

Personal Computer

US\$2.95/SFr4.8/ir£1.76/BFr127
Lire4,500/Dkr31.00

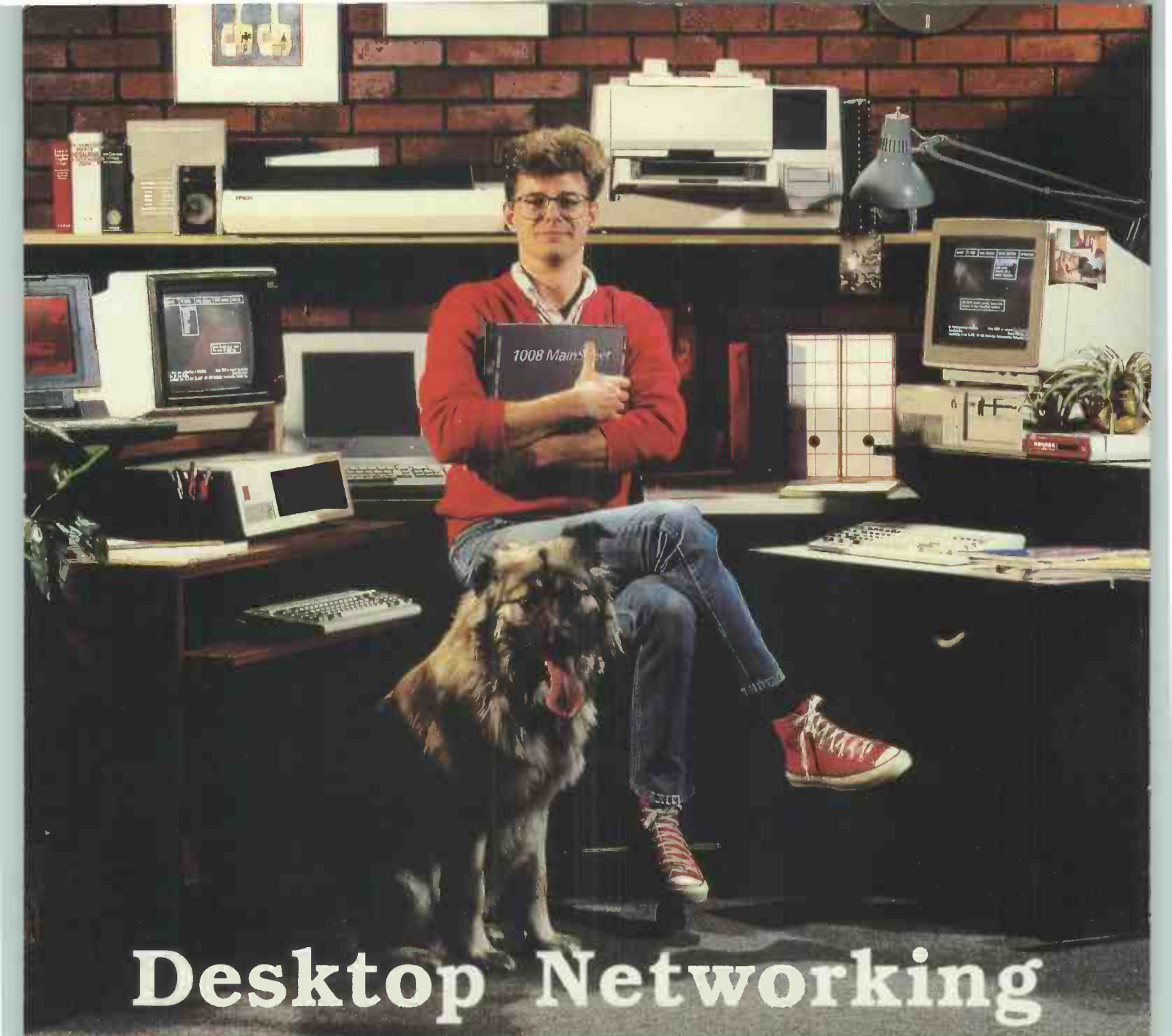
World July 1987 £1.20

Pocket power
from the
HP-28C

BRITAIN'S BIGGEST MICROCOMPUTER MAGAZINE



ATARI DESKTOP PUBLISHING
Exclusive triple Benchtest



Desktop Networking

A MainStreet™ data controller puts you back in control

Living with a computer was simple when you only had a printer. But once you added a modem and several other devices, life became more complex. You seemed to spend more time changing cables, activating switches and altering settings than you did working with your computer.

Now there is an alternative ... a MainStreet data controller from Newbridge. The controller takes care of your peripherals while you take care of business.

Available in two models for use with up to 48 connected devices, MainStreet controllers let you transform your independent computers and peripherals into an integrated desktop network which concentrates, directs and manages the flow of information from your desktop. You and your co-workers can share information, peripherals and other computing resources.

And, to make your life even easier, your desktop network is surprisingly affordable.



NEWBRIDGE

Networks for all ... big and small

- Newbridge Networks Limited 22 Welsh Street, Chepstow, Gwent, UK NP6 5LL Tel. 02912 6896
- Newbridge Networks Corporation 1051 Baxter Road, Ottawa, Ontario, K2C 3P2 (613) 726-1601
- Newbridge Networks Inc. 13873 Park Center Road, Suite 160, Herndon, VA 22071 (703) 834-3600 • 7114 West Jefferson Ave. Suite 106, Lakewood, CO 80235 (303) 986-3600

Newbridge, MainStreet and the Newbridge logo are trade marks of Newbridge Networks Corporation. Copyright 1987.

THE C LANGUAGE

High C is the first 386 compiler for DOS. Turbo C looks wizard.

Alcor C	Z80 + CP/M-80	£ 85
Aztec C Personal 1.06D	CP/M-80	£125
Aztec Commercial 1.06D	CP/M-80	£215
BDS C 1.60	Z80 + CP/M-80	£ 70
Eco-C v3.48	Z80 + CP/M-80	£ 50
Hi-Tech C	Z80 + CP/M-80	£ 99
Mix C	Z80 + CP/M-80	£ 45
Toolworks C/80 v3.2	CP/M-80	£ 45

Advantage C++	MS-DOS	£440
Aztec Apprentice	MS-DOS	£ 40
Aztec Prime	MS-DOS	£ 75
Aztec C86 Developer	MS-DOS	£190
Aztec C86 Commercial	MS-DOS	£310
CI C86 Plus	MS-DOS	£290
De Smet C88 Starter	MS-DOS	£ 85
De Smet C88 Programmer	MS-DOS	£125
De Smet C88 Enhanced	MS-DOS	£165
De Smet C88 Prof.	MS-DOS	£200
ECO-C88 V3.22	MS-DOS	£ 50
HIGH C (Metaware)	MS-DOS	£345
HIGH C 386	MS-DOS	£595
Hi-Tech C	MS-DOS	£ 99
Lattice C v3.10	MS-DOS	£225
Mark Williams MWC86	MS-DOS	£385
Mark Williams LETS C	MS-DOS	£ 60
Microsoft C v4.0	MS-DOS	£235
MIX C	MS-DOS	£ 45
Turbo C	PC-DOS	£ 80
Toolworks C v3.2	MS-DOS	£ 45
Wizard C v3.0	MS-DOS	£300
Zorland C v2.05	PC-DOS	£ 29
Zorland C Power Pack	PC-DOS	£ 59

Aztec C86 Developer	CP/M-86	£250
Aztec C86 Personal	CP/M-86	£150
CI Optimizing C86	CP/M-86	£270
De Smet C Starter	CP/M-86	£ 85
De Smet C Programmer	CP/M-86	£125
De Smet C Enhanced	CP/M-86	£165
Hi-Tech C	CP/M-86	£ 99
Lattice C v1.04	CP/M-86	£260

Aztec C65 V1.05	Apple DOS	£195
Aztec C65 V3.20	Apple PRO-DOS	£250
Aztec C65 Prime	Apple DOS	£ 75

Aztec C68 Commercial	MACINTOSH	£310
Aztec C68 Developer	MACINTOSH	£190

Hi-Tech C	ATARI	£ 99
Lattice C	ATARI	£ 80
Mark Williams C	ATARI	£140

C CROSS COMPILERS

We supply Aztec, Lattice, IAR and Hi-Tech Cross Compilers hosted on MS-DOS and targeted on Z80, 8085, 6502, 6801, 68HC11, 6301, 8051 and 68000. Please call for information or advice.

C INTERPRETERS

C-terp	PC-DOS	£180
Interactive C	PC-DOS	£195
Introducing C	PC-DOS	£ 85
Living C	PC-DOS	£ 70
Instant-C v2.0	MS-DOS	£380
RUN/C	MS-DOS	£ 60
RUN/C Professional	MS-DOS	£120

Living C	Apricot MS-DOS	£ 70
----------	----------------	------

Instant-C v1.27	CP/M-86	£380
-----------------	---------	------

CROSS ASSEMBLERS

We supply cross-assemblers by Avocet, 2500AD, and IAR Systems for more than thirty target processors to run on MS-DOS, CP/M-86 and CP/M-80. This totals more than 200 products and we do not have space to list them all here. We hold some stock but you should allow 10-14 days for delivery. Please call for information or advice.

C LIBRARIES

DATABASE

Btrieve	MS-DOS	£190
Btrieve/Network	MS-DOS	£460
CBTREE	(source any C)	£ 80
C-Index/Plus	(source any C)	£175
C-ISAM (L,MS)	MS-DOS	£225
C-to-dBase (source CI)	MS-DOS	£120
C-tree	(source any C)	£230
R-tree	MS-DOS	£175
db-VISTA	(most C's)	MS-DOS £145
db-VISTA	(with source)	MS-DOS £345
db-QUERY single-user	MS-DOS	£145
db-QUERY multi (w.sce)	MS-DOS	£345
Lattice dBCII	(L) MS-DOS	£170
Lattice dBCIII	(L) MS-DOS	£170
SoftFocus Btree	(source any C)	£ 55
Softfocus ISAM	(source any C)	£ 30
Virtual Memory File Man.	PC-DOS	£150

GRAPHICS

Essential Graphics	PC-DOS	£150
GFX Graphics	PC-DOS	£ 60
GraphiC (CI,L,DS,MS3)	PC-DOS	£255
GSS Kernel	PC-DOS	£350
GSS Lattice Binding	PC-DOS	£110
GSS Graph.Tlkt (L,MS,+)	PC-DOS	£335
GEM Prog.Toolkit (L)	PC-DOS	£405
GSX Prog.Toolkit (DR)	PC-DOS	£270
Multi-HALO (CI,L,MS3)	PC-DOS	£175
MetaWINDOWS (CI,L,MS3)	PC-DOS	£100
MetaWINDOWS Plus	PC-DOS	£140

SCREEN & WINDOWS

Blaise View Manager	PC-DOS	£245
Curses Screen Mngr. (L)	PC-DOS	£120
Entelekon Windows(s'ce)	PC-DOS	£ 99
Multi-windows (MS,L)	PC-DOS	£225
Panel (Most Compilers)	MS-DOS	£205
Vitamin C (source)	PC-DOS	£175
Windows for Data (most)	PC-DOS	£280
Windows for C (most C)	PC-DOS	£175
Greenleaf Datawindows	MS-DOS	£110

PR GRAM EDITORS

Spoilt for choice with so many good things here

BRIEF v2	PC-DOS	£155
EC Editor v2.1	PC-DOS	£ 40
Epsilon v3.1	PC-DOS	£140
Lattice CVUE	PC-DOS	£ 95
FirstTime for Pascal	PC-DOS	£190
FirstTime for Turbo-P	PC-DOS	£ 60
Pmate PC v4	PC-DOS	£120
RED v6.6 (with C S'ce)	PC-DOS	£ 65
XTC (with Pascal source)	PC-DOS	£ 65
Vedit-Plus	PC-DOS	£120
FAST-C (debug.util) L	PC-DOS	£195

CSE (with C source)	MS-DOS	£ 75
MIX Editor	MS-DOS	£ 35
Pmate 86 v4.00	MS-DOS	£115
Vedit-Plus	MS-DOS	£120

Vedit-Plus	CP/M-86	£120
------------	---------	------

CSE (With C source)	CP/M-80	£ 75
MIX Editor	Z80 + CP/M-80	£ 35
Nevada Edit	CP/M-80	£ 35
Vedit-Plus v2.33	CP/M-80	£120

For more information please call us.

DI K COPYING SERVICE

We can copy files to and from 400 disk formats including CP/M, CP/M-86, MS-DOS, PC-DOS, ISIS, APPLE, SIRIUS, BBC, TORCH, APRICOT, HP150, TRSDOS, DEC RT-11, IBM BEF, ATARI520, AMSTRAD.

Our charge is £10.00 + disk + VAT with discounts on small quantities and disks are normally despatched within 24hrs of receipt.

For more information call us.

GENERAL FUNCTIONS

Greenleaf (source)	PC-DOS	£ 95
Smorgasbord (source)	PC-DOS	£150
Blaise Tools 2 (source)	PC-DOS	£ 75
Blaise Tools Plus (sce)	PC-DOS	£135
ESI Utility Lib(source)	PC-DOS	£115
Entelekon Funct(source)	PC-DOS	£ 99
Phoenix Pforce (source)	PC-DOS	£235
Phoenix Pforce C++ (sce)	PC-DOS	£235
Security Library object	MS-DOS	£ 95

COMMS LIBRARIES

Blaise Asynch (source)	PC-DOS	£125
Greenleaf Comms(source)	PC-DOS	£ 95
Novum Comms (source)	PC-DOS	£140

SCIENTIFIC LIBRARIES

Wiley Scientific Lib.	ANY C	£125
Mathpak 87 (L,MS)	MS-DOS	£ 80

PROGRAMMERS UTILITIES

PC-Lint	MS-DOS	£ 80
Pre-C (Phoenix Lint)	MS-DOS	£175
Figureflow C-DOC	MS-DOS	£165
C-BROWSER	PC-DOS	£190
C Toolset	MS-DOS	£ 90
Lattice Cross Ref.	MS-DOS	£ 40
Lattice Text Utilities	MS-DOS	£ 85

REAL TIME & MULTI-TASKING TOOLS

Csharp (CI,L2,MS3) s'ce	MS-DOS	£480
Concurrent C (PC/MPX)sce	MS-DOS	£ 60
Multi C (L,MS,CI)	PC-DOS	£120
Multicomms (L,MS)	PC-DOS	£120
Multiforms (L,MS)	PC-DOS	£125
Multi Windows (L,MS)	PC-DOS	£225
Op.Sys.T'box (MS) s'ce	PC-DOS	£ 70
Timeslicer v3.01 (L)	PC-DOS	£ 90

PRICES AND DELIVERY

Prices do not include VAT or other local taxes but do include delivery in UK and Europe. Please check prices at time of order, ads are prepared some weeks before publication.

Order by phone with your credit card.

PROGRAMMING TOOLS

Ada Compilers	Algol Compilers
Assemblers	Assembler Libs.
Basic Compilers	Basic Interpreters
Basic Utilities	Basic Libraries
BCPL Compilers	C Compilers
C Interpreters	C Libraries
C Utilities	Cobol Compilers
Comms.Libraries	Cross Assemblers
Database Libs.	Debuggers
Dis-assemblers	Editors
Engineers Libs.	Expert Systems
Forth	Fortran Compilers
Fortran Libraries	Graphics Libraries
Icon	Linkers
Lisp	Modula-2
Nial Interpreters	OPS 5
Pascal Compilers	Pascal Libraries
Prolog	Screen Libraries
Smalltalk	Snobol

We stock many items for which there is no space in these advertisements.

LINKERS

Plink-86 Plus v2.22	MS-DOS	£285
Link & Locate	MS-DOS	£250

Plink-II	CP/M-80	£315
SLRNK (Z80)	CP/M-80	£ 45
SLRNK-PLUS (Z80)	CP/M-80	£150

GREY MATTER

4 Prigg Meadow, Ashburton, Devon TQ13 7DF
TEL. (0364) 53499

4 Prigg Meadow, Ashburton, Devon TQ13 7DF
TEL. (0364) 53499

4 Prigg Meadow, Ashburton, Devon TQ13 7DF
TEL. (0364) 53499

CONTENTS



Vol 10 No 7 July 1987

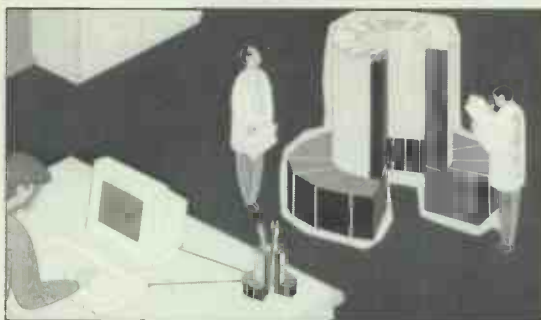
Cover photography by Chris Bell
Cover story begins on page 96

BENCHTESTS & REVIEWS

- ATARI DESKTOP PUBLISHING** 96 The new Mega ST4 and laser-printer from Atari look set to drastically reduce the cost of desktop publishing. Nick Walker takes a look at the hardware while Owen Linderholm tests the two leading packages to complement this system: Fleet Street Publisher from Mirrorsoft and Publishing Partner from SoftLogik.
- HP-28C CALCULATOR** 108 For engineers, scientists and mathematicians, this programmable calculator puts a lot of PCs to shame. Nick Walker discovers the power behind Hewlett-Packard's new HP-28C.
- INTEL INBOARD 386/AT** 120 Can't wait for the price of 386 machines to drop? There's an alternative — plug an expansion card into your existing machine. Peter Jackson drives his PC/AT to new heights with Intel's own Inboard expansion card, with Orchid's Jet 386 also getting a quick spin.
- GRAPHICWORKS** 130 Computer artist Ian McKinnell uses a Macintosh every day for his work. We gave him the new improved Graphicworks from Mindscape and it soon became a part of his palette of Mac art applications.
- AMX DESKTOP** 140 Amstrad calls it a word processor, but as many people know the PCW 8256/8512 machines are also powerful CP/M computers. Now AMS has given the Joyces a 'Mac'-like graphical front-end complete with windows, icons and pull-down menus. Robert Schifreen was pleasantly surprised with its quality.
- TURBO PROLOG TOOLBOX** 150 Borland's Turbo Prolog gave PC-compatibles an AI programming language at a bargain price. Mike Liardet tests the official Borland toolkit for this package which was designed to remove the drudgery out of producing professional-looking applications.
- WORDSTAR 4** 158 Owen Linderholm reviews the latest version of that legendary word processor, WordStar. He finds it a desirable upgrade but doubts its ability to attract new users.
- DELL 286¹²** 112 The very successful US mail-order company PC's Limited is coming to the UK. Under the name Dell Computers it will be offering high-quality PC/AT-compatibles at very competitive prices. Robert Schifreen takes delivery of the first UK model.

Founder Angelo Zgorelec Editor Derek Cohen Deputy Editor Nick Walker Production Editor Ginny Conran Deputy Production Editor Lauraine Danker Technical Editor Owen Linderholm Staff Writer Robert Schifreen Editorial Secretary Debbie Wallace Consultant Editors David Tebbutt, Dick Pountain Art Director Martyn J Rowbotham Art Assistant Soo Abram Publishing Director Mike Agate Publisher Mike James Production Controller Judith Middleton Production Manager Rachel Wynne Production Assistant Howard Bowles Group Advertisement Manager Jan Pitt Advertisement Manager Moira Thomson Sales Executives Julie Carter, Janett Harrison, Stephen Babb, Sally McLester Advertisement Assistant Val Young

FEATURES



A CRAY FOR EVERY DESKTOP 124

The day of the desktop VAX has arrived. Nick Hampshire ponders the possibilities of very high-powered microcomputers and describes the obstacles to producing a desktop Cray.

IMPORTANCE OF STYLE 134

Micro programmers have tended to

take little heed of their big brothers on mainframes, but there is a lot to learn from them. One such example is the use of structure diagrams. Mark Burgess describes the benefits of this programming methodology.

SIXTH SENSE 144

Braille mice, text-to-speech synthesisers, voice recognition. Martin Banks takes a close look at the problems involved in producing computer products for the handicapped.

CP/M MAKES PROGRESS 154

There's still lots of life left in CP/M computers, proves Mike James, as he takes a close look at CP/M Plus and makes it perform tricks that MS-DOS owners would find difficult.

REGULARS

NEWSPRINT

Will Atari buy Immos or just put Transputers in its next products? Guy Kewney reveals Jack Tramiel's latest machinations, as well as unveiling another month's worth of new products and noteworthy events.

WEST COAST CONNECTION 85

Can Commodore survive Atari's aggressive marketing tactics? And why are our American cousins snapping up dedicated games consoles? Tim Bajarin shares his inside knowledge.

LETTERS

Support for Jonathan Green's criticism of computerised style-checkers; and Acorn straightens the record on its independence from Olivetti.



BANKS' STATEMENT

Martin Banks tries to peer out of

70 the cloud of dust produced by the IBM launch of the Personal System/2 and concludes it will be a long time before the dust settles.

COMPUTER ANSWERS 166

How do you include GEM graphics in text files; do laser printers have to leave a bad taste in your mouth; how do you switch display modes on Atari STs? Our experts have the answers.

BIBLIOFILE 172

What lurks inside Dirk Gently's holistic Detective Agency? Douglas Adams' new novel is reviewed, alongside the latest in coffee-table computing.

MAILBOX 174

Peter Tootill surveys the latest in high-speed modems, and discusses the pleasures and problems of communicating through the Mercury network.

PROGRAM FILE 179

Owen Linderholm explains how to add and subtract numbers of any size, while readers' programs make hexagonal worms with a Mac; play Space Invaders on a Psion organiser; and produce coloured artwork on a BBC.

END ZONE 208

Sell your old computer or join a new club, plus the usual gallery of specialist columns.

ADVERTISERS' INDEX

Who sells what, and where.

CHIPCHAT

I.S.C.

Offer the UK's Best Service on computer software

**COME TO THE EXPERTS — I.S.C. ARE THE LARGEST
INDEPENDENT PEGASUS DEALER IN THE U.K.**

PEGASUS ACCOUNTING

(All Pegasus includes FREE 2 year support)

PEGASUS SINGLE USER	£160
Multi Company, Eight Module Integration	
PEGASUS SENIOR	£295
Multi Company, Currency, Consolidations	
PEGASUS MULTI USER	£345
Multi Company, Currency, Workstation, MSDOS	
INFORMATION MANAGER	£160
Reads Data directly from Pegasus Files	
ELITE SENIOR DATABASE	£345
Reads + Writes Pegasus Data Files	
WORK INVOICING	£295
Integrated with Pegasus Single User for Complex Invoicing and Repeat Billing	
SUPPORT CONTRACT	£50
Prices per Module over 2 Years	
Free to ISC Customers	
(Multi User 100 pounds per module)	

*Data Transfer, Upgrades, Bespoke, Training
+ Installation Services Available.*

STATIONERY

Prices are per 500, total order minimum 1000

2 PART STATEMENTS	£26
3 PART STATEMENTS	£27
2 PART INVOICES	£29
3 PART INVOICES	£31
4 PART INVOICES	£43
PAYSLIPS	£21
REMITTANCE ADVICE	£32
BANK GIRO	£19
P14/P60	£34
P35	£34
STATEMENT ENVELOPES	£22
PAYSLIP ENVELOPES	£21

*Please Call for Sample Sets.
Free Delivery Mainland U.K.*

**I.S.C. OFFER A FULL TECHNICAL ADVICE,
SUPPORT AND INSTALLATION SERVICE +
CUSTOMISED SINGLE AND MULTI USER
SYSTEMS**

SMART INTEGRATED SOFTWARE

SMART SYSTEM V3.0	£395
Includes Database, Spreadsheet + WP	
DATABASE MANAGER	£275
SPREADSHEET	£275
WORDPROCESSOR	£195
SPELLCHECKER	£95
SMART LAN MULTIUSER	£1395
For Networking, Three User Access	
SMART SYSTEM USER ACCESS	£450
For Unlimited User Access	

TRAINING

I.S.C. offer training at your premises,
on a wide range of Software and
Hardware Products.

WORDSTAR PROFESSIONAL

LOTUS 1-2-3

SMART INTEGRATED SOFTWARE

PEGASUS ACCOUNTS

NETWORKING PRODUCTS

DBASE 2/3/+

*** * * Many Other Single and Multi
User Products**

MULTIUSER

TANDON PCA30 30MB 80286 PROCESSOR 1MB RAM
2 IBM STYLE TERMINALS
5 MODULES OF MULTI-USER PEGASUS ACCOUNTING
2 DAYS INSTALLATION AND TRAINING
2 YEARS HOT LINE SUPPORT **£5995**
(EQUIVALENT TO 33% DISCOUNT)
**(THE ABOVE IS ONLY AN EXAMPLE, OTHER COMPUTERS OR
SOFTWARE AVAILABLE**

I.S.C.**XEN IN STOCK****AMSTRAD PC
MAIN DEALER**

*** Guarantee the UK's lowest
prices on computer systems**

COMPUTERS*All Computers include Mono Screen, MS DOS and KB*

TANDON PCX10 /256K/10MB/360K	£795
TANDON PCX20 /256K/20MB/360K	£955
TANDON PCA20 /512K/20MB/1.2MB/SP/HERC	£1495
TANDON PCA30 /512K/30MB/1.2MB/SP/HERC	£1750
TANDON PCA40 /512K/40MB/1.2MB/SP/HERC	£1845
TANDON PCA70/512K/70MB/1.2MB/SP/HERC	£2245
AMSTRAD PC1512/512K/TWIN DRIVE/MONO	£595
AMSTRAD PC1512/512K/TWIN DRIVE/COLOUR	£750
AMSTRAD PC1512/512K/20MB/360K/MONO	£935
AMSTRAD PC1512/512K/20MB/360K COLOUR	£1095
12 MONTHS ON SITE MTCE INCLUDED	
APRICOT XEN X120/512K/20MB 1.2MB	£1950
APRICOT XEN XD20/1MB/20MB/1.2MB	£2095
APRICOT XEN XD45/1MB/45MB/1.2MB	£2695
APRICOT XEN 386 1MB/30MB/1.2MB	£2695
APRICOT XEN 386 2MB/45MB/1.2MB	£3445
IBM XTSD/640K/TWIN 360K	£1395
IBM XTSD/640K/20MB/360K	£1595
IBM XT286/640K/20MB/1.2MB	£2260
IBM ATX/512K/30MB/1.2MB	£2999
AST M20/640K/20MB/1.2MB/10MHZ/EGA COLOUR	£2195
AST M40/640K/40MB/1.2MB/10MHZ/EGA COLOUR	£2495
AST M70/640K/70MB/1.2MB/10MHZ/EGA COLOUR	£2695
COMPAQ D286M2/512K/30MB/1.2MB	£3095
COMPAQ D286M3/640K/70MB/1.2MB	£4595
COMPAQ D386	POA
OLIVETTI	POA
ZENITH	POA
KAYPRO	POA

COLOUR SYSTEMS ADD**THE FOLLOWING:-**

APRICOT 195 ... TANDON 215 ...
OLIVETTI 250 ... AMSTRAD 150 ...
IBM 220 ... COMPAQ 220 ... ZENITH 215 ...

**DEMONSTRATION AND SECOND
USER MACHINES AVAILABLE**

**COMPANY SERVICES
INCLUDE:**

LEASING, LEASE RENTAL + HIRE PURCHASE
CUSTOMISED DATABASE SYSTEMS,
MAINTENANCE CONTRACTS,
INSTALLATION CONTRACTS,
NETWORK SYSTEMS, MULTI-USER SYSTEMS

**TRADE AND EXPORT
ENQUIRIES WELCOME**

All products carry 12 months guarantee and

HOTLINE**PHONE SUPPORT**

*** PROVIDE A CURRENTLY ADVERTISED LOWER PRICE
WITHIN 7 DAYS AND DIFFERENCE WILL BE REFUNDED**

I.S.C. LIMITED

GRAPHIC HOUSE
88 WAVENEY ROAD
ST IVES
CAMBRIDGESHIRE
PE17 4FW

TEL: 0480 300530
(16 lines)
TELEX: 329115 ISC LTD

PRINTERS

EPSON LX800 120CPS/20NLQ/80COL	£205
EPSON EX800 300CPS/50NLQ/80COL	£395
EPSON FX800 200CPS/50NLQ/80COL	£305
EPSON LQ800 180CPS/60NLQ/80COL	£430
EPSON EX1000 300CPS/50NLQ/132COL	£515
EPSON FX1000 200CPS/50NLQ/132COL	£395
EPSON LQ1000 180CPS/50NLQ/132COL	£575
EPSON LQ2500 270CPS/90NLQ/132COL	£815
FUJITSU 2100 220CPS/55NLQ/80 COL	£295
FUJITSU 2200 220CPS/55NLQ/132COL	£395
CANON A55 180CPS/45NLQ/132COL	£375
CANON LBP8A1 LASER 8 PAGE PER MIN	£1495
CANON LBP8A2 LASER 8 PAGE PER MIN/GRAPHICS	£2295
CANON LBP SERIES 2 8 PAGE PER MIN/GRAPHICS	£1895
HP LASERJET 8 PAGE PER MIN	£1695
HP LASERJET+ 8 PAGE PER MIN	£2295
HP SERIES 2 8 PAGE PER MIN	£1995
JUKI 6100 15CPS/DAISYWHEEL	£275
JUKI 6200 30CPS/DAISYWHEEL	£425
JUKI 6300 35CPS/DAISYWHEEL	£645
JUKI 7200 PRINTER	£1350

SOFTWARE

PEGASUS SINGLE USER	£160
(2 YEARS SUPPORT)	
PEGASUS SENIOR	£POA
(2 YEARS SUPPORT)	
PEGASUS MULTI USER	£POA
(2 YEARS SUPPORT)	
DELTA 4 PROFESSIONAL	£335
DBASE2	£245
DBASE3+	£355
WORDSTAR PROFESSIONAL	£209
WORDSTAR 2000	£259
MICROSOFT WORD	£270
LOTUS 1-2-3 V1	£179
LOTUS 1-2-3 V2	£269
LOTUS SYMPHONY	£359
SMART INTEGRATED SYSTEM	£395
OPEN ACCESS	£335
LOGISITIX	£255
SAGE BOOKKEEPER	£80
SAGE ACCOUNTANT	£120
SAGE ACCOUNTANT+	£150
VENTURA	£645
ABILITY	£90

SPECIALS

APRICOT 256K RAM	£99
APRICOT 512K RAM	£119
IBM 256K RAM	£119
IBM 384K RAM	£139
SONY 3.5 INCH D/S DISKS	£32
20MG UPGRADE FOR IBM	£395
E.G.A. CARD + MONITOR	£695
HERC/CGA/EGA	

Prices Exclude only VAT and Delivery

SCOTTISH OFFICE:
I.S.C. SCOTLAND
19 CARDEN PLACE
ABERDEEN
AB1 1UQ

TEL: 0224 639944
(3 lines)



BACKUP your troubles **£29.95** in your old **CLIP** bag!

CLIP — THE BACKUP PROGRAM STANDARD

The PROBLEM —

Your free backup utility is slow, difficult to use, and can only restore files into ready-made directories.

It does not record its progress — so you backup everything to be safe.

Or nothing because it's such a bore.

CLIP has the longest track record of all backup programs and an enviable reputation for reliable service. Purchasers of 1000+ copies of CLIP include British Telecom, Philips and Ashton-Tate.

Only the best will do for backup.

The SOLUTION —

CLIP keeps a log of its backups, so you can afford to be selective.

It maintains a menu of your customised commands, so you do not have to stop and think. It is fast, and it compresses data.

Result — fewer disks, less time, less effort, no worry, greater security.

- ★ High-speed data compression
- ★ Execute by highly visual Menu for by command line entry
- ★ On-line help at every point
- ★ Can select new files only
- ★ Multiple wildcard select, include or exclude basis.
- ★ Save to any media-floppy, hardcard Bemoulli etc
- ★ Save to remote/network drive
- ★ Restores directories + files
- ★ Recovery after media errors
- ★ Log of all backup operations

For an experimental period, CLIP 4.0L is offered at £29.95, (The previous advertised price was £67.85). Order now and prove that the trial price is the right one for you and us. Available for PC/XT/AT and compatibles, PCDOS/MSDOS. Price includes VAT and UK postage. c.w.o. or Access



KEELE CODES LTD

University of Keele, Keele, Staffordshire, UK Tel: (0782) 629221 Telex: 36113

THE COMPLETE COMMUNICATIONS SOFTWARE

SEND

FOR IBM PC/XT, IBM AT,
IBM COMPATIBLES,
APRICOTS, AMSTRAD PC,
VICTOR & SIRIUS.

- ★ Free registration to Telecom Gold

Also from
MESSITER SOFTWARE:

**TRANS
PARENT**

superb wordprocessor,
database & mailmerge suite.
£49.95 + £2 p&p + VAT

Telecom Gold is the trademark of British Telecommunications plc

★ MEMORY RESIDENT

- ★ Perfect and total VIEWDATA emulation (PRESTEL)
- ★ Supports EGA, CGA, HERCULES and PC1512 GRAPHICS.
- ★ Virtual (offline) PRESTEL Mailbox editor
- ★ Record and REPLAY ANIMATED frames
- ★ Save VIEWDATA pages to disk and print WITH GRAPHICS.
- ★ User definable menus.
- ★ Access electronic mail services and British Telecom Gold
- ★ Access bulletin boards
- ★ Transfer all types of files AND PROGRAMS between computers
- ★ View directories for remote and/or local disks.
- ★ Built-in TEXT EDITOR for message preparation.
- ★ User definable AUTODIAL, AUTO LOG-ON and telephone directory
- ★ Full, clear manual.
- ★ Online time display in VIEWDATA mode
- ★ Help screens and telephone helpline available
- ★ Automatic error detection and correction
- ★ XMODEM and XON / XOFF file exchange
- ★ User definable BAUD rate, parity, word length, stop bits, timeout
- ★ SOFTWARE DOWNLOADS

- ★ Unattended execution of command files

From MESSITER SOFTWARE.

67, Crescent West, Hadley Wood, Herts. EN4 0EQ, England Tel. 01-449 2994

PRICE
£49.95
Plus £2 p+p
PLUS VAT.

WERRINGTON COMPUTERS LTD

**BRINGS YOU THE MOST
COMPETITIVE PRICES YET**

Software

Pegasus Single user per module.....	£160
Pegasus Multi user per module.....	£355
Pegasus Senior per module.....	£300
Delta Professional	£345
DBase 3+	£355
Word Star Professional	£225
Word Star 2000	£279
Sage Bookkeeping.....	£95
Sage Accountant	£135
Sage Accountant + ...	£165
Lotus 1-2-3	£299
Lotus Symphony	£415
Psion X Change	£325
Smart Series	£450

Printers

Epson FX800	£310
Epson FX1000	£410
Epson LQ800.....	£445
Epson LQ1000.....	£585
Epson EX800.....	£415
Epson EX1000.....	£525
Canon A50.....	£295
Canon A55.....	£375
Juki 6100	£295
Juki 6200	£425
Fujitsu 2100.....	£315
Fujitsu DX2200.....	£415
Canon A1 Laser.....	£1895
Canon A2 Laser.....	£2750
HP Laser	£1995
HP Laser Jet	£2675

Computers

Apricot Xen HD + Monitor.....	£2325
Apricot Xen Xi20 + Monitor	£1799
Apricot Xen i XD 20Mb.....	£2195
Apricot Xen i XD 45Mb.....	£2795



Apricot Xen 386 30Mb + Monitor £2895

IBM Compatibles

Tandon PCX 10 System.....	£795
Tandon PCX 20 System.....	£995
Tandon PCA 20 System.....	£1495
Tandon PCA 30 System.....	£1795
Tandon PCA 40 System.....	£1895
Tandon PCA 70 System.....	£2295
Kaypro 286i 20Mb.....	£1650

Consumables

Apricot 256k Ram Board	£105
Apricot 512k Ram Board	£125
Box of 5¼" XT Disks	£20
Box of 5¼" AT Disks	£35
Box of Sony 3½" Double Sided Disks	£35

**PRICES EXCLUSIVE OF VAT
AND DELIVERY AND SUBJECT
TO AVAILABILITY**

TRADE + EXPORT WELCOME

**PLEASE CALL IMMEDIATELY FOR FURTHER DETAILS
0733 322488**

WERRINGTON COMPUTERS LTD 44 WOODHALL RISE,
WERRINGTON, PETERBOROUGH

ATT peripherals CORPORATION

SPECIALISTS IN EXPORT

PRINTERS

EPSON LX 86	£195	NEC P5	£799
EPSON FX 105+	£37	NEC P6	£425
EPSON EX 1000			£515
EPSON LQ 1000			£575
EPSON LQ 2500			£765
BROTHER HR20			£355
BROTHER HR25 XL			£532
BROTHER M1509			£385
BROTHER M1409			£299
BROTHER TWINWRITER			£975
FULL RANGE OF SIEMANS PRINTERS AVAILABLE			

MODEMS

HAYES SMART MODEM	£360
DOWTY QUATRO	£612
DOWTY MINIMO + 2	£209
DACOM DSL 2123	£172
MIRACLE WS2000	£105
PC COMMS QUATROCARD	POA
RACAL MILGO	POA
THORN DATATECH	POA

MONITORS + ADD-ON BOARDS

NEC MULTISYNC	£544
SONY 10" COLOUR	£495
TAXAN EGA	£418
INTEL INBOARD 386	£1260
ORCHID JET 386	£740
AST PREMIUM/RAMPAGE	POA
HERCULES MONO	£199
HERCULES COLOUR	£105

DRIVES + TAPE BACK UP

SEAGATE 20Mb ST225 Inc WD Cont	£372
SEAGATE 30 Mb ST238 + Cont	£504
SEAGATE 40Mb ST251	POA
RODINE	POA
EVEREX INT 20 Mb T/S	£665
EVEREX INT 60 Mb T/S	£890
EVEREX EXT 20 Mb T/S	£746
EVEREX EXT 60Mb T/S	£970

MOUSE DEVICES + SOFTWARE

MS MOUSE	£142
PC MOUSE	£130
LOGIMOUSE	£76
SUMMA MOUSE	89
MS WORD	£249
DB3+	POA
LOTUS 123	POA
SUPERCALC	POA
MULTIMATE ADV	POA
SMART	POA

ACCESSORIES

DRAMS 664K	£1.50
DRAMS 256K	£5.00
DRAMS 128K	£9.00
MATHSCO-PRO 80287 - 6MHz	£175
MATHSCO-PRO 8087 - 5MHz	£105
MATHSCO-PRO 8087 - 8MHz	£140

SPECIAL OFFERS

PARALLEL PRINTER CABLES	£12.50
EP TONER CART	£74.95

RING NOW: 01-739 4596

**ATT
peripherals**

Corporation Ltd

(T1) INDUSTRIAL UNITS STANWAY STREET LONDON N1 6RY
TEL: 01-739 4596 Telex 895 1182 GECOMSG



AMERICAN
EXPRESS



ATT Corporation Ltd

PRICE GUARANTEE

PROVIDE A WRITTEN LOWER QUOTATION FROM AN AUTHORISED DEALER WITHIN 7 DAYS OF PURCHASE AND THE DIFFERENCE WILL BE REFUNDED!

