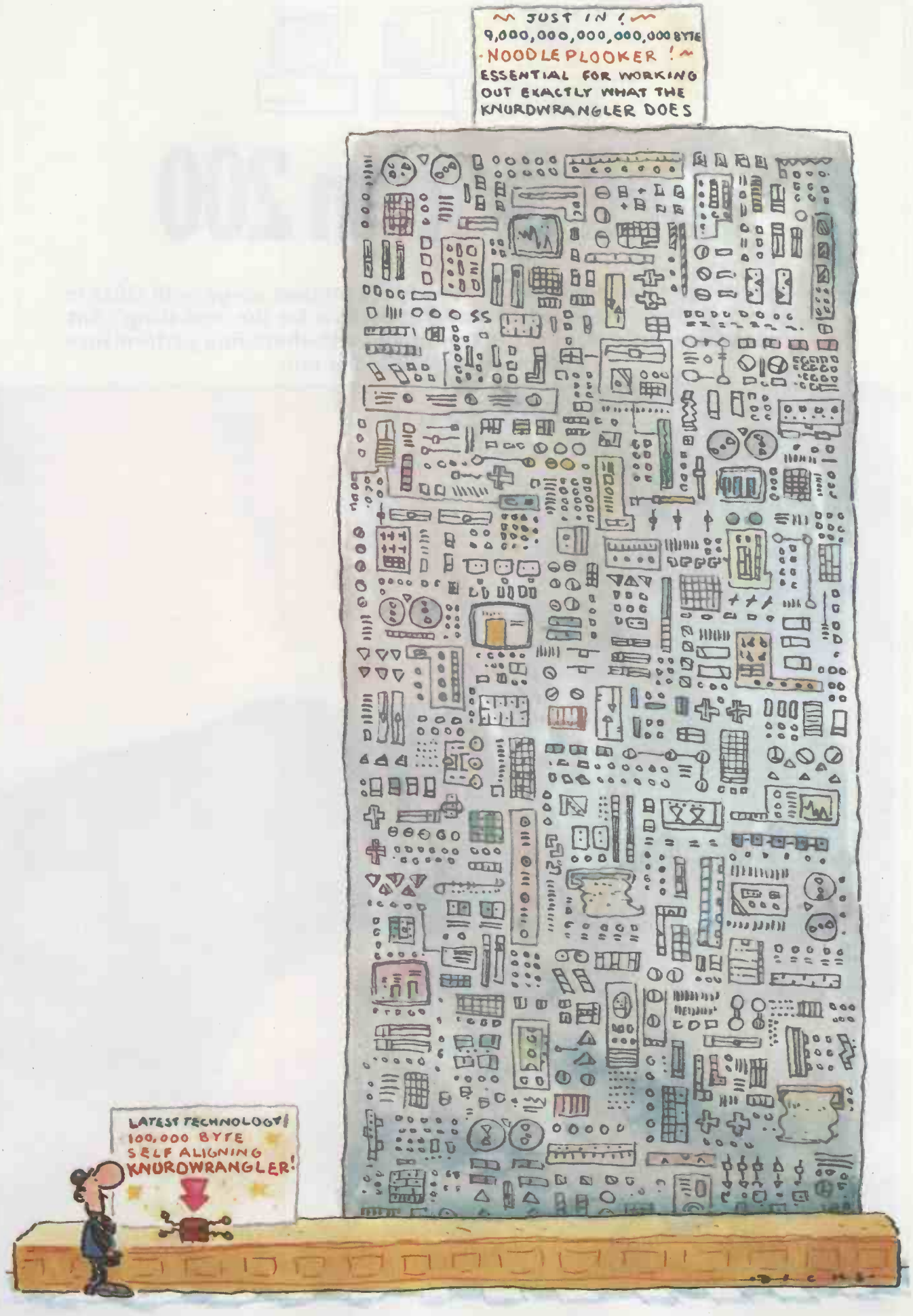
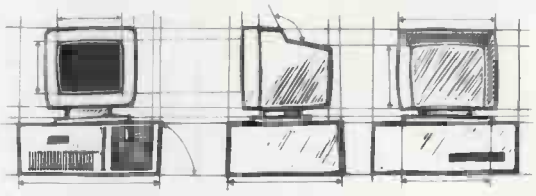


Illustration by Ian Dicks



Dell System 200

One of the first companies to revamp its product range with OS/2 in mind, Dell has produced a reliable substitute for the 'real thing'. But competitive price does not make for an earth-shattering performance, as Peter Jackson found out.

At the giant Las Vegas Comdex Show in November 1985, visitors could be seen pushing past a hippy in a check shirt as he handed out promotional flyers in a walkway between exhibition halls; flyers announcing a $1999 breakthrough in the price of AT clones. The hippy-hiring manufacturer was Texas-based PCs Limited, now much bigger, much more respectable, and known in the UK as Dell Computer.

But that initial approach to marketing was typical of the Dell strategy, initiated by founder Michael Dell and carried through into massive US success and the opening of a UK branch last year. The strategy is to offer high technology cheap by cutting out the middle-man and selling direct to end-users, at aggressive prices but with professional-level support and, these days, with Dell-designed products. That has not always been the case; some of Dell's low-end products were originally manufactured by the American Research Corporation, for example, and these are still being sold in the US.

Now, with the System 200, Dell has refined its plans for the era of PS/2, OS/2, 3½in disks, and VGA graphics. Indeed, the new system is one of the early signs of the expected flood of 'hybrid' PCs; machines that have the same disk drives and graphics displays as the PS/2 and which can run OS/2, but which also use the old PC and AT expansion buses rather than the PS/2's Micro Channel Architecture.

And the need to produce this new system has also given Dell the chance to refine its board design, put in some sighting marks for future enhancements, and still keep prices as low as they can get. The System 200 is an interesting combination of budget pricing, features tailored for the new post-PS/2 world, and high performance, and is aimed at replacing the company's earlier AT-compatible systems.

Hardware

From the outside, the System 200 looks exactly like the older 2868 and 28612 AT clones from Dell, in the characteristic Dell casing that is bigger than an XT but a fraction short of full AT height. The only obvious difference is the presence of a 3½in floppy drive in one of the two half-height floppy disk slots in the front panel, fitted with a standard 5¼in bezel to match the standard 1.2Mbyte 5¼in drive above it. In fact, System 200 customers have the option of buying machines with either floppy drive as standard, with the other type as an extra-price option.

Setting up the System 200 is a simple matter of connecting the keyboard and monitor to the appropriate sockets, plugging in the mains cable, and flicking the power switch. The only slightly unconventional feature is that the EGA monitor is powered from the outlet on the back of the machine rather than from a separate mains lead — another of the benefits of a beefy power supply.

As usual, the machine boots off the hard disk if MS-DOS is present on it, or from the A: drive if it is not. However, there is no provision for booting from the 3½in B: drive, which meant that IBM's OS/2 version could not be booted directly since it was only available in 3½in format.

First impressions are that the System 200 is a noisy machine by current standards, with a positive gale blowing out of the fan in the back of the power supply. Having such a big supply, requiring extra cooling, does have its drawbacks.

'This is one of the hybrid machines that all the US analysts have been predicting while waiting for the true and legal Micro Channel PS/2 clones to emerge from daring manufacturers like Wyse, and as an OS/2 vehicle the System 200 fits the bill.'

Opening the case in the normal PC fashion reveals that there is in fact room for three half-height storage devices in the right-hand bay that normally holds the floppy drives, although one of them is not accessible from outside the case. Presumably a hard disk could be fitted in this extra slot, although there is already space for one full-height or two half-height Winchesters in the left-hand bay.

The power supply is a hefty Malaysian-built Astec unit, providing a maximum 230W — enough to drive the biggest system configuration with some power to spare. It is worth pointing out that this power supply can deliver nearly four times as much energy as the power supply fitted into the original IBM PC, a development that shows how the PC expansion industry has developed. The supply has three outlets for drives in the three floppy bays and only one for the hard-disk bay, but splitter cables are readily available if a second hard disk is to be fitted.

At the base of the machine is the new Dell circuit board which forms the basis of the System 200 range. This is a small board, taking up the minimum space inside the machine and filling just half the width of the case. At the rear are six expansion slots, two 8-bit PC types at the left and four 16-bit AT types to the right. As usual in so many machines these days, the 12.5MHz 80286 processor near the centre of the board is surrounded by the Chips & Technologies custom chip set that provides many of the functions of an IBM AT with the minimum chip count, and the 80287 socket — fitted with an 8MHz 80287 co-processor in the review system — is also nearby. The minimum RAM complement is soldered to the board, and comprises 20 256kbit chips and four 64kbit chips for a total capacity of 672k. The minimum user RAM capacity is 640k, the MS-DOS maximum.

The RAM chips are 120ns types, meaning that the 12.5MHz 80286 needs to insert one wait state for each memory access just as the 8MHz 80286 in the IBM AT does. Some clones use faster memory chips or different memory organisations to give zero wait state operation, giving better performance compared with an IBM AT than their raw processor clock speed would indicate. For instance, the AST Premium/286 uses 100ns RAM chips and a direct processor-to-memory link to give zero wait state RAM access to its 10MHz 80286; as a result, the AST machine runs at the same rate as a 12.7MHz AT with one wait state.

It is in the memory area that Dell has made its first bid for the OS/2 market. Next to the soldered RAM is a set of four single-in-line memory module (SIMM) sockets designed to accept strips of eight RAM chips to boost capacity. Using 256kbit chips each SIMM holds 256k, so fitting four of them would take the RAM capacity up to 1.6Mbytes. And, using 1Mbit chips, these four sockets could add a further 4Mbytes of RAM. The extra RAM could be used as pure extended memory for use with Xenix or OS/2, or, with the addition of suitable software drivers, as Lotus-Intel-Microsoft expanded memory, RAM disk, or cache.

Since OS/2 needs at least 1Mbyte to run, and 1.5Mbytes to run using the MS-DOS compatibility box, RAM expansion is vital for machines that will in the end be running OS/2 as their main operating system. And the more RAM the better.

Also on the board are two serial ports, connected to the outside world via two ribbon cables leading to sockets on the back panel, and one parallel port connected in the same way. Since the casing has blanking plates for eight expansion slots, while the System 200 board only has six slots, these sockets have been fitted to plates that fill the two unused slots on the back panel.

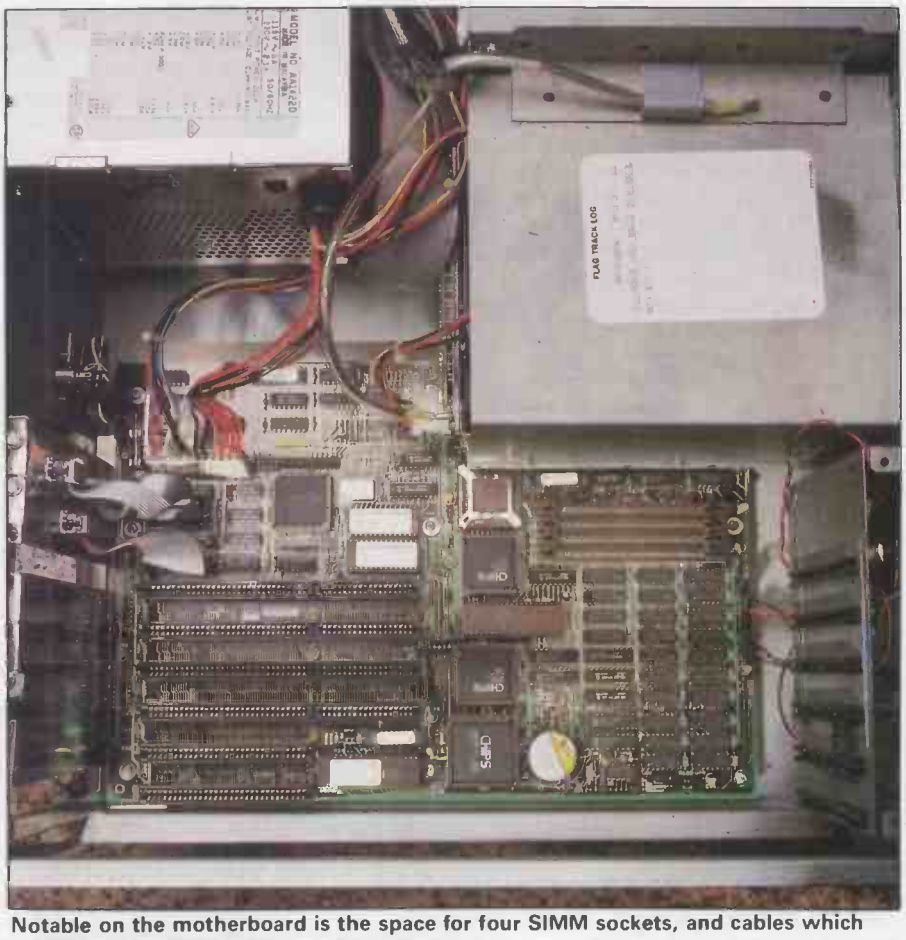
The rest of the board has some unusual features. There are two unused soldering positions at the rear, obviously marked and intended for serial-port sockets to be fixed to the edge of the board. The battery that stores the set-up information in CMOS RAM is actually fitted on the circuit board rather than fixed in a separate holder with a cable connection to the board, although there is a connector for such an external battery to be fitted. The main-board battery is socketed, unlike the similar battery on the Apple Macintosh II, and has a claimed life of three to five years. And there is a connector for a floppy-disk drive on the main board, even though in typical system configurations floppy or hard-disk control is handled by a separate expansion board.

One explanation for these features is that Dell may be planning to launch a diskless workstation for network use, with a single floppy drive, no hard disk and limited expansion possibilities. But that must remain in the realms of speculation. Whatever the thinking behind it, the system board is a finished and solid product, with no strange jumper wires or other hardware fixes.

With Dell systems, the peripherals that surround the electronics are chosen by the user at purchase time. With the System 200, however, there is a wider choice than usual. For example, the base machine comes with either a 1.44Mbyte 3½in floppy drive or a 1.2Mbyte 5¼in drive, and there is a choice of hard disks ranging from a slow 20Mbyte drive with 65ms access time to a 150Mbyte drive using an ESDI interface and promising 18ms access.

More significant for OS/2-compatibility watchers is the addition of a VGA graphics board and compatible monitor to the normal choice between monochrome and EGA combinations. There is no news yet of which VGA board Dell will be buying in for use with the System 200, although the EGA board supplied with the review system was built around the Paradise PEGA custom EGA chip, and Paradise is one of the few manufacturers claiming full VGA hardware compatibility using its PVGA1 custom chip.

Going for the Paradise VGA adaptor or for one of the other boards claiming register-level compatibility — only Compaq and IBM join Paradise in that claim, in fact — would reassure users that their hybrid PS/2 is as compatible as possible with the original. Although other VGA-compatible boards have been produced by companies like STB, Video Seven, Quadram, Sigma and ATI, these are only 'BIOS-level compatible'; in other words, they will only work with software that uses VGA BIOS routines to display graphics, rather than driving the display hardware directly. And, as with other graphics standards, there is no guarantee that applications developers will follow the BIOS rules in their quest for greater execution and display generation speeds.



Notable on the motherboard is the space for four SIMM sockets, and cables which provide an exit for the serial and parallel ports

On the review system that question was academic. One of the two occupied slots in the machine held a Paradise EGA board, a short 8-bit board built around the big PEGA1A custom chip and fitted with 64k of fast-ish 120ns video RAM. An established standard, and no particular surprises here. The second board was the standard hard and floppy disk controller, built around a Western Digital chip and occupying the 16-bit slot nearest to the disk drives. Again, nothing spectacular and no surprises.

The hard disk was a 40Mbyte half-height unit made by Control Data subsidiary Magnetic Peripherals, with a claimed access time of 28ms. As we shall see, the drive actually performed better than that in use, but 28ms is certainly respectable for a drive that does not use a superfast ESDI controller. It is always worth paying extra — £80 extra in Dell's case, for a 28ms drive rather than a 40ms drive in the same capacity — to get faster disk performance on a fast MS-DOS system.

MS-DOS tends to get disk-bound rather than processor-bound at high processor speeds, and if early reports on OS/2 performance are any guide, disk speed will be even more crucial there. An independent testing company in the US, Neal Nelson & Associates, has published results showing that OS/2 runs up to seven times slower in multi-tasking applications than a popular Unix implementation, the Santa Cruz Operation's SCO Xenix 5.2.2. And the blame for that is placed firmly on the OS/2 disk file structure, which is identical with that of MS-DOS. Commenting on the figures in US news weekly, *InfoWorld*, Russ Kepler, vice president of engineering at Basis Inc, said that 'MS-DOS has some tremendous failings in the file system, and they are all faithfully repli-

The serial and parallel ports are accessed from two openings which do not link to the six internal expansion slots

cated in OS/2. The file system that MS-DOS uses was designed for 160k floppy disks, but the files that Unix is designed for are the result of about 17 years of tuning and performance enhancements.'

The clear message is that prospective users of OS/2, which has to do a lot of random disk accesses to perform its multi-tasking, would do well to shell out for the fastest hard disk they can afford.

The Dell floppy drives in the review system were conventional units: one a Mitsubishi half-height 5¼in drive storing the usual 1.2Mbytes; and the other an unidentifiable double-sided 3½in drive storing 1.44Mbytes in standard IBM PS/2 format. Just as the 1.2Mbyte drive can read 360k disks, the 1.44Mbyte drive can read 720k disks; but, unlike the 5¼in drive, the 3½in drive can also write 720k disks reliably. These floppy drives were designated A: and B:, with the hard disk partitioned into two 20Mbyte logical drives, C: and D:. It is interesting to note that even OS/2 will not get round the MS-DOS 32Mbyte disk volume limit until the release of the Extended Edition towards the end of this year.

The keyboard supplied was the now-standard Enhanced type, with all the failings and advantages of that design. Interestingly, although the keyboard has the usual Taiwanese shortcomings of short key travel and lack of tactile or audible feedback, it appears to have been built in the Republic of Ireland by an unnamed manufacturer. There is still, despite claims by some manufacturers, nothing to compare with the pleasant feel and positive action of an official IBM keyboard.

One feature that was annoying at first, thanks to the lack of full documentation, was the loud keyclick sent through the machine's speaker at every key depression. Eventually, trial and error showed that using Ctrl-Alt and the '+' and '−' keys on the numeric pad controlled the keyclick volume to the point of turning it off completely. Similarly, the processor speed can be halved from 12.5MHz to 6.25MHz for compatibility with copy-protected software and older expansion boards, using the 'Ctrl-Alt-#' key combination.

'. . . it will do until the real thing — OS/2 — comes along.'

The monitor too was familiar — a Kaga Taxan 765 EGA screen designed in Japan and built, as is increasing Japanese practice, in Korea. The monitor has a 14in screen, and is actually bulkier than many 14in multi-scan units from companies like NEC and Hitachi, but there is nothing wrong with that. The wide grey bezel round the screen improves contrast and shields the screen from glare and reflections, and the display is clear, rock solid, and sharp. Dell has standardised on Taxans for all its monochrome and colour monitors, including the multi-scan 770+ for the VGA options, and it is a good choice.

And that is it: a proven hardware combination with extra features that should make the System 200 a good vehicle for OS/2 when the official Dell version of that operating system emerges. The possibilities and difficulties of implementing OS/2 on a machine like the System 200 deserve a separate discussion of their own.

System software

The System 200 supplied for review came with a copy of MS-DOS 3.3, licensed and shipped by Dell with its own disk labels and manuals. These cosmetic changes seem to be the only ones the company has made, and MS-DOS 3.3 on the System 200 remains the same as MS-DOS 3.3 on any other machine. But the special features of the machine — room for memory expansion, 3½in drives as standard (if optional) fittings, and VGA support — seem to suit it for use as an OS/2 clone.

The word 'seem' is there because there is a lot of confusion about how hardware-specific OS/2 is. Microsoft is saying that OS/2 will never be a consumer product the way MS-DOS is, sold over the counter at the dealer's, since each licensee and OEM will have to tailor the product to match its particular hardware configurations. However, recent reports on the differences between IBM OS/2 and Microsoft OS/2, combined with word from a source close to Microsoft, suggest that the adaptations that OEMs will need to make are few and may not even be necessary in most cases.

Obviously, it is in the OEMs' interests to make sure that any copies of OS/2 sold to users of their machines only come from the manufacturer itself. But against that is the fact that OS/2 has been designed to run on any IBM machine that uses the 80286 or 80386 processor, including the not-much-lamented XT Model 286 as well as the AT line and the

PS/2s, and that includes machines that have monochrome, CGA, and EGA display boards as well as those with the VGA custom chip.

That seems to suggest that any version of OS/2 will run on any clone that can mimic the AT and its video adaptors closely enough, and the current state of the cloning art suggests that most of them will be able to manage the trick. Indeed, sources close to Microsoft say at present, in the absence of any need to support peculiar Micro Channel co-processors and other hardware peculiar to the PS/2, versions of OS/2 from either Microsoft or IBM itself should run unchanged on clones.

Some empirical evidence for that is available. Using the IBM-supplied version of OS/2 from the software developers' kit (admittedly not the IBM release version of Standard Edition 1.0 but regarded even by IBM as essentially 'frozen' code, the operating system was run successfully on the AST Premium/286 at the review site, and did not run on the System 200 only because it did not have enough RAM fitted, with a helpful message on the screen explaining that that was the reason.

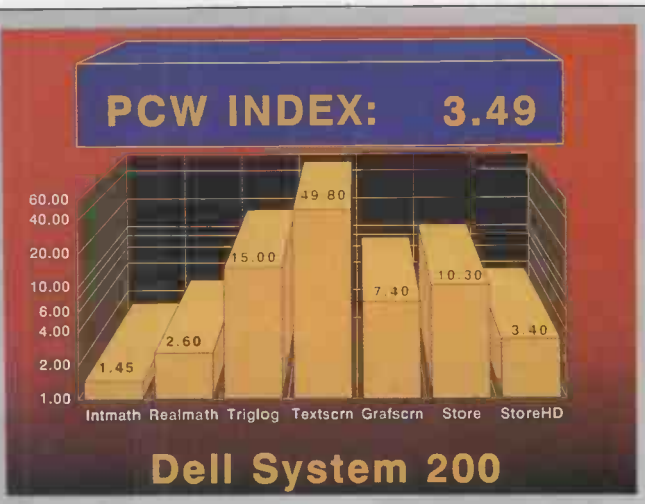
So, there should be no excessive delays among the cloners in getting OS/2 up and shipping on their systems, apart from delays in getting the disk labels and manual binders produced.

However, there are hidden differences beteen the IBM and Microsoft versions of OS/2 that may have an effect on the porting process, and prevent the IBM versions running on certain clones and with certain expansion boards including internal modems and 80286 and 80386 accelerator boards.

For example, Microsoft OS/2 lets OEMs build in a 'dual-boot' feature, allowing users to keep both OS/2 and MS-DOS on their hard disks and select which one to load at boot time. But this needs to be implemented in the machine's ROM rather than on disk, requiring a system upgrade. One of the early OS/2 suppliers, Zenith, has made this change and offers dual-boot facilities.

Also, IBM has no intention of supporting OS/2 — even on its own PCs — if they have been upgraded with an 80386 accelerator board like Intel's InBoard 386. IBM has stated officially that putting an InBoard into an IBM PC turns the system into an Intel machine rather than an IBM one, and that it is up to the board maker to supply a copy of OS/2 tailored to the new hardware.

And, indeed, Intel has announced that it has licensed OS/2 from Microsoft and will be supplying it for the InBoard, as well as making hardware



Specification: 5¼in and 3½in floppy drives; 40Mbyte hard disk; 80286 running at 12.5MHz; GW-Basic version 3.3; EGA-compatible graphics; 80287 maths co-processor fitted (not used by GW-Basic). (See *PCW*, February 1988, for full Benchmark details)

changes to the board to get OS/2 to run on its implementation of 80386 logic. Intel says that there will be 'some kind of upgrade path' for existing users to obtain the new hardware, and that future versions of the board will support IBM's version of OS/2 to some extent. However, the company says that it has no policy as yet to support InBoard users who have bought IBM OS/2.

Microsoft, however, says that its version does provide specific support

'The real interest in the machine is the groundwork it lays for OS/2, with motherboard RAM expansion up to 4.6Mbytes . . .'

for 80386 add-ons. OS/2 uses the special features of the 80386, if one is present, to speed up switching between the protected mode used by OS/2 and the real mode used by the MS-DOS compatibility box. On the 80286 such mode-switching means resetting the processor; on the 80386 it does not. Microsoft's version will allow this mode-switching trick to be used with add-on 80386 boards.

Another fundamental difference is that IBM's OS/2 does not support serial communications using the 8250 chip set, while Microsoft's version of the COMM device driver does. The significance of this is that many internal modems for the PC use the 8250 set, including most of those made by Hayes. The worst of this is that even Hayes doesn't know which of its modems will work with IBM OS/2 and which ones won't; as a general rule, older versions without custom chip sets have the best chance. Hayes also says that a future internal modem for the Micro Channel will have no problems.

Machines that have non-contiguous memory maps, with non-IBM-standard holes in them (Compaq's DeskPro 386 is a good example) will also fail to work with IBM OS/2 but *will* work with Microsoft's version. And Microsoft plans to provide a complete set of custom display drivers with the operating system, including support for EGA and VGA boards from companies like STB, AMI, Tseng Lab, Quadram, AST, Tecmar, Paradise, ATI, Genoa, NEC, Video Seven — and Dell Computer's own-brand EG-1000 — while IBM will only support its own graphics standards. Microsoft expects that in the end the add-on board makers will supply their own OS/2 drivers with their boards, which is not unreasonable given that the OS/2 video drivers supplied by Microsoft originally came from the boardmakers.

The other differences between Microsoft and IBM OS/2 are less important. The code that drives the OS/2 Program Selector, the menu-driven front-end normally used to launch applications, is different in the two versions since IBM had to anticipate its Extended Edition while Microsoft did not. But both IBM and Microsoft insist that the Application Program Interface (API) is identical in both versions, so that all applications will work with either. And since the Presentation Manager will work to that API, all Presentation Manager applications will work on both versions, too.

The significance of this for the System 200 is that, at least for now, Dell says that the IBM Standard Edition will work on the machine and any OS/2 application will also run, given enough memory to work with. In the future, though, if internal modems and graphics cards that aren't 100%

compatible with IBM standards are fitted, then users could well find that IBM OS/2 will either fail to work or will work unreliably. Then they will either have to get the official Dell version and use the drivers that will come with the video boards, or forego those expansion boards.

It will be interesting to watch how the hardware and add-on makers come to terms with becoming software suppliers as well — and how IBM AT users will react to being forced to buy a new version of OS/2 when they upgrade their machines with an InBoard/AT.

Applications software

The EGA-equipped System 200 acts just like what it is — a modern, fast AT-compatible. Everything ran as expected, including Windows 1.04 and 2.03, a very old copy of GEM 1.23, Lotus 1-2-3 Release 2.01, AutoCAD version 2.6, WordStar 2000 Plus Release 3, WordStar Professional Release 4, and any old software lying around including some screen colour utilities that test EGA compatibility by writing to the EGA registers directly. Several packages available on 3½in disk were also tested, including Lotus' new GraphWriter II, Microsoft Word 4.0 and Migent's PageAbility, and again there were no problems or surprises.

To get some idea of how the machine would act with the VGA option fitted, an STB VGA Extra board was plugged in and attached to a Hitachi Multi 560 multi-scan monitor and used to test those packages that had VGA drivers, including Windows 2.03, GraphWriter II, and Word 4.0. Again, no difficulties, and no sign of the inevitable hardware incompatibility that goes with using a VGA clone board rather than the PS/2 original.

The Dell Support Disk that comes with the system includes the new System Analyser package, a comprehensive 'confidence test' that runs detailed analyses of the system board, disk drives, screen, keyboard, and I/O ports. This is not just a test showing that particular options are present or not, but a full exercising of the system to pinpoint any problems. For example, every cylinder on the hard disk is tested, and the keyboard test requires users to press every key on the board at least once to make sure the whole thing works properly.

Also provided on the disk are a Western Digital low-level hard disk formatter, which can be used to adjust things like sector interleaving, and a head park utility to secure the hard-disk heads when the machine is to be transported.

Interestingly, the Dell System Analyser reacted perfectly to the STB VGA board, as did other non-VGA software tried, using the higher-resolution VGA screen fonts rather than EGA fonts.

Landmark's SPEED.COM program confirmed that the System 200 does indeed run like a 12.5MHz AT with one wait state, around the same rate as a 10MHz zero wait state system and 6.6 times as fast as a 4.77MHz PC. But Core International's disk speed test program showed that Dell has been conservative in rating the Control Data drive at 28ms. The test showed an average access time of 19ms, and the drive turned out to be one of the fastest non-ESDI units around. As we have seen, disk speed will be critical for OS/2 performance, and this drive is as good as you get in a reasonably-priced 40Mbyte package.

The results of the standard PCW Benchmarks are given on page 100 and confirm that the Dell is in the fast AT clone bracket. The *PCW* research staff will now have to produce a multi-tasking set of OS/2 Benchmarks . . .

Overall, with the high-quality Taxan screen and a bearable-to-good keyboard, the System 200 is a somewhat noisy but fast pleasure to use.

Prices

Typical system prices for the System 200 start at £1299 for a monochrome system with either a 5¼in or 3½in floppy drive, a 20Mbyte hard disk, and a monitor; ranging up to £3199 for a system with VGA graphics, a multi-scan monitor, one floppy drive, and a 150Mbyte ESDI hard disk.

Somewhere in the middle is the review system, with the faster of the two 40Mbyte hard disks available, an 8MHz 80287 co-processor, and an extra floppy drive as well as an EGA board and a monitor. The price for that, confirmed by the invoice that Dell helpfully sent, is £2334.

For all these systems, MS-DOS is not included and adds £65 to the price, but the prices do include one year's 'next-day on-site' service from Honeywell Bull engineers, unlimited telephone support on Dell's toll-free 0800 number in the UK, and a limited warranty on parts and labour. Extended warranties are available for up to four years, costing around £100 a year for typical systems.

Conclusion

As a fast AT clone, the System 200 is by no means earth-shattering in terms of performance, although Dell's distribution methods make it very competitive on price. The real interest in the machine is the groundwork it lays for OS/2, with motherboard RAM expansion up to 4.6Mbytes, a 3½in disk and VGA graphics options, and very fast hard-disk drives.

This is one of the hybrid machines that all the US analysts have been predicting while waiting for the true and legal Micro Channel PS/2 clones to emerge from daring manufacturers like Wyse, and as an OS/2 vehicle the System 200 fits the bill. And, as a VGA-equipped AT clone with a drive that can transfer data to and from portable PCs, running under MS-DOS, it will also do well until the real thing — OS/2 — comes along.

Dell is on (0344) 860456. END

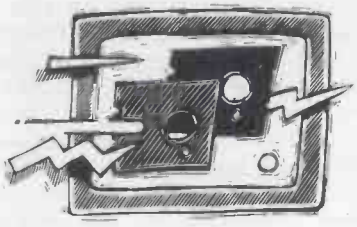
In perspective

Dell is not alone in revamping its range with OS/2 in mind. As described earlier, Zenith Data Systems has already produced its version of Microsoft OS/2 for its own fast AT, including the dual-boot ROM feature that is missing from the System 200 and also featuring 3½in drive options. And there is no doubt that other manufacturers will lose no time in launching fast 80286-based machines with big RAM expansion and VGA capability.

But Dell has a reputation for delivering powerful and reliable machines at very low prices, and has support policies that belie its dealer-free approach. Those other manufacturers will get stiff competition from the System 200.

Technical specifications

Processor:	80286, 12.5MHz
RAM:	640k, expandable to 1.6 or 4.6Mbytes on the main board
Mass storage:	Choice of 1.2Mbyte 5¼in or 1.44Mbyte 3½in floppy drive; 20, 40, 70 or 150Mbyte hard disk drive, with access times between 65ms and 18ms
Display:	Monochrome, EGA or VGA board and matching Taxan mono, colour or multi-scan monitor
Keyboard:	101 keys, Enhanced layout
Expansion:	Four 16-bit, two 8-bit slots; one of each occupied in typical configuration
I/O:	Two 9-pin RS232 serial ports, one 25-pin Centronics parallel port
Operating software:	MS-DOS 3.3 with Phoenix BIOS, OS/2 to come; Dell Support Disk utilities



Microsoft Bookshelf

A dictionary, a thesaurus, an almanac, a book of quotations, a style guide, a spelling dictionary, a postcode book and a news digest take up a fair amount of space on your bookshelf, so is it worth finding room for Microsoft's CD-ROM Bookshelf instead? David Tebbutt decides.

Microsoft claims that its CD-ROM Bookshelf will make your writing more precise and more interesting. It will do this by giving you instant access to thousands of items of information stored in a set of 10 electronic reference books. The company rather arrogantly claims that this is 'probably the most valuable writing aid you'll ever use.' Or course, that's just hype. There's no way that the very first implementation of a new technology can warrant that sort of claim. Even Lotus 1-2-3 built on what had gone before.

Lots of writers who want to impress their audiences start with a quotation. I'll therefore stick with this tradition and use Bookshelf to see if I can find a good quote which links the subjects of 'writing' and 'interest'. I put the cursor over 'writing', press a couple of keys, add the word 'interest' to a dialogue box, press Enter and up pops:

Chikamatsu Monzaemon
1653-1725

In writing joruri, one attempts first to describe facts as they really are, but in so doing one writes things which are not true, in the interest of art.

Chikamatsu Monzaemon
Preface to
HOZUMI IKAN, Naniwa Miyage

Bartlett's Familiar Quotations
Copywright (C) 1937, 1948, 1955, 1965, 1968, 1980 by Little, Brown and Company (Inc) All Rights Reserved

The quote is quite useless for my purposes, except to illustrate how easy it is to grab a relevant quote. After finding it and selecting it, I had to quit Bookshelf to reposition my cursor, then call the program up again to paste the quote into the right position.

To run Bookshelf, you need a CD-ROM player capable of understanding the so-called 'High Sierra' format. (Excuse me, while I see if 'High Sierra' is in the Almanac. It's there, but tells you nothing about CD-ROM formats.) The format was agreed between 13 players-to-be in the CD-ROM business. The group included Philips, Sony, Hitachi, Apple, DEC and Microsoft.

The CD-ROM player supplied for this review was Hitachi's free-standing model CDR 1503S, which will set you back £750. The list price is officially £895, but no one seems to be paying it. Hitachi has two other models, both of which can take the

place of a disk drive in your processor unit. The half-height unit, the CDR 3500, sells for £650 and the full-height one for £450. All units come with audio connections, through either phono or headphone sockets. Sound will come into its own when products appear, such as a dictionary which will not only find the word you're looking for but also tell you how to pronounce it.

The review player measures 12ins by 14ins and is just under three inches high. If you have a conventional three-box desktop, you might find it sits happily between your PC and the monitor. It's certainly strong enough. You would have to be careful not to obstruct the two fairly large ventilation grilles on top, and you will need to leave a disk-sized area free in front for the disk tray to slide in and out.

Bookshelf comes on a single CD-ROM disk and, of the potential capacity of 550Mbytes, only 156Mbytes has been used. You can hold the disk up to the light and see a clear contrast between the reflectiveness of the occupied and unoccupied areas of the disk. Microsoft has packed more than 1000 files on to the Bookshelf disk, including some sales demonstrations for its main product lines. There's also a rather yukky sell for Microsoft itself.

The product is designed as an online aid for any writer, whether they're into business memos, school essays or magazine articles. The present version is targeted at the American market so, unless you are an Americophile, you probably wouldn't find a lot of use for it over here. Still, similar European and British products are under development right now. In fact, Microsoft is the third member of Eikon, a joint venture set up with Olivetti and Seat to develop optical disk software applications for Europe. Eikon will serve as European distributor for Microsoft's CD-ROM division. At the moment Hitachi is doing this job in the UK, more or less as a test marketing exercise.

For this review, I shall try to ignore the fact that the data is American and focus on the potential of this new medium. The present version of Bookshelf costs $195 and the UK version is likely to be about the same price.

Bookshelf is described as a CD-ROM reference library and comprises the following volumes:

American Heritage Dictionary
Roget II: Electronic Thesaurus
1987 World Almanac and Book of Facts
Bartlett's familiar quotations
The Chicago manual of style
A phonetically-based spelling checker
Forms, letters and outlines
ZIP codes
Houghton Mifflin Usage Alert
Business Information Sources

It comes with a Microsoft extensions disk which enables DOS to beat the 32 Mbyte barrier and access the huge volume of data contained on the Hitachi CD-ROM drive. It also contains the Bookshelf software which, when transferred to your PC, can be called from inside any application using your preferred hot-keys. Actually, your choices are limited to any combination of the two shifts, Alt and Ctrl, which is pretty mean of Microsoft because they're the ones that need the least programming effort.

As well as the 10 reference works listed on the main menu bar, a further two items offer you help and the chance to configure the system to your own preferences. The menu bar works in the now traditional fashion, with options selectable by arrow keys or by initial letter, whereupon a pull-down menu appears. Somehow, I'd expected CD-ROM applications to look a lot more exciting than this.

'The product is inconsistent, especially the intelligence . . . simply to match text strings is not good enough when other applications in the same suite can display so much more native wit.'

Installation

The Hitachi player comes with a connecting cable and a PC card. The cable can go either way round and the full-sized card simply pops into a spare slot. I needed to set some DIP switches on my card but I understand these have now been removed. Internal drives are similar except that the connector fits on to the other end of the card. Apart from the fact that the cable is rather shorter than I'd like, because my machine stands under the desk, the physical set-up is very simple.

Or, at least, it would have been had I not had a problem with the Bookshelf disk. The disk, which wasn't new, had a series of hairline cracks radiating from the hub into the encoded section. These cracks were exactly where the boot tracks were, which resulted in read failures whenever I tried to access the disk. Of course, I suspected my set-up, so I tried the card in different slots, the cable different ways round and in each of the two rear sockets on the Hitachi drive, only to discover that it was a disk problem all along.

The software set-up is a bit of a pain because you have to patch your CONFIG.SYS and AUTOEXEC.BAT files to include some really arcane entries. The last drive needs to be Z, although the Hitachi is drive D: and a DEVICE entry reads: \HITACHI.SYS /D:MSCD001 /N:1. Quite what it all means, I've no idea. But that, coupled with some AUTOEXEC entries and some files you copy into the root directory, eventually give you access to the CD-ROM drive just as if it were a normal drive. This could have been considerably more user-friendly: I hope Microsoft automates the procedure a little more.

When you're on to drive D:, you type 'setup' which transfers programs and data from the CD-ROM into a sub-directory on your hard disk. Once in the hard disk, all that remains is to run the program 'BOOKS'. This loads the resident part of Bookshelf, leaving you to pop it up whenever you like. The hard-disk version of Bookshelf needs 512k memory, the floppy disk version 640k, and a non-resident version will run on a 256k system. All versions of Bookshelf require MS-DOS 3.1 or higher. A mouse is a worthwhile addition but isn't strictly necessary.

The only thing you might then want to do is to change the colours or the hot-keys. The default colours are cyan, black, white, brown and green — and that's it. The entire set-up process could be completed in half an hour or so by someone who's reasonably familiar with computers.

The dictionary

The dictionary contains over 200,000 definitions, including extensions for people and places. You can access an entry by placing your cursor over the word you seek, activating Bookshelf and then either getting to the dictionary the long way, through menus, or direct with a strange combination of the Alt, Shift and letter D keys.

The entry you need comes up in three colours, with the entries above and below visible at the edges of the screen. If you've misspelled a word, or Bookshelf thinks you might mean something else, a window of alternatives appears so you can choose the entry you really want to see.

I was disappointed that, in the biography section, I couldn't get at Leonardo da Vinci through any part of his name, only the entire entry. Normally, the Biography searches on surname. I don't know if I'm weird or what, but I seem to have struck a

high percentage of anomalies while using this product.

Thesaurus

The Thesaurus gives access to half a million synonyms and, as far as I can tell, not one of them is rude. Oh, I lie! I did look up 'bedding' quite innocently and discovered that the American synonyms are 'having', 'mating', 'copulating' and you can guess the rest. Anyway, having found a suitable alternative to the word you're employing, you can effect a substitution. (In that sentence, for example, I used the word 'employing' instead of 'using'.)

The blurb suggests that the Thesaurus can offer 'a livelier and more precise alternative'. It's quick, it's simple and I agree, it certainly beats wading through a paper Thesaurus. We're talking about one second to perform a normal search.

Almanac

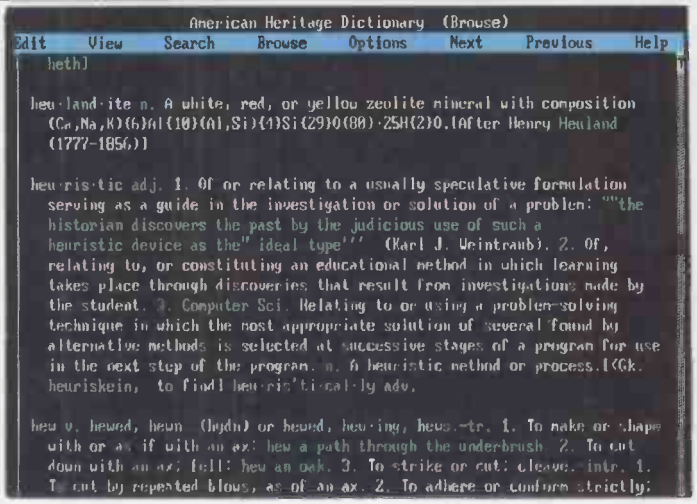
This is the part of Bookshelf I couldn't resist. It contains all sorts of weird and wonderful information. According to the publisher, it contains more than a million facts. You can go straight to the index and browse up and down for something which catches your imagination or you might prefer to go in through the table of contents.

I hit trouble when using the index. I wanted some information on St Lucia, but when I went to the index entry I was routed to the Republic of Rwanda. It's actually two entries away from St Lucia in the Almanac. Tut tut. I also noticed that 'advertising' has been spelled wrongly in the index. You'd have thought that, with all these writing tools available, the publisher would have got its spelling right.

If you prefer a straight search for your chosen subject matter, you can define up to three expressions on which to search. A match on any of the three will make a hit and you will be taken into the first entry which satisfies your criteria. 'Previous' and 'Next' options allow you to roam backwards and forwards through the list of selections.

When you reach an item of interest, you can pan up, down and, if the material on view is wider than your screen, sideways. You can collapse columns to bring those off the screen into view and, like some spreadsheets, you can lock columns in position to prevent them moving off the screen.

When you have the detail you want on display (and this applies to the dictionary, style manual, quotations, business information, forms and letters, too) you can select it with the mouse or Shift-Arrow keys and then copy it into a clipboard for later pasting into your document. Each time you do this, Bookshelf kindly appends a copyright notice.



Unlike the dictionaries included with word processors, the Bookshelf dictionary is complete with full definitions, derivations and pronunciation. Spell-checking can be performed using this version in conjunction with a personal dictionary

I found that if I went too mad with the copy facility, my word processor (a fully-registered copy of PC-Write) actually choked on the input, effectively hanging my machine. You can copy up to 50 lines at a time from a Bookshelf document, so if you use the 'Append' option, you can build a very large clipboard file. If, like me, you have a periodic 'Save' option which asks for keyboard input by way of confirmation, you are in big trouble.

The paste operation works by kidding your application that the pasted information is coming from the keyboard. I presume that Bookshelf keeps repeating the next character due and, if that's not one which activates your save, you're in trouble. Either make a back-up before pasting large quantities of information, stick to smallish items, or use the 'Save Clipboard' option and import the saved file.

Given the intelligence of the spelling checker, which I'll come to in a minute, I'm astonished at the imbecility of the Almanac searching mechanism. It simply matches text strings. If you don't match, hard cheese. I tried to find Ricky Nelson (a pop singer when I were a lad) — I drew a blank. Since he later changed his name to Rick Nelson, I tried that and got: 'Rick Nelson: "Hello Mary Lou"', 'a song made when he called himself Ricky. Hmmm.

Quotations

Ah, yes. This was the very first thing I tried. A quote which has appealed to me ever since I worked in technical support is: 'It is well-known that among the blind, the one-eyed man is king.' Erasmus said that, so I tried to find it. No luck. I was quite disappointed until I remembered that this was an American publication and it did, after all, contain 22,500 other quotations, which is a fair number by anyone's reckoning. The *Bible*'s there, so is Shakespeare, so it can't be all bad.

While I was rummaging through the quotations, the pulchritudinous Martin Banks telephoned me. (I was going to say 'lovely' but the Thesaurus offered that irresistible gem.) I thought I'd look up a quote which suited us writers. It came up with: 'A writer is like a bean plant — he has his little day, and then gets stringy.' We both put the phone down feeling quite deflated. Before hanging up, though Martin made the important observation that, unlike a book of quotations which usually relies on your knowing the first line, this approach lets you find an apt quotation regardless of where the keywords appear. He's right, of course.

You can search the quotations by words and phrases, by author, by table of contents or by index. Once again, it beats the socks off using a paper book of quotations; and, even if I search on a common biblical term like 'thy', material appears on the screen in less than eight seconds.

Style manual

The search engine for the style manual is the same as that used in the quotations and almanac functions. It means you can find information on any aspect of producing a book, from its structure to how to use apostrophies properly. This electronic book is a mine of useful information and, like the others on this disk, lends itself well to the Bookshelf treatment.

Spelling checker

This checker is similar to many I've seen on PCs. (I looked up the use of apostrophies in the style manual for that sentence.) It checks the spelling of a single word or the entire screen. You may either replace all occurrences of a misspelled word or judge

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each one you reach on its own merits. You may ignore case, and you may elect for the checker to detect all words accidentally repeated.

The checker works on both a phonetic and a string-matching basis. 'Reeding' produced 'reading', 'feeding' and 'needing' as alternatives. I don't consider this checker to be particularly fast. It took about 11 seconds on my pretty snappy 80286 to check a 150-word screen. In constant use this would drive me barmy, but if your spelling's not up to much, it must be an attractive program.

Forms, letters and outlines

If you're the sort of person who needs a bit of a nudge to get going, then 'forms, letters and outlines' are for you. These are a whole pile — around 200k's-worth — of standard letters, agendas, form layouts and the like. Bookshelf contains nine copies of these, to suit the requirements of different word processors. Having found a document you like the look of, a 'Transfer' option bolts it straight into your word processor text.

The nine formats are straight ASCII, Displaywrite, MultiMate, PC-Write, Volkswriter, Word, WordPerfect, WordStar and Xywrite. It was interesting to see how much space had to be allocated to the same file for the different word processors. I was amazed to see that WordPerfect's file was slightly smaller than straight ASCII — it was 186,157 bytes. The same file in MultiMate was 390,144 and, in Displaywrite, it was a huge 606,720. I can only guess that this huge overhead must result in a much more graphically sophisticated display.

Anyone who wonders if they have enough insurance would find the 'household inventory' useful. It takes you round the house, room by room, suggesting all the things you might have in each. Boxes are provided to let you fill in the date purchased, quantity, cost and present value. That's where I was when I looked up 'bedding' and received the astonishing response. I also learnt that it is common for American households to have a mangle in the basement. Once again, the search arguments have to be precise.

ZIP codes

Just before Christmas, I must have spent an hour looking for the ZIP code of a friend in America. Bookshelf would have found it in seconds. The program automatically checks the address, providing you are very careful how you type it into your word processor. The entire street and apartment number details must appear on one line, while the town and state have to be on the line below with a single space following the town name. Leave the cursor after the state name or code, so that the ZIP code can be inserted into your document. Here's an example that worked:

Mickey Mouse
209 Lakeview Drive
Apartment B3
Redwood City, California

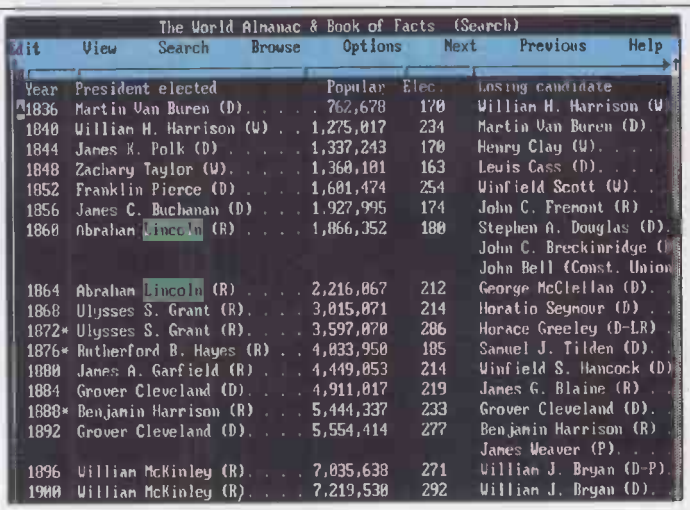
Bookshelf pasted in an accurate '94062' in six seconds. I tried non-existent addresses in the same street and Bookshelf knew that the house numbers were out of range. The California ZIP code file takes just over half a megabyte, New York state takes over 2Mbytes, while poor old Guam rates just 29k.

Usage alert

If you have a word you're not sure about — a lot of people confuse 'stationery' and 'stationary', for example — simply position the cursor on the word you've chosen, go into 'Usage', and you will see the similar words and a quick reminder of their meanings. The two I chose were described as 'paper' and 'unmoving'.

You can check the entire screen and, every time a word is in doubt, you are given the option to replace it or leave it alone. The problem is that Bookshelf hangs on to its own dialogue box display and doesn't let you see where in the text the word lies. Once you've accepted or rejected a word, the dialogue box clears and you can actually see the word being replaced in your document. By then, though, it's too late if you've made the wrong choice. It will also waste time replacing a word in your text even when you've selected the same spelling.

It's a pity that such an advanced medium has been let down by such sloppy programming.



***Trivial Pursuit* fans will have hours of fun using the Bookshelf Almanac. Up to three keywords can be combined when searching for references in the text. Over 1000 pages of text plus an index occupy less than one fifth of the disk capacity**

Business information sources

If you have a business problem — maybe it's staff motivation or where and how to raise money — this part of Bookshelf will help you home in on the right sources of advice. All the information sources are described in some detail, so you can make a fairly good judgement of where to go for that missing information.

The *Financial Times*, *The Economist* and *Euromoney* were in there, but no *Personal Computer World*.

Documentation

The *User's Guide* is a work of art. It's printed on good-quality paper, is 65 pages long, and is filled with jazzy graphics. It looks wonderful but it's not actually that good. It gets you going, though. The accompanying *Quick Reference Guide* — 21 pages of approximately A5 size — is just that, a quick reference. I felt that a real reference section in the *User's Guide* was desperately needed.

Conclusion

This is just the first step on a long road. The potential of this medium is huge for any kind of information which needs to be accessed in fairly small chunks. At £1000 for a complete system you would have to be pretty serious about needing information on tap like this; but, as the range of CD-ROM reference disks grows and the cost of players drops, I can see this becoming a very attractive way of accessing information.

Bookshelf is a worthwhile first product but it is definitely ragged around the edges. The product is inconsistent, especially the intelligence of the various sections. Simply to match text strings is not good enough when other applications in the same suite can display so much more native wit.

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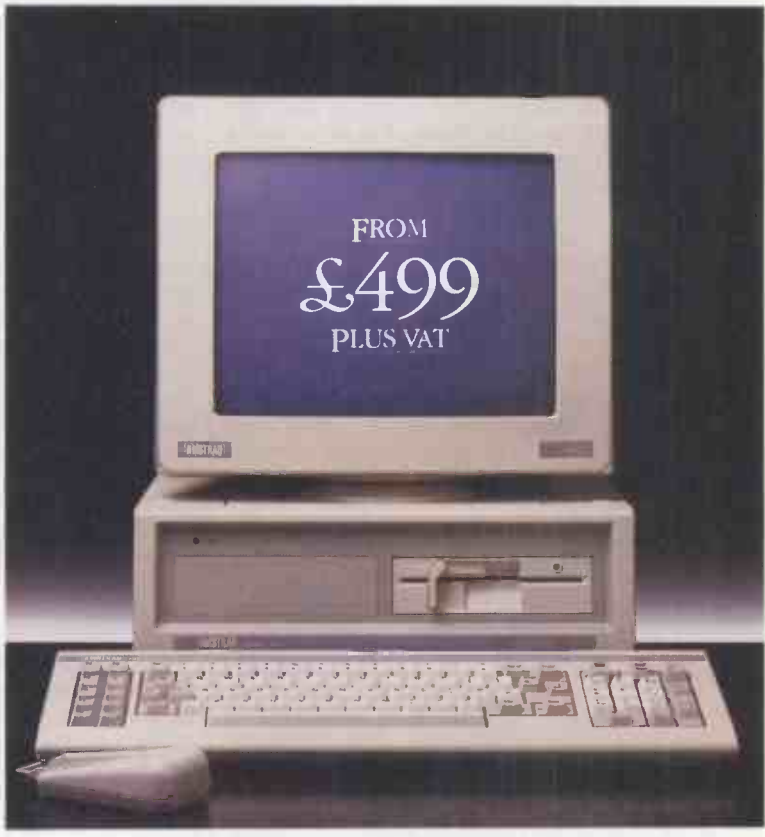

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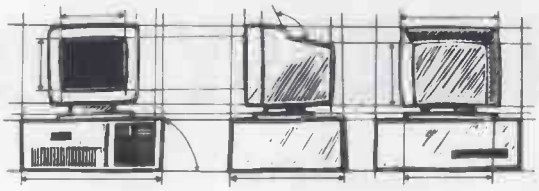


PC/AT toolboxes

Just how much room is there in the portable PC market? Peter Jackson examines three more contenders, from NEC, Sharp and Walters — power computing in a 'lunchbox'.

The launch of the Compaq Portable III two years ago legitimised a brand new segment of the portable computing market, offering a compromise between the battery-powered laptop with limited functions and storage and the full-featured portable that was really just a desktop PC in a different external package.

The Portable III made no performance compromises, and was at launch the fastest machine that Compaq had on its books. It came with a standard 5¼in floppy drive and a fast high-capacity hard disk, with an optional box that could hold standard AT-style expansion cards, and could only run on mains power. But it used a flat-panel plasma screen rather than a CRT to save space and weight, making it possible to fit everything into a smaller external casing that has been described as a 'lunchbox' or 'toolbox' form factor.

Naturally, once a successful new market segment had been defined, everybody else thought of it as well. And the three machines discussed here are simply three of the latest in the rush embodying the different pricing levels involved. However, all of them have one feature in common. They are all around 10lbs lighter than a traditional PC-compatible portable, and around 10lbs heavier than a PC-compatible laptop.

NEC PowerMate Portable

Japan's NEC, now the biggest chip maker in the world, has never made much of a splash in the computer business. After getting off to a bad start with the CP/M-based PC8001 in the early days, it has produced a series of adequate but unexciting machines under the Advanced Personal Computer (APC) label. Now, with the APC IV PowerMate range, NEC seems to have got serious. The PowerMates are top-end AT-compatibles at competitive prices, and the PowerMate Portable is simply one of the line.

Externally, the Portable looks too big for a lunchbox — it is around the same size and shape as a small-footprint AT like the Tandon Targa stood on end, with a hefty solid metal carrying handle at the top. The reason for the extra height is soon apparent; removing a panel from the top of the machine reveals two full-length AT-compatible expansion slots, one short AT slot, and one short 8-bit PC slot. Expansion boards plug in vertically, running across the full width of the machine.

That extra height may make the machine harder to carry, but the decision to include slots also gave NEC some design opportunities. Operating a simple catch releases the detachable keyboard that forms the whole front surface of the case, and reveals a display that uses the full height of the front panel to offer a nearly-square 9in LCD screen. The screen angle can be adjusted at will, but the PowerMate uses nothing so flashy as the Compaq Portable III's 'garage-door' cantilever hinge. Instead, the screen is hinged at the top, allowing the bottom to be pulled out of the case. There are no ratchets, and friction alone is used to hold the screen at the desired angle.

The only other features on the front panel are three indicator lights to show when mains power is on, when the hard disk is being accessed, and when the processor is running at its fastest 10MHz speed, along with a simple knurled wheel to adjust the LCD contrast.

From left to right: the Walters LCD Portable, the NEC PowerMate Portable and the Sharp PC-7200

Looking around the rest of the machine, it is easy to overlook the disk drives altogether since NEC has chosen to buck the Portable III and use 3½in drives. More, it is using the smallest drives possible, both, naturally enough, built by NEC itself. The 720k floppy is just 20mm high and no wider than the disk slot, while the 40Mbyte hard disk is the same width and less than twice the height. Against the overall size of the machine, they look insignificant.

The drives are at the right-hand end of the case, next to a conventional PC keyboard socket for those who prefer a full-scale Enhanced layout. And the only other feature at

this end is a bewildering array of DIP switches, three eight-way and one four-way, along with a simple toggle switch to select CGA or EGA emulation on the LCD screen.

The back panel is completely blank, and all the other external connectors are at the left-hand end. These comprise a 25-pin parallel port, a nine-pin RS232 serial port, an IBM-standard RGB connector to drive an external CGA or EGA monitor, and a 36-pin connector for an external floppy drive — presumably a 5¼in drive for program and data transfer purposes. Next to these are the three blanking plates for the expansion card connectors, normally hidden behind a snap-off panel, the cooling fan, and the mains input socket.

Internally, the design is simple and conventional. All the computer electronics are built onto a single PCB covering the entire area of the back panel, with a single large expansion socket that connects to an expansion daughterboard. This daughterboard mounts at right angles to the main PCB and holds the expansion slots. As mentioned earlier, there are four such slots. Two are conventional full-length ones, while the other two are packed closely together, end-to-end. One of these, the 16-bit short slot, has no access to the outside world at all and normally holds the hard disk controller, while the other will only take a short 8-bit card such as a second serial port.

The main PCB is built around a 10MHz 80286 processor, surrounded by the now-standard group of eight Chips and Technologies custom circuits. The RAM on the board is oddly divided into three separate blocks, one containing 18 256kbit chips and six 64kbit chips, another with eight 64kbit chips, and the third with four more 64kbit chips. However that memory is split between the LCD screen and user RAM, there is the usual 640k of RAM reported by the power-on self-test routines.

Also included on the board are an 80287 maths co-processor socket, four ROMs holding the various Phoenix IBM-compatible BIOS routines, a Western Digital floppy disk controller, and the control logic for the LCD screen.

As you might expect from a major company like NEC, the board is a clean and solid piece of work with no odd jumper wires or other kludges. But it will be a configuration nightmare for users and dealers; besides the four DIP switch blocks accessible on the outside of the case, the PCB holds an astonishing five more eight-way DIP switches.

The keyboard will cause similar confusion for users. Although it is much deeper than a conventional PC keyboard thanks to the extra height of the machine, it still has the typical laptop problem of cramming everything into a limited width. NEC has

got round this by moving one entire block into a very odd position indeed, directly above the numeric keypad. This block consists of the four separate cursor keys found between the QWERTY and numeric pads on normal Enhanced layout keyboards, and the NumLock, PrtScr, Scroll Lock, and Pause function keys.

This is only one of NEC's departures from the new Enhanced standard. The alternative set of editing keys, including Home, End, Insert, Delete, and PgUp and PgDn, is missing completely, as are the grey Enter and slash ('/') keys from the numeric pad. The left shift key has been extended, and the backslash ('\') key moved from next to the 'Z' key to a position above a reduced-size Enter key. However, there are the expected 12 function keys, and Escape is still in its odd position at the top left-hand corner.

In use

Powering-on the machine produces the familiar noise of any AT, a combination of fan and hard disk drive. Indeed, the PowerMate Portable was noticeably noisier than the AST AT clone sitting next to it at the review site.

The LCD display is very reminiscent of that supplied with the Zenith Z-181 laptop, with a blue surround and a blue on yellowish-grey text display which is clear and sharp thanks both to the backlighting and to the EGA compatibility of the screen. This compatibility was tested with a copy of Microsoft Word 4.0 on 3½in disk, which successfully produced a 43-line display on the LCD just as it does on a conventional EGA CRT.

The display was considerably slower than an EGA CRT however, with letters seeming to seep onto the screen as keys were pressed rather than pop up sharply. This can be irritating and distracting when the screen is used for long periods, and is inferior to the fast, glowing amber-on-black display of plasma panels. But the large, square LCD is superior in its turn to the squatter screens found on the Compaq Portable III and on other lunchbox or laptop machines.

The keyboard is excellent in feel, and NEC seems to have got closer than most to the clackety sound and tactile feedback of the IBM original. Compared to the spongy feel of many clone keyboards, both portable and desktop, it is a refreshing change.

The system software provided is MS-DOS 3.2 rather than the newer MS-DOS 3.3, and the compatibility software comes from BIOS specialist Phoenix Technologies. There are a few quirks and additions; holding down a key while the machine is booting bypasses the memory testing routines, and three extra software utilities are provided specifically for the Portable. TURBO sets the processor speed to its top 10MHz rate; while TURBOFF sets it to 8MHz, and RETRACT retracts the heads on the hard disk to protect both them and the drive when the machine is to be moved.

Otherwise, everything worked as expected. The use of 3½in drives limited the amount of software that could be tried on the machine, but both Microsoft's Word 4.0 and Migent's PageAbility worked with no problems.

The same could not be said of the copy of Xerox's Ventura Publisher supplied on the review machine's hard disk, since the batch file that was supposed to start it did nothing of the kind and we could discover no other way of getting it going. But there is no reason to doubt that NEC and Phoenix have made the PowerMate Portable as compatible as any other AT.

One drawback was the inability to switch processor speeds from inside applications using the keyboard; the only way to do it was to quit back to the MS-DOS prompt and run TURBO or TURBOFF. Of course, these commands can be included in batch files used to start up recalcitrant programs or copy-protected ones in slow 8MHz mode, and then go back up to 10MHz after they have finished. But this method does not allow copy-protected programs, say, to be loaded in slow mode and then actually run in fast mode.

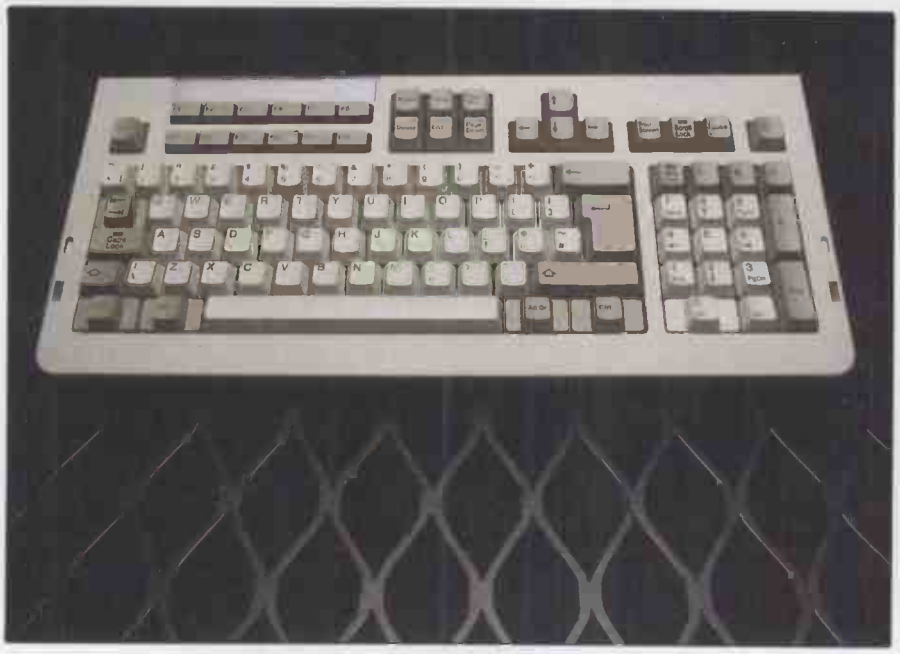
The keyboard takes up an unusual amount of desk space. The cursor key cluster sits in a curious position above the numeric keypad

Four blanking plates can be seen, but the NEC uses three expansion cards

Sharp PC-7200

Saying that Compaq legitimised the lunchbox portable may be true, but it is a little unfair to Sharp. The original PC-7000 had many of the features that the Portable III brought to market, such as a flat panel display, 5¼in drives and mains-only operation, and lacked only fast AT compatibility. That has been put right in the PC-7200.

Externally, the PC-7200 has more of the toolbox look to it, a small suitcase-style handle on top of a mainly featureless grey block. As usual the keyboard is clipped onto the front of the case, and removing this reveals a rather odd front panel. The LCD screen is wide and low above a hefty base, and next to it is a set of controls that look more like



The Sharp PC-7200 keyboard has the IBM Enhanced layout but in a much-altered design; the most significant difference being the re-positioned function keys

The Sharp has 25-pin RS232, Centronics printer and CGA graphics ports

something off a MIDI hi-fi system rather than a computer. At the top are four indicator lights: one showing when the screen is in standby mode, one indicating mains power, and one each for the internal floppy and hard disks. Below these are two sliders like volume controls which handle the contrast and brightness settings for the backlit LCD. And then comes a switch that can change the LCD between standard and reverse 'video', and the button market 'tilt' releases the screen catch and allows its angle to be adjusted.

The hefty base of the machine is there for the same reason as the extra height of the PowerMate Portable: to let users add standard expansion boards. In the Sharp's case, just one board can be fitted in the base of the machine, running flat across the full width of the bottom of the case. Getting access to the slot involves removing the base panel, revealing an odd AT-compatible 16-bit socket. The 8-bit part of the socket is fixed to a circuit board, but the 16-bit extension is a socket on the end of an unfixed ribbon cable. Fitting a 16-bit board into this combination could be a tricky job, given the wobbliness of this cable.

The disk drives, this time conventional 5¼in units, are at the right-hand end of the case and comprise a 1.2Mbyte floppy and a 20Mbyte third-height Winchester. Also at this end is the keyboard socket, using a US-type phone jack. Oddly, if the keyboard cable is left connected when the machine is closed up for carrying, it dangles out loosely; for safety, and to prevent catching the cable on passing objects, users need to remember to disconnect it from both keyboard and machine, and store it in a special compartment provided in the base.

The rest of the major connectors and controls are on the back panel this time. The obvious ones are 25-pin serial and parallel ports, and a nine-pin socket for connection to an external colour or monochrome monitor. This socket can be connected either to an IBM-compatible CGA monitor or to a standard monochrome monitor, since interfaces for both are provided. Less obvious are two small press-out panels to the left, designed for use when an optional internal modem is fitted.

Also on the back panel are controls to set the type of external monitor connected, change the processor speed — a choice of 6, 8, or 10MHz, switch between the different LCD modes and select CRT operation, and alter the speaker column. The only other external connector is a Sharp specific expansion slot hidden behind a metal plate in the base of the machine. This is an external expansion box that will accept two more full-length 16-bit cards, one full-length 8-bit card, and one short 8-bit card.

The internal electronics are very different from the conventional combination of standard components and Chips and Technologies custom circuits found in the NEC machine. The main circuit board makes extensive use of Sharp-labelled custom chips and surface-mounting techniques to cut down the board area, and as a result the board looks simple and uncluttered. The 10MHz 80286 is actually built by Advanced Micro Devices, and sits next to an empty 80287 socket. The standard 640k RAM is made up of 512k using 256kbit chips in the ever more common space-saving single-in-line packaging, and 128k in more conventional 64kbit chips. Memory can be expanded by plugging eight 1Mbit RAM chips into the empty sockets provided, taking total RAM capacity up to 1.6Mbytes for use with Xenix or, these days, with OS/2.