CALLERS BY APPOINTMENT ONLY "PRICES SUBJECT TO FLUCTUATION. VAT NOT INCLUDED"

SPECIALISTS IN EXPORT

APPLE

MACINTOSH SE 2x800	£1940
MACINTOSH SE 1x800/20MB	£2500
Keyboard for the above	£75
MACINTOSH PLUS.	£1570
MAC 512-800	£1480
IMAGEWRITER II	£365
IMAGEWRITER 15"	£405
MAC DRIVE 800K	£310
HARD DISK 20Mb	£850
APPLE LASERWRITER	£3750
LASERWRITER PLUS	£4400

APRICOT

★ SPECIAL ★	£1575
XEN XI/512k/10Mb/1.2Mb	£1975
XEN XI/512k/20Mb/1.2Mb	£2300
XEN I/1Mb RAM/20Mb/1.2Mb	£3050
XEN XD/1Mb RAM/40Mb/1.2Mb	£2350
XEN 80386/1Mb RAM/30Mb/1.2Mb	£3150
XEN 80386/2Mb RAM/45Mb/1.2Mb	£280
P/WHITE MONITOR	£140
GREEN MONITOR	£160
MONO CARD	£299
EGA CARD	

LASER PRINTERS

★ SPECIAL PRICES ★	£4500
T.I. OMNILASER MODEL 2015	£1499
CANON AI LASER PRINTER	£2400
CANON AI LASER PLUS	£1750
CANON LBP 8/2 Pand Sparts	£1599
HP LASER JET	£1975
HP LASER JET II	£2100
HP LASER PLUS	

products carry a 12 months Full
Guarantee with HOTLINE Phone Support

AFFORDABLE DESKTOP PUBLISHING

COMPUTER — KAYPRO 286i

Intel 80286 Processor
20Mb Hard Disk
1.2Mb Floppy Drive
640k RAM
Tri Mode Video Card
Mono Monitor

LASER PRINTER — CANON LBP-8 II

8 Pages per minute
300 DPI
512k RAM to 1.5Mb
Including Printility + Cable + Toner

SOFTWARE

Ventura Publishing
Microsoft Word

★ **£4300** ★

COLOUR SYSTEM add £200
80386 Machine Add £2400

FINANCE

LEASE RENTAL
CASH
LEASE PURCHASE
HIRE PURCHASE
INSTANT CREDIT (Subject to Status)

RING NOW: 01-729 7033

ATT Corporation Ltd

(TI) INDUSTRIAL UNITS STANWAY STREET LONDON N1 6RY

TEL: 01-729 7033

Telex: 895 1182 GECOMS G





(0923) 43301
(24 hours)
(0923) 41921

ALL PRICES EXCLUDE VAT & POSTAGE
Export, Government & Educational Orders Welcome
All enquiries & payments to
RSC Ltd, 75 Queens Road, Watford WD1 2QN
Telex: 265871 MON REF G. REF CJJ128
Tel: (0923) 43301-41921
Callers Welcome

All prices subject to change without notice — all goods subject to availability.

ALL PRICES INCLUDE VAT — INSURANCE & CARRIAGE

AMSTRAD

AMSTRAD PC1512 SINGLE DRIVE MONO	£425.00
AMSTRAD PC1512 DOUBLE DRIVE MONO	£535.00
AMSTRAD PC1512 SINGLE DRIVE COLOUR	£582.00
AMSTRAD PC1512 DOUBLE DRIVE	£690.00
AMSTRAD PC1512 20MB HD MONO	£860.00
AMSTRAD PC1512 20MB HD COLOUR	£1022.00

AMSTRAD SUMMER SPECIAL OFFER PC1512
D/D MONO + DMP3000 PRINTER +
WORDSTAR 1512 + SUPERCALC 3

£685.00

RSC's OWN COMBINATION

PC1512 S/D MONO + 32MB CARD	£780.00
PC1512 S/D COLOUR + 32MB CARD	£947.00
PC1512 D/D MONO + 32MB CARD	£895.00
PC1512 D/D COLOUR + 32MB CARD	£1060.00

TANDON

TANDON PCX TWIN DRIVE MONO	£895.00
TANDON PCX10 10MB MONO	£995.00
TANDON PCX20 20MB MONO	£1195.00
TANDON PCA-AT-SINGLE DRIVE	£1795.00
TANDON PCA20-AT-20MB MONO	£1995.00
TANDON PCA30-AT-30MB MONO	£2295.00
TANDON PCA40-AT-40MB MONO	£2495.00
TANDON PCA70-AT-70MB MONO	£2995.00

COLOUR OPTIONS AVAILABLE

TATUNG

TATUNG TCS7000 E/8/85 AT 20MB	£1450.00
TATUNG TCS7000 G/10 AT 40MB	£1825.00

OPTIONAL MONITORS AVAILABLE

OPUS

OPUS SYSTEM 1 S/D MONO	POA
OPUS SYSTEM 2 S/D 1024K RAM	POA
OPUS SYSTEM 3 D/D 1024K RAM	POA
OPUS SYSTEM 4 20MB 1024K RAM	POA

OPTIONAL MONITORS AVAILABLE

ADD ONS

TANDON 20MB HARD CARD	£405.00
TANDON 20MB HARD DISK	£434.00
SCRIBECARD 30MB HARD CARD	£370.00
TAPE STREAMER-CIPHER 1525	£413.00
(AMSTRAD PC1512 ONLY)	
HERCULES COLOURCARD	£99.00
HERCULES MONO GRAPHIC CARD PLUS	£189.00
HERCULES COMPATIBLE CARD	£85.00
EGA CARD-TUTANG	£250.00
MATHS PROCESSORS	POA

COMPUTER ACCESSORIES

RSC COPYHOLDER	£16.96
RSC 50-LOCKABLE DISK BOX	£10.00
RSC 100-LOCKABLE DISK BOX	£13.00

DISKS

BOXED IN 10'S

TDK 5.25" D/S D/D 48TPI	£12.00
TDK 5.25" D/S D/D 96TPI	£13.00
TDK 5.25" D/S D/D HIGH DENSITY	£24.00
TDK 3.5" D/S D/D	£24.00
RSC 5.25" D/S D/D 48TPI	£8.70
RSC 3.5" D/S D/D	£17.00

DOT MATRIX PRINTERS

EPSON LX86 100CPS/20NLQ/80 COL	£194.00
EPSON LX800 (NEW-LATEST)	POA
EPSON LQ800 180CPS/60NLQ/80 COL	£435.00
EPSON LQ1000 180CPS/60NLQ/132 COL	£570.00
EPSON EX800 300CPS/50NLQ/80 COL	£384.00
EPSON EX1000 300CPS/50NLQ/136 COL	£515.00
EPSON FX800 200CPS/50NLQ/80 COL	£305.00
EPSON FX1000 200CPS/50NLQ/80 COL	£399.00
EPSON LQ2500 270CPS/90NLQ/136 COL	£724.00
EPSON SQ2500 INK JET	£985.00
CANON PW1080 AT 160CPS/27NLQ/80 COL	£234.00
CANON A55 180CPS/45NLQ/132 COL	£399.00
CANON A60 200CPS/100NLQ/80 COL	£399.00
CANON A65 200CPS/100NLQ/132 COL	£491.00
PANASONIC KX-P1081 120CPS/20NLQ/80 COL	£149.00
PANASONIC P1592 180CPS/38NLQ/136 COL	£343.00
AMSTRAD DMP3000 80 COL	£156.00
AMSTRAD DMP4000 200CPS/50NLQ/WIDE	£300.00
MICRO-P135 135CPS/27NLQ/80 COL	£147.00
MICRO-P165/35NLQ/80 COL	£173.00
MICRO-P200 200CPS/40NLQ/80 COL	£235.00
MICRO-P201 200CPS/40 NLQ/132 COL	£275.00
MICRO-P480 480CPS/74NLQ/80 COL	£369.00
BROTHER TWINWRITER 5	£826.00
JUKI 3510-180CPS/45NLQ/80 COL	£265.00

DAISYWHEEL PRINTERS

PANASONIC KX-P3131U 17CPS	£240.00
MICRO-P26 26CPS	£225.00
MICRO-P40 40CPS	£330.00
JUKI 6100 20CPS	£257.00
JUKI 6200 30CPS	£417.00
JUKI 6300 40CPS	£675.00
JUKI 6400 60CPS	£965.00

COLOUR AND LASERS

JUKI 5520 COLOUR PRINTER	£335.00
CANON LBP 841 8 PAGE/A4	£1650.00
CANON LBP 8A28 8 PAGE/A4/GRAPHICS	£2450.00
CANON LBP 8 MARKII	£1850.00
HP LASER PLUS	£2290.00
HP LASER JET II	£2095.00
OKI LASERLINE 6	£1550.00
EPSON GQ3500 (LATEST)	POA

PRINTER ACCESSORIES

PC CENTRONICS CABLE	£11.00
80 COL KD PRINTER STAND	£30.00
132 COL KD PRINTER STAND	£37.00
EPSON EX-COLOUR UPGRADE	£62.00
LX86 TRACTOR FEED	£20.00
LX86 SHEET FEED	£55.00
LQ800 TRACTR FEED	£39.00
LQ1000 TRACTOR FEED	£50.00
LQ800 SHEETFEED	£135.00
LQ1000 SHEETFEED	£161.00
DAISYWHEELS, PAPER, RIBBONS, PLEASE CALL	

COMMUNICATIONS

AMSTRAD PC CARD MODEM FOR ALL PC'S AND COMPATIBLES. AUTO MODEM WITH SOFTWARE	£138.00
LINNET V21/V23 (AUTO)	£129.00
MIRACLE WS4000 V21/V23	£156.00
SAGE CHIT CHAT	£86.00
SAGE CHIT CHAT PACK (MODEM/SOFTWARE/ CABLE)	£209.00

PC SOFTWARE

LOTUS 123 VER 2.1	£260.00
LOTUS SYMPHONY	£347.00
DBASE III PLUS	£347.00
SUPERCALC 4	£213.00
WORDSTAR 2000 VER 2	£257.00
FRAMEWORK II	£347.00
SMART INGEN SYSTEM	£395.00
PEGASUS ACCOUNTS	POA

ACCOUNTS

SAGE BOOKKEEPER	£75.00
SAGE ACCOUNTANT	£115.00
SAGE ACCOUNTANT PLUS	£155.00
SAGE PAYROLL	£73.00
SAGE FIN CONTROLLER	£240.00
DAC-EASY ACCOUNTING	£73.00

DATABASES

SAGE RETRIEVE	£78.00
TAS +	£60.00
VP INFO	£69.00
PC PROMISE (FULL VERSION)	£147.00

WORD PROCESSING

SAGE PC WRITE	£73.00
WORDSTAR 1512 (AMSTRAD)	£46.00
WORD PERFECT JUNIOR	£73.00
WORD PERFECT PERSONAL	£155.00

SPREADSHEETS

SUPERCALC 3 (AMSTRAD)	£47.00
MULTIPLAN JUNIOR	£50.00
VP PLANNER	£69.00
WORDS AND FIGURES	£69.00
MICROSOFT MULTIPLAN	£150.00
SAGE PC PLANNER	£78.00

INTEGRATED

ABLE ONE	£69.00
ABILITY	£69.00
ABILITY PLUS	£129.00
PSION-FOUR	£55.00
LOGISTIX	£69.00
ABC	£129.00

DESKTOP PUBLISHING

FLEET STREET EDITOR	£110.00
PRINTSHOP	£30.00
FONTOSE	£60.00
VENTURA	£645.00

PROGRAM DEVELOPMENTS

BORLAND EURLA	£55.00
BORLAND TURBO BASIC	£55.00
BORLAND TURBO PASCAL	£55.00
BORLAND TURBO PROLOG	£55.00
BORLAND TURBO EDITOR TOOLBOX	£41.00
MICROSOFT QUICKBASIC COMPILER	£69.00
MICROSOFT LEARNING DO'S	£25.00
ZORLAND C	£25.00

GENERAL UTILITIES

CAXTON BRAINSTORM	£34.00
GEM DIARY	£27.00
GEM DRAW	£65.00
GEM GRAPH	£65.00
GEM WORDCHART	£73.00
GEM FONT EDITOR	£73.00
SAGE DESK SET	£65.00
FLYING START	£52.00
PROTEXT	£82.00

FULL ON-SITE MAINTENANCE CONTRACTS AVAILABLE
NEXT DAY DELIVERY FOR MOST HARDWARE
ALL PRICES INCLUDE FULL 12 MONTHS WARRANTY

COMPUMART

WATFORD (0923) 55633

IBM

	Mono	Colour
PC XT (SDD): (640k RAM 2 x 360k Disk)	£1100.00	£1290.00
PC XT (SFD): (640k RAM 360k + 20Mb Disk)	£1400.00	£1600.00
PC XT (286): (640k RAM 1.2Mb + 20Mb Disk)	£2000.00	£2200.00
PC ATX: (512k RAM 1.2Mb + 30Mb Disk)	£2975.00	£3170.00

All prices include Keyboard, Monitor & DOS

8087 Chip £195.00 80287 Chip £295.00 AT 360k Disk £145.00

TOSHIBA

Lap Top Computers

T1100: (256k RAM, 3 1/2" 720k Disk, 80C88 Co-pro, DOS 2.1)	£1122.00
T1100 Plus (640k RAM, 2 x 3 1/2" 720k Disks, DOS 3.2, and A/C Adapter-Charger & Carrying Case:	£1450.00
T3100: (640k RAM, 3 1/2" Disk + 10Mb H/Disk, 8MHz 80286 Co-pro, Clock Cal)	£2772.00

olivetti

	Mono	Colour
M24: (640k RAM 360k + 20Mb Disk)	£1683.00	£1897.00
M24SP: (640k RAM 360k + 20Mb Disk)	£1826.00	£2040.00
M28: (512k RAM 1.2Mb + 20Mb Disk Bs. Con)	£2266.00	£2493.00
M28: (512k RAM 1.2Mb + 40Mb Disk Bs. Con)	£2730.00	£2958.00

All prices include Keyboard, Monitor & DOS

COMPAQ

Portables

Portable II Model 2: (256k RAM 2 x 360k Disk)	£1680.00
Portable II Model 4: (640k RAM 360k Disk + 20Mb H/Disk)	£2275.00

COMPAQ PORTABLE III

640k, 286 Processor, 1.2Mb Floppy, 20Mb H/Disk:	£2914.00
640k, 286 Processor, 1.2Mb Floppy, 40Mb H/Disk:	£3234.00

Subject to availability

Portable 286 Model 3: (640k RAM 1.2Mb + 20Mb H/Disk + 10Mb Tape)	£3147.00
--	----------

All prices include DOS

Deskpros

Deskpro Model 2: (256k RAM 2 x 360k Disks)	£1307.00
Deskpro Model 3: (640k RAM 360k + 20Mb Disk)	£1797.00

New 12MHz MODELS 50% FASTER

Deskpro 286 20: (640k RAM 1.2Mb + 20Mb Disk)	£2367.00
Deskpro 286 40: (640k RAM 1.2Mb + 40Mb Disk)	£2718.00
Deskpro 286 70T: (640k RAM 1.2Mb + 70Mb Disk + 40Mb Tape Backup)	£4245.00
Deskpro 386 40: (1Mb RAM 1.2Mb + 40Mb Disk)	£4706.00
Deskpro 386 70: (1Mb RAM 1.2Mb + 70Mb Disk)	£5186.00
Deskpro 386 130: (1 Mb RAM 1.2Mb + 130Mb Disk)	£5989.00
OPTION 40Mb Tape Backup unit	£480.00

All prices include Keyboard, Dual-Mode Monitor & DOS

PRINTERS

All prices include cable

Dot Matrix		
Epson FX800: (240cps, 35cps NLQ, 80col)	£444.00	
Epson FX1000: (240cps, 35cps NLQ, 132col)	£453.00	
Epson LQ1000: (180cps, 60cps NLQ, 132col)	£681.00	
NEC P660: (180cps, 72cps NLQ, 80col)	£410.00	
NEC P760: (180cps, 72cps NLQ, 136col)	£490.00	
NEC P565XL: (264cps, 88cps LQ, 136col)	£885.00	
Toshiba P351	£856.00	

Letter Quality

NEC Spinwriter 8850: (55cps)	£899.00
IBM Quietwriter Model 1	£858.00
IBM Quietwriter Model 2	£1075.00
IBM Quietwriter Model 3	£925.00
HP Laserjet (8ppm)	£1496.00
HP Laserjet Plus (8ppm + graphics)	£2200.00
HP Laser Series II, 512K	£1995.00

Plotters	HP 7440A: (A4) £776.00	HP 7475A: (A3) £1366.00
-----------------	------------------------	-------------------------

SOFTWARE

Multimate Advantage	£346.00	Dbase III Plus	£399.00
Wordstar Professional	£290.00	Smart	£486.00
Displaywrite III	£322.00	Symphony	£355.00
Lotus 1-2-3	£247.00	Paradox	£430.00
SuperCalc IV	£230.00	Microsoft Mouse	£140.00

Other Printers, Multifunction Cards

& Software available.

EX-RENTAL EQUIPMENT

Please telephone Steven on (0923) 53933 ext 2550 for information and prices on current stock.

SPECIAL OFFERS

Princeton colour monitor 12"	£352.00	Hercules Mono Plus graphic card	£199.00	AST SixPac 384k	£418.00
Princeton EGA monitor 12"	£395.00	Mountain Hardcard 20Mb	£620.00	QUAD EGA (short)	£229.00
Paradise AutoSwitch EGA	£279.00	AST Rampage 512k for AT	£428.00		

Please ring for an immediate response and the latest prices

Prices exclude VAT & Delivery

ALL MAJOR
CREDIT CARDS ACCEPTED

All prices are subject to C.W.O.

Computers by Post

LOWEST U.K. PRICES GUARANTEED



PRINTER RIBBONS



		2+	5+	12+
ACORN	AP80	£2.70	£2.20	£2.00
	AP100	£2.70	£2.20	£2.00
	DMP1	£3.90	£3.30	£3.10
	DMP2000/3000	£4.40	£4.10	£4.00
AMSTRAD	PCW8256/8512	£4.30	£4.00	£3.80
	HR5	£3.00	£2.80	£2.60
	HR15 Corr	£2.90	£2.50	£2.30
	HR15 FAB	£3.30	£2.90	£2.60
BROTHER	HR15 MS	£3.20	£2.80	£2.50
	HR15 also for HR25/HR35			
	EP44	£2.90	£2.50	£2.30
	M1009	£3.40	£2.90	£2.70
CANON	PW1080A Black	£3.10	£2.60	£2.40
	PW1080A Red or Blue	£4.50	£4.10	£3.80
	PJ1080 Ink Jet Colour, One Off			£10.90
	PJ1080 Ink Jet Black, One Off			£8.90
CBM	1515	£2.70	£2.20	£2.00
	1525	£2.70	£2.20	£2.00
	MPS801	£3.60	£3.00	£2.80
	802/1526	£3.70	£2.90	£2.70
CENTRONICS	803	£3.40	£2.90	£2.70
	MPS1000	£2.70	£2.30	£2.10
	4022	£2.70	£2.30	£2.10
	MSC801 Colour, One Off			£18.50
CITIZEN	DPS1101 SS	£2.40	£1.90	£1.75
	DPS1101 MS	£2.90	£2.50	£2.30
	DPS1101 Corr	£1.80	£1.50	£1.40
	GLP 1/2	£3.40	£2.90	£2.70
DAISYSTEP	120D	£5.00	£4.60	£4.30
	2000 MS	£3.10	£2.60	£2.40
	2000 FAB	£4.90	£4.20	£4.00
	EPSON			
EPSON	MX/FX/RX80 Black	£2.70	£2.30	£2.10
	MX/FX/RX80 Red or Blue	£3.90	£3.20	£3.00
	100 Series	£3.70	£3.30	£3.00
	LX80/LX86	£2.70	£2.30	£2.10
JUKI	JX80 Colour, One Off			£18.50
	LQ800	£3.70	£3.30	£3.10
	LQ1000	£4.50	£3.90	£3.60
	6000/2200 MS	£4.00	£3.60	£3.40
KAGA	6000/2200 Corr	£3.10	£2.70	£2.50
	6100 MS	£2.90	£2.50	£2.30
	6100 SS	£2.40	£1.90	£1.75
	6100 Corr	£1.80	£1.50	£1.40
M/TALLY	KP810 Black	£3.10	£2.60	£2.40
	KP810 Red or Blue	£4.50	£4.10	£3.80
	MT80	£3.70	£2.90	£2.70
	80/82	£1.40	£1.10	£1.00
OKI	84	£3.90	£3.40	£3.20
	Mate 20 Colour	£7.00	£6.50	£6.20
	Mate 20 Black	£6.60	£6.20	£6.00
	PANASONIC			
QUENDATA	Dot Matrix	£5.00	£4.60	£4.30
	DWP1120 MS	£3.10	£2.60	£2.40
	DWP1120 FAB	£4.90	£4.20	£4.00

QUENDATA	DWP1120 MS	£3.10	£2.60	£2.40
	DWP1120 FAB	£4.90	£4.20	£4.00
	Sprint 7/9 MS	£2.80	£2.30	£2.10
	Sprint 7/9 FAB	£4.00	£3.70	£3.40
QUME	GP50	£6.00	£5.50	£5.20
	GP80	£2.70	£2.20	£2.00
	GP100/250	£2.60	£2.20	£2.00
	GP500/550	£3.90	£3.30	£3.10
SEIKOSHA	GP700 Colour, One Off			£18.50
	SP1000	£6.00	£5.50	£5.20
	CP80	£3.70	£2.90	£2.70
	Fastext 80 (Twinpack)	£11.70	£11.20	£10.90
SHINWA	TPI M/S	£8.50	£7.90	£7.20
	TPI Fabric	£3.90	£3.60	£3.40
	TPI Corr	£5.00	£4.70	£4.50
	D100/200	£4.80	£4.40	£3.90
CORONA	D300	£6.00	£5.50	£5.30
	DP/GEMINI/SG	£1.40	£1.10	£1.00
	SR15	£4.90	£4.50	£4.30
	NL10	£5.40	£4.70	£4.40
STAR				

FLOPPY DISKS



5 1/4"	JVC inc Plastic Case	BOXES OF 10 DISKS		
		1-2	3-9	10+
JVC	MD-1D S/side D/dens 40TR	£9.99	£9.50	£9.25
	MD-2D D/side D/dens 40TR	£11.99	£11.50	£11.25
	MD-2DD D/side Q/dens 80TR	£15.99	£15.50	£15.25
	MD-2HD D/side H/dens 1.6MB	£26.99	£25.99	£25.49
VERBATIM - DATALIFE	MD525 S/side D/dens 40TR	£11.60	£11.00	£10.60
	MD550 D/side D/dens 40TR	£14.80	£14.00	£13.60
	MD577 S/side Q/dens 80TR	£14.99	£14.75	£14.49
	MD557 D/side Q/dens 80TR	£19.50	£19.00	£18.60
FUJI	MD HD D/side H/dens 1.6MB	£27.99	£26.99	£25.99
	*S/side D/dens 40TR	£10.99	£10.50	£10.25
	*D/side D/dens 40TR	£13.49	£12.99	£12.75
	*Coloured Disks - red, green, blue, beige, grey £1.00 per box extra.	£17.99	£17.50	£17.25
3 1/2"	JVC/TDK S/side D/dens	£17.99	£17.25	£16.99
	SONY/FUJI S/side D/dens	£18.99	£18.25	£17.99
	FUJI/TDK D/side D/dens	£26.99	£26.50	£25.99
	SONY D/side D/dens	£27.99	£27.50	£26.99
BULK 3 1/2" D/SIDE D/DENS DISKS BY VERBATIM				
		10 x Disks	£1.99 each	£19.90 pack
		20 x Disks	£1.89 each	£37.80 pack
3" DISKS				
		CF2 5 Disks	£2.99 each	£14.95 pack
		CF2 10 Disks	£2.89 each	£28.90 pack

LASER PRINTER CONSUMABLES

TONER CARTRIDGES		Canon A1/A2	£74.95
Oki Laserline 6		QMS K8	£74.95
HP Laserjets		Citizen Overture	£22.95

DISK STORAGE



LOCKABLE DISK BOXES		CAPACITY	PRICE
MODEL	SIZE		
DD40L	3 1/2"	40	£8.50
GS100	3 1/2"	100	£13.90
DD50	5 1/4"	50	£8.90
DD100	5 1/4"	100	£11.70
LIBRARY CASE	5 1/4"	10	£1.50
NON-LOCKABLE DISK BOXES		CAPACITY	PRICE
MODEL	SIZE		
MD12/30	3 1/2"	24	£7.20
MF50	5 1/4"	50	£8.00
MICRODRIVE HOLDERS		CAPACITY	PRICE
MODEL	SIZE		
WALLET		4	£1.75
WALLET		20	£4.50

PRINTER CABLES & INTERFACES



AMSTRAD CPC	Parallel	£8.90
ATARI ST	Parallel	£14.50
BBC	Parallel	£6.50
IBM/AMSTRAD PC	Parallel	£14.50
MSX	Parallel	£10.90
CBM 64/128	Parallel I/F	£59.90
SINCLAIR QL/SPEC 128	Parallel I/F	£26.50
SINCLAIR SPECTRUM	Parallel I/F	£32.50
AMSTRAD PCW	Parallel/Serial I/F	£49.90

COMPUTER STATIONERY



PLAIN WHITE WITH MICRO-PERF EDGES		PRICE	
SIZE	GSM	QUANTITY	1 BOX 2 BOXES
11 x 9 1/2	60	2000	£12.50 £12.00
11 x 9 1/2	70	2000	£15.50 £14.50
EXACT A4	70	2000	£20.90 £18.75
11 1/2 x 9 1/2	90	1000	£13.20 £11.25

COMPUTER LABELS



		Price per thousand in brackets	
		1000	2000
70 x 36mm		£5.40	£8.80 (£4.40)
89 x 36mm		£5.50	£9.00 (£4.50)
89 x 49mm			£16.00 (£4.00)
3 across only		£7.20	£12.40 (£6.20)
102 x 36mm		£5.70	£9.40 (£4.70)
Please state number of labels across sheets (1, 2 or 3).			£22.80 (£5.70)
			£17.60 (£4.40)

PRINTERS

Silver Reed EXP500	£159.95
Epson LX86	£199.95
Epson FX800	£319.95
Epson FX1000	£409.95
Epson EX800	£415.95
Epson LX800	£469.95
Citizen 120D	£155.95
Amstrad DMP2000	£139.95
Amstrad DMP3000	£165.95
Amstrad DMP4000	£342.95
Panasonic KXP1080	£149.95
Oki-mate 20 Colour	£169.95
Micro PMP165	£199.95
Star NL10 inc I/F	£199.95
Star NX15	£299.95
Star NR15	£429.95
Star NB24-10	£429.95
Star NB24-15	£549.95

Juki 6100	£329.95
HP Laserjet Mk II Laser	£279.95
Canon LBP8 Mk II Laser	£2049.95
Oki Laserline 6 Laser	£1649.95
QMS K8 Laser	£1559.95
Citizen Overture Laser	£1659.95
	£1529.95

COMPUTERS

Amstrad PCW8256	£379.95
Amstrad PCW8512	£475.95
Amstrad CPC6128 Green	£239.95
Atari 520STM	£213.95
Atari 520STFM	£327.95
Atari 520STFM+mano	£409.95
monitor	£489.95
Atari 1040STF	£572.95
Atari 1040STF+mono monitor	£579.95
20 Meg Hard Disk	£122.95
Mono monitor	

Colour monitor	£329.95
Commodore C64	£139.95
Commodore C64C compend.	£204.95
CBM 1541C Disk Drive	£168.95
CBM Amiga 512K Syst 1	£899.95
Sinclair Spectrum 128K + 2	
inc Joystick + Software	£126.95

AMSTRAD 1512

PC Office System	£669.95
Single Drive Mono Monitor	£435.95
Double Drive Mono Monitor	£539.95
Single Drive Colour Monitor	£599.95
Double Drive Colour Monitor	£709.95
S/D Mona + 20 Meg Hard Card	£829.95
S/D Colour + 20 Meg Hard Card	£999.95
S/D Mona + 30 Meg Hard Card	£899.95
S/D Colour + 30 Meg Hard Card	£1069.95

Maxell 5 1/4" MD1D

S/side D/dens 40TR	
Box of 10 (min. 2 boxes)	
£9.99	

TDK 5 1/4"

S/side D/dens 40TR	
Box of 10 (min. 2 boxes)	
£8.99	

SONY 3 1/2"

D/side D/dens	
Box of 10	
£27.99	

CF2 3" Disks

Box of 10	
£28.90	

DELIVERY

All consumables and software post free Hardware £5 + VAT 4 Day Delivery £9 + VAT 24 Hour Delivery

COMPUTERS BY POST GUARANTEE If after buying any of the hardware or software in this advertisement, you find the same item offered at a lower price locally within one week, we will refund the difference.

All prices exclude VAT

CREDIT CARD HOT-LINE



01-760 0014

Computers by Post (PCW), 30 Bayford Rd, Littlehampton, West Sussex.

Export Enquiries Welcome

To: Computers by Post, 30 Bayford Road, Littlehampton, West Sussex. I wish to order.

My computer is _____ inc VAT

I enclose cheque/PO for £ _____ or charge my Access/Visa No: _____

Name _____

Signature _____

Address _____

Postcode _____ Tel No: _____

OPTIMUM TECHNOLOGY

MORE THAN JUST LOWER PRICES

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

OPTIMUM

*Our Sales Desk has moved
— see details below*

WORD PROCESSORS

Lotus Manuscript	NEW!	£269
Multimate Advantage		£269
Volkswriter Deluxe		£39
Word 3.1 - Microsoft		£244
Wordcraft V3		£345
Word Perfect 4.2		£245
Word Perfect Library		£124
Wordstar Prof. V4 (NEW!)		£199
Wordstar 2000 PLUS Rel 2		£269

DATABASES

Cardbox Plus		£245
dBase-III Plus V1.1 (unprot.)		£335
Clipper (new version)		£369
Genifer-III app. gen.		£229
Paradox V1.1i		£369
Q & A V2 (Inc. spell. chk.)		£165
Rbase-5000		£245
Rbase SYSTEM-V		£445
REFLEX-UK (NEW!)		POA
Rapid File (Ashton Tate)		£269

SPREADSHEETS

Javelin	POA	
Logistix V1.17 - new low price!		£95
Lotus 123 V2.01		£229
Other Lotus Products		→
MATHPLAN-3		£295
Multiplan V3 (NEW!)		£139
Supercalc-4		£225

INTEGRATED PACKAGES

Migent ABILITY V1.2E		£79
ABILITY PLUS (U.K.) (NEW!)		£154
PFS: First Choice inc. Spell Chk		£119
Framework-2 V1.1 (unprot.)		£325
Smart-3.1		£369
Smart Spell Checker		£89
Symphony V1.2		£329
Psion Xchange		£235
Psion PC-Four		£65

UTILITIES/MISC

'Above-Disk' NEW!		£79
Gem Collection		£89
Hard Disc Optimiser		£39
Intelligent Backup V1.5		£79
MS C Compiler V4		£249
MS Flight Simulator V2.13		£39
MS Macro-Assembler V4		£115
MS Quickbasic Compiler		£69
MS WINDOWS V1.03		£69
Norton Utilities V4 NEW!		£69
Norton Advanced Utils NEW!		£99
Norton Commander		£55
Norton Editor		£87
Sideways V3.1		£43
SQZ! Lotus Compressor V1.53		£55
WordPerfect Library		£124
Xtree V2		£47

LOTUS PRODUCTS

LOTUS MANUSCRIPT	£269
LOTUS METRO	(NEW!) £65
LOTUS 123 V2.01	£229
HAL	£98
Report Writer (new low price!)	£75
Quickcode-for-123 (F&G)	£49
SYMPHONY V1.2	£329
Spelling Checker	£89
Text Outliner	£89
1-2-3/Symphony GRAPHICS	
Freelance Plus	£295
Graphwriter Combination	£375

GRAPHICS/CAD

Autosketch	£75
GEM Draw Plus — NEW!	£163
GEM Graph	£145
Harvard Pres. Graphics	£275
Harvard Prof. Publisher	£575
The Newsroom	£49
LOTUS Graphics — see above	
ProDesign-2 V2.5	£238

dBASE PRODUCTS

dBase-III Plus V1.1 (unprot.)	£335
Clipper Compiler (new vers.)	£369
Genifer-III App. Gen. V1.01	£229
Quicksilver Compiler	£369

BORLAND

EUREKA: The Solver	£65
REFLEX-UK (NEW)	POA
Reflex Workshop	£59
Sidekick (unprotected)	£59
Travelling Sidekick	£59
Sidekick & T/Sidekick	£79
Superkey	£59
Turbo Basic NEW!	£65
Turbo C NEW!	£84
Turbo Prolog V1.1	£54
Prolog Toolbox NEW!	£67
TURBO PASCAL V3 (Inc. 8087)	£57
Turbo Database Toolbox	£44
Turbo Editor Toolbox	£42
Turbo Gameworks	£42
Turbo Graphics Toolbox	£39
Turbo Numerical Toolbox	£67
Turbo Tutor V2	£28
Turbo Holiday Jumbo Pk	£175
Turbo Lightning	£59
Word Wizard	£42

COMMUNICATIONS

Our Free communications consultancy means that you can simply telephone or write for free datapaks and/or advice on modems and software.

Modems: All modems are Auto-Dial/Auto-Answer and BABT approved. Baud rates are V21=300/300 V23=1200/75 V22=1200/1200 V22bis=2400/2400.

We also supply modems from Dowty/Racal/Tandata/Steebek/Dacom/PC at best prices.

IBM PC Modem Cables	£15
Modem Cables for other computers	£23
MIRACLE TECHNOLOGY	
WS SERIES — EXTERNAL	
WS4000 V21/V23 (Economy)	£149
WS3000 V21/V23 Professional Series	£259
WS3000 V22 (& V21/V23)	£395
WS3000 V22bis (& V22/V21/V23)	£545
Datataalk with WS Modems	£80
KEYCARD-3000 SERIES — INTERNAL - NEW!	
(includes Protect-3000 security option and Datataalk)	
Keycard V21/23	£289
Keycard V22 (& V21/23)	£449
Keycard V22bis (& V22/V21/V23)	£589
PACE SERIES-4/LINNET — EXTERNAL	
Pace Linnet V21/23 (Economy)	£139
Series-4 21235 (V21/V23)	£229
Series-4 1200S (V22/V21/V23)	£359
Series-4 2400S (V22bis/V22/V21/V23)	£449
HAYES 1200 V22	£395
HAYES 1200B V22 Internal	£375
HAYES 2400 V22bis	£595
MICROTELEX (Inc. software)	£825
ORATOR — Modem & Speech	£695
HASLER PROTELEX	£1199

Comms Software:	
Carbon Copy (each)	£137
Crosstalk XV1	£99
Datataalk V3.27	£133
Sage Chit-Chat V2.2	£85
Smartcom-2 V2.2	£135
Vicom with GEM Desktop	£139

SAGE

All Sage products available at best pricing

Financial Controller	£225
Bookkeeper	£84
Accountant	£118
Accountant Plus	£159
Payroll	£82
Retrieve	£82
Chit-Chat	£85

HARDWARE

Hercules Graphics Cards	CALL
Logimouse C7+ (PC or AT)	£94
MS Mouse V6 (Bus or Serial)	£135
Orchid Tiny-Turbo 286	£385
SummaMouse (Opto)	£95
EGA Wonder Card (NEW!)	£249

JULY'S OPTIMUM CHOICE

- **FREE SHORTFORM CATALOGUE — FREE DATAPAKS**
- **FREE 'OPTIMUM SPREAD' GAME WITH EACH ORDER**
disc is 5 1/4" IBM format while stocks last
- **ORCHID TINY-TURBO 286 - £385!**
upgrade your IBM-PC or XT to run faster than an IBM-AT. The advanced switchable 80286/8088 half-card accelerator upgrade voted 'Editors Choice' in PC Magazine.
- **ABOVE-DISK - £79 -**
gives Lotus 1-2-3 Rel2, Symphony Rel.1.1, up to 8Mb of EMS Expanded Memory using just a Hard Disc! No Expanded Memory Cards needed!
- **CONFUSING COMMS?**
give us a ring and take advantage of the 'wonderful world of datacomms' for datapak!
- **BORLAND TURBO C HAS ARRIVED — £84!!**
- **MICROSOFT V4.0**
MACRO-ASSEMBLER Only £115!
Supports 8086/87/88 & 80186/286/287 ask for free datapak!

YES!

PLEASE RUSH ME

☐ The following good(s):

☐ A FREE Datapak on:

☐ A FREE shortform Catalogue.

I enclose £
(I have added carriage, then VAT)
CARRIAGE: Most software/hardware items add £5 + vat.
dBASE/SMART/MODEMS/EXPRESS DELIVERY add £10 + vat.
EXPORT: Please phone/write with details or estimate the amount and we will refund any extra.

Name _____

Address _____

Phone No. _____

OPTIMUM TECHNOLOGY LTD

Rowlandson House, 289-293 Ballards Lane, Finchley,
London N12 8NP

Sales Desk: 01-446 2223

Telex: 923729 (Roland G) Fax: 01-446 1963 Telecom Gold: 72/MAG10834

PLEASE ADD CARRIAGE, THEN VAT TO ALL PRICES

The above is a sample of the goods we supply — please ask for latest shortform catalogue
We welcome official Govt./Educational/Local Authority and Export orders.
Pro-Forma invoices available on request. Ask for further quantity discounts. Software prices are for the IBM PC — please enquire for other formats. Prices/specifications subject to change without notice. Please phone to arrange demonstrations or to collect goods.

SETTING THE STANDARD

TRISOFT LTD 0629-733111

PROFESSIONAL ADVICE ► LOW PRICES ► HOT LINE SUPPORT ► FAST SERVICE

Whether you are seeking specialist advice or simply wish to buy at a competitive price, we believe that Trisoft Ltd. offers a service second to none. Apart from offering around 300 software packages and a large range of add-on boards, we are also authorised dealers for APRICOT, OLIVETTI, TANDON and NORTHSTAR.

► SOFTWARE

DBASE III PLUS.....	£335
LOTUS 1-2-3.....	£239
FRAMEWORK 2.....	£320
SUPERCALC 4.....	£195
WORDSTAR 2000.....	£245
DATAEASE.....	£385
REFLEX.....	£79
MULTIMATE.....	£199
MS WORD 3.....	£260
WORDCRAFT.....	£320
WORD PERFECT 4.2.....	£260
WORDSTAR PROF.....	£215
MULTIPLAN 2.....	£145
VP PLANNER.....	£75
JAVELIN.....	£380
SMART 3.....	£395
SYMPHONY.....	£339
DOMINO.....	£375
LATTICE C.....	£275
MS C COMPILER.....	£265
PEGASUS.....	P.O.A.
MULTISOFT.....	P.O.A.

► BOARDS

INTEL ABOVE BOARD FROM	£295
RAMPAGE.....	P.O.A.
AST SIX PAK PLUS 384K.....	£245
AST 5251 MOD.11.....	£599
HERCULES MONO PLUS.....	£189
HERCULES COLOUR.....	£115
PARADISE AUTO EGA.....	£295
ORCHID TINY TURBO 286.....	£395
INTER QUADRAM EGA + (SHORT).....	£275

► PLOTTERS/LASER PRINTERS ETC.

ROLAND DXY-880A A3 PLOTTER.....	£675
ROLAND DXY-980A A3 PLOTTER.....	£945
ROLAND DPX 2000 A2 PLOTTER.....	£3245
HP LASER JET.....	£2185
HP LASER JET PLUS.....	£2885
CALCOMP 1043 A0 PLOTTER.....	£7643
CANON LBP A1 LASER.....	£1985
CANON LBP A2 LASER.....	£2985
TONER CARTRIDGE FOR A1/A2.....	£85
8087/80287.....	P.O.A.
MS MOUSE.....	£145
PC MOUSE.....	£145
SUMMA MOUSE.....	£89

► COMPUTER SYSTEMS

ALL SYSTEMS INCLUDE MONO SCREEN, KEYBOARD AND MSDOS

OLIVETTI M24 SP, 10 MHZ PROCESSOR, 20 MB HARD DISK, 640K RAM.....	£1995
OLIVETTI M28, 20 MB HARD DISK, 512K RAM.....	£2295
OLIVETTI M28, AS ABOVE BUT 40 MB HARD DISK.....	£2995
FOR COLOUR MONITOR ADD	£235
APRICOT XEN-i HD, 20 MB HARD DISK, 1 MB RAM, PAPER WHITE MONITOR.....	£2495
APRICOT XEN-Xi10, 10 MB HARD DISK, 512K RAM, PAPER WHITE MONITOR.....	£1695
APRICOT XEN -Xi20, AS ABOVE BUT 20 MB HARD DISK....	£2045

►► FULL TANDON RANGE ◀◀ ►► NOW AVAILABLE ◀◀

ACCOUNTING SOLUTIONS FROM TRISOFT

TRISOFT LTD. are authorised dealers for SAGE, PEGASUS, MULTISOFT, TETRA and MULTIPAC accounting software.

PEGASUS, MULTI-USER and XENIX systems.

MULTISOFT & TETRA, XENIX systems.

Unrivalled accounting expertise in London and the Midlands.

We supply software only or full systems.

Full range of training and maintenance support services from our qualified accountants.



► EXAMPLE SYSTEMS

TANDON PCX 10, 10 MB HARD DISK, 1x360K FLOPPY, 256K RAM KEYBOARD, MONO MONITOR, MSDOS, ANY 4 PEGASUS MODULES..... £1595
OLIVETTI M28, 2 MB RAM, 4-WAY SERIAL CARD, LEVEL V XENIX, KEYBOARD, MONO MONITOR, 3 x WY-50 WYSE TERMINALS, 4 x MULTISOFT XENIX MODULES..... £8995.00

► ENTRY LEVEL CAD SYSTEM

OLIVETTI M24, 20 MB HARD DISK, 1 x 360K FLOPPY, 640K RAM, 7 EXPANSION SLOTS, MONO MONITOR, KEYBOARD, MSDOS, ROLAND DXY-880A A3 PLOTTER, CALCOMP 2200 DIGITIZER, AUTOCAD, AUTOCAD ADEX 1 + 2, 8087 8 MHZ CO-PROCESSOR... £5495.00

► PROFESSIONAL CAD SYSTEM

TANDON PCA 20, 80286 PROCESSOR(8 MHZ), 640K RAM, 20 MB HARD DISK, MONO MONITOR, KEYBOARD, MS-DOS, CAMBRIDGE 1024 20" MONO SCREEN (1024 x 768 RESOLUTION), AUTOCAD WITH ADEKS 1,2 AND 3 (VERS. 2.5), 80287 CO-PROCESSOR, CALCOMP 25120 DIGITISER, CALCOMP AC 1043 PLOTTER, FREE ON-SITE INSTALLATION IN MOST PARTS OF THE U.K. 3 MONTHS ON-SITE WARRANTY... £13950.00

► COMMUNICATIONS

We supply the complete range of HAYES and DOWTY (HAYES-Compatible) MODEMS and SUPPORTING SOFTWARE for most communications requirements. Please call for details.

► EDUCATION

Users in Education please call for details of special prices available on certain products.

Attractive LEASE and LEASE PURCHASE Facilities Available.



► All prices are subject to carriage and V.A.T. ► All software prices are for IBM and compatibles. For other formats, please enquire.

TRISOFT LTD

DARLEY DALE, MATLOCK, DERBYSHIRE DE4 3BP

TELEPHONE (0629) 733111, TELEX 8950511 ONEONE G (please quote ref - TRISOFT.)

► ELECTRONIC MAIL - TELECOM GOLD 83: NTG344 ONE TO ONE 12977001 PRESTEL 533544601...►

LINK Business Systems Ltd

Personal Computer XT+ £599



SPECIFICATION:

SYSTEM MAIN BOARD: 8088-2 CPU. Legal Bios. 8 Expansion Slots. Turbo Speed Switchable 8/4.77 MHz. 512K up to 640K RAM on Board. Real-time Clock/Calendar and Back-up Battery. 150W Power Supply.

KEYBOARD: Standard Typewriter Format. 84 Keys. 10 Function Keys may be used by Application Programmes. Separate Numeric and Cursor Keys. Cherry Brand T5-M0001

DISK DRIVES: Built In. 2 x 360K. Standard 5.25 inch. Number of Heads: 2. Direct Drive.

COMMUNICATION: RS232 Serial Port. Parallel Printer Port.

GRAPHICS: High Resolution: 730 x 350 Hercules – Mono Graphics Card. Medium Resolution: 640 x 200 8 colours – Colour Graphics Card.

OPERATING SYSTEM: 100% IBM Compatible MS-Dos 3.20.

OPTIONS:

HARD DISK: Seagate 20MB – Western Digital Controller. Seagate 30MB, 40MB – Controller.

CARDS: EGA High Resolution in Colour up to 64 colours.

MODEMS: Int/ext: V21, V23 – AA, AD. V21, V23, V22 – AA, AD. V21, V22, V22 Bis – AA, AD.

MONITORS: 14" Colour Medium and Low Resolution Monitor. 14" Colour Enhanced Graphics. High Resolution Monitor (Up to 64 colours on low, medium and high resolution)

MOUSE AND JOYSTICK OPTIONS

XT+ £599

Link Business Systems Ltd

Premier House, 10 Greycoat Place, London SW1P 1SB Tel: 01-799 9911

Trade & Export Welcome

All Prices exclude VAT/Delivery

The Best Software from HiSoft

FTL Modula-2

Modula-2 is the successor to Pascal and highly-respected and widely-used. The cheapest complete Modula-2 programming system for the Amstrad PCW range, the IBM PC, Amstrad PC1512 and compatibles is also one of the best! **FTL Modula-2** incorporates a Wirth-standard Modula-2 compiler, a full-screen interactive editor, a linker and a Z80 (CP/M versions) or 8088/8086 (MS-DOS versions) assembler.

An extra package (the **Editor Toolkit** - £39.95 or £35 with the compiler) gives you the source to the editor, so that you can customise it to your own requirements or maybe even design a completely new editor! 8087 support costs only £34.95 or a mere £24.95 if ordered with the compiler.

The FTL package includes full source code for the majority of the modules supplied and includes full process-handling and a complete Modula-2 standard library. For CP/M and MS-DOS

All versions:

£54.95

"If you're at all interested in languages get FTL Modula-2, you won't regret it!" - Jerry Pournelle, BYTE April 86

Devpac80 Ver. 2

Devpac has always been the popular Z80 development system used by software houses all over the world since we first introduced it over 6 years ago. Many regard it as a standard to work from. Now we have extended the standard to produce the most powerful development package yet and still at the same price (upgrades cost £15, send back disc & manual pages).

- ☒ fully-integrated screen editor, remembers your assembly errors and takes you straight there for correction.
- ☒ standard Zilog macros with strings, nested conditionals & text include, full expression handling etc.
- ☒ makes standard .REL files or .COM files. .REL files allow you to link the output with that of most other languages e.g. CBASIC™, ProPascal™, ProFORTRAN™, all MicroSoft languages etc.
- ☒ the debugger is symbolic i.e. you can see the labels you used when assembling in the code that you are debugging. The debugger uses full conditional breakpoints and watchpoints so that you can even profile your program to highlight slow areas.
- ☒ All this power with an extensive, quality ring-bound User's Manual for the incredible price of

£39.95

Other Products and Ordering Information

Pascal80 version 2 CP/M	£39.95	Knife86 PC	£29.95	THE Index for PCs	£39.95	ZX Pascal V1.7	£25.00
ZBASIC Compiler CP/M	£49.95	DevpacST for Atari ST	£49.95	Devpac Amiga NEW	£59.95	ZX C Compiler	£25.00
HiSoft BASIC Atari ST	£79.95	Saved! for Atari ST NEW	£29.95	HiSoft BASIC ZX	£24.95	ZX Devpac V 4.0	£15.95

All prices include VAT and postage within the UK. You can order by telephone using Access or Visa or send a cheque or postal order to the address below. We always despatch by first class post and delivery is usually within 5 days. Please write or phone for a full catalogue, trade details, export information etc. Please state your computer when ordering or requesting a catalogue.

HiSoft The Old School, Greenfield, Bedford, MK45 5DE. (0525) 718181

SOFT TOUCH COMPUTERS

 **apricot** APRICOT APPROVED DEALER

APRICOT

XEN XI 10, 512k Ram 3 1/2" or 5 1/4" Floppy, Keyboard, Green Monitor, Standard
Apricot Software **£1,499.00**

XEN XI 20, 512k Ram 3 1/2" or 5 1/4" Floppy, Keyboard, Green Monitor, Standard
Apricot Software **£1,849.00**

XEN-I 386, 30MB, MONITOR, STANDARD S/W M.R.P. **£3,367**

OUR PRICE **£2,699**

XEN-I 386, 45MB, MONITOR, STANDARD S/W M.R.P. **£4,367**

OUR PRICE **£3,699**

SOFTWARE

Wordcraft	£299.00
Superwriter	£149.00
Easywriter	£199.00
Wordstar Version 3.4	£200.00
Word Perfect Word Library	£285.00
Open Access Version 1.06	£299.00
Volkswriter Version 3.0	£189.00
Sage Accountant	£108.00
Sage Accountant Plus	£140.00
Sage Payroll	£70.00
Sage P.C. Planner	£70.00
Framework II	£375.00
Javelin	£399.00
Database III Plus	£399.00
Sidekick	£40.00
Xchange	£299.00
Clipper	£399.00

ACCESSORIES

SUPPLIERS OF: DATA SWITCHES, CABLES, TONERS, DISKS, PAPER, ADD ON CARDS, MONITORS, ACOUSTIC HOODS, MODEMS AND OTHER MAJOR COMPUTERS, MONITORS AND PRINTERS

PLEASE DO NOT HESITATE TO CONTACT SOFT TOUCH COMPUTERS, AS ADVICE AND INFORMATION IS ABSOLUTELY FREE CALL SOFT TOUCH COMPUTERS ON **01-571 7614**

PRINTERS

Epson FX 85 160cps	£317.00
Epson LX 85	£219.00
Epson LQ 800 180cps	£425.00
Epson EX 1000 Dual/Tractor Colour Option	£599.00
Epson LQ 1000 180cps	£565.00
Brother HR 20 Dual Daisywheel	£335.00
Brother HR 25 XL	£549.00
Brother Twinwriter 5	£999.00
Brother M1409 180cps/45cps 110 columns	£325.00
Panasonic KXPL081	£199.00
Panasonic KXPL092	£320.00
Citizen Premiere 35P	£550.00

COLOUR PRINTERS

Okimate 20	£149.00
NEC Pinwriter 7	£575.00

LASER PRINTERS

Hewlett Packard Laser Jet	£1,599.00
Hewlett Packard Jet Plus Serial Parallel	£2,199.00
Canon 8A1 Serial Parallel	£1,599.00
Kyocera F-1010 Serial Parallel	£2,699.00
AST Turbolaser	£3,000.00

W E ' R E W I T H Y O U A L L T H E W A Y



NOW AT
Queens House, 2 Holly Road,
Twickenham, Middlesex TW1 4EG

OLIVETTI M19
256k, 20Mb HD, Monitor, Kbd, DOS £895

01-891 6433

All orders subject to carriage and VAT at 15%

SYSTEMS SPECIALS

FREE PRINTER and CHOICE OF SOFTWARE!*

with all TANDON PCA SYSTEMS.
Includes FREE EPSON FX800 (220cps)
and ANY SOFTWARE PACKAGE WITH
RSP UP TO £400

* As specified

TANDON PCA20 1Mb, RAM, 20Mb HD, Mono Screen, Graphics, P/S Ports, Keyboard Dos 3.1	£1999
TANDON PCA30, 1Mb, 30Mb HD	£2299
TANDON PCA40, 1Mb, 40Mb HD	£2499
TANDON PCA70, 1Mb, 70Mb HD	£2999

For colour systems	add £220
For EGA systems	add £495

We are NET- WORKING SPECIALISTS

Full consultation, Installation,
Software and System Support,
Hotline and Maintenance Contracts
on **NOVELLE NETWORK, G-NET,
TOKEN RING, ARCNET,
ETHERNET.**

Call for consultation.

FREE PRINTER AND CHOICE OF SOFTWARE!*

with all COMPAQ DESKPRO 386
SYSTEMS. Includes FREE HEWLETT-
PACKARD 2686AU LASER-JET
PRINTER, 8 PAGES/MINUTE, and
ANY SOFTWARE PACKAGE WITH
RSP UP TO £400.

* As specified

COMPAQ 386 M40 (16MHz), 1Mb RAM 40Mb HD, Mono Screen, Kbd, P/S Ports, DOS 3.2	£5875
COMPAQ 386 M70 1Mb, 70Mb HD	£6475
COMPAQ 386 M130 1Mb, 130Mb HD	£7969

For colour systems	add £220
For EGA systems	add £395

SOFTWARE TOP 10

LOTUS 1-2-3	£235
WORDSTAR 2000	£220
DBASE III+	£340
SUPERCALC 4	£195
SMART 3	£375
SYMPHONY	£335
MULTIMATE ADVANTAGE	£265
MS WORD	£245
DATAEASE	£395
PEGASUS MODULES (SU)	£175
WORDCRAFT	£315

COMMUNICATIONS

IRMA 3270 CARD	£875
IRMA 3279 GRAPHICS	£1475
AST 3270 CARD	£625
SMART ALEX 5250 Emulation	£695
AST 5251 (Local) CARD	£575
QUATTRO CARD V21, 22, 22Bis, 23	£595
PACE SERIES 4, V21, 23, AA, AD, Hayes	£220
HAYES SMART MODEM 1200B	£345

PRINTERS

BROTHER 1109, 120cps, 80 col	£175
BROTHER 1509, 180cps, 132 col	£375
BROTHER 4018, 480cps, 100 NLQ	£1195
BROTHER HR20 daisywheel	£335
BROTHER HR25XL daisywheel	£550
BROTHER HR40 + tractor + SSF	£745

LASERS/PLOTTERS

CANON LBP8 A1 LASER	£1595
EPSON LASER PRINTER, 6PPM	£1395
QUME LASER 10 PLUS, 10PPM	£2095
HP7440 PLOTTER, A3	£775
HP7475 PLOTTER, A3/A4	£1395
ROLAND DXY 880A, A3	£675

MEMORY

AST Rampage (XT), 2Mb	£395
AST Ramvantage (AT), 2Mb	£495
AST Rampage (AT), 2Mb	£595
Everex Minimag 128k (AT)	£110

ENHANCED GRAPHICS

Paradise Switchable EGA Adaptor	£210
Everex EGA+ Card, 256k, Parallel Port	£245
Taxan EGA Compatible Colour Monitor	£399
NEC Multisynch Hi-Res Colour Monitor	£530

SYSTEMS **

OLIVETTI M24, 640k, 20Mb HD	£1295
OLIVETTI M24SP, 640k, 20Mb, (10MHz)	£1595
OLIVETTI M28, 512k, 20Mb, 1.2Mb	£2095
APRICOT XEN Xi, 20Mb, 512k RAM, 1.2Mb	£1595
APRICOT XEN I XD, 45Mb, 2Mb (10MHz)	£2545
APRICOT XEN I 386, 45Mb, 2Mb RAM	£3095
TOSHIBA 1100 Plus, 2x720k FD, 640k	£1495
TOSHIBA 3100 Laptop, 10Mb, 640k	£2695
All TANDON/AMSTRAD Systems	£POA

**All systems include keyboard, monitor and DOS

HARD DISKS

NEC 20Mb HD with Controller Card and Software	£350
Tandon 20Mb Business Card	£395
Miniscribe 30Mb Hard Card	£435

JOIN THE CLUB · SCOOP THE SAVINGS

THE OFFICIAL AMSTRAD PROFESSIONAL USERS CLUB

SEE US AT THE
AMSTRAD SHOW
JULY 10-12th
ALEXANDRA
PALACE

KEEP YOUR COMPUTER IN THE
CONDITION YOU GOT IT IN.



**CLEANING KIT WORTH
£10 - YOURS FREE**

New members receive this Data Care Systems
Screen/Keyboard Cleaning Kit ABSOLUTELY
FREE with your Membership Card.

contents may vary from photograph

**ORDER ACTION LINE -
DIAL 091-5673395 NOW!**

For extra-fast attention, order now by phone quoting
Access or Visa number. Or fill in the coupon.

OFFICIAL AMSTRAD USER CLUB
VICTORIA HOUSE
P.O. BOX 10 · SUNDERLAND · SR1 3PY.

BY JOINING the Official Users Club you
can buy a whole range of new software at
fantastically low prices to make your Amstrad
even more versatile and useful than ever.

By taking advantage of the savings you
will recoup your membership fee in only
weeks! Look what else you get:

- ▲ The widest range of branded Amstrad
approved products stocked in depth all at
substantial discounts of up to 15% — many of
them fully IBM compatible.
- ▲ HELP HOTLINE for any technical advice you
need.

- ▲ 12 MONTHS FREE subscription to Amstrad
Professional Computing Magazine
- ▲ 24 hour telephone ordering facility.
- ▲ FREE monthly newsletter, packed with hints
and tips and reviews.
- ▲ Exclusive products for club members.
- ▲ Privileged previews of new products
- ▲ Big prize competitions.
- ▲ Products delivered direct to your door.

CLUB MEMBERS ALWAYS SAVE

▲ PCW OWNERS ▲

We always have in stock a large selection of products at
highly competitive prices including: LOCOMAIL,
LOCOSPELL, SUPERCALC III and dozens of TOP
GAMES, BUSINESS UTILITIES, MODEMS, DISCS and
RIBBONS

▲ PC OWNERS ▲

The Club offers a vast choice of top programs, games
and peripherals at unbeatable prices including:
WORDSTAR 1512, SUPERCALC II, REFLEX and
SIDEKICK. We can always supply PRINTERS,
MODEMS, LEADS and DISKS from stock.
Exclusive to the Club are our range of specialist
programs written especially for business applications
including Estate Agents, Lawyers, Solicitors,
Accountants and Book Keepers — Join now and run
your business more efficiently

▲ HOW TO JOIN THE CLUB ▲

Simply fill in the coupon and return
it to us at the address shown
together with your remittance. We'll
send you your special membership
card and the Data Care Systems
Screen/Keyboard Cleaning kit.

FOR OFFICE USE ONLY

PLEASE SEND ME:

I enclose £ _____ I am already a member, my number is _____

Yes, I want to enjoy the benefits of Amstrad Professional Users' Club Membership —
Please enrol me today. I enclose cheque/P.O. for £39.95.

Please send all details to:

NAME _____

ADDRESS _____



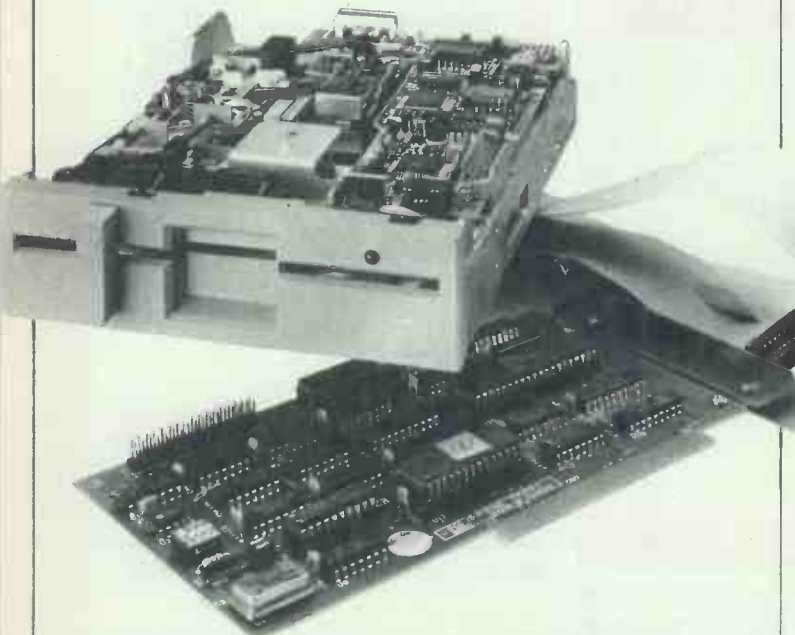
ACCESS/VISA: ☐

All offers subject to availability; all prices correct at time of going to press

POST TO:
OFFICIAL · AMSTRAD · USER · CLUB ·
VICTORIA HOUSE · P.O. BOX 10 ·
SUNDERLAND · SR1 3PY

Amsoft

The Great Communicator



- Allows free interchange between XT® and AT® computers • Dual drive
controller and Brand Name 80TR, 1.2MB formatted drive • Achieves more
than 3-times capacity of normal 360KB floppy drive • Controller handles
(intelligently with on-board ROM) combinations of 1.2MB and 360KB floppies
- FAST data transfer (500K Bits/sec) in 1.2MB format. Excellent for
Winchester backup • 1.2MB drive reads/writes and formats 360KB using
normal DOS 3 · X commands • No messy DOS patch software necessary!
- Standard DIGITASK ONE YEAR parts and labour warranty

DIGITASK

£179

(excluding carriage & VAT)

ABOVE FUNCTION CARD

- Up to 2MB expansion memory (2048KB) • First 384KB may be configured as
conventional memory • LIM, LOTUS®, INTEL®, MICROSOFT®, (EMM)
specification • Async Comms adaptor (configurable as COM1 or COM2 or disable)
- Parallel Printer Port (configurable as LPT1 or LPT2 and Hercules® compatible)
- Real time clock/calendar with battery backup • Games adaptor • Utility
software includes expanded memory manager, clock, ramdisk and printspooler
- Includes cables • Fully compatible with IBM® PC/XT/AT computers.
- Standard DIGITASK ONE YEAR parts and labour warranty.

£179

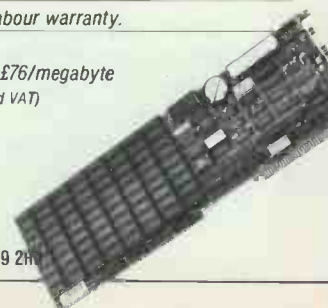
(Unpopulated) Ram at £76/megabyte
(Prices exclude carriage and VAT)

DIGITASK



Tel. 0342 24631 Telex 957418

Unit M, Charlwoods Business Centre,
Charlwoods Rd, East Grinstead West Sussex RH19 2H

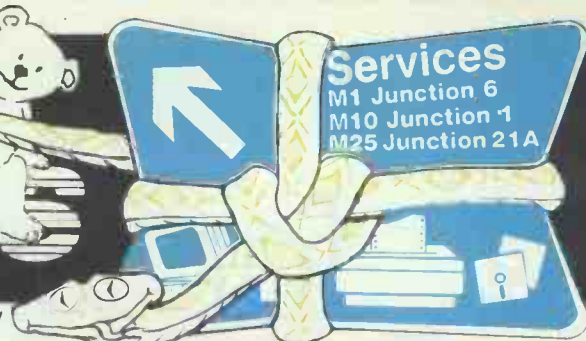




COMPUTER

EXPRESS

"MAKE NO MISSTAKE, OUR PRICES ARE UNBEARABLY LOW"



DOT MATRIX PRINTERS

Epson LX800 - The Brand New Best Seller!	£195
Epson LX86 - The Former World Best Seller!	£189
Star NL10 - The Number Two Seller-Best Spec	£210
Star NX15 - The New Wide-body NL10!	£288
Star NR15 - Replaces the SR15-A Great Mover	£424
Panasonic 1080 100cps	£135
Panasonic 1081 120cps & 80 col - Brand New!	£149
Panasonic 1091 - Byte Magazine Says It's No 1	£228
Epson FX105+ - The Ford Transil of Printers!	£375
Epson LQ800 - Letter Quality-24 Pin Pinthead	£423
Epson LQ1000 - Letter Quality-24 Pins-132 Col	£577
Epson LQ2500 - This one is really good!	£695
Epson SQ2500 - Ink your jet with this one!	£989
Epson FX800 - Brand New! 240cps! Wow!	£298
Epson FX1000 - Brand New! Replaces FX105	£395
Epson EX800 - 300cps & 80 column-Super Fast!	£385
Epson EX1000 - 300cps & 136 column-Super Fast!	£517
Star NB15 - The big, up-market Star 24-pin 300cps	£679
Star NB24-15 - Same as above, but 216cps	£525
Star NB24-10 - 80 column 24-pin winner	£415
Seikosha MP1300AI - 300cps!	£302
Seikosha MP5300AI - 132col Version of MP1300	£439
MP 165 - Cheap Fast And Good Quality 180cps	£170
MP 200 - 200cps! 132 column!	£260
MP 201 - 132 column 200cps	£295
NEC P6 - Good Buy	£389
NEC P7 - One of the Best Sellers Ever - 24 pin	£447
Oki Microline 182 - The Number 2 Brand	£189
Oki Microline 192 - Perennial Favourite	£287
Oki Microline 193 - Worth A Look	£367
Oki Microline 293 - Worth A Long Look	£608

DAISY WHEEL PRINTERS

Star Power Type 18cps - The Current Cheap One	£189
Juki 6100 - 20cps - Very Popular	£259
Juki 6200 - 30cps - Still Popular	£397
Juki 6300 - 40cps - Very Up-Market	£660
Juki 6500 - 60cps - Heavy Duty and Very Fast	£966
Qume Sprint 11/90 - 90cps Daisywheel Printer	£1200

COLOUR PRINTERS

Okimate 20 Thermal Printer	£159
Juki 5520 - The Market Leader - Fast!	£335
Epson EX-Series Colour Option	£55
NEC P565XL - Heavy-Duty Office Favorite!	£744
Epson LQ2500 Colour/Makes LQ2500 Colour	£55
Seikosha MP1300 Colour Kit/Makes MP1300 Colour	£87

PLOTTERS, DIGITIZERS & LASERS

New Oki Laserline 6 - 6 pages per minute	£1499
HP LaserJet Plus - The Leader	£2299
HP LaserJet II - Newer, Better, Cheaper!	£1945
Cherry A3 Digitizer	£475
Roland 880A Plotter - Best Value A3 Plotter	£649

CABLES AND THINGS

IBM-Compatible Centronics Parallel Cable (Round)	£12
BBC Centronics Parallel Cable (Ribbon)	£8
Serial Cables Made to Order	£20
Two-Way Printer T-Switch	£40
Fan-Fold White Paper, 11in long, 1000 sheets	£7
80 Col Printer Stands	£21
132 Column Printer Stands	£28
SpaceBase Adjustable Floor-Standing Printer Stand	£85
DiskStore (Stores 50 5.25in diskettes)	£10

AMSTRAD PC

Amstrad 1512 Single Floppy/Mono Monitor	£436
Amstrad 1512 Double Floppy/Mono Monitor	£539
Amstrad 1512 Single Floppy/Colour Monitor	£599
Amstrad 1512 Double Floppy/Colour Monitor	£689
Amstrad 1512 20mb Hard Disk/Mono Monitor	£869
Amstrad 1512 20mb Hard Disk/Colour Monitor	£1029
Upgrade any 1512 to 640k (including labour)	£40

EPSON PC's

Epson Taxi PC, 256k RAM, Single Floppy	£466
Epson Taxi PC, 256k RAM, Double Floppy	£539
Epson Taxi PC, 256k RAM, 20mb Hard Disk	£870
Epson PC+ 640k RAM, Double Floppy, Video Card	£900
Epson PC+ 640k RAM, 20mb Hard Disk, Video Card	£1000
Epson AX-20 AT 640k RAM, 1.2mb Floppy, 20mb HD	£1799
Epson AX-40 AT 640k RAM, 1.2mb Floppy, 40mb HD	£2249
All Epson PC's, PC+'s and AX's require monitors and all PC's require Monitor Adaptor Cards.	

TOSHIBA

Toshiba T3100 Lap Top	£2675
Toshiba T3100 Carrier Bag	£40
Toshiba T2100 Lap Top	£1800
Toshiba T1100 Plus Lap Top	£1395
Toshiba External 5.25 Disc Drive	£335

MACDOUGALL PC's

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

OLIVETTI PC's

Olivetti M24 Single Floppy Base Unit/640k	£799
Olivetti M24 Double Floppy Base Unit/640k	£899
Olivetti M24SP 20mb/single floppy Base Unit/640k	£1399
Olivetti M24 or M28 Monochrome Monitor	£169
Olivetti M24 82 or 102-key Extended Keyboard	£120
Olivetti M24 or M28 MS-DOS/GW-Basic Pack	£51
Olivetti M28 Keyboard	£140
Olivetti M24 or M28 Colour Monitor	£400
Olivetti M28 AT Compatible - 20mb Hard Disk	£1884
Olivetti M28 20mb Hard Disk with 20mb Tape Back-up	£2368
Olivetti M28 40mb Hard Disk, 640k RAM	£2392
Olivetti M28 40mb Hard Disk with 20mb Tape Back-up	£2877

Special Offers:

Olivetti M24 with 640k, 7-slot Bus Converter	
Monitor, MS-DOS/GW-Basic, Keyboard, 20mb Hard Disk	£1399
M24SP Complete System (Monitor/Keyboard/DOS)	£1719

COMPAQ

Compaq Portable III Model 2 640K/20MB HD	£2824
Compaq Portable III Model 3 640K/40MB HD	£3136
Compaq Deskpro 286 Model 20 640K/1 FD/20MB H.D.	£2161
Compaq Deskpro 286 Model 40 640K/1 FD/40MB H.D.	£2536
Compaq Deskpro 386 Model 40 1024K/40MD HD/Tape Bk	£4050
Compaq Deskpro 386 Model 70 1024K/70MD HD/Tape Bk	£4499
Compaq Deskpro 386 Model 130 1024K/130MB HD/Tape	£5622
Compaq Mono Video Controller Board	£150
Compaq 286 EGA Colour Adaptor	£372
Compaq 286 High Resolution EGA-style Colour Monitor	£413
Compaq Dual-Mode Mono Amber or Green Monitor	£162
All Compaq Deskpro computers require Monitors, Monitor Adaptor Boards and MS-DOS.	

ATARI

Atari 520STM 512k RAM, TV Modulator, no disk drive	£203
Atari 520STFM 512k RAM, disk drive, mouse	£306
Atari 1040STF 1mb RAM, disk drive, mouse	£449
Atari 1040STF with Mono Monitor, 1mb RAM, disk drive	£535
Atari 1040STF with Atari SC1224 Colour Monitor	£705
Atari 1040STF with Philips 8833 Colour Monitor	£671
Atari 1040STF with Philips 8852 Colour Monitor	£674
Atari SF314 1mb Floppy Disk Drive	£150
Atari SF354 512k Floppy Disk Drive	£115
Atari SH204 20mb Hard Disk Drive	£478
Cumana CS354 1mb Floppy Disk Drive	£116
Cumana CS358 double 1mb Disk drive Unit	£198
Micro Peripherals DD41 1mb Disc Drive	£110
Atari SM125 High Resolution Monochrome Monitor	£114
Atari SC1224 Colour Monitor	£296
Philips 8833 Colour Monitor	£250
Philips 8852 Colour Monitor	£252

ATARI TOP SELLING SOFTWARE

Flight Simulator II	£37
VIP Professional (Lotus Clone Gem Version)	£139
Metacomco Lattice C Compiler	£71
Metacomco Macro Assembler	£35
Migraph Inc Easy Draw	£56
Mark Williams C Compiler	£117
Megamax C Compiler	£110
Sage Software	call
SOFTWARE SPECIAL-Starglider/ The Pawn/ Hacker II	
World Games/ ST Karate/ CAD 3D	
Arena/ Lands Of Havoc/ Wanderer	£147
All Other Atari Software	15% discount

DISKETTES

Computer Express 5.25in DS/DD 48tpi disks	£1.00 each
Computer Express 5.25in DS/DD 96tpi disks	£1.40 each
Computer Express 5.25in DS/DD 96tpi Hi-Density	£1.85 each
TDK 3.5in DS/DD diskettes	£2.99 each
Computer Express Branded 3.5in DS/DD diskettes	£1.99 each
Un-branded Sony 3.5in SS/DD diskettes	£1.50 each

MONITORS

Dyneer 12in 12MHI Mono Monitor & Tilt/Swivel Stand	£99
Taxon K12SV3 Supervision III Colour Monitor	£359
Eizo ER8042S 14in Ultra-High Res EGA Colour Monitor	£465
ADI 14in Mono Monitor with Tilt/Swivel Stand	£120

COMMUNICATIONS

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

HARD DISKS, ADD-ON BOARDS, CHIPS

Dysan/Western Digital 20mb File Card	£289
Miniscribe 30mb Hard Disk Card	£339
64k dRAM chips (nine to make 64k)	£1.15 each
256k dRAM chips (nine to make 256k) 150 N.S.	£3.00 each
8087 5mz Maths Co-Processor	£97
8087-2 8mz Maths Co-Processor	£139
80287-8 Maths Co-Processor	£189
AST SixPack Plus 64k memory Multifunction Card	£169
Qube SixShooter Multifunction Card 64k memory	£125
Intel AboveBoard with 0k installed	£225
Seagate 20mb Hard Disk Kit with WD Controller & Cables	£275
Everex Mini Magic Ram Expansion Card (384k)	£117
Hercules Graphics/Graphics Plus Card	£179
Everex EverGraphics Plus Clone Hercules Card	£95
Mouse Systems Mouse with Pop-Up Menus & PC Paint	£145
Mouse Systems Mouse with Pop-Up Menus Only	£122
Microsoft Bus or Serial Mouse - Don't forget the cat!	£132
Eizo Auto-Switch EGA Card	£255
Paradise Auto-Switch EGA Card	£245

IBM-COMPATIBLE SOFTWARE TOP 23

WordStar 2000 release 2	£228
WordStar Version 4 - New Features in Old Dress	£199
WordStar Professional Version 4	£239
Dbase III Plus - Best Selling Professional Database	£325
Framework II Version 1.1	£312
Lotus 1-2-3 ver 2.1 Top Selling Package In The World	£223
Supercalc ver 4 - The Celebrated Lotus-Beater!	£195
Smart System - The Best Integrated Package	£349
Word Perfect ver 4.2 - The Number 1 WP Package	£244
Microsoft Word ver 3 - Number 2 WP Package	£249
Multimate ver 3.31	£193
Multimate Advantage	£247
Executive Systems X-Tree (Super Friendly HD Organizer)	£40
Pegasus Accounts (per Module)	£199
Psion Chess - You too can become like Gary Kasparov	£25
Quaid Software Copywrite (Back up Protected Software)	£35
Lotus Symphony version 1.2 (Latest Version)	£319
Microsoft Flight Simulator - Don't crash!	£34
Funk Software Sideways	£40
Borland Turbo Lighting	£47
Microsoft Windows	£59
Lotus Manuscript - Latest Blockbuster WP Package!	£268
PFS: First Choice	£110
Grafco Logistix	£80
Norton Utilities 4	£52
Xerox Ventura DeskTop Publisher	£636
Smart Spelling Checker	£88
Freelance Plus	£269

ALTERNATIVE LOW-COST IBM/AMSTRAD COMPATIBLE SOFTWARE

VP Planner by Paperback Software - Best Seller!	£61
VP Info (dBASE II Clone)	£62
VP Expert	£75
Borland Sidekick - The Original Co-Resident Process!	£49
Borland Turbo C - C How You Like This!	£65
Borland Turbo Pascal - The Classic Borland Product	£47
Sage Bookkeeper	£75
Sage Retrieve Database	£71
Sage PC Planner Spreadsheet (Lotus Clone)	£71
Sage Desk-Set	£49
Sage PC-Write Word Processor	£71
Sage Accountant	£110
Sage Accountant Plus - Top Selling Cheap Accounts	£155
Sage Payroll	£85
Sage Financial Controller - Just reduced from 995!	£240
Personal Word Perfect	£149
Word Perfect Junior	£80
Microsoft Word Junior	£62
WordStar 1512	£60
Multitran Junior	£62
Supercalc 3	£60
Amstrad Reflex	£60
Migent Ability - Top Integrated Package	£68
Migent Ability II - Spend a Little More, Mate!	£135
Words & Figures - Lotus 123 v1 Clone with WP	£80
Gem WordChart	£69

SPECIAL OFFERS

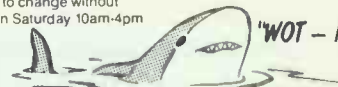
Epson PC+ 20mb with Eizo 8042S EGA Monitor & Card	£1555
Epson PC+ 20mb with Epson Mono Monitor	£999
Epson Taxi PC 512k, Mono Monitor, Graphics Card	£599
Amstrad PC1512 Double Floppy/Colour Monitor	£689
Erccson Portable PC 512k, Printer, 360k Floppy (ex-demo)	£1500
Star PowerType Daisywheel Printer 18cps	£175
Olivetti 48tpi Demodisks - See a dem, use a disk	£15 box
Atari SH204 20mb External Hard Disk	£478

Above offers subject to payment with order and valid only while current stocks last. First come first served. Only one of each item per customer and you must mention this ad.

FOR FULL PRICE LIST PLEASE CALL
TELEPHONE ORDERS WELCOME



0727-72790



SINGLE AND MULTI-USER MICRO-COMPUTER AND SOFTWARE SALES AND SUPPORT
99 PARK STREET LANE • BRICKET WOOD • HERTFORDSHIRE • AL2 2JA • ST ALBANS (0727) 72790

Telex: 8950511 ONE ONE G (Quote Ref: 15412001)

Get the best for less at Ness

ARABIC VERSIONS
AVAILABLE
EXPORT ORDERS WELCOME

**THE
NEW PC 386**
FROM
£2995



**THE NESS SUPER XT
TURBO 20MB £795**

- NEC V20 Super processor
- switchable 4.77/8 mHz clock
- 20MB hard disk
- 1 x 360K floppy drive



**THE NESS SUPER AT
TURBO 20MB £1395**

- a true 10 mHz computer
- switchable 6/8/10 mHz
- 20MB hard disk
- 1.2MB half height floppy

**THE NESS
SUPER
PC-386T**
£2995

- Intel 80386 processor
- up to 2MB RAM on mother board
- fast 16 mHz clock
- 1.2K floppy drive
- full AT compatibility



FEATURES

- 100% industry compatible
- high performance
- quality build
- top-grade components
- fully supported by NESS technicians
- stand-alones or systems
- installation and after-sales engineering
- wide range of upgrades available
- many peripherals in stock
- comprehensive software
- satisfaction or money back in 14 days

**AT
COMPATIBLE**
FROM
£995

★ 30MB, 40MB, 80MB AND MORE UPGRADES AVAILABLE

ALL NESS COMPUTERS COME WITH THE FOLLOWING
AS STANDARD:

- | | |
|---------------------------------------|-------------------------------|
| ● professional keyboard | ● high-resolution 12" monitor |
| ● parallel and RS232 serial ports | ● full set of manuals |
| ● clock/calendar with battery back-up | ● 8 x expansion slots |
| ● monographic and printer cards | ● 12 month guarantee |



ADDITIONAL OVERSEAS AGENTS REQUIRED

NESS INDUSTRIES LIMITED

38-40 Upper Clapton Road, London E5 8BQ

Telex: 261840 NESS G Fax: 01-806 2743

PHONE: 01-806 1072/8904

IGNORE THE REST – WE ARE THE VERY BEST



olivetti M28

40 Mb Hard Disk
8MHz Clock Speed
512 RAM MSDOS
Olivetti Monitor
Olivetti Keyboard **£2695.00**

olivetti M28

20Mb Hard Disk
8MHz Clock Speed
512K RAM MSDOS
Olivetti Monitor
Olivetti Keyboard **£2195.00**

olivetti M24 SP

10MHz Clock Speed
20Mb Hard Disk
640K RAM MSDOS
Olivetti Monitor
Olivetti Keyboard **£1545.00**

olivetti M24

20Mb Hard Disk
Olivetti Monitor
Olivetti Keyboard
640K RAM MSDOS **£1395.00**

WE SUPPLY EVERYONE FROM LEADING UK COMPANIES,
GOVERNMENT DEPARTMENTS, EDUCATIONAL
ESTABLISHMENTS, LOCAL AUTHORITIES, THE COMPUTER
TRADE TO SMALL BUSINESSES AND THE PRIVATE
INDIVIDUAL – ANYWHERE IN THE WORLD!

CALL US NOW – IN YOUR AREA!