The connectors for the AT expansion slot and the expansion box are all along one edge of the board, with the modem socket on another edge, and the other interfaces come out vertically from the surface of the board. A second, inaccessible board, mounted back to back with the main PCB, controls the hard disk.

Again, unlike the NEC board, and typical of machines making heavy use of custom circuitry, the Sharp board is covered with engineering fixes including many small soldered-on wires and diodes attached across chip pins — evidence that the board has not yet been fully debugged.

Preparing the machine for action, it is interesting to note how Sharp has approached the same keyboard problem that NEC faced. Given the lower height of the PC-7200 the keyboard is smaller and lighter than NEC's, and has less space available for the Enhanced keyboard layout that is demanded these days. Sharp has decided to implement all the Enhanced keys, and even add one new key of its own (of which more later), by putting all the control keys above the QWERTY and numeric key areas. As a result, the inverted-T of cursor keys is above Backspace, the duplicate set of six editing keys (Home, End, PgUp and so on) is to the left of that, and the 12 function keys, much reduced in size, are arranged in two rows of six and use small push-buttons rather than full keycaps.

In use

The first noticeable thing about the PC-7200 is that it is extremely quiet,

so that you have to press your ear to the case to hear anything at all. This is despite the fan and hard disk, and was particularly noticeable while the NEC PowerMate or the AT clone were running nearby.

The LCD display is similar to that on the NEC machine, with the same blue backlighting and a greyish screen background with dark blue text. This time the dotty nature of the text was more evident, thanks to the limited cell size of the character set used in both monochrome or CGA emulation. As with other laptops and portables the display aspect ratio is around 3:1, and this makes it hard to believe that there actually are 25 lines displayed on the screen until you type them in and count them. This is particularly noticeable when running graphics programs in CGA mode, with the clock in Microsoft Windows, say, looking so distorted that it is not easy to read.

The LCD screen has only three possible positions, set by a ratchet controlled by the front-panel push-button, and the brightness and contrast controls give only minimal change between illegible darkness and illegible white-out. But there were no problems in obtaining a readable display in various lighting conditions, thanks to the backlighting and the non-reflecting surface of the display.

Using the oddly-laid-out keyboard was surprisingly easy, even in programs like WordPerfect where heavy use is made of the function keys. In most Enhanced keyboards on desktop machines, the function keys are in any case too far above the top row of the QWERTY section for easy touch-typing use, and if you have to look at the keyboard to hit one, you might as well look at two rows of push-buttons rather than one row of conventional keys.

The major problem, however, was the cursor key pad, which is too far away from other keys and in a non-intuitive position. Most users except the most number-intensive will want to boot up with NumLock off, and use the cursor keys on the numeric pad instead.

Sharp provides no special utilities with the machine, although some of the features often provided in software are implemented in hardware instead. For example, it is possible to switch processor speeds in the middle of a program simply by sliding the back-panel switch from its normal 10MHz setting to 8MHz or 6MHz, with no interruptions. And you can also switch between the LCD and CRT displays at any time with another back-panel switch.

The mode of the LCD display can be changed by a third switch, but this must be matched with the setting stored in CMOS RAM. To do this, Sharp has provided a special SetUp key at the top right of the keyboard, which calls up the configuration program. In fact, this is nothing special; all it does is run a setup utility program, and can only be called up from the MS-DOS prompt and not from applications. It is debatable whether using this key is any better than typing SETUP at the prompt, and it must be put down to gimmickry. The setup program itself lets users set the usual AT options, but at least does it in a menu-driven and easy-to-understand way.

If you can live with the squashed-up LCD screen and CGA resolution, then the Sharp is a neat machine with no compatibility problems that we could find. The only slight hiccough was that the monochrome and CGA displays look identical in text mode, and it is easy to forget which is currently set. But a flick of the mode switch solved that problem, and the machine ran graphics-intensive programs like Windows with no problems. As with the NEC, that is what you expect from a reputable maker using a Phoenix BIOS.

The Walters LCD Portable keyboard conforms almost exactly to the original IBM PC/AT layout. Consequently, there is no separate cursor key cluster

Walters LCD Portable

Walters has one of the widest ranges of cheap PC compatibles around, and the LCD Portable is simply one in that range. And the machine has more in common with the rest of the Walters range than the NEC or Sharp ones do with their respective ranges. In fact, the LCD Portable is built around a standard desktop PC motherboard, albeit a small one, with pretty much standard features and pretty much standard expansion boards plugged into it to give the portable its special features.

The Walters' two ports are on expansion cards. The video card is CGA

As a result of using this design, the LCD Portable is larger than the Sharp, which it outwardly resembles. In particular, the casing is much deeper to accommodate the thickness of the keyboard, the LCD screen, and then the height of a normal AT-type expansion card.

Removing the keyboard by pressing two spring-loaded buttons on top of the case reveals an uncluttered front panel with another long and low LCD screen. Three lights indicate the usual motherboard features, including a real-time battery-backed clock and calendar and various timers and interrupt controllers.

Walters has avoided the portable Enhanced keyboard problem by ignoring it. Although the LCD Portable keyboard has 12 function keys across the top of the board, the rest of it has a normal AT layout with Ctrl

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next to A, a large Enter key, and a numeric pad that doubles as a cursor control and editing pad. The separate cursor and editing key groups of standard Enhanced keyboards are missing altogether, but Walters does at least use a standard keyboard connector so that larger Enhanced keyboards can be plugged in.

In use

The Walters machine is also quiet, despite the fan and the 40Mbyte hard disk fitted in the review system. The LCD screen is again a blue-backlit model, but is noticeably inferior to those fitted on the Sharp and NEC machines. The contrast is lower, the background colour is muddier, there is some shimmer like that seen on CRTs close to unshielded power supplies, and there are distracting vertical bars on the background whenever text of any kind is displayed. This last defect is particularly noticeable when the display is completely filled with text, which also shows up the cramped nature of the long and low screen when the full 25 lines are used. The friction hinge on the display is also not particularly effective and it is easy to dislodge the screen by nudging it.

The keyboard is also a good example of the cheap clone kind, with more key travel than usual and a reasonable feel. The AT keyboard layout is a refreshing change after the infelicities of the so-called 'Enhanced' design.

The Walters' Seagate drive comes with Seagate's own Disk Manager partitioning and diagnostic software, developed by Ontrack Systems. This gives users control over the way the hard disk is configured and provides information on defects and faults, as well as offering a head-parking utility that is recommended for use whenever the machine is used. Also supplied with the machine is a set of utilities to manage the interface of the Hercules emulator and Basic programs, although these are not necessary for everyday use of the emulation. Otherwise, the system software is standard MS-DOS 3.21, running on top of an Award BIOS. Award is Phoenix's major competitor, and has an equally high reputation for compatibility.

The CPU speed can be switched from 10MHz to 6MHz either by flicking a switch on the side of the machine or by typing Ctrl–Alt–+ to toggle between the speeds. This can be done at any time inside an application or out, and was shown to best effect by running Landmark's SPEED test program. With the machine in 6MHz mode, SPEED showed it running at exactly 6MHz, or three times the speed of a 4.77MHz PC; flicking the switch instantly changed the display to show 12MHz and 6.3 times PC speed. The extra 2MHz is due to the zero-wait-state RAM used on the motherboard, since SPEED assumes that there is one memory wait state when it makes its comparisons. In everyday use, the Walters LCD Portable runs like a 12MHz AT with one wait state, rather than a 10MHz one with zero wait states.

Again, as expected, there were no compatibility problems with the machine. Interestingly, the LCD controller board drives both CGA and monochrome Hercules displays externally, but only emulates CGA on the LCD. The particular monitor connected, and the LCD display mode, are set by a DIP switch on the display controller board, and there is also a two-way switch that can be used to reverse-out the LCD screen if required. In one of the modes, the LCD can use patterns to emulate colours in CGA, but the user is advised to find out what these look like by trial and error.

The only problem found with the machine concerned the floppy disk drive. Apart from the physical problem, which was that the floppy was positioned behind the hard disk drive and was hard to get at from the front of the machine, the drive produced 'general failure' messages at one point with both 1.2Mbyte and 360k disks. A reboot fixed the problem, which then did not reappear.

Technical specifications

NEC PowerMate Portable

Processor:	80286, 8MHz or 10MHz switchable
RAM:	640k
Mass storage:	720k 3½in floppy, 40Mbyte hard disk
Display:	Backlit supertwist LCD, 80×25 or 80×text, CGA and EGA graphics emulation
Keyboard:	93 keys, modified Enhanced layout
Expansion:	Two long 16-bit slots, one short 8-bit slot in hard disk configuration
I/O:	External floppy disk and monitor ports, RGB monitor port, serial and Centronics ports
Operating system:	MS-DOS 3.2, Phoenix BIOS

Sharp PC-7200

Processor:	80286, 6, 8, 10MHz switchable
RAM:	640k expandable to 1.6Mbytes
Mass storage:	1.2Mbyte 5¼in floppy drive, 20Mbyte hard disk
Display:	Backlit supertwist LCD, 80×25 text and 640×200 CGA graphics
Keyboard:	103 keys, modified Enhanced layout
Expansion:	One long 16-bit slot, one Sharp slot for expansion box
I/O:	External RGB monitor port, 25-pin Centronics and serial ports
Operating system:	MS-DOS 3.2, Phoenix BIOS

Walters LCD Portable

Processor:	80286, 6MHz or 10MHz
RAM:	1Mbyte
Mass storage:	1.2Mbyte floppy disk drive, 20Mbyte or 40Mbyte hard disk
Display:	Backlit supertwist LCD, 80×25 text and 640×200 CGA graphics; external CGA or Hercules monitor supported
Keyboard:	86 keys, AT layout with 12 function keys
Expansion:	Four free 16-bit slots; two almost inaccessible
I/O:	External monitor port, then this is the preferable one of the three

Conclusion

Compaq's Portable III and Portable 386 are obviously designed as machines that will be used on desks most of the time, and transported rarely; the availability of a bolt-on expansion box and tape streamer show that. And who would want to carry a 20MHz 80386 with a 100Mbyte hard disk to and from work every day? The competition — and the three machines here qualify — are competing on price and extra functions, as usual. But it remains to be seen whether the portable mains-powered PC market is as strong as Compaq and the rest think it is — or whether the small number of managers who need such a machine have already been satisfied by Compaq's glossy offering. NEC, Sharp and Walters are hoping that saturation point has not been reached.

The **NEC PowerMate Portable** costs US$3995. Details from **NEC** on (01) 993 8111. At the time of going to press the UK price was not available. The **Sharp PC-7200** costs £2700 from **Sharp** on (061) 205 2333. The **Walters LCD Portable** costs £1733 from **Walters** on (0494) 32751. All prices exclude VAT. END

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A computer which can provide up to 3 Mbytes of memory ... which works on four AA batteries ... which comes with a complete suite of powerful, user-friendly software built in.

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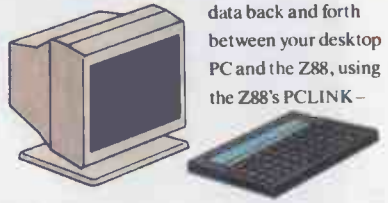
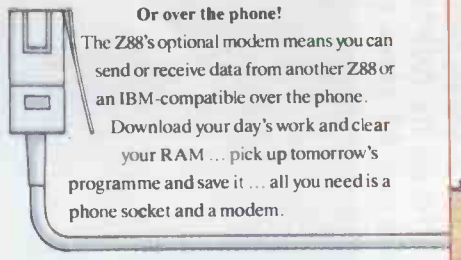


which also converts resident Z88 software files into either Wordstar or Lotus 1-2-3 files. A BBCLINK for BBC micros is also available.

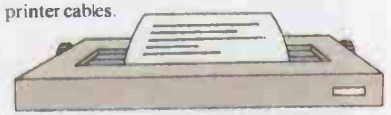
Or over the phone!

The Z88's optional modem means you can send or receive data from another Z88 or an IBM-compatible over the phone. Download your day's work and clear your RAM ... pick up tomorrow's programme and save it ... all you need is a phone socket and a modem.



Printing without problems

The Z88 drives virtually any printer – serial or parallel – directly through either of the Z88's printer cables.



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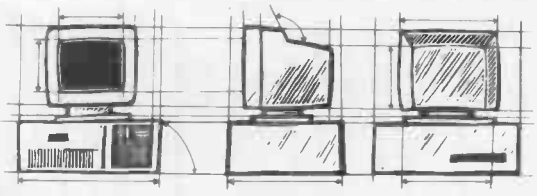


Micro Midget

Despite the growing interest in powerful, high-specification micro systems, a home can still be found for a small MS-DOS unit. Martin Wren-Hilton checked the service offered by ACPM'S Micro Midget, a compact, modestly-behaved AT-class system.

A few months ago, IBM announced that it had 'shipped' its millionth Personal System/2 computer. (IBM definition for 'shipped': transferred from manufacturing facility to warehouse, not necessarily delivered to customers.) According to industry estimates, nearly one half of those machines were Model 30s — which shows that for most office and small-business applications, simple MS-DOS workstations are still popular in a world where all the talk is about the 80286 and 80386.

The Micro Midget from ACPM (Associated Computer Product Marketing) is a neat MS-DOS machine aimed at the same market as the PS/2 Model 30, the Amstrad PCs and the like. It is really called the ASI-009 and is manufactured in the States by a company called Aquarius Systems Inc, although it is only available in the UK by mail order from ACPM.

Hardware

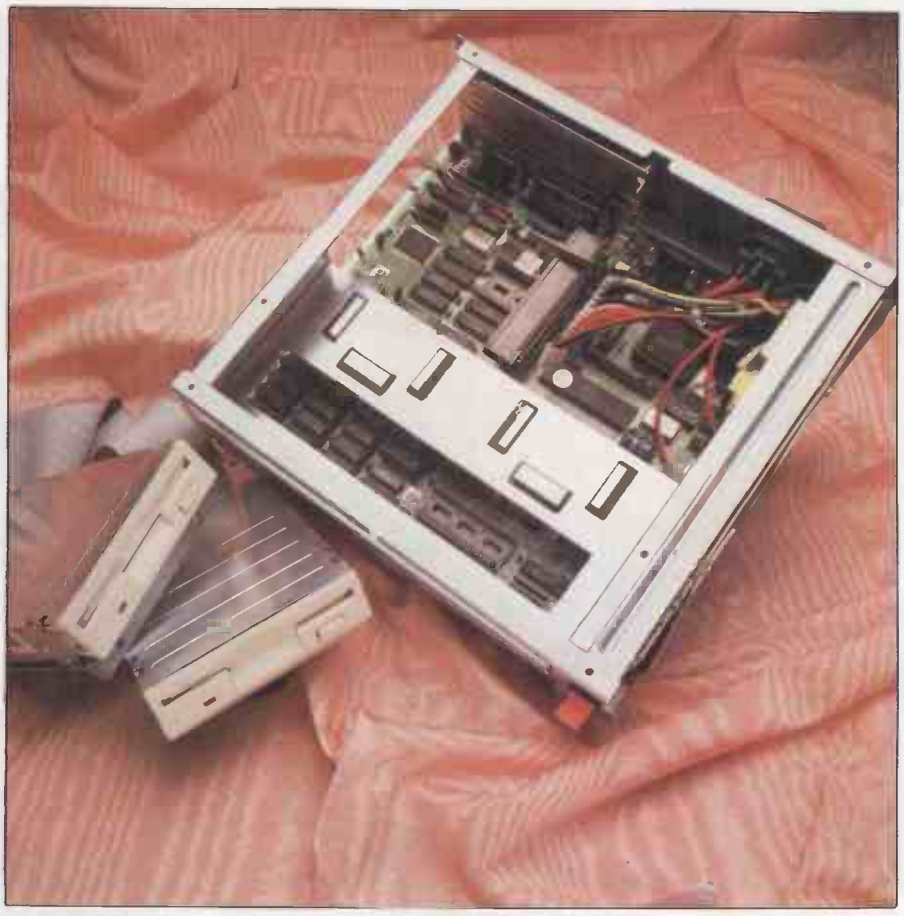
Physically, the system unit is one of the smallest on the market: at 10ins ×10ins×3ins, I suppose that's why ACPM decided to market the machine as the 'Micro Midget', although the name sounds more like a cartoon character or a small, plastic toy figure.

The heart of the Micro Midget is an Intel 8088 microprocessor which can be clocked at 4.77MHz (like the original IBM PC) or at 10MHz (turbo mode). The basic Micro Midget comes with 256k of RAM, which is barely enough to run most modern application programs. For only slightly more than the base price, ACPM can supply you with 640k (which is what the review machine had).

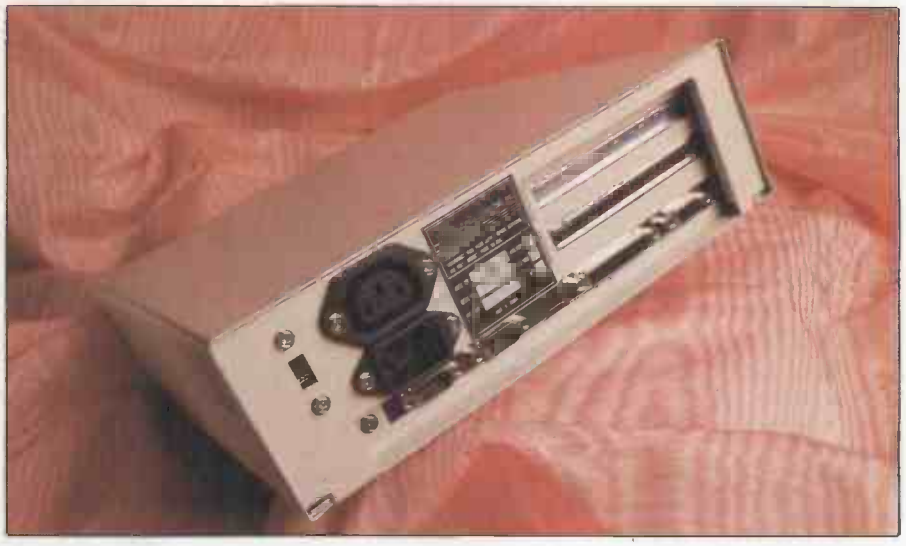
Setting up the Micro Midget required a bit of fiddling inside the case to set two jumpers and a DIP switch to select the type of monitor attached — Hercules-compatible monochrome TTL or CGA-compatible RGB colour.

Next to the display port on the rear of the machine is a parallel printer port (standard 25-pin D connector) and two serial ports (both with 9-pin D connectors). Providing a full complement of ports as standard obviates the need to buy expensive, space-consuming add-in adaptor boards.

The system unit is attached to the mains by means of a standard IEC power cord (as used on all IBM Personal Computer equipment). A socket above it, on the rear of the machine, provides power to the monitor which saves unnecessary cabling and means that the system (including monitor) can be powered from a single plug.



All the components, including power supply, are on a single PCB



For such a small machine, the Micro Midget is well-equipped with ports

The keyboard supplied was a 101-key keyboard, sometimes known as the 'Enhanced' model, although the standard Micro Midget comes with an 84-key keyboard. For those who have never used either version, the 101-key variety, which was first introduced with the IBM PC XT 'S'-models, is much easier to use than the slightly cramped 84-key unit which used to be the standard for PCs and ATs.

There are 12 function keys across the top of the keyboard and separate keypads for the cursor control, numeric input and system control functions (Page Up, Home, and so on). At the top right are indicator LEDs for Caps Lock, Number Lock and Scroll Lock. On the review keyboard, which was a US model and did not have a '£' sign, there was an extra 'Macro' key at the bottom left of the keyboard. I could see no use for it, and ACPM knew of none. The lack of a '£' sign was a

The review machine's keyboard was a foreign AT-compatible unit. The final release will have a standard PC keyboard

feature of the review model, according to ACPM, and all models shipped to customers will have English keytops.

The keyboard plugs into the Micro Midget through a DIN connector on the front of the machine. Also on the front, to the right, is the red power switch. The design and location of the power switch resemble the PS/2 family of computers, all of which feature similarly-mounted power switches.

Many personal computers have the monitor power socket on the rear of the machine wired in with the computer's power switch. Not so with the Micro Midget — the display must be switched on separately. Once switched on, a 'power on' LED above the power switch lets you know that the system is running. There is no cooling fan in the case, so you can't 'hear' that it is switched on. After a brief memory test, the Micro Midget boots MS-DOS from drive A:.

Two storage configurations are available: a single 720k 3½in floppy disk drive, or dual drives, which were fitted to the review machine. Due to space limitations, only one expansion slot is available when two floppy drives are installed, whereas the single-drive machine has two full-length expansion slots available.

If you are considering using one of these machines on a network or with a hard-disk card, it is probably better to have just one floppy disk drive installed for the extra expansion slot you get in compensation. ACPM does not offer any hard-disk options for the Micro Midget. As the use of a drive bay would take up one expansion slot, the best solution would be to use a hard-disk-on-a-card. Because cards are mounted horizontally in the Micro Midget, and to conserve space, the Plus Developments' HardCard would probably be the best choice.

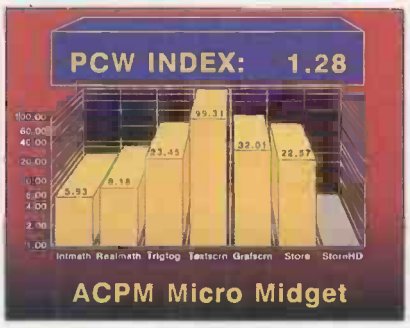
Opening the case is simple — just four screws on the bottom have to be removed in order to slide off the top half. Inside, the miniaturisation and effective use of space become apparent. To the front are two Fuji-manufactured one-third height floppy disk drives connected to the motherboard by a ribbon cable. To the right is a long, thin power supply that extends the full length of the case.

All external ports are connected directly to the motherboard, which integrates the processor, RAM, BIOS, ROM, dual-mode display sub-system, real-time clock with battery back-up, and one or two standard IBM-compatible expansion slots.

Upgrading the memory from 256k to either 512k or 640k merely involves plugging in extra RAM chips and configuring the relevant DIP switches on the motherboard. If you decide to do this yourself, make sure that the RAM has an access time of 120ns (nanoseconds) or less, to cope with the 10MHz clock speed. Further RAM expansion is possible by installing a LIM expanded memory board for those applications which have been designed to make use of it.

Input/output requests from application programs and MS-DOS is handled by 8k of BIOS ROM. Most clones have either Phoenix or Award BIOS, which are the two most well-known. The Micro Midget's BIOS is the ERSO BIOS produced by the Taiwanese Government and includes the ability to toggle the processor speed from 4.77MHz to 10MHz and back by pressing Ctrl-Alt-Minus together. The speed at boot-up can be selected by setting a DIP switch on the motherboard. When in 10MHz mode, the

Benchmarks



See 'Time trials', *PCW*, November, page 138

cursor appears as a solid block, and in 4.77MHz mode, it appears as a single line.

Considering its diminutive size, the Micro Midget has only one SMT (Surface Mount Technology) component — a Yamaha 6363 graphics adaptor. This flat-pack chip provides two modes of operation: HGC (Hercules Graphics Card) emulation for use with monochrome displays; and CGA (Colour Graphics Adaptor) emulation for use with colour displays. Switching between the two, as described above, must be done with the power switched off.

Attached to a monochrome monitor, the Micro Midget can display text (80×25) or high-resolution graphics (720×348). With 64k of display memory, two 32k high-resolution images can be stored at once.

The colour display was slightly disappointing. At a time when the MCGA (Multi Colour Graphics Array — 640×480), VGA (Video Graphics Array — 640×480 with more colours) and EGA (Enhanced Graphics Adaptor — 640×350) are becoming established, the decrepit CGA looks ready for the rubbish bin, with its lowly 640×200 graphics mode.

In 640×200 graphics mode, the only 'colours' available are black on white. With a painful 320×200 display, four colours can be squeezed out, but the rules that govern which four colours you can use are complicated. The Yamaha 6363 carries emulation too far, in my opinion. It even produces a slow, flickering display when text scrolls in the CGA mode, just like the old IBM adaptor.

By comparison, the MCGA chip set in the IBM PS/2 Model 30 has the same amount of display memory (64k) but produces a far sharper and more colourful display, although the analogue monitors required are slightly more expensive. Fortunately, the Micro Midget accepts plug-in display adaptors, unlike some clones (notably the Amstrad PC1512) which does not. By changing two jumpers inside the machine, the graphics subsystem can be completely disabled, which I would recommend if you want a colour display.

Also on the motherboard is a real-time clock powered by a rechargeable battery, and a socket for an optional 8087 mathematics co-processor: unfortunately, the socket is hidden under a disk drive which would have to be removed if you wanted to install one. Certain applications, most notably CAD packages like AutoCAD, speed up quite dramatically when a co-processor is installed.

Software

You will need MD-DOS to operate the Micro Midget, although it is listed as a separate item in the ACPM price list. The version the company supplies is 3.21, which supports 3½in disks. Also available from ACPM is DOS Plus from Digital Research.

For compatibility, I tried a number of well-known applications including Microsoft Works and WordPerfect Executive, which ran without a hitch. However, whenever I ran GW-Basic, the machine switched to 4.77MHz mode, so the *PCW* Benchmarks are *slow*.

Documentation

The review machine was supplied with a preliminary manual, although the contents and presentation were very good. Apart from an unnecessarily long discussion of the keyboard, there was a lot of useful and interesting facts with clear diagrams. The version of MS-DOS that I was provided with was also preliminary, so I didn't receive any documentation for that. It is most likely, however, that ACPM will supply Microsoft's own OEM material, as supplied with many clones.

Price

The Micro Midget with a single drive and 256k costs £290. For a 640k system, add another £59. A second 3½in disk drive costs £79, and Microsoft MS-DOS 3.21, £50. A 12in TTL monochrome monitor will set you back £105, a 14in RGB colour display, £265. Total system price, as reviewed, excluding monitor, is £478. (All prices exclude VAT and carriage.)

Conclusion

Probably the most important aspect to consider when purchasing a personal computer is the after-sales service. Obviously, buying from a mail-order company does not bring the advantages that you would expect when buying from a dealer. But, there again, you probably won't find a machine quite like this at your local dealer.

The service offered by ACPM was exceptionally good. The first machine I received had a faulty video chip; ACPM provided a replacement the following day. Perhaps that's because I was reviewing the machine for *PCW*! To be fair, though, ACPM was very helpful and efficient in all respects.

Although the base price seems low at £290 (excluding VAT), things start adding up when you consider the 'extras' (display, MS-DOS, and so on). If your requirements are for a small-footprint, simple MS-DOS workstation, the Micro Midget is a competent performer that, unlike most AT-class machines, leaves most of your desk free.

ACPM is on (0227) 712882. END

In perspective

At £290, ACPM's little Micro Midget may seem deceptively cheap. By the time a second 3½in disk drive is added, plus the cost of MS-DOS, and a colour monitor, and the RAM upgrade to 640k, the total looks more like £743 (plus VAT).

There are four big markets for small MS-DOS boxes like the Micro Midget — the home, education, lightweight business applications and, perhaps the most common, network terminals accessing a central file server. These markets are both highly competitive and price sensitive.

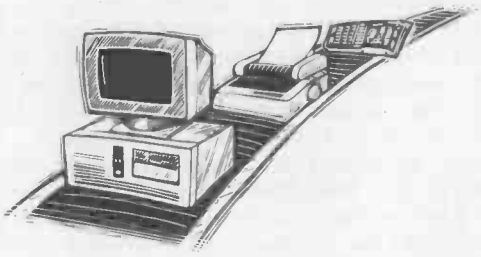
ACPM sells by mail order and has been trading since April 1987. Repairs can only be performed once the faulty machine has been returned to the company; nonetheless, buyers seriously concerned about maintenance will probably buy a maintenance contract anyway.

The three real strengths of the Micro Midget are that it is really small, has a full complement of ports as standard, and the base model is cheap. If you can get hold of a cheap monochrome monitor and can get by with 256k and a single disk drive, then £290 is a hard price to beat.

Apart from the Amstrad, another machine which closely resembles the Micro Midget — at least in terms of its specification — is the Zenith eaZy PC. (See Benchtest, *PCW*, November 1987.) It, too, features 3½in disk drives, a small footprint and noiseless (fanless) operation. Where the Zenith scores highly is with its pin-sharp white-on-black monitor. However, it has little expansion potential (no industry-standard expansion slots) and, at a base price of £499, costs slightly more than the Micro Midget.

Technical specifications

Processor:	Intel 8088-1 running at 4.77/10MHz
Co-processor:	Optional Intel 8087
RAM:	256k, expandable to 640k
ROM:	8k ERSO BIOS, expandable to 32k
Mass storage:	One 720k 3½in disk drive
Keyboard:	84 keys comprising 10 function keys, 57 alphanumeric keys and 17 keypad key
Monitor:	Optional TTL monochrome or RGB colour
Display modes:	Monochrome text mode (9×14 pixels giving 720×350 resolution, two intensities); monochrome graphics mode (720×348, Hercules)



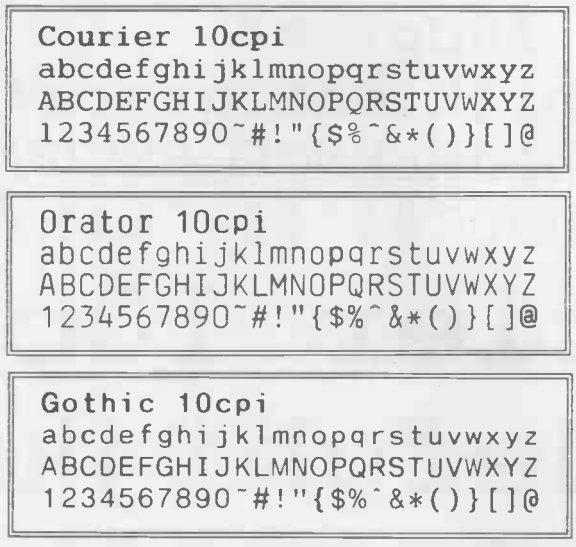
Canon BJ-130

If you're looking for impressive, laser-like printer output without the cost and irritating noise, the BJ-130's clever use of bubble jet technology could be ideal. Simon Jones was impressed with its high-quality output and its quiet operation.

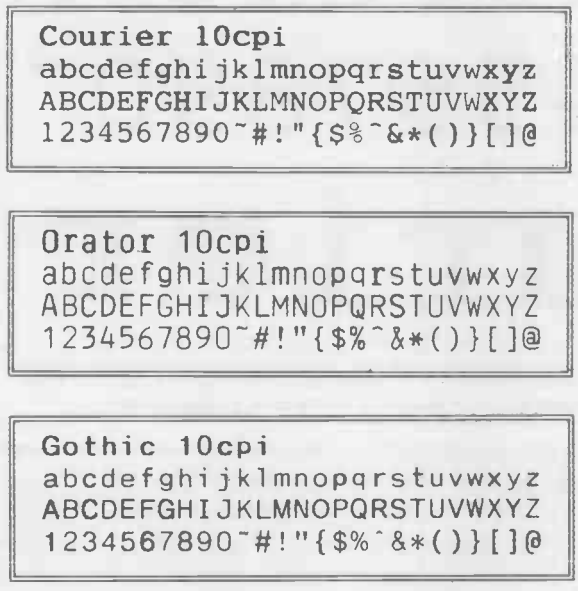
The Canon BJ-130 Bubble Jet Printer is a remarkable machine giving laser printer quality for the price of a good 24-pin dot matrix. The basic technology is not new. Printers that fire jets of ink onto the paper have been around for a few years, but this is the first one to give such high-quality output.

In this review, however, as well as considering the quality, I was looking for ease of use, useful features, speed, and how easy the printer is to set up, all from the point of view of a person who uses a PC for business. To carry out the review I used a Blue Chip PC — an IBM PC compatible — running WordPerfect 4.2.

To show how good the image from a BJ-130 is, compare it with an ordinary impact dot matrix printer. On a 9-pin printer the pins are arranged in one column of nine. A 24-pin printer has two columns of 12 pins each in the same space, which gives a much better quality output. The BJ-130 has one column of 48 nozzles giving print of such high quality that it is almost indistinguishable from that of a daisy wheel printer. The highest graphics resolution obtainable on the BJ-130 is an impressive 360 dots per inch: most laser printers under £4000 can



Courier is the resident font on the BJ-130; while Orator and Gothic can be purchased as plug-in cartridges. Canon plans to make a number of extra fonts available in the near future



An escape code enables the BJ-130 to print different shades of grey tint behind text, potentially very useful for desktop publishing

Unfortunately, bubble jet technology is no better at printing solid black than most dot matrix printers suffering the same characteristic 'streaky' grey lines

can manage only 300 dpi.

Most ink-jet printers use piezoelectric crystals to squirt the ink onto the paper. These crystals expand and contract when an electric current is applied to them, and this movement is used to squeeze ink onto the paper. Unfortunately, the crystals have to be a reasonable size in order to do their job. This limits the size of the print head and the packing density of the print nozzles.

However, a happy accident in Canon's Japanese laboratory in 1979 showed a way to create a print head with no moving parts.

The BJ-130 is called a bubble jet printer because bubbles of ink vapour are used to force liquid ink out of the print head. Each of the 48 nozzles has a heating element built into the nozzle wall. When the element is turned on, the ink touching it boils momentarily, making bubbles. These bubbles force a drop of ink to be fired out of the open end of the nozzle. The heating element is then turned off and the surrounding ink cools the vapour in the bubble, making it collapse, drawing fresh ink into the nozzle. As the print head moves across the paper, the heating elements are fired in sequence to form the letters or graphics required.

The bubble jet print head is cheap and simple to make as it has no moving parts. This also means that it can be smaller, giving more closely-packed nozzles and better print quality. One of its biggest advantages is that it is very quiet. The only noise it makes is the movement of the paper and the print head.

There is one distinct disadvantage, though: you cannot produce carbon copies or use NCR paper. If you need two or three copies of a document, you must either print it once and photocopy it or print it two or three times. Luckily, the BJ-130 is quite quick. Canon quotes 110 cps in High Quality (HQ) mode and 220 cps in High Speed (HS) mode.

The BJ-130 is a wide-carriage printer taking paper up to 16 inches wide. It comes with a cut-sheet feeder as standard; tractor feed is an optional extra.

Having a wide carriage means that this printer can take A4 paper both lengthways and sideways. The sheet-feed hopper can take about 100 sheets of 80 grams per square inch (gsm) paper. Ordinary photocopying paper works fine. The manual recommends using plain bond paper of between 52 and 81 gsm, which may lead you to think that using thicker paper or paper with a fancy surface may cause problems. In fact, I had no trouble at all using 100 gsm laid paper. (Laid paper has a rough surface and is often used for letterhead

notepaper for business.)

One font, Courier, is supplied as standard and there are two slots for optional font cartridges under a flap on the front. I was supplied with three font cartridges to try: Orator, Gothic and Gothic Outline. Although there are only two slots, you can have three extra fonts in the machine at once. There is a simple way to copy one font cartridge into the printer's RAM and then replace that cartridge with another one, thus giving you four different fonts to work with. The printer's RAM is volatile, however, and will lose its contents when the printer is switched off.

All fonts can be printed at 10, 12 and 17 cpi and can be proportionally spaced. You cannot use the term NLQ (Near Letter Quality) to describe the output of this printer because even when it prints at its fastest speed, it produces perfectly-formed letters. The only difference between HQ and HS modes is that the print is darker in HQ mode. There is no special draft-quality font. The high speed option merely prints characters as an 18×48 matrix rather than the high-quality 36×48 matrix. This is done by moving the print head twice as fast across the paper and printing only every other column of dots. Both fonts and pitches (character counts) can be selected from the control panel, as can other features.

The control panel consists of seven 'buttons' and 14 LED indicators (the buttons are really just coloured areas on the smooth plastic surface). The switch mechanisms are underneath and give a little click when you press the buttons. One of the buttons is marked SHIFT and this changes the function of the other buttons. Thus the MODE button, which switches between HS and HQ modes, becomes, when the SHIFT button is on, the FONT button and chooses between the built-in font, the two font cartridge slots and the font RAM.

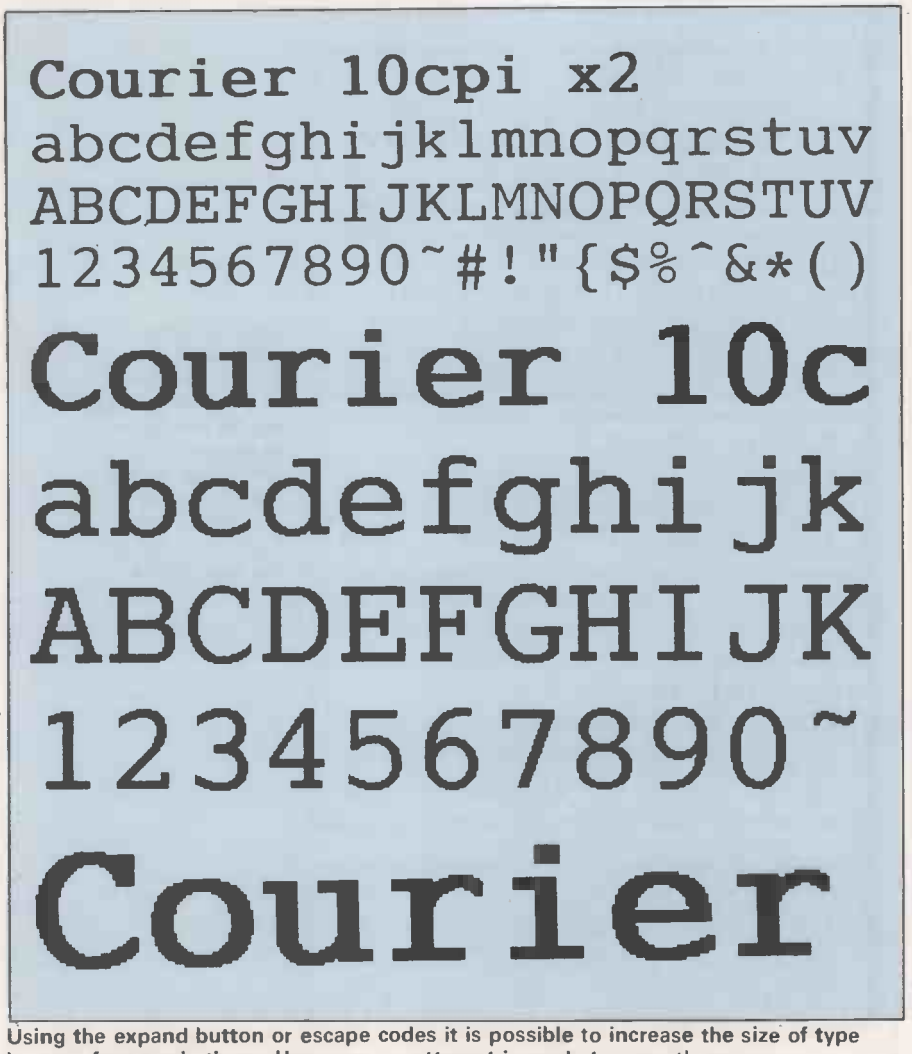
The REVERSE button makes the printer print white letters on a black background, and the SHADING button gives a pale grey wash under the letters. Both these facilities can, however, leave plain white spaces between the lines of print. This can be cured by printing at eight lines per inch rather than the more usual six, or by enclosing the print in box characters.

The EXPAND button allows you to expand the print to two, four or six times its original size, horizontally and vertically (that is, four, 16 or 36 times the area). The characters are still made from a 36×48 matrix so expanding them to more than twice their size does tend to show jagged edges. However, that apart, it is still a useful facility for producing signs and large labels quickly and cheaply.

There is a button marked CLEANING which will remove paper particles and dust which may have accumulated on the print head. You need to use this feature only if the printout has missing dots or the printer hasn't been used for some time.

There are LED indicators for most things on the control panel, including INK. One ink cartridge should last for about one million characters of HQ print — approximately 800 pages. Once the INK indicator lights up, you can only print about 10 lines more before you have to change the cartridge. Changing the cartridge is a very simple job, much easier than changing a ribbon on a daisywheel or dot matrix printer. But, clearly, it always pays to have a spare cartridge handy. They cost around £12.

Setting up the printer is quite simple. You clip one plastic panel into place to form a paper rest for the sheet feeder, two metal guards clip



Using the expand button or escape codes it is possible to increase the size of type by two, four or six times. However, no attempt is made to smooth curves

Speed Test Results

Test	HS10	HQ10
Text	0:40	0:54
Text Bold	0:44	0:58
Text Underlined	1:15	1:44
Standard Letter	0:31	0:39
Boxes	1:34	1:55

Note that each of these pages was printed separately, which meant that the print head had to be uncapped for each page. If you were printing a continuous run of pages, the times would be two seconds faster for each page except the first. However, the sheet feeder also takes time to line up the pages — approximately seven seconds per page. This would be avoided if the optional tractor were used. (Sheet feed times are not included in the table above.)

For details of these speed tests, see the article on 24-pin printers in the March 1987 issue of *PCW*.

onto the front for some unknown, possibly decorative, purpose, and that's it. Loading paper is simply a matter of putting some in the sheet-feed hopper. The ink cartridge and font cartridges slide easily into place and the parallel interface cable plugs in the back.

Unfortunately, Canon UK could not supply me with the DIP switch setting information. There are two banks of 10 DIP switches under the front flap, which control the default settings for MODE and FONT, paper length, and so on. This vital information will be contained in the manual when the printer becomes available.

Many word-processing packages now have drivers for 24-pin printers and, as this printer emulates a 24-pin printer, you should be able to get it to work with your WP package without too much difficulty. I use WordPerfect for all my word processing, and it incorporates a utility which allows you to create your own printer driver routines as well as modify existing printer drivers.

To use the PRINTER utility you must have full details of the control codes the printer responds to. As the manuals for the BJ-130 were not ready when I was testing the printer, I could not construct a full printer driver for it. It did respond to the driver routine for the IBM Quietwriter but, as the Quietwriter has only one font, I was restricted in the number of facilities I could use. Canon says that the BJ-130 will emulate an IBM Proprinter and an NEC Pinwriter if you set the DIP switches correctly.

Most routine operations such as changing ink cartridges, setting the DIP switches and installing new fonts can be accessed via a fold-down panel

The Canon BJ-130 is completely silent when idle, and is so quiet in use that when I first used it I thought there was something wrong with it. Canon quotes the noise level as being under 48dBa, roughly half as loud as a conventional dot matrix printer. There is a quiet whine as the print head moves across the paper and small clunks as the paper moves through the printer. When you first turn the printer on, when software sends it a reset code, or, about 20 seconds after it has finished printing, the printer makes a strange whirring noise. This is the sound of the print head being capped or uncapped. The print head must be kept capped when it's not in use.

The print head lives, when it's not printing, hidden away at the left-hand side of the printer and, unlike impact dot matrix printers, there is no flap or cover giving easy access to it. This is not, however, a problem as there is no ribbon to change.

Technical specifications

Price (excluding VAT)	£795
Dimensions	
Height	122 mm
Width	610 mm
Depth	347 mm
Weight	11 kg
Paper	
Minimum Width	4 inches
Maximum Width	16 inches
Maximum Thickness	1 sheet (<=0.2 mm)
Maximum Line Length	272 chars at 20 cpi
Ink Cartridge	
Life	1 Million HQ chars
Cost	£12
Number of Fonts	
Standard	1
Optional Extras	4
Cost	£60 each
Quoted Speeds	
High Speed 10 cpi	220 cps
High Quality 10 cpi	110 cps
Input Buffer	32k
Sheet Feeder	Standard
Serial Interface	Optional (#50)
Tractor Feed	Optional (#40)

Documentation

The lack of a finished manual caused some problems when I was trying to write this review, but, from what I did see of it, it is fairly well-written with clear explanations and diagrams. It comes in two parts. The first part is a *User Guide* which contains details of setting up and operation, including how to load the paper and change the ink. The second part is the *Programmer's Guide* which lists all the control codes, and is vital to those who need to write their own printer driver routines. The *Programmer's Guide* wasn't available at the time of writing, but if it's as clear as the *User Guide*, it should be OK.

Conclusion

All in all I was impressed with the Canon BJ-130. It is a nice machine to work with and blissfully quiet — and should be available by the time you read this (other bubble jet printers follow later in the year).

If you can forgive the lack of carbon copies, it is a good machine for those who want high-quality printing at a reasonable price. It is certainly cheaper than a laser printer, faster than a daisywheel and quieter than a dot matrix. I'd buy one.

Canon is on (01) 773 3173. END

Waiting for a miracle

IBM's much-heralded OS/2 brings with it a sophisticated multitasking system and many enhancements — for the professional, it's certainly an improvement on PC-DOS. But beware of the wolf in sheep's clothing. Dick Pountain tackled it head-on.

Illustration by Peter Shrank

As I begin this review of IBM's new operating system, I can't help but notice in the morning paper that Samuel Beckett's play, *Waiting for Godot*, has been revived at the National Theatre. The temptation to draw a parallel between the dramatic plight of the play's main characters, Estragon and Vladimir, and that of IBM's PC customers is almost irresistible, but fortunately I have resisted it; I won't even point out the fact that Estragon and Vladimir are usually depicted in Charlie Chaplin-style tramp costumes.

IBM has sown more than its usual crop of fear, uncertainty and doubt with the introduction of OS/2. Ostensibly we are offered a new operating system standard, perhaps to last us for the next decade, which remedies many of the deficiencies of PC-DOS. OS/2 is truly multitasking, allowing us to perform several jobs at once, and it can address up to 16Mbytes of memory instead of the claustrophobic 640k of PC-DOS.

But then come the doubts. OS/2 can run the old PC-DOS software (in a special mode), but any future software which exploits its advanced features will not run under PC-DOS. Software developers must choose *now* — DOS or OS/2. OS/2 is not multi-user, so business users looking for cheaper solutions are still left with a choice from Pick, Unix, BOS or CDOS. OS/2 will not run at all on 8088 or 8086-based machines; you need an AT or better and your old PC must go in the bin.

But what to upgrade to? Any 80286 machine should run OS/2 (provided it has at least 2Mbytes of memory), but 80286 machines are already obsolete since the introduction of the immensely superior 80386 chip. So go for an 80386 machine, then? Fine, but the version of OS/2 featured here has been written for the 80286 and will not support any of the smarter features of the 80386; *that* version is one or two years away, depending upon who you talk to. Waiting seems to be the name of the game.

The version of OS/2 reviewed here is the very first commercial release, 1.0, of the Standard Edition. This is a text-based version of the operating system, with a menu-driven user interface that resembles a simplified form of the ill-fated Topview. Next year we shall see version 1.1 which includes the Presentation Manager, a Windows-like graphical user interface. 'Standard Edition' distinguishes it from the Extended Edition which will have built-in database management and communications compatible with IBM mainframe operating systems.

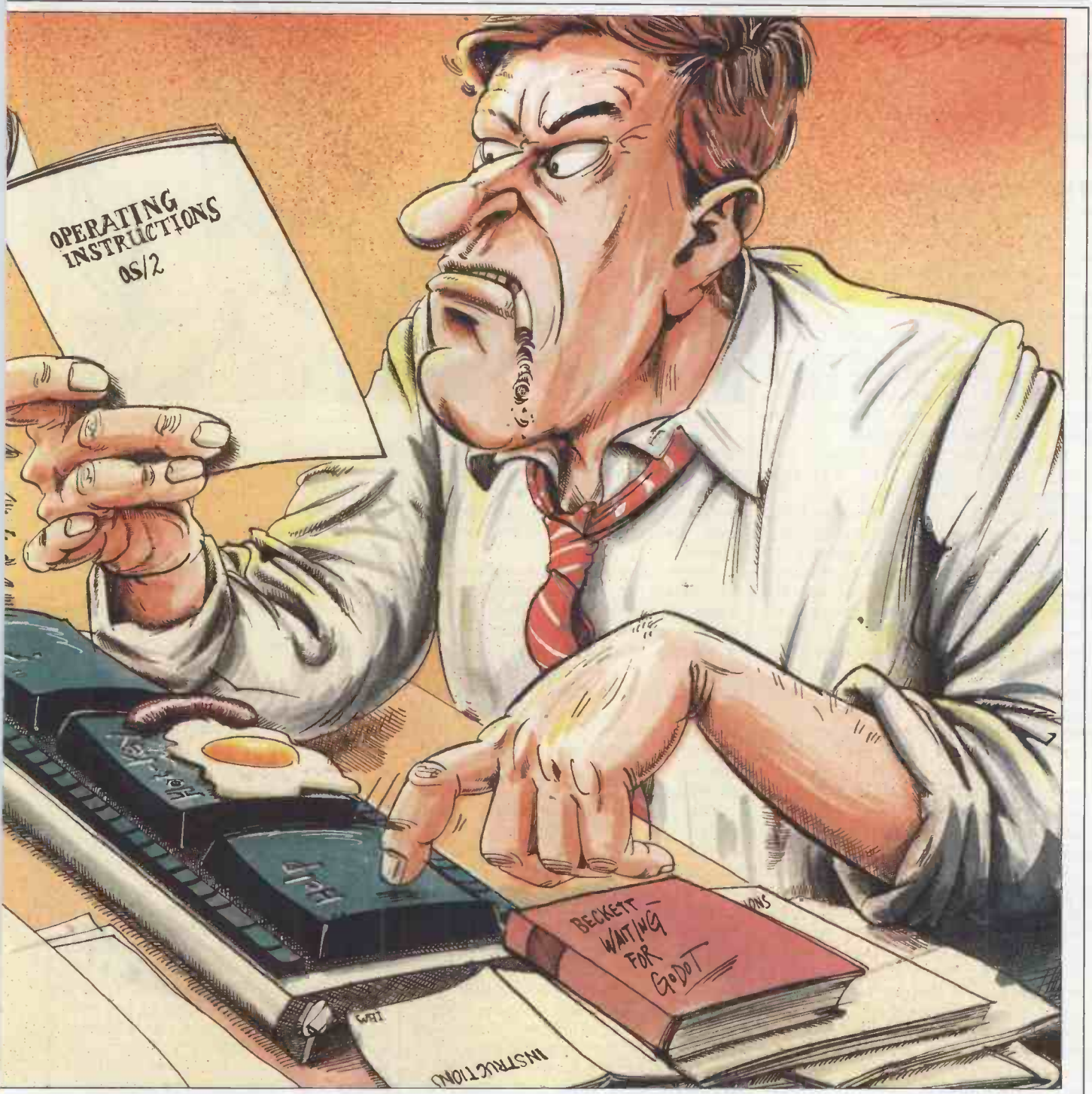
I tested OS/2 on an IBM PS/2 Model 80 loaned by IBM UK, which is an 80386-based machine though it currently runs OS/2 in the 16-bit protected mode, pretending to be a fast 80286.

Installation

I was supplied with OS/2 ready installed on the Model 80's hard disk, but I checked out the installation procedure as a matter of interest. OS/2 is supplied on four of the PS/2's 1.44Mbyte, 3½in diskettes. The first three disks contain the operating system itself and its external commands and utilities, which number 112 files and over 1.6Mbytes of code. The fourth disk is the installation disk and contains 53 files adding up to 869k. As you will quickly grasp, we are talking about a large system here.

OS/2 is installed by booting the fourth disk which takes you through an interactive installation program. This starts by formatting a partition on the hard disk (if required), and then prompts for the other three disks followed by various options such as the national character set and keyboard, type of mouse, and the configuration. The configuration means the contents of the 'CONFIG.SYS' file, which is generated by the installation program automatically. At a later date you can alter the configuration by merely editing CONFIG.SYS, just as you would in DOS. Despite the size and complexity of the system, IBM has made this initial installation procedure very straightforward and more or less foolproof.

CONFIG.SYS is recognisably descended from its DOS equivalent, in that it contains a number of single-line statements such as DEVICE=xxxx, which loads a device driver at system boot time. However, it has grown much more complex than its DOS predecessor. In addition



to the familiar DEVICE and BUFFERS statements, there are a number of new ones, from the obvious DISKCACHE to the less obvious MAXWAIT, PRIORITY, SWAPPATH, MEMMAN, PROTECTONLY, THREADS and TRACE. These control aspects of multitasking and memory management. To set sensible values for these parameters you clearly need to know a lot about OS/2, and the installation program offers a set of default values which will get you running. For the record, the basic CONFIG.SYS generated by my system contained 23 lines.

The PROTECTONLY statement is interesting, as it governs the modes which the CPU is allowed to run in. If you specify PROTECTONLY=YES, then the 80286/386 will only be run in protected mode and can only run pukka OS/2 programs. If, on the other hand, you specify NO, then the CPU can be switched to real mode (in which it emulates an 8086) and this permits DOS programs to be run as well, using OS/2's 'compatibility box' (of which more later).

The only OS/2 programs I was supplied with were BASCOM, C and COBOL compilers, and MASM, so the use of DOS mode was absolutely essential to preserve my sanity. I was able to install SideKick and use this to edit system files, in preference to the supplied EDLIN line editor; both only work under DOS mode. This raises a tricky point which is anticipated in the *User's Reference Manual*. If you set PROTECTONLY=YES in CONFIG.SYS then you cannot run DOS programs, but since no OS/2 editor is supplied you cannot edit CONFIG.SYS back again, and you are locked out. Renaming CONFIG.SYS and rebooting is the only way out, for then OS/2 cannot find a configuration and sets the default, PROTECTONLY=NO. The fact that IBM is still shipping EDLIN as the sole system editor in 1988 is profoundly depressing, but fortunately I remain too speechless to utter a serious libel.

OS/2 can use more disk space than DOS can, but still only in 32Mbyte

chunks. If your hard disk is bigger than 32Mbytes, then you need to use FDISK to set up a primary partition, from which OS/2 boots, and a number of extended partitions which are treated as separate logical drives D:, E:, and so on.

The Program Selector

When OS/2 has been installed and configured, booting it leads you into a screen called the Program Selector. This is the main control panel of the operating system, from which you can run programs directly or create a new command prompt. You can return to the Program Selector at any time, from inside whatever program is running, by pressing Ctrl-Esc, which acts like the 'hot-key' that pops up a TSR like SideKick.

The Program Selector screen contains two boxes, side by side, occupying most of the screen. The left-hand box is called 'Start a Program', and it contains a menu of programs which can be run merely by selecting them with the highlighted bar cursor. When first booted, the only programs that are present on the 'Start' menu are the OS/2 Command Prompt and a graphics demonstration program called Introducing OS/2. Extra programs can be installed by using the 'Update' menu, which pops down from the top of the screen when you either press F10 or point with the mouse. A form is presented into which you enter the required menu title of the program, its full pathname, and any command line parameters it needs.

When a program has been started by selecting it from the Start menu, its name appears in the right-hand box, which is called 'Switch to a Running Program'. Because OS/2 is multitasking, there can be many programs in this box at the same time; selecting one puts you back into that program and gives it control of the screen. The OS/2 prompt itself is a program (the command interpreter, called CMD.EXE) and so you can run multiple copies of this, too. From a prompt you can run other programs as usual by typing their names.

To summarise, then, you can run a program either by installing it on the Start menu and selecting it, or by starting a command prompt and typing its name: IBM calls this process starting a new 'session'. Once it has started, pressing Ctrl-Esc returns you to the Program Selector and you can run another program. All the other programs continue to run with full rights, except that you can't see them on the screen; they are not suspended as is the case with TSR programs like SideKick, or with all GEM applications.

There is at present no way of allowing multiple tasks to share the screen. This will come with OS/2 version 1.1 and the Presentation Manager, which will let each task have its own overlapping window on the screen.

To revisit a running program, you can select its name from the right-hand 'Running' menu, whereupon it returns to the screen instantly. There is also a short-cut to visit another session without going through the Program Selector screen; pressing Alt-Esc cycles you through all the sessions currently running one after another. Like Ctrl-Esc, this is a hot-key which works from inside any application.

The DOS emulation works rather differently. If DOS is enabled (PROTECTONLY=NO), it appears in the Program Selector's right-hand box as an already-running program called 'DOS Command Prompt'. This program cannot be stopped, and you cannot start further copies of it since it does not appear on the Start menu. This reflects the way that OS/2 handles DOS emulation; it reserves a 640k 'box' at the bottom of memory for DOS programs alone and will not release any more memory to DOS. In contrast, OS/2 tasks run above the 1Mbyte mark, and you can run as many as there is memory for (subject to certain limits on threads, see below).

The DOS prompt behaves just like PC-DOS 3.3, complete with all its utilities and even its own AUTOEXEC.BAT that is executed when you first select it, rather than at boot time. However, when you switch away from the DOS box to an OS/2 screen, the DOS application is suspended and does *not* continue to run in the background.

Due to the new OS/2 disk format, the range of software that I could try was limited; but most things I tried worked perfectly, including PC-Write, PC-Tools, SideKick and Notebook. Not all old DOS software works, and you are advised to try any application that you *must* carry over to OS/2 before purchase.

OS/2 boasts more extensive online help facilities and better error reporting than PC-DOS (which is not too difficult to achieve). A strip across the top of the screen called the 'Help line' can be enabled or disabled by the HELP ON and HELP OFF commands. When you are at the OS/2 prompt, for instance, it reminds you of the use of Ctrl-Esc. In the Program Selector it offers both the Update menu and several Help screens which are accessed by pressing F1. One irksome omission is some visual indicator to identify which session you are in; other multitask operating systems like Digital Research's CDOS put a number in the prompt. When you have several sessions open, you can soon forget where you are.

The OS/2 command line error messages are more verbose than those in PC-DOS, and also clearer; however, I am not sure that OS/2's 'SYS 1041: The name specified is not recognised as an internal or external command, operable program or batch file' is any less irritating than good old 'Bad command or file name'. Any error message in OS/2 can be expanded still further by typing 'HELP <errornumber>', whereupon two paragraphs are displayed describing the *explanation* of the cause of the error, and the *action* to be taken.

Despite these effusive messages, there are still a few little horrors in store. When you install the COM02.SYS device driver to run the mouse, a message politely informs you that the 'COM2 port did not install' and 'device adaptor could not be found'; this signifies that all is well because the mouse has grabbed the COM2 port. Perhaps, on reflection, there is a certain Beckettian logic to this.

New commands

The command interpreter of OS/2 version 1.0 has been designed to be very familiar to PC-DOS 3.3 users, so many of the commands are identical in both name and action. You type 'DIR' to see a directory listing, 'TYPE' to view the contents of a text file, 'CD' to change directory, 'DEL' to delete files and 'COPY' to copy them. There are, however, a number of new commands that relate to multitasking and fault tracing, which I shall briefly describe here.

Perhaps the two most important of the new commands are 'START' and 'DETACH'. START <name> starts up a new task callled <name>, as if you had selected it from the Program Selector. It creates a new session and command interpreter for the task, different from the one from which START is executed; to start a task in the current session, you need only type its name.

If this sounds obscure, consider a batch file containing the following instructions:

```
START TOM
START DICK
HARRY
```

When you run this batch file, it will run TOM and DICK in two new sessions, and run HARRY in the current session: that is, it leaves you in HARRY. To see TOM and DICK running, you would need to press Alt-Esc twice. START can execute batch files as well as programs.

DETACH performs a similar role for non-interactive programs — that is, programs which do not perform any keyboard or screen I/O. It does not create a new command interpreter for its task, but runs in pure background mode. Obviously, such a task needs to do some kind of I/O (unless it is a transcendental meditation task) and this has to be provided by redirection to files. For example, if you have a program called LOGGER which reads in data from an instrument, you can run it in the background with output to a file by typing 'DETACH >MONDAY.DAT LOGGER 2>&1'. >MONDAY.DAT redirects standard output to file MONDAY.DAT, while the 2>&1 redirects the standard error channel to the same file; otherwise, any error messages would attempt to go to the display.

OS/2 contains some sophisticated error tracing features resembling those of a minicomputer, and which become necessary with operating systems this large and complex. 'TRACE' permits selective tracing of system events (such as disk reads and writes, or starting new sessions). Major system events are assigned event codes between 0 and 255, and TRACE ON 23,45 would instruct OS/2 to record the time of occurrence of all events of types 23 and 45. The *User Manual* doesn't include the event codes, which are to be obtained from 'your IBM service representative'.

'TRACE ON' with no parameters traces all events, while 'TRACE OFF' can disable tracing of all or some events. The trace data is stored in a memory buffer whose size is set by the 'TRACEBUF' command, but defaults to 4k. Both commands may also be included in a CONFIG.SYS to enable tracing from boot-up.

To see the trace, you have to issue a 'TRACEFMT' command which formats the buffer contents and sends them to the standard output, which you can redirect to the printer or a file. Then 'your IBM service representative' can use the printout to diagnose faults.

'SPOOL is the program that manages the queue for the printer. Various tasks may all print at the same time, each thinking that it has the printer to itself. In fact, SPOOL catches the outputs, separates them, and stores them . . .'

A third problem-related command is 'CREATEDD', which creates a Dump Disk. This is a specially formatted disk for use with the standalone dump facility. In the case of a system crash which did not wipe the memory-resident dump routines, you can dump the entire contents of memory to a series of diskettes for use in fault diagnosis. The dump is started by placing the dump diskette in the drive and pressing Ctrl-Alt-NumLock-NumLock. CREATEDD creates only the first of such a series of disks, the rest being created during the dump itself as promoted. This initial dump disk pretends to be full to stop you from using it for any other purpose.

'PATCH' is a new command which applies patches to OS/2 and related programs, and is a highly simplified substitute for DEBUG. PATCH has a fully automatic mode which patches a program using a file of patch data distributed by IBM or another software vendor; it is invoked by, for example, PATCH BUGFIX /A. If the /A is omitted, then PATCH works in interactive mode, when it resembles the E option from DEBUG, and permits you to enter patches by hand, prompting for offset values.

For a novice user PATCH is easier to use (and more difficult to do damage with) than the old DEBUG, but for the experienced programmer it lacks many essential features, such as search and assemble. DEBUG is no longer supplied.

A multitasking environment like OS/2 presents special problems in the area of I/O, because multiple running programs may want to use the printer or the serial port at the same time. To handle this gracefully, all I/O must be done through operating system services which queue the various tasks to wait their turn. However, old programs written for single-tasking DOS may not observe the necessary etiquette, and the more brutal of them may seize ports directly, bypassing the operating system completely.

SETCOM40 is a command to cope with this situation. It allows a DOS program to directly access COM port, bypassing the OS/2 device drivers. The sort of programs that are likely to need it are communications packages and programs that use a serial mouse or printer. Once you have given a port to DOS — say, by issuing SETCOM40 COM1=ON — it is up to you to make sure that no OS/2 program tries to use COM1 by not switching out of DOS mode till you have returned the port.

SPOOL is the program that manages the queue for the printer. Various tasks may all print at the same time, each thinking that it has the printer to itself. In fact, SPOOL catches the outputs from the tasks, separates them, and stores them as temporary files in a directory which is nominated as a parameter in the command. These files are then printed one after the other, resulting in orderly printing instead of the chaos of jumbled outputs that would otherwise arise. There is seldom any need to run SPOOL interactively, and it is usually executed by CONFIG.SYS at boot-time, with the default spooling directly called \SPOOL.

If you have several printers attached, you can run multiple copies of SPOOL using DETACH. Again, there may be problems for DOS programs that were not written with spooled output in mind; the usual sympton is that they will not print anything at all until you exit from the application. In such cases, OS/2 allows you to press Ctrl-Alt-PrtScr which sends an end-of-file to the spooler to force it to print the file.

The final command I'll mention is

'CHCP', the CHange Code Page command. OS/2 supports multiple character sets through the device of 'code page' switching. A code page is just a national character set stored in RAM, and is identified by a three-digit number. The system can be configured to have two code pages in memory at a time, and the 'CHCP <nnn>' command switches from one to the other. Normally, you will have your national character set as one code page, and the multi-lingual code page, number 850, as the other. The latter has some characters for most European, US and South American languages and is used on IBM mainframes and minicomputers. Printers can also be configured to work with different code pages.

The OS/2 batch processor has all the features of the one in DOS, plus the major addition of the very useful 'SETLOCAL' and 'ENDLOCAL' commands. SETLOCAL saves the values of all environment variables, allowing you to alter them locally and have them automatically restored to their previous values when ENDLOCAL is reached. So, a batch file to run a compiler might completely alter the PATH and DPATH for the duration of its execution without messing up your default/environment.

The command line processor itself has also been beefed up considerably in OS/2. The redirection (>,< , >>) and pipe operators (|) are all retained, but in addition there is conditional processing using AND (&&) and OR (||) operators, plus grouping and separating of commands with () and &.

When two commands are separated by &&, the second is only performed if the first succeeds; success is defined as terminating in a non-error output. For example, the command line 'DIR DICK.DOC && MD DICK' says: 'If there is a file called DICK.DOC in this directory, then make a subdirectory DICK'. On the other hand, 'DIR DICK.DOC || MD DICK' says: 'Make the subdirectory DICK only if there is not a file called DICK.DOC' (strictly speaking, this is an XOR operation rather than OR).

Multiple commands may be given on one line separated by &, when they will be executed strictly from left to right. DIR A: & DIR B:' displays the directory list for A: followed by that for B:, both *after* the second command has run. Parentheses may be used to group such commands to ensure the correct order of execution, leading to sequences like 'DIR DICK.DOC && (MD DICK & COPY DICK.DOC DICK & DEL DICK.DOC)'.

These and other enhancements create what amounts to a job control language, and allow very powerful batch programs to be written. Used in conjuction with PATCH, for example, it should allow IBM to distribute disks which apply complex upgrades and bug-fixes without any user intervention.

Memory management, multitasking & programmer's interface

Much has been written since April 1987 about the internal workings of OS/2, so I won't go over it again in great detail. I'll just point out some of the novel features.

OS/2 uses a more dynamic form of memory management than PC-DOS does, and there are two basic memory maps. In DOS mode, the bottom 1Mbyte is devoted to BIOS ROM and the 640k block of DOS working memory; video RAM also lives in this section. In OS/2 mode, up to 16Mbytes of physical memory can be addressed by pukka OS/2 programs, and it is also possible to run DOS-compatible, so-called 'family' programs (programs written using a restricted set of OS/2 functions) in the upper part of memory. Family applications will provide a bridge for software developers in the short term; by following the rules you can write family applications now using DOS 3.3 compilers, and then recompile them more or less unchanged under OS/2 as the compilers become available.

'The multitask scheduler in OS/2 uses a fairly sophisticated strategy compared to the crude background facilities used in Windows and the Mac Multifinder. The unit of processing under OS/2 is called a "thread", which is a concurrent task . . .'

OS/2 supports a limited form of virtual memory, allowing you to run programs that exceed the physical memory size. In IBM-speak this is called 'storage overcommitment', and there are three levels involved.

Firstly, OS/2 can recognise that a program segment is no longer being used and discard it, using the memory for another program.

Secondly, OS/2 can swap out a program segment into a special file called '\SWAPPER.DAT' which the installation process creates in your root directory. If the segment is needed again, it must be swapped back in place of another segment. Obviously, this process can slow down execution somewhat, but with hard disks as fast as that of the Model 80, you will scarcely notice.

Thirdly, OS/2 can rearrange memory to free more space. As segments are discarded or swapped out, memory becomes fragmented with lots of small holes all over the place. OS/2 can compact the memory by moving things around to make the free space into a contiguous block, until it has enough to satisfy a program's request.

Some programs, especially real-time programs and timing-dependent communications programs, cannot tolerate the uncertain delays caused by swapping and moving memory, so these features can be controlled using the 'MEMMAN' command. It is possible to enable and disable both swapping and compaction separately with lines like 'MEMMAN NOSWAP NOMOVE'.