EDINBURGH
031 556 9903
NEWCASTLE
091 276 6887
MANCHESTER
061 228 7965
NOTTINGHAM
0602 583461
BIRMINGHAM
021 643 5072
LONDON
01 481 3929
BRISTOL
0272 273665

olivetti M24

Twin Floppy Disk Drive
Olivetti Monitor
Olivetti Keyboard
640K RAM MSDOS **£1095.00**

AMSTRAD

Complete systems
Discount for quantity

Free UK Delivery on all
Amstrad PC orders

olivetti M19

Twin Floppy Disk Drive
Olivetti Monitor
Olivetti Keyboard
256K RAM MSDOS **£845.00**

Tandon Complete Systems

PCX 256K 10Mb, Screen **£999.00**
Keyboard, MSDOS
PCX 256K 20Mb, Screen, **£1175.00**
Keyboard, MSDOS
PCA 20 512K 20Mb, Screen, **£1645.00**
Keyboard, MSDOS
PCA 30 512K 30Mb, Screen, **£1925.00**
Keyboard, MSDOS

TOSHIBA 3100 Portable

80286 Processor, 8MHz, 640K RAM,
10Mb Hard Disk, 720K Floppy Serial/
Parallel Port, Weight 15lbs **£2695.00**

TOSHIBA 2100 Portable

8086 Processor, 7MHz, 640K, RAM,
10Mb Hard Disk, 720K Floppy Serial/
Parallel Port,
Weight 13lbs **£2195.00**

PC1512SD – Mono Monitor **£449.00**
PC1512DD – Mono Monitor **£559.00**
PC1512SD – Colour Monitor **£619.00**
PC1512DD – Colour Monitor **£729.00**
PC1512HD 10Mb – **£799.00**
Mono Monitor
PC1512HD 20Mb – **£899.00**
Mono Monitor

PC1512HD 10Mb – **£969.00**
Colour Monitor
PC1512HD 20Mb – **£1069.00**
Colour Monitor
PCW8256 Word Processor **£339.00**
PCW8512 Word Processor **£425.00**

PRINTERS

Epson FX800 160CPS & NLQ **£339.00**
Epson FX1000 160CPS & NLQ **£420.00**
Epson LQ800 180CPS & NLQ **£475.00**
Epson LQ1000 180CPS & NLQ **£625.00**
Epson SQ2000 Ink Jet
Printer **£1295.00**
Olivetti DM280 160CPS
& NLQ **£335.00**
Olivetti DM290 160CPS
& NLQ **£375.00**
Olivetti DM286 220CPS
& NLQ **£480.00**
Olivetti DM296 220CPS
& NLQ **£600.00**
Olivetti DY200
25CPS Daisywheel **£345.00**

Olivetti DY300 **£548.00**
30CPS Daisywheel
Olivetti DY800 **£1050.00**
80CPS Daisywheel
NEC Pinwriter P6 **£395.00**
NEC Pinwriter P7 **£460.00**
Canon LBP-8A1 Laser Printer **£1995.00**
Canon LBP-8A2 Laser Printer **£2995.00**
1.25Mb RAM
OKI Laserline 6 Laser Printer **£1625.00**
Amstrad DMP3000 110CPS
& NLQ **£150.00**

SOFTWARE

DBase III Plus **£385.00**
Framework II **£330.00**
GEM Collection **£75.00**
Lotus 123 **£249.00**

MS Word 3 **£249.00**
Multimate Advantage **£275.00**
Multiplan II **£125.00**
Olitext **£125.00**
Psion Exchange **£250.00**
SMART Software **£395.00**
Symphony **£349.00**
Wordstar 2000 **£236.00**
Sidekick for Amstrad **£25.00**
Relflex for Amstrad **£55.00**
Superkey for Amstrad **£25.00**

All Microsoft Packages **Large Discounts**
All Lotus Packages **Large Discounts**
All Multisoft **Large Discounts**
Accounting Packages **Large Discounts**



Piccadilly Micros, Warwick Chambers, 14 Corporation Street, Birmingham B2 4RN. Telephone: 021 643 5072. Telex: 334264

★ 12 months warranty ★ 7 day money back guarantee ★ Next day del. available
★ On site maintenance contracts available ★ Finance plans available

All prices exclude VAT and delivery and are correct at going to press. Piccadilly Micros reserve the right to vary prices without prior notice.

Trade enquiries welcome. Additional discounts for bulk orders.



WEST ONE BUSINESS SYSTEMS

NEW IBM Personal System 2 Available now Telephone for Demonstration

Model 30/002 with Dual 3-5 720k Floppy drives,
640k Memory, Enhanced keyboard, serial and parallel ports
.....**£1095**

Model 30/021 with 20mb hard disk, one 720k 3-5 floppy
drive 640k memory. Enhanced keyboard, serial and parallel
ports.....**£1445**

Model 50 10mhz, 80286 desk top system with 20mb hard
disk one 1-44mb 3-5 floppy, 640k memory. Enhanced
keyboard, serial and parallel ports.....**£2395**

Monitors for the above systems

Mono-display — 12" screen size, black and white, 64 shades
of grey, 640 x 480 resolution.....**£169**

Colour-display — 12" screen size 256 colours available from
262,144 possible, 640 x 480 resolution.....**£445**
14" screen size, 256 colours available from 262,144 possible,
640 x 480 resolution.....**£495**

Limited Offer!

Save 25-30% on existing IBM systems!

Complete IBM Personal Computer Systems including
Monochrome Monitor, Adaptor card, Enhanced Keyboard
and 640k memory.

IBM XT SDD with two 360k floppy disk drives**£795**

IBM XT SFD with one 20mb hard disk and one 360 floppy
Drive.....**£995**

IBM XT 286 80286 processor with 20mb hard disk and one
1-2mb floppy drive.....**£1995**

IBM ATX Fast 80286 processor with 30mb hard disk and one
1-2mb floppy drive (512k RAM)**£2995**

Complete range of IBM peripherals available including monitors
Memory upgrades and printers
Authorised IBM DEALER

TRAINING AND INSTALLATION

Full onsite training and installation is available on all products. Ask us for a quotation! We also supply
and install a range of Multi user and Network products including Xenix and Novell. Telephone for further
details on 01-636 7142 or 01 323 2840.

The Akhter P.C. — IBM Compatible System

All systems with keyboards
Hercules compatible Adaptercard,
Turbo Main Board 4.77/8mhz,
Serial/parallel port,
Games port, 150 watt P.S.U.
and 8 expansion slots.

P.C. 1000 Single 360 floppy drive, 256 RAM.....**£499**
P.C. 1500 Dual 360k floppy, 256k RAM.....**£598**
P.C. 2000 Single 360k, 20mb hard disk, 512k RAM.....**£859**
P.C. 2500 Dual 360k, 20mb hard disk 512k RAM.....**£958**
P.C. 3000 Dual 720k-3.5" disk drives 512k RAM.....**£615**
P.C. 3500 Single 720k-3.5" disk, 20mb hard disk 512k **£869**

MONITORS

7513 Philips Monochrome Monitor **£89**
8533 Phillips Med. Res 600 x 200 re-
solution (CGA, Mono, T.T.L).....**£246**

CM8873 Phillips E.G.A. Multi Scan,
850-285 max resolution.....**£572**

1404 Mitsubishi Med Res colour 600 x
200 resolution.....**£256**

NEC Multi Synch 800 x 560 max reso-
lution.....**£585**

Disk Drives

20mb hard disk drives and controller
card.....**£349**

40mb hard disk drive and controller
card.....**£749**

360k 5-25 floppy disk drive.....**£95**

1-2mb 5-25 floppy disk drive.....**£129**

720k 3-5 floppy disk drive.....**£119**

Monochrome Adaptor.....**£89**
Colour adapter.....**£89**
E.G.A Card.....**£195**

Please call for more information
on other products

PRINTERS

Superb range of high Quality Star
and IBM Printer

Star N.L.10
— 9pin, 120cps draft — 30 cps N.L.Q. 80 col.....**£226**

Star NX 15
— 9pin as above but 132 col.....**£295**

Star NR15
— 9pin, 240 cps draft — 60cps N.L.Q. 132col.....**£479**

Star NB 24-10
24pin, 216cps draft — 72cps L.Q. 80col.....**£486**

Star NB 24-15
24 pin as above but 132 col.....**£616**

IBM Proprinter
9pin, 160cps draft-40cps. N.L.Q. 80col.....**£266**

IBM Proprinter XL
9pin as above but 132 col.....**£395**

IBM Quiet writer Model 2.....**£695**

IBM Quiet writer Model 3.....**£895**

Canon Laser printer — 8 page per minute.....**£1795**

Full range of Epson printers available — Telephone for details

Sanyo Special Offer

Sanyo 550 with Dual 800k Drives, Monitor,
Wordstar and Calc Star including a Daisywheel
Printer all for **£599**

Sanyo 775 Portable IBM compatible high reso-
lution 9" colour monitor, complete with
Wordstar and Calcstar at

£1295

Sanyo Special Offer

Limited stock! Clearance Prices!

Sperry IT and Sperry HT — 80mb, 40mb, 20mb systems.
Olivetti M24 and M15 — complete systems. Apricot Xen —
Dual Floppy Systems

Up to 40% Discount on
Selected software
products!
Telephone for
Details

37 STORE ST. OFF TOTTENHAM COURT RD, LONDON WC1
01-636 7142 or 01-323 2840 (4 lines)

All prices exclude VAT. Visa and Access accepted. Prices exclusive of
postage and packing. Price subject to change without notice. All goods
subject to availability.

TECHNICAL SUPPORT

We are looking for a very rare breed of person to assume a technical support role in our newly established Software Development Group, The Software Studios.

This rewarding position commands a varied list of duties; the work is challenging and requires a working knowledge of 6502 and/or Z80, and familiarity with most popular home microcomputers. You will work closely with our Product Management team and freelance software developers assisting and resolving any technical issues that may arise, in addition to managing product testing.

Additionally, you will assess new hardware and advise the Group on various technical matters. An understanding of cassette and diskette mastering would be an advantage, as would knowledge of protection techniques for home computer software.

If such a responsible and varied position would suit you, please send a current C.V. to:



The Software Development Manager
Software Studios
Terminus House
Terminus Terrace
Southampton SO1 1FE
Tel: (0703) 229694

FARNHAM
COMPUTERS
We are dealers for

AMSTRAD

Acorn

and **ATARI ST**

For your Computer,
Software and
Peripherals
requirements



Call Us for Prices:
1 South Street,
Farnham, Surrey
Tel: 0252 723107



Goto Computers

10 Old Crown, Windsor Road, Slough, Berks SL1 2DL

Sales Hotlines:



Slough (0753) 34191

Slough (0753) 824767

100 MILE FREE DELIVERY

(Over 100 miles and under £100 add £5)

COMPUTERS

Amstrad 1512 DDM + DMP3000 + WS + S/Ca3	699
Amstrad PC1512HD-20Mb Col+10 DSD	1069
Bell Packard V286 AT 14" Mono Monitor	1399
Epson PC AX 20Mb 640k 10Mhz ex Mon	1625
Epson PC AX 40Mb 640k 10Mhz ex Mon	2125
Epson PC AX Mono Display/Adaptor	245
Olivetti 83 or 102 key Keyboard	120
Olivetti Color Monitor	399
Olivetti M24 640k 20Mb 1FD	1255
Olivetti M24SP 640k 20Mb 1FD 10 Mhz	1425
Olivetti MSDOS/GW Basic	52
Olivetti Mono Monitor	165
Opus PC11 EGA 640x360 16d 20Mb	1325
Opus PC11 EGA upgrade kit Mono + Card	395
Opus PC11 System 3 Turbo 2FD Mono	560
Opus PC11 System 4 20Mb Mono mon	969
Tandon EGA Monitor and Adaptor	440
Tandon PCA20 1024k 20Mb 1FD Col	1750
Tandon PCA20 1024k 20Mb 1FD Mono	1460
Tandon PCA30 1024k 30Mb 1FD Mono	1725
Tandon PCA40 1024k 40Mb 1FD Mono	1895
Tandon PCX20 640k Par/Ser Mono Mon	935
Tandon Target 20 1Mb 20Mb 1FD Mono	1995
Zenith Z-81 Lapheld PC 2x720k Dr	1425

MONITORS

Hercules Color Card 320x240 4 cols	159
NEC JC 1401P34 Multisync EGA PGA	535
Philips 8833 600 dots 285 lines NEW	255
Philips 8873 Multisync 14" EGA/PG	465
Princeton HX125 EGA + Vega Deluxe EGA	535
Taxan 580 EGA/MGA/CGA Switch Card	210
Taxan 760 EGA 14" EGA 15/22 Khz	415
Taxan 770 + Multisync 15/35Khz	660
Taxan 860 16" EGA 0.39 dot	675
Taxan KX 1212/13 Green or Amber	118
Taxan Supervision IV 16" NEW	750
Taxan Supervision IVmRGB + KIF3800	4400
Thompson 44700 14" EGA Dual Scan	4400

SOFTWARE

Ability Plus NEW	145
Autocad 2.6 Basic	285
Borland SuperKey/Light/Pro/SK each	60
Borland Reflex The Analyst V1.1	70
Borland Turbo Basic NEW	65
Borland Turbo Holiday Jumbo Pack	160
Clipper dBase III Compiler NEW	345
Composoft DELTA 4 Professional	325
DS BACKUP + Hard Disk Backup NEW	99
Dbase III + V1.1 Unprotected	330
Expert XI Plus The Expert System	1250
Fantasy Ver 2 On-Screen Fonts/Draw	69
Framework II V1.1	315
Harvard Presentation Graphics	230
Harvard Professional Publisher	575
Lotus 123 Rel 2.01	230
Lotus HAL	105
Lotus Manuscript Word Processor	295
Lotus Measure (Scientific) NEW	345
Lotus Metro NEW	65
Lotus Symphony 1.2	330
MACE + Unformat etc	69
Microsoft Flight Simulator V2.13	42
Microsoft QuickBasic v2.1 NEW	75
Multimate Advantage 3.60	275
Norton Advanced Utils NEW	95
Norton Utilities Ver 4 NEW	54
Open Access II V2 NEW	365
Paradox Rel 1.1 Relational DBase	355
SAGE Accountant Plus	145
SAGE Financial Controller NEW	245
SAGE Payroll V7 NEW	75
Smart System 3.1 LAN Ready V3.10	385
Statgraphics Ver 2.1 NEW	435
SuperProject Plus UK Ver	330
Supercalc IV NEW UK Ver	200
The Genius Desktop Publishing	1645
Ventura Desk Top Publishing V1.1	640
Wordperfect 4.2 NEW	44
XTREE File & Directory Maint V2.0	250

PLOTTERS DIGITISERS LASER

Canon LBP-8A2 MkII More fonts etc	2675
Cherry A3 Digitiser Mk II NEW	465
Citizen Overture 110 10ppm in	1585
Hewlett-Packard 7475A A3 6 Pen Plt	1325
Hewlett-Packard LaserJet Series	2195
Hewlett-Packard ScanJet Imager	1595
Kyocera F-1010 Laser A4 62 fpm	2550
OKI Laserline 66ppm	1595
Roland DXX 2000 A2 8 pen	3100
Roland DXY 880A A3 8 pen	635

Roland DXY 885 A3 + Autosketch NEW	990
Roland DXY 980A A3 8 pen	895
Roland DXY 990 A3 + Autosketch NEW	1025
Summasketch Graphics Tablet	335
Taxan 716 A3 10 Pen	850

DOT MATRIX PRINTERS

Amstrad DMP4000 50NLQ/200cps 15°C	345
Brother 1509 NLQ/Tractor 136cl	365
Brother 1709 50/240cps 136 cl NEW	450
Brother 2024L NLQ/190cps	620
Brother M4018 100NLQ/480cps 18 pin	1425
Canon A55 34NLQ/180cps 156 cols	365
Canon A60 34WQP/100NLQ/200cps 80 col	400
Canon A65 34WQP/100NLQ/200cps 132col	475
Citizen 1200 23NLQ/1200cps 80 col	160
Citizen HOP-45 66NLQ/200cps 136c	535
Epson EX 800 50NLQ/300cps 80 col	375
Epson EX1000 50NLQ/300cps 136 col	465
Epson FX1000 40NLQ/200 132 col NEW	390
Epson FX800 40NLQ/200 80 col NEW	315
Epson LQ 1000 80LQ/160cps 156c24pi	575
Epson LQ 800 60LQ/160cps 80c 24 pin	438
Epson LQ 2500 90LQ/270cps 24pin	715
Fujitsu DX2100 55NLQ/220cps 80cl	285
Fujitsu DX2200 55NLQ/220cps 136c	385
Juki 7200 24 wire flatbed AMF NEW	700
NEC Pinwriter P5XL 88NLQ/264 136c	380
NEC Pinwriter P6 72/216 24p 80c	380
NEC Pinwriter P7 72/216 24p 136c	448
Panasonic KXP 1081 NLQ/120cps NEW	159
Panasonic KX-1592 38NLQ/180 136c	355
Star NL10 30NLQ/120 80cl + i/Face	220
Star NX15 30NLQ/120cps 136i + i/Face	290
Taxan 815 NLQ/180cps IBM set NEW	269

DAISY WHEEL PRINTERS

Brother HR25XL 25XL 25cps Dual 132 Col	520
Brother HR40 FT 30 sheet Sheetfeed	710
Brother Twinwriter 40cps/160 matrix	995
Citizen Premier 35cps Fric-Frac	450
Juki 6100 18cps	270
Juki 6200 30cps 132 col	375
Panasonic KX-P3132 22cps 80 col 32kb	249
Panasonic KX-P3151 22cps 132 col	370

ADD-ONS & UPGRADES

80287 6Mhz Maths Processor AT	165
8087 8Mhz M24/1512/Compag Deskr	140
8087 Maths Processor XT 5Mhz	105
Cypher 1525 CT 25Mb Streamer + PS	500
Dysan (WD) File Card 20Mb	385
Fujitsu Copyboard A4 Presentations	1915
Hercules Color Graphics Card	100
Hercules Graphics Card Plus	170
Inform M/Function 384k C/Ca PS	135
Intel Above Board AT 512k onboard	395
Intel Inboard 386/AT to 16Mb 1Mb	2000
Kodak Datasheet PC to Overhead Proj	1940
Microsoft Mouse Bus or Ser + Paint etc	135
MiniScribe 30Mg HardCard only 9.5w	359
MiniScribe 38 4Mb H/Ht HD+WD+Kit	385
NEC 20Mg half HT + WD + Cont + Kit	340
NEC 256k DRAMS chips(9) 150ns	26
Orchid 286 EGA Turbo	465
Orchid Jet 386 16Mhz	745
Orchid Tiny Turbo 80286 with cable	370
PVC Moulded PC 2 Metre Cable	16
Switch Box 2 Printers to 1 computer	45
Sysgen 60Mb Tape Streamer	850
Tandon 20Mb Business Card	400
V20-5Mhz Speeds up PC/XT up to 35%	20

COMMUNICATIONS

Amstrad Comms Pack Card + Datatalk	149
Crosstalk IV Software New	96
Datatalk Software V3.27	130
Hayes 2400 V22bis	590
Hayes Smartmodem 1200 V22	365
Hayes Smartmodem 1200B Internal	355
Miracle Keypad 3000 V21 V23	270
Miracle WS3000 V21 V22 V23 Auto	380
Miracle WS3000 V22bis 2400/2400	235
PACE Series 4 Modem V21/V23	215
Procom 20 Telex Plug-In Board	840
SAGE Chit Chat Software	82
SAGE Comms pack Modem + Chit Chat	225

NOVELL NETWORK SYSTEMS

Advanced Network 286/Ethernet kc	3800
Advanced Network 286/G-Net	2700
Network Server 286A-30Mb kc	6600

ORDERS TAKEN FROM UK GOVERNMENT BODIES — EDUCATIONAL ESTABLISHMENTS — COMPANIES
EXPORT ORDERS UNDERTAKEN TO BE SEPARATE ITEMS
LEASING AND H.P. ARRANGEMENTS.

PRICES SUBJECT TO CHANGE WITHOUT NOTICE
OPEN 9.00AM TO 5.30PM MON THRU FRIDAY AND 9.30AM TO 12.30PM SATURDAY
WE MOVE SERVICE NOT BOXES
Please add VAT to all prices



TASTM Database and Application Developer

Ready Made Applications

Two application suites are available from MEGATECH. TAS Modifiable Accounting and TAS Advanced Accounting. These were developed using the £199 TAS Plus Developer and this package is included in the price. But besides the database you also get the source code (that's the original database code the accounting systems were written in) and all other information and tools, including an excellent tutorial and reference manual. This allows you or your supplier to add modules or make changes to existing modules that will become your 100% accounting solution.

Modifiable Accounting £499

This includes the £199 TAS Plus Developer's version and consists of:
Nominal Ledger
 3 years totals by month. Budgeting by month. Multiple departments/profit centres. Full VAT analysis for up to 10 rates of VAT. Post to previous periods and reclose. Financial statement writer. Up to 5 bank accounts. Detailed history files.

Purchase Ledger

Easy to enter invoices. Recall last nominal distribution. Pay invoices automatically or by hand. On-line account enquiry. Full supplier history and ageing reports. Real time updates.

Sales Ledger

Invoicing and sales analysis. Easy adjustments of current ledger entries. Statements, aged debt reports, bad debt letters, daybooks etc. define individual customer history.

Advanced Accounting £799

In addition to Modifiable Accounting you get three more modules:

Stock Control

Wholesale distribution-type. Regular and non-stock items. Average and last cost. Multiple selling prices. Easy stock adjustments. Month and year to date sales and costs. Post to individual nominal accounts. Full reporting.

Purchase Order Processing

Provides for regular and non-stock items. Automatic last cost check. Easy adjustments. Allows for part delivery, over/under shipments.

Sales Order Processing

No limit sales order entry with invoicing and backorders. Full salesman support. Unique price matrix "remembers" specials per individual customer. Picking slips. Easy adjustments and much much more.

System Requirements

TAS Plus runs on any IBM PC, XT, or AT compatible machine (including the AMSTRAD PC1512) with at least 384KB RAM and two floppy discs or a hard disc. A version for Concurrent CP/M with a different specification is also available. Ask MEGATECH for more information.

TAS Plus Database and Application Developer

The TAS Plus database and application developer is an invaluable tool for anyone requiring quick access to information. It allows you to enter, store, display, report and manipulate data, quickly, and easily and is suitable for both programmers and beginners.

Fast and Easy to learn

An excellent tutorial and reference manual teaches you step-by-step how to create your own applications using the TAS facilities. You start by "painting" the screen the way you want it and then the TAS Plus program generator writes the program for you. Producing reports is just as easy. When you have created your application, the database browser and report generator allow you to retrieve the information quickly and print it to screen, disc or printer. You will learn how to use the automated source code editor to add commands to your programs in order to produce professional menu-driven applications supporting multiple files, reports and screens that include pop-up menus and windows. Finally, when it comes down to the speed of developing and, more importantly, running your applications (because that's what you do every day) you will find that the compiled code makes TAS quicker than any other database.

Suitable for Most Applications

Use it for mailing lists and mailmerge applications, client records, stock systems, membership records, subscription accounting, and virtually any other application where you want to enter, store, display, report and manipulate data, quickly and efficiently. Our integrated financial accounting system is written in TAS (available with the TAS source code included) which proves conclusively that almost any database application can be produced with TAS.

At £99 TAS Plus is Complete

It consists of a Screen Painter, Program Generator, Database Browser, Report Generator, Command Language, Source Code Editor and Compiler. TAS Plus opens up to 16 files simultaneously where each file may have up to 16 key fields (through which you may locate a record) which are automatically kept in sorted order. Each file may have up to 65,000 records and each record may have an unlimited number of fields with up to 10,000 characters per record. TAS Plus supports excellent array handling, string manipulation and full arithmetic and bracketed expressions as well as time and (European) date arithmetic. Read and write non-TAS (ASCII) files and automatically convert to and from dBase 3 files. Use all IBM compatible colours and business graphics. User definable printer control characters, full function key access and control and more.

TAS Plus Developer £199

This is for those that need even more power and flexibility. Open 32 files, each

What the Press Says

"Combination of good, basic menu driven facilities with powerful programming tools make it excellent value for money, especially for novices wanting to learn, and developers wanting economical runtimes systems". (Personal Computer World)
 "On a value for money basis, this must be one of the most attractive databases on the market". (Accountancy Magazine)
 "TAS manages to pack plenty of power into its small price. It performed well in our tests and you can quickly write dense and efficient code for custom applications". (PC Magazine)
 "There is no doubting that TAS is a very capable product—it handles serious-sized applications and does so with speed." (What Micro Magazine)

with up to 32 keys. Save up to 17 million records per file. It includes extra commands and allows you to develop programs using an ASCII text editor. Study the developer source code of the browser, screen painter, program and report generator and the 120K command editor all of which were developed in TAS!

TAS Multi-User Version £349

The multi-user developer's version of TAS will work with IBM PC Network, Novell Advanced Netware, Torus Netware, 3-Com Netware, Transnet, D-Link, MultiLink Advanced, MS-Net (Apricot Xen-I) and all other MS-DOS 3.1 NETBIOS compatible networks.

30-Day Money Back Guarantee

The package you receive contains a sealed unsealed set of floppy disks. The unsealed set is fully operational but can only save a limited number of records. This allows you to use the complete working system at your leisure. If you find that TAS does not perform in accordance with our claims and provided that the sealed set remains unopened and all goods are returned to us (in a good condition) within 30 days of purchase, we will refund your purchase price less handling and a 10% restocking charge.

Order Your Copy Today



PCW/6/87

NOT COPY PROTECTED

Please send me the following items:

More information:

TAS Plus @ £99:

TAS Plus Developer @ £199:

TAS Plus Modifiable Accounts @ £499:

TAS Plus Advanced Accounting @ £799:

Add handling & shipping @ £6:

Add 15% VAT

I enclose a total of:

Payment

Cheque	Access	Visa
--------	--------	------

Card Number:

Card Expiry Date:

Card Name:

Card Address:

Postcode:

Daytime Tel. No.:

Signature:

A VAT Invoice will be included in the parcel. Enclose a company letterhead if Invoice name and address need to be different from card name and address

MEGATECH
CORPORATION

111-113 Wandsworth High Street
 London SW18 4HY
 Telephone: 01-874 6511. Telex: 21768

XT-Compatible 20 Megabytes 4.77/8 MHz

£795

- The PC88 Turbo
- Legal BIOS
- NEC V20 Super Processor
- Switchable 4.77/8 MHz Clock
- 640K RAM
- 20MB Half Height Hard Disk
- 360K half Height Floppy
- Parallel Printer + RS 232 Serial ports

- Monographic/Printer card
- 130W Power Supply
- Professional Keyboard
- "Hi-Res 12"" Green Monitor
- MS-DOS 3.2
- Full Set of Manuals
- 8 Expansion Slots
- 12 Months Warranty
- Clock/Calendar with Battery Back-up

AT-Compatible 20 Megabytes 6/8/10 MHz

£1295

0 or 1 Wait States

- The PC-286 Turbo
- Legal Bios
- Switchable 6/8/10 MHz
- 640K RAM
- 20 MB Half Height Hard Disk
- 1.2 MB Half Height Floppy
- Parallel Printer + Two RS232 Serial Ports
- Clock/Calendar with Battery Back-up

- Monographic/Printer card
- 200W Power Supply
- Professional Keyboard
- "Hi Res 14"" Green Monitor
- MS-DOS 3.2
- Full Set of Manuals
- 8 Expansion Slots
- 12 Months Warranty

OPTIONS

- 30 MB Hard Disk Drive Upgrade
- 40 MB Hard Disk Drive Upgrade £365
- 14" Colour Monitor Upgrade £175
- 14" Hi Res Colour Monitor and EGA Card Upgrade £395
- EGA Card £165



ELONEX (UK) Ltd.

Please feel free to visit our showroom for demonstration

**RAYS HOUSE, NORTH CIRCULAR ROAD, STONEBRIDGE PARK,
LONDON NW10 7XR TELEPHONE: 01-965 3225**

BATH COMPUTER SHACK

YOU'VE PROBABLY HEARD ABOUT US!

ATARI ST ✓ AMIGA

CALL US LAST FOR THE BEST DEALS

Wide range of Software and peripherals for Atari St & Amiga

★ We promise you full support and after sales service ★

Atari 520 STM keyboard only	inc VAT	£259.00
Atari 520 STFM built in drive and mouse		£399.00
Atari 520 STFM as above + mono monitor		£499.00
Atari 1040 STF with mono monitor		£699.00
Atari 1040 STF with med res col monitor		£899.00
All ST models come complete with our top value starter pack		

Amiga 1000 System 1 512k	£1075.00
Amiga 1000 System 2 512k	£1250.00
	+ VAT

PLUS FREE!! £200.00 VOUCHER
to spend on software or peripherals of your choice

Part
Exchange

★ New Atari and Amiga Models ★
Please call or phone for latest details and prices

Finance
Available

Education, Gov't Department, and volume orders negotiated with pleasure

Tel: 0225 310300

8E, CHELSEA ROAD, LOWER WESTON, BATH, AVON

Tel: 0225 310463

Almo Computer Systems

New Number
More Lines
0730 68877

PRICE REDUCTIONS ON MOST PRINTERS AND SOFTWARE

TOSHIBA 24 Pin Head

P321 (216/72cps)	£415
P341E (216/72cps)	£489
P351 (288/100cps)	£736
P351C (288/100cps) Col	£988

EPSON Dot Matrix

LX86 (120/16cps)	£193
LX800 (150/25cps)	£201
FX800 (240/40cps)	£307
FX1000 (240/40cps)	£393
LQ800 (180/60cps)	£447
LQ1000 (180/60cps)	£597
LQ2500 (270/90cps)	£747
SQ2000 (176/105cps)	£1219
SQ2500 (270/90cps) P/S	£962
EX800 (300/50cps)	£397
EX1000 (300/50cps)	£533

JUKI Daisywheel Printers

6100 (20cps)P	£267
6200 (30cps)P	£403
6300 (40cps)P/S/IBM	£647
6500 (60cps)P	£870

OTC

OTC 700 (700cps)	£1377
OTC 850XL (850cps)	£1515

BROTHER D/wheel Printers

HR20 (20cps)P/S	£354
HR25XL (25cps)P/S	£553
HR40 (40cps) P/S*	£791
*T/feed, S/Feed standard	
TwinWriter Daisy/D.Mat	£1030

BROTHER Dot Matrix

2024L (160/96cps) P/S	£632
M1409 (180cps)	£306
M1509 (180/45cps) P/S	£394
M1709 (240/50)P/S	£473

OKI Microline Dot Matrix

84 (200cps)P	£645
84 (200cps)S	£725
84XS (200/50cps)	£1036
182 (120/60cps)P/I	£210
182HS (H/Speed Ser)	£235
192 (160cps)P/I	£289
192 (160cps)S	£331
193 (160cps)P/I	£373
193 (160cps)S	£416
292 (200/100cps)Col	£461
293 (200/100cps)Col	£615
294 (400/100cps)Col	£843

P=parallel, S=serial, I=IBM, col=colour

CANON Dot Matrix Printers

PW1080A+(160/27cps)	£228
A55 (180/34cps)	£384
A60 (200/100cps)	£397
A65 (200/100cps)	£457

LASER PRINTERS

Canon LBP-8A1 (8pm)P/S	£1453
Canon LBP-8A2 (8pm-Gr)	£2612
Canon SERIES II LASER A1	£1636
HP Laserjet	£1486
HP Laserjet Plus (P&S)	£2162
HP Laserjet 500	£3452
HP SERIES II LASER	£1964
Epson GQ3500 Laser	£1310

MICRO P Dot Matrix Printers

MP135 (135/27cps) P	£133
MP165 (165/35cps) P	£172
MP200 (200/40cps) P	£247
MP201 (200/40cps) P	£266
MP480 (480/74cps) P	£287

MICRO P D/wheel Printers

MP26 (26cps) P&S	£201
MP40 (40cps) P&S	£285

SOFTWARE SPECIALS

IBM

Lotus 123	£249
Symphony	£354
Wordperfect	£268
Wordstar	£174
Dbase II	£242
Dbase III+	£368
Supercalc 4	£252
Ventura Publisher	£675

MACINTOSH

Word3	£207
Works	£172
Excel	£207
Omnis 3	£312
PageMaker	£335

SYSTEMATICS ACCOUNTING

Sales - Purchase ledgers
General Ledger & Fin Planning
Stock Control - Invoicing
Job Costing - Administrator
Cheque Writer

£95 Per Module

Plus Delivery & VAT

Access/Visa/Applec card accepted. All prices are exclusive of VAT. Telephone for prices for other printers and accessories.

Prices correct at time of going to press. Cables from £15 extra. Carriage Printers £8, Laser printers £20.

Terms cash with order - Mail order only

Phone (0730) 68877 16a College Street, Petersfield, Hampshire. GU31 4AD

COMPUTER PRECISION

TOSHIBA LAPTOP COMPUTERS

T3100/20: 80286 8MHz, 640K RAM 20MB
Hard Disk, 720K Floppy Plasma Display, Ser/
Par, 15lbs

T3100: 80826 8MHz, 640K RAM 10MB Hard
Disk, 720K Floppy Plasma Display, Ser/Par,
15lbs

T1100 PLUS: 8086 8MHz, 640K RAM 2 x
720K Floppy, Supertwist LCD Ser/Par, 8 Hour
Battery 10 lbs

OPTIONS: Internal Modem, Keypad 2MB
Memory Board, Expansion Box External 5.25"
Disk Drive

Please Call For Latest Toshiba Prices

NEC COMPUTER SYSTEMS

MULTISPEED: NEC V30 9.54MHz POA
640K RAM, 2 x 720K Floppy Supertwist
Display, Ser/Par 6-hour Battery, 11lbs

APC IV40: 80286 8MHz, 40MB HD .. £2,495
1.2MB Floppy, 640K RAM, Ser/Par
MultiSync Monitor & EGA Adaptor
Enhanced Keyboard, MS Dos

APC IV20: 80286, 8MHz, 20MB HD .. £2,250
1.2MB Floppy, 640K RAM, Ser/Par
MultiSync Monitor & EGA Adaptor
Enhanced Keyboard, MS Dos

TANDON COMPUTER SYSTEMS

PCA70: 70MB HD, 1.2MB Floppy .. £2,275
512K RAM, 14" Mono Monitor
Ser/Par, MS Dos, GW-Basic

PCA40: 40MB HD, 1.2MB Floppy £1,850
512K RAM, 14" Mono Monitor
Ser/Par, MS Dos, GW-Basic

PCA30: 30MB HD 1.2MB Floppy £1,695
512K RAM, 14" Mono Monitor
Ser/Par, MS Dos, GW-Basic

PCA20: 20MB HD, 1.2MB Floppy .. £1,495
512K RAM, 14" Mono Monitor
Ser/Par, MS Dos, GW-Basic

ENHANCED GRAPHICS

NEC MultiSync Monitor EGA, PGA £550
Princeton HX12e EGA Monitor £395
Taxan EGA Monitor £425
Taxan MultiScan Monitor EGA, PGA .. £595
AST 3G Plus EGA Card £245
Orchid EGA Card £225
VEGA Deluxe Auto EGA £279
ATI EGA Wonder Card £249
TVM EGA Monitor & Adaptor £499

MOUSE DEVICES

Microsoft Mouse v6 £135
Mouse Systems PC Mouse £135
LogiMouse C7 £79
SummaMouse £89

MATHS CO-PROCESSORS

8087 5MHz £125
8087 8MHz £155
80287 6MHz £175
80287 8MHz £225
80287 10MHz £295

MEMORY BOARDS

AST Rampage XT 2MB £395
AST Rampage AT 2MB £595
AST 6 Pack Plus 384K £249
AST Six Pack Premium 1MB £395
Intel Above Board XT 2MB £495
Intel Above Board AT 2MB £625

TAPE STREAMERS

Alloy APT40 Internal £475
Archive 60MB External £595
Everex Stream 20 Internal £675
Everex Stream 60 Internal £975

DOT MATRIX PRINTERS

Epson LQ2500 270cps, 90nlq £730
Epson LQ1000 180cps, 60nlq £585
Epson LQ800 180cps, 60nlq £435
Epson EX1000 250cps, 50nlq £525
Epson EX800 250cps, 50nlq £390
Epson FX1000 200cps, 40nlq £385
Epson FX800 200cps, 40nlq £305
Epson LX800 150cps, 25nlq £199

DAISY WHEEL PRINTERS

NEC Spinwriter Elf £310
Brother HR20 £340
Brother HR40 £750

LASER PRINTERS

HP LaserJet II, 8ppm £1,995
HP LaserJet, 8ppm £1,495
Epson GQ-3500 6ppm £1,450
Oki Laserline 6, 6ppm £1,500
Citizen Overture 110, 10ppm £1,595
AST Turbo Laser 8ppm 1.5MB Ram .. £3,295

COMMUNICATIONS

WS4000 V21, 23 AA AD £145
WS4000 V21, 22, 23 AA AD £339
WS3000 V21, 22, 23 AA AD £399
WS3000 V21, 22, 23, 22BIS AA AD .. £520
Keycard 3000 V21, 23 £290
Keycard 3000 V21, 22, 23 £465
Keycard 3000 V21, 22, 23, 22BIS £595
Linnet V21, 23 AA AD £129
Pace V21, 22, 23 AA AD £320
Pace V21, 22, 23 22BIS AA AD £399
Quattro V21, 22, 23 22BIS £635
Orator £715
Procomm 20 Telex on a Card £695

SOFTWARE

dBase 3 Plus vl.1 £350
Framework II £335
FreeLance Plus £285
Lotus 1-2-3 r2.01 £239
MS Flight Simulator £45
MS Multiplan 3 £125
MS Windows £60
MS Word 3.1 £260
Norton Utilities v4 £59
Advanced Norton Utilities £99
SuperCalc 4 £225
Ventura Publisher £635
VP Info £65
VP Planner £65
Word Perfect 4.2 £260
Wordstar Professional v4 £235

BORLAND SOFTWARE

Turbo C £69
Turbo Basic £55
Turbo Pascal 8087/BCD £49
Turbo Tutor £25
Turbo Database Toolbox £35
Turbo Editor Toolbox £35
Turbo Graphics Toolbox £35
Turbo Gameswork £35
Turbo JUMBO Pack £165
Turbo Numeric Methods Toolbox £55
Turbo PROLOG £49
Turbo Prolog Toolbox £55
Eureka the Solver £55
Reflex £70
Reflex Workshop £49
SuperKey £49
SideKick (unprotected) £49
Travelling Sidekick £49
Turbo Lightning £49
Lightning Word wizard £40

Toshiba 3 1/2" format available.

Official orders are accepted from GOVERNMENT & EDUCATIONAL AUTHORITIES & PLCs
Prices exclude VAT. EXPORT enquiries welcome

AUTHORISED **TOSHIBA NEC Tandon** DEALER

Comprehensive service includes: Consultancy, Demonstrations & Hotline support



01-226 3043



TELEX 299091 BRIDGE ATTN COMPRE
271 UPPER STREET, ISLINGTON, LONDON N1 2UQ



Slough Computers



COMMODORE
AMIGA

A500 &
A2000

Come and see the superb Commodore Amiga 2000 starting at only £1095 including one year's on site service
Limited quantities of the new A500
Now available from only £499

Tandon

PCA20 512K. 6/8MHz. 80286. MSDOS 3.2
1.2Mb FLOPPY. 20MB WINCHESTER
£1995

AT NO EXTRA COST WE WILL SUPPLY
THE ABOVE SYSTEM WITH
EGACARD AND MONITOR SAVING £750
NEW 70MB PCA 70 NOW AVAILABLE
FROM £2495



The new target range and
other models available

NEW BRITISH AT — THE SBC MISTRAL

Based on a state of the art 6 layer VLSI motherboard designed in the UK and built by British Aerospace. A range of soft selectable clock speeds and wait states to give incredible speed. Serial and parallel ports, clock, 6 free slots, 1Mb RAM, 1.2Mb floppy, 30Mb Winchester. Not a cheap import. This quality product will be available within weeks at prices starting at only £1799. Including 1 years on-site service.

PC/CARD EGA UPGRADE BARGAIN

14" Enhanced colour monitor with multiple choice colour switch PLUS EGA/CGA/HGC Graphics card, all to suit PC's and compatibles at at previously unheard of price of only

£399

EPSON SPECIALS FOR JUNE

FX800 £309	EX800 £369	LX86 £199
FX1000 £389	EX1000 £459	LQ800 £419.

245 HIGH STREET, SLOUGH, BERKS SL1 1BN Tel: SLOUGH (07053) 21594/32753
VAT & CARRIAGE MUST BE ADDED TO ALL PRICES. TELEPHONE/MAIL ORDERS WELCOMED
ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE

EXPANSIONS AND UPGRADES

30110	Floppy Disk Controller for XI, 2 x 360k Drives	28.00
30130	Colour Graphics Card, 320 x 200 dots	56.00
30140	Monochrome Video Card, 80 x 25 Characters only	56.00
30150	Monochrome Graphic/Printer Card	69.00
30160	Enhanced Graphics Card	229.00
30200	Multi I/O with Floppy Controller	78.00
30210	Multi I/O Card	59.00
30220	Serial Card, 1 + 1 optional	24.00
30230	Parallel Printer Card	16.00
30240	64k Buffered Printer Card with 16k RAM	79.00
30250	Game I/O Card, 2 Channels	14.00
30260	384k Multi function Card supplied without RAM	99.00
30270	Serial/Parallel Card for AT	56.00
30280	576k Memory Expansion Card supplied without RAM	29.00
30290	Clock/Calendar Card	29.00
30300	2.5Mb RAM Card for AT, supplied without RAM	126.00
30310	2.5Mb Multi func. Card for AT, supplied without RAM	165.00
30320	Hard Disk Controller, for XT	129.00
31100	AD/DA Card, 12 bit	98.00
31150	Eprom Writer	117.00
31160	Eprom Writer (4 Textool sockets)	157.00
31180	PAL Programmer Card	314.00
31210	8255 I/O Card	59.00
31220	4 Channel RS232 Card for PC/XT	133.00
31225	4 Channel RS232 Card for AT	158.00
31230	8 Channel RS232 Card for PC/XT	249.00
31235	8 Channel RS232 Card for AT	315.00
31240	Bi-Synchronous RS232 Communications Card	89.00
34010	Joystick	15.00
34020	Mouse	49.00
34100	PC/XT Standard Keyboard Type 5050. PC/XT only	49.00*
34105	AT Style Keyboard Type 5051. PC/XT/AT	58.00*
34110	Selectric Style Keyboard Type 5151. PC/XT/AT	73.00*
34200	XT 8 Slot Cabinet	54.00*
34310	150W Power Supply Unit for PC/XT	79.00*
34320	200W Power Supply Unit for AT	149.00*
38120	PC/XT 20Mb Upgrade Kit, 65mS, with control, cables etc	349.00*
38130	PC/XT 30Mb Upgrade Kit, with control, cables etc	449.00*
38320	PC/XT 20Mb Hardcard	399.00*
38330	PC/XT 30Mb Hardcard	499.00*
38420	PC/XT 20Mb Internal Tape Backup	449.00*
38425	PC/XT 20Mb Ext. Tape Backup Incl. Int'l card	499.00*
38810	Amstrad Comp 10Mb Tape Backup, Cristie	399.00*
38820	Amstrad Comp 20Mb Tape Backup, Cristie	499.00*

Please add £1 pr item (£4 pr item marked *) and 15% VAT and send your order (or phone with VISA or ACCESS number) to
0244 571677

Western Technology

PO Box 312, Wrexham, Clwyd, CL12 0XX

WE'VE GOT THE EDGE IN COMPETITIVE PRICING

Olivetti M24

20Mb Hard Disk
360 Kb Floppy Drive
640 Kb RAM
Monochrome Display
Keyboard
MS-DOS £1195
As above with 30 Mb
hard disk £1245

Olivetti M24 SP (complete) £1445
Olivetti M28
20 Mb complete system £1995
40 Mb complete system £2385
(Colour supplement on all above
£210)

Olivetti M19
20 Mb Hard Disk 640 Kb RAM
(Complete system) £1120
Best pages on all configurations
£CALL

Tandon

PCA20 £1435
PCX20 £875

AMSTRAD

Dual Drive, Mono £539
20 Mb Hard disk,
Colour £1045

Hard Disks

20 Mb Dysan Hard card £395
30Mb Miniscribe Hard
card £395
20 Mb Seagate Kit £295

A number of ex-
demonstration Olivetti,
Tandon, Amstrad PCs and
Epson Printers £CALL

Software

Multimate 3.3	£185
Multimate Advantage	£245
DBase III +	£323
Symphony	£315
Lotus 123	£221
Smart V.3	£355
Framework II	£299
Wordstar	£139
Wordstar Prof V.4	£189
Wordstar 2000/2	£210
Wordstar 2000 +	£256
MS-Word	£239
MS-Chart	£146
MS-Project 2	£207
Multiplan II	£108
SuperProject Plus	£245
Supercalc 4	£189
Lotus HAL	£82
Lotus Manuscript	£238

(Most other packages available)
ALL LATEST VERSIONS

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.

CALL US NOW ON CHICHESTER (0243) 771786.

COMPISTAND.LTD. Quarry Lane, Chichester,
West Sussex, PO19 2NY

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

UTILITIES

for IBM PC/XT
or compatible

SOFTBLANK

£14.95

- ★ advanced screen blanking utility to stop screen burn-in

SOFTDIRECT

£19.95

- ★ sorts disk directory into order
- ★ full screen display of subdirectory structure
- ★ displays hidden files

SOFTDISK

£24.95

- ★ advanced RAM disk
- ★ set size etc to fit your system
- ★ automatic back-up facility

SOFTSAFE

£29.95

- ★ protects important files against accidental deletion, overwriting etc.
- ★ includes resident undelete command, available the instant you need it

SLOWKEY

£9.95

- ★ stop irritating cursor run-on: cursor moves only when key is pressed

SOFTKEY LTD

79 Dryden Court, Renfrew Road, London SE11 4NH

Prices include VAT and P&P.

Not copy protected. Requires IBM PC/XT or compatible, DOS 2.0 or higher, and mono, CGA or Hercules screen.

COMPUTER SUPPLIES

NOBODY DOES IT BETTER

PAPER	PER BOX	1 BOX	5 PLUS
11 x 9.5			
11 x 9.5 60 GSM PLN/MUS	2000	11.90	9.83
60 GSM MICRO P	2000	12.40	10.66
70 GSM PLN/MUS	2000		
70 GSM MICRO P	2000	13.90	11.92
2PT NCR	1000	19.53	15.93
11 x 14.5			
60 GSM PLN/MUS	2000	17.00	12.65
70 GSM PLN/MUS	1750	17.40	12.74
TRUE A4			
90 GSM	1500	17.90	16.09
70 GSM	2000	19.50	14.40

LABELS	IMPERIAL	METRIC	500	1000	5000
1/16" VERTICAL SPACING					
2 WIDE	3 1/2 x 1 1/16	89 x 36	2.20	4.10	17.00
	4 x 1 1/16	102 x 36	2.30	4.40	18.50
	5 x 1 1/16	127 x 36	2.70	5.40	20.30
3 WIDE	3 1/2 x 1 1/16	89 x 36	2.20	4.10	17.00
1/8" VERTICAL SPACING					
1 WIDE	3 1/2 x 1 1/16	89 x 24	2.10	4.20	16.00
	3 1/2 x 1 1/16	89 x 36	2.20	4.10	17.00
	4 x 1 1/16	102 x 36	2.30	4.40	18.50
2 WIDE	3 1/2 x 1 1/16	89 x 24	1.50	3.00	11.50
	4 x 1 1/16	102 x 36	3.10	5.50	17.50
3 WIDE	2 3/4 x 1 1/16	70 x 36	2.20	4.10	15.00
	3 1/2 x 1 1/16	89 x 49	3.90	5.50	22.00

OVER PRINTING OF LABELS ALSO AVAILABLE

PARROTS DISKS 5 1/4	SS/DD	DS/DD	DS/OD	DS/HD
10 PER PACK*	12.40	15.20	19.50	25.50
50 PER PACK	45.00	49.90	67.50	95.00
*FREE PLASTIC DISK BOX				
COPY HOLDERS A4				£19.50
BINDERS				£2.60

MORE QUANTITY MORE DISCOUNT

ALL PRICES INCL DELIVERY ENGLAND AND WALES

PLEASE ADD VAT. RING FOR FULL PRICE LIST AND SAMPLES



TRY US FOR SIZE

PHONE CLP on 0258 89 400

BOX 18 BLANDFORD, DORSET, DT11 7YE

Slough Computers



AMSTRAD PC1512

FLOPPY AND HARD DISK
SYSTEMS
FROM £449
RANGE OF BUDGET PRICED
SOFTWARE IN STOCK

BONDWELL PC PORTABLES

MODEL 8 LAPTOP £799
512K 3 1/2" DRIVE. LCD
MODEL 18 PORTABLE £699
640K, 2 x 5 1/4" DRIVES. CRT
ALL WITH DOS/BASIC 2.11



FREE!
1 YEARS ON-SITE
SERVICE



THE OPUS PC II RANGE

1024K, 2 DRIVES + RAM DISK.
HERCULES COMPATIBLE GRAPHICS.
4.77-8MHz TURBO V20
AT STYLE KEYBOARD.
TILT & SWIVEL MONITOR £679

SYSTEMS FROM £499-20MB £969
EGA SYSTEMS FROM ONLY £799
VARIOUS OPTIONS AVAILABLE INCLUDING
1.2MB & 3 1/2" FLOPPIES AND 8087

PC USER "THIS IS THE ONE I'D BUY"

Card Mounted Winchester

ONLY

Very low power consumption
Ultra fast disk access
Ideal for use with Amstrad 1512 etc.

10Mb £299
30Mb £359

245 HIGH STREET, SLOUGH, BERKS SL1 1BN Tel: SLOUGH (0753) 21594/32753
VAT & CARRIAGE MUST BE ADDED TO ALL PRICES. TELEPHONE/MAIL ORDERS WELCOMED
ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE

FORTRANSOFT LTD

PROFESSIONAL SOFTWARE FOR THE IBM PC/XT/AT AND
COMPATIBLES, eg. OLIVETTI, COMPAQ, AMSTRAD, APRICOT...

BASIC is fine for short programs and when speed and portability are not important. Besides, you can draw pretty pictures on the screen with BASIC. However, if you are writing large programs and wish to protect all the hours (in some cases years) you spent in writing your software then **Fortran** comes into its own. Whilst most languages are 'here today — gone tomorrow', **Fortran**, designed in the late fifties, still remain the dominant language for scientific and general purpose programming today. This means that programs you write today will work tomorrow on future generation of machines with little or no change.

Fortransoft now brings you an affordable ANSI 77 Fortran Compiler. And you can still draw pretty pictures on the screen because the GRAPHKIT library comes with the compiler and is included in the price.

FS-Fortran 77 is now at level 3.15d (with sub strings) and current users may obtain a copy of the compiler for £2 all incl.

FS-Fortran 77 with CGA graphics routines £29.95
FS-Fortran 77 with CGA and Hercules mono graphics routines £39.95

FS-Graphkit is a comprehensive suite of graphics and sound routines, including routines for drawing lines, circles, ellipses, painting, read/write to port... and is available with standard Colour Graphics Adapter (CGA) support, or CGA and Hercules mono graphics support.

CGA colour graphics for Microsoft Fortran Compiler £19.95
CGA colour graphics for Ryan Mc Farland/IBM Professional Fortran £24.95
CGA colour graphics for **Zorland C** £14.95
CGA and Hercules mono for Microsoft Fortran Compiler £29.95
CGA and Hercules mono for Ryan Mc Farland/IBM Professional Fortran £34.95
CGA and Hercules mono for **Zorland C** £19.95

FS-Sortmerge is a suite of Fortran-callable routines for sorting/merging an unlimited number of records on multiple keys. Any combination of alphabetic and numeric keys may be specified.

FS-Sortmerge for **FS-Fortran 77** Compiler £19.95
FS-Sortmerge for Microsoft Fortran Compiler £19.95
FS-Sortmerge for Ryan Mc Farland/IBM Professional Fortran £24.95

FS-Smutil — A sort/merge utility program which may be used on its own without requiring any other software £9.95

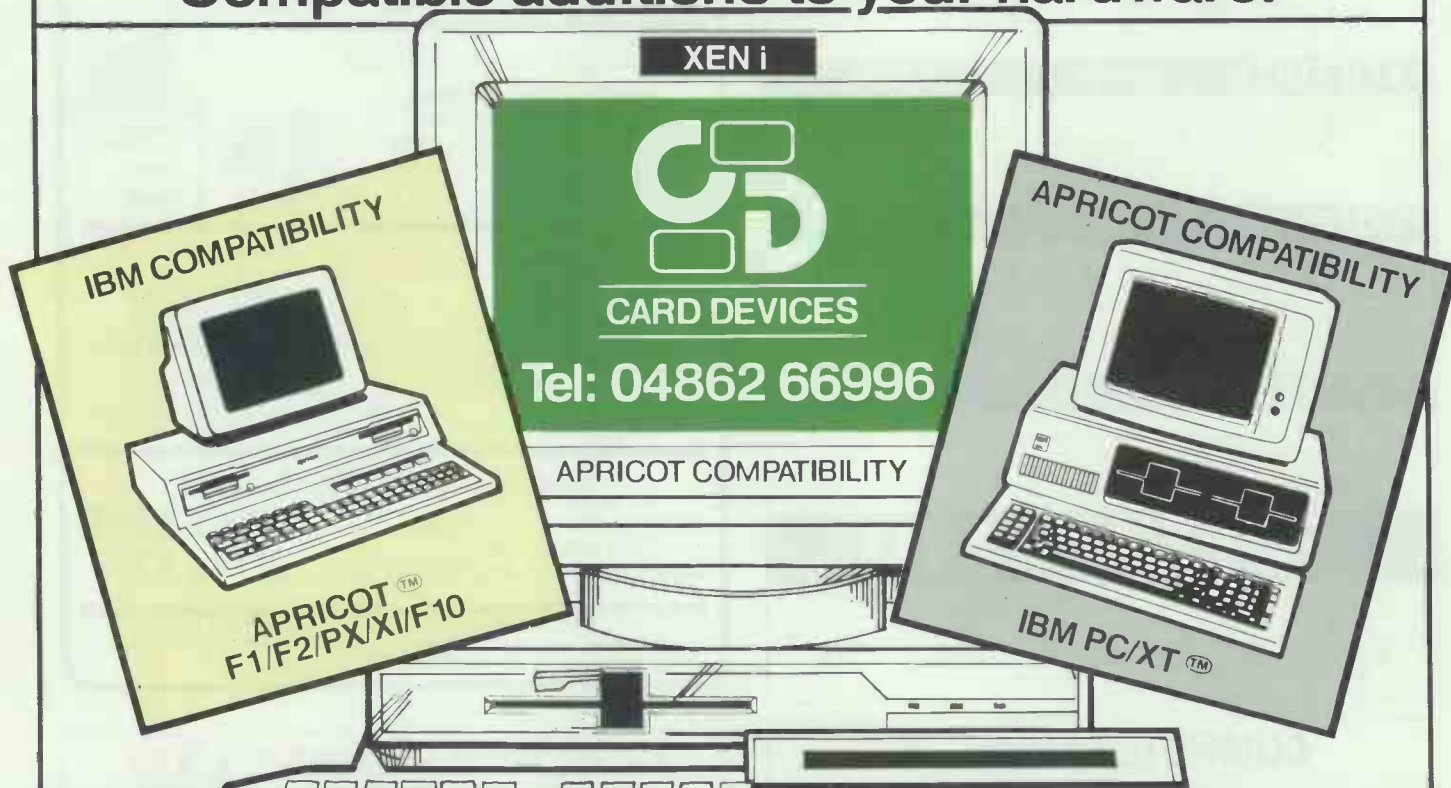
Fortransoft acknowledges all trademarks and registered names in this advert. Please indicate Compiler and Computer type when ordering. All prices include packing, postage and VAT, but please add £3 for air delivery. All software comes on 5.25" 360k diskette. COD's and purchase orders are NOT accepted. Send cheque with order to: (or write for further details)

FORTRANSOFT LTD

60 HARNESS WAY, ST. ALBANS HERTS AL4 9HB.
(Tel: (0727) 32409)

Mix n' match

Compatible additions to your hardware.



Card Devices Ltd., market leaders in compatibility have the easy solution to all your compatibility problems.

Our very flexible software team enables us to offer file compatibility between the most commonly used P.C.'s listed as follows:-

£395

XF400A allows IBM PC compatibility with the APRICOT PC range, enabling you to read and write Data Files on either machine.

£395

XF400S allows IBM PC compatibility with the SIRIUS/VICTOR 9000 range, enabling you to read and write data files on either machine.

£295

XF400X allows IBM PC compatibility with the XEN 3½" PC enabling you to read and write data files on either.

£295

XF700i allows APRICOT PC compatibility with the IBM PC, XT, AT, and CLONES (please state when ordering) enabling you to read and write data files.

£350

XF700S allows APRICOT PC compatibility with the SIRIUS/VICTOR 9000 range.

£350

XF700X allows APRICOT/XEN PC compatibility with the XENi 5¼" PC, enabling you to read and write data files

£295

XF700A gives second drive (720k) on F1 range of computers including portable.

XM512 RAM CARD excellent value for your APRICOT PC/F1/Portable etc. 512k single card, no wait states. For Apricot PC range **£120**. Daughter Board RAM – For XEN & XENi range **£175**

THE EIGHT INCH SOLUTION FOR ALL THOSE DIFFICULT FORMATS THAT YOU WANT TO READ ON YOUR IBM PC, XT, AT & CLONES from formats such as S32, IBM 3740/3741, 4100, PDP11 and many others.

Designed and produced only by Card Devices Ltd. Please write or ring for further information. All Drive Subsystems supplied complete with drive, case, PSU, (where necessary) connecting cables, and software. All products supplied with one year's warranty. Prices are exclusive of V.A.T. and carriage.



CARD DEVICES

Card Devices Ltd, Padmores Yard, St. Johns, Woking, Surrey GU21 1SE. Tel: 04862 66996/65634.

MICRO MEDIA Computer Supplies Ltd. Dept PCW

0707 50913 or 0707 52698 Freeport, Rydal Mount, Baker Street Potters Bar, Herts EN6 3BR (NO STAMP REQUIRED)

SUMMER SALE

Special Offer Prices valid until Sept 10th 1987

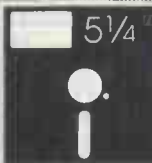
5 1/4 Micro Media Brand Discs

	10	20	30	50	100
SS/DD	6.99	13.10	18.70	29.50	55.80
DS/40T	8.50	16.00	22.75	35.90	67.60
DS/80T	9.99	18.70	26.35	41.05	76.35
DS/HD for PCAT	24.15	46.25	66.25	105.25	200.10

5 1/4 Reversible discs (Flippy's)

Have two write protect notches & index holes. Suitable for single sided drives.

	10.25	19.55	27.15	42.25	78.45
--	-------	-------	-------	-------	-------



All discs supplied are with labels, 5 1/4" write protects, envelopes & hub rings.

Discs purchased direct from one major manufacturer. 100% certified error free - lifetime guarantee.

PRICES INCLUDE V.A.T.



5 1/4 Rainbow Discs come in five colours

	20	50	100	250	500
SS/DD	13.20	30.75	57.10	134.50	252.45
DS/40T	14.35	33.10	60.70	141.45	262.20
DS/80T	15.20	35.20	64.85	148.75	276.00

5 1/4 Unbranded Discs

SS/DD	9.65	22.45	41.40	97.10	181.13
DS/40T	10.95	25.00	45.55	105.25	193.20
DS/80T	11.85	26.73	49.55	116.45	216.20

3 1/2 Micro Media Brand

SS/DD	19.99	38.40	55.50	87.25	163.90
DS/DD	21.99	42.55	61.60	96.90	182.30

3 1/2 Unbranded Discs

SS/DD	14.95	42.95	61.50	111.65	164.50
DS/DD	16.70	48.30	78.20	147.20	212.20

SUMMER SALE · SUMMER SALE · SUMMER SALE · SUMMER SALE · SUMMER SALE

Monitor Swivel Bases



Pan tilt revolves around 360 degrees 12.5 degrees tiltable up and down Adjustable by front mechanism.

	55 x 280 x 260mm for 12" Monitors	55 x 355 x 320mm for 14" Monitors
1	13.25	16.70
3+	12.60ea	15.90ea
6+	11.95ea	15.05ea

Adjustable Copy Holder

A4 adjustable desk clamping. Magnifying cursor line. Paper thickness adjustment. Paper height adjustable clip.

A4 Version 24.00

Desk Top Version 13.69

Holds up to 1000g

A3 Version 42.45

Holds up to 1400g

Printer Stand 5mm perspex

80 Column Version 400 x 310 x 100mm 22.80

132 Column Version 600 x 310 x 100mm 28.60



Mobile Printer Stand

Rugged steel frame. Height adjustable basket for output paper & base shelf for input paper. Self assembly - includes castors.

80 column £50.00

132 column £65.00

The Space Saver



Paper feed and refold positioned one above the other. Dial controlled paper feed with adjustable deflectors ensures smooth flow and automatic refolding.

	80 column 414x380x460mm	132 column 530x380x460mm
1	34.40	43.00
3+	32.10ea	40.70ea
6+	30.50ea	38.65ea

Printer Ribbons

	3	6	12
Amstrad 8512/8256	10.35	20.00	37.95
Colours	15.50	31.00	62.10
DMP 2000	10.35	20.00	37.95
Brother M1009	8.10	15.50	28.95
Colours	12.30	24.60	49.20
HR15 MS	10.70	20.70	39.35
Fabric	11.05	21.40	40.70
Canon PW1156/1080	7.95	15.20	28.30
Centronics GLP	8.10	15.50	28.95
Colours	12.30	24.60	49.20
Commodore MPS 802	10.70	20.70	39.35
MPS 801	11.75	22.75	43.45
Colours	14.40	28.80	57.60
MPS 803	8.10	15.50	28.95
Colours	12.30	24.60	49.20
DPS1101 MS	7.25	13.80	25.55
Epson FX/MX/RX 80/85	7.25	13.80	25.55
Colours	13.20	26.40	52.80
LX/GX 80	6.90	13.10	24.15
Colours	12.60	25.20	50.40
MX/FX 105	8.80	16.90	31.75
LQ 800	10.00	19.30	36.60
Juki 6100 MS	7.25	13.80	25.55
Kaga KP810/910	7.95	15.20	28.30
Colours	13.20	26.40	52.80
M/Tally MT80 MS	10.70	20.70	39.35
NEC PC8023	11.75	22.75	43.45
Colours	15.30	30.60	61.20
Panasonic KXP110/1080	10.70	20.70	39.35
Colours	19.35	38.70	77.40
Shinwa CP80 MS	10.70	20.70	39.35

Colours available - Red/Brown/Blue/Green & Yellow

If the ribbon you require is not listed please let us quote

The above is a small selection of the 250 different ribbons we stock. We shall be pleased to find your ribbon, however old or obscure.

MD 120

1	12.55	5 1/4" x 120
3+	11.90 each	
6+	11.35 each	



MD 50

1	7.80	5 1/4" x 50
3+	7.40 each	
6+	7.10 each	



Wire Printer Stand



stacks print-out in document tray automatically. Suitable for most standard printers. Made of safety coated steel wire. For 80 column £14.80 For 132 column £16.60

MD 100

1	10.80	5 1/4" x 100
3+	10.30 each	
6+	9.80 each	



MM 40

1	8.30	3 1/2" x 40
3+	7.90 each	
6+	7.50 each	



MM 80

1	10.95	3 1/2" x 80
3+	10.40 each	
6+	9.90 each	



Computer Labels

Continuous fanfold, sprocket fed

Price per 1,000 3,000

70 x 36 4.80 13.20

89 x 36 4.90 13.50

89 x 49 6.80 18.30

102 x 36 5.20 14.40

Please state no. of labels across the sheet (1, 2 or 3)

Computer paper

Plain fanfold, micro perf edges

Size Weight 1000s per box Price per box 1 box 3 box +

11x9 1/2 60 2 16.50 46.80

80 2 20.40 56.10

Exact A4 70 2 27.60 73.50

11 1/2 x 9 1/4 90 1 17.40 43.80

A4 Fixed tractor paper available

ALL PRICES INCLUSIVE OF POSTAGE & PACKING AND V.A.T.

MICRO MEDIA

Computer Supplies

Freeport, Rydal Mount, Baker Street, Potters Bar, Herts. EN6 3BR



Access & Visa



Out of Office Hours

0707 52698

Orders despatched 24 hrs.

Please allow 5 days for delivery.

For next day delivery, please ring for details. Postage covers U.K. only.

A Catalogue is available with a more comprehensive range of products including - 3M & Verbatim discs - a wider choice of paper labels, ribbons and accessories.

Ring or write to obtain your copy now!

Educational and HMG orders accepted. For official orders/invoice/credit orders there is a minimum order value of £15.00 excluding V.A.T. Any order under £15.00 will be subject to £3.00 handling charge.

Personal callers welcome
Weekdays 8.30am - 5.30pm
Saturdays 10.00am - 4.00pm

MICRO MEDIA - MICRO MEDIA - MICRO MEDIA - MICRO MEDIA - MICRO MEDIA - MICRO MEDIA -

TECHNOMATIC

17 Burnley Road, London NW10 1ED Tel: 01-208 1177
305 Edgware Road, London W2 Tel: 01-723 0233

INTERGRATED PACKAGES

Smart ver 3.10	£359(a)
Framework II Ver 1.1	£320(a)
Symphony Ver 1.2	£339(a)
Open Access II Ver 2.0	£375(a)
Open Access Ver 1.03	£235(a)
Lotus 1.2.3	£239(a)

WORD PROCESSORS

Wordstar Professional Ver 4.0 NEW	£249(a)
Wordstar 2000 plus Rel 2	£269(a)
Wordstar	£165(a)
Microsoft Word Ver 3.10	£269(a)
Microsoft Word Junior	£64(b)
Multimate Advantage	£269(a)
Word Perfect Ver 4.2	£259(a)
Word Perfect Personal	£165(a)
Word Perfect Junior	£82(b)

DATABASE

dBase III Plus Ver 1.1 unpr.	£335(a)
Quicksilver - Compiler dBase III	£375(a)
Clipper - Compiler dBase III	£375(a)
Genifer - App. Gen. dBase III	£199(a)
Paradox Ver 1.1i	£379(a)
Delta 4 Professional	£429(a)

SPREADSHEET

Supercalc 4	£225(b)
Farsight	£99(b)
Javeline	£359(a)

LOTUS SERIES

Manuscript	£329(b)
Hal	£109(b)
Report Writer	£95(c)
Measure	£345(b)
Freelance Plus	£329(b)
Quickcode	£79(c)
Spot Light	£52(c)
Metro	£65(c)

UNIX SYSTEM

UNIX V Version 2.0 by Microport for PC-AT and compatibles	£169(b)
Runtime System	£170(b)
Software Development 'C', Fortran	£170(b)
Text Preparation	£475(a)
Complete Package	
All packages supported by full documentation	

SICON

SICON AT	£1,375(a)
SICON PC	£455(a)
SICON XT	£755(a)

Please send for full specification

AMSTRAD PCs

PC1512	
SDMM (Single Drive Mono Monitor)	£449 (a)
DDMM (Dual Drive Mono Monitor)	£559 (a)
SDCM (Single Drive Col. Monitor)	£619 (a)
DDCM (Dual Drive Col. Monitor)	£729 (a)
HD20-M (Hard Disc 20Mb, Mono)	£899 (a)
HD20-C (Hard Disc 20Mb, Col.)	£1069 (a)

Call us for details of Amstrad summer special offers

CO Processors

8087-5MHz	£120 (c)	8087-8MHz	£160 (b)
8087-10MHz	£199 (b)	80287-6MHz	£160 (b)
80287-8MHz	£245 (b)	80287-10MHz	£299 (b)
V-20 5MHz	£10 (b)	V-30 5MHz	£10 (b)
V-20 8MHz	£12 (b)	V-30 8MHz	£12 (b)

BUSINESS SOFTWARE

ACCOUNTING SOFTWARE

Sage Book Keeper	£85(b)
Sage Accountant	£125(b)
Sage Account Plus	£160(b)
Sage Financial Controller	£269(b)
Sage Payroll	£85(b)

PROFESSIONAL CAD

Autosketch	£79(d)
AutoCad Basic Ver 2.5	£300(a)
AutoCad ADE1,2&3 Ver 2.5	£2500(a)
Tracker ball for AutoCad	£109(b)
Inside AutoCad	£24(c)
Pro-Design II Ver 2.5	£245(b)

DESKTOP PUBLISHING

Ventura Publisher	£749(a)
Pagemaker	£595 (a)
Fleet Street Editor	£199(b)
GEM Collection	£89(b)
Lotus Manuscript	£329(b)

BORLAND SOFTWARE

Reflex Ver 1.1	£75(b)
Reflex Workshop	£65(b)
Turbo Basic	£65(b)
Turbo C	£65(b)
Turbo Pascal BCD/8087	£59(b)
Turbo Tutor	£25(b)
Turbo Prolog	£54(b)
Turbo Prolog Toolbox	£65(b)
Turbo Lightning	£59(b)
Lightning Word Wizard	£39(b)
Turbo Editor Toolbox	£39(b)
Turbo Graphix Toolbox	£39(b)
Turbo Database Toolbox	£45(b)
Turbo Numerical Toolbox	£65(b)
Eureka The Solver	£65(b)
Sidekick	£59(b)
Traveling Sidekick	£59(b)
Superkey	£59(b)
Turbo Gameworks	£45(b)
Turbo Holiday Jumbo Pack	£159(a)

PROJECT MANAGEMENT

Super Project Plus	£325(a)
PertMaster	£475(a)
PertMaster & PertPlotter	£525(a)
MS Project	£245(a)

INTERFACE CARDS

for IBM PC/XT & Compatibles

Auto Switch 560 Card

The 560 card recognises EGA, CGA, Monographics adaptor and Hercules Software. It automatically switches modes to suit the application software. 256K Video memory. Flicker free scrolling in all modes. dip switches on external edge to configure for a particular monitor

EGA Board

* Multimode card including all the capabilities of IBM, EGA, Hercules mono card, IBM colour and mono card.

Monochrome Graphics Card

Fully compatible Hercules graphics card. Includes parallel printer port.

Colour Graphics Card

* 320 x 200 colour graphics mode.
* 640 x 200 Hi-Res mono graphics mode.

Multi I/O Card

* Parallel/Serial Ports
* Battery backed calendar/clock.

RAM Card 384K

(Expandable to 512K).

LANGUAGES & O.S.

MicroSoft Basic Interpreter	£245(b)
MicroSoft QuickBasic	£75(b)
MicroSoft Pascal Compiler	£209(b)
MicroSoft C Compiler	£260(a)
MicroSoft Cobol Compiler	£399(a)
MicroSoft Macro Assembler	£125(b)
Digital Research C Compiler	£249(b)
Digital Research Fortran 77	£249(a)
Digital Research Level II Cobol	£470(a)
Digital Research Assm. & Tools	£169(b)
Zorland C	£29(d)
Zorland C - Power Pack	£59(c)
MS DOS & GW Basic	£65(b)
PC DOS 3.2	£55(b)
Learning DOS	£24(c)

COMMUNICATIONS

Datataalk (inc. Prestel) V3.27	£129(d)
Crosstalk XVI	£95(d)
Sage ChitChat Ver V2.2	£85(d)
Dial-Up	£89(c)

BUDGET SOFTWARE

Ability Ver 1.2E	£69(c)
Psion PC-Four	£65(c)
VP Planner	£65(c)
VP Info	£65(c)
WordStar 1512	£59(b)
dBase II 1512	£95(b)
Delta 4 1512	£85(b)
Supercalc IV 1512	£59(b)
Turbo Pascal 1512	£49(c)
Sidekick 1512	£29(c)

UTILITIES

Norton Utilities Ver 4.0	£55(c)
MicroSoft Windows Ver 1.03	£72(c)
Copy II PC	£40(c)
Fastback	£165(c)
Xtree Ver 2.0	£49(c)

PRINTER UTILITIES

Sign Designer	£42(d)
Widespread	£39(d)
Typewriter	£39(d)
Keyboard Master Tutor	£39(d)

MISCELLANEOUS

MS Flight Simulator	£45(c)
Psion Chess	£22(c)
Share Master - Inv Analyst	£129(c)

RS232 Serial Card

Short slot card with option for 2nd port	£35(c)
Extra for 2nd port	£16

Parallel Interface Port

Short slot card, Epson/Centronics compatible	£19(c)
--	--------

MOUSE

MS Mouse specify bus/serial version New Release: Version 6.02	£135 (b)
Logimouse (Serial)	£89 (b)
PC Compatible Witty Mouse Plugs into serial port, adaptor for parallel conn. to k/bd. MS software compatible.	£79 (b)

NETWORK ADAPTORS

Economical interlink between IBM PC, XT, AT and compatible including Amstrad PC1512.

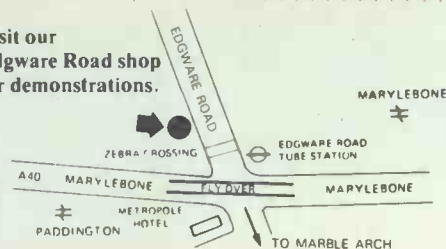
TRANSNET Starter Pack

Links two stations with adaptors, cabling, NETBIOS and easy to use menu driven software.	£429 (a)
Transnet Pack for additional station.	£229 (b)

Ask for full details

**MAIL ORDER
& RETAIL**
7 Burnley Road
London NW10 1ED
Telex 922800
WEST END BRANCH
305 Edgware Road
London W2

Visit our
Edgware Road shop
for demonstrations.



For fast delivery telephone
your order on 01-208 1177
using VISA/Access Card



Orders welcome from
government depts &
educational establishments

All prices ex VAT.
No VAT on exports
Phone 01-450 9803
for export enquiries
Please add carriage
(a) £8.00 (Datapost)
(b) £2.50 (c) £1.50
(d) £1.00

PRINTERS

DOT MATRIX PRINTERS:

EPSON PRINTERS:

LX86	£195 (a)		
FX800	£319 (a)	FX 1000	£449 (a)
EX800	£399 (a)	EX 1000	£579 (a)
LQ800	£439 (a)	LQ1000	£579 (a)
Taxan KP815			£269 (a)
Taxan KP915			£379 (a)
National Panasonic KX P1081			£169 (a)
Star NL 10 with IBM Interface			£229 (a)
Amstrad DMP3000 Printer			£159 (a)

DAISY WHEEL PRINTERS

Juki 6100	£349 (a)
Brother HR20 (Parallel & Serial Interface)	£349 (a)

National Panasonic KX P3131 with 38K buffer	£249 (a)
Integrex Inkjet Colour Printer	£549 (a)
IBM EGA/CGA dump 64 colour screen dump for Integrex.	£45 (b)

PLOTTERS

Hitachi 672 A3 4 colour High speed, high precision plotter Serial & Parallel Interface.	£479 (a)
<i>We can also offer Roland & Watanabe plotters at competitive prices</i>	
IBM Type Parallel Printer Lead (2m)	£10 (d)

SHARERS & BUFFERS

PB 128K Buffer Internal buffer suitable for most EPSON printers. Easy to instal. Instructions supplied.	£99 (b)
---	----------------

Printer Sharers:

(All lines are switched).	Parallel	Serial
2 computers to one printer	£45 (c)	£45 (c)
3 computers to one printer	£69 (c)	£65 (c)
4 computers to one printer	£85 (c)	£75 (c)
2 computers to 1 or 2 printers.	£69 (c)	£69 (c)

Cable sets for all popular computers available.	
External Serial/Parallel	£37.50(c)
Parallel/Serial converter	£37.50(c)

A wide range of printer interfaces, sheetfeeders,
tractor units, acoustic hoods, ribbons available
from stock.

3M DISCS & CARTRIDGES

5.25" 745 48TPI DSDD for IBM pc	£11.50 (d)
5.25" 747 96TPI DSDD	£15.00 (d)
5.25" HD 1.6Mb Discs for AT	£28 (d)
3.5" 96TPI DSDD Disc	£23 (d)
Back up cartridges for tape streamers.	
DC1000	£12.00 each (d)
DC300 XL	£16.50 each (d)
DC600A	£18.50 each (d)
Bulk Discs Supplied in pack of 50 discs in a lockable disc box.	
48TPI DSDD	£42 (d)
Floppyclene Drive Head cleaning kit supplied with 20 disposable cleaning discs.	
5.25" Floppyclene Kit	£12.50 (d)
3.5" Floppyclene Kit	£14.50 (d)

WINCHESTER SPECIALS

30 Mbyte Seagate ST4038
complete with controller card and cables for PC/XT **£299(a)**

20 Mbyte Seagate ST225
complete with controller card and cables for PC/XT **£265(a)**

20 Mbyte Olivetti HDC372 File Card
Low power, compact and suitable for Amstrad PC **£379(a)**

30 Mbyte Miniscribe File Card
Low power, compact and suitable for Amstrad PC **£399(a)**

File card just plugs into expansion slot - No further installation work required

MODEMS

Full range of *Miracle Modems* available from stock. Please phone for details or complete
the coupon below.

MONITORS

MONOCHROME 12"

Composite Video (for use with CGA)	
Philips 7502 Green + Swivel Stand	£75(a)
Philips 7522 Amber + Swivel Stand	£79(a)
Taxan KX117 Green	£79(a)
Taxan KX119 Amber	£85(a)
Monochrome 12" TTL Input (for use with monochrome adaptor).	
Philips 7513 + Swivel Stand	£99(a)
Taxan KX1212G Green.	£120 (a)

COLOUR MONITORS (CGA)

Mitsubishi XC1404 14"	£229 (a)
Taxan Super Vision 620 12"	£279 (a)
Taxan Super Vision 625 12"	£319 (a)
Taxan Super Vision IV 12"	£479 (a)

COLOUR MONITORS (EGA)

Taxan Super Vision 760 14"	£499 (a)
Taxan MultiScan 770	£659 (a)
Taxan Supervision IV 12"	£479 (a)

BOOKS (NO VAT £2 p&p)

80286 Prog Ref Manual	£14.95	Understanding dBase III	£22.95
8086 Book	£23.95	dBase III for 1st Time User	£19.95
8087 Appl & Prog for PC	£19.10	Mastering the dBase III	£22.95
Prog the 8086/8088	£16.	Adv Tech in dBase III	£22.95
RS232 Solutions	£17	Understanding dBase III +	£22.95
RS232 Made Easy	£19.95	dBase III Handbook	£18.45
Solutions in C	£17.95	Multimate Complete Guide	£16.95
C at a Glance	£7.95	Multiplan Made Easy	£18.95
Advanced C Tech & Appl	£19.95	Introduction to Turbo Pascal	£14.95
Understanding Unix	£18.45	We can only show a small range of the products stocked by Technomatic in this advertisement. If you would like further information, please indicate your interest by ticking the appropriate box and we will send you a brochure. ☐ Sicon ☐ Software ☐ Modems ☐ Printers ☐ Monitors ☐ BBC Systems NAME _____ ADDRESS _____ POST CODE _____ Return to Technomatic Ltd 17 Burnley Road, London NW10 1ED PCW 7/87	
A User Guide to Unix	£19.95		
MS/PC DOS Prompt	£10.95		
Using PC DOS	£19.95		
How to write an IBM PC Program	£6.95		
123 for Business	£16.95		
ABC of Lotus 123	£17.45		
Using 123	£18.45		
123 Tips Tricks & Traps	£18.45		
Mastering 123	£24.95		
Introduction to Wordstar	£17.95		
Wordstar Made Easy	£16.95		
Wordstar Handbook	£11.95		
Wordstar Prompt	£5.95		
Practical Wordstar Uses	£18.95		
Inside AutoCad	£24.00		



THE AMSTRAD 8256. MORE THAN A WORDPROCESSOR,

The Amstrad 8256 offers you more than the average wordprocessor for less than the average typewriter.

Its incredibly low price includes a monitor, disc drive, keyboard, word-processing software and a printer.

And with the 8256 you don't just get quantity, you get quality too.

A high speed RAM disc facility means you can store and retrieve information instantly.

The high resolution, green screen monitor can show 90 columns and 32 lines of text at the same time.

That's 40% more useable screen area than most PCs.

Special function keys on the keyboard save you memorising complicated codes.

And because all the necessary wordprocessing software comes free, you

FOR LESS THAN A TYPEWRITER.

won't have to pay for any hidden extras.

What's more the enormous 256K memory means you're also getting a powerful personal computer.

(If you want even more wordprocessing and computer power there's now the 8512 model, with two disc drives and 512K of memory.)

But what makes the Amstrad even more of a bargain is the fully integrated printer, with its automatic paper loader, tractor feed and choice of letter quality or draft speeds.

The 8256 is also backed up by numerous extras and services.

You can add an optional combined serial and parallel interface to gain access to modem, additional printers and other peripherals.

And business users can take advantage of our nationwide service and maintenance contracts, not to mention the many advanced training courses.