The multitask scheduler in OS/2 uses a fairly sophisticated strategy compared to the crude background facilities used in Windows and the Mac Multifinder. The unit of processing under OS/2 is called a 'thread', which is a concurrent task that forms a component of an application. All tasks (or, to be exact, threads) have a priority assigned to them, and multitasking is achieved by giving out slices of processor time to all threads with the same priority on a round-robin basis. An application can belong to one of three classes of activity: time-critical, regular or idle-time, in descending order of 'importance'. There are 32 priority levels within each class. The lattter class corresponds to the Windows/Multifinder type of background process that is only run when the system is doing nothing else — for example, waiting for a keystroke.

The priority of regular tasks is dynamically variable, and OS/2 can alter the priority of task to make sure it is run within an acceptable time. The CONFIG.SYS command 'MAXWAIT' determines the length of time a process can be made to wait before it is uprated to a higher priority — that is, how long it can be left out in the cold by higher-priority processes. 'TIMESLICE' alters the actual size of a single timeslice and can be used to fine-tune the system. 'PRIORITY' enables or disables the dynamic variation of priorities. (Incidentally, OS/2 can only handle up to a maxium of 255 threads, which places a

limit on the number of concurrent applications that can be run. 255 sounds a lot, but one application could use 20 or more threads.)

The programmer's interface to OS/2 is a huge improvement over the low-level software interrupt system of PC-DOS. All OS/2 services are called by their names (for example, DosCreateThread, DosGetMessage) and parameters are passed to them on the stack instead of in processor registers. This latter feature is a great step towards portability as the operating system is no longer tied to a particular chip architecture. On the other hand, there are now over 900 OS calls to learn as opposed to 90 under PC-DOS.

Another feature provided by OS/2 which excites many programmers is the dynamic linking of modules. Under DOS, all the modules of your program have to be linked into one large .EXE file before it can be loaded and run, which puts strains on the writing of large programs. Under OS/2 it's possible to leave linking until run time; a program can have unresolved external references which are satisfied by loading a new module while the program is running. This means that code which is very seldom used may never need to be loaded at all, thereby saving memory; and that code which is used very often can be shared by a number of programs, saving disk space. Libraries of linkable code can be updated without having to recompile all the applications which use them. In short, it makes writing and running very large programs much easier.

Performance

Testing the performance of an operating system in any useful way is more difficult than the normal Benchmarking exercises that *PCW* tackles. Nevertheless, it seemed like a good idea to try to assess the relative performance of OS/2 compared to PC-DOS 3.3 when running the *PCW* Benchmarks. The only language I had in common with DOS 3.3 and OS/2 was the new IBM C/2 compiler, which can compile objects for either operating system. This compiler came complete with Microsoft's Codeview tracer/debugger, though the latter only runs in the DOS mode.

As a further comparison between DOS 3.3 and OS/2 DOS mode only, I also ran the Benchmarks in interpreted BasicA.

PCW Benchmarks in BasicA

	OS/2 DOS Mode	PC-DOS 3.3
Intmath	0.60	0.54
Realmath	0.82	0.82
Triglog	2.60	2.60
Textscrn	18.01	16.80
Grafscrn	3.62	3.46
Store F/D	11.25	11.25
Store H/D	2.41	3.18

You can see they are almost the same, suggesting there is no penalty for running DOS software under OS/2 DOS mode. Indeed, the hard-disk access appears to be significantly faster under OS/2 than under DOS in this case.

However, this difference disappears in C/2; the timings for OS/2 native mode, OS/2 DOS mode and PC-DOS 3.3 being substantially identical.

PCW Benchmarks in IBM C/2

	OS/2 Native	OS/2 DOS Mode	PC-DOS 3.3
Intmath	0.007	0.007	0.007
Realmath	0.42	0.41	0.43
Triglog	7.80	7.88	8.01
Textscrn	16.01	15.82	16.20
Grafscrn	N/A	0.32	0.29
Store H/D	0.68	0.69	0.70

A question which fascinates me is this: how much of the 2Mbytes of memory fitted to the Model 80 is available to user programs under OS/2? This proved impossible to determine with the available software. Normally, I would run a little utility called MEM.COM, or, failing that, Norton's or PC-Tools, or, in desperation, CHKDSK. I had none of the aforementioned tools under OS/2 and CHKDSK has been modified so that it shows disk space only.

I was able to run eight copies of the OS/2 command shell before swapping to the hard disk started to occur and opening a new session became noticeably slower (though still only around a second). The shell file CMD.EXE is 57k in size, which would mean that about 456k of RAM was occupied. At 13 sessions, an error box opened up saying that the maxium number of programs was now running and would I close something down in order to proceed. Surprisingly, after closing down one session, I was able to run PATCH in each of the 12 remaining sessions; perhaps PATCH employs code sharing and only one physical copy is loaded, but in that case perhaps CMD.EXE does too. This way madness lies.

Conclusion

There is no question that OS/2 remedies many of the limitations of PC-DOS. It provides an amount of memory which should not prove constricting for two or three years, and the promise of more with the 80386 version. It has a sophisticated system of multitasking which, even in version 1.0, is quite easy to use at the command level. It has many enhancements in the area of command and batch processing, dynamic linking of modules, and more. It provides far more facilities for professionals than PC-DOS ever did. Why, then, do I feel so depressed about it?

The answer is that the huge, complex OS/2 is a big step forward into a realm I do not wish to enter. OS/2 is a minicomputer operating system masquerading as a personal computer operating system, just as the Model 80 is a minicomputer masquerading as a PC. OS/2 will no doubt be excellent for downloading IBM mainframe files to corporate spreadsheets, though a recent report commissioned by Lotus suggests that even large corporate purchasers are being quite chary about the new system, and barely 10% were planning a wholesale changeover in 1989. Most (40%) suggested they would be taking on OS/2 for specific applications, not to replace DOS.

I am not really qualified to say whether or not OS/2 is a good minicomputer operating system, having cut my computing teeth on a Commodore Pet and never having worked a single day in the DP industry. In the hairy early days of *PCW*, we used to swear blood oaths never to use a computer that needed to stand on the floor, and not to trust anyone who uses 'port' as a verb. IBM, on the other hand, has always wanted to sell us minicomputers; the PC was a highly successful aberration, and industry myth has it that many of the crippling limitations of the original PC were deliberately imposed so that it would not impinge too seriously on mini sales. Now the 80386 has allowed the company to close the circle with a mini/PC.

My own ideas of what my next operating system should look like are as far removed from this leviathan as they are from the patronising hieroglyphics of the Macintosh. I've glimpsed bits of what I like in programs such as SideKick, ProComm, SuperKey, Automator mi and QuickDOS, but nothing as yet which puts them all together. I do know that it is unlikely to come from IBM.

Estragon: 'Shall we go...'
Vladimir: 'Yes, let's go...'
(They do not move. Curtain.) END

A window into the brain

Neural network research has become fashionable once more. Jack Weber assesses the importance and relevance of recent developments, and asks whether they enable us to understand how the brain works through the possibility of genuine analogies.

There was a time when you could say the words 'electronic brain' with a certain sense of dignity. Now the phrase sounds as up-to-date as punched cards and core stores. But industry watchers will have noticed that electronic brains are poised for a big revival.

Like most fashion trends, this one has its roots in the distant past. In 1943, before the first real computers had been built, an 18-year-old prodigy called Walter Pitts teamed up with Warren McCulloch, a neurophysiologist at the University of Illinois, to write a paper called *A Logical Calculus Of The Ideas Imminent In Nervous Activity*. It proposed an explanation of how brain cells could operate as digital on/off devices.

As it turned out, McCulloch and Pitts got it wrong. Their explanation was far too simplistic, but it marked the beginning of a stormy marriage between brains and computers that has remained fruitful. At times the brain has been seen as a living computer, at other times computers have been explained as electronic brains. Often the link between them has been fiercely denied. Yet today it seems that some of the most important work in understanding how the brain operates is based on ideas borrowed from computing, while the most exciting developments in computing are using the sorts of structures, called neural networks, which occur in the brain.

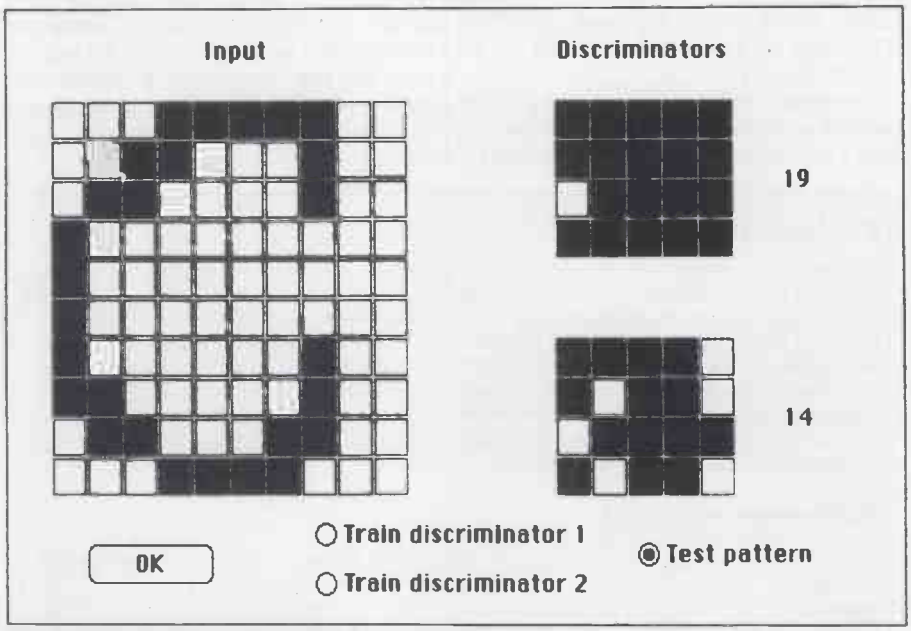
Distributed processing

Examined under the microscope, both brains and computers are made up of vast numbers of simple elements connected together in highly complex patterns. In the case of computers these building blocks are logic gates and memory circuits. In the brain, they are neurons — brain cells which in some respects operate rather like gates.

There are many specific types of neuron but they share certain features in common. Each neuron produces bursts of electrical impulses; the more active the cell, the more impulses it generates. This activity is controlled by input connections, called synapses, which come from as many as several thousand other neurons. Some of these inputs are 'excitatory', making the cell fire more rapidly; others are 'inhibitory' and reduce the cell's activity. It is the combination of all these inputs which sets the cell's firing rate and so determines the output that will be passed on to further neurons; but the relationship between input and output is likely to be quite complex. What makes this so different from the circuitry of conventional computers is not so much the basic elements involved, because they can be modelled with logic gates, but rather the way that the various elements are linked together.

The pathways, finely etched into silicon chips or printed circuit boards, are the outcome of a deliberate design process so that each one has a precise purpose. Alter any one and that particular purpose will no longer be served — in some specific way the computer will now be faulty. But alter any link in a neural network and all that is likely to happen is that it will tend to be less reliable, occasionally producing incorrect answers or perhaps becoming less able to cope with incomplete data. It's a subtle distinction but an important one, and it arises because of the unusual way that neural networks process information.

Conventional computers follow a standard design called the von Neumann architecture. This consists of a central processing unit and an extensive addressable memory, the two being joined together by a data bus. To speed things up, modern parallel processing machines make use of several, or even very many, processors, with some way of dividing up the task between them and with an overall control system to prevent conflicts. Neural networks go far beyond even these parallel machines to a style of operation called distributed processing in which all the activities are mixed up and spread out throughout the whole network. Whereas, in an ordinary computer, one group of gates may be wired together as a shift register, another group as an adding circuit; in a neural network, any region looks and operates like any other.



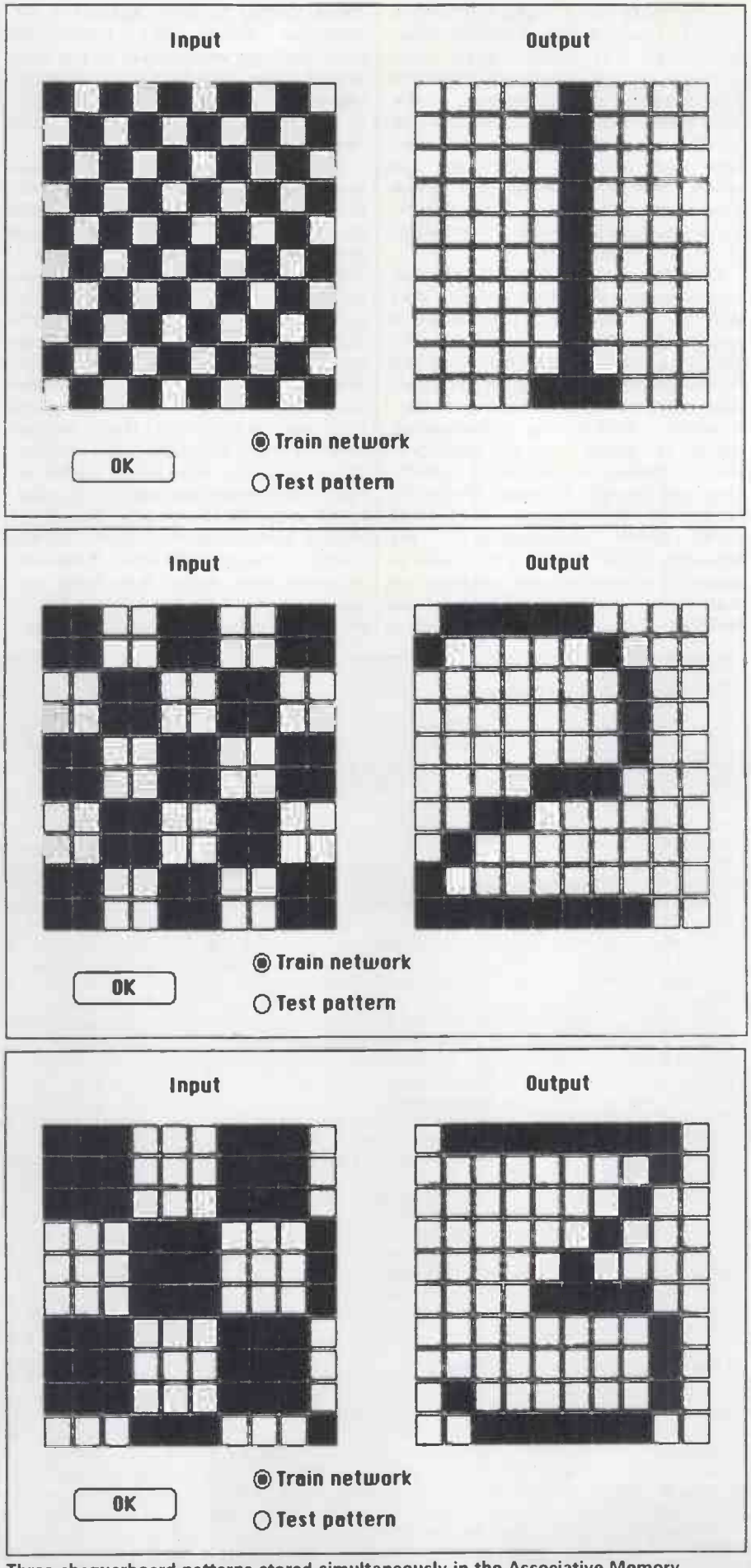
The top discriminator was trained on letter 'c's, the lower one on 'o's. This distorted 'c' is identified correctly — 19 is a significantly higher value than 14

The implications of this distributed approach are significant. For a start, there's the ability (already mentioned) of being able to cope gracefully with faults. That's something that we have cause to be grateful for — an adult brain loses a great many brain cells every day, yet all that we experience is a very gradual decline in our capabilities. Then there is the ability to handle incomplete or corrupted information. The brain is very good at recognising a familiar face from just a fuzzy photograph or understanding speech in a noisy room; so too, artificial neural networks can grasp connections from partial data. The third important ability is that of learning from experience. This is clearly something at which the brain excels, but it is very difficult to program into a computer; neural nets do it naturally — indeed, a neural network cannot be programmed to perform a task, only trained by example. This arises out of another characteristic of neural networks: they are self-organising, able to settle into a stable and meaningful state without requiring the details to be specified. Indeed, we need not know the internal state of a network and, anyway, we could not discover it just by observing its outward behaviour.

There is no evidence to suggest that any electronic neural networks are replicas of the living neural networks in our brains, but they do seem to follow the same general principles and exhibit similar qualities. How close the analogies really are is a matter of great scientific debate at present, but, whatever the outcome of that, there is no doubt that neural networks are starting to have a profound effect on computing. In areas as diverse as robot vision; natural language understanding, the travelling salesman problem and handwriting recognition, neural networks are the fashionable line of research. What is so intriguing is that they have been around almost since the days of McCulloch and Pitts but fell from grace catastrophically and, until recently, were so thoroughly unfashionable that few people would admit to working with them.

Neural fashions

A dominant figure in this whole field is Norbert Wiener, a mathematical genius who, in 1947, wrote a book called *Cybernetics* and, in the process, created the science of the same name. Among other things, Wiener proposed that the way the brain is built may determine the way that it works and suggested that it might be worthwhile, in trying to understand the brain, to build machines that resemble it.



Three chequerboard patterns stored simultaneously in the Associative Memory with their linked output (see the 'Program information' box on pages 132/133)

Forty years on, it looks as if this is going to prove a very prophetic idea; cybernetics has rather faded from prominence but much of cognitive science rests on this proposal. At the time it was simply not practicable to put Wiener's suggestion to the test. The then current technology of valves and electromagnetic relays was simply too large and power-hungry to build any but the smallest of neural machines.

Nevertheless, in 1952, a British psychologist, W Ross Ashby, was able in all seriousness to write a book called *Design For A Brain*. It's hardly a DIY guide for budding Frankensteins, the limit of its practical aims being an ingenious construction called the Homeostat, which is made up of electronic valves, telephone exchange switchgear and troughs of water. It was intended to demonstrate what Ross Ashby called 'ultrastability' — the tendency found in living creatures to adapt to environmental changes so that some desired state could be maintained even when external influences tended to work against it. An analogue device, the Homeostat owed nothing whatsoever to the new digital computers that were developing so rapidly at the time, but it was a forerunner of attempts to build brain-like machines.

In fact, the development of computers and the study of neural networks followed strictly separate paths throughout the 1950s. The rapid progress being achieved in computing did not encourage its developers to get involved in the seemingly impossible task of constructing an artificial neural net. A number of large electro-mechanical and even electrochemical machines were built in the early 1960s, both in Britain and in the US, but nobody in their wildest dreams could envisage such cumbersome creations ever being useful for real information processing. Ironically, it was the increasing power of digital computers that came to the rescue of neural nets when it became apparent that, rather than build networks, it would be much easier to simulate them in computer software.

Naturally, simulating a vastly parallel system inside a serial computer takes time, but at least it made it possible to study networks of a useful size. During the 1960s neural nets suddenly became fashionable, attracting many researchers eager to explore the possibility of recreating some of the brain's unique abilities. Prominent among them was Frank Rosenblatt of Cornell Univeristy, who devised the Perceptron — an artificial vision system using a matrix of photocells as the retina. The outputs of the photocells were fed to a simple neural network that could be trained to recognise visual patterns.

At last, it seemed as if the two strands of information processing were coming together. But the enthusiasm was short-lived. In 1969 Marvin Minsky, one of the gurus of computer science, and Seymour Papert, best known as creator of the LOGO language, showed mathematically that Perceptrons could never form the basis for a general computer. Work on neural networks virtually stopped.

Program information

The programs which appear in 'Program File', page 200, are designed to demonstrate how a conventional microcomputer can simulate parallel distributed processing by a neural network. Written in Microsoft Basic version 3.0 for the Apple Macintosh, they make extensive use of the Mac's graphical capabilities and mouse, but could easily be adapted for other machines and other user interfaces. They also provide a base from which to delve into more complex neural networks.

Although the two nets are different in their layout and operation, they share many features. Both consist of simple, binary McCulloch-Pitts neurons which are either firing or not. The neurons appear onscreen as small squares — white if the cell's output is zero, black if it is one; with layers of neurons arranged as blocks, so that patterns of cell activity can be visualised graphically.

The method of entering patterns into the neuron layers is based on the FatBits technique used in MacPaint. Pressing the mouse button on a cell changes its value (0→1, 1→0) and the pointer will then paint this new value onto any other squares that it is dragged over. The Toolbox routines 'SetRect', 'PtInRect' and 'PtInRects' are used to test whether the pointer is within a block, and then calculation is used to find the specific cell that it is on. The volume name 'MyDisk', which appears in both programs, must be changed to the actual location of the NetLib file containing Toolbox routines.

Both nets need to be trained before they can be used and buttons are provided to select training or testing functions. A pull-down menu offers the choice of quitting the program or restarting with a new net of the same type; on some machines it may be necessary to use cursor keys to move around and set individual neurons, while function keys could replace screen buttons and menus.

The associative memory

How do we remember the date of the Battle of Hastings or the shape of a cat? Nobody knows, but what is certain is that we don't do it by filing the information away at specific memory locations — human memory appears to be distributed within networks of brain cells. Whereas extracting data from a computer requires that we should know exactly where to look, human memories are often brought out simply by association.

This network demonstrates one way that a simple distributed associative memory can be created. It has two layers of neurons arranged in a symmetrical, bi-directional, fully-connected network. Fully-connected, because every neuron in the first layer is connected to every neuron in the second; bi-directional, because the outputs of each layer feed back to the inputs of the other; and symmetrical, because the connection weight between any two units is the same in both directions. Several pairs of patterns can be stored simultaneously within the network, and entering any one of them will recall its associated memory in the opposite layer.

Initially, the program asks for the extent of input and output layers; both are arranged as square blocks, so entering '8', for example, will result in a layer of 64 neurons. The two layers need not be the same size. To train the net, select 'Train Network' and use the mouse to enter a pattern in each layer. Pressing the 'OK' button calculates the connection weights needed to associate these two patterns and stores them in the array c%(99,99).

This is a very simple calculation. Each neuron has an output of 0 or 1, and the outputs for the two layers are stored in a%(99) and b%(99). To find the connection weight between the ith unit in the first layer and the jth unit in the second, convert their 0 or 1 values to −1 or 1 and multiply to give c%(i,j). Training on subsequent pairs of patterns simply involves repeating this process and adding the results to the weights already stored in the connection array. This is all done in the 'Matrix' subroutine by the line:

```
c%(i%,j%) = c%(i%,j%) + ((a%(i%)*2-1)*(b%(j%)*2-1)).
```

Further patterns may be added at any time; the number that can be stored simultaneously in the net depends very much on the actual patterns, but three separate pairs should usually be possible and, in some cases, five pairs or even more may co-exist. Once trained, the net can be used by selecting Test Pattern and painting a pattern onto either layer of neurons. Press OK and, if it can, the net will respond by recalling the associated pattern in the other layer and then correcting any errors in the input pattern. Simple chequerboards offer a very good demonstration of the network's abilities as even very fragmentary portions should be correctly identified. Some patterns are more difficult and the net may show quite complex behaviour, perhaps combining a couple of patterns if it cannot decide between them; or, sometimes, finding the pattern most unlike what it sees and negating it.

These results are produced by the subroutine 'Compute'. Each neuron takes an input from every neuron in the other layer, so we need two nested loops to calculate a whole layer. Taking the essential features of a neuron in turn: 'Input'

The great Perceptron debacle was based on perfectly valid criticisms but it might have been easily avoided. Perhaps the Perceptron's supporters claimed too much; perhaps they just needed more time to create more sophisticated networks. Whatever the cause of the problem, it took about 15 years before neural networks could return from the wilderness. That return is now taking on the appearance of a triumphal homecoming. A new name — 'Connectionism' — is emblazoned on the banner and new theories legitimise the neural approach.

Soft in the head

Creating a software model of the sort of neural cells that are inside our heads is, in principle, a straightforward task, though the restrictions of processor speed and memory capacity still limit us to very small nets. Nevertheless, interesting behaviour can be observed even in network simulations on a home micro.

Two aspects need to be considered in designing any neural network. One is the overall pattern of interconnections that makes the net. The other is the detailed performance of each individual neuron. Any software neuron must be capable of simulating five important functions:

● **Input** According to the arrangement of the network, the neuron must be able to read the output values of various other neurons and use them for calculating its own level of activity. In the simplest form — the McCulloch-Pitts neuron — these are the binary values 1 and 0 (firing or not firing), though it is often more useful to read these as 1 and −1. More complex neurons may use a range of discrete values or a continuous range — possibly, between 0 and 1.

● **Weightings** It is known that real neurons have connections of different strengths, so that the same input will affect one neuron more than another. To simulate this, it is usual to assign a weight to each input. This may be positive or negative (for excitatory or inhibitory inputs) and take discrete or continuous values. The weight multiplied by the received input gives the value that will actually be used by the cell.

● **Summation** An overall input strength is found by summing all the weighted inputs and taking account of positive negative values. This sum represents the total excitation available to the cell.

● **Threshold** In order to fire, a brain cell needs its input sum to exceed a preset threshold value. This not only reduces the effects of random noise but gives the cell the ability to discriminate between input values. Similarly, any simulated neuron must do the same. If the input sum falls below the threshold, then there is no output; if it is above, then an output will be generated.

● **Transfer function** In the binary McCulloch-Pitts cell the output is simply determined by the threshold function: 0 if the input is below, 1 if it is above the threshold. In cells that have a range of values, there is still no output below the threshold but, above it, some function needs to relate input to output. This may be as

comes from every neuron in the other layer and is held in a%() or b%(); the 'connection weight' (which may be positive or negative) for any two cells is held in c%(,). It must be multiplied by the input value; 'Summation' of all these weighted inputs is built up in s%; and the 'threshold' for the cell to fire is zero. If s% is less than zero, the neuron will not fire (output=0). If it is greater, then it will fire (output=1). If it is equal to zero, then the output is left as it is.

The subroutine goes through this whole process to calculate every neuron in the second layer, and then again for the reverse flow of excitation back to the first layer. As the new output of each cell is calculated, it is compared to the old value and then displayed. The differences are totalled in diff% and the network is recalculated until diff%=0, indicating that both layers have stabilised.

Discriminator

The discriminator is a small simulation of the WISARD robot vision system; it offers impressive pattern recognition from a very simple single-layer network. The program creates a 10x10 block of input cells, on to which a pattern can be painted with the mouse, and two discriminator blocks which score its similarity to previously-trained patterns.

The idea behind it is very simple: we take a random group of five units from the input layer and assign to each of them one bit in a five-bit binary word. If the cell is on, then its bit is set to one, otherwise to zero. Clearly, every possible combination of on and off among the five inputs produces its own unique binary number — the whole pattern can be stored in 20 such numbers. In order to train the net to discriminate between two patterns, we simply enter them both and store the two sets of numbers that result. Any subsequent patterns can then be tested by comparing their numbers to those stored.

This comparison is displayed in the two discriminator blocks. For every one of the 20 random groups of input cells, there is one unit in each of the discriminators. If the number produced by that grouping matches the value for either of the two training patterns, then the appropriate discriminator cell turns on (there may be elements common to both patterns which will, therefore, affect both discriminators). Finally, a score of the number of units matched in each discriminator shows which of the two training patterns was closest to the test pattern.

There are, of course, easier ways of comparing two patterns. But what we want is a system that can generalise by detecting, for example, the similarity between all letter 'c's and differentiating them from all letter 'o's. This is achieved by training the net on up to five examples of each type of pattern and storing all the sets of numbers produced. When a new test pattern is applied, each cell in the two discriminator blocks acts as an OR gate, showing if at least one of its training examples matches the present value of the group. This gives the system remarkable abilities: training one discriminator on five different hand-drawn 'c's and the other on five 'o's will let it correctly identify almost any other example of the two letters.

The program begins by creating a display screen and building up the random connections, which are different every time. The array b%(19,4) holds a list of the five input cells that each of the 20 discriminator units is connected to. In order to train the net, select 'Train discriminator 1' or 'Train discriminator 2' so as to allocate the pattern to one or other type, then paint it in. Pressing OK stores the values of all input cells in the array a%(100).

The 20 numbers that define this training pattern are produced by the subroutine 'Matrix' and stored in the arrays b1%(19,4) or b2%(19,4) according to which discriminator was selected (the second dimension allows for five examples for each). The effect of setting individual bits in a five-bit word is achieved by multiplying each input value by its corresponding power of two.

When all the examples have been entered, press 'Test pattern' and paint a pattern onto the input layer. Pressing OK directs the program to the subroutine 'Compute' which calculates the value of each group and compares it to all the corresponding stored values. If any of them match, the appropriate discriminator cell is switched on and that discriminator's score is increased by one.

Apart from using it to recognise individual letters, another good demonstration is provided by training one discriminator on five vertical bars, each two cells wide, and the other on five horizontal bars. They will then identify very effectively whether any roughly-scrawled line is more nearly vertical or horizontal. It's an ability that forms an important part of the brain's visual processing.

Everything happens in a single pass so the discriminator is very fast and, unlike most neural networks, provides its response in a fixed, predictable time. Because its individual units are so simple, it is really just on the borderline of neural networks, but it does demonstrate some of the enormous potential of the connective approach.

complex as required.

A single neuron is relatively simple to build as hardware and is easily simulated in software. The complexitiy all resides in the intricacies of the network. Large numbers of neurons, heavily interconnected, create a system of pent-up energy. Let us suppose that a network is set up with some initial set of values for the weights and that all the cells are quiescent. If some input signals are now applied, cells may begin to fire, providing input to further cells which may in turn excite or inhibit other cells, and so on. The whole network will eventually settle into a stable state consisting of some pattern of cell outputs. We can treat this whole pattern, or some small part of it, as being the output of the net.

Neural nets tend to be arranged in layers; generally, all the cells in one layer take their inputs from neurons in the preceding layer and pass their outputs on to the next one, but there are no hard and fast rules about this. The degree of connectivity between layers is also variable: in a fully connected net, each cell will take inputs from every cell in the previous layer; conversely, neurons may take just a small number of inputs, perhaps from randomly chosen cells. Just as there are many different arrangements of cells within the brain, so there are many types of artificial neural nets and new ones are constantly being devised. The aim is always to find a layout of connections and a distribution of weights such that we can enter certain inputs and obtain outputs which are related to them in some useful way.

With any conventional computer, we would need to create an algorithm — a sequence of instructions that carries out the required task. Neural networks on the other hand, need to be trained by example — we either set an input and directly force connection weights that will give the desired output or allow a combination of weights to develop by iterative steps until the correct output is achieved. Finding learning rules to modify the weights so that the network will rapidly move towards a correct and stable state is one of the central problems of the subject. It was a major factor in the recent unpopularity of neural networks.

The glaring fault that Minsky and Papert had identified in the Perceptron back in 1969 was that there was no way to create an Exclusive . . . OR function: that is, no way of making a cell fire if one, and only one, of two input cells was firing. Without the ability to perform an Exclusive . . . OR, large areas of computing were inaccessible.

The Perceptron was a quite simple device with just two neuron layers, one connected to the retina, the second providing the output, with a learning rule to set the connection weights between them. The solution which emerged after Minsky and Papert's critique was that the only way to provide an Exclusive . . . OR was to introduce at least one further 'hidden' layer of neurons between input and output. Unfortunately, no-one could find a learning rule that would deal with hidden units. Hence the long exile of neural networks.

Recently a number of new learning rules have been found to solve the problem. The basis of all these methods is to apply the input and allow cell activity to propagate through to the output layer. Then compare this output with the desired output values and adjust connection weights throughout the net according to a mathematical function that will reduce the error. This process is repeated, perhaps thousands of times, until a stable distribution is produced.

Vision & hearing

The sorts of problems that are particularly suitable for neural network solution are those for which no algorithm is known, or where the only available algorithms are themselves too time-consuming. An excellent example is the travelling salesman problem in which the shortest route joining a number of cities needs to be found. As the number of cities increases, the problem rapidly becomes unmanageable; 10 cities, for instance, offer 181,440 different routes and there is no known algorithm for finding the shortest one other than calculating and comparing them all. Recently trials with a neural network at Bell Laboratories gave a best or nearly best answer about 75% of the time. With a specially built hardware network it is thought that such answers could be provided in a fraction of a second.

Neural networks are especially successful in the traditional AI activities of robot vision and speech recognition. One of the most talked about networks at the moment is NETalk. It is a self-learning net built at Princeton University which takes text as its input and drives a phonemic speech synthesiser with its output. Initially, with random connection weights, it babbles completely incoherently. But given training in the form of matched pairs of written words and phoneme patterns, it adjusts its connections until, after about a day, it is chattering away pretty intelligibly.

But image processing has produced perhaps the most practical applications: the Perceptron, remember, was an early vision system and now one of the few neural networks to have become a commercial product is a visual device called WISARD.

Designed at Brunel University, WISARD consists of a video camera attached to a large but simple network. It can successfully tackle problems that would be way beyond traditional algorithmic AI techniques. For example, train it on a number of smiling faces and a number of frowning ones and it will correctly identify the expression on almost any subsequent face it sees.

Other possible uses are optical character recognition, analysis for medical imaging, deciphering handwriting and so on. These are tasks for which no rigid algorithmic set of instructions exists, but neural networks excel at precisely such problems. What matters is that there are genuine similarities between smiling faces or between all examples of the letter 'A'; we may not know how to define those similarities but, with a neural network, we don't need to. Their internal workings are just a means to an end: we don't need to specify them, we don't even need to *know* them. WISARD is one of those nets which has totally random internal connections.

Conclusion

As long as the bulk of research is done on simulated nets the real world applications may be restricted, but already some special neural network chips have been built by Bell Laboratories and they offer the prospect of true parallel processing speeds. Going even further, the obvious technology for such massively parallel structures is optical processing. At the California Institute of Technology, a pattern recognition system has been built which, given an input image, can select the matching image out of several stored within a hologram. So far, its achievements may appear modest. But the fact that holograms offer enormous storage density and that light beams can cross each other without interference implies that very large and dense neural nets may be achieved in this way.

Ultimately, what makes neural network research important to us is the possibility that it may provide genuine analogies for how the brain works. If that is the case then it offers the prospect of some real artificial intelligence. But, more importantly, it could open a window into the brain. Being able to simulate even just a tiny portion of the brain would help us to understand it, treat it and perhaps make better use of it.

The program listings which accompany this article are in 'Program File' on page 200. END

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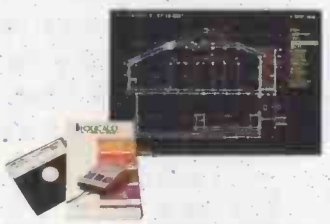

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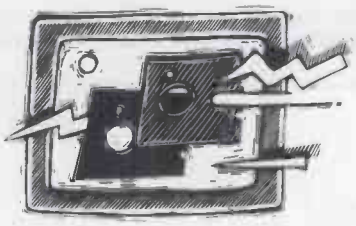


SideKick Plus

Addicts of Borland's memory-resident SideKick program for the IBM PC and compatibles may be sitting comfortably now; but the enhanced version, SideKick Plus, has much to offer. Dick Pountain was very impressed with its ease of use and increased power.

Before proceeding with this review of Borland's SideKick Plus I must declare an interest, namely that I am a hopeless addict of the original SideKick. Since I first laid eyes on the program (in a review for *PCW* some years ago) it has never been off my computer, and I estimate that I use one or other of its component parts at least 50 times a day, every day.

While ruminating on the reasons for SideKick's success, it came to me that in fact all it does is what the operating system ought to be doing; it's an extension which drags PC-DOS, kicking and screaming, from the gloomy Teletype-based world in which it was born into the world of colour and memory-mapped video which the hardware supports. Of course, hardware has now moved on into new realms of bit-mapped graphic displays and soft fonts, so SideKick represents a character-based compromise between the CP/M style scrolling 'glass teletype' and the fully graphical interfaces of GEM, Windows and the Macintosh.

For example, the Notepad's file window provides a handy (if limited) way of locating files without quitting your present application. The Dialler serves admirably for online documentation and for other reference data such as international dialling codes, metric/imperial conversions and the like; and Notepad's cut-and-paste facility in conjunction with a disk editor like Norton Utilities has more than once enabled me to retrieve lost data files.

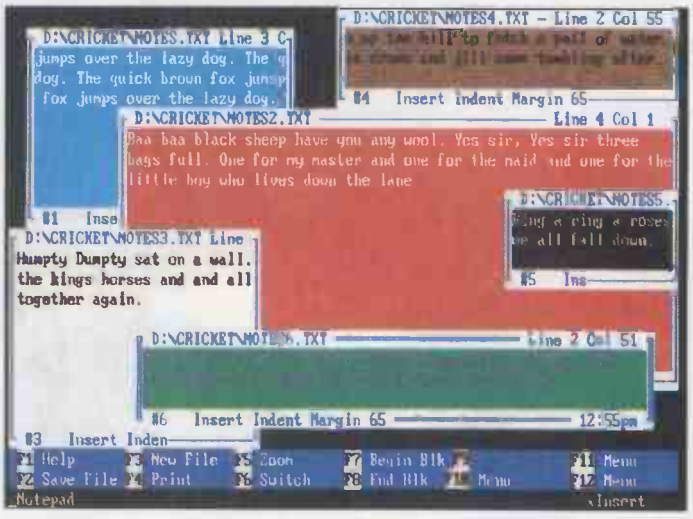
When the news of SideKick Plus first arrived, I made up a shopping list of the improvements I would like to see in it. First, by a long way, was the provision of multiple Notepad windows, followed by a more powerful database function in the Dialler, and a more extensive Appointments calendar with an alarm facility. Borland has provided all these things and much, much more. SideKick Plus is a very ambitious product indeed, to the point where it can no longer be considered a resident utility, but rather has become a whole operating environment; it even has hooks for third-party software houses to write applications to run under it. It is consequently much larger and very much more complex than the old SideKick. Despite my initial forebodings that Borland might have gone 'over the top' with SideKick Plus, I discovered that the same intelligence and elegance of design that initially attracted me are still there, and certain new features like the customisable menu system represent a real breakthrough in user interface design. Within a few days SideKick Plus became even more indispensable than SideKick, and now the idea of going back to a single Notepad is unthinkable.

This review was performed on various preliminary versions of the SideKick Plus software (SK Plus from now on for brevity), and was completed before the first release version became available. Nevertheless, all the parts of the system were complete and working in the last version (0.83 Beta) that I used, and it was stable enough to use for serious work — if not entirely bug-free.

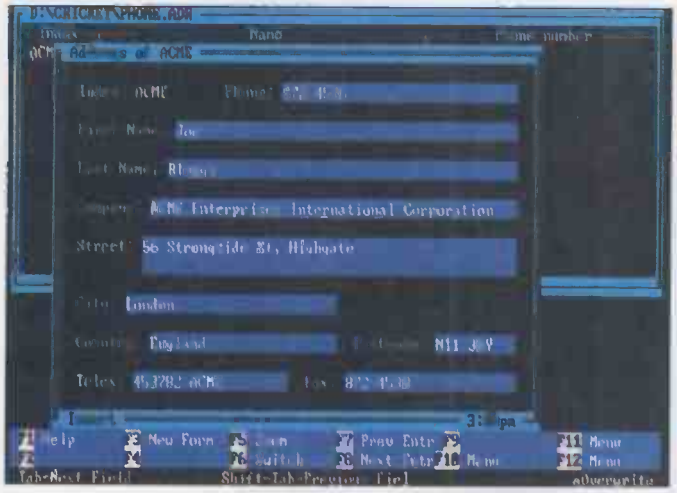
Because of its large size and the memory limitations of PC-DOS, SK Plus employs a clever and complex system of memory management to squeeze itself into less than 640k. Its size also prevents it being distributed as a single .EXE file, as it exceeds the capacity of a 360k PC disk; this also means that it is impossible to use without a hard disk. SK Plus is distributed as a number of libraries, on three disks, from which you build a system including and excluding parts as you require. The end result is a .EXE file which can be loaded at boot-up time and remains partly memory resident; a main menu, similar to that in the original SideKick, pops up when you press the CTRL-ALT keys simultaneously.

Applications

SideKick Plus comes supplied with seven basic applications, two more than the original SideKick. These are the File Manager, Notepad, Outlook, Phonebook, Time Planner, Calculator and ASCII Table. Of these the File Manager and Outlook (a ThinkTank-



Up to nine Notepads can be opened simultaneously with SideKick Plus. The active window has a double line as its border. Switching between active windows is easily achieved with the F6 function key



The modestly-named Phonebook is a fully-automated communications and telephone management system. This shows an expanded window in European format

The Time Planner personal-organiser style system includes a month planner. The bars represent appointments, under which are the calendar and diary windows

style outline editor) are wholly new, and the other five are greatly improved versions of those in the original SideKick; Phonebook is the new Dialler and Time Planner is the new Calendar.

File Manager

The File Manager, as its name suggests, is a DOS shell program for managing files. It performs a similar function to standalone utilities like Xtree, QuickDOS or the Norton Commander, and shares features with all of them. It takes the place of the file window in the old SideKick, appearing on the screen automatically whenever a file name is requested, and you reply ambiguously (that is, with a directory name, a wildcard specification or nothing at all). The File Manager can also be chosen from the main menu as an application in its own right, and multiple File Manager windows can be on the screen at the same time, which is very handy for people with several hard disks or partitions.

File Manager supports all the housekeeping functions you would expect, such as Rename, Delete, Copy, Move and Modify file attributes. It enables you to mark a group of files and perform a function on all of them, equivalent to 'tagging' in Xtree and QDOS. Also, floppy disks can be formatted from inside an application, which will delight users of certain hostile word processors. The directory listing in the File Manager window can be sorted by name, extension, size or date and restricted by a wildcard specification. File contents can be viewed in ASCII or hex format; the search function finds files across directory boundaries on a hard disk; a string search finds all files containing the specified string. Unlike Xtree and QDOS and similar utilities, File Manager cannot show you a graphic tree diagram of your directory structure.

Notepad

The Notepad is not very different in its fundamental workings from that in old SideKick. The biggest difference is that you can have up to nine of them. When you hit N for Notepad in the main menu, a submenu appears showing the nine Notepads and the names of any files that are attached to them. You can select one from this menu to open. Notepad windows can also be opened directly by pressing the ALT key and a number from 1-9.

When you have several Notepads on the screen at once, the top or active one is indicated by a double line as its border, while all the others have single ones (this indication is used throughout SK Plus). A Notepad can be removed from the screen by pressing ESC when it is the active window; its file remains attached and open, ready for it to be reactivated. You can cycle through all the visible Notepads in the order they were opened by pressing the F6 'Switch' key, or bring a particular one to the top by pressing ALT <number>. The border of each Notepad window is crammed with information, including the number of the Notepad, the filename currently attached, the current time and the status of various toggles like Insert/Overwrite; there is also a little indicator that shows whether the file contents have been changed.

Changing the file attached to a Notepad is accomplished by pressing F3 and typing its name, or by using the File Manager. You are warned, as before, about saving files which have been altered, and there is an option to save *all* Notepads, which is very handy when shutting down with several active. Default files can be assigned to Notepads, so that they will always start up with these files attached. I found it very convenient to keep AUTOEXEC.BAT and my address database permanently attached to two Notepads.

The main editing commands remain unchanged, based on those of WordStar. There are, however, some extra ones, like greatly enhanced search options (including 'sounds like' matching using the Soundex algorithm), better tab and margin controls, and the option to switch off the automatic creation of .BAK files (which makes me very happy indeed). Dot commands are supported for headers, footers and conditional pagebreaks.

In short, the Notepad is as powerful as many word processors, and had I not been spoiled by my customised PC-Write I would happily use it for serious writing. One area Borland has not enhanced is the memory management of the Notepad; its files are still entirely RAM resident and limited to around 54k in size.

Outlook

Outlook is a pop-up outline processor, and the best outline processor I've tried, comfortably beating Think-Tank, PC-Outline and Ready! in elegance and ease of use, and rivalling Mac programs like More. As with the Notepad, you may have up to nine Outlook windows open at the same time with different files. Outlook allows you to enter and manipulate structured outlines, composed of headlines, subheadings, sub-subheadings, and so on. There are the usual pruning functions for moving blocks of headlines from one level to another and from one part of the outline to another.

There is no word-wrap, every line being treated as a separate headline (of arbitrary length). If you want a

substantial quantity of word-wrapped text to appear under a headline, you use the 'Attached Note' command which pops up a window identical to a Notepad window and allows you to associate any amount of text with the headline; this note text is stored in the same file with the outline. This scheme neatly overcomes the contradiction between the ways of handling word-wrapped text and structured headlines that messes up the user interface of many outliners.

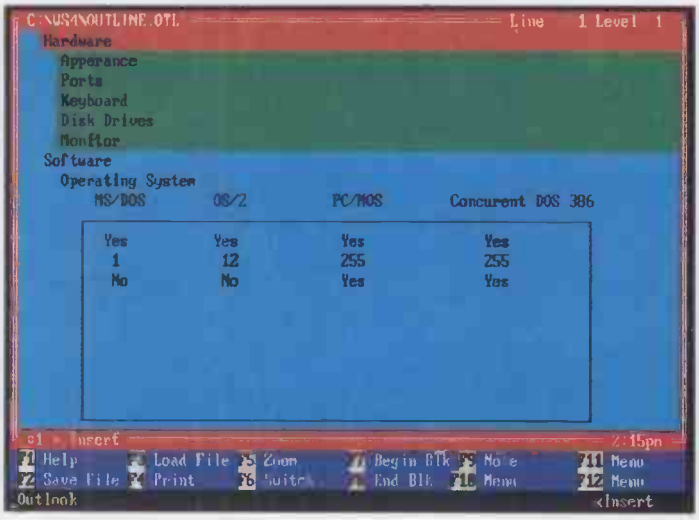
Headlines which have associated notes are marked with three horizontal bars in the right margin. You can have any number of attached notes in an outline, but they seem to be limited to around 5k per note. Nevertheless, this is a way of creating larger documents than the Notepad alone permits; you must divide the text up into sections smaller than 5k with their own subheads.

The entry of headline text into Outlook is delightfully simple. Pressing RETURN gives you a new line at the same level, while ALT RETURN gives you a new line at the next level down. Pressing TAB while on a line demotes that headline one level, and SHIFT TAB promotes it. Using these simple keystrokes, structured text can be typed as fast as into an ordinary word processor. The text under a headline can be folded away and hidden by pressing the Keypad key and revealed again by pressing '+'. If you prefer you can select 'browse mode' in which the text under a headline automatically unfolds when the cursor moves onto it, and closes again when you move out.

Outlook can import text from other sources, and will try its best to structure such text as an outline. For example, if you read in a Turbo Pascal source program, it correctly identifies BEGIN...END blocks and structures the text so that only the procedure names are visible at the top level. Printing is flexible, with a variety of numbering formats and automatic generation of a table of contents.

A most impressive feature of Outlook is the diagram drawing facility. By selecting the 'Insert Diagram' command, you can 'paint' block diagrams with the cursor keys or mouse, using the IBM extended box characters; corners and intersections are automatically closed correctly. Any outline at all can be automatically printed out as an organisation chart, merely by selecting the 'Output Chart' command; each headline is printed in a box, arranged in a tree structure from the top down. You can alter the default width and depth of the boxes used.

Many charts will be too wide to print in one piece, so Outlook helpfully chops them up into slices the size of your printer paper, which can be stuck together later.



Outlook offers all the features you might expect from a dedicated outline processor. The diagram-drawing facility makes it extremely easy to draw tables and boxes in the manner shown here

Phonebook

The Phonebook has come a long way from the crude Dialler in old SideKick. For one thing it has acquired a fully-featured communications package which can work in the background; you can upload and download files while continuing to work on your PC. The Phonebook is now a proper database program, with indexed searching in place of the glacially slow sequential search of Dialler, and with structured records in place of single-line addresses.

The Phonebook window is divided into three columns, marked Index, Name and Phone Number, and each entry occupies a single line. This, however, is only a restricted view of the underlying record, which may have many more fields, for name, address, comments, and so on. Eight predefined forms are supplied, covering commonly used US and European address formats, mailing labels, personal and business and Email services, but the user cannot define new forms which is a definite drawback.

The indexed search is very quick but there is an even quicker partial search which works only on the first letter; if you press the 'T' key you will instantly jump to the first record whose index begins with T. It's a pity this principle couldn't have been extended to the succeeding letters so that you could home in on the required entry. When the bar cursor is over the entry you want, you can press RETURN to dial the number (supposing that you have an autodial modem connected, of course). Pressing SPACE opens a window which shows the full form for that record. When entering a new address you can choose any of the eight forms provided, and the Phonebook automatically keeps itself alphabetically sorted. If the forms do not hold enough information for you, you can Attach a Note to the entry, just like the ones in Outlook. The search facility permits searching through these notes, as well as the index entries and the forms.

Any Phonebook entry can be declared as being of Voice or Data type. If you declare it Data, then you can associate a set of communications parameters with it, and optionally a log-on script too. Though it's possible to keep as many different Phonebooks as you want, it is not essential; you can ceep grdiniry voice numbers and online services in the same book. A password protection system protects private information from prying eyes.

The script language is one of the best I have seen, with a clear Pascal-like syntax, and full looping and conditional branching. You edit scripts via a Notepad window just like a note, but on exit the editor checks the script syntax for you and places the cursor over the site of any error. If the thought of programming makes you blench, there is a learn mode which will write a script for you as you go through the log-on procedure manually. The background communications mode works, and I was able to download mail from BIX while writing this review in the foreground. Simply pop-up the Phonebook, dial the number with the download script attached, pop it down again; a hideous electronic burble, reminiscent of an arcade game phaser, is the only indication that the mail has arrived safely. I quickly came to love the Phonebook, which has even replaced the excellent ProComm in my affections.

Time Planner

The Time Planner has advanced even further than the Phonebook. When you first select Time Planner from the main menu, a window which looks just like the old SideKick one-

month Calendar appears, with today's date highlighted. Even this is improved, however; you can move the highlight using the cursor keys to a new date, rather than typing in the number as before. Pressing the 5 key on the keypad returns you instantly to today, which is handy when you are groping around finding out what day of the week the First World War ended on. Pressing the F5 'Zoom' key opens up a whole new ball game. A new window called the Schedule window appears which shows the next week, one day per line with a horizontal scale of hours. Your appointments appear as horizontal bars, as on a wall chart, indicating their duration. You have the option of expanding this display to show the next two or four weeks at a glance. Moving the cursor to a day brings up the Appointment book for that day.

The Appointment book itself is hugely enhanced. You can choose the resolution, from hourly to five minute intervals, and the start and end of your day. You can designate days as holidays, which then appear as such in the Scheduler (weekends are already marked as holidays; some hope!).

Each Appointment still occupies only a single line, but you can have as much text as you want, automatically scrolling sideways.

However, for a lot of text you will probably prefer to attach a note (an Agenda) to the appointment, as in Outlook or the Phonebook. It's also possible to attach a note to the whole day, called the Daily Agenda, and this can be inspected directly from the Calendar or Schedule windows. The search facility allows you to string search through all the Appointments and Agendas, as well as for free periods of a specified duration, holidays included or not ('I can give you a 13 minute breakfast meeting on 1 March at 7.03am').

An interesting facet of the Appointments book is that it has been designed with networking in mind. In addition to your Personal book there is a Common Appointments book, password-protected so only authorised staff can alter it, which can be shared by a whole work group for scheduling meetings.

An alarm system allows you to set buzzers for a particular time/date, with pre-warning and 'snooze' facilities. It can also open the Phonebook and make a call at a certain time/date, or 'paste' a string into the underlying application at a certain time/date.

This latter facility enables you to run other programs automatically. All you have to do is paste suitable commands at the DOS prompt.

Calculator

The Calculator is no longer *one* but *four* calculators; you can switch the type to Business, Scientific, Programmer or Formula. All four types share the same screen image, which is rather less 'realistic' than of old since it lacks a keyboard. Instead, the calculator now has a 'paper tape', like a desk calculator, which records all the calculations performed, may be edited by using all the Notepad commands and can be stored as a named file. You can import a block of figures from the screen of another application onto the tape and then calculate them. All calculations are performed to 18-digit precision.

'While ruminating on the reasons for SideKick's success, it came to me that in fact all it does is what the operating system ought to be doing . . .'

The options available in the four types of calculator are far too many to enumerate here. The Business calculator now has the percentage function notoriously lacking from the old SideKick, but also has a range of functions to do with interest and future payment calculations. The Scientific model has 18 trig, log and other maths functions, and the Programmer has variable number bases and Boolean functions. All the calculators share the ability to use named variables in calculations, and the variables in use can be listed in their own window for inspection or editing; in the Scientific mode several universal constants such as pi, g, mu and h are predefined with symbolic names. The Formula calculator combines all the functions of the other three types, and also has the ability to store up to three symbolic formulae for repeated calculation. In theory you only need this one calculator, but the others help to avoid frightening people with too many features.

Clipboard & ASCIII Chart

Though it doesn't feature by name on the main menu, the Clipboard deserves mention because the enhanced cut-and-paste functions are perhaps the most attractive feature of SK Plus. Where the old SideKick had a rag bag of import and export functions (for example, different commands to export from the Calculator and Notepad), SK Plus has a powerful, consistent ability to cut-and-paste from any application to any other.

Cutting and pasting in underlying non-SideKick applications is performed by the CTRL-DELETE and CTRL-INSERT key combinations, and you can do this at any time without needing SK Plus to be on the screen. Pasting from any SideKick application to any other is performed by selecting the date (for example in the Notepad, as a block) and pressing ALT-ESC, which copies the data into the application or window which lies immediately below, at the cursor position. In applications which use structured data, an appropriate action is taken; in the case of the Phonebook a whole record is pasted; in the Scheduler the time and date is pasted, and so on.

All these cut-and-paste functions work via the Clipboard, which is a special Notepad window that you can inspect and edit, like that on the Macintosh. The currently active item (that is, the one which will be pasted) is always the first item in the clipboard and is highlighted, but previously cut-and-pasted items remain there in order, which is wonderful for accumulating clippings from various documents into a new document, for example.

SK Plus retains the priceless ASCII chart, but it too is now more powerful. It has a buffer in which you can assemble strings of non-typeable characters for pasting into documents (like an electronic Dymo label), and a clever system for enclosing or separating such strings with a chosen character. For example, if you are writing Pascal you could have all strings wrapped in single quotes, or they could be separated by commas.

User interface and customisation

Having sketched out *what* SideKick Plus does, now let's examine *how* it does it. You will probably have gathered by now that SK Plus has a great deal more functions than old SideKick. SideKick originally got by with a single-line menu at the foot of the screen, indicating the function key assignments. SK Plus needs two lines at the foot of the screen for function keys, together with a whole system of GEM-style drop-down menus. The good news is that the system is well-designed and rapid to use, and, what's more, if you don't like it you can change it.

Certain function keys are used consistently throughout SK Plus. F1 always provides context-sensitive Help. F5 is the Zoom key which instantly toggles a window between its default

size and full screen. This feature has a huge effect on usability; it's quite practical to have eight or more small windows on the screen when you can expand the one you wish to work on at a single keystroke. F6 is the Switch key, which makes the next visible window active, in cyclic order. F7 and F8 in most applications are used to mark block beginning and end, and F10 summons up the drop-down menu system.

The drop-down menus actually resemble those on the Amiga Workbench more than GEM; when you select an option a new menu may drop down from that point, slightly offset to one side. The menu system is context-sensitive, so that only options which are currently available appear on the menu; for example, if no block is selected then the Block Move option doesn't appear. All menu choices can be made either by moving the bar cursor or by pressing the first letter of the option name, and as you become familiar with the location of things, you tend to use sequences of letters (cf. Lotus 1-2-3) without looking at the menus. Some of the menus go down to four levels deep, but this is only for default settings and other parameters, commonly used commands always being at the top level.

'SideKick Plus is a very ambitious product indeed: it can no longer be considered a resident utility, but rather a whole operating environment . . .'

The menu system is fully customisable, a feature I have never encountered before. You can cut any menu option and paste it somewhere else in the menu path, perhaps at a different level. You can add new menu levels, or remove a level. You can assign any menu option to a function key or assign a keyboard 'shortcut' to any option.

Changes you make to the menu system can be saved permanently once you are happy with them. You can also alter the colours, size and position of any of the scores of windows, interactively, at any time, by pressing ALT-W to bring up the Windows menu.

Setting up all the SK Plus windows to your satisfaction can be quite a task and can take a long time as, for example, each Notepad must be coloured separately. Once you have got it right you don't want to lose all that effort, and so the Services option on the main menu allows you to export the whole set-up as a file, which can be imported into any other SK Plus system.

System building & memory management

As I mentioned at the beginning of this piece, SideKick Plus is supplied as a set of modules and libraries on three disks. You need to copy all these to a hard disk, and then use the program called SKBUILD to link these modules into a system. SKBUILD is a menu-driven, interactive program and very simple to use. You pick those applications you wish to include from a menu, and set certain default memory sizes by sliding a bar with the cursor keys. You can choose how many Notepads and Outlooks (from 1-9) to include, though cutting down saves no memory. This is also where you tell SideKick about your modem.

Borland intends to release the linkage specification to third-party software houses so they can write new applications that can be linked into SideKick Plus. You could have, for example, a spreadsheet or graph program on the main menu. How many will take up the offer remains to be seen, since the market is fragmenting at an alarming enough rate already, what with GEM, Windows and OS/2 to worry about.

Memory management in SK Plus is so sophisticated that it almost amounts to an alternative operating system. The program can be loaded in either swapping or fully-resident forms, and a number of permutations in-between.

The fully-resident mode is just like the old SideKick, all of the program being loaded into memory. A full system will take up about 256k in this mode, and all the applications will respond instantly.

In swapping mode only the kernel of SK Plus, which is 67k in size, is loaded into memory. This kernel controls two separate virtual memory systems, one for code and another for data. Every time you switch applications, the code will be read in from disk, and data will be continually swapped between memory buffers and disk. As you would expect, this mode slows the response time of SK Plus; on my slow PC it takes about three seconds to pop-up after you hit CTRL-ALT, and five seconds to pop down again, but on a fast AT clone it would be quite acceptable. The amount of main memory tied up is tiny (less in fact than old SideKick!) but a great deal of hard-disk space is used by the swap files, which can exceed 1Mbyte in size.

SK Plus can also use an Above Board (or equivalent) expanded memory card, or a RAM disk to hold its swap files, in which case the degradation of response time is negligible, and you get lots of free main memory. To use this option you must select it when originally building the system with SKBUILD.

'SK Plus has more functions than Old SideKick . . . the good news is that the system is well-designed and rapid to use, and you can change it.'

You can even alter the memory strategy *after* SK Plus has been loaded. Running a program called SKBAT with a memory size as its parameter will reconfigure SK Plus, on the fly, to occupy that amount of memory. If you choose a figure between 67k and 256k then swapping will still occur, but less frequently and to a lesser extent. When building a system with SKBUILD you can also alter the various buffer sizes, and specify that a particular subset of the applications be made fully resident (that is, non-swapping).

Conclusion

I was initially worried that SideKick Plus would prove to be overcomplicated. I was pleasantly surprised. After a few days of familiarisation it becomes as easy as the original SideKick, and the increased power of all the components is so welcome that I would find it impossible now to go back.

It's important to recognise that SK Plus is quite unusable without a hard disk and is not really much use without 640k of RAM, too. In these respects it is typical of the new generation of 'muscle' software.

As truly multitasking environments like DESQView, Windows/386 and OS/2 gain in popularity you may query the need for pop-up accessories like SideKick Plus at all. In my view, the individual applications in SideKick Plus are of such a standard that I would be hard put to better them with a collection of standalone applications, and the cut-and-paste facilities would be far less flexible in such a mixed bag.

I remain an addict.

The price of **SideKick Plus** had not been fixed at press time. END

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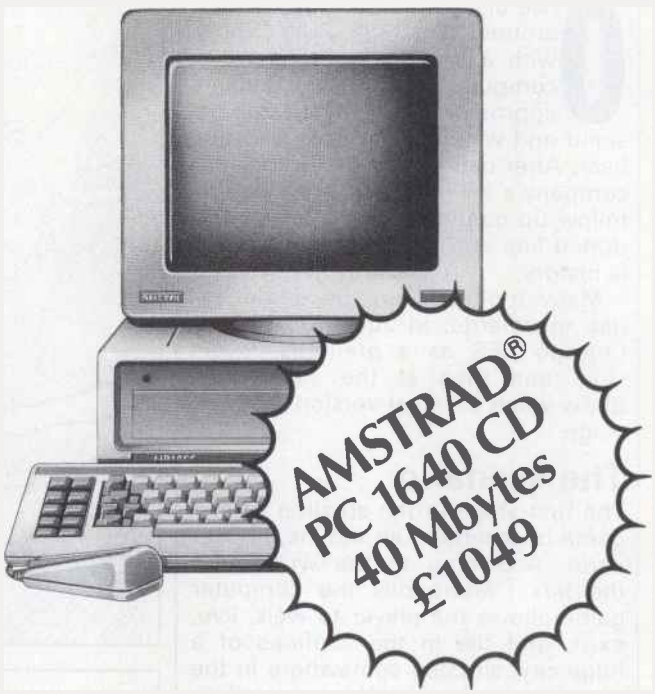

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PCW.3

Holiday in Metropolis

The computer game that takes your time and money, at home and in the arcade, wasn't just thrown together: there has been a storyline, months of program development, and the collation of all the elements into an action-packed whole. Graham Devine traces the history of his own creation, Metropolis.

Once upon a time, I was walking around the 1986 PCW Show with a two-page outline for a computer game called Static. I approached Mastertronic's stand and was hastily thrust a can of beer. After being invited along to the company's offices the next week to follow up its interest, I signed on the dotted line and the rest, as they say, is history.

Many moons later, the game began to emerge; in June 1987 at the Chicago CES as a pre-release version, and then at the 1987 PCW Show when the final version took the stage.

The scenario

The first stage in the creation of any game is designing an outline, or scenario. According to the writing on the box: 'Metropolis the computer game allows the player to walk, live, exist, and die in the confines of a huge city, situated somewhere in the player's imagination. You may talk to any of the characters and walk freely among the city streets.'

The (real) idea of the game is to progress through the levels of the city to get to some distant place. The reason? To fetch back the master tape of a game stolen from IC&D by a rival software house. Changing level is simple: all you have to do is use the ZoomTube — you are even told where it is! The only problem is that although the city has been built for human occupancy, there aren't any humans! The droid at the ZoomTube seems to be a little crazy, and requires you to follow the ZoomTube's strict rules to the letter (presumably made up after all the humans had gone). You can talk to any of the robots and they will talk back (using synthesised speech and a small AI module). There is also a newscaster who adds a backdrop and time limit in which you have to solve the crime, as well as providing more information.

The name has changed from Static to Metropolis, but the actual format of the game hasn't changed too much from the original idea except that I didn't intend to spend quite so long writing it!

'This is Pixel Sprite, reporting for the IC&D news. Metropolis has had a patchy history. It started as a haven for hackers and ended up the trendiest place for those up and coming software designers. All of the giants are here: IC&D, Mastertronic, Arcadia, to name a few.'

Metropolis is dominated by adverts, and I initially felt that this was really what the game was all about. As time progressed, deadlines drew close and the coffee cups piled up, I changed my mind. This game is about something completely unrelated. People should be able to work

out what it is; after all, I give enough hints!

The news reports in Metropolis consist of a series of 25 bulletins made up to set the pace for solving the crime. At the end of the twenty-fifth news item, the city level blows up and becomes Martian property, and so on.

The tricky thing here was trying hard not to be political, but at the same time make the news interesting. War is a good subject, but very hard to report. So, I stuck more to the impossible (invaders from Mars, rabbits taking over . . .). For example, here are the first four newscasts from level one of Metropolis:

'. . . Thank you for that, Bob. Reports are coming in of a robbery at the IC&D main office, police refuse to comment right at this moment.'

Here, the crime for the human to solve is introduced, as is Bob Sleigh, the co-host of the IC&D News.

'Following the robbery at IC&D the police have issued the following statement: we believe the villian to have bathysiderodromophobia, but of course that may well be supposititious, we will be able to say more after a more thorough perlustration. For those with icondite prose our police are programmed to have a fulgent logodaedaly rightly . . .'

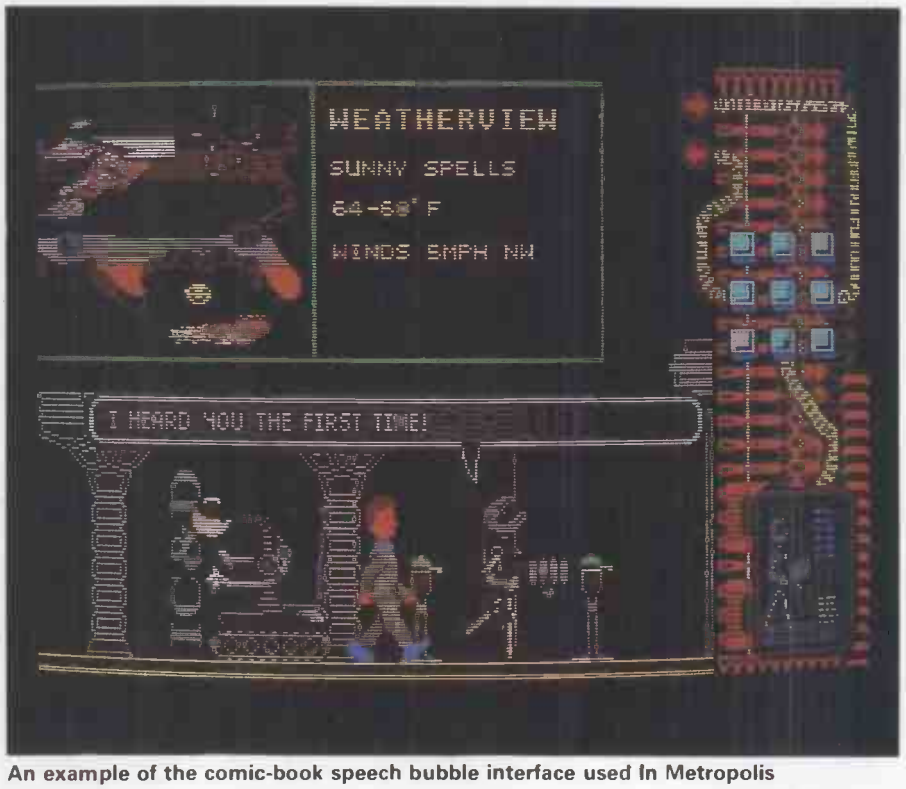
We keep up the robbery at IC&D coverage for a while, this time bombarding the player with long and apparently meaningless words:

'This is the IC&D news. Following reports on Newstar 3 of a raid by terrorists in the Northern Quadrant, TV 1 has not carried the story. Apparently, there is some doubt over the validity of the story.'

This story builds up to reveal the fact that television companies are fighting a real war to attract the maximum number of viewers, and can, therefore, charge lots of money for the adverts.

Development

All programmers like to use a set of development programs that they are happy with. I used the Microsoft Macro Assembler, the Borland Turbo Linker, Degas Elite, and the Microsoft QuickBasic Editor. The assembler is slightly modified through a set of macros that allowed me to structure the code in a C-like block structure: this makes conversion to other processors much easier. Purists might say that this method does not produce the 'best' code — I disagree.



An example of the comic-book speech bubble interface used in Metropolis

The branches have to be made anyway, and it speeds up debugging, conversion, and development time. The modifications, although quite short, require several pages of explanation, so I won't go into them here. Other programs I found useful were Norton Utilities, and Borland's SideKick and Turbo C.

'. . . the game hasn't changed too much from the original idea except that I didn't intend to spend quite so long writing it!'

Using these development tools and only two machines, a Tandy 1000 and an Atari ST, I embarked upon coding my ideas. All the graphics in Metropolis were developed on the Atari ST and then uploaded onto the Tandy. I then converted the files into Tandy 1000 format (Listings 1 and 2 show the upload and download programs).

The final program consists of a small AI module, a speech synthesis module, a graphics environment manager, and an interactive news source. The whole thing fits into 256k which, I am told, is quite impressive for a game of this complexity. Each of these modules fits together to form the game, and I'll examine each of the modules separately. (I assume that the reader has a little knowledge of programming in Basic, C, and 8086.)

Programming

The Atari ST has, in my view, an odd screen format. The first four 16-bit words of screen RAM refer to the first physically-displayed 16 pixels.

To identify the colour of, say, the first pixel, combine bit 15 of each of the first four words to achieve a 4-bit number, and so on, for all 16 pixels. The process then starts again, combining 4-bit fourteens, and so on, until you reach bit 0 and pixel 15. The next four words then define pixels 16 to 31, and so on, for the entire memory map.

The Tandy 1000 has a much easier screen format. Instead of words the Tandy uses nibbles, so the top four bits of the first byte belong to pixel 0, and the bottom four bits to pixel 1.

The IBM CGA format is similar to the Tandy 1000, but you can only have four colours on the screen. Also, there are only two colour palettes from which to choose: either background, cyan, magenta, and white or background, red, green and yellow. The screen consists of two bit quantities.

The IBM EGA card is different again. To gain 16-colour 320×200 format, you have to address four planes of memory (the intensity

Listing 1

```
The program ato convert Atari ST screen files to RS232 line on the ST
1987 Industrial Concepts & Design Limited
Free for copy, modification, etc.
These programs are provided in their "native" state, i.e. these
are the programs I used, they may be terribly written, or very
unfriendly, it is up to the user to modify and use them.
*/
100 q=0
120 clearw 2:fullw 2:gotoxy 0,1:color 2,1,1,1,1
130 print "Degas to RS232"
140 color 1,1,1,1,1
160 gotoxy 1,6:input "Filename >",in$
170 in$=in$+".PI1"
180 open "R",#1,in$,2
190 field #1,2 as inword$
400 for i%=18 to 16017
410 get #1,i%
420 a$=str$(cvi(inword$))  :rem watch this, it has changed in 1.08
421                        :rem to 4 byte values!
422                        :rem change to a$=str$(cvi(inword$)/65536) I think!
430 if a$="-0000000" then a$="-32768"
440 gosub 1000
470 next i%
480 close
500 out (1),26
999 end
1000 rem
1010 q=q+1:if q=3 then a$=a$+chr$(13)+chr$(10)
1020 if q<>3 then a$=a$+","
1030 if q=3 then q=0
1040 for j%=1 to len(a$):out (1),asc(mid$(a$,j%,1))
1050 next j%
1060 return
```

Listing 2

```
The program ato convert Atari ST screen files to EGA/CGA format
1987 Industrial Concepts & Design Limited
Free for copy, modification, etc.
These programs are provided in their "native" state, i.e. these
are the programs I used, they may be terribly written, or very
unfriendly, it is up to the user to modify and use them.
*/

1 REM Program modified to pset graphics rather than to Tandy 1000 format
2 REM S originally held the screen RAM pointer
3 REM No current save facility, remember DEF SEG=&Hb800 for CGA
4 REM                                DEF SEG=&ha000 for EGA
5 REM This program requires CGA/EGA/Pc Jnr graphics
6 REM
10 DEF SEG                                    ' use basic data segment
20 KEY OFF                                    ' keyboard macros off
30 CLEAR ,45000!:SCREEN 7:GOSUB 220:MC=45000! ' set up the machine code
40 DEFINT D,E,F,G,S,C                         ' integer variables
50 X=0:Y=0:S=0                                ' should be zero anyway
60 INPUT "Filename ";A$                       ' file to read from
70 NA$=A$+".bin"
80 FI$=A$+".pi1"
90 OPEN "I",#1,FI$
100 WHILE NOT EOF(1)
110 INPUT #1,C0
120 INPUT #1,C1:INPUT #1,C2:INPUT #1,C3       ' fetch four words
130 CALL MC(C0,C1,C2,C3,S)                    ' and call the m/c
140 FOR Z=45080! TO 45087!
150 A=PEEK(Z):A0=INT(A/16):A1=A AND 15        ' two pixels to a byte
160 PSET(X,Y),A0:X=X+1:IF X=320 THEN X=0:Y=Y+1
170 PSET(X,Y),A1:X=X+1:IF X=320 THEN X=0:Y=Y+1  ' onto the screen
180 NEXT Z
190 WEND
200 CLOSE
210 END
220 OPEN "R",#1,"EGA.EXE",1                   ' read the machine code in
230 FIELD #1,1 AS A$
240 FOR I=1 TO 512:GET #1:NEXT I
250 FOR I=0 TO 200:GET #1:POKE 45000!+I,ASC(A$):NEXT I
260 CLOSE
270 RETURN

;
; modified to return pixel values in ram
```

```
codes   segment para public

    assume  cs:codes
prog    proc    far

basvar  macro   offset,reg
    mov     bx,[bp-offset]          ; fetch variable address from stack
    mov     reg,[bx]                ; and put it in the correct register
endm


start:
    push    bp                      ; GeeWhizz Basic uses this
;
; call start(p0,p1,p2,p3,sc)
;
    mov     bp,sp                   ; point to end of stack
    add     bp,(4+2*5)              ; far ptr +5 items
    basvar  0,dx                    ; palette 0
    basvar  2,cx                    ; palette 1
    basvar  4,di                    ; palette 2
    basvar  6,si                    ; palette 3
    basvar  8,bx
    push    es
    mov     ah,8                    ; the number of bytes to rotate
    mov     bx,45080                ; quick fix for basic
loop:                                   ; about to use MASM rept prefix
    rept    2                       ; shift in from ST to /xxxx/
    shl     si,1
    rcl     al,1
    shl     di,1
    rcl     al,1
    shl     cx,1
    rcl     al,1
    shl     dx,1
    rcl     al,1
    endm                            ; end of MASM rept prefix
    mov     [bx],al                 ; save the result in basic DATA seg
    inc     bx
    dec     ah
    jnz     loop
    pop     es
    pop     bp
    ret     10                      ; used 5 items
```

plane, the red plane, the green plane and the blue plane respectively). The most confusing aspect is that all the planes have the same memory address (A0000H), but IBM has solved this problem by giving the EGA card registers to select the read/write format, and so on. IBM has also made this card a 'hands off' graphics system, which means that technical information is very hard to come by.

The AI module

The parser works on two levels. The first really goes to work on the sentence and forms a word list from the sentence; and the second level then tries to parse the sentence by looking at the words and filling in what you have really asked. If that achieves nothing, then the computer engages its 'idle chat' mode and comes up with a semi-intelligent reply or a helpful hint. Either way, the overall impression is that of intelligence (except to programmers).

All of the interaction in Metropolis stems from the book *Godel, Escher, Bach* by Douglas R Hofstadter (*very* highly recommended), followed by its related text (which consists of about 20 years' worth of *Scientific American*, several obscure books and a Russian translation!).

'This story builds up to reveal the fact that television companies are fighting a real war to attract the maximum number of viewers . . .'

When you ask the computer a question in Metropolis, the machine response should at least be a grammatically correct answer and at best incorporate some relevant facts, based upon something relevant to the crime or just a flat guess at what the sentence is about. To actually form the reply, the computer 'fleshes' up a sentence format with words that are listed in the related word library. A typical conversation, using both game and guess format, might read:

Player: Hello.
Computer: Good afternoon, Sir.
Player: Where the photon am I?
Computer: I don't know where the photon you are. Do you fancy a cup of tea?
Player: No, what's through this door?
Computer: The green or red one?
Player: Red.
Computer: The supermarket.
Player: My armadillo can ride a bicycle.
Computer: But can it drive a Porsche?

If the user enters enough single words and small phrases, you can get away with fooling people into believing that something intelligent is at work — the biggest asset in convincing people that a computer is

talking to them is their own gullibility. Most people want to believe that computers really are capable of talking fluently. After all, didn't HAL look good in *2001 A Space Odyessy*, and how about WOPR in *War Games?*

The human mind has no way of knowing that I or any other person is intelligent. It relies on the fact that because I look human, I am intelligent. Therefore, the way you present the answer is also very important. Speech bubbles seemed natural to me, since people will associate these with comics and human scripts (look at *2000 A.D.* — talking robots everywhere!).

The game can store so much text by using something called Weighted Huffman coding. This relies on the unevenness of letter distribution in the English language and changes the amount of memory a particular character takes up accordingly. So, the letter e, which is the most frequently-used letter in the English language, takes only two bits of memory instead of the usual eight. This works very well on the text (and also protects it quite nicely, too), but it's too slow for the graphics. Given that the buildings in Metropolis are all of the vertical skyscraper variety, I decided to store the graphics as lengths of vertical, coloured lines. Overall, the compression squeezes files down by about 40%.

Speech synthesis

The speech synthesis uses digitised phonemes. Words are translated to their phonetic equivalent by using some simple rules. Those (many) words that don't follow the rules are held in an exception dictionary that stores all the phonetic data for the word: for example, 'PCW' becomes 'PEE SEE DOUBLE YOU'. The IBM PC doesn't have a sound chip: it has something that I would call a tone generator (others might think of more appropriate names). However, you can 'click' the speaker to give the impression of volume. The machine I originally programmed Metropolis on, the Tandy 1000, has a fine sound chip, so the speech is fairly good on this format.

'The whole thing fits into 256k, which, I am told, is quite impressive for a game of this complexity.'

The graphics environment manager

All the characters in Metropolis use 16 frame-per-step animation which makes walking look quite smooth (this is similar to the animation used in feature-film cartoons). To add to the realism, the newscaster also moves her lips to the words. The graphics are all compressed using a bit strip method, which involves the well-trodden method of using a code prefix.

The data takes the format:

byte [0-127] add the next n bytes to graphic

byte [128-255] add n-128 of byte+1 to graphic

For example:

```
db 5,1,2,3,4,5,170,0
```

expands out to:

```
db 1,2,3,4,5,42 dup(0) ; bytes 1,2,3,4,5 and 42 zeros
```

Putting it all together

As the jigsaw began to fall into place, demos were presented to Mastertronic, for a long time centring upon the graphics and speech; the actual gameplay followed much later (about June 1987). By this time, the game only worked on the Tandy 1000.

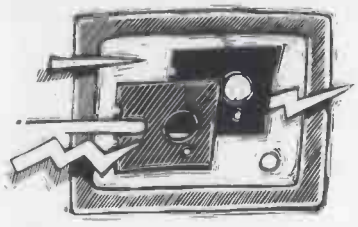
Conversions to other IBM formats followed, but various problems made this process quite difficult. CGA graphics are odd, to say the least, and the EGA format is . . . well, horrible, and the Amstrad 1512 is worse. On top of all this are the various processor speeds to account for (the speech has to be timed extremely accurately).

In the end I used a dithering technique on the CGA to shade 16 colours using only four. This was slow, but by utilising vast tables the speed was made acceptable.

Finally, the instruction booklet was written. It took two months to decide who was going to write it, and four hours for me to write.

And so a game was born.

Graham Devine's Metropolis is reviewed in 'Screenplay' on page 162. END



JPI Modula-2

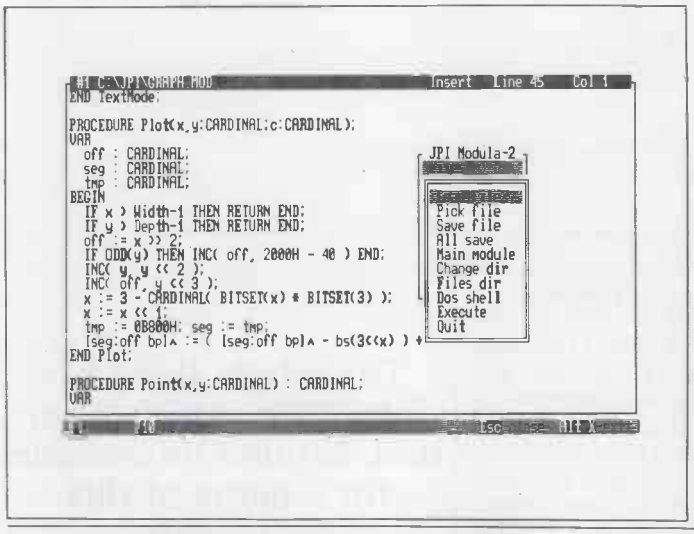
The reluctance of many programmers to tackle the idiosyncrasies of Modula-2 could turn to enthusiasm with the arrival of JPI's version — a fast, full-featured compiler for the IBM PC and compatibles. Owen Linderholm attempted to keep up with it.

Language freaks and hackers either love or hate Modula-2 — it's that sort of language. Some swear by it and, given the choice, would use nothing else. Others loathe it, and wouldn't use it even if the alternative was entering binary digits via a front panel. The two camps are split into those who prefer structured languages like Pascal, and those hackers who prefer assembly code but would use C if necessary.

The reasons for this split lie in the nature of the language, which stems directly from its original author and from its roots. Modula-2 was conceived as a successor to the original Modula and to Pascal. Both of these languages were created by the same man — Niklaus Wirth. Many people are familiar with Pascal, but Modula, on the other hand, is a rather obscure, experimental multi-programming language.

Modula-2 scores over Pascal in that the syntax has been heavily simplified; it has a module concept and a stricter structure; it includes processes for multi-programming low-level facilities and easy type conversion; and, finally, it uses procedure types so that procedures can be assigned to variables. The result is that Modula-2 is a very highly-structured language with powerful facilities. It is especially good at large projects involving low-level hardware facilities, such as operating systems, and is also ideal for any programming project involving more than one programmer.

The disadvantages involve typing '—' for variables or keyboards. Modula-2 is what is known as a 'strongly-typed' language, which means that every variable must be of a defined type and may only be referred to in a context where it is legal. Because of this, and the need to rigidly define variables, types, structures and procedures, Modula-2 is a 'wordy' language with long source code files. Many programmers find the extra finger exercise rather excessive.



The JPI Modula-2 environment in standard use. Any of the open windows can be changed at will. All of the compiler commands are immediately available via the menus or direct keyboard shortcuts. Operation is swift, easy and efficient

Another contributing factor to Modula-2's unpopularity is that since it was developed with one machine in mind and later ported to others, it has a standard core but non-standard extensions to that core. Consequently, there are very few implementations of Modula-2 that are truly compatible, except at a basic level.

The version of Modula-2 reviewed here evolved from a product which was only partly developed but has been successfuly launched by the well-known software giant, JPI. The program's ancestry shows to some extent, although JPI has rewritten it and added many interesting and novel ideas of its own.

Commands & facilities

JPI Modula-2 only runs on the IBM and compatibles. It requires 512k of RAM and at least two floppy disk drives — preferably a hard disk.

JPI Modula-2 is a full implementation, with many extensions, of Modula-2 version 3 as defined by Wirth. However, the standard libraries it has been installed for are *not* Wirth version 3. Instead, they are JPI's own libraries, modified to work well on the IBM PC and including many extensions. More surprisingly, they are not particularly similar to Wirth's suggested libraries, even though this would be easy to achieve. (A set of Wirth standard libraries is included with the program, but you have to instruct the compiler to use them.)

As an example, Wirth suggests that the command to read a cardinal (a positive integer) shoud be 'ReadCard(x)', where x is a variable defined as a cardinal and ReadCard is held in the library 'In Out'. Instead, JPI uses 'x:=RdCard', with RdCard as part of the library IO. These differences may seem small, but they can cause real headaches when converting from compiler to compiler.

The compiler is extremely fast. It can compile programs of up to 1Mbyte in code and data size, and generates standard .EXE files. Modules can be compiled separately and saved as object code to be linked later with other modules to create a complete program. This would be standard practice on a large project

with many people working on different parts of a large program. Libraries of modules are included with JPI Modula-2 to support I/O, string handling, DOS calls, mass storage, processes, concurrent programming, real maths with or without the 80×87 chips, graphics and windowing.

All these modules and libraries are monitored by a 'librarian' which automatically creates library files for every module, and helps the linker link in only the parts of each module that are needed.

The compiler works from a windowing and menu-driven environment which is extraordinarily configurable — far more so than any other program I have seen. JPI Modula-2 can be invoked as a full compiler and/or linker from the DOS prompt as part of a batch command. More interesting, however, is the level of configurability of the environment. Each part of JPI Modula-2 appears in a window and each of these windows can be moved, recoloured, resized and even restyled. All changes are remembered and stored in a configuration file. These configuration files can be specially created, saved and reloaded under different names.

JPI Modula-2 contains a file called M2.MNU, which is a text file containing the order of menus, style of menus and keys used to invoke options throughout the environment (including the editor). If you want, the 'Quit' option can lead to the editor! I really like the idea that you could load this file into the JPI editor, change it and save it, so that the program was completely different the next time you ran it.

An item of interest on the main compiler menu is 'Techline'. It will only be relevant to those users with modems, but it allows you to call up a BBS system providing specialised support for JPI Modula-2. Essentially, Techline is a JPI and IBM PC-specific communications program. You dial up, and windows containing information and menus appear. You have to register first but, once this has been done, you can ask questions which will be replied to within a day or two, and you can browse through other questions and answers to see other people's solutions to problems. You can look at news to see what updates and new versions are available, as well as bug lists and fixes. You can also download sample JPI Modula-2 code to look at and run.

Performance

The impression I got while working on JPI Modula-2 was one of power and speed, although when I examined the Benchmark and compile speed figures, I was a little surprised at some of the results. In particular, the compiler is highly disk intensive while compiling a program, due to the language's modular nature. When compiling, module definitions have to be loaded in from disk for syntax checking; and, when linking, object files for the modules must be loaded in to slot together to make the final program.

Using the compiler from the environment is very pleasant. It is easy to configure to suit your idiosyncrasies and operates quickly. The editor can have up to five windows open at once (one reserved for editing compilation errors), making the process of entering and editing source code considerably easier. For example, repetitive bits of code that aren't suitable for compilation as separate modules can be copied from a program in one editor window to a new program in another window.

JPI Modula-2 takes care of closing and saving files automatically. In addition, when the compiler is started up, it automatically reloads all the editor files and window and configuration settings that were last in use. Short-cuts are available for all commands in the form of single and combination keystrokes.

Judging by the Benchmarks (see page 148), JPI Modula-2 performs fantastically well in one area especially — graphics. Not only is it faster than any of the comparable compilers, it is also the second fastest result we have ever obtained for the 'GrafScrn' Benchmark! The only machine/language combination to achieve a faster rating was a Sun workstation running Sun C — just. All the other Benchmark results for JPI Modula-2 are impressive, too — well on a par with the fastest compilers from other software houses, and better than most. I have compared it with Turbo Pascal version 4, the fastest IBM compiler I know of, and Turbo C, since it is the only widely-accepted C compiler for which I have figures running on comparable hardware. Turbo Pascal version 4 emerges as being slightly quicker to run and significantly quicker at compiling. Turbo C is about the same as JPI Modula-2.

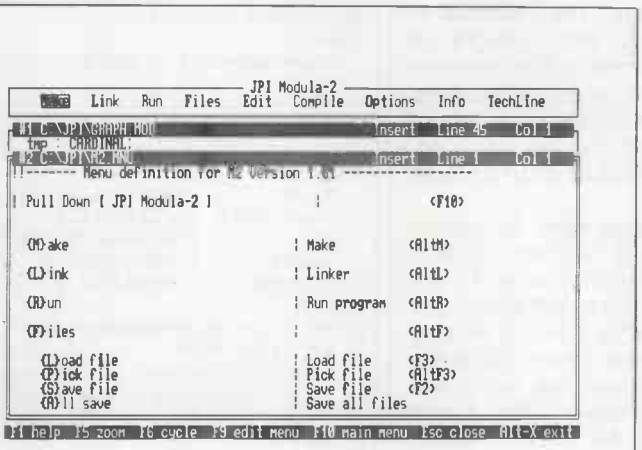
One of the major criticisms of Modula-2 in comparison with C is that it produces less compact and slower code. This may have been true of previous Modula-2 compilers on the PC, but is definitely *not* true of JPI Modula-2. It produces more compact code which runs slightly more quickly than Turbo C, and produces it quicker — and Turbo C is just about the fastest C compiler around!

The new Microsoft C apparently produces extremely compact and fast code, but is certain to be a rather unwieldy monster compared with JPI Modula-2.

There *are* bugs in JPI Modula-2, but JPI doesn't hide this fact. It encourages the reporting of bugs and provides a list of the known ones on Techline. Those that have been fixed in the next version of the compiler are listed. New versions will be available at regular intervals for the cost of a stamped, addressed envelope.

In use

Installing the compiler is quite straightforward — you copy the two disks for the compiler and the libraries to the hard disk and run the program. A third disk contains source code for the libraries, for those keen developers who want to customise them. Setting up double-floppy systems is also straightforward. I did encounter one serious problem, though. I transferred the two disks to a single 720k floppy for use in a portable at home. The program worked fine, but I didn't bother initially to make the compiler use drive B: for source and object files. Eventually, the 720k floppy filled up: when I tried to save my current file, I was informed that no more space was



An open editor window and the main menu. In the editor window is the M2.MNU file which allows the menu structure, appearance and keyboard controls to be altered. Notice that the menu differs from that in the screen shot alongside

available. I instructed the compiler to switch to drive B: and thought all was well. Unfortunately, the compiler still insisted that it save the file onto drive A: *before* moving on to drive B:. Nothing would change its mind, so I gave up and lost an hour's worth of editing.

The compiler was easy to use — so much so that it rivalled my previous favourite, Turbo Pascal 4. The environment is very different but even more extensive. I found writing code a chore at first since the libraries JPI uses by default are not in the standard Wirth format. After I had used the compiler for about a week, however, I was able to convert the syntax automatically as I entered code.

I rarely used the context-sensitive Help which is available, mainly because JPI Modula-2's operating environment is quite straightforward. I found it easier to use the manual and the example programs provided. You can view these in separate editor windows while entering your own program, to learn how to use JPI's libraries.

During the review period I wrote a couple of short test programs and started work on a large project. I found the process of debugging reasonably easy, since JPI Modula-2 uses the popular integrated development approach by returning you to the editor with syntax errors marked. It marks all errors in a file at once. When you then move the cursor through the source file in the editor, you get a separate message for each error as the cursor passes across it.

Problems

I have already mentioned the major problems that I had, but I should also say that the compiler, when running programs from within the environment, was a bit shaky. I occasionally suffered from run-time errors (subsequently returning safely to the environment) that proved to be unrepeatable. However, JPI is willing to provide overnight solutions to problems, so this should give end users confidence.

```
PROCEDURE Statistics ;
CONST
  MsgWindowDef = Window.WinDef ( 5,5, 37,10,
                                 Window.Blue,Window.LightGray,
                                 FALSE,TRUE,FALSE,TRUE,
                                 Window.SingleFrame,
                                 Window.Red, Window.LightGray );
VAR
  MsgW      : Window.WinType;
  MsgX,MsgY : CARDINAL;
  WD        : Window.WinDef ;
  count     : CARDINAL ;
  change    : BOOLEAN ;
BEGIN
  WD   := MsgWindowDef ;
  IF IsBW THEN
    WD.Foreground := Window.Black ;
    WD.FrameBack := Window.LightGray ;
    WD.FrameFore := Window.Black ;
  END ;

  MsgW := Window.Open( WD );
  Window.SetTitle(MsgW,' Statistics ',Window.CenterUpperTitle) ;
  MsgX := 5 ; MsgY := 5 ;
  Window.Use(MsgW);
  count := 200 ;
  LOOP
    Process.Delay(1) ;
    IO.WrLn;
    IO.WrStr('Cars: ');IO.WrCard(MaxCar+1,1) ;
    IO.WrStr('  Average Speed: ');IO.WrCard(AvSpeed DIV 10, 1 );
    IO.WrChar('.');IO.WrCard(AvSpeed MOD 10, 1 );
    IF count=0 THEN
      MsgX := RANDOM(50);
      MsgY := RANDOM(20);
      count := 200 ;
    ELSE
      DEC(count) ;
    END ;
```

A sample piece of JPI Modula-2 code. Note the non-standard library calls

Documentation

The manual, a hefty 266-page paperback, is lucid and thorough, but inaccurate in several places. The inaccuracies are not serious, but can cause irritating delays. For example, the library MATHLIB is listed in different places as being 'MATHLIB' and 'Mathlib', the former being correct. Modula-2 differentiates between upper and lower case, and the confusion meant that I had to compile a program twice.

Conclusion

Although JPI Modula-2 felt a bit 'prerelease' because of the inaccuracies in the manual and the program's general 'flakiness', my overall impression was favourable. The support for the product from JPI is, frankly, fantastic — better than for any other software I have encountered and certainly on a par with Dell's hardware support. It is a fast, full-featured compiler and is continually being extended: for example, I was shown a preliminary symbolic debugger which will be released in the next few weeks. Toolboxes are also in the pipeline, especially for graphics. As the product attracts more support, the various bugs and minor problems will be ironed out.

Developers who want a serious compiler for the IBM PC, and who need the power of C but want a more structured alternative, should consider this compiler *very* carefully. Existing Modula-2 fans won't be able to resist — it's a great bargain.

Many of the facilities show the way towards what a development compiler *should* be like. Programmers have put up with sub-standard compilers for far too long: the main factor in *my* reluctance to use C is that there has never been a compiler available that I was prepared to use.

JPI Modula-2 costs £79.95 including VAT and is available from **Jensen and Partners International Ltd**, 63 Clerkenwell Road, London EC1M 5NP. Phone (0800) 444143 to order or (01) 253 4333 for general enquiries. END

Benchmarks

All timings were run on a Hewlett-Packard Vectra unless stated otherwise, and are in seconds.

	JPI Modula-2	Turbo C (1.0)	Turbo Pascal 4
IntMath	0.015	0.015	0.02
RealMath	1.2	1.5	0.8
TrigLog	10.25	10.60	12.75
TextScrn	28.9	41.5	26.25
GrafScrn	0.6	—	1.25
StoreHD	4.0	2.3	2.5

Compile speed

Five hundred and forty eight lines of code using several different modules took 10.7 seconds to compile, including disk access to fetch the module definition files. Excluding the disk access, compilation was about six seconds. This performance is rather slower than Turbo C and *much* slower than Turbo Pascal 4.

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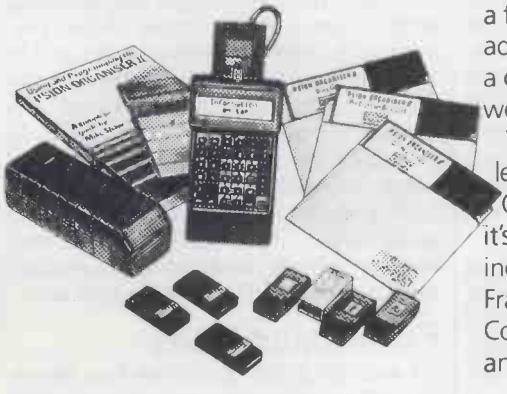

You can also plug pre-programmed packs into Organiser II. Our Pocket Spreadsheet, for example, gives you all the major features of a PC spreadsheet and, with Comms Link, allows you to transfer Lotus 1-2-3* type spreadsheets to and from your PC. There's a range of program packs to help you, from a Spelling Checker to a Formula Calculator.

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Talking pictures

In the final part of our Teach Yourself Smalltalk series, Carl Phillips looks at the language's interactive programming environment, and presents a picture of how it looks on the screen.

One of the distinguishing characteristics of Smalltalk systems is their support for interactive bit-mapped graphics. The ability to create, manipulate, and display high-quality graphical images is a fundamental part of the system. The interactive Smalltalk programming environment and Smalltalk applications programs rely heavily on the graphics classes.

Since this series has referred to 'Smalltalk — the language' and not 'Smalltalk — the interactive programming environment' I haven't said much about what Smalltalk looks like on the screen. However, to appreciate the graphics classes built into Smalltalk, it is useful to see what a Smalltalk screen looks like. Shown on page 144 is a typical view: in this case, Digitalk's Smalltalk/V at work.

As on the Apple Macintosh, work is performed in overlapping windows which are manipulated using the mouse. These windows are further sub-divided into different areas called 'panes'. Entering, editing, and compiling Smalltalk code is done in specialised multi-paned windows called 'browsers'. Applications that run within the Smalltalk environment usually provide their own specialised windows or browsers which reflect their use. For example, one simple application that comes with Smalltalk systems is the 'Form Editor' (a 'Form' is the Smalltalk name for a bitmap). This displays a window which lets the user create and edit bitmaps in a similar way to MacPaint on the Mac.

Xerox Smalltalk was the *first* bit-mapped windowing system — the Apple Macintosh, Microsoft Windows and GEM subsequently borrowed these ideas. Dan Ingalls, one of the original Xerox researchers who created Smalltalk-80, is credited with inventing the — now famous — 'bit block transfer' or 'BitBLT' graphics operation (bit block transfer was the name of an instruction on one of the Xerox research computers). BitBLT is a single underlying graphics primitive which can support all screen operations on a bit-mapped screen. It became famous as the operation at the heart of the windowing systems provided by the Apple Macintosh ROM toolkit, Microsoft Windows and GEM. Some modern personal computers such as the Commodore Amiga have a hardware BitBlt where the operation uses custom hardware to speed things up.

Of the three Smalltalk dialects discussed so far, Xerox Smalltalk-80 and Digitalk's Smalltalk/V both support a rich set of graphics functions. Little Smalltalk currently only provides a simple 'turtle graphics' library which reflects its origins on Unix systems. Little Smalltalk can have windows and BitBLT-style operations added if the underlying operating system or hardware supports it.

BitBLT

BitBLT operations appear directly in Smalltalk as a named class 'BitBlt'. An object of class BitBlt represents a movement of bits from one place to another, possibly with a transformation taking place during the movement, and with a number of parameters (such as clipRect, which limits the rectangle of bits affected in the destination).

BitBlt is an interesting example of how objects can represent what is normally thought of as a pure procedure. It is possible to create a BitBlt object as usual by sending the class BitBlt a message requesting a new instance of a BitBlt object. The object returned can then be sent various messages that set the parameters for the BitBLT operation.

The message 'copyBits' sent to a BitBLT object will actually perform the fundamental operation associated with BitBlts — moving bytes from place to place with certain transformations (governed by the parameters) taking place during the transfer. The benefits of representing BitBLTs as objects rather than, say, having a 'BitBLT' message to a bitmap object include simplicity and flexibility. After having performed one 'copyBits' operation, it is easy to change one or two parameters and send 'copyBits' again to the same BitBLt object, leaving the rest of the parameters the same. Common screen update tasks and animation are performed efficiently in this way.

Forms and pens

As well as BitBlt, Smalltalk has several other classes associated with

Illustration by Gary Thompson

graphics. Objects of class 'Form' are bitmapped images consisting of an array of words that hold the raw bitmap data plus the height and width of the bitmap image. Form objects can provide the source and destination objects for BitBlt transfers.

The display screen is usually a Form object in Smalltalk as a Form (or an object of class DisplayScreen which is a specialised subclass of Form). Note that the graphics operations can use any form for the destination — there is no need for all graphics to appear on the screen.

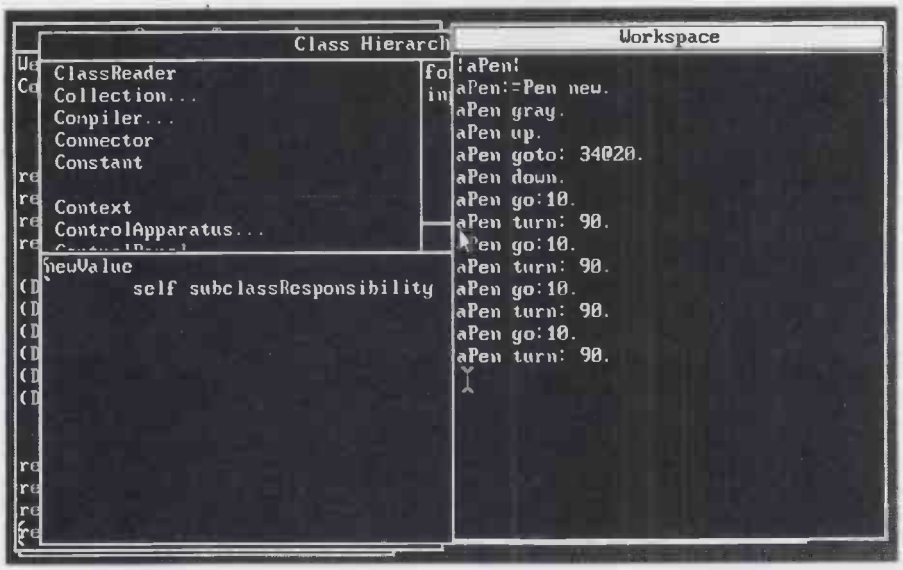
Class Pen gives Smalltalk the 'turtle graphics' facilities made famous in the programming language Logo. 'Pens' are a subclass of BitBlt that have some additional state and methods, and take the form of a brush or a nib, as well as a position, direction and state (whether the pen is up or down). Pens respond to messages sending their colour, their position, direction, and state.

Class CharacterScanner is a subclass of Class BitBlt that allows the easy manipulation and display of characters onscreen. Objects that are instances of class CharacterScanner are BitBlt, such as 'procedural' objects that will convert strings of ASCII characters to a bitmap source image which can then be transferred to the screen. Among other things CharacterScanners have a font object associated with them that governs the appearance of each displayed character. CharacterScanners respond to the message 'display:at:' to actually display a string as the message 'copyBits' is used with BitBlts.

These graphic objects are created and manipulated using simple Smalltalk statements, just like any other kind of Smalltalk object.

For example, the ST/V statements:

```
|aForm|
aForm := Form fromUser.
```



A typical Digitalk Smalltalk/V screen showing turtle graphics commands being entered directly into the workspace window

aForm displayAt: 34@20

will ask the user to appoint a rectangular area of the screen using the mouse, copy that area to aForm, and then redisplay the saved form at a particular location — the point object 34@20.

The message 'fromUser' is a class message — sent to the class Form and not to an instance of Form. The method that implements the 'fromUser' message will use a BitBLT operation to transfer the bitmap the user designates from the screen to a newly created form and return that form object. This form is assigned to the temporary variable aForm which is sent the message 'displayAt:' with a single argument — the point object 34@20. The method in Class Form that implements the response of form objects to the 'displayAt:' message will create and execute a new BitBlt object that copies the source form (in this case aForm) to the destination form — in this case the display screen — at the point 34@20.

As the above example demonstrates, by making use of the classes supplied with Smalltalk, very high-level graphics operations can be performed in just a few statements. Graphics operations with Pen objects are easy too:

```
|aPen|
aPen:=Pen new.
aPen grey.
aPen goto: 34@20.
aPen down.
aPen go: 10.
aPen turn: 90.
aPen go: 10.
aPen turn: 90.
aPen go: 10.
aPen turn: 90.
aPen go: 10.
```

will draw a grey rectangle on the screen beginning at point 34@20. These statements create a new instance of class Pen, send a message to aPen setting its colour to grey, send a message settings its position to the object 34@220, send a message setting its state to down, and then a series of messages commanding it to move about the screen drawing the rectangle.

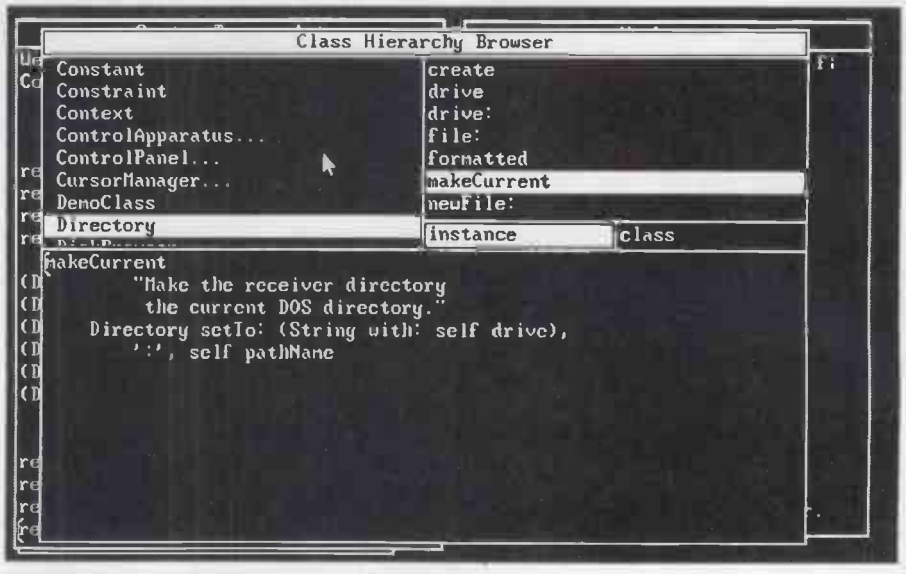
'The ability to create, manipulate and display high-quality graphical images is a fundamental part of the (Smalltalk system).'

These graphic classes provide the underlying basis for the Smalltalk user interface. Coupled with the Smalltalk user interface classes they provide the elements for building serious applications programs.

Interface classes

Software systems, such as the Apple Macintosh toolbox, Microsoft Windows, or GEM, provide a library of routines that can be called from an application program to provide a graphical interface. In Smalltalk, the standard user interface is provided in a set of classes. There is no distinction between an application program, operating system, or window manager in Smalltalk; they all live and cooperate in the single integrated Smalltalk environment, so the user interface classes that you use in building Smalltalk applications programs also support the browsers and windows that are used to implement Smalltalk.

By reusing these standard classes built into Smalltalk in the creation of an application program you can save yourself a lot of work. There are many predefined building block user interface classes that support the facilities built into Smalltalk. By directly creating and using instances of these classes or by subclassing to change their behaviour as required, you build on what has been done before rather than reinvent the wheel. Since representing everything as an object is a powerful abstraction you can re-use both high and low-level objects in your work. If, for example, part of your application needs to create and edit bitmap images,



The Class Hierarchy Browser gives access to an important feature of Smalltalk: the ability to manipulate and create your own classes

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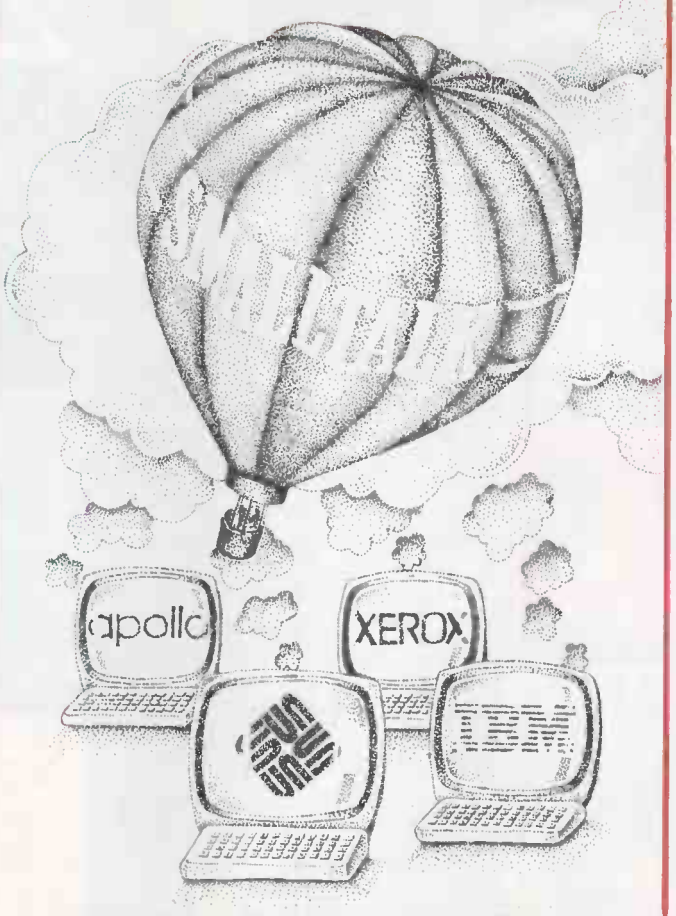

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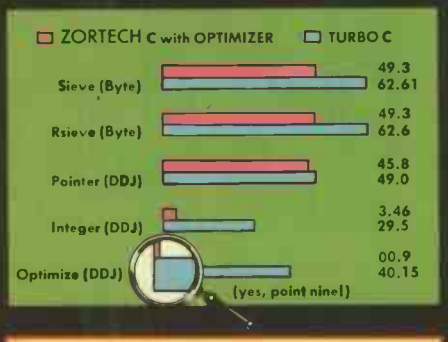

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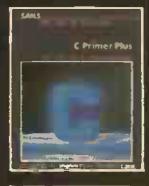

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you can just re-use the classes that make up the Form Editor directly.

This is in sharp contrast to the window manager systems on the Macintosh or Microsoft Windows. While these provide low-level building blocks of varying degrees of utility, there is no easy way to re-use higher level abstractions.

Model-View-Controller

Xerox Smalltalk-80 uses a system called 'Model-View-Controller' (usually abbreviated to MVC) to provide a high-quality user interface. Digitalk's Smalltalk-V has a roughly parallel but simpler set of classes and uses different terminology — application-pane-dispatcher rather than model-view-controller. This explanation will use the Smalltalk terminology but the fundamental ideas remain the same. One problem with Model-View-Controller is that up until recently it had not been very well documented anywhere. Xerox and Addison-Wesley have published a series of three books about Smalltalk-80 but the fourth book about using Model-View-Controller was announced but never materialised. This means that MVC has acquired an unjustified reputation for being difficult to use and understand.

Many people who supply Smalltalk systems publish applications notes or papers that describe how to use Model-View-Controller, but it still remains a stumbling block for novice Smalltalk programmers. Source code for the MVC classes is provided with Smalltalk and using the browser to look at the Model-View-Controller class source code and see how the existing Smalltalk tools make use of them is a good way to learn about the MVC classes.

Model-View-Controller divides an application up into three elements: the 'Model', the 'View' and the 'Controller'. For most applications only the model will require extensive programming. The View and Controller elements are created by re-using classes from the View or Controller class hierarchy.

The 'Model' is the object that represents the application being displayed or viewed. Any Smalltalk object can act as the model — until recently there was no class Model defined in Xerox Smalltalk — which was the source of some confusion. All the objects care about is that the object being used as the model can understand the messages that they send to it and that the results are intelligible to them. The messages that provide these links between Models, Views and Controllers and the message protocol that is assumed are implemented in Class Object — so all objects understand them.

A 'View' provides a visual picture or view of some part of the model. There can be multiple views of the same object or different parts of the object. At the top of the class hierarchy for Smalltalk view objects is the Class View. Other views are subclasses of View that get more and more specialised but perform more useful functions for the user. Some examples are BinaryChoiceView which displays a view giving a choice between two different options, FormView which provides a view onto a form object, and TextView which provides a view of formatted text. (Smalltalk/V uses slightly different names for some of these classes.)

A 'Controller' handles the interaction between the application and the user — the interface with the keyboard, mouse or other peripheral devices. As with Views, Smalltalk provides a set of different Controller classes which can be re-used in an application. At the top of the hierarchy is class Controller which implements the messages all controllers have to understand. Other controllers include: BinaryChoiceControllers, which let a user choose between two different options; MouseMenuController, which handles the interaction with a pop-up menu controlled by a mouse; ParagraphEditor, which is a controller that allows the input of formatted text; and ListController, which lets the user choose between items displayed on the screen.

Class StandardSystemController is the standard controller for a Smalltalk window. It handles all the interactions that allow a window to be displayed, moved, have its size altered, and so on.

The objects that represent the model, one or more views, and one or more controllers are linked together through a dependency chain. This is a mechanism by which Smalltalk objects can communicate changes in their internal state to other interested objects. Whenever the state of an object changes, it can send itself a 'self changed' or similar message. The implementation of this message sends further messages to the objects that are dependent on that object. This is a powerful but simple mechanism. There are a number of messages provided in class Object that enhance the basic dependency mechanism by allowing an object to broadcast messages to all interested objects at once, or to alter the update mechanism to improve efficiency.

For example, suppose we have an object that stores a number, and a simple object that provides a view onto that number. Whenever the value of the number changes, the view object will get a message saying its model has changed its value. The View object can then ask the model object its new value and display the result on the screen. If a user points at the view on the screen and changes the number, the controller object can be used to notify the view and model to accept a new input value.

The constraint system browser

By putting the simple network constraint system described last month ('Class system', *PCW*, February) together with the Smalltalk graphics and user interface classes, it is possible to create an interactive application program — the constraint browser. This will allow the graphical display and input of constraint networks created using last month's programs.

To do this we can make use of a number of the standard building block classes from the View and Controller class hierarchies. An instance of Class Network would represent the model. A custom subclass of one of the view classes will provide a view onto the displayed network and a controller subclass will let the user point at the displayed network and make changes. Such applications can be built incrementally: having created the constraint Network classes and tested them using Smalltalk applications, we can now re-use them in an interactive application. END

Homework

- Investigate the Smalltalk graphics classes.
- Can you use Class Pen and Class Rectangle to create a class of Rectangle that knows how to display itself onscreen?
- How about using BitBlt instead of Class Pen to do the same job?

Smalltalk is cheap

PCW has negotiated a special deal with Smalltalk Express which will enable our readers to follow the 'Teach Yourself Smalltalk' series at a reasonable cost.

For owners of an IBM compatible, an Acorn Archimedes or an Atari ST, Little Smalltalk is available for £7.50 for the disk and minimal documentation, or £32.50 including the book *Little Smalltalk*.

Smalltalk/V, the highly recommended graphical Smalltalk programming environment for IBM compatibles with at least 512k of RAM and two floppy disk drives, is available for £135 including full documentation. A free copy of Little Smalltalk will also be supplied with Smalltalk/V.

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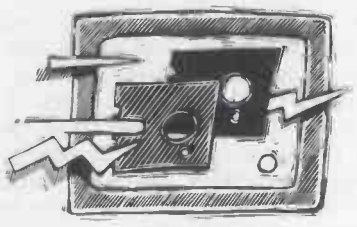


Stop Press

Stop Press is the latest addition to the collection of desktop publishing packages available for the Amstrad PCW and is ideal for the 'amateur' publisher. At a fraction of the cost of big DTP packages, Ross Blackman considers it fantastic value for money.

It's astounding what programmers are capable of when presented with severely limited resources. The Amstrad PCW has — at best — no more than a few tens of kilobytes of usable RAM (discounting its RAM disk), runs under the outdated and much-maligned 8-bit CP/M operating system, and has a tortoise-rated 4MHz clock. But the vast user base has tempted software houses to squeeze every last drop of power from the machine, and the result is that they have made it do things which even Amstrad could not have dreamed of when the company first conceived it.

Nowhere is this more true than in the area of desktop publishing. For over a year the PCW market supported two competing packages (Fleet Street Editor Plus and Newsdesk International). They were joined a few months ago by the blandly named Desktop Publisher, which is also selling well. These programs offer a range of facilities at least comparable with those available for 'big' systems — graphics, a range of fonts and type enhancements, columnar output, incorporation of digitised images, mouse control, and all the paraphernalia of a WIMP environment. When you see them in action, it's difficult to believe that they're being driven by an antiquated 8-bit processor.

Of course, the screen resolution of the PCW can't be compared with that of the Macintosh, let alone the resolution of specialised graphics monitors for 16- and 32-bit machines. And since no desktop publishing package available for the PCW is designed to drive anything but the dedicated printer, the final output can't be placed in the same category as the professional quality available from a laserised machine.

But for many purposes, high-resolution screens are a luxury. And let's face it: not everyone needs to produce laser-quality output. For local newsletters, menus, personalised greetings cards, notices, business reports, invoices, and so on, a dot-matrix is often perfectly adequate.

What's more, the price of desktop publishing software for the PCW is kept way down because of market expectations. It falls into the same kind of price bracket as that of the cable required to link an IBM PC to a laser printer. For less than the cost of a desktop publishing program running on a 16-bit machine, you can buy a complete PCW system — the micro with monitor and disk drive, printer, mouse and interface, and software.

Design

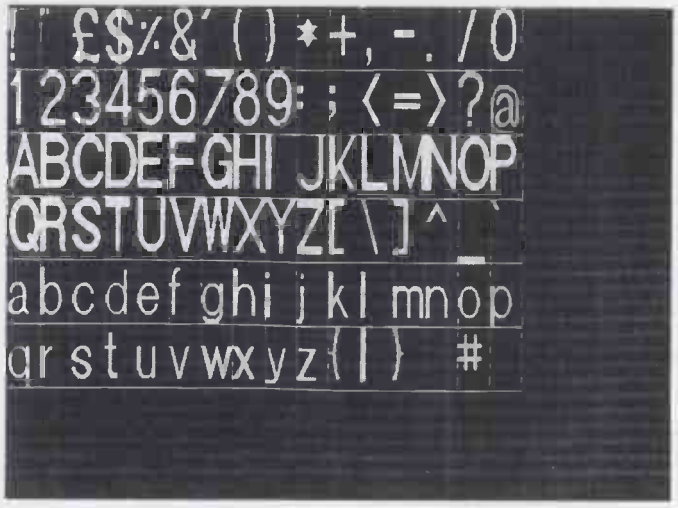
Stop Press, from Advanced Memory Systems, is the latest addition to the PCW desktop publishing collection.

The package started life on the BBC Micro, and was then produced in versions for other machines. But good as it was on them, it could not simply be converted to PCW format as it stood — it had to offer more in order to stand a chance of survival in the fiercely competitive PCW marketplace. The result is that it is just about the state of the art in 8-bit desktop publishing, offering several facilities lacking in the competition, and a user interface which differs fundamentally from its three PCW rivals.

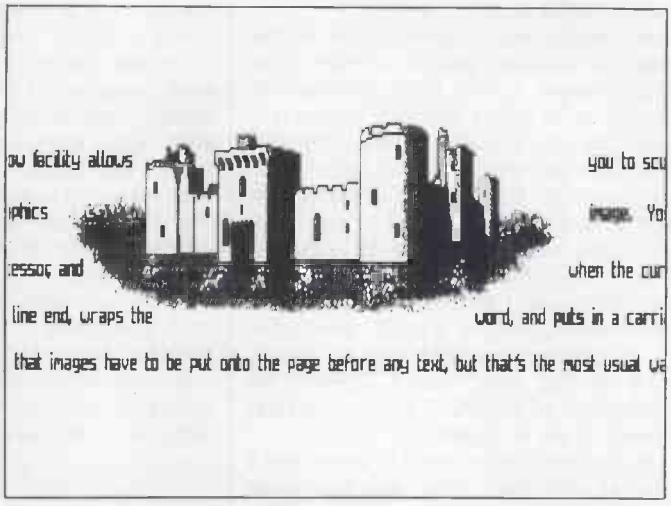
The most obvious difference is that Stop Press does not use pull-down menus. Instead, it presents a single control panel containing a veritable multitude of icons, to which you can return at any time and from which nearly all operations can be performed. This makes the initial learning curve somewhat flatter — at least, it did in my case. Once I mastered the panel, however, I realised that it's a more efficient method of control than pull-down menus because everything is in one place.

The control panel is divided into columns, each representing a particular type of operation: filing, pasting, text, graphics, and such like. A second level of control is also provided by various windows and dialogue boxes accessed from the panel. These are concerned with actions like loading and saving files,

The Stop Press text editing screen. The currently available tools are arranged along the bottom of the screen, although the main control panel is more complex. The current document displays some of the typefaces available



A font editor allows for the resident typefaces to be modified or new ones created. A little experimentation will soon make the user aware how difficult improvement can be



Clip-art files are provided, and Stop Press can be instructed to flow around the jagged edges of an illustration

adding graphics patterns to a temporary clipboard, viewing a complete A4 page (as opposed to the square window on that page represented by the screen, called the canvas in Stop Press parlance), adjusting the size and shape of characters, and other nitty-gritty activities which require a user interface beyond that of the panel.

You can access the panel, windows and boxes either via the keyboard or using a mouse connected to an interface which plugs into the 50-way edge connector at the back of the PCW. The program will accept either an AMS or a Kempston mouse, and the interfaces for both will pass on the edge connector, so you can piggy-back a serial port or whatever onto it and leave them all permanently in place.

I wouldn't recommend using Stop Press without a mouse — the front end has been designed throughout with the little beast in mind, and you'll require bags of patience if you choose not to use one. Moving the canvas around a page, rubberbanding a box, or pasting in a previously saved picture is far easier when the cursor can be moved quickly and smoothly from one part of the screen to another.

Having said that, keyboard control is occasionally necessary for fine drawing work, and some people may find it easier to access the control panel using the keys. This is made practicable by an alphanumeric grid reference for each cell of the panel: for example, to access the ellipse icon you would simply enter G5.

When the panel is not displayed, the screen initially consists of a horizontal and a vertical line, the point at which they cross acting as a hair cursor. The lines are used to create boxes for all block operations, such as pasting in illustrations, and to define specific areas of the screen within which you wish to work without affecting the rest of your page. This is particularly useful when drawing free-hand, since you're then most likely to make mistakes and ruin something which took you ages to create and which you forgot to save.

As with all PCW desktop publishing packages, one page is held in memory at any one time. And, as you build it up, you can preview its overall effect by calling up a page-access window which overlays the canvas and displays the complete A4 page in miniature.

A moveable square box within the page-access window allows you to jump instantly to any part of the page. It's also possible to move the screen around the A4 page in real time, but the screen refresh then becomes very slow while the PCW works its little heart out to process kilobytes of constantly changing data.

Text entry is kept quite separate from graphics mode, but once a pixel has been lit on the screen, text and graphics are treated identically by the program. This is an advantage because it's possible to cut out a section of the screen whatever it contains, and save it to a file for later use or move it immediately to a different part of the page.

Graphics

The program comes with a library of graphic cut-outs (clip-art), and an impressive collection of ready-made patterns and shapes, both solid and hollow. Any pattern can be temporarily loaded into the clip-board for fast access, then easily 'dropped' into the relevant area of the screen.

If you own a twin-drive PCW, the graphics and other demonstration files (there are plenty of them to mess around with) can be held in drive B, while drive A holds your data disk. The system disk is no longer required once the program has loaded into the RAM drive, but since a page consumes about one third of the 170k of space available on an 8256 disk, you need to keep plenty of formatted disks handy (there's no way of formatting them from within the program).

The graphics tools supplied, not unexpectedly given AMS's long involvement in painting programs, are very good. You can do just about anything from spraying large areas with patterns to zooming into a particular area of the screen and changing individual pixels, from cutting, copying, pasting and rotating to automatically putting a border round a page.

There's a grid option for delicate drawing, which sets the hair cursor to move only by a given number of pixels. And a particularly welcome feature is a mouse lock: by holding down the X or the Y key while using the mouse, the cursor will only move horizontally or vertically — the perfect answer to drawing straight lines with a shaky hand.

Shapes are drawn by selecting one from the control panel, then rubberbanding a dotted box containing it. The range of shapes provided is not enormous, but with judicious use of what's there, plus other ready-made effects such as dotted lines and 'ghosting' (a light-grey effect achieved by superimposing one image on another), there's no limit to what you can paint (all in monochrome, of course, but AMS can hardly be blamed for that).

3-D effects with hollow shapes can be produced using a special tool which blanks out hidden lines in perspective drawings. The process is fiddly, but the facility will no doubt be very useful for publishing the re-

sults of CAD applications.

An important graphics tool is the scanner option, which allows digitised images (taken from a video recorder or a video camera) to be entered into a canvas. A video digitiser is of course required, and some people may feel that the total extra cost of incorporating digitised images negates the whole purpose of using an inexpensive PCW set-up for desktop publishing. But there's nothing like a photograph to give a club newsletter or a poster a professional touch, even if the final result, given the limitations of the PCW printer, is best viewed from a distance.

A graphics effect which deserves a special mention is a slip-and-slide routine for re-positioning areas of the screen with pixel accuracy. The normal copy function will achieve the same effect, as it does in the other PCW desktop publishing packages, but less accurately unless you're very lucky or have a lot of patience.

On top of all that, AMS has provided a further graphics tool clearly intended to set the program apart from the competition: a graphing facility called Easigraph. A straightforward data-entry screen allows you to input numeric data for the Y axis, and textual or numeric data for the X axis. A graph, bar graph or pie chart is then produced from it, in whatever horizontal or vertical dimensions you desire, on any part of the canvas. It's not as powerful as dedicated graphing facilities available for the PCW, but it's just the kind of thing needed for business reports.

Working with text

Text can be input directly from the keyboard or loaded from a word-processed file (including LocoScript 1 and 2 files, with the enhancements preserved).

A variety of off-the-shelf fonts is provided (including one meant specifically for headlines), and these can be presented in any of 18 point sizes and a range of horizontal and vertical spacings (including proportional spacing and kerning). Alternatively, you can design your own typestyles with the built-in font editor — though I wouldn't advise starting a font from scratch (I did, and the result was atrocious). Far better to take one of the existing fonts and alter it.

Two fonts can be held in memory at the same time, and either can be selected at will, though one of them must be the standard Amstrad typeface (the one used by LocoScript). Each font can be output in bold, italics and reverse video, and can also be underlined and superimposed on a graphics pattern.

Text can be set in up to nine columns, justified or ragged at either margin, and centred if required, though these text-formatting functions are more difficult to use than with most word processors. For this reason, particularly if you're dealing with large amounts of text, it is better to use LocoScript or some other text editor to create files before loading Stop Press, design and create the graphics, then read in the text at the appropriate points on the page.

A special entry routine is used for text, but once it is on the screen, it can be subjected to all the effects available in graphics mode. You can rotate it, stretch it, compress it, enlarge it . . . whatever.

'If you own a PCW 8000 series machine, and haven't yet bought a desktop publishing package, I can strongly recommend Stop Press.'

And, best of all, you can make it 'flow'. This is not an Artificial Intelligence application to help with structured creative writing, but a method of treating text almost as if it were a liquid moving around an object. Whenever the text meets an obstacle, such as a graphics image or simply a line, it assumes that it has reached a margin and wraps the next word. So, by drawing a diagonal line, you can produce triangular wedges of text. Or, if the obstacle is irregular in shape, the effect will be that the margins of the text take on (roughly) that irregularity.

Documentation

Stop Press is so jam-packed with features that it takes 158 dense pages to describe them. This will not astonish those who have spent weeks ploughing through the manuals of big-system desktop publishing packages running to several volumes, but documentation of this length and complexity is rare in PCW circles. And it could have been longer if more space had been devoted to the tutorial section.

This is my one complaint. The quick 'getting started' introduction tells you almost nothing about the package, and when you know little more than how to click on an icon and load an example file, you're plunged into the reference section.

It's no good being reminded that you really ought to read through entire sections of the documentation and absorb everything before you begin — human nature doesn't work like that. And, in any case, whose memory would be up to such a task? So, in practice, I discovered that learning to use the package often came down to a matter of trial and error, awful mistakes, and flicking through the manual to find the section which would guide me.

However, once you have created a satisfactory page or two (be warned — this can be a long process), you get to know where to look when all else fails. And the manual does have its plus points: there's a useful section on worked examples and hints (though I found that these are better left until you understand why you're doing what you're doing), and an advanced user guide which is full of goodies for adventurous souls.

The index is poor, but this is offset by the contents pages which are very detailed. There are two appendices: one being a glossary of terms, and the other a well set-out section on trouble-shooting.

Conclusion

Stop Press is not as powerful as the Venturas or the GEMs of this world, nor does it rival its bigger brother from the same AMS stable, Finesse. But for many purposes it will prove equally useful, and it does have what many would consider to be the advantage of not being cluttered up with features you might only use once in a blue moon.

Stop Press is priced a little higher than its immediate competition, but then it offers more, and handy additions they are too — the 3-D facility, the slip-and-slide windows, Easigraph, and so on. In any case, £50 can hardly be called exorbitant for a relatively sophisticated piece of software, clearly the result of hundreds if not thousands of man-hours of planning, design and coding. What's more, the all-in price of £89.99 for the software, an AMS Mark 3 mouse and mouse interface, has to be excellent value for money.

If you already own a PCW 8000 series machine, and haven't yet bought a desktop publishing package, I can strongly recommend Stop Press. And if you're thinking about doing some amateur desktop publishing but are at present machineless, it's certainly worth buying a PCW and Stop Press for the purpose. You'll not get everything a 16- or 32-bit processor can offer, nor the kind of quality output provided by a laser printer. But if all you need is something which takes you into the world of fancy fonts and graphics without having to starve for a month, the PCW/Stop Press combination is it.

Advanced Memory Systems is on (0925) 413501. END

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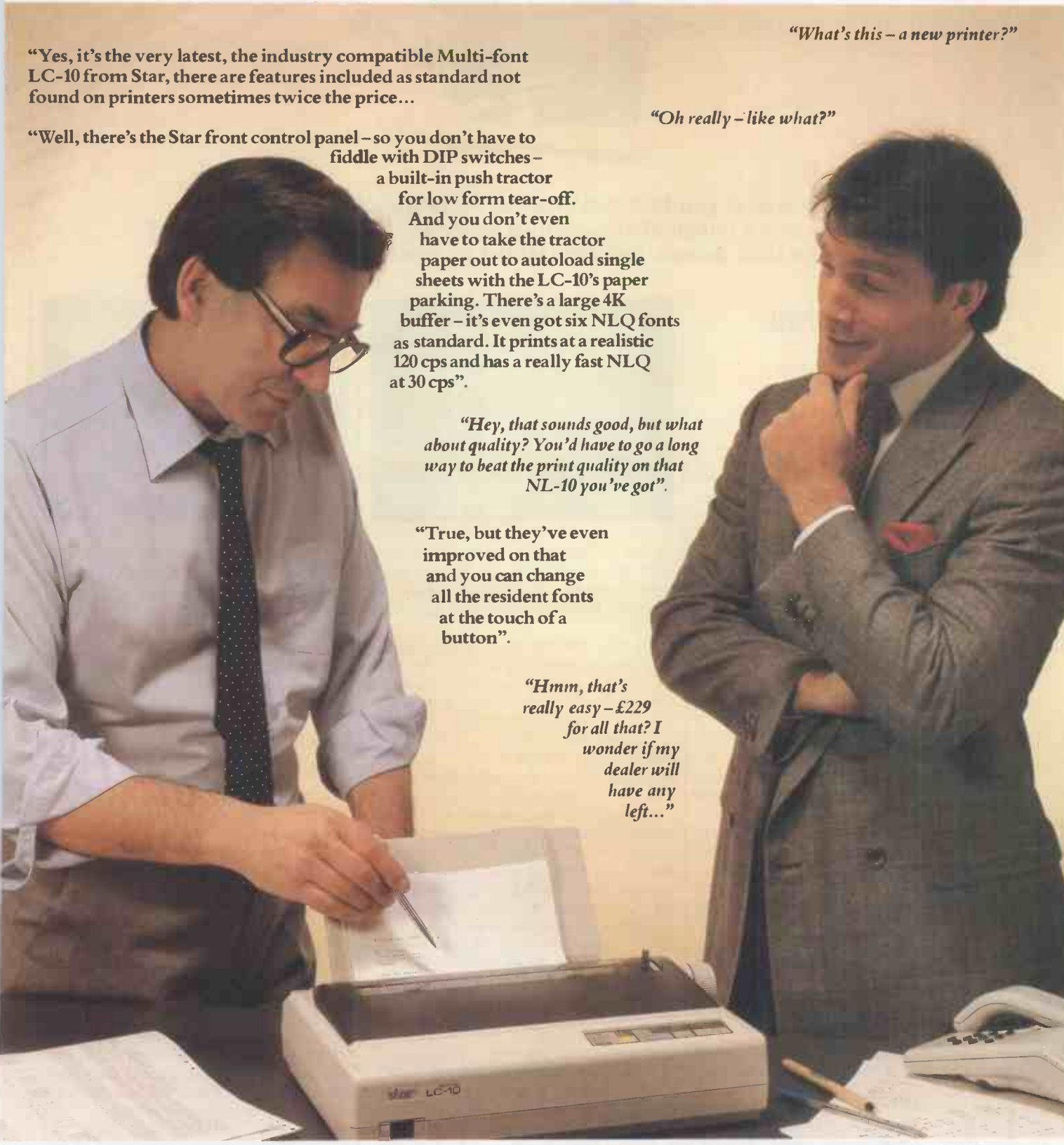

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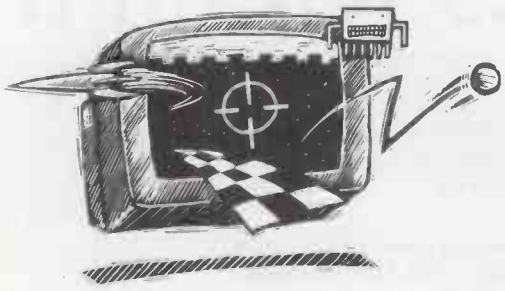


Where would you find lost charms, more gimmicks than you can handle, and a bunch of treacherous acolytes? In this month's pick of the best games, bravely tackled by Stephen Applebaum.

Animal magnetism

Title: Jinxter
Computer: Atari ST; Amiga
Supplier: Rainbird
Format: Disk
Price: £24.95

Will Magnetic Scrolls never put a foot wrong? After the runaway success of The Pawn and The Guild of Thieves, you would have thought that the company might have run out of inspiration.

But if its competitors were hoping that its latest game, Jinxter, was going to be the one where everything started to go wrong, they must be mortified. Far from being a step backwards, Jinxter is, incredibly, an improvement on its predecessors.

Jinxter is a humorous tale about strange goings-on in Aquitania, a mythical world full of bureaucrats and statisticians. Unfortunately for the people of Aquitania, the magical charm bracelet, bequeathed to them by the magician, Turani, and which brought them perpetual good luck, has had its charms stolen. Without its charms, the bracelet is useless, and Aquitania is helpless against the ill offices of the green witches and their evil leader, Jannedor.

Your objective is to recover the various charms and reassemble the bracelet, thus restoring its magic properties. You must then use the bracelet's power to defeat the noxious green witches.

If this *sounds* simple, it isn't. While the bracelet is without its charms, its magic gradually diminishes, causing you to have increasingly bad luck. Jinxter is unusual, therefore, in that it gets progressively more difficult the further you go.

Although a number of items which appear in the adventure could be mistaken for part of the bracelet, Magnetic Scrolls has prevented any possibility of this happening by including pictures of the charms on the packaging and in the title screen, as well as informing you what they are in the Infocom-like bumph included with the game disk. However, apart from making the charms easier to identify, this does not help you find them.

All the charms have magic spells attached to them, which can be cast by saying the name of the charm. The spells include ones to make it rain, to make the sun come out, and to make things come to life. Each one of these comes in useful at some point, no doubt, though I have yet to discover where.

Throughout the adventure, you are watched over by a benevolent spirit called Len Wossname. He is one of the 'Guardians', whose job it was to protect the bracelet. Wossname, like all Guardians, cannot express his thoughts in words, and continually calls things by the wrong names. When he talks about the charms, for instance, he rambles on about the 'thingy' (dragon), the 'doodah' (fire engine), the 'oojimy' (walrus) and the 'doofer' (pelican).

A short insight into Wossname's speech appears in a phoney newspaper supplied with the game. Apart from being fairly amusing, this rag contains numerous clues and ciphered hints which can be keyed in and deciphered when things get really rough.

Humorous dialogue has always been a feature of Magnetic Scrolls' adventures, but in Jinxter the writers have gone overboard. When Wossname introduces himself, he does so in a way that reads like a snippet from *Monty Python*: 'You wouldn't believe I was an Immortal, would you?' he says. 'You wouldn't look at me and say: "Stone me, a bleeding immortal being, God-like in his majesty"?'

Inspecting a wall for clues produces a rather sarcastic reply, which takes up the best part of a screen, and ends: 'Thinking on the role of walls in your life, you eventually enter a trance-like state which the mystics of the Orient call "Nirvana" and the rest of us call "idiocy".'