All this for a machine that costs just £399 plus VAT.

Which is less than you'd expect to pay for many other wordprocessors. Or obsolete typewriters.

Please send me some more information about the PCW 8256.

Home user ☐ Office user ☐ (Please tick)

Name

Address

Tel

PCW 7/87

Company

AMSTRAD PCW 8256

Amstrad plc., PO Box 462, Brentwood,
Essex CM14 4EF. Telephone: (0277) 262326.



**The new
Amstrad
PC range**

(IBM Compatible)

IN STOCK NOW

**PRICES
FROM**

£449 + VAT

Hard Disk Models from £799 + VAT

HI VO

London's Largest

LONDON'S LARGEST SPECIALIST AMSTRAD DEALER

Alternative PC clones – in stock now.

COMMODORE 10 MHz AT

20 Meg Mono

£1995 + VAT

40 Meg EGA

£2495 + VAT

includes 1 year Free
on site service

ZENITH

Prices from

£699 + VAT

20 meg Hard
disc models
From

£999 + VAT

EGA available

TANDY

Prices from

£399 + VAT

10 meg Hard
disc models

£849 + VAT

EGA available

LOW COST PC SOFTWARE

Over 100
Titles in Stock

Word Processors,
Spreadsheets, Databases,
Graphics, CAD/CAM,
Accounts, Languages, Desk
Top Publishing, Utilities,
Integrated Packages.

AMSTRAD HARD DISK MODELS NOW IN STOCK

20 Megabyte **£899** + VAT

30 Megabyte **£959** + VAT

PCW 8256/ 8512

USED MODELS –
GUARANTEED FROM

£299 + VAT
(£343.85 inc VAT)

DAISY WHEEL PRINTER PACKAGE FOR PCW8256/8512

£199.96 + VAT
(£229.95 inc VAT)

Use LOCOSCRIPT with a DAISY WHEEL

New LSPRINT enables you to
print your Locoscript text
files on a daisywheel printer.

£29.95 inc VAT

PART EXCHANGE YOUR PCW 8256 or PCW 8512 FOR THE NEW AMSTRAD PC – PHONE FOR PRICES

HARD DISKS ON A CARD

Including formatting and
configuring

21 Megabyte **£429** + VAT

30 Megabyte **£499** + VAT

Low cost Networking From **£279** per PC + VAT

CHRISTIE TAPE STREAMERS FOR HARD DISK BACK UP

10 MEG **£399**.00 + VAT

20 MEG **£499**.00 + VAT

8087-2 8 MHz Maths Co-processor Including test software

£159 + VAT
£182.85 inc VAT

NEW PC CATALOGUE PHONE NOW

640K MEMORY UPGRADE

Add an extra 128K of RAM

£39 + VAT
£44.85 inc VAT

RECOMMENDED PRINTERS FOR THE AMSTRAD PC

Choose from over
50 models

New Star NX15
132 col 120cps
NLQ **£379**.95 inc VAT

Star NL10
IBM compatible
NLQ dot matrix **£259**.95 inc VAT

Citizen 120D
IBM compatible
NLQ dot matrix **£199**.95 inc VAT

Epson
LX86 **£229**.95 inc VAT

PORTABLE PC COMPATIBLES

Zenith Z-171

512K RAM 2 x 5 1/4"

360K disks

25 line LCD display

£1099 + VAT

Zenith Z-181

640K RAM 2 x 3 1/2"

720K disks · 25 line

Supertwist Screen

£1695 + VAT

OPUS PC's

We carry all models of this popular range of PC clones.

Prices from **£499** + VAT



10 meg Hard disc models.

Prices from **£829** + VAT

20 meg Hard disc models.

Prices from **£995** + VAT

Extra for EGA.

Now only **£399**
+ VAT

SBC PC COMPATIBLES

SBC PC-Turbo

8 MHz Turbo. NEC V40 CPU. MS DOS
3.2 + GWBasic. 640K Ram. 12 months
on site service free.

SBCFD **£599** + VAT

2 x 360K disc drive mono monitor

SBC HD 20 **£999** + VAT

20 Mb hard disc mono monitor

CGA colour **£199** + VAT extra

EGA colour **£499** + VAT extra

SBC Mistral 286 AT

12 MHz AT80286

30 Meg hard disc, 1 Meg Ram.

British designed and built. 12

months on site service free.

SBC 286 AT with

mono monitor

£1799 + VAT

SBC 286 ATC with

colour monitor **£1999** + VAT



SBC 286 ATE with EGA

colour monitor **£2199** + VAT

VOLTAGE

Computer Shop

**DON'T TAKE A CHANCE
— COMPARE BEFORE YOU BUY**

**OVER 40
PRINTERS ON
DISPLAY. MOST
ON DEMONSTRATION**

DOT MATRIX PRINTERS

Amstrad DMP2000 NLQ	£159.95	Star NB 24-10 NLQ 80 col 24 pin	£549.95
Amstrad DMP3000 NLQ IBM	£194.95	216cps	
Amstrad DMP4000 NLQ 132 col 200cps	£399.95	Star NB24-15 NLQ 132 Col. 24 Pin	£699.95
Canon PW1080A NLQ	£289.95	216cps	
Citizen 120D NLQ IBM	£199.95	Star NB15 NLQ 132 Col. 24 Pin	£879.95
Epson LX800 NLQ (150cps)	£239.95	300cps	
Epson FX800 NLQ 200cps	£399.95		
Epson FX1000 NLQ 132 col 200cps	£515.95		
Epson EX800 NLQ 300cps	£519.95		
Epson EX1000 NLQ 132 col 300cps	£699.95		
Epson LQ800 NLQ	£585.95		
Epson LQ1000 NLQ 132 col 300cps	£799.95		
Epson LQ2500	£979.95		
Oki-Mate 20 Colour + software	£199.95		
Micro P. 165 NLQ	£229.95		
Micro P. 201 NLQ 132 col 200cps	£399.95		
Star NL10 NLQ inc I/F	£259.95		
Star NX15 NLQ 132 col	£379.95		
Star NR15 NLQ 132 col 240cps	£559.95		

DAISYWHEEL PRINTERS

Dyneer DW12	£139.95
Juki 6100	£329.95
Juki 2200 Typewriter Serial	£249.95
Silver Reed EXP500 16cps	£229.95
Silver Reed EXP550 19cps serial	£279.95

All popular interfaces, cables, etc. available from stock. Custom cables made to order.

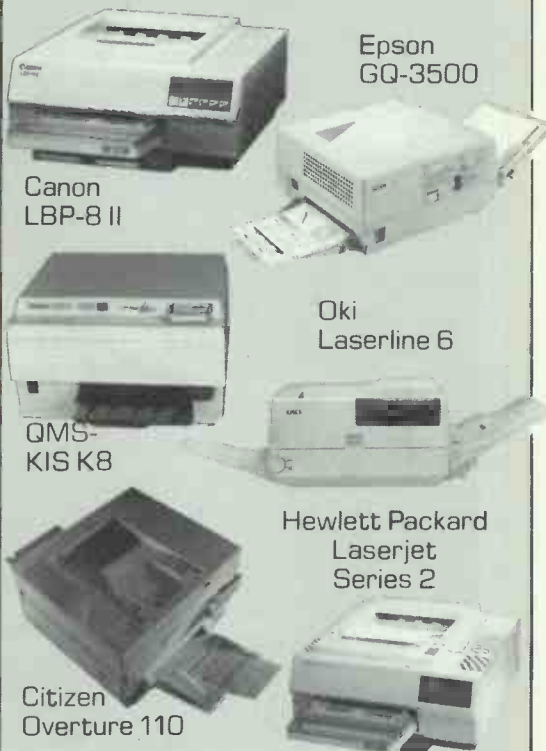
Let our experts match your computer to the printer of your choice. Printers — All models parallel-centronics interface Serial RS232C available at same or slightly higher prices.

LASER PRINTERS

Prices from only **£1395 + VAT**

THE UK'S LARGEST RANGE OF LASER PRINTERS ON DEMONSTRATION

Are you confused by the variety of lasers available? No problem! Visit our showroom and compare before you buy. Off the shelf delivery on most models.



**Plus full ranges from
Canon and Hewlett Packard**

LONDON'S AMIGA CENTRE

Hi-Voltage are the Amiga experts. As Commodore's largest computer store we are proud to give the world's most advanced computer pride of place in our showroom. We stock the most comprehensive range of peripherals and software including colour printers, as they become available. New items are arriving every day so contact us now! **FREE on site service during the first year.**

NEW AMIGA A500
INCLUDING FREE SOFTWARE
PRICES FROM **£499 + VAT**
NOW IN STOCK



**NEW AMIGA CATALOGUE
JUST PRINTED —
PHONE FOR YOUR FREE COPY.**

*Price excludes monitor

AMIGA A1000 IN STOCK NOW!

Based around the Motorola 68000 CPU, with multi-tasking as standard along with a palette of 4096 colours.

PRICES FROM **£599 + VAT**
INCLUDING ON SITE MAINTENANCE

NEW AMIGA A2000 NOW IN STOCK

Standard versions from IBM Compatible versions

£1095 + VAT £1595 + VAT
FULL RANGE OF CBM 64C/128D
COMPUTERS AND PERIPHERALS IN STOCK

ATARI

SPECIAL PACKAGE OFFER

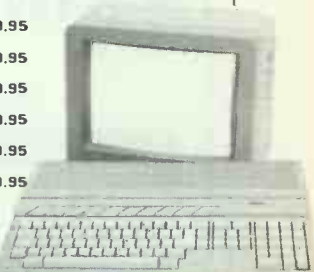
• 520 STM Computer & Mouse • SF 354 Disk Drive • SM 125 Mono Monitor • 1st Word Software Package Normal Price £559.85 inc VAT

Hi-Voltage Package Price **£439.95 inc VAT**

520ST	£199.95	520STM	£249.95
520STMF	£389.95		
520STMF + mono monitor	£489.95		
1 x Meg Disk Drive	£199.95		
2 x 1 Meg Disk Drive	£239.95		
20 Meg Hard Disk	£689.95		

High Res. Mono Monitor	£139.95
Med. Res. Colour Monitor	£389.95
1040 STF inc 1 Meg Drive	£589.95
1040 STF inc Mono Monitor	£689.95
1040 STF inc Std. Colour Mon.	£979.95

**LATEST
SOFTWARE
IN STOCK**



**EXPORT CUSTOMERS SUPPLIED
TAX FREE — ASK FOR EXPORT LIST**

Official orders welcomed from PLC's government and education establishments

ALL PRICES INCLUDE VAT
(except where stated)

**OPEN MONDAY-SATURDAY
9AM-6PM**

VOLTAGE

**Largest range of floppy disks and printer ribbons
available in London over the counter.**

**London's largest range of games and software.
Thousands of titles in stock.**

Mail Order + Export Hot Line Phone 01-686 6362



Delivery by Securicor (4 day) please add £5.75 per item.
Delivery by Securicor 24 hour please add £9.95 per item.



Send off or order by 'phone quoting your Access, Visa No. 'Phone 01-686 6362.
Immediate despatch on receipt of order or cheque clearance. Or Telex your order on:
946240 Attn 19001335. **EXPORT CUSTOMERS SUPPLIED TAX FREE.**

Dept. PCW, 53-59 High Street, Croydon, Surrey CR0 1QD. Tel: 01-681 3022

Prices correct at copy date. Subject to change without notice due to currency fluctuations etc. E. & O. E.



PC 88 TURBO

- ★ 16 bit 8088-2 processor 4.77/8 MHz
- ★ Phoenix/AMI BIOS (IBM compatible)
- ★ 512K Hi-Speed Dynamic RAM expandable to 640K/1024K on motherboard
- ★ 360K Half Height Drive
- ★ Hi-Res Monochrome Monitor
- ★ 2 Parallel Printer Ports
- ★ 2 Serial RS232 Ports (1 optional)
- ★ Clock/Calendar with battery back-up
- ★ Hi-Res Graphic Adaptor
- ★ Joystick Port
- ★ 8 Expansion Slots
- ★ 150W Approved Power Supply
- ★ Enhanced Quality Keyboard
- ★ Comprehensive User Manual set
- ★ 12 Months Warranty

From **£499**

PC 286 TURBO

- ★ 80286 processor 6/8/10 MHz
- ★ Phoenix/AMI BIOS (IBM Compatible)
- ★ 512K Hi-Speed Dynamic RAM expandable to 4Mb on Motherboard
- ★ 1.2Mb Half Height Drive
- ★ 1 Parallel and 2 Serial RS232 (1 optional)
- ★ Hi-Res Monochrome Monitor
- ★ Hi-Res Graphic Adaptor
- ★ Clock/Calendar with battery back-up
- ★ Joystick Port
- ★ 8 Expansion Slots
- ★ 200W Approved Power Supply
- ★ Enhanced Quality Keyboard
- ★ Comprehensive User Manual set
- ★ 12 Months Warranty

From **£999**

PC 386

To Be Announced

The software systems which have been fully evaluated and could be supplied with BETOS computers include:

ACCOUNTING

Tetraplan
SunAccount
Omicron
Pegasus
Sage

DATABASES

dBASE III plus
Smart
Rbase
Symphony
Framework

WORD PROCESSORS

Wordstar
Stellatext
Multimate
Smart
Framework

SPREAD SHEETS

Lotus 123
Supercalc
Javelin
Smart
Framework

LANGUAGES

Turbo Pascal
Fortran
Cobol/level II/VS
Basic
C

OP. SYSTEMS

MS DOS
XENIX SYSTEM V
Local Area
Network

HOT LINES (021)356 3828

(01)281 4259



IBCS Ltd

10-18 Manor Gardens
LONDON
N7 6JY
Tel: 01 272 8944



Rosco Ltd

289 Birchfield Rd
BIRMINGHAM
B20 3DD
Tel: 021 356 7402
Telex: 334303 TXAGWMG



Group of Companies

KAYPROAUTHORISED
DEALER

RRP FROM £1299 + VAT

CALL NOW FOR OUR PRICE ON:

Tel: (0342) 311755 or Fax: 311235

PROTO SYSTEMS LTD

ALSO XT AND AT 386 SYSTEMS



COMPATIBILITY



RIGHT PRICE



RELIABILITY



EXPANDABILITY

THE OFFER INCLUDES

- 10 MHZ HIGH SPEED 80286 PROCESSOR
- FREE WORDPROCESSOR, DATABASE, SPREADSHEET, UTILITY
- 2 YEAR WARRANTY
- ENTIRELY USA MANUFACTURE
- MS DOS 3.21 + GW BASIC
- HERCULES/CGA VIDEO CARD
- PARALLEL/SERIAL PORT
- 1.2 MB FLOPPY DISK
- MONO MONITOR (COLOUR MONITOR OPTIONAL)
- 20 MB, 30 MB OR 40 MB HARD DISK OPTIONAL.

AND **ZENITH** AND **olivetti** COMPUTERS**SURPLUS COMPUTER SALES**

IBM PORTABLE COMPUTERS

NOW AVAILABLE WITH A 30MB HARD CARD FOR AN AMAZING £999

JUST LOOK WHAT YOU GET...

★ IBM PORTABLE COMPUTER ★ TWIN 360KB DISK
DRIVES ★ 30MB HARD CARD ★ 256KB MEMORY ★ PARALLEL
PRINTER PORT/RGB OUTPUT ★ SMART IBM CARRY CASE ★
★ DOS 3.0 ★ FULL MANUALS ★ 12 MONTHS WARRANTY

ALSO AVAILABLE FOR ONLY £850

THE SAME IBM PORTABLE COMPUTER WITHOUT THE HARD DISK BUT FITTED WITH THE VERSATILE
RACAL 2123 INTERNAL MODEM...SEND TELEXES, E-MAIL OR CONNECT IN TO PRESTEL BY SIMPLY
CONNECTING TO THE NEAREST TELEPHONE POINT.

DON'T BE STUCK FOR MEMORY...UPGRADE YOUR PORTABLE TO 640KB FOR ONLY £79

SCS LTD SPECIALISE IN THE SALES OF SURPLUS
COMPUTER PRODUCTS. THIS MONTH'S END OF LINE
SPECIALS ARE:

STAR DELTA 10 80 COL, 160 CPS DUAL I/F	£175
RICOH 1200 DAISYWHEEL, 132 COL, 22CPS	£250
FUJITSU DC1200 132 COL, 180CPS, NLQ	£290
OLIVETTI PR1450 80 COL 120CPS	£160
OLIVETTI PR17 132 COL, 180CPS, NLQ	£210
PERSYST EGA CARD	£145
PERSYST SB III M/F EMS CARD	£99

THERE IS A GREAT DEAL GOING ON AT:

SURPLUS COMPUTER SALES LTD

20A HORSESHOE PARK,
PANGBOURNE, BERKS, RG8 7JW

ALL PRICES EXCLUDE VAT/DELIVERY

TELEPHONE: PANGBOURNE (07357) 5455

Unlimited Creativity in Kit Form. The new Cherry Graphics Tablet Mk.2.

The new A3 Graphics Tablet Mk.2 is more versatile, easier to use and available as a complete Kit. For architectural, designing, draughting, educational and research Applications.

The main Advantages of the Mk.2:

- Standard A3 working area of 384 x 260 mm.
- Increase of working area to 384 x 290 mm if menu strip is not being used.
- Change over from stylus to cursor puck at the flick of a switch.
- Stable and accurate display under all normal operating conditions.
- Resolution 0,1 mm with accuracy $\pm 0,5$ mm.
- Actual accuracy through "zoom" option of virtually all painting and CAD software in effect almost infinite.
- Configuration can be altered with 16 set-up DIP switches in easily accessible position.
- LED "power-on" indicator.
- Single industry standard 25 pin "D" connector provides parallel and serial ports.
- Calculator-style independent power supply for cases where power cannot be supplied from host computer.
- Re-legendable menu.
- Supports RS232 serial, and serial or parallel TTL interfaces, all with optional handshaking.
- Choice of standard ASCII or fast, packed binary formats.
- User-selectable baud rates of 300, 600, 1200, 2400, 4800, 9600 and 19200 in point, stream or switch-stream modes.
- Attachable to practically any type of computer system.
- Compatible with Summagraphics protocols.
- Kit includes digitising tablet, 4-key crosshair cursor puck, stylus, power supply, interface cabling, user-definable menu strips, marker pen and documentation.

Send today for further technical details!
Or contact one of the following Distributors:

P.M.S. (Instruments) Ltd. Waldbeck House, Reform Road, Maidenhead, Berks. SL6 8BR Contact: Mr. Bill Webb Tel.: 0628-38036	S.K. Micro Systems Ltd. St. Michaels House, Norton Way South, Letchworth, Herts. SG 6 1PB Contact: Mr. Noel May Tel.: 0462-679331	Kingsland Data Services Ltd. 1, Wood End Road, Edlington, Birmingham. B24 8AA Contact: Mr. John Blyth Tel.: 021-384-8080	Environmental Equipment Limited. Envlron House, Welshmans Lane, Off Welsh Row, Nantwich, Cheshire CW5 6AB Contact: Mr. Roger Hill Tel.: 0270-625115/626605
--	---	--	--

CHERRY



New Generation Graphics Tablets.

The Features.



Switch for stylus or cursor stick.



6 set-up DIP switches.



LED "power-on" indicator.



Re-legendable menu.



25 pin "D" connector.



Complete kit.

MICRO BRITISH COMPUTING AWARDS 1987

SPECIAL ANNOUNCEMENT BRITISH MICROCOMPUTING AWARDS 1987

The British Microcomputing Awards 1987 will be given for those personal computer products which, in the opinion of the judges, provide value for money, ease of use, flexibility and innovation.

This year the Awards presentation and dinner will take place in London on the first night of the Personal Computer World Show, Wednesday 23rd September.

The categories of Awards are:

● BUSINESS MICRO-COMPUTER OF THE YEAR

For the most outstanding personal computer for business/professional use

● BUSINESS SOFTWARE OF THE YEAR

For the most outstanding software package for business/professional use

● HOME/SMALL BUSINESS MICROCOMPUTER OF THE YEAR

For the most outstanding personal computer for use in the home or small business

● HOME/SMALL BUSINESS SOFTWARE OF THE YEAR

For the most outstanding application software package for serious home/small business use

● GAME OF THE YEAR

● BRITISH MICRO-COMPUTING SPECIAL AWARDS

In addition to the above categories, three discretionary awards will be given for personal computing

products of especial merit. Typically, these awards will be given for such products as peripherals, hardware and software combinations, add-in boards, networking and multi-user systems and education software packages. The British Microcomputing Special Awards are designed to ensure maximum representation across the industry.

● 1987 MICRO-BUSINESS AWARDS

Once again, in conjunction with The Personal Computer World Show, the Micro-business Awards will be given for the microcomputing innovations which offer an outstanding and original contribution to business profitability and efficiency. Two awards will be given, one for hardware and one for software.

Nominations for any of the awards may be sent by any reader of this announcement and must reach the organisers by Friday 10th July 1987.

Your nomination should include the following information: Product name; Manufacturer's name; Award Category/ies; a **short** statement of why you think the product/s nominated should receive an award; your name, address and telephone number.

Please send your nominations to:
British Microcomputing Awards
c/o Matthew Pudney & Associates Ltd
8-10 Hallam Street
London W1N 5LF



Tel. (0342) 24631
Telex: 957418

Charlwoods Business Centre, Charlwoods Road, East Grinstead, West Sussex RH19 2HH



DIGITASK PC16-X

- 8088-2 co-processor operating at 4.77 MHz • Soft/hard switchable to 8 MHz Turbo (provision for 8087-2 co-processor) • Full 512 KB on-board memory as standard • Single floppy (brand name) drive
- 8 IBM* compatible expansion slots (7 on portable) • 150 watt power supply
- 1 x parallel port, 1 x serial port (2nd serial opt.) 1 x clock, 1 x games port, 1 x light pen interface • Reset button, enabling cold boot without switching off • Strong, durable case • Easy access flip-top lid (slide on portable) • 84 key, AT* style keyboard • Colour display adaptor
- Composite green/amber monitor (internal 9" TTL on portable)
- Excellent software compatibility • Free Application/Utilities Software
- One year parts and labour warranty (on-site maintenance available)

STARTER SYSTEM

(Specifications as above)

£499

FULL FEATURE SYSTEM

Dual 360KB Floppy Drive 640K Ram,
High Resolution TTL Monitor, Mono-Graphics Adaptor

£695

BUSINESS PRO SYSTEM

20MB Hard Drive, Single 360KB Floppy Drive

£975

BUSINESS PRO PLUS SYSTEM

20MB Hard Drive, 1 x 1.2MB + 1 x 360KB Floppy Drive

£1159

MICROSOFT MS-DOS®

3.20 with GW Basic Interpreter (latest version)

£65



DIGITASK AXIOM 286-10

- 80286-10 co-processor (6/10 MHz switchable) • Zero or one wait-state selectable • 16 level interrupt, 7 channel DMA • 3 programmable timers
- 16-Megabyte addressable mode • Reduced chip count (due to custom chips set) • Optional 80287 co-processor • Phoenix BIOS • Full Megabyte on-board memory supplied • Combined floppy/hard drive controller
- 1.2 MB floppy drive • 6 x 16 bit IBM* compatible expansion slots (5 usable on portable) • 2 x 8 bit expansion slots • 200 watt power supply (180 watt on portable) switchable 110/220V • 2 x parallel ports, 1 x serial port (2nd serial opt.) • On-board CMOS real time clock with ni-cad battery back-up • Hardware reset from front panel • Keyboard lock on front panel
- Modern, attractive case • Easy access flip-top lid (slide on portable)
- Small Footprint • 84 key, AT* style keyboard • Mono/graphics adaptor
- High resolution TTL monitor (internal 9" on portable) • One year parts and labour warranty (on-site maintenance available)

AXIOM SILVER

(Specifications as above)

£1253

AXIOM GOLD 20

1 x 20MB Hard Drive

£1399

AXIOM GOLD 40

2 x 20MB Hard Drive

£1649

Other configurations-please call

MICROSOFT MS-DOS®

3.20 with GW Basic Interpreter (latest version)

£65

THE DIGITASK PORTABLE RANGE

- | | |
|-------------------------------------|-------|
| • PC16-X STARTER SYSTEM PORTABLE | £699 |
| • PC16-X-FULL FEATURE PORTABLE | £779 |
| • PC16-X BUSINESS PRO PORTABLE | £1069 |
| • PC16-X BUSINESS PRO PLUS PORTABLE | £1239 |
| • AXIOM SILVER PORTABLE | £1353 |
| • AXIOM GOLD 20 PORTABLE | £1499 |
| • AXIOM GOLD 40 PORTABLE | £1749 |

Specifications as desktop systems

All prices do not include carriage & VAT (Please call)



RAGLEY DATA SYSTEMS

(Computer Peripherals Division)
TLX 449148

0789 765295 North/Midlands or 0380 870867 South

COMPUTERS

ALL IN STOCK

Make	Model	Specification	Mono Colour
TATUNG	7000-1	6/8MHz 640RAM/1.2Mb/20Mb	1586 1741
TATUNG	7000-2	6/10MHz 640RAM/1.2Mb/20Mb	1697 1852
TATUNG	7000-3	6/8MHz 640RAM/1.2Mb/30Mb	1950 2105
TATUNG	7000-4	6/10MHz 640RAM/1.2Mb/30Mb	2057 2212
TATUNG	7000-5	6/10MHz 640RAM/1.2Mb/40Mb	2157 2327

COMPLETE TANDON RANGE Call for best prices

APRICOT	XENXi20	8MHz 512RAM/1.2Mb/20Mb	1854 2503
APRICOT	XENiXD20	10MHz 1Mb/1.2Mb/20Mb	2025 2730
APRICOT	XENiXD45	10MHz 2Mb/1.2Mb/45Mb	2594 3299

SPECIALS F2 520 F10 695 X110 1295

ZENITH	Z-181	Portable 640RAM/2x720K	1350 -
ZENITH	159	8MHz 768RAM/360/20Mb	1900 2156

*All systems include Monitor, Keyboard, MS-DOS.

Call for best prices on OLIVETTI, COMPAQ, IBM, AMSTRAD 1512.

ENHANCEMENTS

Hercules Mono +	191	Orchid PC Net	312
Hercules Colour	103	IBM Par Cable(P)	18
Hercules Compatible Card	75	WS4000 + Multicom	198
C.G.A. Card	81	Sage V21/V23AA.AD	
Vega E.G.A.	256	+ Chit Chat S/W	285
Taxan E.G.A. + 14" Monitor	665	20Mb H.D.D.	469
AST Sixpak 64	230	30Mb H.D.D.	662
Microsoft Mouse	127	40Mb H.D.D.	795
PC Mouse + Software	127	14" COLOUR MONITORS	
Orchid Tiny Turbo 286	399	Tatung 1322 C.G.A.	294
Orchid Turbo E.G.A.	585	Tatung 1380 + E.G.A. Card	639
Orchid Jet 386	750	Tatung 1376 P.G.A.	504
80287 8MHz	250	Tatung 1380 E.G.A.	429
256 DRAMS(9) £4 each		64 DRAMS (8) £1.68 each	

PRINTERS

EPSON LX86 120cps/16/80clm	194	BROTHER Twinwriter 160cps/40	995
EPSON FX800 160cps/32/80clm	306	OKI182 120cps/20/80(P)	190
EPSON FX1000 160cps/32/132clm	391	OKI 182 120cps/20/80(S)	235
EPSON LQ800 180cps/32/80clm	435	OKI 192 160cps/40/80(P)	285
EPSON LQ1000 200cps/60/132clm	575	OKI 192 160cps/40/80(S)	325
EPSON EX800 250cps/50/80clm	395	OKI193 160cps/40/136(P)	375
EPSON EX1000 250cps/50/132clm	530	OKI 193 160cps/40/136(S)	400
EPSON LQ2500 200cps/90/132clm	735	OKI 292 200cps/100/80(SP)	435
BROTHER 1409 180cps/45/80clm	294	OKI 293 200cps/100/136(SP)	575
BROTHER 1509 180cps/45/132clm	378	OKI 294 400cps/100/136(SP)	750

LASER PRINTERS

CANON A1	1775	KYOCERA	2720
CANON A2	2700	QUME 10	2255
QMS K8	1900	TALLY 910	2685
OKI Laserline	1563	CENTRONICS PP8	1600
GENICOM 5010	1750		

SOFTWARE

Lotus 1-2-3 v.2	250	Javelin	350
Symphony	375	Harvard Pres.Graphics	223
Supercalc IV	235	First Choice	115
Multimate Adv	299	Sage Accountant	125
Smart	410	Sage Accountant +	165
Wordstar 2000	250	Sage Payroll	90
Wordperfect	298	Wordstar 1512	60
Framework 2	355	Reflex	99
Delta 4	335	Sidekick	55
Cardbox +	256	Gem Collection	99
D Base III +	350	Gem Draw 1512	90
Wordcraft	325	Gem Graph 1512	90
Pertmaster	575	*Other software prices on request	

TERMINALS

WYSE 50	380	ESPRIT 6515	459
WYSE 50 +	420	ESPRIT 6310	430
WYSE 60	420	ESPRIT 6110 +	307
WYSE 85	390	OPUS II	410
WYSE 99GT	685	AMPEX 220	390

Please call our Systems Division for a TOTAL Computer Package

R.D.S. LTD
Pendennis House, Keevil
Trowbridge, Wilts BA14 6NA
All prices exclude VAT/Delivery

NTS Group

Call 031-220 1115



NTS PC

From **£399**
only

Spectacular low cost IBM compatible entry level system. Full 640K RAM, dual RS232C and parallel printer interface. NEC V20 processor dual clock speed 4.77/8.00 MHz, one 360K floppy drive. Hercules compatible. AT style 84 key keyboard. Free PC-Write word processing software. Full 12 months parts/labour warranty — unbeatable.

* 12" monochrome monitor £90 extra.



NTS XT

From **£795**
only

Superb Amstrad beater, fast NEC V20 dual 4.77/8.00 MHz processor, 20 Mb hard disc, one 360K floppy drive, dual RS232 ports and parallel printer port, 640K RAM, AT style 84 key keyboard. Hercules compatible graphics, 12" high resolution TTL monochrome monitor with tilt-swivel base. Free PC-Write word processing software, PC-Calc spreadsheet, PC-File III database. Games disc and hard disc utilities.



NTS AT286-12

From **£1,295***
only

We think that this is the fastest AT on the market, with Dynamex speed control it will run most applications at 12 MHz. Clock speed with 0 or 1 wait states, one 1.2 Mb floppy drive, one fast access 20 Mb hard disc, dual RS232 ports and parallel printer port. AT style 84 key keyboard, full 1 Mb RAM 12" high resolution TTL paper white, green or amber monitor.

* Zenix V version with 10 I/O ports available for £2,475. Handles up to six concurrent users — call for further details.



NTS AT386-14

From **£1,995***
only

A fast 80386 based mini-computer with 20, 40 or 80 Mb hard disc, one 1.2 Mb floppy drive, dual RS232 and parallel printer ports, 12" paper white, green or amber monitors.

*Unix system 5 available shortly with up to 16 I/O ports supporting up to 10 concurrent users, call for further details.

HOW TO ORDER

Order with confidence, 7 days money back guarantee, full 12 months part/labour warranty. Call 031-220 1115 (Edinburgh) or 01-581 3556 (London) for further details or mail cheque/Postal Order with coupon to: NTS Ltd.

All prices exclude VAT at 15% and carriage of £6 ex VAT per order. Personal callers by appointment only.

Name

Address

Tel No (Day)

Please send:

Price inc VAT and carriage £.....

Mail to:
NTS Ltd NTS Ltd
Head Office:
9 St Colme Street 1 Elystan Place
Edinburgh EH3 London SW3
Tel 031-220 1115 Tel 01-581 3556

FREE SOFTWARE?

SPECIAL SELECTIONS FROM THE PUBLIC DOMAIN (0344) 86 3020

Well, almost free. We don't charge for the public domain and user supported software but there is a small service charge from £6 per disk to cover promotion costs, selection, testing, copying, etc. We have disks for MS-DOS and CP/M. Mail and telephone order only.

Out of the thousands of programmes we have collected, we bring you a **SELECTION OF THE BEST** that have been carefully tested and documented. They'll run on a wide variety of computers that will accept 5¼" disks.

MS-DOS programmes are intended for the IBM-PC and close compatibles. Documentation is included on the disks, where required.

MS-DOS

Disk No. GAMES

M1: SPECIAL COLLECTION. A graphic, intelligent adventure, a space trek and a surprise called Bouncing Baby.

M3: ORIGINAL ADVENTURE. The original classic in C, with source.

M4: SELECTED BASIC GAMES. More than 20 games, including Blackjack, Catch88, Eliza, Meteor, and Pacman.

M5: SUPER COMPILED GAMES (1) Eight very good arcade games, including Pango, Gold, Pyramid, 3-Demon, etc.

M6: CHESS. Several extensive versions of this well-written game. Has graphics.

M8: SELECTED FAMILY FUN GAMES. 2 Flight Simulators, Music Generator, excellent Pacgirl, Space Wars, etc.

M11: MONOPOLY. Several excellent computer versions of this popular board game.

M13: DUNGEONS & DRAGONS. Cave Quest — a very good adventure game. If you like monsters and magic this is for you.

M17: PINBALL GAMES. Contains three fascinating games of varying degrees of difficulty. Engrossing.

M1022: SUPER COMPILED GAMES (3). Arcade type games. Includes Kong, Striker, Spavevade, Life2 and Frog.

M1023: GREAT BASIC GAMES. Over a dozen, including Wizard, Xwing, Combat, Mars, Racecar, CIA. Requires Basic.

M1037: POOLS AND LOTTO. Choose your numbers and the game does the rest.

M1038: TAROT AND I CHING. A choice Aussie contribution. Reads your "cards" or "throws" coins or yarrow sticks.

M1039: JOKES AND INSULTS. Harmless practical jokes on computer users. Also surprises with insults on screen.

M1040: YACHT RACE SIMULATION. Interactive, extensive and fascinating. Based on America's Cup match racing.

UTILITIES

M26: UTILITIES FOR PERSONAL MANAGEMENT. Similar to Sidekick, with calculator, notepad/editor, phone index, alarm clock, calendar, printer controls, etc.

M27+: UNPROTECTION METHODS. Hints and programmes that help you to back-up a variety of copy-protected programmes. 3 disk set for £24.

M32: DISK DOCTOR COLLECTION. Excellent debugging and file repair programmes. Includes Jaz, Easy-Zap, Diskit, etc.

M33: HARD DISK UTILITIES. Special set of dozens of highly useful utilities for greater efficiency.

M34: MULTI-TASKING SHELLS. Two excellent DOS Shells which allow you to operate and execute from a menu-system — Dosomatic and Still River Shell. Interrupt tasks and switch to other programmes.

M35: CP/M EMULATION. Run CP/M software on your PC. Well-documented and source coding is provided.

M2030: SYSTEM SNOOPER. Has device drivers, utility tutorials, marks bad blocks, diagnostics, redirects output, etc.

M2031: STRATFORD UTILITIES. Has demon for backing-up some difficult programmes, replaces joystick commands with cursor control and more.

M2032: NANOVISION UTILITIES. Converts text files to com files for self-display; memory-resident page; visual file deletion. More.

M2033: SELECTED MENU SYSTEM. Menus are created with word processor. 10 options per menu; sub-menus, etc. Makes usage friendlier.

M2034: MULTIPLE FILE CATALOGUER. Catalogues for word processing, databases, games, etc. Searches, sorts, prints reports and directories.

M2035: MORE HARD DISK UTILITIES. A super collection for optimising disk usage. Well worth having.

M2036: PC SPEED-UP. Inexpensive way of getting more out of your hardware. Diagrams need Epson-compatible printer.

M2037: MANAGING MEMORY-RESIDENT UTILITIES. Organise and control memory better.

WORD PROCESSING

M42: TYPING TUTOR. Improve your keyboard work. Menu-driven, easy to use.

M43: MULTI-FONT WRITER. On-screen scientific notation. Greek letters, gothic; bold, italics, etc. Recommended.

M48: OUTLINER FOR WORD PROCESSING. Considered by many to be the best outliner/ideas processor available.

M49: FORM LETTERS. Examples of the most commonly-used business letters — dozens of them.

M3014: SIDEWRITER. Generates printed output sideways to fit wide reports on to a page.

M3019: PROGRAMMERS EDITOR for source code editing in structured languages. can be memory-resident. Built-in doc.

GRAPHICS

M61: GRAPHICS. Some of the best programmes, including picture-graphics set of commercial standard.

M62: SLIDE PRESENTATION. Prepare transparencies for overhead slides.

M66: EXTENDED FONT CHARACTERS — A utility for Epson-compatible printers that will print all of the printable characters of MS-DOS character set.

M67+: COMPUTER-AIDED DESIGN. Powerful control over drawing, graphics, printing, and slide show. Two-disk set £18. Requires colour monitor.

LANGUAGES

M85: PASCAL. A popular language for general programming. Good choice for learning to programme.

M94+: ARTIFICIAL INTELLIGENCE. These 2 disks contain TWO expert system shells — Esie and Expert. £18. They help you gather information and make a recommendation.

M95+: BASIC LANGUAGE. Interpreter with manual. 2 disks. £18.

COMMUNICATIONS

M101: TWO MAJOR COMMUNICATIONS programmes — Qmodem and Kermit. Lots of bells and whistles.

M6010: PROCOMM. Many featured programme for contacting bulletin boards.

M6012: UK BULLETIN BOARDS. A comprehensive listing of bulletin boards in UK. M107 is an Australian listing.

BUSINESS/CALCULATION

M121: GENERAL LEDGER ACCOUNTING. A small-business recording system. Highly regarded. Excellent reports.

M124: STOCK MARKET ANALYSIS. Special aids to help you "think and grow rich". For managing and evaluating portfolios and prospects.

M125: GOAL/TIME MANAGEMENT. For goal-directed organisation. Arranges information, prompts action.

M126: STATISTICAL ANALYSIS. Many programmes in Basic for analysis — Chi, Regression, Fisher, Binomial, Variance, Histogram, Poisson, Correlation, etc.

M127: SPREADSHEET. Easily used, comprehensive programme.

M128+: INTEGRATED PACKAGE. Three disks. Includes integrated word processor/spreadsheet/database/graphics. £24.

M129: 1-2-3 UTILITIES. Highly regarded collection of utilities that enhance the operations of Lotus 1-2-3.

M132+: 1-2-3 WORKSHEETS. Comprehensive special set of worksheets, aids and utilities. £54 for 8 disks. (Does not include M129.)

M136: PROJECT MANAGEMENT. Will handle 1000 tasks and does critical path analysis, cash flow, bar charts, cost reports, etc.

M137: STOCK CHARTING SYSTEM. Records highs, lows, volumes, prices, etc. In Basic.

M7029: INTEGRATED ACCOUNTING. General Ledger, Cash Book, Debtors, Payroll, etc — all on one disk.

M7030: CALCULATORS' COLLECTION. Calculations for various occasions — programming, school, finance, many digits, etc.

M7031: PERSONAL FINANCE MANAGER. Manages cheque and credit card a/c's, savings, purchases, withdrawals, interest, budgets.

DATABASE MANAGEMENT

M142+: DBASEIII APPLICATIONS. Extensive group including: cheque payments, mail management, inventory ctrl, budgeting, accounting, depreciation, general ledger, graphics, etc. 5 disk set £36.

M143+: FAMILY TREE/GENEALOGY. Recording, tracing, grouping, printing family tree. In Basic. 2 disks with documentat. £18.

M147: DBASEIII SCREEN CODE GENERATOR. Greatly reduces the amount of programming you need to do. Generates coding to include in your own programme.

M150+: DATA BASE MANAGER. Suits sales/stocks/mailling/personnel/payroll. Calculates, prints invoices etc. 2 disks £18. Has full documentation.

M151: MAILING LIST MANAGER. You can add, edit, sort, and print mailing labels for all members or selected groups.

M152+: RBASE LOOKALIKE. Operates as standalone system in menu and command modes or will drive application programmes. 3 disks. £24. Requires hard disk.

M8012: LABEL PRINTING. Collection that allows you to print labels for all sorts of uses, as well as control mailing lists.

M8013: FREE FILE. Menu-driven, easy to use relational data base that allows 100 fields and up to 2 billion records.

M8015: RETAIL INVENTORY. Menu-driven, very fast system for keeping inventories up to date.

M8017: PRODUCTION DATABASE. Keeps track of suppliers, materials requirements, product costs, etc.

EDUCATION

M201: BASIC TUTORIAL. How to programme in Basic. Onscreen demonstration and explanation.

M203: MATHS TUTOR. A Basic programme that suits primary classes. Has six grades of arithmetic training.

M204: PC-TUTOR. Learn more about the operation of your computer, the important commands, etc.

M9007: SECONDARY MATHEMATICS. Collection of Basic programmes that provide instruction in key areas.

M9015: FOREIGN LANGUAGES TUTORIAL. Has instruction for French, German, Italian, Spanish and Hebrew.

M9016: LOTUS 1-2-3 TUTORIAL. Advanced techniques when developing spreadsheet skills.

M9017: DOS TIPS AND HINTS. Collection of advice on printing, screen, keyboard, colour, batching, booting, AT keyboard, etc.

GENERAL

M9501: DIETER'S FRIEND. Nutritional analysis programme compares your intake.

M9502: SPORTING ADMINISTRATION. Helps run events, match opponents, report results.

M9503+: BIBLICAL QUOTES. 14,800 cross-references to 7956 verses of new testament for talks, sermons, essays. £18.

SHAREWARE REQUIRED FOR INTERNATIONAL DISTRIBUTION

We have extensive marketing and distribution facilities locally and overseas and require quality software for international distribution. Adequate documentation should be on the disk. Please forward submissions to our Chief Executive at the address below.

CP/M

Call or write for free catalogue.

PUBLIC DOMAIN NEWSLETTER

For news, reviews, views and how to use public domain and user-supported software subscribe to our bi-monthly newsletter and keep informed on the free programmes that help your computer to serve you. Only £12 per annum. (VAT not applic.)

ORDERS:

The first disk costs £10, the second £8 and each disk thereafter is £6. The price of sets is specified in adv. Add £2 post/pack and 15% VAT to total. Orders outside U.K. post/pack £3 (no VAT). **ORDERS MUST BE PREPAID.**

PAYMENT BY MAIL TO: SELTEC COMPUTER PRODUCTS LTD, "Farley Hall", Wokingham Road, Bracknell, Berkshire RG12 5EU

TELEPHONE ORDERS: (0344) 86 3020 (0344) 56 029
Pay by Mastercard or Visa.

We cannot guarantee the suitability of public domain/user-supported software for users' needs or equipment.

MORE

PC PROGRAMMES FOR ONLY £2!

From the thousands of programmes we have collected from public-domain and user-supported software we bring you a special selection of the best utilities available – special purpose programmes that you may choose in any combination that you wish.

Choose any number for only £2 each (service charge), with a minimum of six programmes; and we transfer them on to one (or more) of our disks for you.

We include source coding where possible. The programmes are documented, where required. Disks are formatted for MS-DOS ver 2 or greater. 360k 5¼" disks.

Programmes are intended for IBM-PC or close compatibles. If Basic is specified then Basic or GWBasic is required. Most programmes are compiled.

EFFICIENCY WITH FILES AND COMMANDS

- U14. FAKE A KEY to provide the input expected when batch processing.
- U15. MULTI-CHOICE MANAGER. Very cleverly apportions memory so that you can switch between three files.
- U16. SOUND A TUNE that lets you know a stage has been completed in batch processing.
- U17. REQUESTS INFORMATION in batch file processing. A timed ask utility.
- U18. MULTIPLE FORMATTING of disks. Lets you format a lot at same time.
- U19. SMALL, FAST SUPER DIRECTORY. Lists directory in 2,4, 6 columns, sorts, etc.
- U20. SORTED DIRECTORY. Screen listing that automatically shows hidden files and offers 2 or 4 columns. Various sorts.
- U21. PERMANENT DIRECTORY SORT. Resorts your directory and saves it to file. Will work on subdirectories and hard disks, as well as floppies.
- U22. SUBDIRECTORY LIST. Shows subdirectories in a given directory.
- U23. SPACE ALLOCATION. Combines Dos Tree and Dir commands to show amount of space to be allocated when files transferred to hard disk.
- U24. FILE MANAGER with execution facility for running programmes. Will also copy, view, delete, etc.
- U25. MEMORY-RESIDENT FILE MANAGER with multiple windows, variable size. Needs CGA card.
- U26. BATMAKER. Creates bat files containing all matching files. This is great when using Find in a text search.
- U27. MENU PROGRAM. Allows for tailor made menus. Good screen appearance.
- U28. GO TO DIRECTORY directly on a hard disk. Reduces amount of keyboard work.
- U29. SECONDARY DOS. Lets you suspend currently executing application and invokes a secondary Dos command processor so new commands can be executed.
- U30. ALLBUT the programmes you specify can be acted on. Eg, delete, copy, etc.
- U31. MEASURE the time your computer takes to execute commands.
- U32. DISK ERROR MONITOR. A resident programme that monitors disk errors and gives more information than the abort/retry/ignore message.
- U33. REMEMBER COMMANDS. Remembers last 50 commands which may be edited or executed.
- U34. RENAME A DIRECTORY.
- U35. DISPLAY COMMENTS FROM CONFIG.SYS file when booting up.
- U36. BUILD DIRECTORY FILE WITH COMMENTS. Has asm source code so that you can tailor to own needs. Produces list of files with size, crc, file no. and space for comments.

FILE PRINTING/EDITING

- U130. PRINT ITALICS. Set printer for output in italics. Epson compatible.
- U131. PRINTER RESET. Resets printer to power-up mode.
- U132. GRAPHIC SCREEN DUMP for Epson compatibles.
- U133. SET 51 LINES PER PAGE on Epson compatible computer.
- U134. SET 132 COLUMNS PER PAGE on Epson compatible computer.
- U135. SET UNDERLINE MODE on Epson compatible printer.
- U136. SET COMPRESSED PRINT on Epson compatible printer.
- U137. SET ENLARGED PRINT on Epson compatible printer.
- U138. SET WIDE PRINT on Epson compatible printer.
- U139. SET EMPHASISED PRINT on Epson compatible printer.
- U140. SET EXTENDED CHARACTERS on Epson compatible printer.
- U141. PRINT SPOOLER. Creates a 16k buffer in memory, which allows you to do other work whilst printing.
- U142. DISK-BASED PRINT SPOOLER. Uses capacity of disk as buffer for printing, allowing you to continue with other work.
- U143. SEND ESCAPE (ESC) SEQUENCES as part of command, such as for printing.
- U144. WORD FREQUENCY. Counts number of times each word is used in a text file.
- U145. FAST WORD COUNT. Provides count of words, characters, lines, plus a mathematical check sum, which allows you to compare text files for changes.
- U146. APPOINTMENT REMINDER. Stores data on disk like a daily appointments diary. Prints details of next 7 days.
- U147. PRINT WITH NUMBERED LINES. Great for listing source coding.
- U148. SIMULTANEOUS EDIT of multiple text files. Lets you make the same text changes to several files at once.
- U149. WORD LENGTH ANALYSER. Checks the length of words in text and compares with readers' level of schooling.
- U150. TEXT CHECKER. Examines Wordstar files for typing errors such as missing brackets and quotes.
- U151. TEXT FILE SORT. Fast and works with very large files.
- U152. LIST NON-ASCII BASIC FILE without loading Basic. Also helpful for listing if you don't have Basic/GWBasic.
- U153. PAUSE LISTING so that printer will produce 55 lines on a page.

EQUIPMENT HANDLING

- U406. CONTROL BACKGROUND/ FOREGROUND COLOURS as displayed on your monitor.
- U407. HARD DISK PERFORMANCE TEST. Checks the running of hard disks.
- U408. COMPUTER LOG to keep track of amount of time of computer usage, how time spent.
- U409. ELECTRIC TYPEWRITER. Converts computer into electric typewriter (for notes, envelopes, etc.).
- U410. KEYBOARD OPTIMISER that will set cursor size, give type ahead buffer, more. Easy to use command line editing.
- U411. MAP RESIDENT PROGRAMS. Shows program addresses, possible conflict.
- U412. TRACK MEMORY as programs are running. Has windows and more.
- U413. MEMORY ORGANISER. Determine, mark, release, allocate, display memory. Shows how files are loaded in memory.
- U414. MULTI-SCREEN. Allows output to be directed to more than one screen. Needs CGA. Multitasking features.
- U415. NEW ANSI.SYS that may aid screen presentation and allow faster execution of many functions.

- U416. BLACK & WHITE MODE can be switched on colour graphics card.
- U417. TIMEPARK HEAD of hard disk after a specified time has elapsed.
- U418. SET 40 or 80 screen columns BW mode on colour systems.
- U419. STATUS REPORT on system, including information about drives, memory available.
- U420. SPEED TEST (1) checks processor speed and compares with IBM-PC. Similar to Norton test.
- U421. SPEED TEST (2) checks computer speed in two areas, including Sieve calculation and track to track access time, and compares with IBM-PC.
- U422. SPEED TEST (3) comprehensive checks on processing, including block write, register/memory, multiply, divide, stack operations, far jumps, etc, and compares with IBM-PC.
- U423. RAM TEST. Tests and tests ram. Identifies faulty memory.
- U424. DOS ENVIRONMENT VARIABLE EDITOR. Make changes to edit path, prompt, etc.
- U425. EXPAND DOS ENVIRONMENT SPACE TO 1K.
- U426. FLIP ON/OFF (TOGGLE) DOS PARAMETERS. Works on several standard Dos parameters.
- U427. WHAT PROCESSOR? Examines and identifies the processor/s being used, such as 8088, 8086, etc.
- U428. WHAT DEVICE DRIVERS? Examines and reports on devices (eg ports) installed in your computer.
- U429. WHAT DOS CONFIGURATION? Examines and reports on memory, vector addresses, and statistical information about version of Dos you are using.
- U430. WHAT EQUIPMENT? Examines your equipment and reports on the installed drives, type of cards (eg, printer, colour, mono, RS232) etc.
- U431. EDIT RAM STORAGE in your computer.
- U432. DRIVE STATUS. Reports on no. of bytes, sectors, clusters-what capacity is and how much is free.
- U433. DIAGNOSTICS. Performs large number of computer diagnostics and reports on serial, parallel ports, video, etc.
- U434. DRIVE TEST. Floppy disk test drive utility.

FILE MOVING

- U511. HARD DISK UNERASE. Exceptional features. Most unerase utilities don't work on hard disk – this one does!
- U512. DELETE ALL BUT those programs you identify.
- U513. INTELLIGENT COPY PROGRAM that creates sub-directories as part of the transfer. Also renames rather than over-writes.
- U514. SUPERIOR COPY PROGRAM that checks and evaluates target before copying. Eg, copies last dated version.
- U515. UNIQUE COPY PROGRAM with same function as U514 but does not copy those already on target disk.
- U516. TREE-SURGERY. Prune files unwanted/ duplicated on hard disk. Has source code and compares files with the same name.
- U517. KILLDIR. Delete a branch of a directory. Reduces steps and saves time.
- U518. MOVE DIRECTORY around if you prefer it stored in different location.

FILE ORGANISATION & CHECKING

- U611. BOMB ALERT. Examines new files for malicious intent and reports on possible danger to other files.
- U612. BASIC MENU GENERATOR. Better access to your Basic files through a menu. For Basic/GWBasic.
- U613. UNSQUEEZE ARC FILES. Small, efficient utility that occupies less space and is simpler to use than Arc.Exe.

- U614. HARD DISK OPTIMISER. Related group of files that optimise hard disk usage and eliminate file fragmentation. Helps pack the disk.
- U615. FILE RE-ORGANISER. Regroups a fragmented file into contiguous sectors on a disk for more efficient disk access.
- U616. RECOVER BAD SECTORS. Records data on disk. Does 12 retries and thus may recover bad sectors.
- U617. COLLECT BAD SECTORS. Marks bad sectors for collection into a separate file that will not be used. Works with floppies and hard disk.
- U618. ADVANCED COMPARE facility that can save as edlin script, generate and update deck.

SPECIAL FEATURES

- U805. PREPROCESSOR FOR "C" COMPILERS. Has "C" source and helps organise coding into efficient form for compiling.
- U806. VOICE EMULATION. Compiled with Basic source module which allows extensions, revision or use as tutorial.
- U807. DEMONSTRATION OF COMPUTER GRAPHICS for those who have CGA.
- U808. DAYS SINCE JAN 1ST. Calculate no. of days elapsed since beginning of year. Needs Basic/GWBasic.
- U809. BINARY FILE CONVERTER. Converts files from machine language to hex equivalent for examination and modification.
- U810. CAPTURE BIOS contents and store in a separate file.
- U811. EXPLORE FAT (FILE ALLOCATION TABLE). Shows the table entries, starting clusters of files, etc.
- U812. MINICALC. A small, easy to use spread sheet with 11 x 22 cells for quick every day use.
- U813. PROGRAMMER'S CALCULATOR which does special hex and other calculations for those writing programs.

ORDERS:

The service charge for each program is £2. There is a minimum charge of £12 (six programs) plus £2 for postage and packaging (£3 foreign). UK purchasers add 15% VAT to total.

ORDERS MUST BE PREPAID.

PAYMENT BY MAIL TO:
SELTEC COMPUTER PRODUCTS LTD,
Farley Hall, Wokingham Rd, Bracknell,
Berkshire RG12 5EU UK.

TELEPHONE ORDERS:
Pay by Access/Mastercard or Barclay/Visa.
Tele: (0344) 86 3020

We cannot guarantee the suitability of programs for users needs or equipment.

CIRCLE NUMBERS BELOW AND SEND TO US WITH PAYMENT AND YOUR NAME AND ADDRESS. OR TELEPHONE US WITH THE PARTICULARS. SEE ABOVE.

- | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
| 32 | 33 | 34 | 35 | 36 | 130 | 131 | 132 | 133 |
| 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 |
| 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 |
| 152 | 153 | 406 | 407 | 408 | 409 | 410 | 411 | 412 |
| 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 | 421 |
| 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 |
| 431 | 432 | 433 | 434 | 511 | 512 | 513 | 514 | 515 |
| 516 | 517 | 518 | 611 | 612 | 613 | 614 | 615 | 616 |
| 617 | 618 | 805 | 806 | 807 | 808 | 809 | 810 | 811 |
| 812 | 813 | | | | | | | |

there are only two names
to remember when you want to buy a printer

OLIVETTI ...

OLIVETTI DM 100/4

80 column,
120 cps draft,
25 cps NLQ.
IBM graphics
Epson FX compatible.
Friction feed.
Centronics Interface.
RRP £299 **Our price £199**



OLIVETTI DM 296/2

132 column
18 pin NLQ
220/90 cps
Epson FX compatible
Colour option.
RRP £859 **Our price £759**

OLIVETTI DM 280/1

80 column
160 cps draft
35 cps NLQ.
Friction and pin feed,
Parallel Interface.
IBM graphics
Epson FX compatible.
RRP £479 **Our price £307**



OLIVETTI DM 590/1

132 column
192/120/48 cps NLQ/LQ
Epson JX compatible plus
Qume and Diablo.
Parallel Centronics Interface.
RRP £1083 **Our price £846**

OLIVETTI DM 285/1 (Colour)

80 column
160 cps
35 NLQ
F/T Parallel
JX compatible
RRP £555 **Our price £415**



OLIVETTI DY 450/1

45 cps
Parallel Centronics Interface.
RRP £1249 **Our price £799**

OLIVETTI DM 286/2

80 column
18 pin NLQ
220/90 cps.
Epson FX compatible.
Colour option.
RRP £689 **Our price £589**



OLIVETTI DY 800/2

80 cps.
Dual Interface.
RRP £1599 **Our price £1059**

OLIVETTI DM 295/1 (Colour)

132 column
160 cps
35 NLQ, F/T
Parallel & Serial
(dual interface)
JX compatible
RRP £707 **Our price £526**



OLIVETTI PG 101 (LASER)

8 ppm
Diablo, Epson & HP compat.
6 Resident fonts.
Dual Interface.
RRP £3209 **Our price £2499**

OLIVETTI DM 290/1A

132 column,
160 cps draft,
35 cps NLQ.
Friction feed.
Parallel Interface.
IBM graphics Epson
FX compatible.
RRP £539 **Our price £363**

OLIVETTI DM 600/2

132 column
24 needle.
200/70 cps. Letter quality
LQ 1500 compatible.
Dual interface.
RRP £1151 **Our price £929**

OLIVETTI PCPR 3

132 column
18 pin
400/100 cps.
IBM Graphics compatible
Parallel Centronics Interface.
RRP £1808 **Our price £1559**

... and DIGITASK

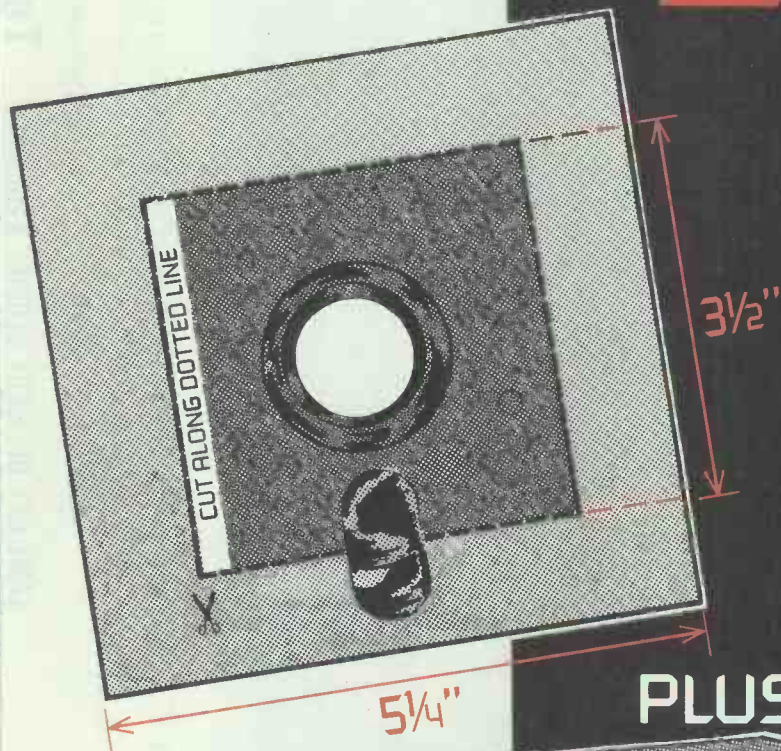
0342 24631 Telex: 957418

Unit M, Charlwoods Business Centre, Charlwoods Road,
East Grinstead, West Sussex RH19 2HH

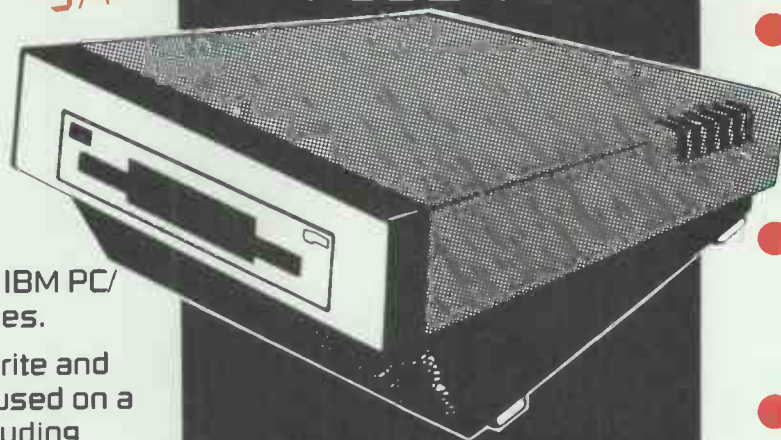


PLUS

5



PLUS-FD



PLUS-FD: Installs on IBM PC/XT/AT and Compatibles.

PLUS-FD Will read/write and format 3 1/2" floppies used on a variety of micros including APRICOT, TOSHIBA and the new IBM PERSONAL SYSTEM/2

PLUS-FD: Comes complete with disc drive, case, power supply, cables and driver/format software.

The PLUS 5 PLUS-FD range offers many options for floppy disk transfer between micro's of different formats and/or drive sizes, including:

ONE WAY TO CONVERT FROM 5 1/4" TO 3 1/2" FORMATS!

But if that doesn't work try our:

PLUS-FD 3 1/2" Floppy Drive Sub-System
(Only £250 R.R.P.)

- **SIRIUS/VICTOR 9000:** 5 1/4" IBM Compatible drive. 3 1/2" APRICOT/IBM Compatible drive. **NEW, DUAL 5 1/4" and 3 1/2" DRIVE SUB-SYSTEM**
- **APRICOT PC AND Xi,** 5 1/4" IBM Compatible drive. **XEN and XENi/XENXi:** 3 1/2" APRICOT/IBM Compatible drive.
- **IBM and Compatibles,** (inc. AMSTRAD PC1512): 3" AMSTRAD PCW Compatible drive. (N.B. read-only device)

All PLUS 5 products are covered by 12 months warranty on parts and labour.

Available from:

PLUS 5 ENGINEERING LIMITED

Crowborough Hill, Crowborough, Sussex TN6 2EG. Tel: (08926) 63211
Telex 95538 PLUS G



Mail and Telephone Orders welcome.

0342 24631 MODEM SELECTOR

MANUFACTURER	MODEL	SPECIFICATION	DESCRIPTION	AUTO ANSW	NO. STORE	AUTO DIAL	ERR CORR	AUTO SENSE	BUFF I/FACE	PULSE TONE	AUTO LOG ON	RRP	OUR PRICE
ANSWERCALL	MINIMODEM	V21	Simple direct connect modem									(75)	59
DACOM	DSL 2123AD	V21, V23	Mainstay of Dacom range	Y	Y	HAYES		Y	Y	BOTH		(255)	195
DACOM	DSL 2123GT	V21, V23	Fully buffered to 9600 intelligent	Y	Y	Y	Y	Y	Y	BOTH	Y	(398)	359
DACOM	PC123	V21, V22, V23	Latest IBM multispeed internal	Y		HAYES	Y & EPAD	Y	Y	BOTH		499	399
DACOM	PC123 BIS	V21, V22, V22BIS, V23	Latest IBM high speed internal	Y		HAYES	Y & EPAD	Y	Y	BOTH		699	549
INTERLEKT	PORTMAN	V21, V23	Reliable no frills modem	Y					OPT			173	139
INTERLEKT	PROSPECT	V21, V23	Reliable no frills modem									125	99
MIRACLE	WS2000	V21, V23	Low cost manual modem	OPT	Y	OPT			Y	BOTH		108	89
MIRACLE	WS3000 2123	V21, V23	Cost effective multispeed	Y	Y	HAYES		Y	Y	BOTH		295	235
MIRACLE	WS3000 22	V21, V22, V23	Cost effective multispeed	Y	Y	HAYES		Y	Y	BOTH		495	385
MIRACLE	WS3000 22 BIS	V21, V22, V22BIS, V23	Multispeed top of Miracle range	Y	Y	HAYES		Y	Y	BOTH		650	519
MIRACLE	WS4000	V21, V23(V22 OPT)	Budget 'Hayes' multispeed	Y	Y	HAYES				PULSE		170	133
MODULAR TECHNOLOGY	INTERMOVER 5021	V21	Low cost compact stand alone	Y								98	79
MODULAR TECHNOLOGY	INTERMOVER 5022	V22	Low cost compact stand alone	Y								295	269
PACE	NIGHTINGALE	V21, V23	Low cost manual modem		Y	HAYES			Y	BOTH		99	77
PACE	SERIES 4 2123S	V21, V23	Latest multispeed (Space Age)	Y	Y	HAYES		Y	Y	BOTH		265	224
PACE	SERIES 4 1200S	V21, V22, V23	Latest multispeed (Space Age)	Y	Y	HAYES		Y	Y	BOTH		399	339
PACE	SERIES 4 2400S	V21, V22, V22BIS, V23	Top pace range multispeed	Y	Y	HAYES		Y	Y	BOTH		499	429
MISSING LINK	BREAKOUT 2123	V21, V23 & S/W	IBM internal card & software pack	Y	Y	Y	Y	Y	Y	BOTH	Y	525	449
MISSING LINK	BREAKOUT 2400	V21, V22, V22BIS, V23	IBM internal card & software pack	Y	Y	HAYES	Y	Y	Y	BOTH	Y	945	819
MISSING LINK	QUATTRO CARD	V21, V22, V22BIS, V23	Multispeed IBM internal card	Y	Y	HAYES	Y	Y	Y	BOTH	Y	795	695
RACAL	MPS1222	V22	Stand alone professional modem	Y		OPT		Y				625	599
RACAL	V12422	V21, V22, V22BIS	High spec PSTN multispeed	Y		Y	OPT			AUTO		865	819
RACAL	MPS24	V26	Synchronous leased line & PSTN	Y				Y				530	509
RACAL	CP2123	V21, V23	Stand alone	Y		Y				AUTO	Y	356	299
RACAL	CP2123PM & S/W	V21, V23 & SPEAKEASY	IBM internal card & software pack	Y	Y	HAYES	Y			AUTO		450	395
RACAL	CP2123PM	V21, V23	IBM internal card	Y		HAYES		Y		AUTO		385	295
RACAL	PM22	V22	IBM internal card latest Racal	Y		HAYES				AUTO		495	395
DOWTY	QUATTRO	V21, V22, V22BIS, V23	Multispeed modem top Dowty range	Y	Y	HAYES	Y	Y	Y	BOTH	Y	795	P0A
DOWTY	TRIO	V21, V22, V23	Intelligent multispeed	Y	Y	HAYES	Y	Y	Y	BOTH	Y	595	P0A
DOWTY	DUO	V21, V23	Multistream modem plus!	Y	Y	HAYES	EPAD	Y	Y	AUTO	Y	340	P0A
DOWTY	MINIMO + 2	V21, V23	Auto/Manual direct connect	Y	Y	HAYES		Y	Y	P(T, OPT)	Y	245	P0A
DOWTY	SB1212	V22	UK best selling V22 stand alone	Y		OPT		Y		BOTH	Y	495	P0A
DOWTY	TRIO CARD	V21, V22, V23	Multispeed IBM internal card	Y	Y	HAYES	Y		Y	BOTH		595	P0A
DOWTY	SB2426	V26 BIS	PSTN or LL synchronous modem	OPT								317	P0A
DOWTY	SB4827	V27	High speed Sync/Async private line									795	P0A
DOWTY	SB9629	V29	High speed Sync/Async private line									995	P0A
TANDATA	TM512	V21, V23	Easy to use professional modem	Y	Y	HAYES	EPAD OPT	Y	Y	AUTO	Y	255	195
TANDATA	TM602	V21, V22, V23	Cost effective reliable multispeed	Y		Y			Y	BOTH		465	397
THORN	VX543	V21, V23	Thorn's best selling low cost modem	Y	Y	Y	Y	Y	Y	AUTO		195	165
THORN	VX512	V21, V22, V23	New multispeed high tech modem	Y	Y	HAYES	Y	Y	Speed buff	BOTH		399	335
THORN	VX524	V21, V22, V22 BIS, V23	Top of the range multispeed	Y	Y	HAYES	Y	Y	Speed buff	BOTH		499	459
LION SYSTEMS DEV	ORATOR	Call for details	Integrated speech & data comms centre									795	CALL

★ SPECIAL OFFER—FREE Chit-Chat S/W & IBM Cable with every V22, V22BIS (RRP £119) OR only £45 with every V21, V23. ★
(Offers available while stocks last)



Unit M. Charlwoods Business Centre
Charlwoods Road
East Grinstead
West Sussex RH19 2HH

0342 24631

SAME DAY DELIVERY SERVICE AVAILABLE

Telex 957418

Prices do not include VAT and Carriage

Top software at rock-bottom prices

and an incredible free prize draw!

Powerful software is now within reach of every serious micro user. Please write or phone for a complete list of used MS/PC-DOS software; below is a small selection from our range of over 1300 programs.

All prices include VAT, post and packing - at TOS there are no hidden extras!

Lotus 1-2-3 (rel.2)	£299	Microsoft	
Symphony	£329	C-Compiler	£139
dBase III plus	£319	Multiplan	£119
Framework II	£329	The Word	£159
Wordstar 2000 +	£339	Windows	£59

Can you afford to pay over the top?

Enter our completely free draw. We're giving away Wimbledon finals tickets- two for the Ladies Finals (July 4) and two for the Mens Finals (July 5).

Tickets include VIP hospitality in a private box - all you have to do is send us your name and address on a postcard, to arrive no later than June 25 1987. The draw will take place on June 26; winners will be notified by post. That's all there is to it!

We welcome enquiries from government bodies, local and education authorities.



TOS International Limited
Swiss Cottage, 24 Hatfield Road
Torquay, Devon TQ1 3BP
Telex 42553 ALLIED-G

Credit Card Hotline - (0803) 28599

FREE OVERNIGHT DELIVERY!*

01-455 9823

COMPUTERS/CALCULATORS/PLOTTERS

LASERPRINTERS		HP 18C (BUSINESS CAL)	£160.00
CANON LBP8	£1835.00	HP 28C (SCIPRO CAL)	£200.00
EPSON GQ 3500	£1395.00	HP 7440 (A4 1/2 PEN PLOTTER)	£860.00
QUME LASERTEN	£2285.00	HP 7475A (A3 6 PEN PLOTTER)	£1499.00
NEC L08	£2399.00	HP 7550 (8 PEN A4/A3)	£2850.00
HP LASER PLUS	EPOA	HP 7580B (A1)	£7500.00
HP LASERJET	£1750.00	ROLAND 980 (A3/8 PEN)	£1075.00
HP THINKJET	£435.00	TAXAN 710 (A3/6 PEN)	£895.00
RICOH LP 4081-RU (WITH HP LASER		SHARP PC 1500A	£157.00
+ EMULATION	£2999.00	PC1600 (16K)	£230.00
AST TURBO-LASER	£3550.00	EPSON PC AX WITH 20MB HD	£2350
OKI LASERLINE	£1750.00	AMSTRAD 8512 PC/1512	
OLIVETTI M24		(MONO/COLOR/DISK 10/20	
EPSON PC 256K + 2 x 360K/D	£650.00	MBHD	FROM £449.00
EPSON PC 256K + 360K/D +		AMSTRAD SOFTWARE, SAGE ETC IN	
20MB HD	£999.00	STOCK	
EPSON PC + 640K + 2 x		IBM 8 COMPATIBLE EXPANSION	
360K/D	EPOA	PRODUCTS AST/PERSYST/EVEREX/	
HP 41 CV COMPUTER	£139.00	TECMAR/GENOA/OMEGA/	
HP 41 CX COMPUTER	£199.00	QUADRAM/ORCHID/PARADISE	

MONITORS/PRINTERS

MICROLINE 102 (120 CPS)	£193.50	TAXAN - PRINTERS AND PLOTTER	
MICROLINE 192 (160 CPS)	£307.50	RANGE HELD	
MICROLINE 847/F (200 CPS)	£620.00	EPSON COMPLETE RANGE IN STOCK	
OKI 284 (400 CPS)	£700.00	LX86 (120CPS)	£195
OKI COMPLETE RANGE IN STOCK		LQ1000 67K BUFFER (180CPS)	£620
NEC P7	£465.00	LQ800 (60 180CPS)	£470.00
NEC P5	£750.00	LQ2500	£785
NEC COMPLETE RANGE IN STOCK		EX8000	£439.00
DISK DRIVES/TAPE STREAMER POA		EX1000	£559.00
QUME 1220	£410.00	SO2500 (NEW)	EPOA
QUME 1245 SPRINT (S/P)	£599.00	BROTHER HR20	£333.00
QUME 1190 (90 CPS)	£1353.00	HR25 (3K BUFFER 25CPS)	£549.00
QUME COMPLETE RANGE IN STOCK		HR35 (35CPS)	£720.00
STAR NB15 (136COL/300CPS)	£760.00	2024L (190CP/NLO)	£690.00
MODEMS		1708 (240CPS)	£456.00
DACOM/MASTER/EPSON		(BUFFERS/IN-LINE 1256K/512MG)	
NIGHTINGALE/INTERLEKT/		AUTO-SWITCH/BI-DIRECTIONAL	
STEEBEK/ANSWERCALL ETC		CONVERTERS	
FROM	£73.50	MONITOR/TERMINALS	
MANNESMANN TALLY (FULL RANGE)		ZENITH	FROM £425.00
MT290 (IBM/EPSON COM)	£600.00	TELEVIDEO	FROM £280.00
MT90 (INKJET 220/110 CPS)	£395.00	WYSE	FROM £360.00
MT85 (80 COL IBM)	£264.00	QUME	FROM £360.00
		HAZELTINE/SPRINT	FROM £425.00
		TAXAN/PHILIPS/ZENITH	FROM £65.00
		NEC MULTISYNC COLOUR	

**CAN YOU FIND A LOWER PRICE
PHONE US FOR BEST DEAL**

SOFTWARE

IBM COMPAQ/OLIVETTI/AMSTRAD		SMART SYSTEM	£399.00
LOTUS 1-2-3	£222.00	SMART SPREAD SHEET	£299.00
SYMPHONY	£319	SMART WORD PROC	£220.00
GRAPHWRITER COMBO PAK	£339.00	DATA MANAGER	£299.00
CHARTMASTER	£295.00	MICROSOFT PROJECT	£275.00
MAP MASTER	£285.00	SUPERCALC 4	£238.00
PSF PROF WRITE	£169.00	TURBO CAD	£330.00
PFS PROF FILE	£228.00	WORDSTAR 2000	£215.00
PFS PROF PLAN	£250.00	WORDSTAR PROF 4.0	£267.00
FREELASE +	£350.00	MULTIMATE	£247.00
FRAMEWORK II	£113.00	QUICKCODE III	£179.00
DBASE III PLUS	£320	SAGE CHIT-CHAT	FROM £76.00
DBASE CLIPPER	£399.00	SAGE ACCOUNTS	FROM £85.00
JAVELIN	£345.00	CROSSTALK	£120.00
RBASE 5000	£220.00	GEM PAINT/WRITE	£125.00
EASY FILLER	£199.00	BOPLAND TURBO RANGE	FROM £22.00
TRAINING LOTUS 1-2-3	£65.00	JENNER	£275.00
LOGISTIX	£85.00	SANAPLUS	£498.00
HERCULES GRAPHIC CARD PLUS	£195.00	MULTIMATE ADVANTAGE	£295.00
FORMATTING AVAILABLE		ORMS 30BASE	£296.00
HARVARD PRESENTATION		LATTICE C COMPILER	£245.00
GRAPHICS	£250.00	REFLEX	£57.00
MS WINDOWS	£75.00	VP INFO	£690
COBOL COMPILER	£495.00	LOTUS MANUSCRIPT	£268.00
PASCAL COMPILER	£190.00	VENTURA DESKTOP PUBL	£630
FORTRAN COMPILER	£220.00	VOLKSWRITER III	£187
VOLKSWRITER 3	£169.00	WORD III	£243.00
MICROSOFT MOUSE/		WORDCRAFT	£309.00
WINDOWS	£199.00	WORD PERFECT	£249.00
MICROSOFT WORD 3.1	£310.00	WORD PERFECT LIBRARY	£124.00
LOTUS HAL	£115.00	WORDSTAR	£144.00
FUNK SIDWAYS 3.1	£64.00	WORDSTAR 2000	£229.00
HARVARD TOTAL 2	£399.00	WORDSTAR 200 +	£268.00
RBASE SYSTEM 5	£499.00	WORDSTAR PROFESSIONAL	£193.00
(SELECTION OF EXTENSIVE RANGE)		MULTIPLAN	£109.00
OPEN ACCESS II	£575.00	SAGE PC PLANNER	£71.00
OPEN ACCESS	£265.00	VP PLANNER	£61.00
LOTUS MEASURE	POA	LOTUS MANUSCRIPT	£265

GOODS FULLY GUARANTEED. PRICES EXCL VAT (P&P EXTRA ON GOODS UNDER £300)

Company and Government orders accepted by telephone Barclaycard/Access/Visa accepted by phone

Tel: 01-455 9823

MOUNTAINDENE

22 Cowper Street, London EC2

A PACK FOR
C16/PLUS 4
NOW AVAILABLE

TROJAN CAD-MASTER

THE ULTIMATE IN GRAPHICS TOOLS

SUPERB GRAPHICS SOFTWARE

PLUS

A TOP QUALITY LIGHT PEN

CBM
64

SPECTRUM

Discover the exciting world of creating your own graphics on screen.

- **FREEHAND DRAW** - 5 pen thicknesses inc. Quills
- **PAINT BRUSH** - for the artistic touch
- **FILL ANY SHAPE** - use 16 colours and 11 patterns.
- **GEOMETRIC SHAPES** - circles, boxes, triangles, lines & banding.
- **DYNAMIC RUBBER BANDING** on all geometric options.
- **PIN-POINT FUNCTION** - for pixel accuracy on all functions.

Plus many more too numerous to mention in this ad. All these features in the Program + a top quality Light Pen and an Instruction booklet in one reasonably priced package. Easy to use for creating colourful pictures or technical drawings. Ideal for use by all ages of micro users. Full back-up service from manufacturers. Available at good dealers or direct from Trojan Products.

Please state which Micro.

ONLY
£19.95
per pack

TROJAN

Micro Computer Software & Accessories

Send cheque/P.O. to:

TROJAN PRODUCTS

Dept Y. Com. 2, 166 Derlwyn, Dunvanl,
Swansea SA2 7PF Tel: (0792) 205491

TRADE ENQUIRIES WELCOMED



NEW!

SAMNA WORD IV™

Corporate word processing with desktop publishing functions

MORE VERSATILE. MORE POWERFUL. SAMNA MEETS THE WORLD'S TOUGHEST STANDARDS.

The big guys. They're always one step ahead. That's why after years of evaluating word processing software, so many leaders choose Samna, IBM, AT & T, Hewlett Packard, DEC, Philips, Sharp, NCR, Texas Instruments and Ferranti all sell and support Samna software. Samna is powerful enough to meet the needs of the world's largest corporations. But simple enough to be used by everyone.

And now, this newest, most powerful version has more than 50 new dynamic features.

SAMNA WORD IV. IDEAL FOR MANY NEEDS OR ANY NEED.

Samna is as versatile as it is powerful. In big corporations it meets all the administration needs from the legal department to the engineering division.

So whether you need one that does it all or just one that does it right, Samna Word IV is the one.

BUSINESS ASKED. SAMNA DELIVERED. MORE THAN 50 NEW FEATURES.

When developing Word IV, Samna asked its customers what they needed most, and that's exactly what we put into Word IV.

This new powerful package includes on-screen columns, enhanced footnotes, improved proofing and Samna Word IV joins graphics and text on a page without linkage software.

Samna delivers automatic forms processing, equation processing and revision marking. The new text sorting feature automatically organises information and enhanced page numbering saves time and effort.

AND SAMNA LOOKS AFTER YOU.

When you buy Samna software you can sign up for STARS service. Experts on the telephone to answer your questions and arrange your training.

Call SAMNA INTERNATIONAL LIMITED on 01-587 1121 for more information on Word IV, networked or Unix versions, or send in the coupon below.

SAMNA
WORD IV



Please send me details about the the 50 new ways Samna Word IV means business.

Name _____
Company _____
Title _____
Telephone _____
Address _____

Samna International Limited
Southbank House, Black Prince Road
London SE1 7JS

NEW SAMNA WORD IV

The Ultimate in Corporate Class Word Processing

ATLANTA -- SAMNA Corporation, headquartered in Atlanta, Georgia, announces the introduction of SAMNA WORD IV. This corporate class word processing package is the latest innovation from a company known for being on the cutting edge of office automation technology.

In addition to the standard features, which have made SAMNA WORD IV famous, SAMNA WORD IV contains the following:

FEATURE:

ON-SCREEN COLUMNS

GRAPHICS

FORMS

FUNCTION:

The ability to edit multi-column documents while keeping the format.

Place graphs directly in text and print with document.

Easily identify and print fields on any pre-existing form.

BEN

Name (Last Name First)

Address

No

son

What kind of work are you applying for?

What special qualifications do you possess?

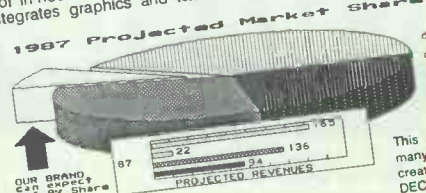
Are you 18 years or older?