Amusing as much of this is, the constant stream of rather laboured jokes eventually becomes rather tedious, and you begin to wish that the program's writers had not been such a happy bunch.

Like the Kerovnian adventures, Jinxter contains many superb graphic illustrations designed to complement the rich prose. These are far better than those in either The Pawn or The Guild of Thieves, which is quite an achievement. Only the first picture, depicting the inside of a crowded bus, lets the graphics down, simply because the passengers look like zombies. Then again, perhaps that was the artist's intention.

Magnetic Scrolls, like Infocom, hides its game disks among a mass of bits and pieces which, for some reason, are considered terribly important. Games companies seem to assume that their adventures are incomplete if they don't provide some useless free gift which most people probably discard soon after they have opened the package.

With Jinxter, then, you get a copy

of *The Independent Guardian* newspaper, a beer mat, and an enveloped memo containing an outline of the story. I was pleased with this last item — it replaces the turgid novella which Magnetic Scrolls usually includes with its adventures. We should be thankful for small mercies, I suppose.

As well as excellent graphics, Amiga owners are treated to an opening tune on their version of Jinxter, a swirling piece of fairground music. Sadly, the Atari version of the game is a non-musical affair.

Jinxter is the natural successor to The Pawn and The Guild of Thieves. I am pleased to see that Magnetic Scrolls has not rested on its laurels. It would have been easy for the company to produce an inferior program and counter-attack by challenging people to write a better program than either of the aforementioned two. But it has not done this. Instead, it has produced an adventure that sparkles on every level. Once again, I look forward to Magnetic Scrolls' next production.

Killing time

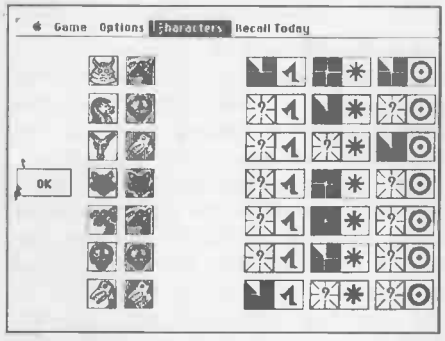
Title: Trust & Betrayal: The Legacy of Siboot
Computer: Macintosh
Supplier: Mirrorsoft
Format: Disk
Price: Not fixed at press time

Chris Crawford's work is nothing if not original. His previous venture, the controversial Balance of Power, was an intelligent and thought-provoking blend of politics and military strategy based on contemporary world fear of nuclear war. Trust & Betrayal is far removed from that concept, but it is equally controversial since it portrays, as a virtue, man's ability to betray his 'friends'.

However, to make the whole thing more palatable, Crawford has dissociated the game's action from our everyday experience by locating it in an alien environment, inhabited by grotesque creatures which look like exiles from *Alice in Wonderland*. But the appearance of these creatures is an all-too-thin disguise; they are people, just like you and me, with loves and hates, conceits and affections, fears and aspirations.

Although their personalities are quite different, all these beasties are striving for the same thing — and to get it they will stop at nothing. Their *forte* is back-stabbing.

The scene, then, is Kira, a moon of the planet Lamina. Kira is a spiritual centre, inhabited by creatures who communicate telepathically. The moon's spiritual leader, known as the



Shepard, has died, and a new leader must be appointed before Kiran society falls into chaos.

Seven acolytes, of which you play one, are in line for the Shepardship. To be admitted to the office, an acolyte must have mastered to perfection the art of telepathy. But, as usual, there is a catch: there are three forms of telepathy, each of which is made up of eight 'auras'. Perfection is achieved only when all eight auras of each category of telepathy have been collected.

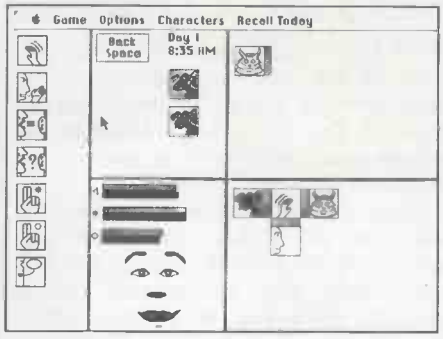
Back-stabbing is rife in religious circles, not just in politics, business and every sphere where ambition and jealousy are the driving forces. Thus, on Kira, our seven candidates must befriend and then betray each other, and ultimately battle among themselves to win knowledge of the various telepathic forms.

In play, Trust & Betrayal is unique. Like most Macintosh games it uses icons, but in a way that has, as far as I know, never been tried before. When play begins, the screen is divided into five sections comprising four rectangular windows, and a vertical strip which runs down the full length of the left-hand side of the screen. A menu bar, more of which later, is situated above the main playing area.

The above-mentioned strip is a menu which constantly changes to indicate, by way of small icons, the actions that are available at any given moment. Initially, there are just two icons in the menu. One shows a walking figure, and the other the rather incongruous symbol of a gun pointing at a watch: the former means 'go to' and the latter 'kill time', or wait.

Although there are a great many such icons in the game, several of which are very similar, you don't have to refer constantly to the manual to find out what each one does. You just click once on an icon and its image is replaced with a brief, written explanation of its function. Being a Macintosh game, Trust & Betrayal is entirely mouse-driven and is, therefore, extremely easy to learn.

The 'go to' icon enables you to walk to your own house or that of any one of the other six acolytes. If



you reach a house which is occupied, you may ask to be let in. Once inside, you can strike up a conversation with the creature whose house it is.

Dialogue with other characters is important, as it is the means by which you discover the telepathy levels of other acolytes. To be successful you must be diplomatic, or you will find characters reluctant to pass on information.

Communication with your fellow acolytes is simple, as, like everything else in the game, it is enabled through icons. The way you express yourself is extremely important. Some people like to be spoken to nicely, while others will yield information only after being threatened. It is important that you weigh up the character you wish to talk to and modify your speech accordingly.

The way you greet someone is crucial, as first impressions can have a profound effect on the way a character responds to your request for information. Trust & Betrayal contains seven icons simply for modifying a greeting. With these, you can greet a character warmly, nicely, sincerely, coolly, threateningly, haughtily or formally.

In general I find the warm greeting to be the best, as this can always be followed by a touch of flattery. This sounds terribly sycophantic, but nearly all the characters in the game respond positively to it because they are incredibly vain. There are times, though, when no amount of flattery will work. Sometimes you just have to swallow your pride and *beg* for information.

It is usually possible to see how well you are doing by the expression

on a face that appears near the bottom of the screen. Clicking on the face gives a short, detailed description of the character's feelings towards you; whether it is suspicious, flattered or angry.

During one of these conversations, you can ask if you have been betrayed by another character. Betrayal can mean one of several things, though generally it means either breaking a promise or divulging confidential information — that is, telling one character another character's aura count. A character believed to have been betrayed by anyone will normally retaliate by betraying its betrayer.

Information can be gained by requesting it or, more usually, by striking up a deal whereby you trade information. The latter is an act of betrayal on the part of both parties involved. The more deals you take part in, therefore, the worse your already shaky relations with the other acolytes becomes.

All the time you are wandering around between houses, wheeling and dealing, a clock, representing the time of day, is ticking away in the top left-hand corner of the screen. When night comes, you must select a character to fight for a prize of aura units. Clicking on the 'Characters' option in the menu bar along the top of the display gives a full run-down of the acolytes' individual aura counts. This gives you a chance to select the character who has the units you need.

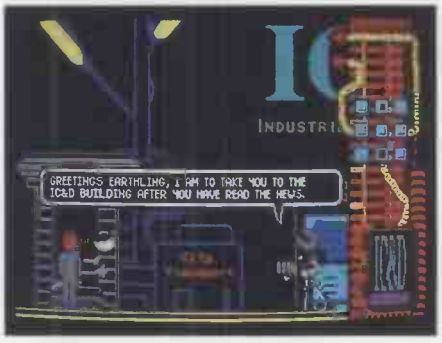
To fight, you click on an adversary and then on the type of aura you intend to use as your 'weapon'. Which one you choose depends on the type of aura you want from the acolyte. Each aura has a different strength ratio and it is important that you choose the right one, as a defeat means losing whatever aura unit it was that you chose to fight with. It sounds complicated, but it is really nothing more than a computerised version of 'paper, scissors, stone'.

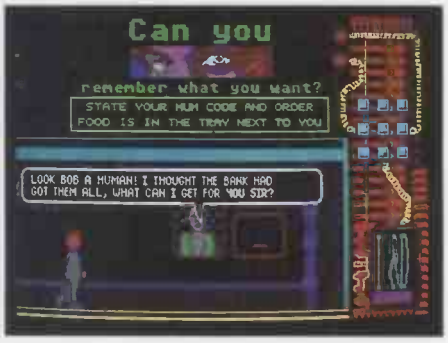
Trust & Betrayal also includes a number of random events. When one of these occurs, a screenful or more of descriptive prose appears, outlining a situation you suddenly find yourself in. Below the description are listed four possible responses from which you must select one. Although these events often appear to bear no relation to the rest of the game, the response you choose can affect vour relationship with the other characters involved. So, when you see the private parts of a Frern, you should respond tactfully and not laugh.

Trust & Betrayal is wonderfully whimsical. It is one of those games that is very simple to play but so strategically complex that it is infuriatingly difficult to win. Or, at least it is when played on the hardest level. I'm not sure that I like Crawford's self-indulgent inclusion of a digitised picture of himself (Hitchcock he isn't), but Trust & Betrayal is a game that no Macintosh owner should be without.

Broken English

Title: Metropolis
Computer: IBM PC
Supplier: Mastertronic
Format: Disk
Price: £19.99





If you remember Eliza, the program shell that was supposed to enable a computer to hold an intelligent discourse with a human being, you will know that intelligent was something it was not. A programmer has recently written an ambitious game, Metropolis, which uses an Eliza-type parser to allow you to talk directly to its characters in natural English. Unfortunately, though not altogether surprisingly, the computer I played Metropolis on had a very strange idea of what constitutes natural English, so its replies were not always what one would expect. Inanities are, it seems, still the major constituent of computer talk.

Metropolis is a detective yarn, set in a futuristic city that looks like the backdrop from a *Blade Runner* outtake. You are in Metropolis to track down the master tape of a new super-game, stolen from your company, IC&D, by a rival software house. The jokes and allusions are, as implied by the brief summary, all very 'in'; if you are not familiar with computer industry gossip or the pioneers of computing, you won't fully appreciate everything that goes on in the game.

Getting about Metropolis usually involves walking, though for long journeys you can use public transport and something called the 'ZoomTube'. First, though, you must convince a rather pedantic droid that you know inside out the rules for using the ZoomTube. Even though most of the world's evils have been eradicated in this futuristic fantasy, bureaucracy remains as rife and as pernicious as ever.

Clues, apparently, are thick on the ground, but I couldn't find any that were obvious. Not even the newsflashes that frequently appear on the right of the display helped much. These newsflashes are vital to the game because they tie events together and push the story along. As events happen in other parts of the city, they are picked up by the TV stations and broadcast immediately. There is supposed to be a sub-plot concerning a tiff between the various news channels of Metropolis, but I didn't get that far into the game.

Metropolis is simply an abundance of gimmicks, loosely linked by an incoherent storyline. As far as they go, though, the gimmicks are extremely well done. The animated graphics, for instance, are certainly some of the best I have seen on a PC. Your detective character, a podgy, raddle-faced man in a natty jumpsuit, walks across the screen, nonchalantly swinging his arms. Various robots and droids do much the same thing; they, however, seem to be little more than extras who are there only so that you can stop them for a conversation. Some have useful information which they will gladly divulge — if you can find the phrases that will trigger the desired responses.

Another interesting feature of Metropolis is the speech; not the onscreen dialogue which appears in speech-bubbles, but the synthesised speech which pours through the computer's speaker when a character is talking. This is under total software control, and can be speeded up, slowed down or turned off, all from within the game via the keyboard.

Metropolis, for all its fancy features, is flawed through want of a good scenario. It is an ambitious project that has not quite succeeded. All credit to the game's programmer for having done everything, including the graphics, himself. In spite of his enthusiasm, though, it just doesn't grab your attention sufficiently to warrant a return visit. END

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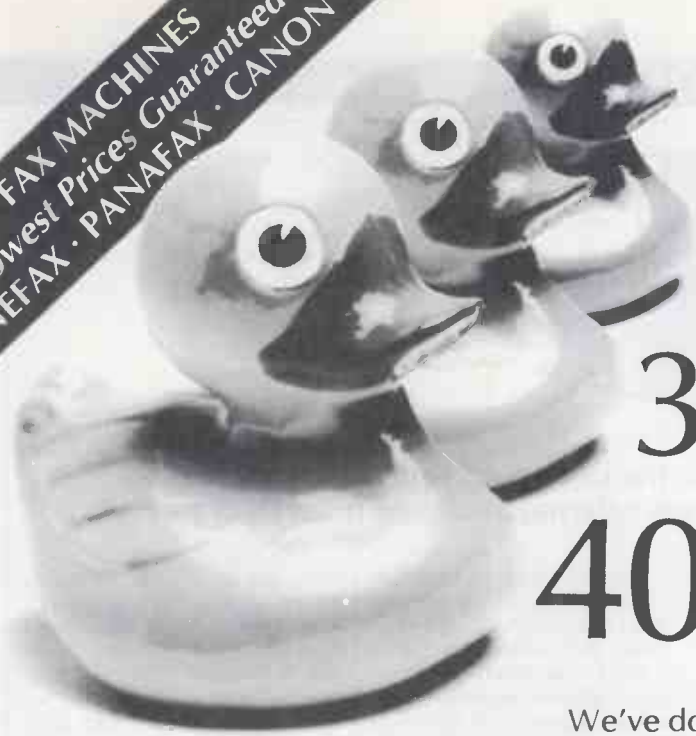

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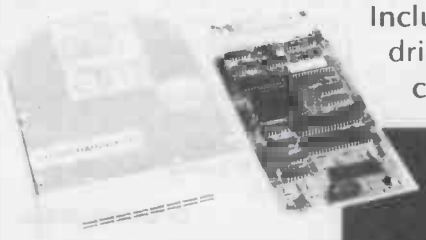

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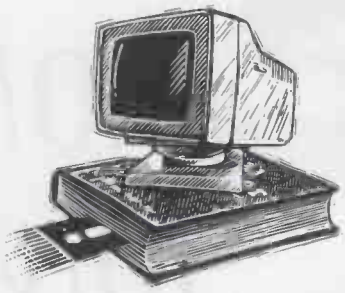
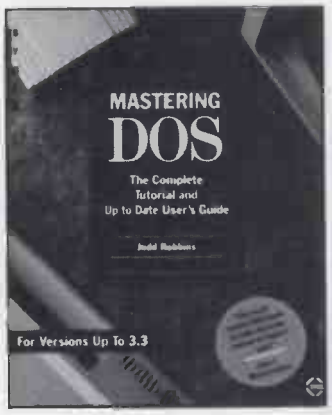


With OS/2 breaking new ground in the operating system arena, this month our book reviewers assess current offerings ranging from DOS to Pick.

Mastering DOS:

The complete tutorial and user's guide

Author: Judd Robbins
Publisher: Sybex Computer Books



ISBN: 0-89588-400-3
Price: £19.95

This large (500+ pages) book is both a tutorial introduction and a user's guide to the principal IBM PC/XT/AT operating systems PC-DOS and MS-DOS, covering versions 2.0 through 3.3.

As with most books of this genre, it starts from first principles with an introduction to hardware and software concepts and how to back up disks before moving on to elementary DOS operations. The next section is a tutorial-based guide aimed at introducing elementary file manipulation and setting up suitable directory structures for running different application packages.

From the halfway stage in the book, the emphasis shifts from a tutorial approach to a more advanced text covering DOS usage for power users and system programmers. Unlike many DOS books, this section is not merely a catalogue of DOS features but clearly explains the use of such features through well-documented examples. Many of these examples are available on a disk obtainable from Sybex. (It's a pity Sybex didn't include one with the book.)

It is a measure of the quality of this book that the same clarity of description found in the introductory sections is maintained in the highly technical advanced section. This advanced section covers virtually every aspect of DOS including keyboard customisation, sophisticated batch file usage and connecting multiple disk drives into a single DOS directory structure.

The last chapter looks at a range of utility software available for DOS machines and gives an even-handed assessment of their capabilities and limitations.

I very much liked *Mastering DOS*. It is clearly written, authoritative and, for once, succeeds in taking the reader from elementary DOS through to the design and application of sophisticated utilities. Either as a tutorial introduction or as a reference book for more advanced users, this book is one of the clearest and most authoritative guides to DOS that I've read.

Dr Simon Jones

Hard Disk Management with MS-DOS and PC-DOS

Authors: Dan Gookin and Andy Townsend
Publisher: TAB Books Inc
ISBN: 0-8306-2897-5
Price: $18.95 (US price)

This book delivers rather more than its title promises. It starts with a description of disk technology and becomes a general introduction to DOS; one of the best I've read, if more detailed than most business users would need (and more technical than they might like). By the time you've finished it you have a usable toolkit for large PC systems — batch programming, menus, DOS shells, back-up and recovery methods, and hints on improving performance.

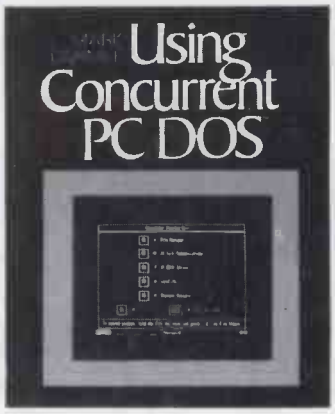
The authors explain subdirectories well, using examples from a complex directory structure belonging to an imaginary company to teach the relevant MS-DOS commands. They're fond of DOS pipes to FIND and SORT to produce reports — some of the more long-winded examples ran rather slowly when I tried them out on a 30Mbyte disk with 63 subdirectories that I saw on a PC at work. When you have disks like that you *need* a book like this.

The second part, hard disk security, is necessary but boring. There's an overview of back-up methods, disk and tape, with software and hardware recommendations and a few example programs dealing with passwords, encryption and logging. Things hot up again in the performance section: defragmentation, overlay files, RAM disks, caches are all surveyed. I'd be reluctant to take some of the hints — it's hard to imagine many people replacing the controllers of their hard disks — but I like a book that says: 'Modifying a directory . . . is not at all recommended' then tells you how to do it with DEBUG.

The book has some bad points. It hasn't been properly proofread: for example, 'media' and 'phenomena' are treated as singular (irritating) and there is some confusion between '\' and '/' (nearly unforgivable: both slashes occur all too frequently in MS-DOS commands). However, it's friendly, readable, and useful, especially if you have to support other PC users. It's a book of 'hints and tips' really, almost a system programming guide. I know PCs are supposed to have liberated computers from these arcane mysteries, but things are getting more complex all the time. Just wait for OS/2!

Ken Brown

Using Concurrent PC-DOS



Author: Mark Dahmke
Publisher: McGraw-Hill
ISBN: 0-07-015073-7
Price: £19.95

Concurrent PC-DOS is Digital Research's alternative to Microsoft's Windows and provides the multi-tasking facilities that MS-DOS lacks. The reader that this book is aimed at, therefore, will be emigrating from MS-DOS and would probably

want an overview of the new system plus some discussion of the special features provided. I am not sure, however, if Dahmke's book exactly fits the bill. It is insubstantial (150 pages) and greatly overpriced, offering a very quick canter through the subject (I read the whole book in one evening) and glossing over any area which threatens to require a fuller treatment.

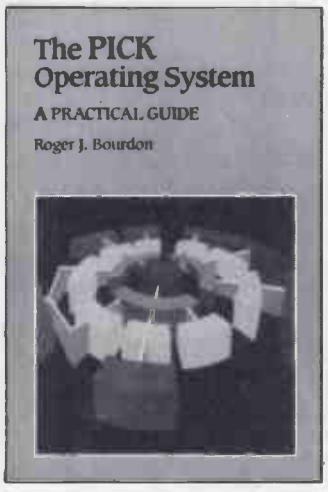
Yet it is useful. The introductory chapters provide a concise overview of the history of PC operating systems in general and Concurrent PC-DOS in particular. The concept of concurrency itself is also explained quite clearly, and Dahmke provides numerous illustrations of the various screen displays to clarify the textual explanations of individual Concurrent PC-DOS functions. There is also an appendix of Concurrent PC-DOS commands in quick-guide format which would be useful once one was fairly familiar with the system.

Nevertheless, the book is disappointing. The chapter which I found particularly frustrating was the one entitled 'Customizing Your Personal Computer'. This is just nine pages long whereas it really should have been as long as all the other chapters put together. There are no examples of batch files which would exploit the Concurrent PC-DOS multiple window environment, merely a few airy references, in the book's usual throwaway style, to possibilities which are not explored. Certainly, Dahmke does not attempt to convey the idea that working within a multi-tasking environment might involve different disciplines from single-tasking.

All in all, this is a book to skim through in a quiet hour in a book shop before buying something else!

Jeff Wells

The Pick Operating System: A Practical Guide



Author: Roger J Bourdon
Publisher: Addison-Wesley
ISBN: 0-201-18055-3
Price: £15.95

Pick, named after its inventor, the euphonious Dick Pick, is often touted as a rival to Unix in the war for an industry standard multi-tasking operating system. However, while Unix developed in the scientific and academic markets, Pick has always been aimed squarely at the business user.

With commercial needs in mind, Pick was designed around a database manager and its query language. All files are in a common database format regardless of whether they are data or programs and can, therefore, all be processed by the query language. This integration of a database into the operating system has won Pick many devoted adherents.

In this book Roger Bourdon sets out to appeal to the whole spectrum of potential users, from complete beginners right through to system managers. Thus he starts at the very beginning with booting the system and logging on. This is followed by an account of the database structure, a tutorial on Pick's amazingly primitive line editor and a chapter on the use of printers. He then launches into the meat of the book with chapters on the query language, programming in Pick Basic and the system command language, PROC. The remainder is taken up with a brief summary of the text formatter, RUNOFF, a couple of chapters of advice to system managers, Pick on the IBM PC and a comparison with other operating systems.

Each topic is covered in considerable depth, explaining relevant commands with all their optional parameters. Unfortunately all the detail is thrust upon us at once: there is no progression from simple to complex and I was left floundering, unable to tell the useful from the esoteric.

I cannot recommend the book, therefore, to beginners since it does not provide an easy way into Pick. However, it does contain a lot of information and more experienced users might find it useful as a reference manual.

Nicolas North

The CP/M Plus Handbook

Author: Alan R Miller
Publisher: Sybex Computer Books
ISBN: 0-89588-158-6
Price: £13.95

The objective of this book is to teach the use of the CP/M Plus operating system: no previous knowledge of computing by the reader is assumed.

The *CP/M Plus Handbook* opens with a section that describes what a computer is and how to turn it on and off safely (take the disks out first). Following this, the book is organised into four main sections. The first covers backing-up disks and elementary file manipulation using the PIP utility. The second section covers the most commonly used commands such as listing a file directory and renaming and deleting files. Following this is a section devoted to more complex PIP operations such as concatenating files, copying system files and resetting parity bits. The fourth section covers basic text manipulation using the CP/M editor and, rather out of place I feel, the internal structure of CP/M. The book ends with a summary of CP/M commands.

Alan Miller's writing style is reasonably clear and if you read this book you will end up with a solid appreciation of the structure and commands of CP/M. As such Amstrad PCW owners might think that this book is relevant to them; I do not feel this to be so. This is not a new book; it was originally published in the US in 1984. This is confirmed by the very old-fashioned pictures used. The Osborne Executive machine (now, long-defunct) is pictured as 'a typical CP/M machine'. Furthermore, only 8in and 5¼in disks are discussed. No mention of more modern disk formats is made.

The CP/M Plus Handbook is an adequate introduction to CP/M, but frankly I can't see at whom the book is aimed. Amstrad users don't need to use the system editor or PIP for most tasks, as the majority of these functions can be performed by Locoscript. The number of newcomers to old-style CP/M machines must be very small and the book is not detailed enough to appeal to those CP/M users looking for an advanced guide.

Dr Simon Jones

A Concise Introduction to MS-DOS

Author: Noel Kantaris
Publisher: Bernard Babani (Publishing) Ltd
ISBN: 0-85934-177-1
Price: £2.95

To any user who has waded their way through the massive MS-DOS/PC-DOS operating manual and then cried 'I wish there were a few more examples', or 'What does that mean in English?', then rest assured; your pleas have been heard. *A Concise Introduction to MS-DOS* has been written with you in mind.

This book in no way claims to replace the MS-DOS/PC-DOS manual; indeed, at only 39 pages its typeface would have to be microscopic to attempt that feat, but only 'to supplement and explain it' and it follows the doctrine of *'what you need to know first, appears first'*.

With an ME in Electronics and a PhD in Physics to his credit, the author, currently Head of Computing at the Camborne School of Mines, keeps his text compact and relevant. He assumes that the reader has some familiarity with floppy disks and hard disk drives and has read the microcomputer's installation manu-

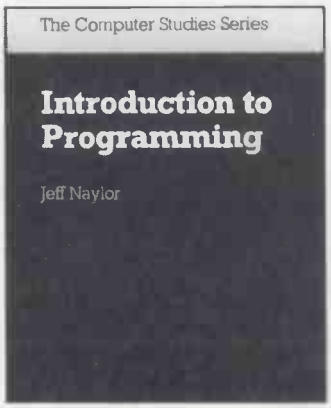
al. Commands are explained simply with examples given, although there were times when I felt he could have been more aggressive — for example, on the FORMAT command: 'be careful never to format an already formatted disc' — sometimes instructions have to be written in blood! Time and care is spent illustrating the EDLIN Line Editor and the creation of directories, sub-directories and batch files are all clearly discussed.

At £2.95 you'll be hard pushed to find better value.

Lorna Kyle

GENERAL

Introduction to Programming



Author: Jeff Naylor
Publisher: Paradigm
ISBN: 0-948825-45-6
Price: £8.95

A book written for students by those responsible for designing their courses and syllabuses is a gift indeed. Therefore, those reading computer studies as any part of their curriculum should rush to their bookshop and purchase *Introduction to Programming* by Jeff Naylor. The author is the principal lecturer in computer science at the South Bank Polytechnic and a member of BTEC's Computer Studies and Information Technology validation panels. His writing is succinct and knowledgeable as well you might expect and he concludes each chapter with a summary and exercises (unfortunately, no answers are supplied) as one would in a lecture; indeed, he confesses that the contents of his book are largely derived from his lectures.

No previous knowledge of computing or programming is assumed and Chapter 1 serves as an introduction to the programming environment of operating systems, language translators and text editors. The course of the subsequent chapters is fairly fast flowing, moving through control structures, debugging and testing, structured design and ending with the future of programming and the discussion of the possibility of a universal programming language.

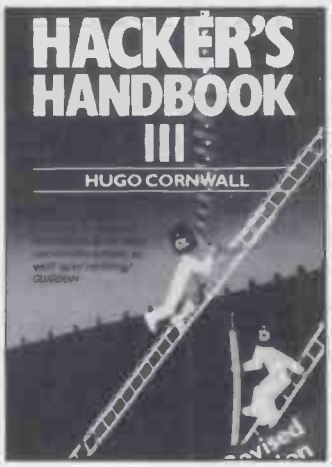
This pace is as you might expect in a degree or HNC course, but the text is clearly explained and obviously a book always offers the opportunity of re-reading and re-digesting, something a lecture doesn't.

This volume is designed to stand alone as an introduction to programming but it also forms part of Paradigm's Computer Studies series' integrated approach to all aspects of computing required by most students of further education.

You don't have to be a student of course to reap its benefits, but I'd rate this book as a worthwhile addition to any user's computing library.

Lorna Kyle

Hacker's Handbook III



Author: Hugo Cornwall
Publisher: Century Hutchinson
ISBN: 0-7126-11479
Price: £6.95

This latest incarnation of *The Hacker's Handbook* looks, in places, like the computer enthusiast's version of *Spy-c**cher*. There is a very impressive chapter (around 40% of the book has not appeared in previous versions) about how two UK journalists discovered details of the computer installation used by MI5. The actual details include the make and model of the machine, the number of terminals, the operating system and the communications protocol. However, the (fairly simple) method which allowed the journalists to gather this information is probably more useful to amateur sleuths than the eventual results.

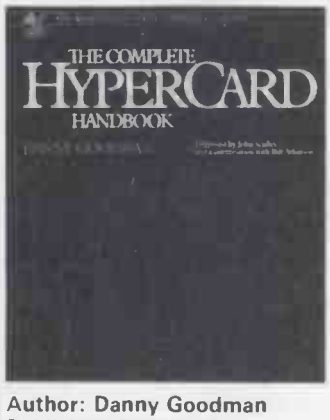
The chapter on Government installations is just one of the additions in *HH3*. Another is the updated information on previously-reported hacks, including the Prince Philip Prestel hack. The report on this one in particular now includes details of the acquittal in the High Court. Thankfully, the chapter on radio hacking has been trimmed, as I always felt that such information was slightly out of place. While many computer users have modems, few have RTTY (radio teletype) receivers.

As before, the book contains full details of the events leading up to a number of 'unauthorised accesses' to computer systems. Some people are bound to criticise the author for explaining the tricks. However, my personal feeling is that the only way to protect computer information is by employing experienced security managers. Knowing how to spot the early stages of a hack — and how to prevent them happening altogether — requires some knowledge of the way a hacker thinks and operates, and this is what the book is trying to provide. As such, I feel it should be required reading for anyone involved in upholding the security of a computer, as well as anyone who has a spare phone line and is fed up with paying 38p per minute for a one-way conversation with Sexy Samantha.

And if you're not already into computer communications, prepare to be amazed.

Roger Dalton

The Complete HyperCard Handbook



Author: Danny Goodman
Publisher: Bantam Books
ISBN: 0-533-34391-2
Price: $29.95

I am always very suspicious of computer books that are published a matter of weeks after their subject is launched. It usually means one of two things: either the book is no more than a rewrite of the manual, or the author has been commissioned by the manufacturer to write an accompanying book. In the first case, the book is rarely worth the paper it is printed on; in the second, it is often a dull and biased read. *The Complete HyperCard Handbook* is a hefty 700-page tome that arrived at practically the same time as HyperCard itself. I was prepared for the worst.

By page 5 it was obvious that this book is different. Author Danny Goodman has been involved with HyperCard for the past year and a half, since the time it was little more than a few MacPaint pictures. By page 10 I'd fired up my Macintosh and was busy following a guided tour of HyperCard concepts. *The Complete HyperCard Handbook* is not a reference book; it is a book to be worked through page by page with a Macintosh in front of you all the way.

The book is basically divided into four sections: Browsing through HyperCard, HyperCard's Authoring Environment, HyperCard's Progamming Environment and Applying HyperCard & HyperTalk.

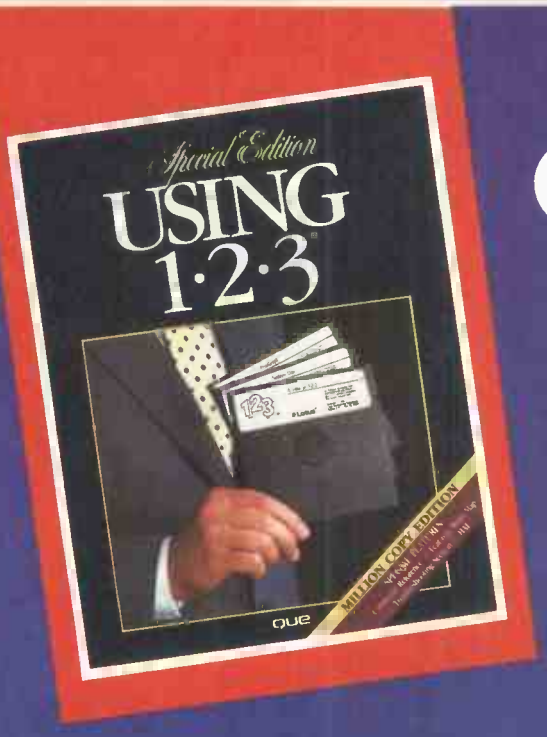
The section on HyperCard's programming environment is where the book really excels, for me totally replacing the official Apple documentation. I particularly recommend this section for those with no previous programming experience, as the author purposefully steers clear of making analogies with existing programming languages. One chapter which lists the properties of every element in HyperCard is now incredibly dog-eared after less than one month's use.

HyperCard is a wonderful piece of software. *The Complete HyperCard Handbook* is a wonderful book.

Barbara Gaskell

Dr Simon Jones is a lecturer in Computer Systems Engineering at the University College of North Wales. **Ken Brown** is a mainframe system programmer. **Jeff Wells** is a teacher of Computing at Haringey College, London. **Nicholas North** is a computer science researcher at the National Physical Laboratory. **Lorna Kyle** is a systems analyst/programmer. **Roger Dalton** and **Barbara Gaskell** are freelance computer journalists.

Next month: spreadsheet manuals



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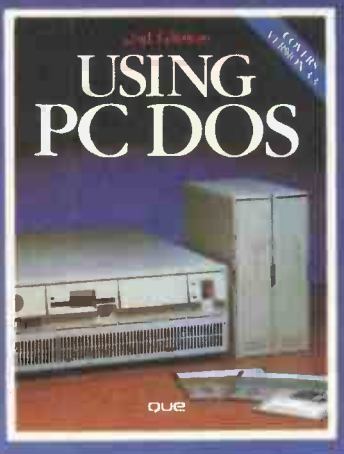

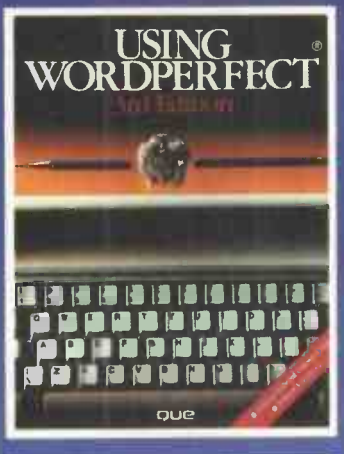

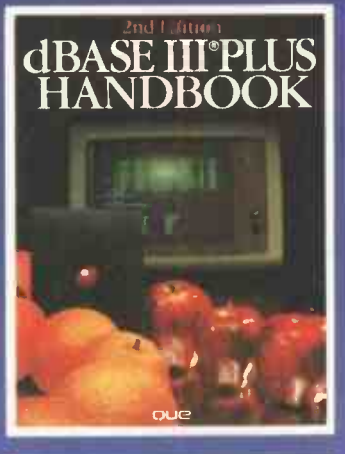

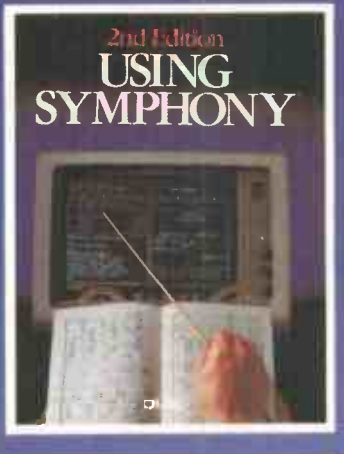

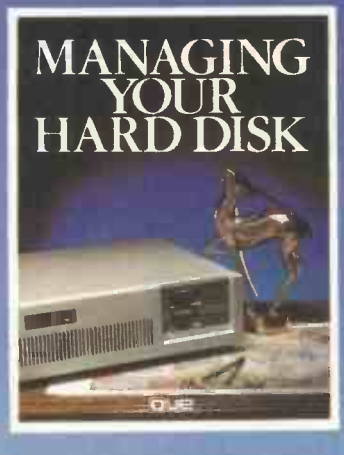

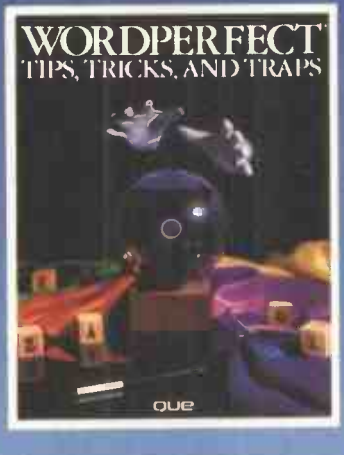

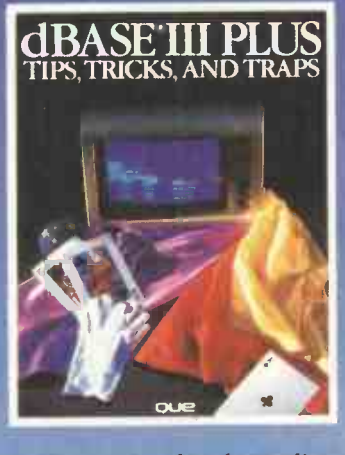

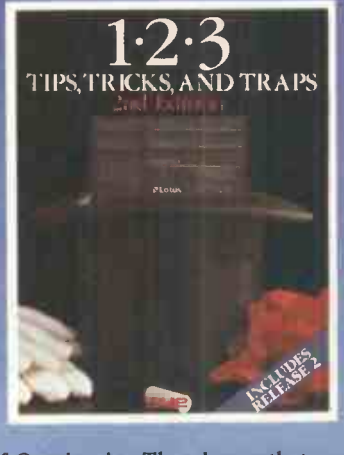

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JPI Modula-2 V1.0	**95**	**3.3**
Turbo-C V1.0	115	4.4
Microsoft CV4.0	130	7.4
Logitech V3.0	165	7.4

**Modula-2 was developed by Niklaus Wirth, the father of Pascal, as a powerful successor to Pascal.*

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Complete documentation
The system comes with a 250 page typeset manual which provides an introduction to Modula-2 and a detailed description of the JPI Modula-2 system.

```
MODULE Bench;
FROM IO IMPORT WrStr;
CONST NoOfIterations =   25;
      Size           = 8190;
VAR   I:CARDINAL;(* unsigned 16-bit inte

  PROCEDURE Sieve;
  VAR I,K,Prime,Count: CARDINAL;
      Flags: ARRAY [0..Size] OF BOOLEA
  BEGIN
    Count := 0;
    FOR I := 0 TO Size DO
      Flags[I] := TRUE;
    END;
    FOR I := 0 TO Size DO
      IF Flags[I] THEN
        Prime := I + I + 3;
        K := I + Prime;
        WHILE K <= Size DO
          Flags[K] := FALSE;
          K := K + Prime;
        END;
        INC( Count );
      END;
    END;
  END Sieve;

BEGIN
  WrStr("Start..");
  FOR I := 1 TO NoOfIterations DO
    Sieve;
  END;
  WrStr("..Stop");
END Bench.
```

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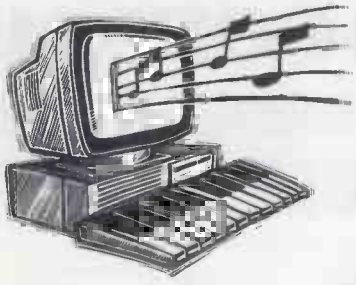


Musical touch

Finding a Basic way of writing tunes, a library of songs, a composing brainstorm and a harmonious sampler. Roger Howorth puts more music at your fingertips.

Last month I detailed the software instructions available to the MIDI programmer, which are part of the internationally agreed specification for the MIDI interface. As a follow-on, this month I have included a short Basic program that will display data as it arrives at the MIDI port, as well as allow simple instructions to be sent from your computer.

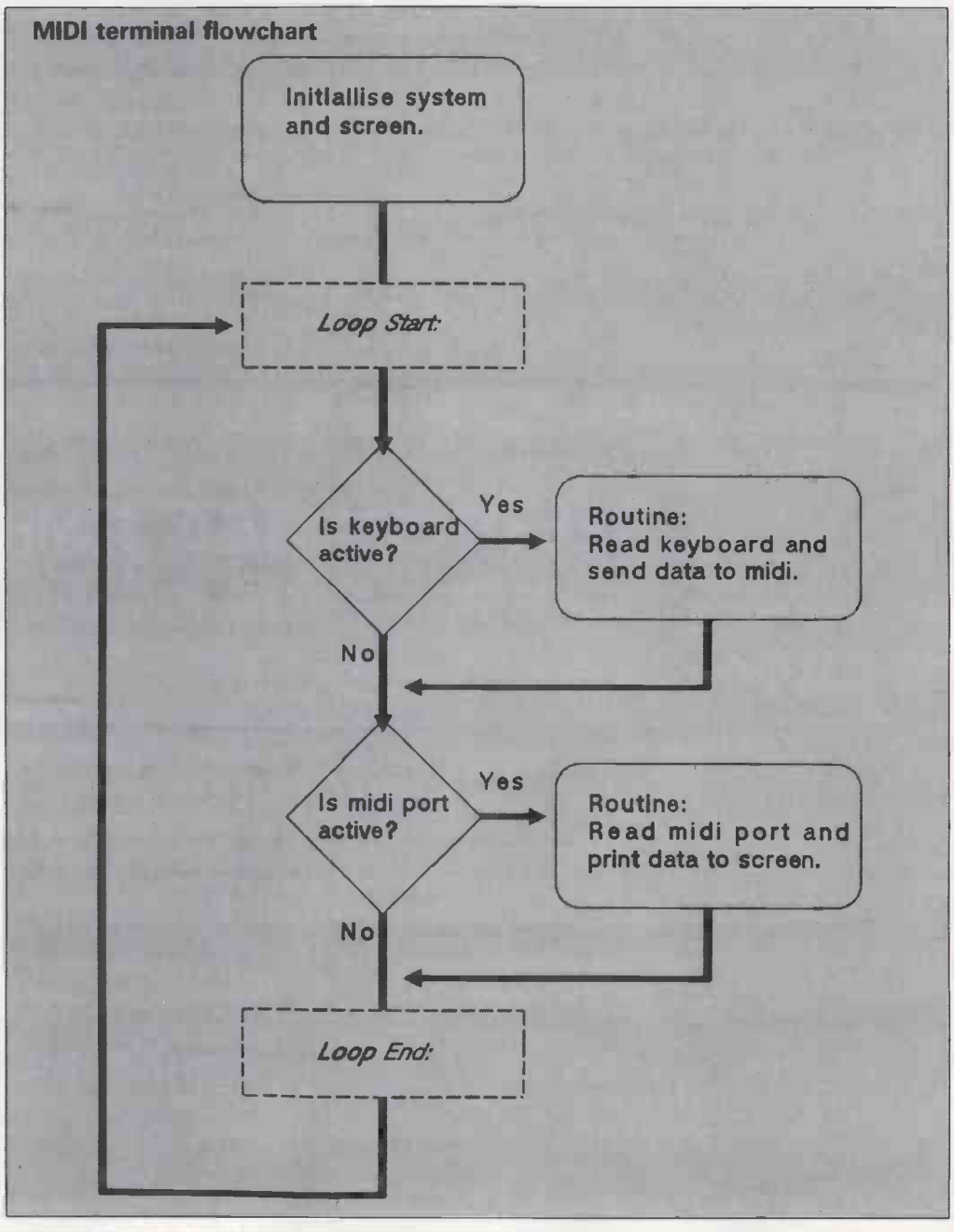
The program was written in Basic on an Atari ST, which is the only computer that comes with a true MIDI interface as standard, but it could easily be adapted to run on any computer fitted with an add-on interface. The simple flow chart presented here might prove useful in converting this program to other languages or computers.

The core of the program is a loop that continually checks whether data is present at the computer's keyboard and MIDI interface: as soon as data appears, the loop branches to a subroutine to read that data and either send it out to the MIDI port or print it onscreen as appropriate.

Unfortunately, Atari Basic is rather slow at checking for data at the keyboard, which makes the program tedious to use in its present state. I have deliberately not improved this section of code because to do so would involve using instructions that are not only highly machine-dependent, but also incredibly cryptic.

By virtue of MIDI's ability to operate with so few instructions, it is relatively easy to produce useful programs quite quickly. The program featured here, while crude and slow, does provide a starting block for other, more advanced ones. Indeed, for those with no

MIDI terminal flowchart



The new Music City section on Prestel provides news, features, and downloadable files of pop tunes. There are charges for some files, with the most popular costing 50p

musical hardware, it is possible to alter the program so that rather than communicating with a synthesiser, two or more computers could be linked together to form a simple 'network'.

Musical modem

As if recent price rises at Telecom Gold were not enough, another reason for subscribing to Prestel has emerged. Micronet has announced a new service called Music City, which it describes as an 'online' music magazine.

One of its proudest features is that subscribers can download files of music software for use with their favourite sequencer. Initially, Micronet plans to support only a few hardware-software combinations centred around the Commodore 64 and the Hybrid Music System for the BBC Micro, but hopefully this range should expand quickly to other computers and software.

The strength of such a service in tandem with a few of the specialist bulletin boards, notably Pan in the US, is that anyone with a modem can gain access to potentially vast quantities of pre-programmed music files which can be downloaded and played. Their weakness is usually that they suffer through the understandable reluctance of songwriters to part with their copyright compositions. This leaves little else but implementations of classical and other 'public domain' music such as folk and traditional songs.

In an attempt to combat this problem, or perhaps simply to ensure that it doesn't fall foul of copyright law, Micronet has made an arrangement with the Mechanical Copyright Protection Society whereby royalty payments will be made whenever appropriate. Exactly what this will mean to the home musician remains to be seen, but it is certainly a step in the right direction.

It costs £66 per year to join Micronet, which includes the necessary subscription to Prestel. Micronet is also offering a free modem to all new annual subscribers.

Bats in the belfry . . .

Not to be outdone by Micronet, Westhill Music is also proud to announce an 'intelligent music breakthrough', MasterComposer. Westhill, via its latest press release, assures me that its new baby is not just a passive music sequencer but a composer in the truest sense.

The program was written by a professional mathematician, research scientist and musician who was 'determined to disprove the cynical comments of his colleagues'. He spent seven years developing his algorithms before finally 'the analysis of music produced this new development in machine intelligence'.

This, says the company, has resulted in a program that uses expert knowledge of harmony and rhythm to compose individual melodies that are never the same!

Fear not, 'the complexity is all inside the program', the good doctor of mathematics goes on to explain. But, what's this? Westhill may never be able to sell us his best program! 'It would be like selling a piece of my brain,' he declares.

More amazing than any of Westhill's claims for this exciting product are that it can all be done on a standard Amstrad CPC. Cast off your 4Mbyte/386 processor/VGA system and splash out £29 on your Amstrad.

Instant Music on cassette

Finally, the news from Electronic Arts is that Instant Music is now available for the Commodore 64 on both disk and cassette.

Instant Music is another 'intelligent' program that has been available on the Amiga for some time, and this new implementation has a lot in common with its more advanced cousin.

Although basically a sequencer, Instant Music is unusual in that, as opposed to traditional sequencers which are like a blank piece of paper waiting to be filled with your musical ideas, Instant Music is more like a radio. It comes with a variety of sounds and a few pre-programmed tunes that can be altered and fiddled around with very easily — some enthusiasts would say instantly.

To make life as simple as possible, you tell the computer what notes or chords to play in real time by moving a cursor up and down the screen with a joystick or a mouse. The program then interprets your movements and plays the appropriate notes so that the final result is harmonically pleasing rather than being a jumbled and discordant mess, which it would be if these rather clumsy input devices were left uncorrected.

The main difference between the two versions is that whereas the Amiga allows you to work with four sounds simultaneously, the Commodore 64 version works with only three at a time. These are synthesised with the C64's sound chip rather than being samples of real sounds as on the Amiga. The C64 version scores over the Amiga by including a crude sound editor that allows you to customise any of the sounds that are supplied with the program.

Instant Music costs £14.95 on the Commodore 64 and £24.95 for the Amiga version.

Micronet is on (01) 278 3143.
Westhill Music is on (0224) 740412.
Electronic Arts is on (01) 736 4281.

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 him or you would like to pass on any interesting snippets, write to him care of *PCW*, VNU House, 32-34 Broadwick Street, London W1A 2HG.

END

Basic listing

```
10    GOSUB CLS
20    PRINT "Midi Terminal Program"
97    REM ************************
98    REM MAIN LOOP STARTS HERE..
99    REM ************************
100   GOSUB CHECKKEYS
110   IF READY=1 THEN GOSUB READKEYS
120   GOSUB CHECKMIDI
130   IF READY=1 THEN GOSUB READMIDI
140   GOTO 100
497   REM ************************
498   REM ROUTINE TO CLEAR SCREEN!!
499   REM ************************
500   CLS:
510   CLEARW 2
520   RETURN
595   REM ************************************************
596   REM ROUTINE TO CHECK WHETHER A KEY IS BEING PRESSED
597   REM NOTE THAT THIS ROUTINE DOESN'T WAIT FOR A KEYPRESS
598   REM OR READ ONE!!
599   REM ************************************************
600   CHECKKEYS :
610   X=INP(-2)
620   IF X= -1 THEN READY=1 ELSE READY=0
630   RETURN
697   REM ****************************************
698   REM ROUTINE TO CHECK WHETHER MIDI PORT IS ACTIVE
699   REM ****************************************
700   CHECKMIDI:
710   X=INP(-3)
720   IF X=-1 THEN READY=1 ELSE READY=0
730   RETURN
797   REM ********************************************************
798   REM ROUTINE TO READ A NUMBER FROM KEYBOARD & SEND IT TO MIDI
799   REM ********************************************************
800   READKEYS:
810   INPUT Z!
820   OUT 3, Z!
830   RETURN
897   REM ********************************************************
898   REM ROUTINE TO READ BYTES FROM MIDI AND PRINT THEM ON SCREEN
899   REM ********************************************************
900   READMIDI:
910   COUNT=1
920   X=INP(3)
930   PRINT X
940   GOSUB CHECKMIDI
950   IF READY=0 GOTO 980
960   COUNT=COUNT+1
970   GOTO 920
980   PRINT COUNT;" bytes received.."
990   RETURN
```

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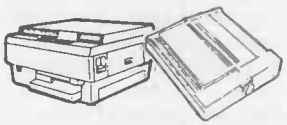

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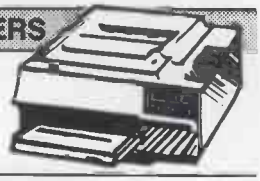

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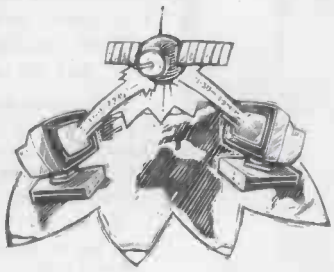


Modems and more

Comms links come in many guises. How do you choose the right one? Peter Tootill answers some oft-asked questions, considers downloading to a word processor and gives viewdata a look.

I recently received a letter from David Garrat of Wisbech. In it he asks me to clarify some basic issues that he finds confusing, and they are the sort of things that confuse many people when they first come into contact with microcomputer communications.

The main questions concern modems, so I will deal with those first. Can a full duplex modem talk to a half duplex modem or do they have to match? The answer is generally no; a full duplex modem can't talk to a half duplex modem — the modems at opposite ends of the line must match.

Full duplex means that data can travel in both directions at the same time, like a telephone conversation. **Half duplex** means that data can travel one way at a time only, like walkie-talkie or CB radios. One end has to say 'over' before the other can reply.

However, confusion can arise because people use the same terminology for two entirely different things — modems and terminal software. Here we are talking about *modems* not about how the modems are used. Just as it is possible to have a half duplex telephone conversation on a normal phone line (each person waiting for the other to finish) it is possible to have a half duplex link between two micros using full duplex modems. Full duplex transmission works by using two different frequencies, one to transmit and the other to receive. This is a useful thing to do as it helps confirm that everything is working satisfactorily. Let me explain why.

In most cases when you call an online service such as Prestel or a bulletin board, it uses the full duplex mode to allow it to echo everything you send back to you so that you can see what you have typed. This means that when you type, for example, a page number on Prestel and it appears on your screen, it is actually being put there by Prestel, not directly by your computer at all. It is confirmation that the number has been received correctly and hasn't been corrupted by line noise on the way. With half duplex modems, only one frequency is used for transmission in both directions, so that information can go only in one direction at a time. This means, among other things, that the remote system can't echo data back as you type it, so half duplex modems are rarely used for normal online systems.

'a full duplex modem can't talk to a half duplex modem . . .'

However, if you call a friend and link your computer to theirs (to send them a copy of the program you have just written, for example) you will probably find that when you type something it appears on your friend's screen but not on yours and vice versa. This is because you both have your software set to the mode for using normal online systems (as we saw above, they echo data back to you) and if both ends are expecting data to be echoed back, neither will actually do it. To 'talk' to your friend, you will both have to change your settings to provide local echo — this is often (misleadingly in my view) called 'half duplex' because it is the mode used with half duplex modems. The whole thing can be difficult to grasp, so perhaps it will help if I summarise the terms used:

Remote echo This is the normal method of working with online systems such as Prestel, Telecom Gold, bulletin boards, and so on. The remote online system echoes data back to the caller as it is typed. Sometimes called 'feed back'. Cannot be used with half duplex modems.

Local echo This is the setting you would use if you were calling another person rather than a BBS or similar. Characters are echoed to the screen by the terminal software as you type them in, at the same time as they are sent to the remote system. Sometimes called half duplex mode (see above).

(NB: The V.23 standard (see below) is sometimes called half duplex, but that is not strictly accurate. Data can travel in both directions at the same time, but it does so at different speeds: 1200 bits/sec one way and 75 bits/sec the other. It is sometimes called asymmetric duplex.)

The second question concerns modems with auto-dial facilities. Do you require special software to drive them? The answer is not always, but it does help.

Most auto-dial modems available these days use the Hayes command language. The modem is given instructions simply by preceding them with the letters 'AT' for 'attention'. For example, you tell the modem to dial the number (01)618 1111 by typing 'ATD(01)618 1111'. This means that most terminal software can be used to drive them.

However, many communications packages available these days have special features built in to support Hayes-type modems. So you can set up a dialling directory with a list of your most frequently used numbers and simply tell the software that you want, for example, number 12 on the list. It will then go away and dial the number associated with that entry and, in many cases, automatically takes you right through the log-on process.

As well as the Hayes system, there is also an international standard for auto-dialling with modems (called V.25bis) but very few manufacturers of modems or software support it. Again you can use it by typing in commands but they are more complex and include control codes — best avoided, in my view.

Modems in both the above categories incorporate a microprocessor of some description (often a Z80 or 6502 — remember them?) and are called 'intelligent' modems, because they understand simple commands. Another type of auto-dial modem has no microprocessor and is (obviously) called a dumb modem. These definitely need special software, but are now rare and usually not BABT-approved, at least not with the auto-dial option fitted.

David Garrat also raised the following points. 'I recently bought a (very cheap) 2400 baud *synchronous* modem. I now suspect that it will be of very little use to me as most

online systems using 2400 baud are *asynchronous.*'

It is quite right to say that online dial-up systems generally use asynchronous modems. Furthermore, there are several different sorts of 2400 bits/sec modems available. Many of them are not designed to be used on ordinary telephone lines at all but on private direct connections or leased lines (permanent links hired from BT). These modems are frequently used in commercial environments (to link terminals in remote offices to a company's mainframe, for example). So be careful if you are buying a second-hand modem — if you want one for general use, the standards to look for are:

V.21 (300 bits/sec) This is supported by most online systems (but not by all viewdata systems). A little slow by modern standards, but very cheap to buy.

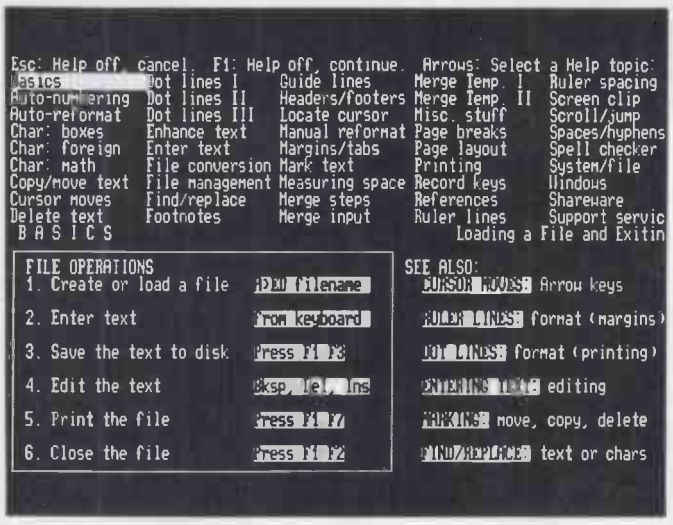
V.23 (1200 bits/sec from the online system to you and 75 bits/sec from you back to it). This is the normal standard for viewdata systems and is also supported by most other online systems. In most cases it is better than V.21 as information comes to you four times as quickly but it is not so good if you want to *send* a lot of data as that can travel at one quarter of the speed. Also cheap to buy.

V.22 (1200 bits/sec full duplex) supported by most commercial online systems and a growing number of BBS. Better than V.23 because you can *send* information four times as quickly as with V.21 (and 16 times as quickly as with V.23). Has until recently been a bit expensive for domestic use but prices are falling and the modems are now becoming available in the £200-£300 range.

V.22bis (2400 bits/sec full duplex). Faster still and more expensive (starting at about £500) but prices are falling.

Most of the faster modems incorporate one or more of the slower standards as well. Other V standards exist, but are not used by the dial-up systems the majority of us will be calling either for business or personal use.

On the subject of V.22bis modems — someone left a note on my BBS recently saying that he and some friends had calculated that full duplex operation at 2400 baud is impossible on an ordinary telephone line. They are quite right. Next month I'll tell you why — and explain how V.22 bis is really only 600-baud full duplex, although data is transferred at 2400 bits per second in both directions! The key lies in the difference between bits per second and baud.)



An example of PC-Write's many Help screens

PSS

Another of David's questions concerned PSS (BT's packet switching data network). He asks 'If there are no bulletin boards in my local area, should I subscribe to PSS?'

The answer is probably not. PSS is not a system that you *use* like a BBS. It is like the telephone network, except that it is for data. You use PSS to contact services that are linked to it, in the same way that you use the telephone system to call other telephone subscribers.

PSS is, however, a little different in that there are two types of PSS subscribers. The first are the providers of online services, such as Telecom Gold, who are permanently wired to the PSS network by (expensive) data links. The others, the users, connect to PSS and thence to the remote system by dialling their local access point in the same way as they would contact Prestel or a BBS. They then tell PSS which online service they want by giving its network user address (NUA) which is equivalent to the telephone number on the telephone system.

There is, therefore, no point in joining PSS unless you want to use one of the services linked to it (after all, you wouldn't have a telephone unless there were people you wanted to call). Most of them are expensive commercial systems.

Furthermore, many commercial systems have special arrangements with PSS so you don't actually need to join. Instead, you use the company's PSS account and pay a small extra fee for the privilege. At present there are no BBS type systems available on PSS — the nearest you'll get to that is Microlink, and you don't need to have your own PSS account to use it because you use theirs. The cost is added to your bill (that's why there's an extra 2p minimum charge if you use the PSS access points).

The bottom line is: don't bother with PSS unless a system you want to join tells you that you'll need a PSS account.

PC-Write

This is not the place you'd expect to find a review of a word processing package, and I'm not about to give you one. However, one of the problems of downloading information from BBS is that text files come in a range of formats. Some have linefeeds with no carriage returns or vice versa, which can confuse word processing packages and printers since they often expect both. Also, if you are not using error-correcting protocols, you tend to get line noise affecting the text as well.

One of the advantages I have found with PC-Write is that the search and replace features are very powerful. It is easy to search for just about any character, including carriage returns or line feeds with the necessary carriage return/line feed pairing. In fact there is a built-in feature for repairing line breaks that adds carriage return to line feed, but I find that I usually end up with the opposite problem. There is also a command to search for the next non-ASCII (that is, not normal text) character — useful for finding line noise. PC-Write even allows you to edit the text portions of EXE and COM files and to load and save disk sectors!

I like PC-Write, it is lightning-fast and very powerful, but I must admit that it is a bit complex and idiosyncratic to use. It is also limited to files of 60k or less (but provides a facility to split up the longer ones. As an aside, the mailmerge features are very powerful as well.

PC-Write version 2.4 is available as shareware from many BBSs and software libraries. Version 2.7 (which has quite a good spelling checker) is published by Sage at about £95 and is available from most retailers. Sage is on (091) 284 7077.

Epnitex

First covered in *PCW* in March last year, Epnitex (a viewdata system designed to compete with Prestel) has finally been launched. Said chairman Roy Norman: 'We were reluctant to launch Epnitex earlier when it was structured and ready. Instead we took the decision to wait until there were sufficient user refinements added to leave the competition behind.'

Well, that sounds a bit like stalling to me; it seems more likely that all the bugs hadn't been ironed out. When I looked at the system I was impressed. They had obviously learned from Prestel's shortcomings and come up with some good ideas for the business community (such as a rotating carousel of frames that can be continuously displayed in public places and instantly updated from a central point). The messaging features are much slicker than Prestel's and include word wrap, automatic reply, radio paging and full editing features.

The subscription costs are high compared with those for Prestel and I don't think they will have much impact on the domestic market. Business subscriptions are £300 pa; other subscribers (who can call outside peak times only) pay £2.40 per week. Time charges are 5p/minute, but the first five minutes (business) and 15 minutes (others) per day are free. On top of this there are ordinary BT charges to pay as there is no local call access and you have to dial the Lincoln code. However, there are no page charges and that will certainly make a difference for business users because some of the Prestel pages they use carry quite high charges. Epnitex claims it had 50 information providers signed up within one month of the public launch.

For more details, phone (0526) 861136.

Peter Tootill *can be contacted on Telecom Gold 83:VNU202, Prestel 219991119 or CompuServe 72746, 3202.*

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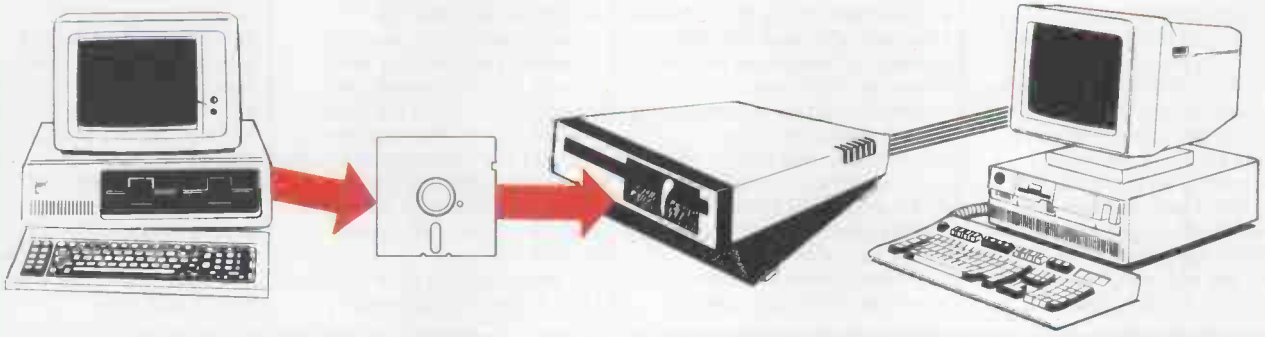

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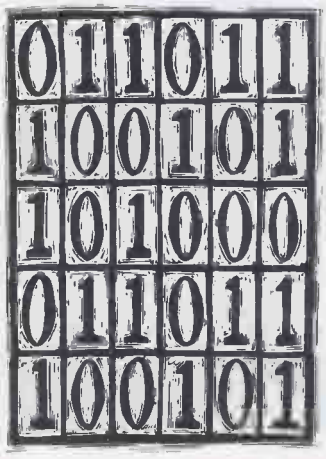


David Barrow presents more machine code routines and information for assembly language programmers. All helpful programming hints and short, useful new routines are welcome as are improvements to or conversions of those already printed. Submissions must be printed or typed clearly and be documented to the SubSet standard, although documentation may be amended for publication. Send your contributions to SubSet, PCW; 32-34 Broadwick Street, London W1A 2HG.

8086 graphics

The two datasheets this month are an area fill routine, RFILL, and a line drawing routine, LINE, for the 8086/88 processor from John Hardman of Welling.

Because display mapping varies so much between computers, all transportable graphics routines have to use lower level routines which are system-dependent. RFILL and LINE are no exception, and call 'GPOINT', 'GSET' and 'PLOT' to access the display.

Subroutines to perform these tasks should be found somewhere inside the software supplied with your particular system, although the method of calling them and the registers used for inputting the coordinates and colour information may not correspond to that used by RFILL and LINE. These system routines are also unlikely to reside in the same code segment as that in which you assemble RFILL and LINE.

The solution may be to write short interfacing routines attached to RFILL and LINE which will transfer the information to the correct registers and perform the correct type of system call, whether that be of the 'CALL far' (segment:address) type or the 'INT nn' software interrupt type. The interface routines must also deal with saving any registers corrupted by the system routines.

The comments in RFILL and LINE are those supplied by John. Although the commentary does match the algorithm given in the header documentation — so demonstrating how the concept has been translated into real code — I do perceive a tendency for John to merely 're-hydrate' the mnemonics. The comment 'If x=0 Jump to UNSTAK' at label HITTOP in RFILL says little more than the source listing 'OR CX,CX: JZ UNSTAK'. It would be more useful to explain why the jump has to take place.

Datasheet 1

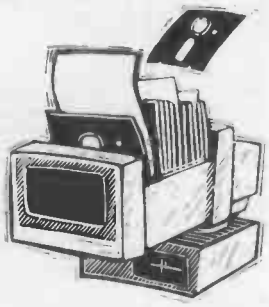
```
;================================================================
;RFILL          Region colour filling routine.
;================================================================
;STRUCTURAL CONCEPTS
;PROGRAM        If pixel colour at start position (x,y)
;               = fill colour
;               {
;                 Quit.
;               :
;                 Background colour = colour at start position.
;                 While (TRUE)
;                 {
;                   Clear up and down flags.
;                   While x < MAXCOL and pixel colour at
;                   (x+1,y) = background colour
;                     x++;
;                   Repeat
;                   {
;                     Plot pixel (x,y) in fill colour
;                     If y <> 0
;                     {
;                       If pixel colour at (x,y-1)
;                       <> background colour
;                       {
;                         Clear down flag
;                       :
;                         If down flag clear
;                         {
;                           Save position (x,y-1) on stack for
;                           later use.
;                           Set down flag
;                         }
;                       }
;                     }
;                     If y <> MAXROW
;                     {
;                       If pixel colour at (x,y+1)
;                       <> background colour
;                       {
;                         Clear up flag
;                       :
;                         If up flag clear
;                         {
;                           Save position (x,y+1) on stack for
;                           later use.
;                           Set up flag
;                         }
;                       }
;                     }
;                   } Until x post-decremented = 0 OR pixel
;                     colour at (x,y) <> background colour
;                   Repeat
;                   {
;                     If any coordinates left on stack
;                     {
;                       Pop coordinate pair off stack
;                     :
;                       Quit
;                     }
;                   } Until pixel colour at new (x,y) =
;                     background colour
;                 }
;               }
;---------------------------------------------------------------
;SYSTEM REQUIREMENTS
;PROCESSOR      8086/8088
;HARDWARE       bit mapped output device.
;SOFTWARE       "GPOINT" - AL <-- colour of pixel (CX,DX).
;               "SPOINT" - pixel (CX,DX) <-- colour in AL.
;               Both routines must not change register contents.
;---------------------------------------------------------------
;PROGRAM DETAILS
;INPUT          AH = fill colour.
;               CX = column number.
;               DX = row number.
;OUTPUT         None.
;STATE CHANGES  Region shaded on output device.
;I/O ERRORS     None known.
;OPTIMISATION   None.
;INTERRUPTS     May be interrupted and re-entered.
;LOCATION NEED  Must be located in same code segment (CS) as
;               the calling program and as the two subroutines
;               called, otherwise...
;               Not specific. Relocatable. PROMable.
;PROGRAM BYTES  131.
;STACK BYTES    Variable as the stack is used to store sets
;               of coordinates.
;TIMING         Not given.
;================================================================
;
GPOINT                  ;System dependent get & set point
SPOINT                  ;routines. Must be in same segment as
;                        RFILL to use intraseg displaced CALL,
;                        or re-assemble with other CALL form.
;
MAXCOL  EQU     cccc    ;Maximum column value.
MAXROW  EQU     rrrr    ;Maximum row value.
;
RFILL   PUSHF           ;Save registers used.           9C
        PUSH    AX      ;                               50
        PUSH    BX      ;                               53
        PUSH    CX      ;                               51
        PUSH    DX      ;                               52
        PUSH    BP      ;                               55
;
        MOV     BP,SP   ;Keep track of stack base.      8BEC
;
        CALL    GPOINT  ;If pixel colour at (x,y) =     E8    dldh
        CMP     AL,AH   ;fill colour then quit.         3AC4
        JE      QUIT    ;                               74    6D
;
        MOV     BH,AL   ;Backgnd colour = colour (x,y).8AF8
;
CLRALL  XOR     BL,BL   ;Clear up & down flags.         32DB
;
MOVR    CMP     CX,MAXCOL ;While ((x < MAXCOL) AND      81F9 cccc
        JGE     HITR    ; (pixel colour at (x+1,y)      7D   09
        INC     CX      ; = background colour))         41
        CALL    GPOINT  ; {                             E8   dldh
        CMP     AL,BH   ;   increment x                 3AC7
        JE      MOVR    ; }                             74   F2
        DEC     CX      ;                               49
;
HITR    MOV     AL,AH   ;Plot pixel at (x,y)            8AC4
        CALL    SPOINT  ;in fill colour.                E8   dldh
;
```

```
        OR      DX,DX       ;If y = 0                       0BD2
        JZ      HITBOT      ; jump to HITBOT.               74   18
;
        DEC     DX          ;If pixel colour at (x,y-1)     4A
        CALL    GPOINT      ; <> background colour,         E8   dldh
        CMP     AL,BH       ; jump to CLRB.                 3AC7
        JNE     CLRB        ;                               75   0C
;
        TEST    BL,1        ;If down flag set               F6C3 01
        JNZ     INCROW      ; jump to INCROW.               75   0A
;
        PUSH    CX          ;Save position (x,y-1) on       51
        PUSH    DX          ;stack for later processing.    52
        OR      BL,1        ;Set down flag.                 80CB 01
        JMPS    INCROW      ;Skip next instruction.         EB   03
;
CLRB    AND     BL,0FEH     ;Clear down flag.               80E3 FE
;
INCROW  INC     DX          ;Restore y.                     42
;
HITBOT  CMP     DX,MAXROW   ;If y = MAXROW                  81FA rrrr
        JGE     HITTOP      ; jump to HITTOP.               7D   18
;
        INC     DX          ;If pixel colour at (x,y+1)     42
        CALL    GPOINT      ; <> background colour,         E8   dldh
        CMP     AL,BH       ; jump to CLRA.                 3AC7
        JNE     CLRA        ;                               75   0C
;
        TEST    BL,2        ;If up flag set                 F6C3 02
        JNZ     DECROW      ; jump to DECROW.               75   0A
;
        PUSH    CX          ;Save position (x,y+1) on       51
        PUSH    DX          ;stack for later processing.    52
;
        OR      BL,2        ;Set up flag.                   80CB 02
        JMPS    DECROW      ;Skip next instruction.         EB   03
;
CLRA    AND     BL,0FDH     ;Clear up flag.                 80E3 FD
;
DECROW  DEC     DX          ;Restore y.                     4A
;
HITTOP  OR      CX,CX       ;If x = 0                       0BC9
        JZ      UNSTAK      ; jump to UNSTAK.               74   08
;
        DEC     CX          ;Decrement x                    49
;
        CALL    GPOINT      ;If pixel colour at (x,y)       E8   dldh
        CMP     AL,BH       ; = background colour,          3AC7
        JE      HITR        ; jump to HITR.                 74   B5
;
UNSTAK  CMP     BP,SP       ;If popped all coordinates      3BEC
        JE      QUIT        ;pushed to stack, QUIT.         74   0B
;
        POP     DX          ;Get new x,y off stack.         5A
        POP     CX          ;                               59
;
        CALL    GPOINT      ;If pixel colour at (x,y)       E8   dldh
        CMP     AL,BH       ; = background colour,          3AC7
        JE      CLRALL      ; jump to CLRALL.               74   97
;
        JMPS    UNSTAK      ;Jump to UNSTAK.                EB   F1
;
QUIT    POP     BP          ;Restore registers.             5D
        POP     DX          ;                               5A
        POP     CX          ;                               59
        POP     BX          ;                               5B
        POP     AX          ;                               58
        POPF                ;                               9D
        RET                 ;Return.                        C3
;
;================================================================
```

Datasheet 2

```
;================================================================
;LINE            Draw a straight line between two points.
;================================================================
;STRUCTURAL CONCEPTS
;PROGRAM         If ABS (end column - start column)
;                > ABS (end row - start row)
;                {
;                  MXS = ABS (end row - start row)
;                  MNS = ABS (end column - start column)
;                  DXS = SGN (end column - start column)
;                  DYS = 0
;                }
;                {
;                  MXS = ABS (end column - start column)
;                  MNS = ABS (end row - start row)
;                  DXS = 0
;                  DYS = SGN (end row - start row)
;                }
;                SXS = SGN (end column - start column)
;
;                SYS = SGN (end row - start row)
;                LGC = MXS / 2
;                For count of 0 to MXS
;                {
;                  Plot point
;                  LGC = LGC + MNS
;                  If  (LGC < MXS)
;                  {
;                    Move right DXS pixels
;                    Move up DYS pixels
;                  }
;                  {
;                    LGC = LGC - MXS
;                    Move right SXS pixels
;                    Move up SYS pixels
;                  }
;                }
;----------------------------------------------------------------
;SYSTEM REQUIREMENTS
;PROCESSOR       8086/8088
;HARDWARE        bit mapped output device.
;SOFTWARE        "PLOT" - plot pixel (CX,DX).
;                Must not change register contents.
;----------------------------------------------------------------
```

```
;PROGRAM DETAILS
;INPUT          AX = start column.
;               BX = start row.
;               CX = end column.
;               DX = end row.
;OUTPUT         None.
;STATE CHANGES  Line drawn.
;I/D ERRORS     None known.
;OPTIMISATION   None.
;INTERRUPTS     May be interrupted and re-entered.
;LOCATION NEED  Must be located in same code segment (CS) as
;               the calling program and as the subroutine
;               called, otherwise...
;               Not specific. Relocatable. PROMable.
;PROGRAM BYTES  131.
;STACK BYTES    24 + PLDT stack use.
;TIMING         Not given.
;================================================================
;
PLDT                    ;System dependent point plot routine
                         Must be in same segment as LINE to use
                         intrasegment displaced CALL, or
                         re-assemble with other CALL form.
;
LINE    PUSHF           ;Save registers used.           9C
        PUSH    AX      ;                               50
        PUSH    BX      ;                               53
        PUSH    CX      ;                               51
        PUSH    DX      ;                               52
        PUSH    BP      ;                               55
;
        PUSH    AX      ;Save these two for later use.  50
        PUSH    BX      ;                               53
;
        SUB     CX,AX   ;CX = ABS(end col - start col)  2BC8
        JZ      ISZ1    ;AH = SGN(end col - start col)  74   0C
        JG      ISPOS1  ;  where SGN can be +1,0,-1.    7F   06
        NEG     CX      ;                               F7D9
        MOV     AH,-1   ;.                              B4   FF
        JMPS    JDIN1   ;                               EB   06
ISPOS1  MOV     AH,1    ;                               B4   01
        JMPS    JOIN1   ;                               EB   02
ISZ1    XOR     AH,AH   ;                               32E4
;
JDIN1   SUB     DX,BX   ;DX = ABS(end row - start row)  2BD3
        JZ      ISZ2    ;AL = SGN(end row - start row)  74   0C
        JG      ISPOS2  ;  where SGN can be +1,0,-1.    7F   06
        NEG     DX      ;                               F7DA
        MOV     AL,-1   ;                               B0   FF
        JMPS    JOIN2   ;                               EB   06
ISPOS2  MOV     AL,1    ;                               B0   01
        JMPS    JOIN2   ;                               EB   02
ISZ2    XOR     AL,AL   ;                               32C0
;
JDIN2   MOV     BX,AX   ;BH = SGN(end col - start col)  8BD8
                         BL = SGN(end row - start row)
;
        CMP     CX,DX   ;If ABS(end col - start col)    3BCA
        JLE     NOTGT   ; > ABS(end row - start row)    7E   04
;                        {
        XOR     AL,AL   ;AL = 0                         32C0
        JMPS    DOLINE  ;AH = SGN(end col - start col)  EB   04
;                        CX = ABS(end col - start col)
;                        DX = ABS(end row - start row)
;                        }
NOTGT   XOR     AH,AH   ;AL = SGN(end row - start row)  32E4
        XCHG    DX,CX   ;AH = 0                         87D1
;                        CX = ABS(end row - start row)
;                        DX = ABS(end col - start col)
;                        }
;
DOLINE  PUSH    CX      ;Save no. of steps on stack.    51
        SHR     CX,1    ;Init. Logic Controller to      D1E9
        PUSH    CX      ;1/2 no. of steps, and stack.   51
        ROL     CX,1    ;Set up counter.                D1C1
        MOV     BP,SP   ;For stack indexing.            8BEC
;
NXTDOT  XCHG    CX,[BP+6] ;Plot point using coordinates 874E 06
        XCHG    DX,[BP+4] ;stored on stack.             8756 04
        CALL    PLOT    ;                               E8   dldh
        XCHG    CX,[BP+6] ;                             874E 06
        XCHG    DX,[BP+4] ;                             8756 04
;
        JCXZ    ALDONE  ;If all points done, quit.      E3   26
;
        PUSH    AX      ;Save AX temporarily.           50
        ADD     [BP],DX ;Add MIN( ABS(end col - start   0156 00
;                         col), ABS(end row - start
;                         row) ) to logic selector.
;
        PUSH    CX      ;If logic controller >= steps   51
        MOV     CX,[BP+2] ;{                            8B4E 02
        CMP     [BP],CX ;sub no. of steps from          394E 00
        JL      DOADD   ;logic controller and do a      7C   05
;                        diagonal step by
        SUB     [BP],CX ;temporarily setting            294E 00
        MOV     AX,BX   ;AH = SGN(end col - start col)  8BC3
DOADD   POP     CX      ;AL = SGN(end row - start row)  59
;                        }
;
        PUSH    AX      ;Move to next pixel.            50
        CBW             ;                               98
        ADD     [BP+4],AX ;                             0146 04
        MOV     AX,[BP-4] ;                             8B46 FC
        MOV     AL,AH   ;                               8AC4
        CBW             ;                               98
        ADD     [BP+6],AX ;                             0146 06
        POP     AX      ;                               58
;
        POP     AX      ;Restore AX from stack.         58
;
        DEC     CX      ;Decrement counter and          49
        JMPS    NXTDOT  ;loop to do plot pixel.         EB   C9
;
ALDONE  ADD     SP,8    ;Clear stack w'space and        83C4 08
        POP     BP      ;restore registers.             5D
        POP     DX      ;                               5A
        POP     CX      ;                               59
        POP     BX      ;                               5B
        POP     AX      ;                               58
        POPF            ;                               9D
        RET             ;Return.                        C3
```



A mixed bag

A reminder about the details of the PCW Disk Library Catalogue, a sensible solution to a scheduling problem, and this month's readers' programs, presented by Owen Linderholm.

The PCW Disk Library Catalogue has not been updated this month because of the extended Christmas holiday. However, there will be a bumper crop next month!

The disks cost £5 each, which includes VAT, postage and packing. Of this £5, a royalty of 50p will go to the authors (split evenly between them if there are more than one).

The disks are *not* public domain and may not be copied at will. If you order one and friends want copies, they will have to purchase their own.

Programs will not be immediately available after being published in *PCW*. There is an inevitable delay in organisation and, since we want to provide two programs per disk, we may have to wait until two suitable programs are available. However, if a program *is* to appear in the disk library at some point, the PCW Disk Library logo will appear by its title in Program File. As soon as a program is available, it will appear in the catalogue which appears opposite.

No documentation is provided with the disks except that which is embedded in the program. So, only order disks for which you have the relevant issues of *PCW*, unless the lack of documentation is not a problem. Some back issues are available and can be ordered from the Back Issues department at VNU House, 32-34 Broadwick Street, London W1A 2HG, or by telephone on (01) 439 4242 (ask for Back Issues).

The catalogue list is organised by machine. The first number is the disk's catalogue number which should be quoted when ordering. The date is the issue of the magazine in which the program appeared, and the rest is a brief description.

Disks can *only* be ordered from S&S Enterprises, PCW Disk Library, 31 Holloway Lane, Amersham, Bucks HP6 6DJ. Payment can be made by credit card, cheque, banker's draft, postal order or cash. Telephone orders can be made by credit card to (02403) 4201 or (02403) 28095. Please do *not* contact the *PCW* office about orders — we *cannot* help.

Christmas cheer

I would like to thank Jaroslav Mlodzski for cheering me up during the busy weeks before Christmas. He sent me a Christmas card all the way from Poland, so, to return the good deed, Jaroslav's next program will be considered for 'Program File'.

Return match

Peter Cameron of Oxford has solved the problem posed by Mr Bramhall in January's Program File, regarding the scheduling of matches, and has pointed out the elementary and rather embarrassing error in my suggested method of solution. Here is Peter's detailed method:

Consider the case where the number of teams is odd: a *geometric* solution can be obtained as follows. Draw a regular polygon with n sides and number the vertices (corners). For each round of the tournament, select an edge in turn. The two teams whose numbers are joined by that edge should play; so should all pairs of teams whose numbers are joined by a diagonal parallel to the edge. This leaves one team opposite the chosen edge, which is given a bye in that round. Then proceed around the polygon with each edge in turn to get n rounds. (This method was taken from Robin Wilson's book,

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.

PCW Disk Library Catalogue

Here is the list of programs currently available: the disk number is given first.

IBM PC 5.25 inch 360K

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

IBM5-APR87-0002 Apr 87 Turbo Pascal Circuit Validation
Create and analyse logic circuits on screen in graphics

Apr 87 PC/AT CMOS RAM Editor
Examine and modify the AT's CMOS RAM

IBM5-SEP86-0003 Sept 86 Turbo Pascal Logiprog
Interpreter for simple version of Prolog

Aug 86 Turbo Pascal Sideways Printer
Print things out sideways on the printer

IBM5-JUL86-0004 Jul 86 Turbo Pascal 6502 Emulator
Run 6502 code on your PC. Can run the BBC Micro OS!

Feb 86 MBasic Expert System
Powerful expert system shell

IBM5-NOV87-0005 Nov 87 Turbo Pascal Menus
Front end menus for programs and DOS in Turbo

Sep 87 Graphics Algorithms
Very fast graphics routines in assembler and Turbo

IBM5-FEB87-0012 Feb87-Apr 87 Teach Yourself Prolog
Programs from the teach yourself Prolog series

IBM5-NOV87-0015 Nov 87 MBasic Number Pursuit
Educational arithmetic game based on Trivial Pursuit

Dec 87 Turbo Pascal Circuit2
Design and layout circuit boards (with disk 2 above)

BBC Micro (single sided/single density 100K disks)

BBC1-JUL87-0006 Jul 87 Artwork
Fully featured painting program, icon based

Mar 87 1d Cellular Automata
Investigate a fascinating mathematical world

BBC1-NOV87-0013 Nov 87 *USE
Text file display and search utility for help files

Nov87 Empty Drive
Checks if a drive is empty, works with most DFS's

Apple Macintosh single sided disks

MAC--JUL87-0007 Jul 87 Worm Plotter
Unusual mathematics based patterns

Jun 87 Excel Macros
Derive rules from tables of data using Excel

MAC--DEC86-0008 Dec 86 Mac Mandelbrot
Mandelbrot program with a new, fast plotting algorithm

Mar 86 Mac Fractal
Create realistic 3D landscapes using pseudo fractals

Atari ST single sided disks

ST---JAN87-0009 Jan 87 Darwin's Lens
Investigate natural selection (black and white)

Sept 86 Super Breakout
The old favourite in black and white

Amstrad PCW single sided disks

PCW--JUN87-0010 Jun 87 Mailout
Mailmerge program for LocoScript

Jun 86 Touch Typing Tutor
How to untangle your fingers..

PCW--NOV87-0014 Nov 87 Kong
Donkey Kong game written in Basic - design screens!

Dec 87 File recovery
Menu driven undelete program - good and classy

Amstrad CPC single sided disks

CPC--AUG87-0011 Aug 87 Adventure Creator
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Nov 85 Amsquill
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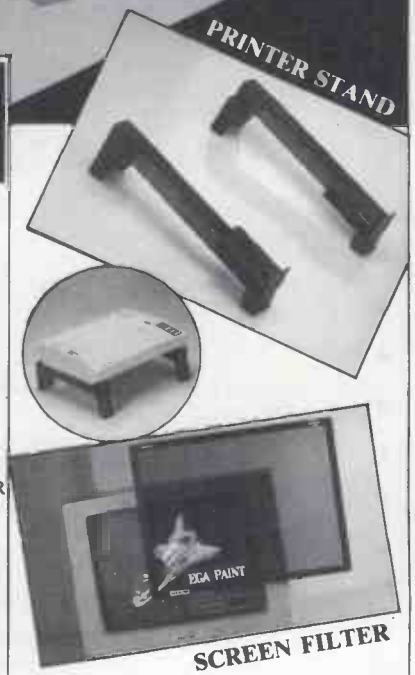

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Introduction to Graph Theory.)

This method can be represented by a simple formula. Number the teams from 0 to n-1. Team 'i' has a bye in week 'i' (for real-life purposes, week 0 is the first week). Teams i and j play in week (i+j)/2 if i+j is even, and week (i+j+n)/2 if i+j is odd. Then, to find team i's opponent in week 'k', calculate 2k-i mod n.

A similar procedure for even numbers can now be obtained. The number of teams should be n+1 where n is odd (one less than the number of teams). Temporarily remove a team from the pool and schedule an n week tournament for the remaining teams as described above. Finally, for each week i, add back in a match between team i and the team you temporarily removed.

This is an extremely elegant and straightforward solution. I apologise to all those readers who followed my suggestion up blind alleyways.

This month's programs

The Program of the Month, written by MDR Croning, is for the Atari ST and is simply called Chaos. It has been written in Fast Basic and explores plots based on chaos theory as described in the article 'From chaos to beauty', *PCW*, November 1987. The program uses GEM fully and event-driven programming – the natural way to write programs for WIMP environments. The program only runs on black and white systems, but it shouldn't be too difficult to convert to colour.

Other programs are for the Amstrad CPC and PCW, including a typing game and a file recovery program. A wide variety of other machines are also represented.

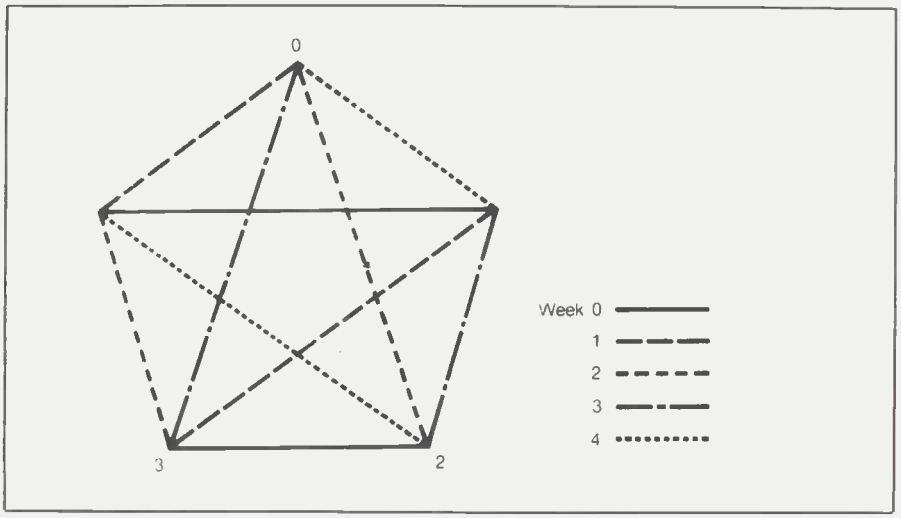

Diagram for Peter Cameron's method

Program of the Month
ST Fast Basic Chaos
by MDR Croning

PCW DISK LIBRARY

This program is for a mono-screen ST and has been written in Fast Basic. It explores the creation of 'chaos' plots and is based on the article 'From Chaos To Beauty', *PCW*, November 1987.

The program uses the GEM environment to create plots in a window so that plots much larger than the screen size can be created and examined. On a 512k machine, plots up to 890×890 pixels can be displayed. Plots can be loaded from and saved to disk and printed to a C.Itoh-compatible printer. It shouldn't be hard to convert the program for other printers.

Function keys are used to select the various modes of the program:

F1 — loads in a saved plot file.

F2 — saves the current plot to a disk file.

F3 — starts a plot once initial parameters have been set up, or continues an interrupted plot.

F4 — allows you to set up initial values for the three seeds for a plot and the magnification at which to display it.

F10 — quit.

HELP — interrupts a plot so that it can be saved or a new one started.

When the program has been typed in, its workspace should be changed to 150k from the 'Show Info' option in Fast Basic. If more memory is available, then increase this and the size of the variable 'picbuffersize%' in 'PROCinitvariables'.

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routine so that it can be altered for other printers:

OUT 0,27,112 — sets the printer to 1152 dots/line (144dpi).

OUT 0,27,84,48,49 — sets linefeeds to 1/144in to get a 1:1 aspect ratio.

OUT 0,27,76,"×" — sets left column to ××16 pixels from left of paper (used to centre picture on paper).

OUT 0,27,71,,"N" — prints N dot positions of 8×1 graphics.

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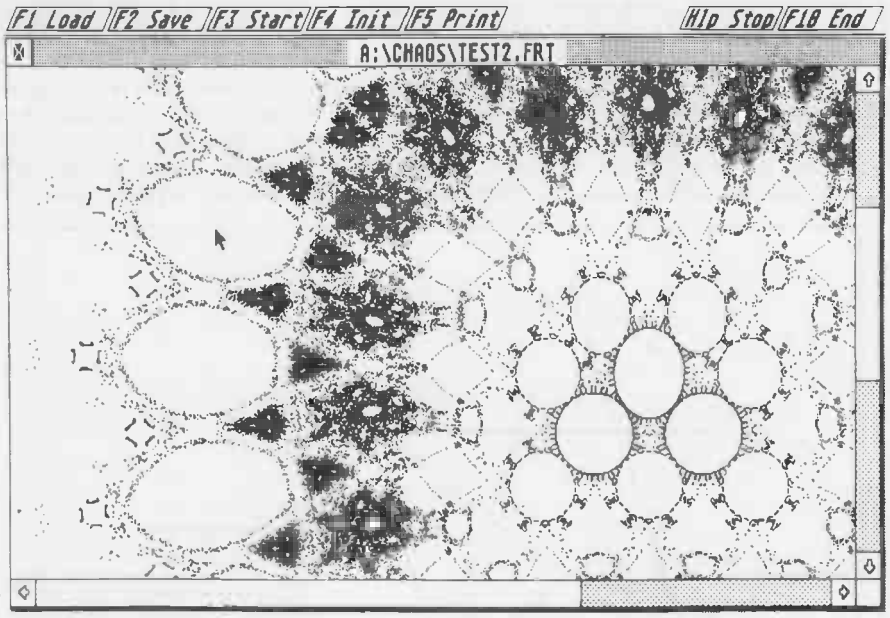
The remainder of the file is picture data using all eight bits of each byte. The number of bytes per line is dependent on the number of pixels per line. The actual bit format mimics that of GEM rasters — the low bit of each byte is the right-most pixel held by that byte in the plot.




```
\ CHAOS.BSC by MDR Croning November 87
\ Written in Fast Basic by Computer Concepts

ON HELP PROCstopdraw
PROCerrorinstall
PROCinitvariables
PROCassemble
PROCinitscreen

\ Major program loop that handles all events occuring
\ and passes control to correct procedure(s)
\ Events detected are keypresses,clicks on closebox and scroll box events

eventget:
WAITEVENT 2pbf&(0),2mbf&(0)
IF pbf&(16)=1 THEN PROCkeypress:IF gen!=1 THEN HELP ON:PROCdraw
IF mbf&(0)=22 THEN PROCquitplc
SWITCH mbf&(0)
CASE 24:PROCarrow
CASE 25:PROChslide
CASE 26:PROCvslide
ENDSWITCH
mbf&(0)=0
GOTO eventget

\ This procedure is called via getevent when you click on the close box

DEF PROCquitplc
alert!=ALERT("[3][Are you sure you wish to quit this picture ?][Yes|No]",2)
IF alert!=1 THEN wx&=1:wy&=21:CLOSEWIND wnd!:DELETEWIND wnd!:pic!=0:init!=0
ENDPROC

\ This is called via getevent if a scroll bar is altered either
\ by clicking or dragging

DEF PROCarrow
SWITCH mbf&(4)
CASE 0:PROCscv(-200)
CASE 1:PROCscv(200)
CASE 2:PROCscv(-20)
CASE 3:PROCscv(20)
CASE 4:PROCsch(-200)
CASE 5:PROCsch(200)
CASE 6:PROCsch(-20)
CASE 7:PROCsch(20)
ENDSWITCH
ENDPROC

\ This procedure changes the vertical slider by the value supplied by
\ the parameter (ychng%); may be positive or negative
\ this routine is used if a scroll box or arrow has been clicked upon
\ it makes sure slider is not set out of range
\ updates window to display correct part of picture
```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PROGRAM FILE

```
DEF PROCscv(ychng%)
IF ychng%<0 AND vspos&=0 THEN ENDPROC
IF ychng%>0 AND vspos&=1000 THEN ENDPROC
IF ychng%<0 THEN
IF vspos&<ABS(ychng%) THEN vspos&=0 ELSE vspos&=vspos&+ychng%
ELSE
IF vspos&>(1000-ychng%) THEN vspos&=1000 ELSE vspos&=vspos&+ychng%
ENDIF
pposy&=((pheight&-wheight&)/1000)*vspos&:PROCpb
VSLIDE wndl,vspos&
ENDPROC

\ Similar to above procedure except works on horizontal slider

DEF PROCsch(xchng%)
IF xchng%<0 AND hspos&=0 THEN ENDPROC
IF xchng%>0 AND hspos&=1000 THEN ENDPROC
IF xchng%<0 THEN
IF hspos&<ABS(xchng%) THEN hspos&=0 ELSE hspos&=hspos&+xchng%
ELSE
IF hspos&>(1000-xchng%) THEN hspos&=1000 ELSE hspos&=hspos&+xchng%
ENDIF
pposx&=((pwidth&-wwidth&)/1000)*hspos&:PROCpb
HSLIDE wndl,hspos&
ENDPROC

\ This procedure is called if the horizontal scroll box has been dragged
\ it updates the window

DEF PROChslide
pposx&=((pwidth&-wwidth&)/1000)*mbf&(4):PROCpb
hspos&=mbf&(4)
HSLIDE wndl,hspos&
ENDPROC

\ This is similar to the above routine but works on the
\ vertical slider

DEF PROCvslide
pposy&=((pheight&-wheight&)/1000)*mbf&(4):PROCpb
vspos&=mbf&(4)
VSLIDE wndl,vspos&
ENDPROC

\ This procedure is called via getevent if a function key is pressed
\ it passes to control PROCload, PROCsave, PROCstartdraw
\ PROCinitdraw, PROCprint, PROCendprog

DEF PROCkeypress
fkey&=pbf&(21)
SWITCH pbf&(21) DIV $FF-58
CASE 1:PROCload
CASE 2:PROCsave
CASE 3:PROCstartdraw
CASE 4:PROCinitdraw
CASE 5:PROCprint
CASE 10:PROCendprog
ENDSWITCH
fkey&=0
ENDPROC

\ Updates window to display the correct part of the picture
\ using BLIT

DEF PROCpb
HIDEMOUSE
BLIT @pib&(0),pposx&,pposy&,wwidth&,wheight&,@scb&(0),wx&,wy&,3
SHOWMOUSE
ENDPROC

\ Will redraw obscured parts of window by calling PROCpb

DEF PROCrebuild
HIDEMOUSE
IF picl=1 THEN PROCpb ELSE DRAWOBJECT @desk&(0),0,99,0,0,640,400
SHOWMOUSE
ENDPROC

\ Initialises the picture buffer, desktop tree
\ all variables, arrays of the program
\ Sets graphic attributes.

DEF PROCinitvariables
picbuffersize%=$19000

RESERVE pbuff%,picbuffersize% :\ reserves picture buffer memory
RESERVE wtitle%,80:(wtitle%)$="":\ reserves window title memory

DIM desk&(11),pbf&(23),mbf&(8),scb&(9),pib&(9)

RESTORE desktree
FOR I%=0 TO 11
READ desk&(I%)
NEXT

desktree:
DATA -1,-1,-1,20,0,0,0,$11A7,0,20,640,380

pib&(0)=(pbuff%+4))>>16:pib&(1)=(pbuff%+4) AND $FFFF:pbf&(0)=%10001
scb&(0)=LOGBASE>>16:scb&(1)=LOGBASE AND $FFFF
scb&(2)=SCREENWIDTH:scb&(3)=SCREENHEIGHT:scb&(4)=SCREENWIDTH>>4
scb&(5)=0:scb&(6)=1:scb&(7)=0:scb&(8)=0:scb&(9)=0
pib&(5)=0:pib&(6)=1:pib&(7)=0:pib&(8)=0:pib&(9)=0
picl=0:tpath$=PATH$:tfile$="":pbwidth&=0:ptstl=0
pwidth&=0:pheight&=0:pposx&=0:pposy&=0
wwidth&=0:wheight&=0:wx&=1:wy&=21:wndl=0:wextw&=636:wexth&=376
hssize&=0:vssize&=0:hspos&=0:vspos&=0:T=1/SQR(2)
lwn%=0:maddr%=0:genl=0:flag%=0:fkey&=0:initl=0

FILLCOL 1:FILLPERIM 1:FILLSTYLE 0,0:TXTSIZE 13
frtA=0:frtB=0:frtC=0
picorigx&=0:picorigy&=0
frtx=0:frty=0:frtxx=0:frtyy=0
ENDPROC

\ Sets up the screen by closing all editor and program windows
\ Clears screen, draws line and draws fuction keys using
\ PROCfb(XX)

DEF PROCInitscreen
HIDEMOUSE
CLOSEWIND OUTHANDLE:DELETEWIND OUTHANDLE
```


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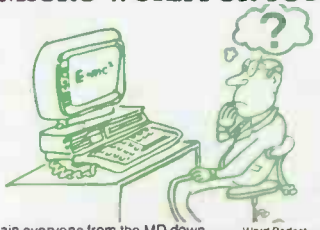

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PROGRAM FILE

```
CLOSEWIND IMMHANDLE:DELETEWIND IMMHANDLE
FOR SEG%=1 TO 10
CLOSEWIND SEGHANDLE(SEG%):DELETEWIND SEGHANDLE(SEG%)
NEXT
GRAFRECT 0,0,SCREENWIDTH,SCREENHEIGHT
CLG 0
LINECOL 1:LINE 0,19 TO 640,19
GTXTEFFECTS 4:GTXTSIZE 13:GTXT 5,14,"F1 Load  F2 Save  F3 Start F4 Init  F5 Prin
t"+STRING$(17," ")+"Hlp Stop F10 End"
Y%=16:FOR X%=2 TO 290 STEP 72:PROCfb(X%):NEXT:PROCfb(490):PROCfb(562)

SETDESK @desk&(0),0
DRAWOBJECT @desk&(0),0,99,0,0,640,400

SHOWMOUSE:RELEASEMOUSE:MENU""
ENDPROC

\ Draws outline of function key given x-coordinate

DEF PROCfb(X%)
LINE X%,Y% TO X%+7,Y%-15:LINE X%+7,Y%-15 TO X%+75,Y%-15
LINE X%+1,Y% TO X%+68,Y%:LINE X%+68,Y% TO X%+75,Y%-15
ENDPROC

\ Assembler routine
\ clearmem - Clears memory quickly to value in D1.L

\ Start address in maddr%
\ Number of long words to be cleared in lwn%

\ pixeldrawtest - Either tests a pixel of sets it to black

\ works directly on the picture stored in the
\ buffer NOT onscreen

\ Y-coordinate in D0
\ X-coordinate in D2
\ If ptstl <> 0 then the pixel is tested rather than set
\ It testing the pixel: D6 will be set to colour

DEF PROCassemble
LOCAL pass%
RESERVE code%,$500
FOR pass%=1 TO 2
[
OPT pass%,"W-L-"
ORG code%

clearmem
MOVE.L @lwn%,D0
MOVE.L @maddr%,A0
cmloop
MOVE.L D1,(A0)+
DBRA D0,cmloop
RTS

pixeldrawtest
MOVE.L @pbuff%,A0
ADDA.L #4,A0
TST.W D0
BMI pdtend
CMP.W @pheight&,D0
BPL pdtend
MULU @pbwidth&,D0
ADDA.L D0,A0
TST.W D2
BMI pdtend
CMP.W @pwidth&,D2
BPL pdtend
DIVU #8,D2
CLR.L D1
MOVE.W D2,D1
ADDA.L D1,A0
MOVE.W #7,D1
SWAP D2
SUB.W D2,D1
TST.W @ptstl
BNE testpixel
BSET D1,(A0)
BRA pdtend
testpixel
CLR.L D6
BTST D1,(A0)
BEQ pdtend
MOVEQ.L #1,D6
pdtend
RTS
]
NEXT pass%
ENDPROC

\ Pressing F3 (start) causes program to come here
\ This program will start drawing i.e. genl is set to 1
\ Checks if there is a picture in memory (picl=1)
\ Checks if pic has been initialised (initl=1)

DEF PROCstartdraw
IF picl=0 THEN alertl=ALERT("[2][You have to have a picture in memory to startd
rawing.][Ok]",1):ENDPROC
IF initl=0 THEN alertl=ALERT("[2][You have to initialise first.][Ok]",1):ENDPROC
genl=1
ENDPROC

\ Pressing F4 (Init) comes here to initialise drawing via 'PROCkeypress'
\ gets three seed values and magnification
\ clears screen

DEF PROCinitdraw
LOCAL t1,t2,t3,t4
IF picl=0 THEN alertl=ALERT("[2][You must have a picture inmemory to initialise
drawing.][Ok]",1):ENDPROC
BAR 200,100,440,300
TXTRECT 200,107,218,188
PRINT TAB(9,0)"Init Drawing"
INPUT TAB(2,3)"Seed 1  "t1:INPUT TAB(2,5)"Seed 2  "t2
INPUT TAB(2,7)"Seed 3  "t3
INPUT TAB(2,9)"Mag     "t4

idrawyn:
PRINT TAB(9,10)"Ok - Y or N ";:A$=GET$
IF A$="n" OR A$="N" THEN PROCrebuild:ENDPROC
```

```
IF A$()"Y" AND A$()"y" THEN BEEP:GOTO idrawyn
frtA=t1:frtB=t2:frtC=t3:frtx=0:frty=0:initl=1:mag=t4
D1=0:lwn%=((pwidth&*pheight&) DIV 32)-1:maddr%=pbuff%+4:CALL clearmem
PROCrebuild
ENDPROC

\ Draws the picture
\ Draws 350 pixels to memory and then BLITs them back

DEF PROCdraw
HIDEMOUSE
REPEAT
FOR I%=1 TO 350
frtxx=frty-SGN(frtx)*SQR(ABS(frtB*frtx-frtC)):frtyy=frtA-frtx:frtx=frtxx:frty=fr
tyy
D2=(T*frtx+T*frty)*mag+picorigx&:D0=(-T*frtx+T*frty)*mag+picorigy&:CALL pixeldra
wtestNEXT:PROCpb
UNTIL genl=0
SHOWMOUSE
WHILE INKEY$()"":WEND
ENDPROC

\ Stops drawing
\ this procedure is called if the HELP key is pressed during drawing
\ it itself is called via ON HELP trap - it sets genl = 0

DEF PROCstopdraw
genl=0
ENDPROC

\ Pressing F5 (Print) comes here
\ Prints out picture to parallel port
\ Suitable for C. ITOH compatible printers e.g. APPLE DMP etc
\ Prints centred picture with 1:1 aspect ratio at 144 dpi
\ Prints picture on its side so that pics up 1152 pixels
\ high can be printed

DEF PROCprint
LOCAL col%,col$
IF picl=0 THEN alertl=ALERT("[2][You must have a picturelin memory to print it][
Ok]",1):ENDPROC
IF pheight&)1152 THEN alertl=ALERT("[2][That picture is tooltall to print][Ok]",
1):ENDPROC
ptstl=1:Y$=STR$(pheight&-1):WHILE LEN(Y$)(4:Y$="0"+Y$:WEND
OUT 0,27,112:OUT 0,27,84,48,49
OUT 0,27,76
IF pwidth&(1152 THEN
col%=(1152-pheight&) DIV 32
col$=STR$(col%):WHILE LEN(col$)(3:col$="0"+col$:WEND
IF VAL(col$)(1 THEN col$="001"
LPRINT col$
ELSE LPRINT"001"
ENDIF
FOR XX%=0 TO pwidth&-1
OUT 0,27,71:LPRINT Y$;
FOR YY%=pheight&-1 TO 0 STEP-1
D2=XX%:D0=YY%:CALL pixeldrawtest
OUT 0,D6
NEXT YY%
LPRINT
NEXT XX%
ptstl=0
ENDPROC

\ This procedure is called if you press the F10 (end) key
\ Picture window is closed if program is left

DEF PROCendprog
alertl=ALERT("[3][Are you sure you wishlto leave the programme ?][Yes|No]",2)
IF alertl=2 THEN ENDPROC
IF picl=1 THEN CLOSEWIND wndl:DELETEWIND wndl
TAKEMOUSE
END

\ Displays standard file selector
\ uses file extender .FRT

DEF PROCfselect
tpath$=tpath$+"*.FRT"
FSELECT tpath$,tfile$,flag%:ESCAPE OFF
WHILE RIGHT$(tpath$,1)()"\"
tpath$=LEFT$(tpath$,LEN(tpath$)-1)
WEND
PATH$=tpath$
PROCrebuild
ENDPRDC
\ This is called if F1 (Load) is pressed
\ BLOADs file, gets picture size
\ Initialises picture window + variables via PROCinitpic

DEF PROCload
LOCAL alert$
IF picl=1 THEN alertl=ALERT("[2][Close the existinglpicture first.][Ok]",1):ENDP
ROC
PROCfselect:IF tfile$="" OR flag%=FALSE THEN ENDPROC
BLOAD tfile$,pbuff%
pwidth&=(pbuff%)&:pheight&=(pbuff%+2)&
PROCinitpic
alert$="[2][    Size          | |Pic width "+STR$(pwidth&)+"|Pic height "+STR$(ph
eight&)+"][OK]"
alert%=ALERT(alert$,1)
ENDPROC

\ This is called if F2 (Save) is pressed
\ Uses BSAVE
\ Checks if therE is enough free space or the file already exists

DEF PROCsave
LOCAL handle%
IF picl=0 THEN alertl=ALERT("[2][No picture in memory|to save.][OK]",1):ENDPROC
PROCfselect:IF tfile$="" OR flag%=FALSE THEN ENDPROC
SETMOUSE 2,0
handle%=OPENIN tfile$
piclength%=(pwidth& DIV 8)*pheight&+4
IF handle%)0 THEN GOTO closefile
IF DISKFREE(-1)((piclength%+1024) THEN PROCnospace:ENDPROC ELSE GOTO savefile
closefile:
CLOSE# handle%
savefile:
BSAVE tfile$,pbuff%,piclength%
SETMOUSE 0,0
```


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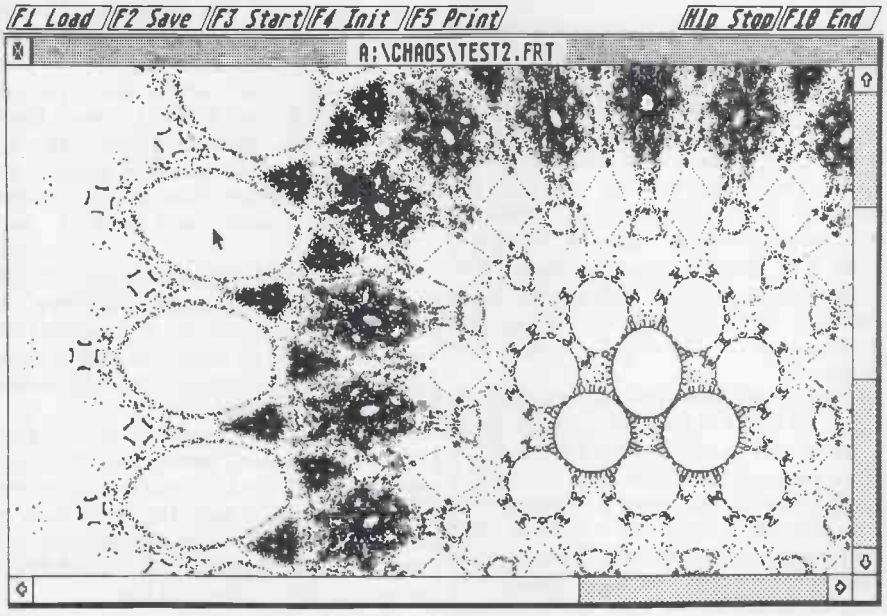
PROGRAM FILE

```
PROCwtitle
ENDPROC
\ Called by PROCsave if there is not enough space on the disk
\ and the file does not already exist.

DEF PROCnospace
SETMOUSE 0,0
alert%=ALERT("[3][There is not enough|space on the disk to|save this file.][Ok]"
,1)
ENDPROC

\ If an error occurs during the program, control comes here
\ If the error is unknown the picture window is closed and
\ the program is terminated by LASTERROR

errcheck:
ESCAPE OFF
\ If next IF is satisfied it means 'File not found' during PROCload
IF ERR=92 AND fkey&=$3B00 THEN PROCerrorinstall:GOTO pnfound

\ If next IF is satisfied then some sort of BIOS/GEMDOS error
IF ERR>73 THEN PROCerrorinstall:GOTO eventget

\ IF next IF is satisfied then an arithmetical error occurs
\ 'Too large' - 'Negative square root' - 'Too big to be real'

IF (ERR=15 OR ERR=27 OR ERR=28 AND gen1=1) THEN gen1=0:init1=0:PROCerrorinstall:
GOTO eventget
IF pic1=1 THEN CLOSEWIND wnd1:DELETEWIND wnd1
LASTERROR

\ This routine reinstalls error handler after an error has occured
\ this has to be done
DEF PROCerrorinstall
ON ERROR GOTO errcheck
ENDPROC

\ This is called via errcheck if a file was not found during PROCload
\ this determines if a new picture should be created

pnfound:
alert1=ALERT("[2][No picture of that name|exists do you wish|to create it ?][Yes
|No]",1)
SWITCH alert1
CASE 1:PROCmakepic
ENDSWITCH
GOTO eventget

\ This is the routine that creates a new picture
\ it is called by pnfound
\ Gets picture width and height

DEF PROCmakepic
getsizes:
BAR 200,120,440,280
TXTRECT 200,127,218,158
PRINT TAB(9,0)"Picture Size"
INPUT TAB(2,3)"Picture width  "pwidth&:INPUT TAB(2,5)"Picture height "phelght&
mpicyn:
PRINT TAB(9,8)"Ok - Y or N ";:A$=GET$
IF A$="n" OR A$="N" THEN PROCrebuild:ENDPROC
IF A$()"Y" AND A$()"y" THEN BEEP:GOTO mpicyn
PROCrebuild
IF pwidth&<640 THEN pwidth&=640
IF phelght&<400 THEN phelght&=400
IF pwidth& MOD 16 >0 THEN pwidth&=(pwidth& DIV 16)*16+16:PROCround
IF (pwidth& DIV 8)*pheight&+5)picbuffersize% THEN PROCpicbad:ENDPROC
D1=0:lwn%=((pwidth&*pheight&) DIV 32)-1:maddr%=pbuff%+4:CALL clearmem
(pbuff%)&=pwidth&:(pbuff%+2)&=pheight&
PROCinitpic
ENDPROC

\ Called by makepic to inform user that picture width entered has been
\ rounded up to a multiple of 16

DEF PROCround
alert1=ALERT("[2][Picture has been|rounded up.][Ok]",1)
ENDPROC
\ Called by makepic if the picture size specified (after rounding) is
\ too large for buffer
DEF PROCpicbad
alert1=ALERT("[3][That is too big for|the currently reserved|memory][Ok]",1)
ENDPROC

\ Initialises picture
\ Opens window, sets slider size and various variables

DEF PROCinitpic
wnd1=CREATEWIND(4035,0,0,0,0)
OPENWIND wnd1,wx&,wy&,wextw&,wexth&
GETWINDWORK wnd1,wx&,wy&,wwidth&,whelght&
PROCwtitle
pib&(2)=pwidth&:pib&(3)=phelght&
pib&(4)=pwidth&)>4
hssize&=INT((wwidth&/pwidth&)*1000):HSLSIZE wnd1,hssize&:hspos&=0:HSLIDE wnd1,hs
pos&
vssize&=INT((whelght&/pheight&)*1000):VSLSIZE wnd1,vssize&:vspos&=0:VSLIDE wnd1,
vspos&
pposx&=0:pposy&=0:pic1=1
picorigx&=(pwidth& DIV 2)-1:picorigy&=(phelght& DIV 2)-1
pbwidth&=pwidth& DIV 8
PROCpb
ENDPROC
\ Sets picture window title using SETWINDTITLE
\ checks if name is too wide for window
DEF PROCwtitle
(wtitle%)$=" "+tpath$+tfile$+" "
IF wextw&>LEN((wtitle%)$)*16+30 THEN SETWINDTITLE wnd1,wtitle% ELSE (wtitle%)$="
":SETWINDTITLE wnd1,wtitle%
ENDPROC
\                          Table of variables
\                          ------------------

\ picbuffersize% - holds picture buffer size
\ pbuff% - address of picture buffer
\ wtitle% - address of start of windo title (80 bytes)

\ desk&(11) - holds object tree of desktop
\ pbf&(23) - parameter buffer for WAITEVENT
\ mbf&(8) - message buffer for WAITEVENT
```

```
\ scb&(9) - screen mfdb for BLIT
\ pib&(9) - picture mfdb for BLIT

\ picl - indicates if a pic is in memory (0-yes, 1-no)
\ tpath$ - path used in program
\ tfile$ - holds filename of picture
\ ptstl - indicates whether assembler routine 'pixeldrawtest' either
\       - draws or tests (1-test)

\ pbwidth& - width of picture in bytes
\ pwidth& - picture width in pixels (always multiple of 16)
\ pheight& - picture height in pixels
\ pposx& - x-coord of point of picture picture
\        - displayed at top left of window
\ pposy& - y-coord
\ picorigx& - x-coord of centre of picture
\ picorigy& - y-coord

\ wwidth& - internal width of window
\ wheight& - internal height of window
\ wx& - x-coord of top left of window (internal)
\ wy& - y-coord
\ wndl - window handle
\ wextw& - external width of window
\ wexth& - external height of window

\ hssize& - horizontal scroll box size
\ vssize& - vertical scroll box size
\ hspos& - horizontal scroll box size
\ vspos& - vertical scroll box size

\ T - 1/SQR(2) - constant used in rotating picture through 45 degrees

\ lwn%=0 - variable used to pass number of bytes/4 to assembler
\        - routine 'clearmem'
\ maddr% - memory address to start clearing for 'clearmem'

\ genl - indicates whether picture is being drawn (0-no, 1-yes)
\ initl - indicates whether picture has been initialised
\       - i.e. seed values + mag entered

\ flag% - flag used by fselect to indicate whether [OK] or [Cancel]
\       - was clicked on at end of FSELECT

\ fkey& - variable used to hold value of function key pressed
\       - used by 'errorinstall'

\ frtA - Three seed values for drawing picture
\ frtB -
\ frtC -

\ frtx - x-coord of last point created by 'PROCdraw'
\ frty - y-coord
\ frtxx - x-coord of point being generated by 'PROCdraw'
\ frtyy - y-coord
```



Amstrad CPC Rescue

by David Brewer

Have you ever lost hours of work when your program has crashed? Even the best commercial software contains bugs, and if you have tried your own machine code programming you will, like me, have grown to dread the sudden appearance of the warm-up screen.

Rescue is at hand, however, if you own a CPC6128, or a CPC664/464 with a memory expansion. This program will save the contents of mem-
with memory expansion. This prog-
which hides in the background of your computer, and keep it safe in case you crash. If (or when) you

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crash, Rescue will restore the memory to the exact state it was in when you last saved it.

Type in Program 1, which is a Basic loader. When you run it, any data errors will be pointed out. If there are no errors, it will automatically save the binary program, Rescue, to disk or tape.

To use Rescue, simply load it at any time and then CALL &BF00 whenever you want to save the contents of the memory to the second block of 64k. To rescue the memory contents after a crash, reset the computer with CTRL-SHIFT-ESC, type 'CALL &BF00,1' then ENTER.

When Rescue has been loaded, it will remain in the computer even if you reset it or it crashes, and it will only be lost if you turn the computer off. This means that you do not have to reload Rescue each time your computer crashes or when you reset it with CTRL-SHIFT-ESC.

The program works by saving all the usable memory into the second memory block of 64k, which very few programs use. Obviously, if the program you are using or writing does require the second block of 64k, then you cannot use Rescue. These programs include the better word processors such as TASWORD 128 or rare programs such as MASTERFILE, which run on the CPC6128 but not on the unexpanded CPC664/464.

The second block of memory cannot be addressed directly because the Z80 processor (which is used in all CPCs) can only use 64k at any one time. In order to use any of the second block of memory, some of the original block must be swapped with it so that the total is always 64k. The easiest way of doing this is to swap a bank of 16k of the second block with a 16k bank of the first block.

Swapping memory banks can be done in Basic. The best bank to swap with is the one from &4000 to &7fff. This will not interfere with any Basic programs (unless they are more than 15k long) nor with any machine code programs above &8000. The second block of memory has four banks, and any one of them can be swapped into the first memory block at &4000 with the following short program:

```
10 bank=1: REM or 2,3 or 4
20 OUT &7F00, 195+bank
```

The original bank can be restored by:

```
30 OUT &7F00, 192
```

This second block of 64k can be used to store data, screens, or, as with this program, the whole contents of the first block of memory. Unlike the first block, it is not cleared when you reset the computer, so information stored there is not destroyed when your computer crashes. The following lines added to the above program will put your name into the second block of memory so that it can then be rescued after you have reset the computer:

```
24 INPUT "Name:", n$:FOR n=1 TO
   LEN (n$):POKE &4000+n, ASC
   (MID$(n$,n,1)): NEXT

26 OUT $7F00,192
```

Run this short program, then reset the computer with CTRL-SHIFT-ESC. Run the following program to recover your name:

```
10 bank=1: REM (or whatever num-
   ber you used before)
20 OUT &7F00, 195+bank
30 p= PEEK(&4001+n):IF p<123
   AND p>31 THEN PRINT CHR$(p);:
   n=n+1:GOTO 30
```

The machine code listing of Rescue shows how this bank-switching is done in machine code. What Rescue does is to copy each of the four banks of the first block of memory into the corresponding bank in the second block, and then copy them back again. For example, the first step is to place the fourth bank of the second block into memory at &4000, then to copy the contents of the fourth bank of the first block (&C000 to &FFFF) into &4000-&7FFF. This effectively copies the screen (which occupies &C000-&FFFF) into bank four of the second block, so, by studying the listing, you should be able to work out how to save more than one screen and how to call them back.

With a bit of ingenuity, you should also be able to work out how to adapt this program to grab protected programs out of memory and to save them to disk or tape, but I had better not encourage you!

When all the copying and swapping of memory banks has finished, the original bank is restored and the screen mode is set. The only part of the memory which is not copied into the second bank is &BF00-&BFFF, which is where Rescue lies.

Rescue has been placed in the memory at &BF00 because this is not affected when the computer is reset. The area of &BF00 to &BFFF is reserved for use by the stack, but the bottom end of this space is very rarely used. If your program uses so much stack that it overwrites Rescue, then it is likely that it has gone into a continuous loop of CALLing or PUSHing values into the stack. If this happens, CALL &BF00,1 will not restore your crashed program until you have reloaded Rescue.

Now you can hack without a care. If you crash, Rescue is at hand.

Amstrad Rescue: Basic loader

```
10 REM Basic loader for RESCUE.BIN
20 REM (C) Dave Instone Brewer 1987
30 REM CPC 6128 or expanded 664/464 only
40 REM
50 address=&BF00:l=200
60  FOR d=0 TO 11
70   SUM=0:READ a$
80   FOR n=0 TO 7
90    p=VAL("&"+MID$(a$,n*2+1,2))
100   sum=sum+p:POKE address,p
110   address=address+1
120  NEXT
130  IF sum<>VAL("&"+RIGHT$(a$,3)) THEN PRINT"Data error in line";l:END
140  l=l+10
150 NEXT
160 PRINT:PRINT"Saving RESCUE.BIN,b,&BF00,&5E
170 SAVE"!RESCUE.BIN",b,&BF00,&5E
180 PRINT:PRINT"To save memory CALL &BF00"
190 PRINT:PRINT"To rescue memory CALL &BF00,1":PRINT
200 DATA A72006214ABFCD1C2E0
210 DATA BF2154BFCD1CBF3E3D9
220 DATA C001007FED79CD113B4
230 DATA BCC31CBD0605C5E540D
240 DATA CD2ABFE12323C1103AE
250 DATA F5C97EE60FC6C0014B8
260 DATA 007FED797EE6F057490
270 DATA 237EE60FC63F477E360
280 DATA E6F0670E00596BED3FC
290 DATA B0C947C14680440138C
300 DATA C04145C1C54140C140E
310 DATA C74186400441000021 3
```

Amstrad Rescue: machine code listing

```
                        BANKSWAP
                        decide
BF00: A7                AND A
BF01: 20 06             JR NZ,restore
BF03:                   .store
BF03: 21 4A BF          LD HL,store-table
BF06: CD 1C BF          CALL start-loop
BF09:                   .restore
BF09: 21 54 BF          LD HL,restore-table
BF0C: CD 1C BF          CALL start-loop
BF0F: 3E C0             LD A,192
BF11: 01 00 7F          LD BC,&7F00
BF14: ED 79             OUT (C),A
BF16: CD 11 BC          CALL &BC11
BF19: C3 1C BD          JP &BD1C
BF1C:                   .start-loop
BF1C: 06 05             LD B,5
BF1E:                   .loop
BF1E: C5                PUSH BC
BF1F: E5                PUSH HL
BF20: CD 2A BF          CALL bank
BF23: E1                POP HL
BF24: 23                INC HL
BF25: 23                INC HL
BF26: C1                POP BC
BF27: 10 F5             DJNZ loop
BF29: C9                RET
BF2A:                   .bank
BF2A: 7E                LD A,(HL)
BF2B: E6 0F             AND 15
BF2D: C6 C0             ADD A,192
BF2F: 01 00 7F          LD BC,&7F00
BF32: ED 79             OUT (C),A
BF34: 7E                LD A,(HL)
BF35: E6 F0             AND 240
BF37: 57                LD D,A
BF38: 23                INC HL
BF39: 7E                LD A,(HL)
BF3A: E6 0F             AND 15
BF3C: C6 3F             ADD A,&3F
BF3E: 47                LD B,A
BF3F: 7E                LD A,(HL)
BF40: E6 F0             AND 240
BF42: 67                LD H,A
BF43: 0E 00             LD C,0
BF45: 59                LD E,C
BF46: 6B                LD L,E
BF47: ED B0             LDIR
BF49: C9                RET
                        TABLES
BF4A:                   .store-table
BF4A: 47 C1             DEFW &C147
BF4C: 46 B0             DEFW &B046
BF4E: 44 01             DEFW &0144
BF50: C0 41             DEFW &41C0
BF52: 45 C1             DEFW &C145
BF54:                   .restore-table
BF54: C7 41             DEFW &41C7
BF56: 40 C1             DEFW &C140
BF58: C7 41             DEFW &41C7
BF5A: B6 40             DEFW &4086
BF5C: 04 41             DEFW &4104
BF5E:                   END
```


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QL File Analyst

by David Marsh

File Analyst analyses all parts of a SuperBasic file and generates a report on the file to the screen or printer. It will only analyse those parts of a program that you want it to — for example, you could analyse FOR . . .NEXT loops only.

The program uses a menu system with a menu bar controlled by cursor keys, and operations are selected by pressing ENTER. When you have chosen a file to analyse, the options available are:

SEARCH WORD — scans for all occurrences of a word and reports.
SEARCH/REPLACE — finds all occurrences of a word and replaces them with a new word.
SEARCH INTEGERS — scans for all variables used as integers.
SEARCH STRINGS — scans for all string variables.
SEARCH REPeat LOOPS — scans for REPEAT loops and reports the start and end of each loop.
SEARCH FOR LOOPS — does the same for FOR loops.
SEARCH PROCedures — scans the program for all PROCedure declarations.
SEARCH FuNctions — scans for functions.
SEARCH SELects — searches for selects.
SEARCH IF THEN — scans for IF statements.
QUIT ANALYSER — quit and return to SuperBasic.
DIRECTORY MDV1/MDV2 — gives a directory of MDV1/2.

```
1 REMark FILE ANALYSER
2 :
3 REMark DAVID MARSH - 1987 - GTR. MANCHESTER.
4 :
5 CLEAR:DIM WORD$(40,30)
6 INIT:SETUP:WORK
7 :
8 DEFine PROCedure INIT
9 A$="SCREEN":F$="NONE":W%=0:E%=0:BAUD 2400
10 END DEFine
11 :
12 DEFine PROCedure SETUP
13 MODE 4:WINDOW 512,256,0,0:PAPER 0:CLS:OPEN#1,CON:Y=30
14 INK 4:CSIZE 1,1:PRINT TO 19,"FILE ANALYSER"
15 INK 7:CSIZE 1,0:CSIZE#0,1,0:AT 3,0
16 PRINT TO 10,"INPUT FILE.....:"
17 PRINT TO 10,"SEARCH WORD.....:"
18 PRINT TO 10,"SEARCH/REPLACE.....:"
19 PRINT TO 10,"SEARCH INTEGERS.....:"
20 PRINT TO 10,"SEARCH STRINGS.....:"
21 PRINT TO 10,"SEARCH REPeat LOOPS.....:"
22 PRINT TO 10,"SEARCH FOR LOOPS.....:"
23 PRINT TO 10,"SEARCH PROCedures.....:"
24 PRINT TO 10,"SEARCH FuNctions.....:"
25 PRINT TO 10,"SEARCH SELects.....:"
26 PRINT TO 10,"SEARCH IF THEN.....:"
27 PRINT TO 10,"QUIT ANALYSER.....:"
28 PRINT TO 10,"DIRRECTORY MDV1.....:"
29 PRINT TO 10,"DIRRECTORY MDV2.....:"
30 PRINT TO 10,"REPORT.....:"
31 INK 2:FOR IY=4 TO 16:AT IY,40:PRINT "NO"
32 AT 3,40:PRINT F$
33 AT 17,40:PRINT A$
34 OVER -1:BAR
35 END DEFine
36 :
37 DEFine PROCedure BAR
38 BLOCK 390,10,30,Y,7
39 END DEFine
40 :
41 DEFine PROCedure CHANGE(I$)
42 BAR:OVER 0:AT Y/10,40:PRINT I$:OVER -1:BAR
43 END DEFine
44 :
45 DEFine PROCedure WORK
46 REPeat LOOP
47 GETKEY
48 IF K=208
49 BAR:Y=Y-10:IF Y=20:Y=170
50 BAR:NEXT LOOP
51 END IF
52 IF K=216
53 BAR:Y=Y+10:IF Y=180:Y=30
54 BAR:NEXT LOOP
55 END IF
56 IF Y=30 AND K=10
57 BAR:OVER 0:AT 3,40:PRINT FILL$(" ",16)
58 AT 3,40:INPUT F$:IF F$="":F$="NONE"
59 AT 3,40:PRINT F$:OVER -1:BAR
60 END IF
61 IF Y=40 AND K=10 AND F$<>"NONE"
62 IF CONFIRM=0:NEXT LOOP
63 INPUT#0,"ENTER WORD="'W$:IF W$="":CLS#0:CHANGE "NO ":NEXT LOOP
64 OPEN_CHANNELS "SEARCH WORD"
65 REPeat SCAN
```

```
66 IF EOF(#10):EXIT SCAN
67 INPUT#10,T$:IF W$ INSTR T$:REPORT W$,T$
68 END REPeat SCAN
69 REPORT_TIMES(W$):CLOSE_CHANNELS
70 END IF
71 IF Y=50 AND K=10 AND F$<>"NONE"
72 IF CONFIRM=0:NEXT LOOP
73 INPUT#0,"ENTER WORD TO REPLACE="!W$:CLS#0
74 IF W$="":CHANGE "NO ":NEXT LOOP
75 INPUT#0,"ENTER REPLACEMENT="!R$:CLS#0
76 IF R$="":CHANGE "NO ":NEXT LOOP
77 OPEN_CHANNELS "SEARCH/REPLACE WORD"
78 DELETE "MDV2_"&F$:OPEN_NEW#11,"MDV2_"&F$
79 REPeat SCAN
80 IF EOF(#10):EXIT SCAN
81 INPUT#10,T$:P%=W$ INSTR T$
82 IF P%
83 REPORT W$,T$
84 T$=T$(1 TO P%-1)&R$&T$(P%+LEN(W$) TO)
85 END IF
86 PRINT#11,T$
87 END REPeat SCAN
88 REPORT_TIMES(W$):CLOSE#11:CLOSE_CHANNELS
89 END IF
90 IF Y=60 AND K=10 AND F$<>"NONE"
91 IF CONFIRM=0:NEXT LOOP
92 OPEN_CHANNELS "INTEGER SEARCH"
93 CHAR_FIND "%","INTEGER"
94 END IF
95 IF Y=70 AND K=10 AND F$<>"NONE"
96 IF CONFIRM=0:NEXT LOOP
97 OPEN_CHANNELS "STRING SEARCH"
98 CHAR_FIND "$","STRING"
99 END IF
100 IF Y=80 AND K=10 AND F$<>"NONE"
101 IF CONFIRM=0:NEXT LOOP
102 OPEN_CHANNELS "REPeat LOOP SEARCH"
103 FIND_WORD "REPeat ","END REPeat "
104 REPORT_TIMES "REPeat":CLOSE_CHANNELS
105 END IF
106 IF Y=90 AND K=10 AND F$<>"NONE"
107 IF CONFIRM=0:NEXT LOOP
108 OPEN_CHANNELS "FOR LOOP SEARCH"
109 FIND_WORD "FOR ","END FOR "
110 REPORT_TIMES "FOR":CLOSE_CHANNELS
111 END IF
112 IF Y=100 AND K=10 AND F$<>"NONE"
113 IF CONFIRM=0:NEXT LOOP
114 OPEN_CHANNELS "PROCedure SEARCH"
115 FIND_WORD "DEFine PROCedure ","END DEFine"
116 REPORT_TIMES "PROCedure":CLOSE_CHANNELS
117 END IF
118 IF Y=110 AND K=10 AND F$<>"NONE"
119 IF CONFIRM=0:NEXT LOOP
120 OPEN_CHANNELS "FuNction SEARCH"
121 FIND_WORD "DEFine FuNction ","END DEFine"
122 REPORT_TIMES "FuNction":CLOSE_CHANNELS
123 END IF
124 IF Y=120 AND K=10 AND F$<>"NONE"
125 IF CONFIRM=0:NEXT LOOP
126 OPEN_CHANNELS "SELect SEARCH"
127 FIND_WORD "SELect ON ","END SELect"
128 REPORT_TIMES "SELect":CLOSE_CHANNELS
129 END IF
130 IF Y=130 AND K=10 AND F$<>"NONE"
131 IF CONFIRM=0:NEXT LOOP
132 OPEN_CHANNELS "IF THEN SEARCH"
133 FIND_WORD "IF ","END IF"
134 REPORT_TIMES "IF THEN":CLOSE_CHANNELS
135 END IF
136 IF Y=140 AND K=10
137 IF CONFIRM=0:NEXT LOOP
138 ICE:RUN
139 END IF
140 IF Y=150 AND K=10
141 IF CONFIRM=0:NEXT LOOP
142 CLS:INK 7:DIR MDV1_:PAUSE:SETUP
143 END IF
144 IF Y=160 AND K=10
145 IF CONFIRM=0:NEXT LOOP
146 CLS:INK 7:DIR MDV2_:PAUSE:SETUP
147 END IF
148 IF Y=170 AND K=10
149 IF A$="SCREEN":A$="FILE  ":ELSE A$="SCREEN"
150 CHANGE A$
151 END IF
152 END REPeat LOOP
153 END DEFine
154 :
155 DEFine PROCedure FIND_WORD(STAT$,FIN$)
156 L1%=LEN(STAT$):L2%=LEN(FIN$)
157 IF FIN$="END IF":LX%=1:ELSE LX%=0
158 REPeat SCAN
159 IF EOF(#10):EXIT SCAN
160 INPUT#10,T$:L3%=LEN(T$)
161 P1%=STAT$ INSTR T$:P2%=FIN$ INSTR T$
162 IF P1% AND P2%=0
163 IF "DEFine PROCedure " INSTR T$:E%=1
164 IF "DEFine FuNction " INSTR T$:E%=2
165 FOR I=P1%+L1% TO L3%
166 IF Y<>130 AND (CODE(T$(I))<65 OR CODE(T$(I))>122 OR I=L3%)
167 IF I=L3%:I=I+1
168 W$="START - "&T$(P1%+L1% TO I-1):REPORT W$,T$:NEXT SCAN
169 END IF
```


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```
170 IF Y=130 AND (T$(I)=":" OR T$(I)=" " OR I=L3%)
171 IF I=L3%:I=I+1
172 W$="START - "&T$(P1% TO I-1):REPORT W$,T$:NEXT SCAN
173 END IF
174 END FOR I
175 END IF
176 IF P2%
177 IF STAT$="DEFine PROCedure " AND E%<>1:NEXT SCAN
178 IF STAT$="DEFine FuNction " AND E%<>2:NEXT SCAN
179 E%=0
180 FOR I=P2%+L2% TO L3%
181 IF Y<>130 AND(CODE(T$(I))<65 OR CODE(T$(I))>122 OR I=L3%)
182 IF I=L3%:I=I+1
183 W$="END   - "&T$(P2%+L2% TO I-1):REPORT W$,T$:NEXT SCAN
184 END IF
185 IF Y=130 AND (T$(I)=":" OR T$(I)=" " OR I=L3%)
186 W$="END   -"&T$(P2%-LX% TO I-1):REPORT W$,T$:NEXT SCAN
187 END IF
188 END FOR I
189 END IF
190 END REPeat SCAN
191 END DEFine
192 :
193 DEFine PROCedure CHAR_FIND(CH$,TXT$)
194 REPeat SCAN
195 IF EOF(#10):EXIT SCAN
196 INPUT#10,T$
197 FOR J=0 TO W%:WORD$(J)=""
198 W%=0.
199 FOR K=LEN(T$) TO 1 STEP -1
200 IF T$(K)=CH$
201 FOR S=K-1 TO 1 STEP -1
202 T=CODE(T$(S))
203 IF (T<65 AND T>57) OR T>127 OR T<48
204 W$=T$(S+1 TO K):REPORT W$,T$:NEXT K
205 END IF
206 END FOR S
207 END IF
208 END FOR K
209 END REPeat SCAN
210 REPORT_TIMES TXT$:CLOSE_CHANNELS
211 END DEFine
212 :
213 DEFine PROCedure OPEN_CHANNELS(I$)
214 CLS#0:PRINT#0,"ENSURE SOURCE FILE IN DRIVE 1";
215 IF Y=50:PRINT#0," AND CARTRIDGE IN DRIVE 2";
216 PRINT#0\\\"PRESS ANY KEY TO START...":PAUSE
217 CLS#0:PRINT#0,"PERFORMING "&I$&"..."
218 OPEN_IN#10,"MDV1_"&F$:TIMES=0
219 IF A$="FILE  "
220 FILE$="MDV1_"&F$&"_rep":DELETE FILE$:OPEN_NEW#15,FILE$:C=15
221 ELSE CLS:CSIZE 0,0:C=1
222 END IF
223 INK 2:PRINT#C,"FILE="!F$\\
224 INK 4:PRINT#C,I$\\:INK 7
225 END DEFine
226 :
227 DEFine PROCedure CLOSE_CHANNELS
228 CLS#0:CLOSE#10
229 IF A$="FILE  "
230 CLOSE#15
231 ELSE PRINT#0,"PRESS ANY KEY TO CONTINUE...":PAUSE
232 END IF
233 SETUP
234 END DEFine
235 :
236 DEFine PROCedure REPORT(W$,T$)
237 L$=T$(1 TO " " INSTR T$)
238 IF Y=60 OR Y=70
239 FOR J=0 TO W% STEP 2
240 IF WORD$(J)=W$ AND WORD$(J+1)=L$:TIMES=TIMES+1:REturn
241 END FOR J
242 WORD$(W%)=W$:W%=W%+1:WORD$(W%)=L$:W%=W%+1
243 END IF
244 PRINT#C,W$;
245 PRINT#C,TO 50;"FOUND AT "!L$:TIMES=TIMES+1
246 END DEFine
247 :
248 DEFine PROCedure REPORT_TIMES(W$)
249 IF Y=100 OR Y=110:TIMES=TIMES/2
250 IF TIMES=0
251 W$=W$&" - NONE FOUND"
252 ELSE W$=W$&" OCCURANCE= "&TIMES
253 END IF
254 PRINT#C\\W$
255 END DEFine
256 :
257 DEFine PROCedure GETKEY
258 K=CODE(INKEY$(-1))
259 END DEFine
260 :
261 DEFine FuNction CONFIRM
262 CHANGE "YES":GETKEY
263 IF K=10:REturn 1
264 CHANGE "NO ":REturn 0
265 END DEFine
```


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Psion Organiser Utilities

by Chris Shaw

This program contains two Psion Organiser utilities for use with the Comms Link. The first, PDIR, transfers a directory of all the types of file in RAM down the Comms Link to a printer or PC. The second, DUMP, formats and transfers the contents of selected areas of memory down the Comms Link for analysis. The impetus for writing them was given when Psion's Technical Support department stated that it was not possible to list the user procedure names.

The first stage was to create the DUMP program which produces a formatted hex and printable character listing of the contents. This program was used to discover the procedure heading structure so that a routine to list a directory of the files could be written. So far, I have not been able to extend PDIR to access filenames on Datapacks: suggestions would be welcome.

General notes on PDIR

Data file names can be accessed using the OPL string function DIR$. The built-in filetypes for procedures, diaries and spreadsheets are recognised by a characteristic 'intial word':

DIARY FILE — £0982
PROCEDURE FILE — £0983
COMMS LINK SETUP FILE — £0984
SPREADSHEET FILE — £0985

The word at memory location £2006 contains the address of the end of the 'active' diary. This address is then used as the start address for the next file. If the initial word contains £FFFF, this denotes that there are no more files. Records of the user-procedure created data files are held as character strings. For these types, the initial word comprises a length byte and a file identifier byte. When PDIR encounters this type of record, it increments the memory address until the next initial word is found.

An address limit is used to prevent the routine reading the machine stack area of memory. This limit should be adjusted according to the type of Organiser available:

Model CM, limit=£3F00
Model XP (16k), limit=£5F00
Model XP (32k), limit=£7F00

Note that you don't need to, and shouldn't, type in the REMarks.

```
PDIR:
rem 871025cs v4 export RAM directory
local a%,fn$(8),i%,fl$(4),c%,d%,ft$(3)
onerr ll::
cls
print"*    MEMORY    **  DIRECTORY   **"
pause 20
lprint"Listing of MEMORY DIRECTORY on",datim$
lprint rept$("-",55)                    :REM output underline for heading
fn$=dir$("A")                           :REM get 1st datafile name from mem
while fn$<>""                           :REM loop until null filename
 print fn$;".GEN"                       :REM disp filename with filetype "GEN"
 lprint right$(fn$,len(fn$)-2);rept$(" ",10-len(fn$));".GEN        ";
 c%=c%+1                                :REM increment output column count
 if c%>3                                :REM newline if column count > 3
  lprint
  c%=0
 endif
 fn$=dir$("")                           :REM get next datafile name
endwh
a%=peekw($2006)                         :REM locate end of "active" diary
do                                      :REM increment memory address until
 a%=a%+1                                :REM "initial word" detected
 d%=peekw(a%)
until (d%>$0981 and d%<$0986)
do                                      :REM start of filesearch loop
if d%=$0982                             :REM assign filetype according to
 ft$="DIA"                              :REM value of "initial word"
elseif d%=$0983                         :REM    DIA = diary file
 ft$="PRC"                              :REM    PRC = procedure
elseif d%=$0984                         :REM    COM = Comms Link setup file
 ft$="COM"                              :REM    SPR = spreadsheet
elseif d%=$0985
 ft$="SPR"
endif
 a%=a%+2                                :REM address = start of filename
 fn$=""                                 :REM assemble filename string
 i%=1
 do
  fn$=fn$+chr$(peekb(a%))
  a%=a%+1
  i%=i%+1
 until i%>8
 fl$=hex$(peekw(a%+3)+13)               :REM file length (incl header) in HEX
 print fn$,chr$(35)+left$("0000",4-len(fl$))+fl$
 lprint fn$;".";ft$,chr$(35)+left$("0000",4-len(fl$))+fl$;"  ";
 c%=c%+1                                :REM increment output column count
 if c%>3                                :REM newline if column count > 3
  lprint
  c%=0
 endif
 a%=a%+peekw(a%+3)                      :REM address = end of file
 do                                     :REM search for next file
  a%=a%+1                               :REM increment memory address until
  d%=peekw(a%)                          :REM initial word or endfile detected
 until (d%>$0981 and d%<$0986) or d%=$FFFF or a%>=$7F00
 if d%=$FFFF                            :REM if end of files detected set
  a%=$7F00                              :REM address = limit

  endif       :REM limit = $3F00 for CM, $5F00 for 16K XP or $7F00 for 32K XP
 until a%>=$7F00                         :REM end filesearch loop = limit addr
 lprint
 lprint"---------- END ----------"
```


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PROGRAM FILE

```
lprint"Bytes free =",chr$(35)+left$("0000",4-len(hex$(free)));hex$(free)
lprint chr$(26)                          :REM output ^Z - end of file char
print"Bytes free",chr$(35)+left$("0000",4-len(hex$(free)));hex$(free)
pause 20
11::return

DUMP:
rem 871001cs v3 dump memory contents down link
local a%,b,dl%,lc%,dl$(5),add%,add$(5),data$(80),hdat$(2),cdat$(16),cnt%,dat%
cls
print"*    MEMORY    **     DUMP     *"
pause 20
do
 cls
 print"Start address ?  "+chr$(35);      :REM prompt for HEX start address
 kstat 1                                 :REM Upper case alpha keyboard
 a%=0                                    :REM Character by character HEX to
 b=0                                     :REM integer conversion
 do
  a%=get
  if a%>72 and a%<76
   print chr$(a%-18);
   b=16*b+(a%-66)
  elseif a%>78 and a%<82
   print chr$(a%-27);
   b=16*b+(a%-75)
  elseif a%>84 and a%<88
   print chr$(a%-36);
   b=16*b+(a%-84)
  elseif a%=89
   print chr$(a%-41);
   b=16*b+(a%-89)
  elseif a%>64 and a%<71
   print chr$(a%);
   b=16*b+(a%-55)
  endif
 until a%=13                             :REM <EXE> key completes HEX input
until b>=0 and b<=32767
add%=b                                   :REM set DUMP start address
add$=chr$(35)+left$("0000",4-len(hex$(b)))+hex$(b)
do
 cls
 print"Dump length?      "+chr$(35);     :REM prompt for DUMP length in HEX
 a%=0
 b=0
 do
  a%=get
  if a%>72 and a%<76
   print chr$(a%-18);
   b=16*b+(a%-66)
  elseif a%>78 and a%<82
   print chr$(a%-27);
   b=16*b+(a%-75)
  elseif a%>84 and a%<88
   print chr$(a%-36);
   b=16*b+(a%-84)
  elseif a%=89
   print chr$(a%-41);
   b=16*b+(a%-89)
  elseif a%>64 and a%<71
   print chr$(a%);
   b=16*b+(a%-55)
  endif
 until a%=13
 until b>=0 and b<=32767
 dl%=b
 dl$=chr$(35)+left$("0000",4-len(hex$(b)))+hex$(b)
 cls
 print"St addr =",add$
 print"Dump len=",dl$
 pause 10
 lprint "PSION MEMORY DUMP on",datim$     :REM output DUMP heading & timestamp
 lprint"Start addres   =",add$
 lprint"Dump length    =",dl$
 lc%=0
 do
 add$=chr$(35)+left$("0000",4-len(hex$(add%)))+hex$(add%)
 at 1,2
 print"Address =",add$                    :REM display current DUMP address
 data$=add$+"   "                         :REM assemble output string
 cnt%=0
 cdat$=""
 do                                       :REM loop for assembling DUMP
  dat%=peekb(add%)                        :REM get value at current address
  add%=add%+1                             :REM increment address
  cnt%=cnt%+1
  if dat%<16                              :REM form 2 character HEX values
   hdat$="0"                              :REM insert leading zero if required
  else
   hdat$=""
  endif
  hdat$=hdat$+hex$(dat%)
  data$=data$+hdat$+" "                   :REM append HEX char pair to o/p
  if dat%>=32 and dat%<=$07E              :REM test for printable HEX value
   cdat$=cdat$+chr$(dat%)                 :REM append to char string
  else
   cdat$=cdat$+"."                        :REM append "." if non-printable
  endif
 until cnt%=16 or add%=32767              :REM test for end of line or max addr
 data$=data$+rept$(" ",36-2*len(cdat$))+cdat$
 lprint data$                             :REM output assembled DUMP line
 lc%=lc%+1
 until lc%+1>dl%/16
 lprint chr$(26)                          :REM output ^Z - end of file char
 return
```

1) Output from PDIR program:-

```
Listing of MEMORY DIRECTORY on TUE 27 OCT 1987 08:36:49
-------------------------------------------------------------------------------
MAIN     .GEN          TASKS    .GEN          FUEL     .GEN          EXPNSS   .GEN
DATES    .PRC #00B2    DATE     .PRC #0075    DAYNUM   .PRC #021C    VDATES   .PRC #0244
NDATE    .PRC #014C    DCAL     .PRC #04AA    HXIN     .PRC #04EB    OK%      .PRC #025A
EXCH     .PRC #05FF    MONEY    .PRC #0041    CLK      .PRC #0519    Q        .PRC #0074
JPNX     .SPR #04AB    COMSETUP.COM #0028     SSCOST   .SPR #03C4    PDIR     .PRC #07BD
RELCOST  .SPR #0463    DIARY    .DIA #037F
---------- END ----------
Bytes free = #07EF
```

2) Output from DUMP program:-

```
PSION MEMORY DUMP on TUE 27 OCT 1987 08:29:30
Start address  = #59D0
Dump length    = #00B0
#59D0   33 33 2E 34 36 34 33 34 35 38 37 33 31 09 83 51     33.4643458731..Q
#59E0   20 20 20 20 20 20 20 00 02 80 00 67 00 1F 00 0C      .......g....
#59F0   00 11 01 02 00 00 00 00 00 00 00 00 53 00 02 4E     ............S..N
#5A00   09 FF FC 71 0E FF F4 6D 4E 01 FF F4 79 00 44 51     ...q...mN...y.DQ
#5A10   3A 28 41 24 29 00 6C 6F 63 61 6C 20 7A 00 6F 6E     :(A$).local z.on
#5A20   65 72 72 20 6C 31 3A 3A 00 6C 31 3A 3A 63 6C 73     err l1::.l1::cls
```

```
#5A30   20 3A 70 72 69 6E 74 20 61 24 3B 00 69 6E 70 75     :print a$;.inpu
#5A40   74 20 7A 00 63 6C 73 00 72 65 74 75 72 6E 28 7A     t z.cls.return(z
#5A50   29 00 00 09 85 4A 50 4E 58 20 20 20 20 00 02 80     )....JPNX    ...
#5A60   04 9E 00 06 08 00 07 B2 04 4E 00 39 00 4A 50 4E     .........N.9.JPN
#5A70   58 20 41 01 00 07 01 00 00 01 01 09 40 00 00 36     X A.........@..6

Note

The sample DUMP output shows the "initial word" for procedure filename Q
(see PDIR output sample above) located at address #59DD. Procedures are
held in memory as the translated version immediately followed by its source
code. The next item in memory is the spreadsheet filename JPNX (see above).
The initial word for this file is held at address location #5A53.
```

Commodore 64 Toolkit

by Obbe Vermeij

This Commodore 64 program is a toolkit that provides a grey bar across the screen which follows the cursor on each line. This makes it easy to find the cursor when entering data. Each key clicks when pressed, also to make data entry easier. The program provides a second screen which can be used for notes without affecting your normal screen.

Full instructions are provided within the program.

```
200 REM
210 REM *********** MENU **************
220 POKE 53280,0:POKE 53281,0:POKE 646,I
230 PRINT"      SUPER-SCREEN BY OBBE VERMEIJ"
240 PRINT"            WHAT DO YOU WANT ?"
250 PRINT"     <I> = INSTRUCTIONS"
260 PRINT"     <S> = START SUPER-SCREEN"
270 GET A$
280 IF A$="I" THEN GOTO 430: REM (INSTRUCTIONS)
290 IF A$="S" THEN GOTO 340: REM (START)
300 GOTO 270
310 :
320 REM ********** START ***********
330 :
340 PRINT "WAIT A SECOND  PLEASE"
350 X=0:FOR T=49152 TO 49652 : READ A : POKE T , A :X = X + A : NEXT
360 IF X<>63119 THEN PRINT "SOMETHING'S WRONG WITH DATAS":END
370 POKE 49404,4 :REM KEY FOR SCREEN SWITCH        F1=4  F7=3  ←=57  ↑=54  *=4
380 SYS 49152
390 END
400 :
410 REM ******** INSTRUCTIONS ********
420 :
430 FOR T=I TO 4
440 PRINT "     +++++++++++++++++++++++++++++"
450 PRINT "     ++       INSTRUCTIONS      ++"
460 PRINT "     +++++++++++++++++++++++++++++"
470 ON T GOSUB 510,610,690,790
480 PRINT"       PRESS ANY KEY TO CONTINUE"
490 GET A$:IF A$=""THEN GOTO 490
500 NEXTT:GOTO 220
510 PRINT:PRINT"SUPER-SCREEN  HAS BEEN DESIGNED TO MAKE"
520 PRINT: PRINT"LIFE EASIER FOR BASIC AND  MACHINE CODE"
530 PRINT: PRINT"PROGRAMMERS."
540 PRINT: PRINT"SUPER-SCREEN  DOES  NOT OFFER YOU EXTRA"
550 PRINT: PRINT"FUNCTIONS LIKE  RENUMBER OR UNNEW ;   "
560 PRINT: PRINT"I'LL LEAVE THAT TO  ORDINAIRY TOOLKITS."
570 PRINT:PRINT"START  SUPER-SCREEN AND YOU'LL NOTICE A"
580 PRINT:PRINT"GREY BAR ON THE SCREEN."
590 PRINT:PRINT
600 RETURN
610 PRINT:PRINT"THE  BAR  ALWAYS  FOLLOWS  THE  CURSOR."
```

Amstrad PCW Nimble Fingers

by Gerard Browner

Although a full-blown typing tutor has appeared in Program File in the past, these programs are generally a bit too 'ordinary' for part-time typists or cannot help in brushing up on rusty skills. This simple game is a brave attempt, however. Simply type in the listing, save it and run it.

```
  5 ' Filename Nimfing.bas
 15 ' ************************************************
 25 ' *                Nimble Fingers                *
 35 ' *  Copyright  Gerard Browner  September 1987  *
 45 ' ************************************************
 55 'line numbers ending in "...5" need not be typed in as part of the
     listing
 65 'for Short Program listing, type in down as far as line number 2640
 75 'then type - 3000 RETURN <cr> 4000 RETURN <cr> 5000 RETURN
 85 'Short Program has no introductory text and no skill level choice or
     score is given
 95 ' set up initial values and definitions
100 esc$=CHR$(27)
110 cls$=esc$+"E"+esc$+"H": nrm$=esc$+"q": rev$=esc$+"p"
120 on$=esc$+"e": off$=esc$+"f": ston$=esc$+"1": stoff$=esc$+"0"
130 hard=3: targettime=30: skill$="Competent": 'set initial level of
     difficulty
140 DEF FNa$(x, y, a$)=esc$+"Y"+CHR$(32+y)+CHR$(32+x)+a$
150 DEF FNcur$(x, y)=esc$+"Y"+CHR$(32+y)+CHR$(32+x)
160 DIM text$(19)
170 PRINT stoff$: PRINT off$: PRINT cls$
```


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PROGRAM FILE

```
180 GOSUB 3000: 'call the introductory screen
190 GOSUB 4000: 'set difficulty level
200 totcorpts=0: totalright=0: totaltime=0: ptsflag=0
210 flag=0: lap=2
220 x=36: y=lap
230 GOSUB 1000
240 message$="Type this :": GOSUB 2500
250 flag=flag+1: GOSUB 2000
260 x=70: y=30: message$="Continue: y/n"
270 PRINT FNa$(x, y, nrm$+message$)
280 in$=INKEY$: IF (in$="y" OR in$="n") THEN 290 ELSE 280
290 IF in$="y" THEN 300 ELSE 360
300 IF flag=3 THEN 310 ELSE 330
310 PRINT cls$
320 GOTO 190
325 ' second and third screen lines
330 lap=lap+7
340 PRINT FNa$(x, y, nrm$+SPACE$(13));
350 GOTO 220
355 ' end sequence and reset
360 PRINT cls$: PRINT nrm$: PRINT on$: PRINT ston$
370 END
1000 REM generate random string of letters
1010 typ$=""
1020 seed=PEEK(645041)
1030 RANDOMIZE seed
1040 FOR a=1 TO 45
1050 no=INT(RND*100)+33
1060 IF (no>125 OR no=64 OR no=92 OR no=94 OR no=96 OR no=124) THEN 1070
     ELSE 1080
1070 a=a-1: GOTO 1090
1080 typ$=typ$+CHR$(no)+CHR$(32)
1090 NEXT a
1100 RETURN
2000 REM main program routine
2010 x=0: y=lap+2: right=0
2020 message$=typ$
2030 GOSUB 2500
2040 in$="": x=0: y=lap+4
2050 PRINT on$
2060 PRINT FNcur$(x, y-1)
2070 GOSUB 7000
2080 FOR count=1 TO 45
2090 check$=MID$(typ$, (count*2-1), 1)
2100 in$=INKEY$: IF in$="" THEN 2100
2110 IF check$=in$ THEN 2120 ELSE 2170
2120 message$=in$+CHR$(32)
2130 right=right+1
2140 totalright=totalright+1
2150 GOSUB 2500
2160 GOTO 2200
2170 PRINT CHR$(7)
2180 message$=in$
2190 GOSUB 2600.
2200 PRINT FNcur$(count*2, y);
2210 NEXT count
2220 PRINT off$
2230 GOSUB 5000
2240 RETURN
2500 REM print normal text
2510 PRINT FNa$(x, y, nrm$+message$);
2520 x=x+2
2530 RETURN
2600 REM print error in reverse
2610 PRINT FNa$(x, y, rev$+message$);
2620 PRINT FNa$(x+1, y, nrm$+CHR$(32));
2630 x=x+2
2640 RETURN
3000 REM opening screen
3005 ' top of screen text box
3010 ln=29: x=27: y=1
3020 PRINT FNa$(x-1, y, rev$+CHR$(134)+STRING$(ln, CHR$(138)));
3030 PRINT CHR$(140)
3040 PRINT FNa$(x-1, y+1, rev$+CHR$(133)+SPACE$(ln)+CHR$(133))
3050 PRINT FNa$(x-1, y+2, rev$+CHR$(131)+STRING$(ln, CHR$(138))+CHR$(137))
3060 message$=" Quick Finger Typing Tester "
3070 PRINT FNa$(x, y+1, rev$+message$)
3080 text$(0)="This is a simple game to improve PCW keyboard typing
     skills."
3090 text$(1)="A random selection of 45 characters from the standard
     keyboard is displayed."
3100 text$(2)="Only characters visible on the keyboard are used, i.e. Alt
     or Extra keys are not used."
3110 text$(3)="Type the letter of the displayed line that has the cursor
     beneath it."
3120 text$(4)="Do not attempt to correct errors - errors are 'beeped', and
     printed in reverse."
3130 text$(5)="Type a copy of the line as accurately, and as quickly as
     possible."
3140 text$(6)="Accuracy is more important than speed, and is rewarded
     more."
3150 text$(7)="At the end of the typed line, the score is given."
3160 text$(8)="The option to continue by pressing 'y' or 'n' is also
     given."
3170 text$(9)="A round consists of three typed lines, and the score
     accumulates after every line."
3180 text$(10)="The skill level may be set at the beginning of the game,
     and at the end of a round."
3190 text$(11)="A score of 5 points is awarded for each key typed
     correctly."
3200 text$(12)="Bonus points are awarded for each correct line."
3210 text$(13)="Additional bonus points are awarded if two lines are
     completely correct."
3220 text$(14)="A maximum score of 1000 points is given if all lines are
     typed correctly."
```

PROGRAM FILE

```
3230 text$(15)="However, penalty points are deducted for slowness."
3240 text$(16)="A target-time is set for each skill level."
3250 text$(17)="Time taken over target-time is penalised more severely at
     higher skill levels."
3260 text$(18)="The maximum score at all skill levels is 1000 points."
3270 text$(19)="So, to achieve maximum score at the highest level will
     require very nimble fingers."
3275 ' print first screen of introductory text
3280 FOR text=0 TO 7: x=4: y=text*2+9: GOSUB 3310: NEXT: GOSUB 3330
3285 ' print second screen of introductory text
3290 FOR text=9 TO 19: x=4: y=(text-9)*2+6: GOSUB 3310: NEXT: GOSUB 3330
3300 RETURN
3305 ' print lines of text
3310 PRINT FNa$(x,y,nrm$+text$(text))
3320 RETURN
3325 ' press any key to continue message bar
3330 x=28: y=30: message$="Press any key to continue"
3340  PRINT FNa$(x,y,nrm$+message$)
3350 in$=INKEY$: IF in$="" THEN 3350
3360 PRINT cls$
3370 RETURN
4000 REM choice of difficulty
4010 choice$(0)="Select the Skill Level Number from 1 to 5 you wish to type
     at:"
4020 choice$(1)=" Skill Level   -  Target time  -  Penalty Points"
4030 choice$(2)="1 : Beginner   -  60 seconds  -  1 per second"
4040 choice$(3)="2 : Improver   -  45 seconds  -  2 per second"
4050 choice$(4)="3 : Competent  -  30 seconds  -  3 per second"
4060 choice$(5)="4 : Advanced   -  20 seconds  -  4 per second"
4070 choice$(6)="5 : Expert     -  10 seconds  -  5 per second"
4080 choice$(7)="    No Change  -  press any other key"
4090 choice$(8)="Present Skill Level is set to  -  "+skill$
4100 choice$(9)="Skill Level Number selected ?"
4110 choice=0: x=8: y=choice*2+5: GOSUB 4270
4115 ' print screen for level of difficulty selection
4120 FOR choice=1 TO 7: x=20: y=choice*2+6: GOSUB 4270: NEXT
4130 FOR choice=8 TO 9: x=14: y=choice*2+7: GOSUB 4270: NEXT
4140 in$=INKEY$: IF in$="" THEN 4140
4150 IF (ASC(in$)<49 OR ASC(in$)>53) THEN in$="6"
4160 selection=VAL(in$)
4170 ON selection GOTO 4180,4190,4200,4210,4220,4230
4175 ' selected skill level - variables "hard" and "targettime" can be
     changed to suit
4180 hard=1: targettime=60: skill$="Beginner": GOTO 4230
4190 hard=2: targettime=45: skill$="Improver": GOTO 4230
4200 hard=3: targettime=30: skill$="Competent": GOTO 4230
4210 hard=4: targettime=20: skill$="Advanced": GOTO 4230
4220 hard=5: targettime=10: skill$="Expert": GOTO 4230
4230 x=48: y=25
4235 ' print the skill level chosen
4240 PRINT FNa$(x,y,nrm$+skill$)
4250 FOR delay=1 TO 500: NEXT: PRINT cls$
4260 RETURN
4265 ' print screen text
4270 PRINT FNa$(x,y,nrm$+choice$(choice))
4280 RETURN
5000 REM print score at bottom of screen
5010 GOSUB 7200
5020 elapse=timefinish-timestart
5030 totaltime=totaltime+elapse
5040 len1=24: len2=31: len3=31: x=1: y=22
5050 IF flag=1 THEN GOSUB 6000 ELSE GOSUB 6500
5060 x=28: y=23: message$="Skill level:  "+skill$: GOSUB 5160
5070 x=1: y=25: message$="Time taken:"+STR$(elapse)+" seconds": GOSUB 5160
5080 x=27: message$="   Correct:"+STR$(right)+" out of 45": GOSUB 5160
5090 x=58: GOSUB 7400: message$="Points scored:"+STR$(points)+" out of
     300": GOSUB 5160
5100 IF flag<>1 THEN 5110 ELSE RETURN
5110 x=1: y=27: message$="Total time:"+STR$(totaltime)+" seconds": GOSUB
     5160
5120 x=27: message$="Total correct:"+STR$(totalright)+" out
     of"+STR$(45*flag): GOSUB 5160
5130 IF flag=1 THEN maxpoints=300 ELSE IF flag=2 THEN maxpoints=650 ELSE IF
     flag=3 THEN maxpoints=1000
5140 x=58: message$="Total points:"+STR$(totalpoints)+" out
     of"+STR$(maxpoints): GOSUB 5160
5150 RETURN
5155 ' print score in reverse in box
5160 PRINT FNa$(x,y,rev$+message$)
5170 RETURN
6000 REM display single line box at bottom of screen for first typed line
6010 PRINT FNa$(x+len1,y,rev$+CHR$(150)+STRING$(len2-1,CHR$(154)));
6020 PRINT CHR$(156)
6030 PRINT FNa$(x+len1,y+1,rev$+CHR$(149)+SPACE$(len2-1)+CHR$(149))
6040 PRINT FNa$(x-1,y+2,rev$+CHR$(150)+STRING$(len1,CHR$(154)));
6050 PRINT FNa$(x+len1,y+2,rev$+CHR$(159)+STRING$(len2,CHR$(154)));
6060 PRINT FNa$(x+len1+len2,y+2,rev$+CHR$(159)+STRING$(len3,CHR$(154)));
6070 PRINT CHR$(156)
6080 PRINT FNa$(x-1,y+3,rev$+CHR$(149)+SPACE$(len1));
6090 PRINT FNa$(x+len1,y+3,rev$+CHR$(149)+SPACE$(len2));
6100 PRINT FNa$(x+len1+len2,y+3,rev$+CHR$(149)+SPACE$(len3)+CHR$(149))
6110 PRINT FNa$(x-1,y+4,rev$+CHR$(147)+STRING$(len1,CHR$(154)));
6120 PRINT FNa$(x+len1,y+4,rev$+CHR$(155)+STRING$(len2,CHR$(154)));
6130 PRINT FNa$(x+len1+len2,y+4,rev$+CHR$(155)+STRING$(len3,CHR$(154))
     +CHR$(153))
6140 RETURN
6500 REM display double line box at bottom of screen for second and third
     typed lines
6510 PRINT FNa$(x+len1,y,rev$+CHR$(150)+STRING$(len2-1,CHR$(154)));
6520 PRINT CHR$(156)
6530 PRINT FNa$(x+len1,y+1,rev$+CHR$(149)+SPACE$(len2-1)+CHR$(149))
6540 PRINT FNa$(x-1,y+2,rev$+CHR$(150)+STRING$(len1,CHR$(154)));
6550 PRINT FNa$(x+len1,y+2,rev$+CHR$(159)+STRING$(len2,CHR$(154)));
6560 PRINT FNa$(x+len1+len2,y+2,rev$+CHR$(159)+STRING$(len3,CHR$(154)));
6570 PRINT CHR$(156)
```


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PROGRAM FILE

```
6580 PRINT FNa$(x-1, y+3, rev$+CHR$(149)+SPACE$(len1));
6590 PRINT FNa$(x+len1, y+3, rev$+CHR$(149)+SPACE$(len2));
6600 PRINT FNa$(x+len1+len2, y+3, rev$+CHR$(149)+SPACE$(len3)+CHR$(149))
6610 PRINT FNa$(x-1, y+4, rev$+CHR$(151)+STRING$(len1, CHR$(154)));
6620 PRINT FNa$(x+len1, y+4, rev$+CHR$(159)+STRING$(len2, CHR$(154)));
6630 PRINT FNa$(x+len1+len2, y+4, rev$+CHR$(159)+STRING$(len3, CHR$(154)));
6640 PRINT CHR$(157)
6650 PRINT FNa$(x-1, y+5, rev$+CHR$(149)+SPACE$(len1));
6660 PRINT FNa$(x+len1, y+5, rev$+CHR$(149)+SPACE$(len2));
6670 PRINT FNa$(x+len1+len2, y+5, rev$+CHR$(149)+SPACE$(len3)+CHR$(149))
6680 PRINT FNa$(x-1, y+6, rev$+CHR$(147)+STRING$(len1, CHR$(154)));
6690 PRINT FNa$(x+len1, y+6, rev$+CHR$(155)+STRING$(len2, CHR$(154)));
6700 PRINT FNa$(x+len1+len2, y+6, rev$+CHR$(155)+STRING$(len3, CHR$(154))
     +CHR$(153))
6710 RETURN
7000 REM starting time
7010 elapse=0
7020 ms=PEEK (64503!)
7030 smins=ms-INT(ms/16)*6
7040 ss=PEEK (64504!)
7050 ssecs=ss-INT(ss/16)*6
7060 timestart=smins*60+ssecs
7070 RETURN
7200 REM finishing time
7210 mf=PEEK (64503!)
7220 fmins=mf-INT(mf/16)*6
7230 sf=PEEK (64504!)
7240 fsecs=sf-INT(sf/16)*6
7250 timefinish=fmins*60+fsecs
7260 RETURN
7400 REM score calculation
7410 corpts=right*5
7420 IF corpts>224 THEN corpts=corpts+75: GOTO 7480 ELSE 7430
7430 IF corpts>199 THEN corpts=corpts+25: GOTO 7480 ELSE 7440
7440 IF corpts>175 THEN corpts=corpts+20: GOTO 7480 ELSE 7450
7450 IF corpts>149 THEN corpts=corpts+15: GOTO 7480 ELSE 7460
7460 IF corpts>124 THEN corpts=corpts+10: GOTO 7480 ELSE 7470
7470 IF corpts>99 THEN corpts=corpts+5
7480 IF corpts=300 THEN ptsflag=ptsflag+1: GOTO 7500 ELSE
     totcorpts=totcorpts+corpts
7490 GOTO 7530
7500 IF ptsflag=1 THEN totcorpts=totcorpts+300
7510 IF ptsflag=2 THEN totcorpts=totcorpts+350
7520 IF ptsflag=3 THEN totcorpts=1000
7530 linetime=elapse-targettime
7540 IF linetime<0 THEN linetime=0
7550 timepenalty=linetime*hard
7560 tottimepen=tottimepen+timepenalty
7570 points=corpts-timepenalty
7580 IF points<0 THEN points=0
7590 totalpoints=totcorpts-tottimepen
7600 IF totalpoints<0 THEN totalpoints=0
7610 RETURN
```

Neural Networks Listing

by Jack Weber

PCW DISK LIBRARY

This is the listing which accompanies Jack Weber's article 'A window on the brain', on page 130 of this issue. It has been written in Microsoft Basic for the Apple Macintosh, but shouldn't be too difficult to convert to other languages and machines.

```
Neural Network Associative Memory
© Jack Weber - November 1987

Constructs fully connected bidirectional associative memory
   Variable size neuron layers
   Iterates until stable
   Visual input/output
-------------------------------------------------------------
   Runs on Apple Macintosh under MS Basic v3.0 with Toolbox Library
-------------------------------------------------------------

ON BREAK GOSUB Quit
GOSUB Initialise
net:
GOSUB Parameters
GOSUB Display
loop:
GOSUB Pattern
FOR i% = 2 TO 3
   state% = BUTTON(i%)
   IF state% = 2 THEN choice% = i%-1
NEXT
ON choice% GOSUB Matrix, Compute
GOTO loop
END
-------------------------------------------------------------
```

```
Initialise:
   DIM a%(99), b%(99), c%(99,99),pt%(1),recs%(7)
   Declare name of file containing Toolbox Library routines for this program
   LIBRARY "MyDisk:NetLib"
   side% = 0
   choice% = 1
   WINDOW 1,,(7,25)-(507,335),3
   Put network options into menu bar
   MENU 6,0,1,"Network"
   MENU 6,1,1,"New net"
   MENU 6,2,1,"Quit"
   ON MENU GOSUB Menuhandle
   ON DIALOG GOSUB Dialoghandle
   MENU ON
   DIALOG ON
RETURN
Menuhandle:
   A menu selection has been made - divert program to restart or quit
   menunumber% = MENU(0)
   IF menunumber% <> 6 THEN RETURN
   menuitem% = MENU(1)
   MENU
   IF menuitem% = 1 THEN GOTO net ELSE GOSUB Quit
RETURN

Dialoghandle:
   A dialog event has happened - find what it is
   action% = DIALOG(0)
   number% = DIALOG(action%)
   IF action% = 1 THEN GOSUB Dobutton
   IF action% = 2 THEN GOSUB Dofield
   IF action% = 6 THEN done% = 1
   IF action% = 7 THEN GOSUB Dotab
RETURN

Dobutton:
   A button has been pressed - find its number, toggle buttons if needed
   1 = OK, 2 & 3 are mutually exclusive "radio buttons"
   IF number% = 1 THEN done% = -1: RETURN
   FOR i% = 2 TO 3
      IF i% = number% THEN BUTTON i%,2 ELSE BUTTON i%,1
   NEXT
RETURN

Dofield:
   Something has happened in an edit field - select it
   edfield% = number%
   EDIT FIELD edfield%
RETURN

Dotab:
   Tab pressed - move to next edit field, wrapping round from 2nd to 1st
   edfield% = (edfield% MOD 2) + 1
   EDIT FIELD edfield%
RETURN

Parameters:
   Offer window for entry of sizes for the two neuron layers
   CLS
   WINDOW 2,,(77,80)-(437,220),4
   CALL TEXTFONT(0)
   CALL MOVETO(20,35)
   PRINT "Width of INPUT array    (Max 10)"
   CALL MOVETO(20,75)
   PRINT "Width of OUTPUT array  (Max 10)"
   EDIT FIELD 2," ",(310,62)-(340,77),1,3
   EDIT FIELD 1," ",(310,22)-(340,37),1,3
   edfield% = 1
   BUTTON 1,1,"OK",(40,95)-(100,120),1
   Allow entry of fields until OK button is pressed
   done% = 0
   getsize:
   DIALOG ON
   WHILE done% = 0
   WEND
   Entry finished - check if valid. If not, clear edit field and try again
   insize% = VAL(EDIT$(1))
   IF insize% > 10 THEN EDIT FIELD 1," ",(310,22)-(340,37),1,3: done% = 0
   outsize% = VAL(EDIT$(2))
   IF outsize% > 10 THEN EDIT FIELD 2," ",(310,62)-(340,77),1,3: done% = 0
   IF done% = 0 THEN GOTO getsize
   WINDOW CLOSE 2
   Valid sizes entered - clear all inter-neuron connections
```


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PROGRAM FILE

```
    ' Change to wristwatch cursor while clearing connections
    ChangeCursor 4
    FOR i% = 0 TO insize%*insize%-1
      FOR j% = 0 TO outsize%*outsize%-1
        c%(i%,j%) = 0
      NEXT
    NEXT
    ' Restore default cursor
    CALL INITCURSOR
  RETURN

  Display:
    ' Draw both layers of neurons with all units set to zero
    CALL TEXTFONT(0)
    CALL MOVETO(110,25)
    PRINT "Input"
    CALL MOVETO(352,25)
    PRINT "Output"
    xin% = 115 - (insize%-1)*10
    yin% = 136 - (insize%-1)*10
    ' Use Toolbox routine to set a rectangle for whole of input layer display
    SetRect recs%(0),xin%,yin%,xin%+insize%*20,yin%+insize%*20
    ' Draw all input neurons as outline squares
    FOR x% = xin% TO 115 + (insize%-1)*10 STEP 20
      FOR y% = yin% TO 136 + (insize%-1)*10 STEP 20
        LINE(x%,y%)-STEP(18,18),,b
      NEXT
    NEXT
    xout% = 367 - (outsize%-1)*10
    yout% = 136 - (outsize%-1)*10
    ' Use Toolbox routine to set a rectangle for whole of output layer display
    SetRect recs%(4),xout%,yout%,xout%+outsize%*20,yout%+outsize%*20
    ' Draw all output neurons as outline squares
    FOR x% = xout% TO 367 + (outsize%-1)*10 STEP 20
      FOR y% = yout% TO 136 + (outsize%-1)*10 STEP 20
        LINE(x%,y%)-STEP(18,18),,b
      NEXT
    NEXT

    BUTTON 1,1,"OK",(45,270)-(115,290),1
    BUTTON 2,2,"Train network",(165,255)-(320,275),3
    BUTTON 3,1,"Test pattern",(165,280)-(320,300),3
  RETURN

  Pattern:
    ' Allow user to draw a pattern of active neurons in either layer
    MENU ON
    DIALOG ON
    ' If last pattern was a test result then keep it until mouse is clicked
    IF choice% = 1 THEN GOTO skip
    WHILE MOUSE(0) > -1
    WEND
    skip:
    GOSUB Clearneurons
    ' Allow pattern entry until OK button is pressed
    done% = 0
    WHILE done% = 0
      GetMouse pt%(0)
      ' Invert colour beneath pointer
      IF POINT(pt%(1),pt%(0)) = 30 THEN col% = 33 ELSE col% = 30
      WHILE MOUSE(0) < 0
        GetMouse pt%(0)
        PtInRects pt%(0),recs%(0),2,side%
        ON side% GOSUB Drawin, Drawout
      WEND
    WEND
    MENU OFF
    DIALOG OFF
  RETURN

  Drawin:
    ' Calculate position of input cell pointed to and plot it
    xpos% = INT((pt%(1) - xin%)/20)
    ypos% = INT((pt%(0) - yin%)/20)
    LINE(xin%+1+xpos%*20,yin%+1+ypos%*20)-STEP(16,16),col%,bf
    a%(xpos% + ypos%*insize%) = SGN(col%-30)
  RETURN

  Drawout:
    ' Calculate position of output cell pointed to and plot it
    xpos% = INT((pt%(1) - xout%)/20)
    ypos% = INT((pt%(0) - yout%)/20)
```

```
    LINE(xout%+1+xpos%*20,yout%+1+ypos%*20)-STEP(16,16),col%,bf
    b%(xpos% + ypos%*outsize%) = SGN(col%-30)
  RETURN

  Clearneurons:
  ' Clear all neurons to zero output
    FOR xpos% = 0 TO insize%-1
      FOR ypos% = 0 TO insize%-1
        a%(xpos%+ypos%*insize%) = 0
        LINE(xin%+1+xpos%*20,yin%+1+ypos%*20)-STEP(16,16),30,bf
      NEXT
    NEXT
    FOR xpos% = 0 TO outsize%-1
      FOR ypos% = 0 TO outsize%-1
        b%(xpos%+ypos%*outsize%) = 0
        LINE(xout%+1+xpos%*20,yout%+1+ypos%*20)-STEP(16,16),30,bf
      NEXT
    NEXT
  RETURN

  Matrix:
  ' Recalculate all connections to incorporate current training example
    FOR i% = 0 TO insize%*insize%-1
      FOR j% = 0 TO outsize%*outsize%-1
        c%(i%,j%) = c%(i%,j%) + ((a%(i%)*2-1)*(b%(j%)*2 - 1))
      NEXT
    NEXT
  RETURN
  Compute:
  ' Calculate both neuron layers until the whole net is stable
    recalc:
    diff% = 0
  ' First calculate and plot output layer from pattern in input layer
    FOR j% = 0 TO outsize%*outsize%-1
      s% = 0
    ' Sum all inputs times their connection weights
      FOR i% = 0 TO insize%*insize%-1
        s% = s% + a%(i%)*c%(i%,j%)
      NEXT
    ' Save previous value of neuron to see if it is changing
      old% = b%(j%)
    ' Check summed input against threshold
      IF s% > 0 THEN b%(j%) = 1
      IF s% < 0 THEN b%(j%) = 0
      x% = xout%+1+(j% MOD outsize%)*20
      y% = yout%+1+(j%\outsize%)*20
      LINE(x%,y%)-STEP(16,16),30+3*b%(j%),bf
    ' If neuron has changed then increment diff%
      diff% = diff% + ABS(b%(j%)-old%)
      MENU ON
      MENU STOP
    NEXT
  ' Now calculate and plot input layer from pattern in output layer
    FOR i% = 0 TO insize%*insize%-1
      s% = 0
      FOR j% = 0 TO outsize%*outsize%-1
        s% = s% + b%(j%)*c%(i%,j%)

      NEXT
      old% = a%(i%)
      IF s% > 0 THEN a%(i%) = 1
      IF s% < 0 THEN a%(i%) = 0
      x% = xin%+1+(i% MOD insize%)*20
      y% = yin%+1+(i%\insize%)*20
      LINE(x%,y%)-STEP(16,16),30+3*a%(i%),bf
      diff% = diff% + ABS(a%(i%)-old%)
      MENU ON
      MENU STOP
    NEXT
  ' Recalculate net if any neuron has changed its value since last time
    IF diff% > 0 THEN GOTO recalc
  RETURN
  Quit:
    MENU RESET
    END
  RETURN
```

List of Variables Used in Associative Memory

a%	Array - holds values of all neurons in input layer
action%	Returned by Dialog function - shows type of last user action
b%	Array - holds values of all neurons in output layer

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PROGRAM FILE

c%	Array - holds connection weights between all pairs of neurons
choice%	Choice of training or testing as selected by radio buttons
col%	Colour being painted - white = 30, black = 33
diff%	Number of neurons changed in current calculation
done%	Flag - set to 1 when OK button or Return pressed
edfield%	Number of currently selected edit field
i%	General purpose loop counter
insize%	Extent of input layer
j%	General purpose loop counter
menuitem%	Number of item in menu selection
menunumber%	Number of menu bar selection
number%	Number returned by Dialog function of selected button or edit field
old%	Temporary variable for last value of neuron
outsize%	Extent of output layer
pt%	Array - holds mouse position (y,x) as returned by GetMouse
recs%	Array - holds corner co-ordinates of input and output layers
s%	Sum of all weighted inputs to a neuron
side%	Returned by PtinRects - 1 if mouse is in input layer, 2 if in output
state%	Number of currently active radio button
x%	X co-ordinate of top left corner of current neuron
xin%	X co-ordinate of top left corner of input layer
xout%	X co-ordinate of top left corner of output layer
xpos%	Column number of current neuron
y%	Y co-ordinate of top left corner of current neuron
yin%	Y co-ordinate of top left corner of input layer
yout%	Y co-ordinate of top left corner of output layer
ypos%	Row number of current neuron

```
' Neural Network Discriminator
' © Jack Weber - November 1987

' Constructs randomly connected neural network
'    'WISARD' type pattern discriminator
'    Single pass operation
'    Visual input/output

' ---------------------------------------------------------------------
'    Runs on Apple Macintosh under MS Basic v3.0 with Toolbox Library
' ---------------------------------------------------------------------

ON BREAK GOSUB Quit
GOSUB Initialise
net:
GOSUB Clearin
GOSUB Clearout
GOSUB Buildnet
GOSUB Display
loop:
GOSUB Pattern
FOR i% = 2 TO 4
   state% = BUTTON (i%)
   IF state% = 2 THEN choice% = i%-1
NEXT
IF choice% < 3 THEN discriminator% = choice%
ON choice% GOSUB Setvalues, Setvalues, Compute
GOTO loop
END
' ---------------------------------------------------------------------

Initialise:
   DIM a%(99), b%(19,4), b1%(19,4), b2%(19,4), p%(4),pt%(1),rec%(3)
   RANDOMIZE TIMER
   Declare name of file containing Toolbox Library routines for this program
   LIBRARY "MyDisk:NetLib"
   plot% = 0
   Create array of coefficients (1,2,4,8,16) for five input cells in a group
   FOR i% = 0 TO 4
      p%(i%) = 2^i%
   NEXT
   WINDOW 1,,(7,25)-(507,335),3
   Put network options into menu bar
   MENU 6,0,1,"Network"
   MENU 6,1,1,"New net"
   MENU 6,2,1,"Quit"
   ON MENU GOSUB Menuhandle
   ON DIALOG GOSUB Dialoghandle
   MENU ON
```

PROGRAM FILE

```
    DIALOG ON
RETURN
Menuhandle:
  ' A menu selection has been made - divert program to restart or quit
    menunumber% = MENU(0)
    IF menunumber% <> 6 THEN RETURN
    menuitem% = MENU(1)
    MENU
    IF menuitem% =1 THEN GOTO net ELSE GOSUB Quit
RETURN

Dialoghandle:
  ' A button or the Return key has been pressed - find which
    action% = DIALOG(0)
    number% = DIALOG(action%)
    IF action% = 1 THEN GOSUB Dobutton
    IF action% = 6 THEN done% = 1
RETURN

Dobutton:
  ' A button has been pressed - find its number, toggle buttons if needed
    IF number% = 1 THEN done% = 1: RETURN
    FOR i% = 2 TO 4
      IF i% = number% THEN BUTTON i%,2 ELSE BUTTON i%,1
    NEXT
RETURN

Buildnet:
  ' Create random connections between input and output neurons
  ' Change to wristwatch cursor while building up the network
    ChangeCursor 4
    FOR i% = 0 TO 19
      FOR j% = 0 TO 4
        repeat:
        cell% = INT(RND(1)*100)
        IF a%(cell%) = 1 THEN GOTO repeat
        a%(cell%) = 1
        b%(i%,j%) = cell%
      NEXT
    NEXT
  ' Restore default cursor
    CALL INITCURSOR
RETURN

Display:
  ' Create screen layout to display the discriminator network
    CALL TEXTFONT(0)
    CALL MOVETO(110,25)
    PRINT "Input"
    CALL MOVETO(308,25)
    PRINT "Discriminators"
  ' Use Toolbox routine to set rectangle for input layer
    SetRect rec%(0),25,46,225,246
    FOR x% = 25 TO 205 STEP 20
      FOR y% =  46 TO 226 STEP 20
        LINE(x%,y%)-STEP(18,18),,b
      NEXT
    NEXT
    FOR x% = 307 TO 387 STEP 20
      FOR y% = 46 TO 106 STEP 20
        LINE(x%,y%)-STEP(18,18),,b
      NEXT
    NEXT
    FOR x% = 307 TO 387 STEP 20
      FOR y% = 166 TO 226 STEP 20
        LINE(x%,y%)-STEP(18,18),,b
      NEXT
    NEXT
    BUTTON 1,1,"OK",(45,270)-(115,290),1
    BUTTON 2,2,"Train discriminator 1",(170,255)-(325,275),3
    BUTTON 3,1,"Train discriminator 2",(170,280)-(325,300),3
    BUTTON 4,1,"Test pattern",(350,265)-(490,285),3
    example1% = -1
    example2% = -1
RETURN

Pattern:
  ' Allow user to enter pattern into input neurons
    DIALOG ON
  ' Hold existing pattern until mouse is clicked
    WHILE MOUSE(0) > -1
      MENU ON
      MENU STOP
```


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PROGRAM FILE

```
    WEND
  ' Clear all cells and old scores
    GOSUB Clearin
    GOSUB Clearout
    LINE(290,130)-(450,155),30,bf
  ' Look for mouse events until OK is pressed
    done% = 0
    WHILE done% = 0
      GetMouse pt%(0)
    ' Invert colour beneath pointer
      IF POINT(pt%(1),pt%(0)) = 30 THEN col% = 33 ELSE col% = 30
    ' Continue painting cells during drag
      WHILE MOUSE(0) < 0
        GetMouse pt%(0)
        PtInRect pt%(0), rec%(0), plot%
        IF plot% = -1 THEN GOSUB Draw
      WEND
    WEND
    DIALOG OFF
RETURN

Draw:
  ' Find cell currently pointed to and paint it
    xpos% = INT((pt%(1) - 25)/20)
    ypos% = INT((pt%(0) - 46)/20)
    LINE(26+xpos%*20,47+ypos%*20)-STEP(16,16),col%,bf
    a%(xpos% + ypos%*10) = SGN(col%-30)
RETURN

Clearin:
  ' Clear all input neurons to zero output
    FOR xpos% = 0 TO 9
      FOR ypos% = 0 TO 9
        a%(xpos%+ypos%*10) = 0
        LINE(26+xpos%*20,47+ypos%*20)-STEP(16,16),30,bf
      NEXT
    NEXT
RETURN

Clearout:
  ' Clear all discriminator cells to zero
    FOR xpos% = 0 TO 4
      FOR ypos% = 0 TO 3
        LINE(308+xpos%*20,47+ypos%*20)-STEP(16,16),30,bf
        LINE(308+xpos%*20,167+ypos%*20)-STEP(16,16),30,bf
      NEXT
    NEXT
    LINE(420,70)-(450,220),30,bf
RETURN

Setvalues:
  ' Add values based on current training example to its discriminator
    IF discriminator% = 2 THEN GOTO second
  ' Only five training examples allowed per discriminator
    example1% = example1% + 1
    IF example1% > 4 THEN GOSUB Toomany: RETURN
    FOR i% = 0 TO 19
    s% = 0
  ' For each group of five cells, find a value and store it
      FOR j% = 0 TO 4
        s% = s% + a%(b%(i%,j%))*p%(j%)
      NEXT
      b1%(i%,example1%) = s%
    NEXT
    GOTO inclear
    second:
  ' As above but for second discriminator
    example2% = example2% + 1
    IF example2% > 4 THEN GOSUB Toomany: RETURN
    FOR i% = 0 TO 19
    s% = 0
      FOR j% = 0 TO 4
        s% = s% + a%(b%(i%,j%))*p%(j%)
      NEXT
      b2%(i%,example2%) = s%
    NEXT
    inclear:
    GOSUB Clearin
RETURN

Toomany:
  ' User attempted to enter more than 5 examples for a discriminator
    BEEP
```

```
    CALL MOVETO(290,150)
    PRINT "Too many examples!"
    GOSUB ClearIn
  RETURN

  Compute:
    Calculate current example's scores on both discriminators
    score1% = 0
    score2% = 0
    For each group of five cells, find a value
    FOR i% = 0 TO 19
      s% = 0
      FOR j% = 0 TO 4
        s% = s% + a%(b%(i%,j%))*p%(j%)
      NEXT
      Look for matching values among training examples
      match1% = 0
      match2% = 0
      FOR k% = 0 TO 4
        IF b1%(i%,k%) = s% THEN match1% = 1
        IF b2%(i%,k%) = s% THEN match2% = 1
      NEXT
      If match found, set corresponding discriminator cell and increment score
      IF match1% = 1 THEN
      x% = 308+(i% MOD 5)*20
      y% = 47+(i%\5)*20
      LINE(x%,y%)-STEP(16,16),33,bf
      score1% = score1% + 1
      END IF
      IF match2% = 1 THEN
      x% = 308+(i% MOD 5)*20
      y% = 167+(i%\5)*20
      LINE(x%,y%)-STEP(16,16),33,bf
      score2% = score2% + 1
      END IF
    NEXT
    Print scores
    CALL MOVETO(425,90)
    PRINT score1%
    CALL MOVETO(425,210)
    PRINT score2%
  RETURN

  Quit:
    MENU RESET
    END
  RETURN
```

List of Variables Used in Discriminator

a%	Array - holds values of all neurons in input layer
action%	Returned by Dialog function - shows type of last user action
b%	Array - holds list of input neurons for each discriminator unit
b1%	Array - holds values given by training examples in discriminator 1
b2%	Array - holds values given by training examples in discriminator 2
cell%	Number used to select random groups of input neurons
choice%	Choice of training or testing as selected by radio buttons
col%	Colour being painted - white = 30, black = 33
discriminator%	Number of current discriminator
done%	Flag - set to 1 when OK button or Return pressed
example1%	Number of current training example for discriminator 1
example2%	Number of current training example for discriminator 2
i%	General purpose loop counter
j%	General purpose loop counter
k%	General purpose loop counter
match1%	Flag - set to 1 if value of current group matches in discriminator 1
match2%	Flag - set to 1 if value of current group matches in discriminator 2
menuitem%	Number of item in menu selection
menunumber%	Number of menu bar selection
number%	Number returned by Dialog function of selected button
p%	Array - holds coefficients (1,2,4,8,16) for all neurons in group
plot%	Flag - set by PtInRect to -1 if pointer is inside input layer
pt%	Array - holds mouse position (y,x) as returned by GetMouse
rec%	Array - holds corner co-ordinates of input layer
s%	Value produced by pattern of five cells within a group
score1%	Score (number of matched patterns) for discriminator 1
score2%	Score (number of matched patterns) for discriminator 2
state%	Number of currently active radio button
x%	X co-ordinate of top left corner of current neuron
xpos%	Column number of current neuron
y%	Y co-ordinate of top left corner of current neuron
ypos%	Row number of current neuron

END

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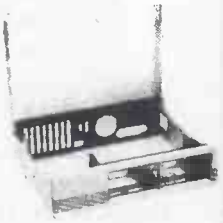

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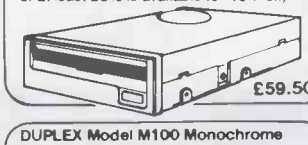

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● **Apple IIE.** 80 column card disk drive and monitor. £300 o.n.o. Software, professional and games, cheap. Phone for list (09904) 2816, eves (09904) 4611.
● **Apple IIE.** Twin drives, 128k, 80 col printer interface, BMC green monitor, manuals, books, software. Very good condition £450 o.n.o. Bolton Lancs. Tel. (0204) 63799.
● **Macintosh 512E.** With Epson QX10 256k, Epson FX80 printer. Reasonable offers. Tel. (0324) 712810 after 6pm.
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● **Apple Macintosh Plus.** With loads of software, brand new with 1 year's warranty. A bargain at only £1400. Tel. (05827) 69152 after 6.30pm or weekends.
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● **IBM Portable PC.** 256K, twin 360K floppies, printer port, graphics card, word processing and spreadsheet software, excellent condition, £600 o.n.o. Micro peripherals MD-165 dot matrix printer, £90 o.n.o. Tel. (01) 748 3607.

● **Tandy Model 100.** 32K disc/video interface, monitor, power supply, all leads, ROM, disc and cassette business software. £395. All items boxed as new and complete. Tel. John (01) 790 8163.

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● **Epson PX8 CP/M Portable. Plus** 120K RAM disk, WordStar, cardbox, CalcStar and terminal emulation. Includes modem cable and printer cable. £375, negotiable. David Mather, Tel. (01) 493 3323.

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● **Grid Compass 1129.** 8086+8087 512K RAM, 300K bubble memory, applications software, GR1005 ROM, MS-DOS disk, built-in modem, £1200 o.n.o. Also floppy plus 10 megabyte drive unit, £350. Tel. (0666) 824037 evenings.

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● **QL Computer System.** JS ROM V2 software, twin 3½inch disk system, MicroV11EC colour monitor, Ice, extras. Excellent condition £450. Tel. Des, Brighton (0273) 694807.

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● **Seikosha GP700A printer users manual.** £20 given for complete readable copy. Also Jupiter Ace and manuals. Please Tel.Derek (0749) 840676 (Somerset) after 5pm.

● **Wanted Amstrad 1512 Basic Model.** Or Atari 520ST, high res mono monitor, disk drive. Tel. (0223) 62129 Cambridge, Mr Ross.

LEISURE LINES

Quickie

No answers, no prizes for this one.

What number must be added to both the numerator and the denominator (top and bottom) of the fraction 2/5 to give a result of 3/4?

Prize puzzle

The sequence of numbers 1,1,2,3,5,8,13,21,34 is known as a 'Fibonacci' series, since each number in the series after the first two is formed by adding the preceeding two. Thus,

2=1+1
3=1+2
5=2+3
8=3+5

and so on.

In our example we started with 1 and 1, but we could have started with any two numbers.

If we wanted to include the value of one million — that is, 1,000,000 — in our series, what are the two smallest positive (non-zero) numbers that we could have used to start off the series? We define the smallest two numbers as the two numbers whose sum is the least. (Note that the second number cannot be less than the first, although it may be equal.)

Answers on postcards only please, to arrive not later than 31 March 1988.

Send your entry to: Leisure Lines Prize Puzzle — March, *Personal Computer World*, VNU House, 32–34 Broadwick Street, London W1A 2HG.

December prize puzzle

This was much harder than usual. Only 31 entries were received, of which eight were incorrect.

The winning card, drawn at random, came from Mr Martin Fisher of Thornbury, Avon.

The winning solution is:

96 × 8745231 = 839542176

Congratulations Mr Fisher, your prize is on its way. To all the others — keep trying.

DIARY DATA

A guide to forthcoming computer shows. Readers are advised to check details before setting out on their journey.

ELECTRON & BBC MICRO USER SHOW UMIST, Manchester — Database Exhibitions (061) 456 2991	**18–20 March 1988**
ELECTRONIC PRINTING AND PUBLISHING EXHIBITION Olympia, London — BED Exhibitions (01) 948 9900	**22-24 March 1988**
COMPUTERS IN RETAIL AND RETAIL TECHNOLOGY NEC, Birmingham — Focus Events (01) 834 1717	**29–31 March 1988**
COMPUTERS IN TRANSPORT AND DISTRIBUTION Wembley Conference Centre, London — Computers in Transport and Distribution (0303) 45979	**19–21 April 1988**
ATARI COMPUTER SHOW Alexandra Palace, London — Database Exhibitions (061) 456 2991	**22–24 April 1988**

NUMBERS COUNT

Mike Mudge returns to the popular topic of prime numbers including reference to recently published results.

Definition Denote by p(n) the number of prime numbers not exceeding n. Thus p(1) = 0, ( ); p(10) = 4, (2,3,5,7); p(100) = 25, (2,3,5,7, . . . 79,83,89,97).

The state of the art

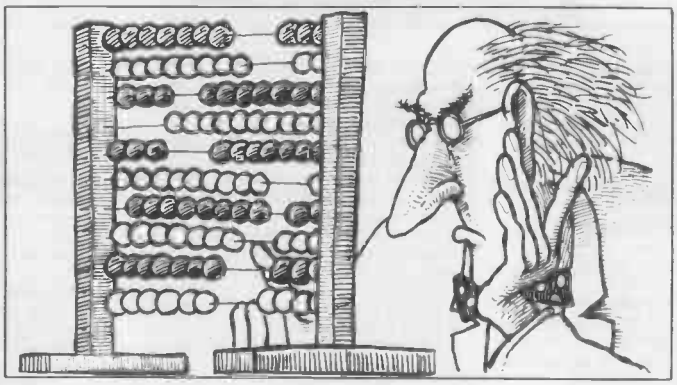
EDF Meissel (*Math Ann* 1870, vol 2, pp636–642; 1871, vol 3, p525; 1885, vol 25, pp251–257) calculated and published p(10) = 664579, $p(10^8)$ = 5761455 and $p(10^9)$ . . . which remained the largest published result until 1959. In that year DH Lehmer (*Illinois Journal of Math* vol 3, pp381–388) corrected $p(10^9)$ (the value calculated — by hand — by Meissel being too small by 56) and published $p(10^{10})$ (in fact, too large by 1).

In 1986 P Shiu (*Math Comp* vol 47, pp351–360) published $p(10^{11})$ and $p(10^{12})$ while JC Lagarias, VS Miller and AM Odlyzko (*Math Comp* vol 44, pp537–560) calculated $p(4\times10^{16})$ using approximately 30 hours processing time on an IBM 3081 Model K.

It is clear, therefore, that *PCW* readers should not feel encouraged to extend the range of values of p(n) beyond 4×10^{16}.

Problem

The computing problem associated with p(n) which follows is formulated in such a way that it tests the skill and ingenuity of the programmer rather than the speed and word length of the computer, the efficiency of the compiler or the choice of language.



How many basic operations do *you* need to compute p(n) for a given n? In particular, for n = 10, 100, 1000, 10000. *Note* It is recommended that an algorithm is detailed, coded and checked, then an operation count carried out. If possible, the fundamental operations of arithmetic should be separated into + − * & / and, in turn, separated from logical operations. It is thought inadvisable to attempt this count from the algorithm at its pencil and paper stage. Readers may feel differently! If such a count seems too laborious, an alternative measure of efficiency may be supplied in the form of ratios of times taken to evaluate $p(10^n)$:times taken to evaluate $p(10^{n-1})$ as a function of n.

As and when multi-precision arithmetic becomes essential, many readers will feel that they are excluded from entry . . . but rest assured an efficient algorithm developed within the normal arithmetic precision of the computer is likely to remain efficient when combined with suitable arithmetic multi-precision routines which may not be immediately available.

Changing the subject:

A Nearly Pattern involving Palindromic Squares

In February 1985 a study of palindromic numbers (reading the same way backwards and forwards) produced the record ever response to a 'Numbers Count' article. Thus it seemed appropriate to quote the result (see Fig 1) of JKR Barnett (*Bulletin IMA*, vol 23, Nos 6/7, June/July 1987 pp100–101).

Now construct the eighth member of the sequence of squares appearing on the right-hand side. It is nearly, but not quite, palindromic! Why?

Readers are invited to send their attempts at eighter, or both, of the above problems to Mike Mudge, 'Square Acre', Stourbridge Road, Penn, South Staffordshire WV4 5NF, to arrive by 1 June 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.

9	$= 3^2$
94249	$= 307^2$
942060249	$= 30693^2$
9420645460249	$= 3069307^2$
94206450305460249	$= 306930693^2$
942064503484305460249	$= 30693069307^2$
94206450348000084305460249	$= 3069306930693^2$

Fig 1

Mike Mudge welcomes correspondence on any subject within the areas of number theory and other computational mathematics. Particularly welcome are suggestions, either general or specific, for future Numbers Count articles; all letters will be answered in due course.

Isolated readers can be put in contact with others sharing the same interests. However, greater efficiency regarding published problems should result from contacting the prizewinner.

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(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 (01) 200 7577 & (01) 220 8281 24 Hrs; 3/1275
Opus system

Infotel ROS (01) 581 3376
24hrs; 3/1275

ITCU Training (01) 960 4742
24 hrs; 1275v
Lots of ITeC training materials

Link Fido (01) 659 6992
24 hrs; 3-12

London U'gnd (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

Nottingdale Tec Ctr
(01) 968 6033; 24hrs; 1275v; Communitel system

OS1 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

Twigh'l't Phone Fido
(01) 624 5338 24 hrs; 3

WBBS Wimbledon (01) 542 3772
Sat 7pm - Mon 8am; 3/1275

The South East

Acorn BBS; Cambridge
(0223) 243 642 24 hrs; 1275v

Andrew's Fido; Aylesbury
(08444) 4833; 24hrs; 3/1275
IBM-based system

Apple Crackers Basildon
(0628) 778956; 24hrs; 3-1275
Apple II/IIGS; also on 781318 and 771724

ARCNET; Colchester
(0376) 518 818 24 hrs; 300

Audio Output, Weybridge
(0932) 244906; 24hrs; 3/1275
Viewdata & scrolling

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

BOOG BB; Fleet; Hants
(0252) 626 233 24 hrs; 3/1275
Osborne; MS-DOS; CP/M areas

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

CATS BBS*; Maidenhead
(0628) 824852; 24hrs; 3/1275
V22bis coming

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

Folkestone TBBS (0303) 42690
24hrs; 3-12; Portable SIG

Gosport Apricot BBS
(0705) 524 805; 24 hrs; 300

MacTel Phoenix; Ipswich
(0473) 610139; 24hrs; 3-24
Multi-line; Mac users

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

Mirrorworld; Surrey
(0883) 844044/844164; 24hrs
3/1275; Multi-user games

Music World; Weybridge
(0932) 245593; 24hrs; 1275v
Viewdata & scrolling

NBBS Essex; Brentwood
(0277) 228 867 24 hrs; 3/1275
subscribers only

NodeRunner BBS; High Wycombe
(0494) 881289; 10pm-7am
3/1275; Atari 520STFM

Patnet; Colchester
(0206) 844 813 Daily 8pm-8am
12h; runs on a Spectrum

PD-Sig Fido 1; Crowborough
(08926) 61 149 24 hrs; 3/1275
PD software interest group

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

QMC Viewdata; Basingstoke
(0256) 471 757 24 hrs; 1275v
Queen Mary's College

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

Sentinel; Maidenhead
(0628) 781429; 3/12/24
IBM PC; FidoNet

Sky; Guildford;
(0483) 275455; MF:6pm-8am
WE:24hrs; 1275v

Staines BBS (0784) 65794
24hrs; 3-24

TBBS Gamlingay; Sandy; Beds
(0767) 50 511 24 hrs; 3-24

Trinity 2; Faringdon
(0367) 81 507 24 hrs; 3/1275
Sponsored by Courier Consultancy

Trinity 3; Reading
(0734) 484 847; 24 hrs
3/1275 Multi-choice bedtime story

Typnet (0689) 50866; Herts
24 hrs; 300; Budget Typsetting

Vampire's Coffin; Weybridge
(0932) 245 593 24 hrs; 1275v
Viewdata & scrolling

The Midlands

Access Fido; Worcester
(0905) 52 536 24 hrs; 3-24
midi section

Bloxam; Banbury (0295) 720812
Daily 10pm-1am; 300

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

Intel-Ace; Oundle
(0832) 73 003 MF:6pm-8am
WE:24 hrs; 1275v

MacTel Green Box; Nottingham
(0602) 455444; 24hrs; 3-24
Multi-line system; Mac users

TABBS; Tamworth; (0827) 281713
9pm-8am; 1275; Runs on Amstrad 464/664; Trivia

The City; Birmingham
(021) 353 5486 24 hrs; 300
Atari 8 bit & ST; Lonely Hearts

Key Board; Milton Keynes
(0908) 668 398
8pm-8am exc Tues and Thurs
12h Runs on a Spectrum.

MacTel HQ; Nottingham
(0602) 817 696 24 hrs; 3-12
Macintosh Users

Norview; Northants
(0604) 20 441; 24 hrs; 1275v

Sponge; Leicester (0936) 77025
24hrs; 3/1275

TABBS Amiga BBS; Leicester
(0533) 550893; MF:6pm-9am; Sun:24hrs; Amiga Users Group

TUG II; Birmingham
(021) 444 1484; 24 hrs; 3/1275
Amstrad;Tandy;online Adventure

West Midlands Central;
(0902) 633303; 24hrs; 3/1275
Opus system

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

Forum-80; Hull (0482) 859 169
MF:7pm-11pm; WE:1pm-11pm
3/1275
Midnight-8am on Bell 103 tones

Kirklees ITeC; Batley, Yorks
(0924) 442598; 24hrs; 1275v
Information Technology Centre

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

LEMS BBS; Leeds; (0532) 600749
24hrs; 3/1275; Wildcat system

Log On Tyne Fido; Tyneside
(091) 477 3339 24 hrs; 3-24

MacTel Sheffield
(0742) 350 319 24 hrs; 3-24
For Macintosh Users

MBBS Leconfield (0401) 50 745
24 hrs; 3/1275

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

Stockton Fido; Teeside
(0642) 588989 24hrs; 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

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

Might Micro; Manchester
(061) 224 8117; MF:6pm-9am; Sun:24hrs; 3/1275; Fido/Opus
Commercial system

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

Scotland

Aberdeen ITEC (0224) 641 585
24 hrs; 1275v

Aberdeen Commodore
(0224) 781 919 24 hrs; 300
Commodore 64 based

A.L.A.N. Fife; (0592) 860313
9.30pm-8am; 3

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

Northern Ireland

Deep Thought Fido; Bangor NI
(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 hrs; 300
Irish ACC Runs on Commodore 64

Infomatique; Dublin
(0001) 764 942 24 hrs
3/1275 Amiga based

Channel Islands

Jersey Fido (0534) 39 389
24 hrs; 3/1275

Prestel

Demonstration area access
South (01) 618 1111
Midlands (021) 618 1111
North (061) 618 1111
Scotland (041) 618 1111
ID: 4444444444
Password: 4444

ABBREVIATIONS

3	V.21 (300 baud)
1275	V.23 (1200/75)
12	V.22 (1200/1200)
24	V22bis (2400/2400)
3-12	V.21,V.23,V.22
3-24	V.21,V.23,V.22,V.22bis
v	viewdata graphics
s	scrolling (non viewdata)
h	half duplex
r/b	ring back
*	Fide Net node

Most systems are
8 bits no parity
1 stop bit.
Viewdata 7bits,
even parity,
1 stop bit

ENDZONE

USER GROUPS

Rupert Steele presents his regular round-up of UK user groups.

The personal computer business is a very different game from what it was at the beginning of the 80s. The success of IBM has forced us into a number of hardware and software standards which have proved remarkably enduring, no doubt because there are very few things that *homo sapiens* likes less than learning how to drive a new word processor.

While good for users who see computers as black boxes for getting things done, this standardisation has been mixed news for user groups and for innovation towards better standards. Many user groups now have PC sections of varying quality which supplement the information widely available from specialist magazines, but the number of new machines which are significantly different from the PC standard is quite small. Consequently, many user groups now support machines which have been discontinued.

This is, of course, an extremely valuable service, although not usually one that can go on for ever as, eventually, many of the systems in circulation end up on the scrap heap. However, until a discontinued model reaches this 'dead' state, it would be better to call it 'retired' and be thankful for the dedicated enthusiasts who run the user groups for such machines.

There are, of course, exceptions. For example, the UK user groups for Commodore and Apple (ICPUG and Apple2000 — see the 'Directory') support the whole family of products, from the retired Pet and Apple II through to the active Amiga and Macintosh.

Ethics

One interesting retired machine is the Texas Instruments TI99/4a, which is being supported in its old age by no less than two competing groups: Clive Scally, the chairman of TI99/4a Users Group UK, has written to me about the services this non-profit group provides. There are some 500 members, a free public domain software library, and a regular 60-page newsletter called *TI*MES*.

Clive has also asked me to clarify publicly why his competitor, The International TI User Group, is also included in the directory, as it is run by proprietors as a small business. The answer is quite simple. The 'User Groups' column and the accompanying directory exist to provide readers with contacts that may lead to solutions to their computing problems. It is not for me to make judgements as to whether it is right for the people who provide solutions to earn all or part of their living from doing so.

I will obviously say if the services on offer appear to me to be bad value — and have done so on occasion. And while I cannot guarantee the type of service given by *any* of the groups listed in the directory, I will remove those who appear to be the subject of continuing legitimate complaint. I hope that answers your question, Clive.

Membership enquiries for Clive's group should include an *sae* and be sent to Peter Walker, 24 Bacons Drive, Cuffley, Potters Bar, Herts EN6 4DU.

Having mentioned the rather expensive 'World of Lotus' running on Telecom Gold a few months ago, I should touch on the Ashton-Tate equivalent, also on Gold. This is called 'Serviceline', and is described as 'a further development in Ashton-Tate's commitment to increasing its level of customer support'. It will be regularly updated and includes news, product information, a user notice board, Tech-Tips and other features. The press release is not absolutely clear as to what charges, if any, are made for the service, so the next step should be to write to Clare Winter, Ashton-Tate UK, Oaklands, 1 Bath Road, Maidenhead, Berks, or tel: (0628) 33123.

In the news

I have been sent a couple of sample newsletters from Amstrad clubs. One is *WACCI*, the only 'tabloid' computer club newsletter I know of (it's actually printed on A4 paper but, unlike most of the others, it aims as much to entertain as to inform). It is for Amstrad CPC users, with a little bit of the PCW and PC machines thrown in, and is scruffily produced, rather rude, and relentlessly good fun. Strongly recommended for those who don't take their computing too seriously. Contact Jeff Walker, 75 Greatfields Drive, Hillingdon, Uxbridge UB8 3QN.

The latest newsletter from the Amstrad 1512 Independent User Group is quite a different animal, aimed at the serious PC1512 and PC1640 user and packed with a lot of useful information that would, indeed, be helpful to users of other types of PCs. It contains 120 A5 pages of closely-printed information, including a 12-page piece on the innards of MS-DOS, all sorts of reviews, and lots of technical information. A good one. Call (0732) 63157 for more information.

Local clubs

Although there has been something of a thinning out of local computer clubs recently, some of the more effective ones are still going strong — indeed, some are growing. I have had a note from Martin Randall, of the Gateway Computer Club, pointing out that they have some 150 members. The group meets at the Bob Hope Recreation Centre at RAF Mildenhall on the third Sunday of each month from 2pm to 4pm. There are specialist sections for a variety of topics including the Mac, the Commodore machines and PCs. There is also a monthly club newsletter (about 20 pages) included in the membership fee of £7 a year. For more information, contact Phil Herberer, 164d Radcliffe Road, Lakenheath, Suffolk, tel: Eriswell 2363.

From further west I have had a copy of the newsletter of the Reading Computer User Group, which meets at 7.30pm on the first and third Thursday of each month in the senior common room of Reading University. The subscription rate is £5 a year, and this includes a quarterly newsletter. The issue I saw was a little sparse, although it did have an excellent article on the 'fuzzy' matching of misspelt names using the Soundex code. Contact Mike Mallett, RUG News, 19 Knollmead, Calcot, Reading RG3 7DQ.

I have had a letter from Paul Cuthbertson about the Grampian Amateur Computer Society. The club places great emphasis on the technical aspects of computing, and the more 'serious' applications as opposed to simply playing games. The members, coming from all walks of life, meet regularly on Monday evenings and the club aims to provide organised talks, demonstrations and visits wherever possible. There is a newsletter every two months which gives details of forthcoming events as well as some interesting hardware/machine code information. Those living in the north-east of Scotland might like to call Paul on (0467) 24030 or write to him at 18 Morningside Crescent, Blackhall, Inverurie AB5 9FA.

Finally, the Lincolnshire Micro Society has sent me a sample newsletter. This has been simply produced, and contains some technical material as well as club news and the programme of meetings for this Spring. The club will meet at the Cardinal's Hat, Grantham Street, Lincoln at 7.30pm on: 16 March (Amiga Music), 6 April (PCs), 20 April (Amateur Radio & Computers), 1 & 15 June and 6 & 20 July (to be arranged). There are also meetings at other locations on: 22 March (the Night Sky), 11 April (Desktop Publishing) and 10 April (Interactive Video Disks). For details of this busy group's activities, call Douglas Griffiths on Lincoln 680578 or write to him at 659 Newark Road, Swallowbeck, Lincoln LN6 8SA.

If you would like your user group or club be mentioned in this column, or you wish to be considered for the Directory of User Groups, please write to **Rupert Steele**, 12 Philbeach Gardens, London, SW5 9DY, or tel: (01) 370 0601.

DIRECTORY OF USER GROUPS

MACHINES A–K

APPLE MACINTOSH
John Lewis, Macintosh User Group UK, 55 Linkside Ave, Oxford, OX2 8JE. (0865) 58027. £25. Professional.

APPLE MACINTOSH – BBS
David Nicholson-Cole, MacTel, 15 Elm Tree Avenue, West Bridgeford, Nottingham, NG2 7JU. Board (0602) 817696 or (0742) 350319; V21/22/23.

APPLE SYSTEMS
Irene Flaxman, Apple2000, PO Box 3, Liverpool, L21 8PY. 051-928 4142. Used to be called BASUG. Local groups; newsletter; BBS etc.

APRICOT
Apricot File, TP Group, PO Box 509, London, N1 1YL. 01-833 3501. Detailed technical newsletter.

ATARI
N Lewis, Atari National User Group, 13 Weavers Walk, Courthouse Green, Coventry, CV6 7LG. Newsletter; SAE.

ATARI 8-BIT USERS
Atari Correspondence Club, 160 Newland Rd, Withywood, Bristol, BS13 9DX. (0272) 647196.

ATARI LOCAL GROUPS
Association of Atari User Groups, 45 Coleburn Road, Lakenham, Norwich. (0603) 661149.

ATARI ST
Paul Glover, ST-Club, PO Box 20, Hertford. PD software.

BBC MICRO – SIDEWAYS RAM
Kenneth Hardacre, Solinet, 13 St John Street, Bridlington, E Yorks, YO16 5NL.

CAMBRIDGE Z88
Roy Woodward, Z88 Owners' Club, 68 Wellington Street, Long Eaton, Nottingham, NG10 4NG. SAE.

COLECO ADAM
Keith Marner, UKAS, 33 Homer Rd, Croydon, CR0 7SB. Bi-monthly journal. SAE.

COMMODORE ALL MACHINES
Jack D Cohen, ICPUG, 30 Brancaster Road, Newbury Park, Ilford, IG2 7EP. 01-346 0050 home; 01-579 1229 day. £10 +£1 entry fee.

COMMODORE AMIGA
UK Amiga Users Group, 66 London Road, Leicester, LE2 0QD. (0533) 550993 voice; (0533) 550893 Bulletin Board.

COMMODORE PLUS 4
Steve Kent, 203 Wolverhampton Road, Pelsall, Walsall, WS3 4AW. SAE.

COMPUCORP
Compucorp University Users Group, c/o Compucorp, Cunningham House, Westfield Lane, Kenton, Middx, HA3 9ED.

CPM MACHINES
PIP, 28 Gordon Mansions, Torrington Place, London, WC1E 7HF. Supports Amstrad, Einstein, Osborne etc; BBS.

EINSTEIN
Graham Bettany, UKEUG, 80 Dales Road, Ipswich, IP1 4JR. £15. Monthly newsletter. SAE.

ENTERPRISE
Martin Wallace, Independent Enterprise User Grp, PO Box 13, Crowborough, E Sussex, TN6 1XQ. (08926) 3890 Mon-Sat 7pm-10pm. £15.

HEWLETT-PACKARD HANDHELD
HPCC Membership Secretary, Geggs Lodge, Hempton Road, Deddington, Oxford, OX5 4QG.

HITACHI MBE 16002 PC
Bruce Ainge, HICUPS, 16 Nine Acres Road, Cuxton, Kent, ME2 1EL. (0634) 715759

IBM PC
IBM PC User Group, PO Box 830, London, SE1 0DB. 01-620 2244. £25 personal; £95 corporate. Professional.

JUPITER ACE
Mr J R Charter, Jupiter ACE Users Group, 8 Abney Close, Cheedale Ave, Chesterfield, S40 4PF. (0246) 37555. SAE.

JUPITER ACE
Ian Jones, Jupiter Ace User Domain Resource Centre, 21 Dene St, Pallion, Sunderland, SR4 6JB. 091-565 2833. SAE.

MACHINES L–Z

MEMOTECH
Phil Eyres, Memotech Owners Club, 23 Denmead Road, Harefield, Southampton, SO2 5GS. SAE.

MOTOROLA 68xxx MICROS
Rick Applegate, 68 Microgroup, 8 Great Cob, Springfield, Chelmsford, Essex. BBS 01-316 7402.

MSX SYSTEMS
Keith Neal, MSX Link, Austerby House, 80 Austerby, Bourne, Lincs, PE10 9JL. (or) Craig Bell, North Lodge, Cairnhill Road, Airdrie, Lanarkshire, Scotland, ML6 9RJ.

MSX SYSTEMS
Lee Simpson, MSX User Group, 3 Mayfair Pl, Tuxford, Newark, Notts, NG22 0JD.

MSX SYSTEMS
Memory Alpha, 16 Mayfield, North End, Portsmouth, Hants. SAE.

NASCOM/80-BUS/CPM
Scorpio Systems, PO Box 286, Aylesbury, Bucks, HP22 6PU. (0296) 624868.

NEWBRAIN
Gerald McMullon, NBUG, 36 Armitage Way, Cambridge, CB4 2UE. SAE.

NEWBRAIN
Ron Bury, OPEN*STREAM, 70 Cranberry Lane, Darwen, Lancs, BB3 2HL. (0254) 771891.

ORIC
Gary Ramsey, IOUG, 1 Kingsway Crescent, Burnage, Manchester, M19 1GA. Newsletter.

OSBORNE/CPM/MSDOS
Jeremy Browne, BOOG Ltd., 102a Aldershot Road, Hants, GU13 9NY. (0252) 621745. BBS on (0252) 626233.

PSION ORGANISER
Mike O'Regan, Independent Psion Organiser User Group, 130 Stapleford Lane, Beeston, Nottingham, NG9 6GB. Monthly newsletter. SAE.

RESEARCH MACHINES (RML)
RML National User Group, Steve Burrows, Wirral CAE Services Ltd, Gorsey Lane, Wallasey, Wirral, L44 4HE. 051-639 8237. All RML micros.

SAMURAI S16
Andrew Lee, Samurai S16 Self-Help User Group, 57 Darnley Rd, Gravesend, Kent, DA11 0SF. SAE. S16 is discontinued MSDOS non-PC.

SANYO MBC-550
Mr M H Syed, Wistaria, 53 Acacia Grove, New Malden, Surrey, KT3 3BP. 01-942 9009. Informal group.

SHARP
Andrew Fergusson, Sharp User Group, 11 Harcourt Clo, Henley on Thames, Oxon, RG9 1UZ. (0491) 574850. £6. 60pp Newsletter. Software.

SINCLAIR QL + COMPATIBLES
Brian Pain, Quanta, 24 Oxford Street, Stony Stratford, Milton Keynes, MK11 1JU.

SINCLAIR QL + COMPATIBLES
Richard Turner, QL Super User Bureau, PO Box 3, Shildon, Durham, DL4 2LW. £15 (£30 business). 50p for sample of monthly newsletter.

SORD M-23
Mr B Nicholson, c/o Aberdeen Reservoir Interpretation Centre, Woodlands Drv, Kirkhill Industrial Estate, Dyce, Aberdeen. (0224) 771117. Informal group.

TANDY/GENIE/AMSTRAD/MSDOS
Roger Storrs, NATGUG, Oakfield Lodge, Ram Hill, Coalpit Heath, Bristol, BS17 2TY. (0454) 772920. Newsletter. PD software.

TEXAS TI99/4a
Peter Walker, TI99/4a User Group (UK), 24 Bacons Drive, Cuffley, Potters Bar, Herts, EN6 4DU. (0707) 873778. £10. Newsletter. Software library.

TEXAS TI99/4a
Gordon Pitt/Peter Brooks, International TI User Group, 259 Sneyd Lane, Bloxwich, Walsall, WS3 2LS. £12.50. Bloxwich 476373. Newsletter.

TRANSPUTER
Dr Howard Oakley, Transputer Users Group, Brooklands Lodge, Park View Close, Wroxall, Ventnor, Isle of Wight, PO38 3EQ. £5.

LOCAL CLUBS

DETAILS OF YOUR LOCAL CLUB
SAE please to John Dale, British Association of Computer Clubs, Banc-y-rhosyn, 14 Bron Y Glyn, Bronwydd Arms, Carmarthen, SA33 6JB.

AMSTRAD

AMSTRAD (SERVICES USERS)
LtCol Charles Joint, Services' Amstrad Society, Leros TA Centre, Sturry Rd, Canterbury, CT1 1HS. (0227) 61397. £5. Newsletter.

AMSTRAD 1512/1640
1512 Independent User Group, PO Box 55, Sevenoaks, Kent, TN13 1AQ. (0732) 63157. £22 pers; £25 business.

AMSTRAD ALL MACHINES
National Independent Amstrad User Club, 1 The Middle Way, Wealdstone, Harrow, HA3 7EQ. £9 (specify machine). A5 SAE. Discounts. Newsletter.

AMSTRAD ALL MACHINES
Jeffrey M Green, Advantage, 33 Malyns Close, Chinnor, Oxon, OX9 4EW. (0844) 52075. Newsletter; software lib; SAE.

AMSTRAD BUSINESS USERS
Amstrad Professional User Club, Enterprise Hse, PO Box 10, Roper St, Pallion Industrial Estate, Sunderland, SR4 6SN. 091-510 8787. £39.95.

AMSTRAD HOME USERS
Jeff Walker, WACCI, 75 Greatfields Drive, Hillingdon, Uxbridge, UB8 3QN. (0895) 52430. £12. Newsletter. Special offers. Good fun.

AMSTRAD LOCAL GROUPS
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Ron Morland, The PCW Computer Club, 12 Deneve Avenue, Poole, Dorset, BH17 7LR. SAE.

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Chris Bryant, PCW File, 11 Havenview Road, Seaton, Devon, EX12 2PF. £7 with free PD software. Large SAE for sample newsletter.

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Peter Vass, Computer Services (Scotland), PO Box 244, Glasgow.

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END ZONE

Basic gone bust

I am having difficulty loading GW-Basic on my Amstrad 1640 HD ECD. Although it initially seemed to load correctly from the hard disk, all I got on the screen was a flashing cursor at the top and the machine needed resetting.

Thinking it might be a problem with the hard disk, I tried booting and loading Basic from the floppy disk; that seemed to work for a while but then that too stopped. This was after I first loaded PC Deskmates.
Chris Elliott, Brockenhurst, Hants

There are a number of things to check. The most obvious is making a fresh copy of GW-Basic from your distribution disk — it could be that the copy you are running has been corrupted. If you have not made copies before and have been using the original disk, then you are about to learn a new lesson — *never* use the original disks. Always (copy protection schemes permitting) work from copies.

Another solution may lie in PC Deskmate. As you are running the EGA version of the Amstrad PC, it could be that this resident software is interfering with the way that GW-Basic writes to the screen. A single flashing cursor on a blank screen is symptomatic of a situation where the program you are running is writing to a different screen device than the one installed.

As an experiment, load GW-Basic, and when you have your blank screen, just type the word SYSTEM followed by a carriage return. If GW-Basic is in fact writing to the wrong screen address but still running satisfactorily, it should still read the keyboard and act on what it receives. In this case, the computer should exit GW-Basic and return you to DOS, with your usual DOS prompt appearing on the screen.

Check that your CONFIG.SYS and AUTOEXEC.BAT files don't contain any mode commands to affect screen behaviour.

WordStar times out

I have just changed from Superwriter to WordStar Professional Release 4, but have kept my Juki 6100 printer. My problem is that printing has now become extremely unreliable.

I bought the Juki in 1984 and the manual is rather out of date. It advises me to install the printer within WordStar as a Diablo 630 and to include the statement 'mode lpt1:,,p' in AUTOEXEC.BAT. When I tried this, the result was pretty horrendous. I achieved a marked improvement by installing the printer as a Diablo daisywheel, but this has not solved the problem entirely.

During printing, the printer stops, apparently randomly. If I am lucky, pressing 'C' restarts the printing correctly but, all too often, the Juki goes haywire, writing garbage or reprinting a section of text from earlier in the document.

Can you help?
RG Knight, Hendon, London

Solving the timing-out problem is not difficult. Run the program called WSCHANGE that is included with WordStar and increase the printer time-out variable. Using a lengthy document as a test, gradually increase the value until the whole document prints without problems.

I can't explain why the printer goes haywire after pressing 'C' to continue, as no special control codes are sent during a time-out. My only suggestion is that sometime during your experimentation, you've corrupted the printer driver. Try using a fresh copy of the WordStar software.

For the best results, drop the mode statement from your AUTOEXEC.BAT and create your own printer driver using the generic Diablo daisywheel as your model. Using the Juki manual and the WordStar manual, this is a fairly easy task. (By the way, these solutions were found with relative ease in the *WordStar Professional* manual.)

Long-distance reading

I have an NEC computer with a Z80-compatible CPU and 64k of memory. I know very little about CP/M and wonder if you could recommend any books on the subject.
Khalid Al Zubaidi, Baghdad, Iraq

At such a distance it is difficult to advise you on what might be available in your country. In the UK there are two sources of information. Firstly, you should write to the PIP User Group whose address appears in the 'User Groups' directory on page 215. The other option is to write to Computer Bookshops at 30 Lincoln Road, Olton, Birmingham B27 6PA, whose catalogue will include some CP/M-specific books. (*Make sure you turn to this month's 'Bibliofile' also to read our review of* The CP/M Plus Handbook *on page 165. Ed.*)

The main attraction

My faithful BBC Micro will have to go. I can't bear its lack of memory any longer, and I can't afford an Archimedes. I have decided on a PC compatible, probably Amstrad, but how easy is it to emulate the BBC's teletext screen mode?
Graham Crowder, Edinburgh

Mode 7 on the BBC Micro is one of that machine's great attractions. It uses very little memory and provides a display mode compatible with viewdata systems like Prestel, which I assume is what you want the teletext mode for.

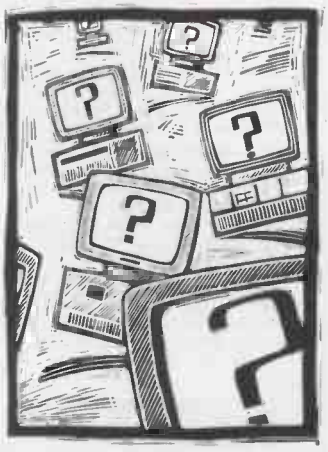
Unfortunately, PCs are very bad at teletext. The teletext character set comprises seven colours, numerous graphics characters and the option to have any character double-height and/or flashing. The poor PC is stuck with a text character set of 256 characters with totally different graphics characters and only flashing as an attribute.

To emulate the teletext character set, there are two solutions. One method is that followed by Sagesoft with its ChipChat communications package. This approximates the teletext system, but the graphics are only approximate and double-height characters are replaced by single but underlined ones. It also offers a replacement character set ROM for full teletext, but this loses you some of the IBM characters, such as rules and European characters, which you may want.

The alternative is to drive the PC in graphics mode. Again, the PC is poor here compared with the BBC. In its cheapest CGA mode, it can only manage three foreground colours (red/yellow/green or cyan/magenta/white) and drawing teletext screens in graphics mode is slow. EGA graphics can provide the full teletext emulation but is also slow, and the hardware required is quite expensive. Many other communications programs such as Baudwalk, Datatalk and Vicom-GemComm use this option, and you get all the correct attributes and graphics, but you're limited in the number of colours you can see.

Smartcom III from Hayes works best with an EGA, where it re-programs the EGA board's own character set and so produces a full teletext emulation but with the speed of a text-mode screen.

The best teletext terminal you can find is almost certainly your BBC. Why not keep it as a dedicated terminal and use your PC for everything else?



Computer Answers is *PCW*'s help column. We offer advice about all kinds of hardware and software problems through the pages of the magazine. The address to write to is: Computer Answers, PCW, VNU House, 32-34 Broadwick Street, London W1A 2HG.

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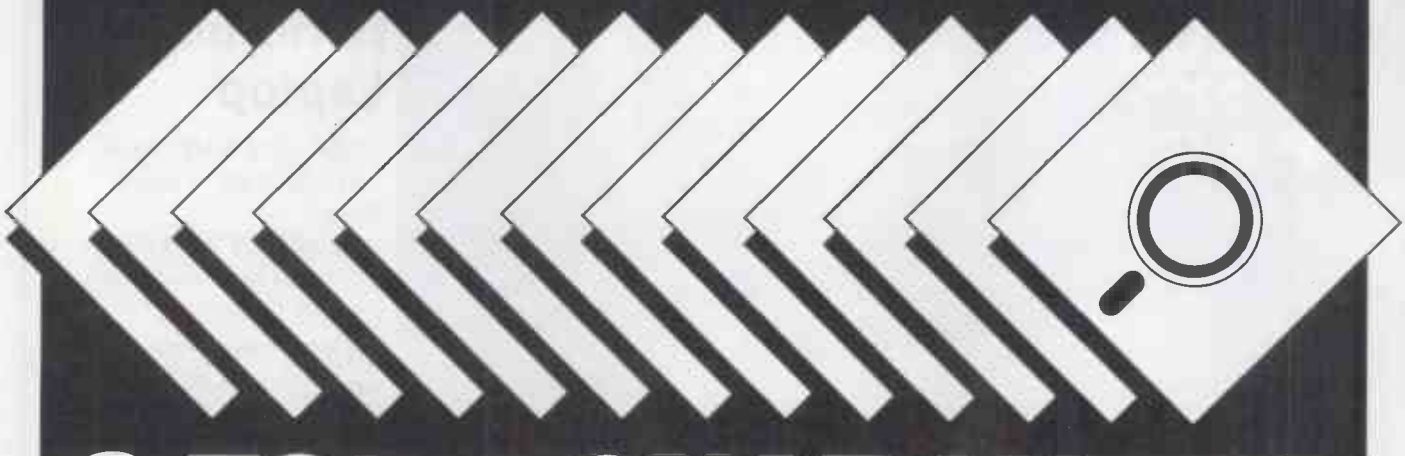

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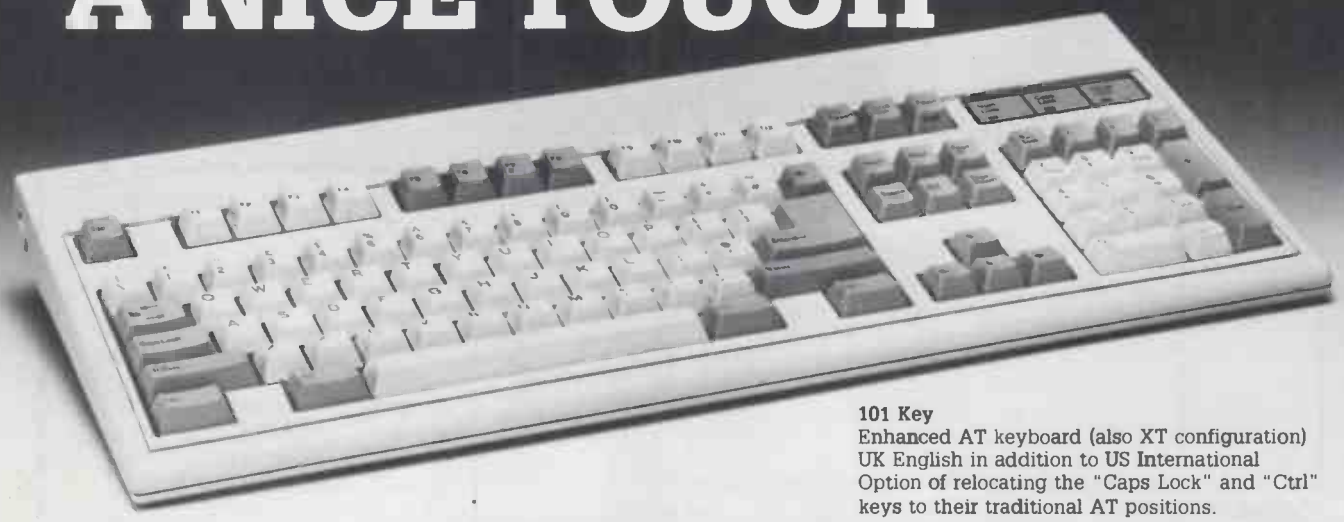

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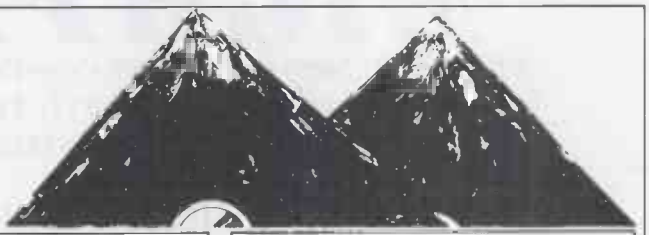

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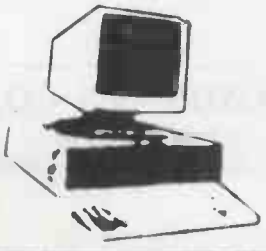

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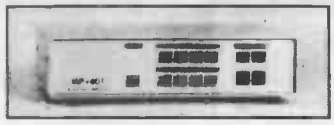
£95  **£95**

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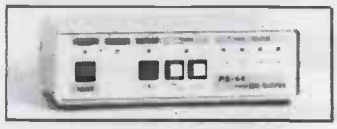

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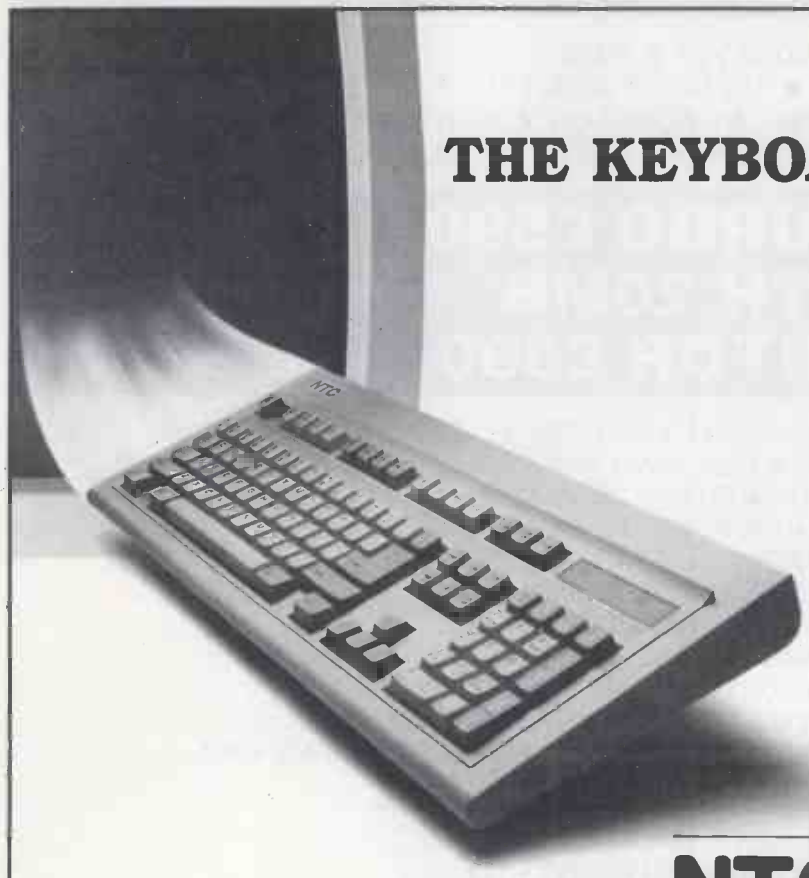

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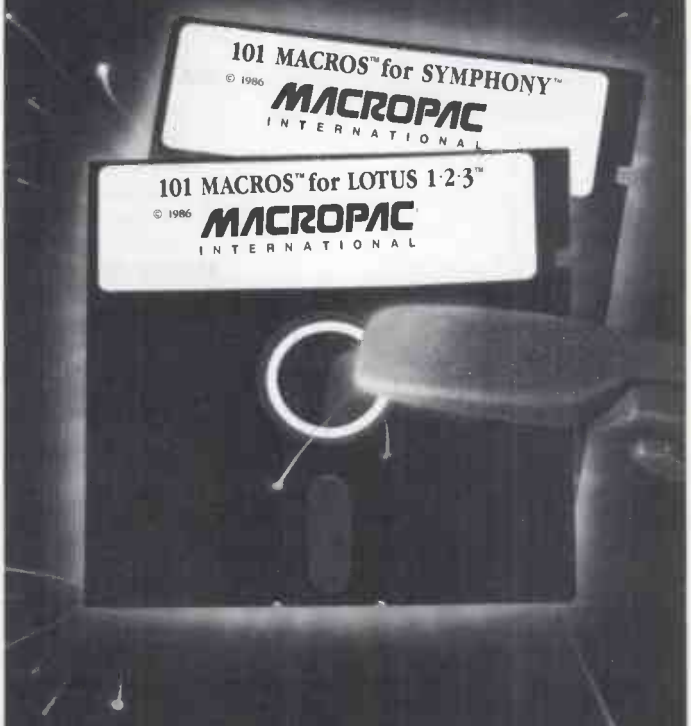

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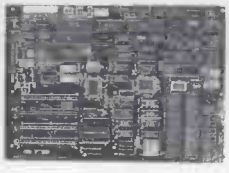

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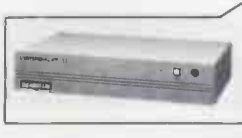

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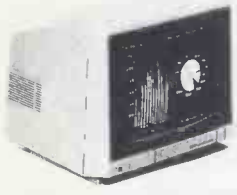

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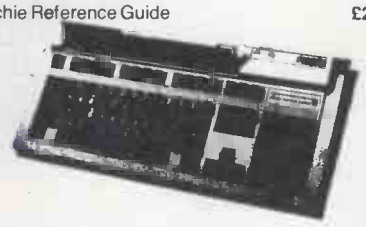

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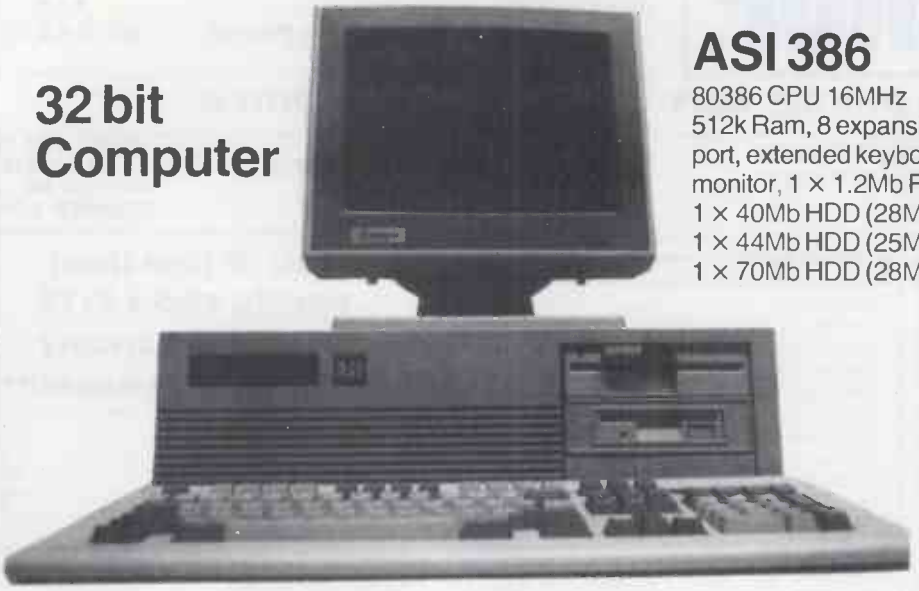

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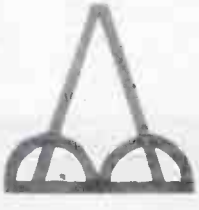

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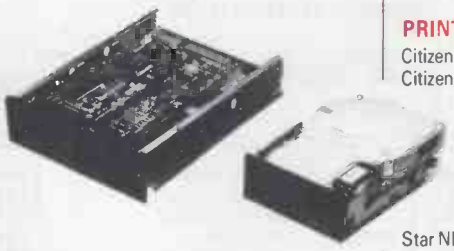

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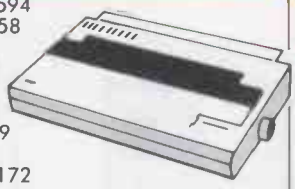

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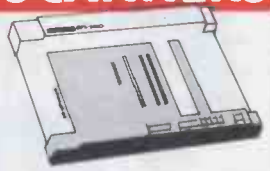

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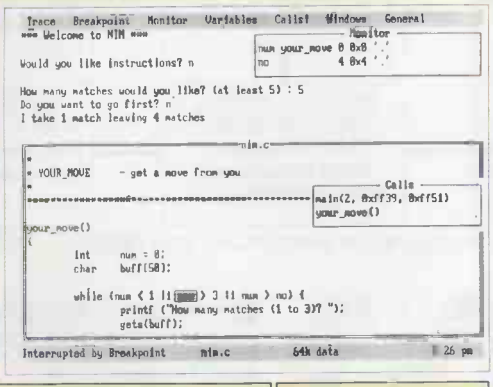

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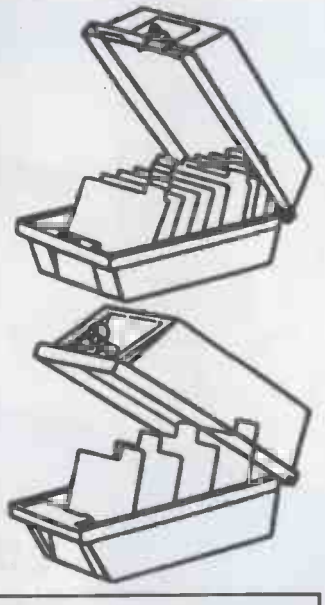

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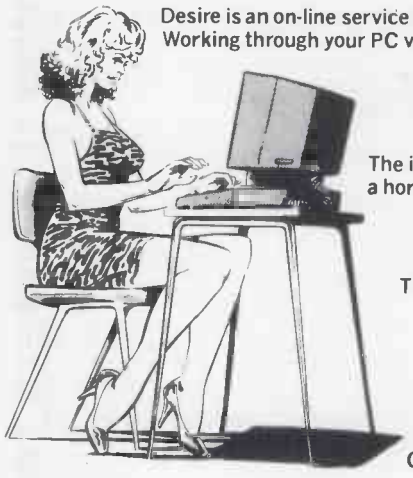

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A printer operates at a slower rate than a computer, forcing the PC to wait whilst the printing job is completed. And with a plotter producing a complex CAD schematic, that could be several *hours*, not minutes. Fine if you've got time to waste—but most of us haven't.

WHAT IS THE X-BUFFER?

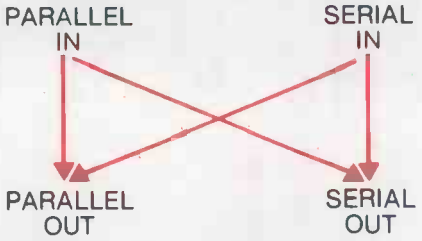
X-Buffer is an intermediate storage device that acts as an extension to the computer's own memory. It allows text or data to be downloaded in seconds and 'held' in the buffer ready to be fed to the printer at the correct rate.

So there's no waiting for printing to finish, the PC is free to be used for other tasks.

In the case of your 30 page report, downloading to the X-Buffer would take around 28 seconds, leaving you 16½ minutes to get on with something far more constructive.

VERSATILITY

Until recently printer buffers had to be specified according to the type of PC and the printer used and the interfaces each had. The X-Buffer is designed for maximum flexibility and incorporates four interfaces: RS232 Serial i/o and Centronics parellel i/o.



The interfaces can be used simultaneously so the buffer can be used in a variety of ways. Two computers sharing one output device (printer, plotter, modem). One computer driving two devices. Two computers using two devices.

EXPANDABILITY

The X-Buffer is also easily expandable by the user, plug-in memory modules offering from 64K to 4 Mbytes of buffer memory.

That's not only good news for users but great news for dealers too—instead of holding large stocks of varying fixed capacity buffer units,the X-Buffer modules allow custom configuration depending on the users' needs.

EXTRAORDINARY VALUE

And the price of the X-Buffer is probably the best feature.

Xbuffer FROM £159

The 64K basic unit costs a mere £159 RRP including a standard two year parts and labour warranty.

X-Buffer from Micro Control Systems. Don't let your printer (or plotter or modem) keep you waiting.

The X-Buffer is just one of a range of buffer products manufactured and supported in the U.K., available from Micro Control Systems.

micro control systems on 0602 391 204

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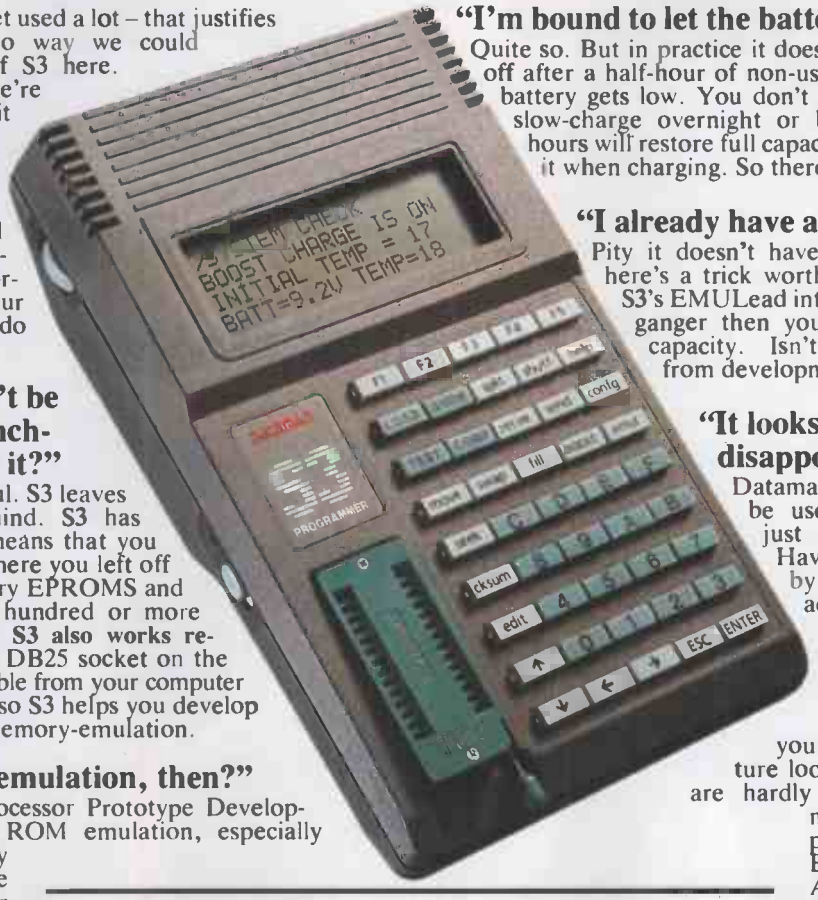
"It's a pretty small battery-powered PROM programmer – so what?"

Tools which are convenient get used a lot – that justifies their existence. There is no way we could explain all the usefulness of S3 here. Instead, if you're interested we're going to let you see it, use it and evaluate it in your own workshop. We went to a lot of trouble to design S3 just the way it is – no other PROMMER is all CMOS and all SMT. So we must be convinced that S3 would be a formidable addition to your armoury. Now all we have to do is to convince you.



"Such a little thing can't be powerful, like a big bench-programmer – er – can it?"

Yes, it can. It is more powerful. S3 leaves other prommers streets behind. S3 has continuous memory, which means that you can pick it up and carry-on where you left off last week. S3 has a huge library EPROMS and EEPROMS. S3 can blow a hundred or more PROMS without recharging. **S3 also works remotely, via RS232.** There's a DB25 socket on the back. All commands are available from your computer (through a modem, even). Also S3 helps you develop and debug microsystems by memory-emulation.

"What's this memory-emulation, then?"

It's a technique for Microprocessor Prototype Development, more powerful than ROM emulation, especially useful for single-chip "piggy back" micros. You plug the lead with the 24/28 pin header in place of the ROM/RAM. You clip the Flying-Write-Lead to the microprocessor and you're in business. The code is entered using either the keyboard or the serial interface. Computer-assembled files are downloaded in standard format – ASCII, BINARY, INTELHEX, MOTOROLA, TEKHEX.

Your microprocessor can WRITE to S3 as well as READ. You can edit your variables and stack as well as your program, if you keep them all in S3.

S3 can look like any PROM up to 64K bytes, 25 or 27 series. Access is 100ns – that's really fast. Memory-emulation is cheap, it's universal and the prototype works "like the real thing".

"I'm bound to let the battery go flat."

Quite so. But in practice it doesn't matter. S3 switches off after a half-hour of non-use anyway, or when the battery gets low. You don't lose your data. Then a slow-charge overnight or boost-charge for three hours will restore full capacity. You can keep using it when charging. So there really is no problem.

"I already have a programmer."

Pity it doesn't have S3 features, eh? But here's a trick worth knowing. If you plug S3's EMULead into the master socket of a ganger then you get an S3 with gang capacity. Isn't production separate from development anyway?

"It looks nice. Will I be disappointed?"

Dataman tools are designed to be used by Engineers. Not just sold to Management. Have you ever been misled by some mouthwatering ad for a new product? Great artwork and exciting promises which feed your fancy? On impulse you buy and when the thing arrives you feel let down. The picture looked better. The claims are hardly justified; not exactly misrepresentation, just poor implementation. But you've bought it. And you're stuck with it. It stays in the cupboard, most of the time. **So how about this: buy S3 and use it for up to a month. If you're not still thrilled then you can have your money back.**

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S3 loads its working programs out of a PROM in its socket, like a computer loads from disk. Software expansion is unlimited. Upgrades will come in a PROM. Programs can be exchanged between users. How's that for upgradability?

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We trust S3 to fire your enthusiasm. We trust you not to use us as a free hire-service. We bet you won't send it back. How would you manage without it?

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We wouldn't get you all excited and then let you down. It Costs **£495** plus VAT. That includes P & P, Charger, EMULead, Write Lead and a HELP program in ROM. S3 is in stock. Buy it today. Use it tomorrow. *(That's a fair promise. But please reserve product by phone or telex to make it come true).*

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4000

LP 1000

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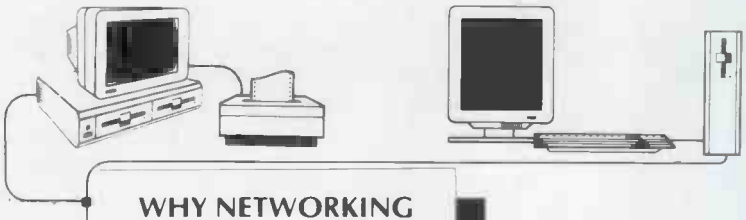

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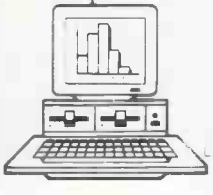

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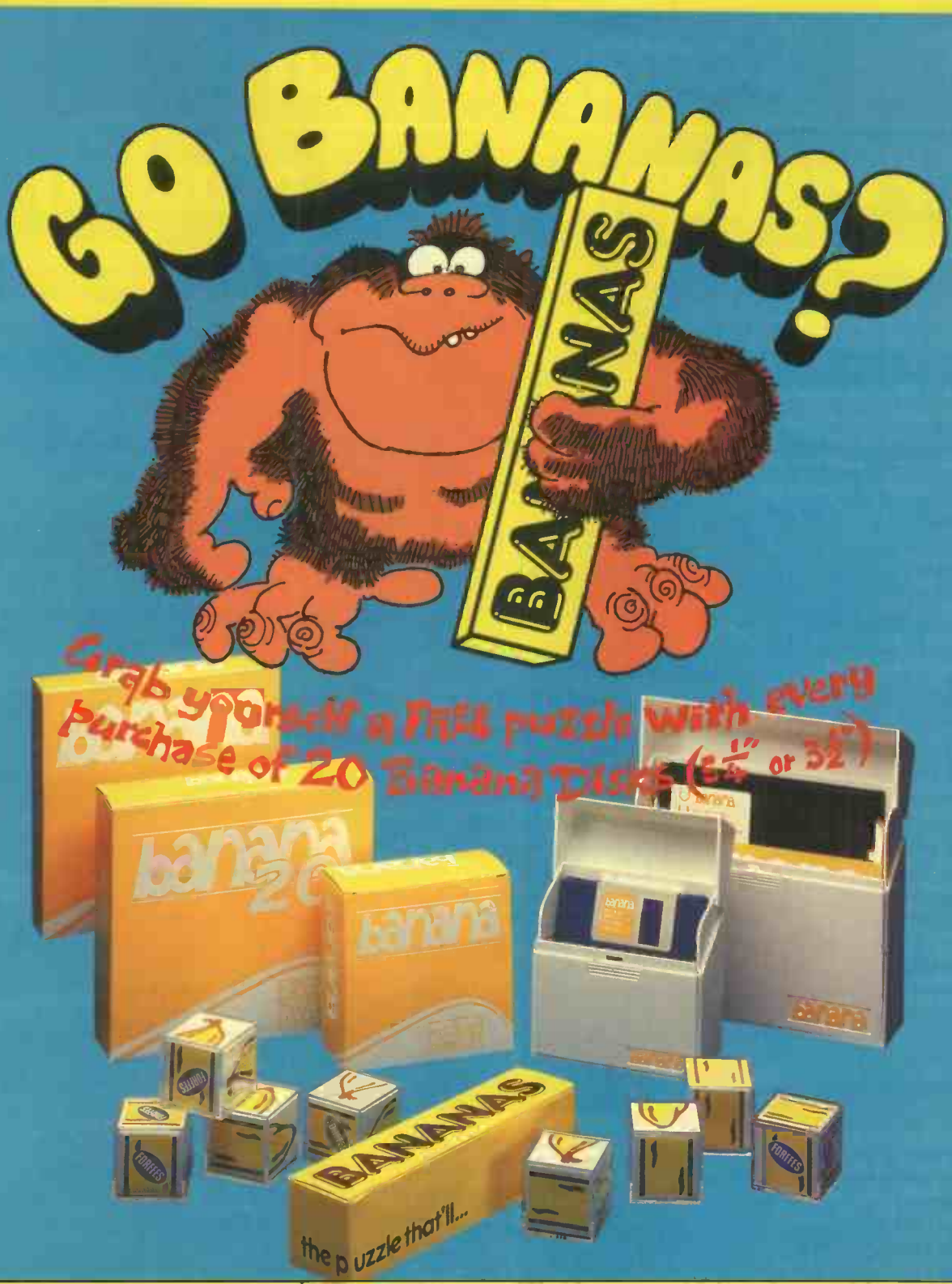

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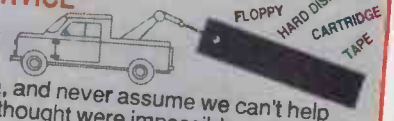

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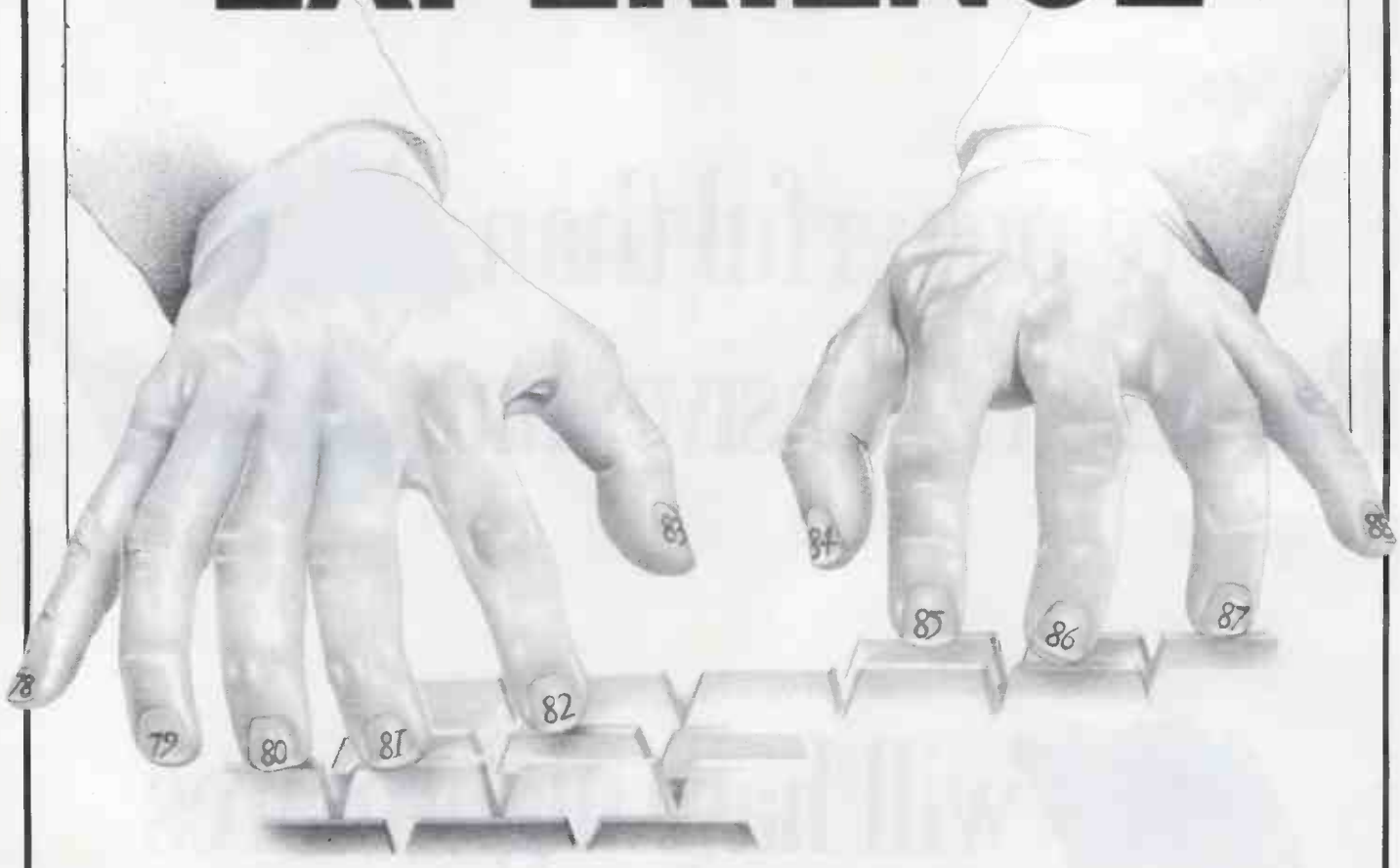

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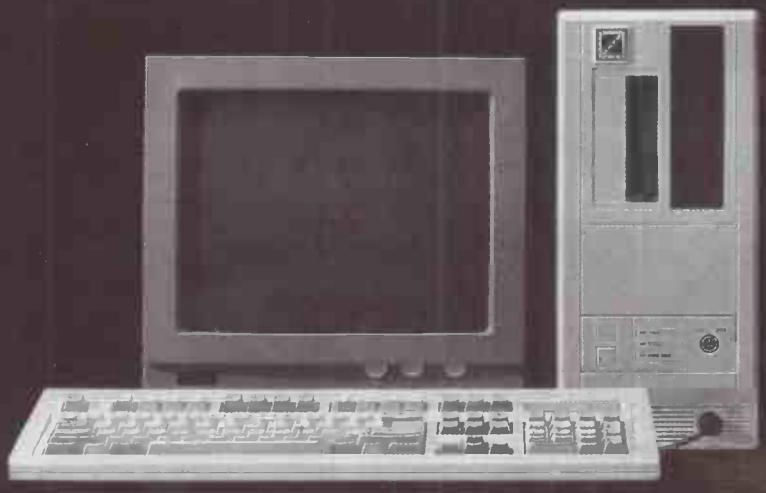

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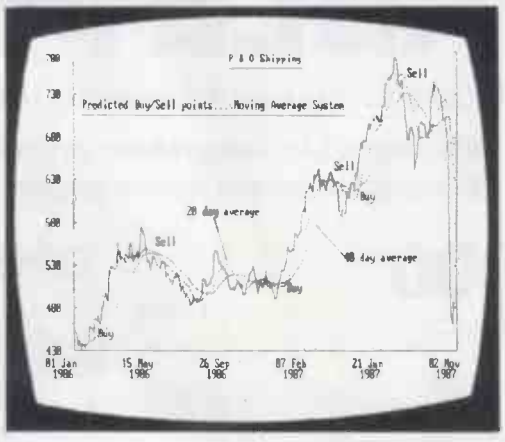

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CHIPCHAT

Dell Computer Corporation is getting worried that it is being considered in the same breath as Damart, Great Universal Stores and South Bucks Rainwear as a 'mail order' company. Now, while no-one is likely to confuse Michael Dell's 386 machine with a pair of thermal long-johns, his company is nonetheless keen to distance itself from these more intimate merchandisers. But we don't think its new nomenclature is any the less tinged with 'personal' connotations. Dell now says it is engaged in 'direct relationship marketing', which makes it sound like the company is running a marriage bureau. Next, we'll get letters from Dateline saying it is really in the computer business...

NCR is concerned that we ran a Benchtest of 386 *towers* when it has marketed its own NCR Tower machines for some time, and even trademarked the word 'Tower'. This little-known legal claim is set to have far-reaching consequences. We look forward to hearing of the renaming of some famous landmarks such as the 'leaning floor-standing bell tower of Pisa'; London's 'Post Office under-the-desk-communications centre'; and New York's twin 'World Trade very tall buildings'. Good luck, NCR...

The Americans have a wonderful love of coining new words, even if their meaning is not quite what is meant. Waiting to see a company executive recently, a colleague was told that the man in question would be with us 'momentarily'. Fortunately, the interview lasted longer than that...

Things must be getting very slippy for all those companies in the M4 corridor from London to Bristol who thought they were making computers. In the January edition of *Rail News,* BR announced that it had created four new supervisory posts to manage its network of trains running though 'Silicone Valley'...

A Lotus ad for its system centres was backed by a list of computer shows for 1988. Included for September was the *PC Week* Show at Olympia. So that's why VNU and show organiser, Montbuild, moved the Personal Computer World Show to Earls Court and renamed it The Personal Computer Show...

When a company offers a money-back guarantee that its products are compatible with an industry standard, it has to be careful of the wording. The latest Paradise VGA+ card is guaranteed to run 'all VGA software that will run on a genuine IBM VGA display adaptor fitted inside an IBM XT or AT.' What about software running on the PS/2s? A bit too difficult?

Take the editor of the country's best computer magazine attending a meeting to demonstrate his latest database application. Mix in the marketing director of the company which publishes the generating program, and a leading rental company for IBM equipment. Result — a recipe for disaster. Editor arrives with 5¼in 1.2Mbyte disk containing application. Marketing director doesn't bring original database program. Machine sitting in corner is IBM PS/2 Model 50 with 3½in 1.44Mbyte drives. 'No problem,' they all said. 'Let's call up the IBM dealer who supplied the machine and get an external 5¼in disk drive.' Dealer arrives with one 5¼in external drive — for 360k disks only. IBM doesn't manufacture a high-density external 5¼in disk drive. 'No-one seriously uses those disks for anything,' the dealer said in all seriousness. All of a sudden, all the other fools in the room felt much better...

This isn't really 'have a go at Ashton-Tate' month, but we couldn't believe our eyes when we received the Byline

demonstration disk. Byline is A-T's long-overdue desktop publishing product. You'd expect a demo disk to show you a demo of the product. Wrong. It is a fancy storyboard-type presentation with typical presentation graphics detailing how wonderful the product is. Not a sign of the product anywhere on the disk. Not even sample screens. Makes you wonder how the company managed to get away with the other thing about the disk that had us falling about. It costs $4.95 to buy...

On a visit to Hong Kong's Golden Computer Arcade recently, *PCW*'s editor, Derek Cohen, found some real software bargains, including Ventura Publisher and dBaseIII+, both at £14 including manuals and a full set of disks. Ironically, this was just a few weeks after Ashton-Tate in particular had made loud noises about cleaning up the piracy business in Hong Kong. The properly-printed and bound manuals have full-colour covers and, in the above products' case, are easier to use than the heavy ring-bound originals. Other bargains included a dBaseIII+ LAN pack, also for around £15, and SCO Xenix for £25.

Despite Ashton-Tate's law enforcement, the pirates may still have the last laugh: inside the dBaseIII+ manual it says: 'If you experience problems with this product, technical support is available from your local Ashton-Tate dealer'...

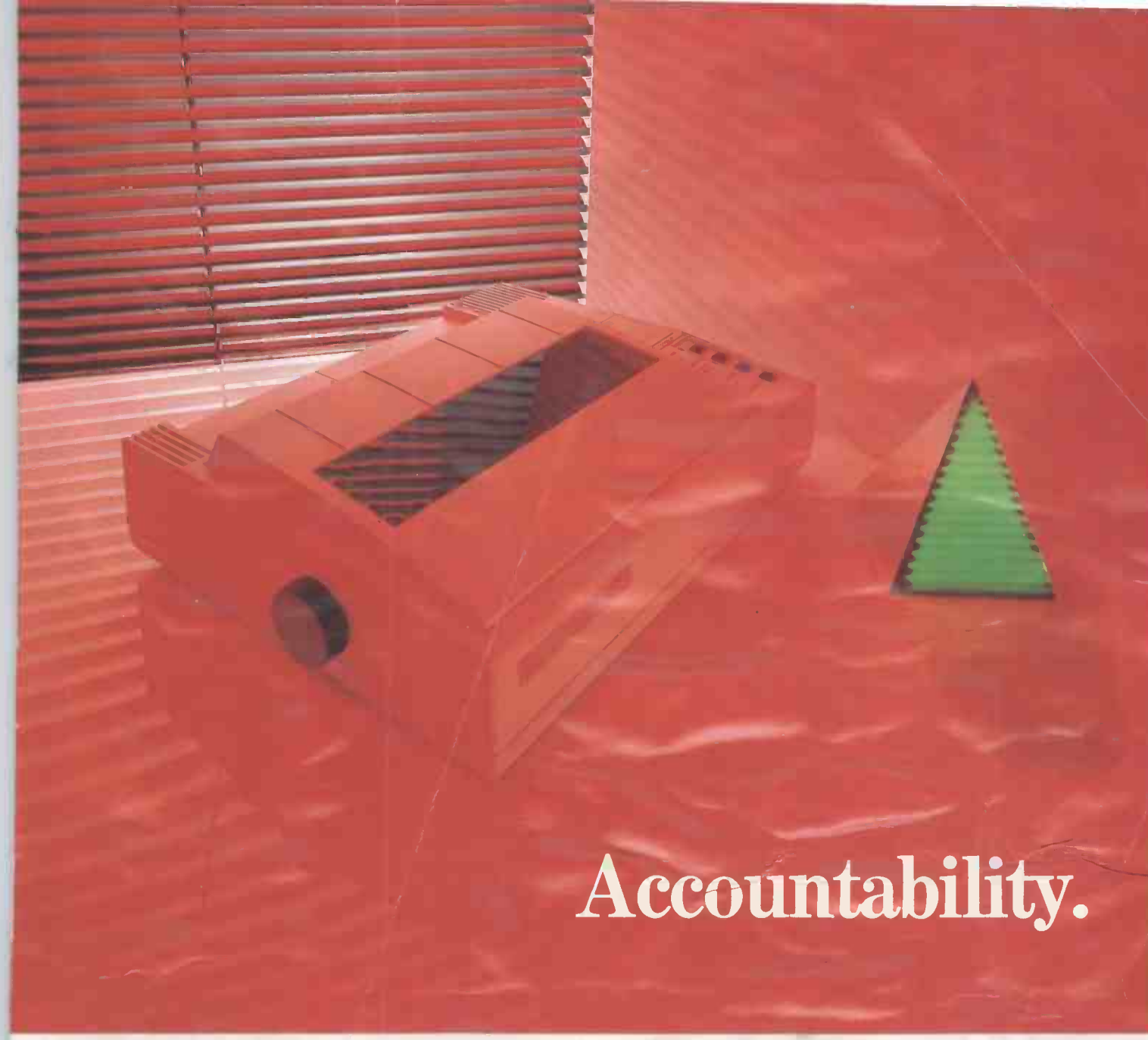
This Month

Dell Computers can do no wrong. Its new System 200, reviewed in this issue, certainly represents better value than the company's existing range and provides higher performance. But we do wish someone would supply an entry-level machine that really was a switch-on-and-go OS/2 engine — with OS/2 already installed, and plenty of high-speed RAM already on the motherboard. See page 96 for how close Dell came.

This month *PCW* welcomes a new staff writer, Andy Redfern. He joins us from Warwick University where he was doing work on medical image processing. He made his first significant contribution on only his second day by appearing on a BBC radio show to discuss the Amiga virus currently threatening the Commodore community.

Next month sees *PCW*'s Tenth Anniversary issue. As well as the usual crop of world exclusives, in-depth reviews and forward-looking features. we'll be offering you the opportunity to win valuable computer hardware and software, including an Acorn Archimedes and the latest Borland products. All you'll need to do is tell us what you think about *PCW*.

Phoenix the Panther wonders: Which lucky chap will be my breakfast and which lunch.



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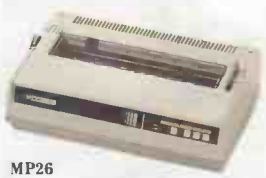

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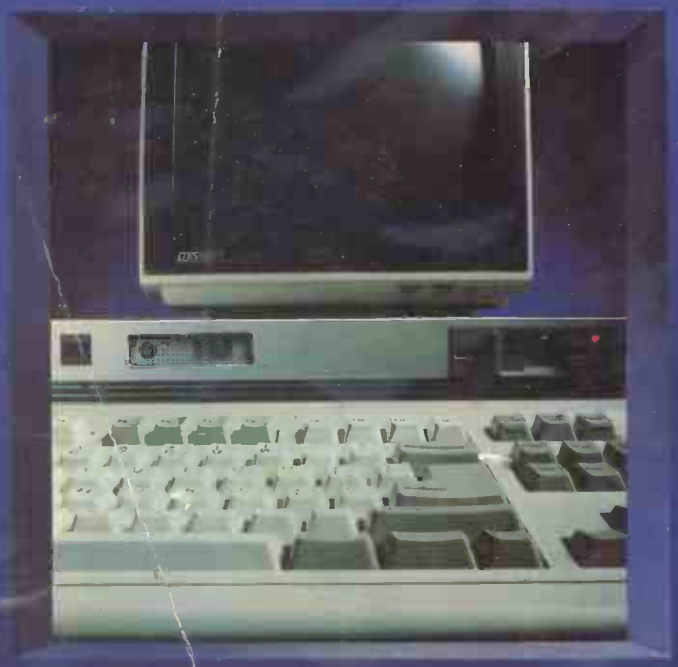

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