Pre-exist

now bene

word proc

Fans of in-house publishing will also be pleased to note that smoothly integrates graphics and text.



In spite of the sophisticated features, SAMNA WORD IV remains easy to learn and easy to use. For more information, contact a qualified customer service consultant at 01-587 1121.

1 The 3-D pie graph was created with SAMNA DECISION GRAPHICS.
WORD PROCESSING REPORT

page-1

On Screen Columns enable you to create up to ten columns on screen, as well as edit and integrate other features within them.

Graphics And Text can be integrated into any document without a costly and cumbersome bridge module. No cutting. No pasting. No unprofessional presentations.

Multiple Fonts on each page allow you to give a typeset look to your important documents. Samna supports all the popular laser printers.

Forms Processing lets you define and print fields anywhere on a pre-existing form. Save hundreds of hours. Save hundreds of pounds by not purchasing a form utility.

© 1986, Samna Corporation
Samna Word IV is a trademark of the Samna Corporation.

PACKARD BELL

THE HIGH LEVEL AT COMPUTER FOR LOW LEVEL PRICES



VX 88 small footprint
 very fast XT compatible
 with 20 MB only £725!
 with 30 MB only £795!
 with 40 MB only £895!



Special Show Prices available
 during exhibition!

Since its founding in 1929, Packard Bell has established itself as a leader in electronic innovation and quality. Today, that innovation and quality is found throughout the complete range of new Packard Bell Business System Products. State-of-the-art technology, reliability, durability and value, hallmark each of these new products. To meet expanding business application requirements, the VT286 provides:

- Significantly faster Processing and Throughput.
- 640KB RAM standard; expandable to 15MB.
- High capacity Disk Drives and 1.2 MB Floppy Disk.
- Parallel and Serial Interface.
- 220W Power Supply.
- Professional Keyboard.
- MSDOS 3.2, GW Basic 3.2
- 7 Channel DMA.
- 16 Level Interrupts, 3 Program Timers.
- 4 Level Memory Protection

For further information please call on 01-842 0071

CAL-ABCO

Over 50 offices worldwide

CAL CIRCUITS-ABCO (U.K.) LIMITED
 SPENDALE HOUSE, THE RUNWAY, SOUTH RUISLIP, MIDDLESEX.
 HA4 6SE; Tel: 01-842 0071 Fax: 01 841 3891, Telex: 295441

Cal-Abco acknowledges all trade marks in this advertisement

SOFTWARE

Massive Discounts

We are the most consistently, low priced advertiser in the UK.

Our prices and our products are genuine. Excellent service, totally comprehensive range and a same day delivery service* makes Digitask first choice every time!

DATABASE

	RRP	Our Price
DBASE III+	595	323
DELTA PROFESSIONAL	495	328
Q & A SYMANTEC	250	163
R-BASE 5000	295	208
REFLEX	100	57
REFLEX WORKSHOP	70	57
SAGE RETRIEVE	99	71
SSI DATA	195	169
VP INFO	65	61

WORD PROCESSORS

LOTUS MANUSCRIPT	395	237
MULTIMATE	375	193
MULTIMATE ADVANTAGE	495	247
PFS PROFESSIONAL WRITE	189	169
PFS WRITE	115	99
SAGE PC WRITE	99	71
TURBO LIGHTNING	70	47
VENTURA—DESKTOP PUBL	925	769
VOLKSWRITER III	325	187
WORD III	425	243
WORDCRAFT	475	309
WORD PERFECT	425	244
WORDPERFECT LIBRARY	149	124
WORDSTAR	295	144
WORDSTAR 2000	465	229
WORDSTAR 2000 +	549	269
WORDSTAR PROFESSIONAL	399	193

SPREADSHEETS

JAVELIN	595	343
LOTUS 123	395	227
MULTIPLAN	175	107
NOTE IT	69	59
SAGE PC PLANNER	99	71
SQZ	69	55
SUPERCALC IV	396	192
VP PLANNER	75	61

PERSONAL PRODUCTIVITY

ABILITY	99	67
EXCEL (MICROSOFT) FOR MAC	395	345
FRAMEWORK II	550	297
LOTUS SYMPHONY	550	319
PFS FIRST CHOICE	149	113
SMART	695	348
SMART SPELLCHECKER	95	87
SUPERPROJECT +	495	297
WORKS (MICROSOFT) FOR MAC	245	219

ACCOUNTS

DAC EASY ACCOUNTS	85	79
SAGE ACCOUNTANT	149	110
SAGE ACCOUNTANT +	199	143
SAGE BOOK-KEEPER	99	71
SAGE FINANCIAL CONTROLLER	299	216
SAGE PAYROLL	99	71

PROGRAMME DEVELOPMENT & LANGUAGES

CLIPPER COMPILER	595	343
PARADOX VER 1.1	550	377
QUICK BASIC COMPILER	85	75
TURBO DATABASE TOOLBOX	50	34
TURBO EDITOR TOOLBOX	50	34
TURBO GAMEWORKS	50	34
TURBO GRAFIX TOOLBOX	50	37
TURBO HOLIDAY JUMBO PACK	165	157
TURBO PASCAL	70	47
TURBO PROLOG	70	47
TURBO TUTOR	30	23
ZORLAND C	30	27

COMMUNICATIONS

CROSSTALK XVI	169	93
SAGE CHIT-CHAT (S/WARE)	99	71
SMARTERM VT-100	135	119
DATATALK		129

MOUSE

LOGIMOUSE & SOFTWARE	99	77
MICROSOFT MOUSE (BUS OR SERIAL)		133
MOUSE SYSTEMS & PC PAINT	162	145
MOUSE SYSTEMS MOUSE	143	128
SUMMAGRAPHS SUMMAMOUSE	99	87
SUMMASKETCH 12x12 & GEM DRAW	625	569
SUMMASKETCH 9x6 & GEM DRAW	525	479

OTHER

CHARTMASTER	295	229
COPY II PC	50	38
COPY II PC OPTION BOARD	90	74
FLIGHT SIMULATOR	45	34
FANTASY	80	67
FREELANCE +	320	289
GEM COLLECTION	130	73
GEM DESKTOP	50	45
GEM DRAW +	130	119
GEM GRAPH	180	123
GEM PROGRAMMERS TOOLKIT	450	369
GEM WORDCHART	130	83
HARVARD PRESENTATION GRAPHICS	295	219
LIGHTNING (CACHE) Copy Protected	70	94
LIGHTNING (CACHE) Non-copy Protected	99	94
LOTUS HAL	120	81
LOTUS MEASURE (SCIENTIFIC)	395	343
MICROCACHE Non-copy Protected	125	119
NORTON UTILITIES	85	52
S/KICK (PROTECTED)	50	38
S/KICK (TRAVELLING)	70	48
S/KICK (UNPROTECTED)	70	43
S/KICK (TRAV) & S/KICK NCP	109	89
SAGE DESK SET	69	49
SAGE PC CHART	99	89
SIDEWAYS	50	34
SUPERKEY	70	47
V-FEATURE	95	89
V-FEATURE DELUXE	125	119
VCN CONCORDE	550	495
WINDOWS (MICROSOFT)	85	57

Prices do not include VAT and Carriage

DIGITASK

0342 24631

Charlwoods Business Centre, Charlwoods Road, East Grinstead, West Sussex RH19 2HH

Telex 957418

* Please call for details.

33 MARKET STREET, HECKMONDWIKE, WEST YORKS

JULY 1987 PCW 53

DOT MATRIX PRINTERS

BROTHER M1109 80col 100cps 25NLQ F/T P&S	(220)	162
BROTHER M1409 110col 180cps 45NLQ F/T P&S	(385)	289
BROTHER M1509 136col 180cps 45NLQ F/T P&S	(495)	353
BROTHER M1709 136col 240cps 65NLQ F/T P&S (dual i/face) IBM/PC Comp Paper Parking	(595)	439
BROTHER M1744 136col 160cps 96NLQ P24 pin head	(795)	635
BROTHER TWINWRITER		959
CITIZEN 120D 80col 120cps 25NLQ F/T P	(245)	152
CITIZEN MSP-10 80col 160cps 40NLQ F/T P	(349)	259
CITIZEN MSP-15 136col 160cps 40NLQ F/T P	(449)	325
EPSON LX-800 80col 160cps 25NLQ F/T P	(275)	194
EPSON FX-800 80col 200cps 40NLQ F/T P	(430)	299
EPSON EX-800 80col 300cps 50NLQ T P	(555)	399
EPSON FX-1000 136col 200cps 40NLQ f/t P	(550)	396
EPSON LQ-800 80col 180cps 60NLQ F P 24 pin head	(625)	423
EPSON EX-1000 136col 300cps 50NLQ T P	(745)	536
EPSON LQ-1000 136col 180cps 60NLQ F P 24 p h	(835)	559
EPSON LQ-2500 136col 270cps 90NLQ T P 24 p h	(1045)	695
EPSON SQ-2500 Ink Jet	(1345)	989
FUJITSU DX2100 80col 220cps 44NLQ F/T P (Sopt)	(435)	335
FUJITSU DX220 136col 220cps 44 NLQ F/T P (Sopt)	(565)	422
MICRO-P MP201 132col 200cps 40NLQ F/T P	(399)	305
NEC Pinwriter P6 80col 216cps 72NLQ F P 24 p h	(549)	389
NEC Pinwriter P7 136col 216cps 72NLQ F P 24 p h	(649)	447
NEC Pinwriter P5 136col 264cps 86NLQ F P 24 p h	(1066)	745
NEWBURYDATA, DIABLO, QUME, RICOH		CALL
OKI ML182 80col 120cps NLQ F P	(269)	189
OKI ML192 80col 160cps NLQ F P	(375)	283
OKI ML193 132col 160cps NLQ F P	(485)	367
OKI ML84 80col 200/400cps NLQ F/T P	(779)	618
OLIVETTI DM100/4 80col 120cps 25NLQ F P	(295)	199
OLIVETTI DM280/1 180col 160cps 35NLQ F/T P	(466)	307
OLIVETTI DM290/1 136col 160cps 35NLQ F/T P	(581)	363
OLIVETTI DM600 132col 200cps 70NLQ F P&S	(1179)	929
STAR NL-10 80col 120cps 30NLQ F/T P	(278)	197
STAR SR-15 136col 160cps 40NLQ F/T P	(489)	279
STAR SR-10 80col 200cps 50NLQ F/T P	(489)	279
STAR NX-15 136col 120cps 30NLQ F/T P NEW	(389)	289
STAR NR-15 136col 24cps 60NLQ F/T P	(589)	399
STAR NB 24-15 136col 216cps 72NLQ F/T P IBM/Epson Comp 24 pin head 360dpi NEW	(759)	525
STAR NB-15 136col 300cps 100NLQ F/T P IBM/Epson Comp 24 pin head 260dpi NEW	(949)	679

DAISY WHEEL PRINTERS

BROTHER HR20 117col 22cps F P&S (dual i/face)	(445)	327
BROTHER HR25XL 132col 25cps F P&S (dual i/face)	(695)	529
BROTHER HR35 132col 20cps F P	(935)	699
JUKI 6000 80col 12cps F P	(199)	147
JUKI 6100 132col 20cps F P	(399)	259
JUKI 6200 132col 30cps F P	(579)	397
JUKI 6300 132col 40cps F P	(899)	660
JUKI 6500 132col 60cps F P	(1299)	997
OLIVETTI DY450/1 132col 45cps F P Diabolo compat	(1140)	799
OLIVETTI DY800/2 132col 80cps F P&S (dual i/face)	(1483)	1059

COLOUR PRINTERS

OLIVETTI DM 285/1 80col 160cps 35NLQ F/T P JX compat	(555)	415
OLIVETTI DM 295/1 132col 160cps 35NLQ F/T P&S (dual i/face) JX compat	(707)	526
OLIVETTI DM 590/1 132col 192cps 120NLQ F P JX/Qume/Diablo compat	(1137)	846

LASER PRINTERS

AST TURBO LASER 10 page/min 1.5MB	(4150)	3319
EPSON GQ3500 6 page/min 512K	(1795)	1342
CANON LBP8-A1 8 page/min P or S 128KB	(2600)	1550
CANON LBP8-A2 8 page/min P A4 Vec G 1024KB	(3845)	2699
DATAPRODUCTS LASER PRINTER 26 p/m p/script	(4950)	14359
HP LASERJET 8 page/min 128KB	(2664)	1945
HP LASERJET PLUS 8 page/min P or S 512KB	(3658)	2629
INTERQUADRAM QUADLASER 8 page/min 1.5MB		CALL
OLIVETTI PG-101 8 page/min P & S Diabolo/HP/Epson 250KB NEW	(3140)	2499
QUME LASERTEN PLUS 10 p/m t & eng 512KB	(3499)	2875
QUME LASERTEN 10 page/min t & q 128KB	(2880)	2249
KYOCERA F1010 10 page/min	(2795)	2445
KYOCERA F2010 10 page/min	(4365)	3792
RICOH LASER PRINTER 10 page/min	(3950)	3159
CENTRONICS PP-88 page Epson/Diablo	(1595)	1340

COMPUTERS

DIGITASK PC16X STARTER SYSTEM XT compat. Single 360KB floppy drive	499
DIGITASK PC16X FULL FEATURE SYSTEM XT compat. Dual 360KB floppy drive	695
DIGITASK PC16X BUSINESS PRO SYSTEM XT compat. 20MB hard drive, 1 x 360KB floppy drive	975
DIGITASK PC16X BUSINESS PRO PLUS SYSTEM XT compat. 20MB hard drive, 1 x 1.2MB + 1 x 360KB floppy drive	1159
DIGITASK VT286 TURBO AT compat.	From 1399

MAINBOARDS

SUPER TURBO XT 4.77/8 MHz (up to 640K-with OK)	149
SMALL FOOTPRINT PC/AT Comp 6/8/10 MHz (OK)	499

MONO MONITORS

SAMSUNG SM125F 12" Amber, Med Pers, HI Res, TTL/IBM with T&S base	(139)	95
TAXAN KX-1201 12" Green comp P31 Short Pers	(109)	85
TAXAN KX-1202 12" Green comp P39 Long Pers	(119)	89
TAXAN KX-1203 12" Amber comp PUL Long Pers	(119)	95
TAXAN KX-1212 12" Green Hi Res P39 Long Pers TTL/IBM	(149)	109
TAXAN KX-1213 12" Amber Hi Res PUL Long Pers TTL/IBM	(149)	109

COLOUR MONITORS

TAXAN SUPERVISION II 12" Hi Res IBM/RGB	(389)	265
TAXAN SUPERVISION III 12" Ultra Res IBM/RGB	(459)	309
TAXAN SUPERVISION IVm 12" Hi Res IBM/OLI/RGB	(499)	349
TAXAN SUPERVISION IV 12" Ult Res IBM/OLI/RGB	(579)	409
THOMSON 36512VP1R 14" Med Res TTL/RGB/RGBI/PAL comp 0.48 dot	(261)	225
THOMSON 36382SIR 14" Hi Res TTL/RGB/RGBI 0.38 dot (inc cabl)	(385)	329

EGA MONITORS

NEC MULTISYNC 14" Hi Res TTL/Analog IBM/CGA/EGA/PGS 0.31 dot NEW	(649)	579
PHILIPS CM8873 MULTISYNC 14" Hi Res TTL IBM/RGB/RGBI CGA/EGA/PGA NEW	(499)	425
TAXAN SUPERVISION 660 12" Hi Res TTL/EGA	(549)	389
TAXAN SUPERVISION 760 14" Hi Res TTL/EGA	(579)	409
TAXAN SUPERVISION 860 16" Hi Res TTL/EGA	(899)	699
THOMSON 44700 14" Hi Res TTL/IBM/EGA/CGA	(495)	419
THOMSON 42700 MULTISCAN 14" Super Hi Res TTL IBM/MDA/CGA/EGA/PGA 0.31 dot NEW	(669)	559

PC/XT/AT HARDWARE

POWER SUPPLY 135/150 max Watt Switch Mode XT AT Keyboard replacement (84 Key)	89
MITSUBISHI FLOPPY DRIVE 360KB Half Ht	109
MITSUBISHI FLOPPY DRIVE 1.2MB for PC/AT	69
FLOPPY DRIVE 360KB Half Ht DS/DD (Grey front) for AT	125
NCL HARD/FLOPPY CONTROLLER for PC/AT (to 16MHz)	95
KEYBOARD K-150M AT-Style for XT (84 Key)	169
CASE PC/XT Swingtop (incl hardware kit)	89
	55

WINCHESTER DRIVES

SEAGATE ST213 10MB H.Ht (65ms access)	(470)	220
SEAGATE ST225 20MB H.Ht (65ms access)	(545)	240
SEAGATE ST238 30MB H.Ht (65ms access) Plated Media with all Contr & Cables (Xt only)	(575)	499
SEAGATE ST4026 20MB F.Ht (40ms access)	(745)	524
SEAGATE ST251 40MB H.Ht (40ms access)	(1015)	624
SEAGATE ST4038 30MB F.Ht Vcol (40ms access)	(919)	624
SEAGATE ST4051 40MB F.Ht (40ms access)	(1060)	754
SEAGATE ST4096 80MB F.Ht (28ms access)	(1946)	999
WD/NCL XT Hard drive controller & cables		95
NCL SHORT CONTROLLER (Up to 16MHz)		169
FDD/HDD for AT		12
AT HARD DRIVE Cable set		12
AT FLOPPY DRIVE Cable set		12

TAPE STREAMERS

ARCHIVE 3540 40MB Internal streamer (XT or AT)	(499)	389
CRISTIE THE REEL ONE 1020i 20MB Internal Strmr	(695)	559
EVEREX STREAM-20 20MB Internal Streamer	(895)	585
EVEREX STREAM-60 60MB Internal Str (XT or AT)	(1295)	815
ODYSSEY DRIVER BOARD for Extl Strmr XT & AT	(125)	95
ODYSSEY XR4 40MB Internal Streamer XT & AT	(895)	595
ODYSSEY XR4 40MB External Streamer XT & AT	(995)	695
QIC-125 Fast prof 125MB b up Novell, 3COM comp	(1499)	1349

T-SWITCHES & BUFFERS

T-SWITCH Parallel 1-2 (or Serial 1-2)		35
INTELLICOM LONGLINK Parallel to Parallel inc 50ft cable (up to 7000ft maximum)	(149)	135
UPGRADE TECH BUFFER 64KB P-P stand alone	(140)	119
UPGRADE TECH BUFFER 256KB P-P stand alone	(256)	219
UPGRADE TECH BUFFER Half Megabyte Dual Channel full feature stand alone	(395)	335
UPGRADE TECH BUFFER One Megabyte Dual Channel full feature stand alone	(495)	419

PLOTTERS

EPSON HI-80 4 pen A4	(400)	345
HP 7440A 8 pen A4	(1160)	985
HP 7475A 6 pen A3	(1796)	1469
HP 7550A 8 pen A3	(3813)	3399
ROWLAND DXY 880A 8 pen A3	(775)	645
ROWLAND DXY 980A 8 pen A3	(1100)	924

SPECIAL OFFERS

INFORM MULTIFUNCTION CARD 640KB Max Populated to 384KB Name brand UK product Comms 1, Comms 2 opt, parallel 1, games, clock with full Software	(195)	95
WESTERN DIGITAL FILECARD 10MB	(595)	296
VICTOR 80286 FASTCARD for PC/XT and comp. Socketed for 80287 8K cache selectable 5 or 8MHz (virtually ident'l to Mountain Racecard)	(799)	375
IBM PC-ATE 512KB Ram 1.2MB 20MB Keyboard UK	(3467)	2395
EPSON PC 256KB 1 x 360KB 20MB 12" Hi Res Dyejet Monitor Persyst display adaptor with printer port	(1459)	1139
EPSON PC As above with Taxan Supervision II & Taxan display adaptor	(1675)	1299

BRANDED PERIPHERALS

EGA & MONITOR COMBI	
TAXAN K14SV760 14" Supervision 760 monitor non glare, high contrast 21.85/15.75KHz/Paradise autoswitch EGA-MDA, CGA, Hercules & Plantronics compatible	649
PACKARD BELL EGA & Monitor EGA, CGA, MDA compat	559
PRINCETON 12" & AST 3G EGA card, MDA, CEA, Hercules compat optional printer port	575
RAM EXPANSION	
AST ADVANTAGE PAK 1S, 1P (AT only) upgradeable to 3MB	349
AST ADVANTAGE PAK OK (up to 1.5MB)	119
AST RAMPAGE XT (2MB) Pop. to 256K	199
AST RAMPAGE AT (2MB) Pop. to 512K	449
AST RAMVANTAGE with 128K (upgrable to 3MB) for PCAT	369
AST SIXPACK PLUS, 64KB, 1C, 1S, 1P (upgrable to 384K)	249
AST SIXPACK PREMIUM 512KB, C, 1S, 1P (EMS)	329
INTEL ABOVE BOARD	
INTERQUADRAM Memory expansion & I/O cards	CALL
INFORM 256K Ramcard (256K pop) (128K for AT)	CALL
PERSYST PC/Short memory board (OK pop) to 384K	95
PERSYST MEGA Memory AT/XENEX up to 3MB (OK pop)	109
PERSYST STRETCH (Lotus/intel/MS) up to 2MB (OK pop)	289
EVEREX Mini Magic 60K pop up to 576K	219
EVEREX RAM 3000 at (OK pop) up to 3 MB	85
EVEREX RAM 2500 at (OK pop) up to 2.5MB	219
EVEREX Magic Card at 1p, 1s, Ws, (OK pop) up to 2MB	199
EVEREX Magic Card at 1p, 1s, Ws, (OK pop) up to 2MB	259
NETWORKS	
AST-PC NET II (RSN 34 PCs more with repeaters 5Mbps)	345
3-COM	CALL
IRMA Emulators & Accessories	CALL
CHASE AT-8 8MHz 32K Ram 32K Rom 50-38400 Baud 8 port serial intell contrllr using 80186 PC/AT-ATE- ATX Xenix 5/concurr PC DOS-5 comp with drivers	1099

GO-FASTER BOARDS

AST FLASHPAK (NEC, V30 at 9.54MHz)	289
INTERQUADRAM QUADSPRINT	329
MAYNARD SURPRISE TURBO (State PC or compatible)	189
MOUNTAIN RACECARD 80286	459
ORCHID TINY TURBO	439
ORCHID TURBO EGA	499
ORCHID PC-TURBO 186 with 256K	699
ORCHID JET 386 PC/AT upgrade up to 3 x faster! NEW	799
ORCHID TURBO PGA	949
TITAN ACCELERATOR PC 512K	729
TITAN ACCELERATOR PC 256K	659
DISPLAY ADAPTORS	
AST 3-G EGA card 256K, MDA, Herc, CGA & EGA compat	218
AST COLORGRAPHPLUS (full spectrum) 32KB, 1P	159
EVEREX THE EDGE Mono/Colour 80/132 col.	
Lotus/Symphony compat	319
EVEREX GRAPHIC EDGE as above with graphics	339
ORCHID EGA, (MDA, CGA & Hercules compat)	233
TAXAN KIF3810 IBM comp (640 x 400 dots)	
Download Characters	
TAXAN KIF 3800 IBM CGA comp (10 x 16 text)	229
Supervision 4/4M	
TAXAN KIF3650SP IBM CGA, MDA, Herc comp (short) 1P	145
TAXAN KIF 3600SP IBM CGA compat (short) 1P	169
HERCULES PLUS Card	119
HERCULES CGA	94
HERCULES Monochrome/gr Adaptor	165

GENERIC PERIPHERALS

576K Ramaster Expansion Card (OK)	89
640K Multifunction Card (OK) 1P, 1S, 1G, 1C, SW	97
8255 I/O Card	89
Async Comms Adaptor (dual port) 2S	39
Async Comms Adaptor Upgrade Kit (1-port)	12
Async Comms Adaptor 1S, 2S, optional	27
4-port Multi Async comms adaptor, 4S	119
Colour/Gr & Printer Adaptor RGB 2 comp LP	129
Colour/Graphics adaptor	79
Drive Master 1.2MB/360KB 4 floppy contr for PC/XT	CALL
Eprom Programmer/Analyser PCP-128 to 128K SW	149
Eprom Programmer/Analyser to 512K, 4-BANK, SW	259
Floppy Drive Adaptor (4 drive) 4FI	54
Floppy Drive Adaptor (2 drive) short, 2FI	32
Games Adaptor (dual port)	24
Little Dictator Voice Recognition Syst. 500 word 2/10 sec	CALL
Mono/Graphic (Hercules compat) card	87
Multi I/O & Display Adaptor 1P, 1S, 1G, 1C, 2FI, CGA, MGA, LP, SW	159
Multi I/O Adaptor 1P, 1S 1C, 1G, 2FI, SW	95
Parallel Printer Adaptor 1P	18
PS10-XT short Multifunction Adaptor 1P, 1S, 1C, SW	99

RAM CHIPS & PROCESSORS

INTEL 8087 (8087-3) 5MHz math co-processor chip (PC/XT)	97
INTEL 8087-2 8MHz math co-processor chip (TURBO PC/XT)	139
INTEL 80287-6 5MHz math co-processor (PC/AT Apricot)	149
INTEL 80287-8 8MHz math co-processor (PC/ATX Apricot)	220
INTEL 80287-10 10MHz math co-processor	289
NEC V-20 Fast processor (8088 equiv)	14.95
NEC V-30 Fast processor (8086 equiv)	14.95
SAMSUNG 4164 DRAM CHIP 150ns (set of 9)	8.50
SAMSUNG 41256 DRAM CHIP 150ns (set of 9)	22.50
SAMSUNG UPGRADE 256KB - 640KB	39.95
SAMSUNG ONE MEGABYTE CHIP SET (144 x 4164) or (36 x 41256) multiples of 1MB only	79

CALL US FOR THE BEST GENUINE PRICES IN THE UK.

FREE PRINTER DUST COVER WITH EVERY PRINTER PURCHASE

FREE PRINTER CABLE with EVERY PRINTER PURCHASE OVER £400 (Offers available while stocks last)

FREE VIDEO COPYING KIT OR BOX OF 10 DISKETTES WITH EVERY ORDER OVER £300 (Excluding printers)



Prices do not include VAT and Carriage
IF YOU DON'T SEE WHAT YOU WANT - CALL 11
SAME DAY DELIVERY SERVICE AVAILABLE

At last . . . all the leading software fully described in one manual



FREE
£10 VOUCHER
in every manual
against your first
purchase!

***Isn't
this what
you have
always wanted?***

The Software Handbook is a brand new publication listing all the top selling software packages from utilities to integrated packages including leading names such as; Lotus 123, DBASE III, Symphony, Wordstar, Smart, Sidekick, Supercalc 4 and many more . . .

If you've ever wondered what all these software packages actually do, now you can find out. Written in straightforward, easily understood text, the SOFTWARE HANDBOOK is clearly laid out to make identification easy. Over 70 different software packages are described in detail, listing all the features and functions of each.

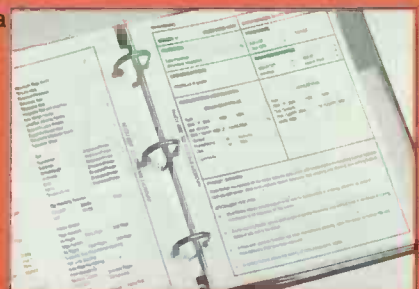
Once you receive your manual we will keep you up to date with the latest software by issuing new pages as information becomes available — including regular special offers.

All the software is available 'off the shelf' at guaranteed INFOSOFT low prices.

If you have an IBM/IBM compatible, AMSTRAD or APRICOT then you must not be without the SOFTWARE HANDBOOK.

To order your copy, telephone or write to Infsoft, enclosing **£19.95** plus £2.00 postage and packing.

Access and Visa card accepted.



Clear copy and detailed description of each package helps you exactly fit the software to your needs.

**Infsoft
Systems Ltd**

17 Queen Street, Droitwich, Worcs, WR9 8LA.
Tel: 0905 772773. Telex: 335540.



MacLine

Quality Macintosh Software
Competitive Prices

Wren House
Sutton Court Rd
Sutton
Surrey SM1 4TL

PHONE
(01) 642 4242

Ask for MacLine



	RRP	MacLine		RRP	MacLine
Borland			Symmetry		
Reflex	£ 99.95	£ 63.00	Picturebase	£ N/A	£ 48.00
Turbo Pascal	99.95	63.00	T/Maker		
Bravo			Write Now	165.00	126.00
MacCalc	N/A	90.00			
Cricket Software					
Cricket Draw	295.00	189.00	GAMES		
Cricket Graph	175.00	136.00	Dark Castle		29.00
Forethought			Leather Goddess of Phobos		25.00
Filemaker Plus	265.00	168.00	MacGolf		38.00
PowerPoint	325.00	291.00	Flight Simulator		34.00
Hayes					
Smartcom II	138.30	95.00			
Living Videotex					
More	295.00	169.00			
Microsoft					
Excel 1.04	395.00	239.00			
Works 1.0	295.00	200.00			
Word 3.0	295.00	253.00			
Silicon Beach					
Superpaint	90.00	59.00			
Solutions Inc.					
Glue	N/A	48.00			
Survivor Software					
MacMoney	N/A	48.00			

SPECIAL OFFER

Write Now and Superpaint bundled together
for second generation write/paint power
£165.00

ORDERING

- *Payment is by cheque money order or C.O.D .
- *Payment is only deposited if stock is available.
- *If a partial order is despatched, the balance is posted free of additional postage charges.
- *All Goods are sent by Registered First Class Mail.
- *Courier services are available.
- *Defective software is replaced immediately.
- *To order call Monday - Friday, 9.30 to 5.30.
- *Add VAT and £2.50 per order to cover postage.

All prices are subject to change without notice.

WordPerfect, MathPlan, SSIData



WordPerfect

WORD PROCESSING

MathPlan

SPREAD SHEET

SSIData

DATA BASE

WordPerfect
Library

How to get
a £499 daisywheel printer
for your IBM PC or compatible
(but pay less).



**DATAPRODUCTS DAISYWHEEL PRINTER
22 CPS, SERIAL I/F, 136 COLUMN WIDTH**

Dataproducts DP 20 fully equipped with mains lead, self test switch, daisywheel, ribbon etc. This full-size, heavy duty (weight 26.4 lb) commercial application printer has choice of 10, 12, or 15 c.p.i. plus proportional spacing, & 100 character drop-in daisywheel. Brand new, boxed and guaranteed, limited supply. Original price £499. (Opt single bin sheet feeder £150).

£195

MORGAN COMPUTER CO.
179 Tottenham Court Road, W1. 01-636 1138

**DATA
DIMENSION
DIMENSION**

**DATA DIMENSION
(MAINTENANCE) LTD**

**HARD DISK UPGRADE KITS
(SEAGATE)**

	XT		AT
20mb Half Height	£277 (65ms)	Half Height	£233 (65ms)
30mb Half Height	£309 (65ms)	Full Height	£472 (40ms)
40mb Half Height	£445 (65ms)	Full Height	£545 (40ms)
80mb		Full Height	£725 (28ms)

Fitting can be arranged

ADD ON BOARDS

ORCHID JET 386	£799.00
INTEL INBOARD 386	£1299.00

ALL PRICES EXCLUDE V.A.T.

For other boards please call

DATA DIMENSION (MAINTENANCE) LIMITED

37 Clarendon Court
Winwick Quay
Warrington
Cheshire
0925 573422

Conavon Court
Blackfriars Street
Salford
Manchester
061-834 4023

... You may confer.

WordPerfect Library brings new meaning to the subject of software integration by linking three of today's most advanced software packages – WordPerfect, MathPlan and SSIData.

Programs are immediately accessed from the Shell menu by a single key stroke as are the 6 powerful utilities which provide a full function Calculator, Calendar, Notebook, File Manager, Macro and Program Editor.

The movement of text, figures, graphs and records

is simplicity itself within WordPerfect Library, which provides an impressive degree of flexibility, in operation and is simplified by the use of function keys and a colour coded template dispensing with the need for complex control codes. Create your own menu structure, from which you can run DOS commands and batch files.

To improve your knowledge and to find out details of how you too can join the WordPerfect Library, telephone or write to Sentinel Software.



SENTINEL
SOFTWARE

Wellington House, New Zealand Avenue,
Walton on Thames, Surrey KT12 1PY.
Telephone: (0932) 231164
Telex: 916005. FERGUS G.

WordPerfect

Mathplan

SSIData

PCW SHOW FOCUS



**23-27 SEPTEMBER 1987
OLYMPIA LONDON**

Sponsored by Personal Computer World and PC Week

No more queues

Queues to enter Olympia for the PCW Show should be much shorter this year, despite more visitors than ever before being expected to pass through the turnstiles. PCW's organisers at Montbuild have invested in a bar-coding registration system from Coventry Data Services, and this will speed visitors on their way into the exhibition.

This is the first time Coventry Data Services' American-developed system has been used at a computer exhibition, although it has proved highly successful at the past three Motor Shows. Pre-registration tickets for business visitors will need to be completed as usual, but the details will be keyed directly into a registration terminal. Badges with the visitor's name, title, company and all-important bar code are produced in less than a minute, while the data is fed simultaneously into a central database held on an IBM Series 1 mini.

Exhibitors will be issued with light pens so that, instead of filling out enquiry forms or collecting up business cards, they can fill out an index card by passing the pen over the visitor's badge. At the end of the day, the pens can be taken to terminals around the halls to have the information recorded and transformed into a printed report.

'The system will make things much easier for visitors by speeding up registration and simplifying the process of getting further information,' said Melanie Edwards, exhibitions and conferences sales manager at Coventry Data Services. 'Because it is a central service, they will also be able to find out if colleagues or business contacts have already arrived, regardless of which entrance they used.'

Babani books a regular space

One of the annual exhibitors at the PCW Show over the past years has been Bernard Babani Publishing from Shepherds Bush. The company was set up by the current managing director's late father in 1942, and prides itself on its topical, low-priced selection of technical books.

The books are all paperbacks, with prices ranging from £1.95 to £5.95, and cover the fields of radio, electronics and most aspects of computing. Managing director, Michael Babani, says that his main claim to fame was employing Sir Clive Sinclair when he left school; someone he still encounters at the Show.

Babani usually stocks what is probably the smallest stand in the Show with about 100 assorted titles. He is not particularly disappointed if the majority return to Shepherds Bush, because he sees the Show as a two-way publicity vehicle rather than a sales outlet.

'We don't advertise at all, so it is very helpful to be in front of our potential customers. At the same time, I listen to them and their ideas about what we should do next — the public are never very slow to make suggestions!' he explained.

Despite the small stand, Bernard Babani Publishing sells nearly everywhere in the world. Babani was particularly pleased to have his Spanish sales boosted two years ago when, he says, 'half of Spain seemed to come to the PCW Show.'

New names, familiar faces

Some of the new names at the PCW Show this autumn are actually no strangers to the industry, or to the show itself. Quite apart from Sir Clive Sinclair — who must be one of the most familiar faces around, and his new company, Cambridge Computer, which will be

showing off its, by then, six-month-old Z88 — there are familiar household names outside the computer field. One of the biggest of these is leading toy manufacturer Mattel, coming to the show to launch a new range of products from Japan.

Mattel is exhibiting for the first time beyond the children's toy exhibition. Although the company has been involved in the games market before, Mattel Electronics was one of the casualties of the video games shake-out a few years ago. Now it is staging a comeback as UK distributor for the Japanese Nintendo Company, the leading home video and arcade games manufacturer in Japan and the US.

Nintendo is currently expanding its distribution network to cover Canada, the UK, Italy and Australia. In the US, about 65 per cent of the games sold are Nintendo's, and about 98 per cent in Japan.

'We are very keen that they should enjoy the same success here,' commented Gordon Macfadyen, group product manager at Mattel. 'Nintendo stopped the decline and proved that the video games market was not dead. They showed that if you go in with quality products with dedicated machines, scrolling graphics and full colour, and not the cubic graphics of the past, you are on a very strong wicket.'

Mattel is acting as a distributor for the Nintendo Entertainment System hardware and 27 software titles, 17 of which will be available at the PCW Show launch. Emphasis will be placed on letting the public have hands-on access and giving them a chance to try out the games for themselves.

Spreading the word

Every year, the PCW Show turns the spotlight onto a number of applications of topical interest. This year one of the major features will be desktop publishing,

which represents one of the fastest-growing — and most controversial — sectors of the micro industry. The PCW feature will be no sales hype, however; rather a glimpse of desktop publishing in operation, producing real magazines.

'We want to emphasise the practical side of DTP — independent and impartial advice will be the hub of the feature,' says Henry Budget, editor of *Desktop Publisher*, who is organising the stand. His magazine's show newsletter will be one of the two main items produced 'live', the other being the exhibitors' show newsletter.

The stand will be split into two sections. One half will be an information centre manned by independent people who use desktop publishing, such as bureaux, consultants and journalists. The other half will be set up as a production unit, and a wall of monitors will give the public insight into what goes into producing newsletters.

Information will be gathered electronically, either direct via an RS232 port or using public electronic mail services such as Telecom Gold and One to One.

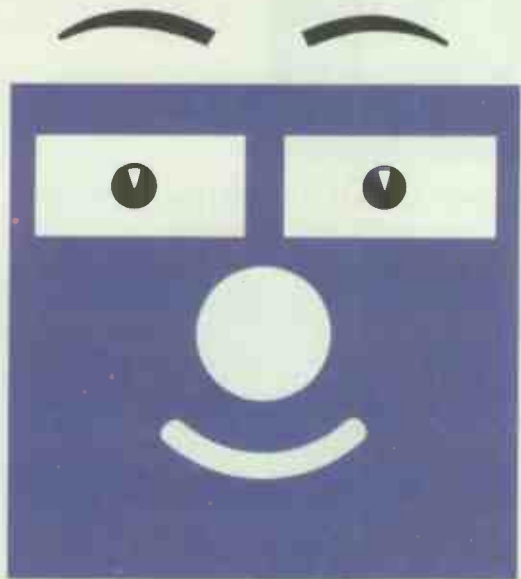
On show, there will be three different types of system: one PC-based; one on a Macintosh; and one dedicated desktop publishing system, all being used for full production. Budget also hopes to have an A3 duplexing printer, capable of printing on both sides of the paper, over from the US in time for the show. Anyone wanting to try out a system for themselves will be able to do so on the supplier's stand close by, and get further explanations of the hardware and software involved.

'This will show people what desktop publishing systems actually do and not what salesmen are told to say they do,' Budget commented.

INFORMATION

To book your PCW show space contact Richard Hodgson on (01) 486 1951 or (01) 487 5831, or write to: Computer Upgrade, PCW Show, 11 Manchester Square, London W1M 5AB.

END



How to build Expert systems.

Find out what you need to know at a **FREE Crystal workshop**

And find out why the press think the following about Crystal – the new P.C. expert system builder;

"A basic tool for use in every office"

PRACTICAL COMPUTING

"Clean, fast and easy to use"

WHAT MICRO

"High speed and compact"

A.I. BUSINESS

"Personal computers gain in expertise"

THE INDEPENDENT

"The basis for an 8000 rule system"

THE OBSERVER

Phone 01-940 6333 for your free information pack or free workshop. Or send the coupon to: Intelligent Environments Limited, Northumberland House, 15-19 Petersham Road, Richmond, Surrey TW10 6TP.

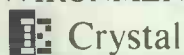
Name _____
Company _____
Business _____
Job Title _____
Address _____

PCW 7/87

Tel. No. _____

PHONE: 01-940 6333
FOR INSTANT CONFIRMATION

INTELLIGENT ENVIRONMENTS



THE 1987 ACORN USER exhibition

THE RED HALL
BARBICAN EXHIBITION HALL
GOLDEN LANE LONDON EC2

23rd July 1987 Trade & Education Day
24th-26th July 1987 Open to the general public

Organised by Redwood Publishing Ltd

The 1987 ACORN USER Exhibition is the premier show in the UK devoted to all aspects of buying, using and getting the most out of your BBC computer. You will have the unique opportunity of being able to review the latest hardware and software innovations whether you are an educational, business or home user.

Running alongside the Show will be a series of informative seminars exploring many areas of interest which will allow you to hear and talk to the industry experts and your regular ACORN USER authors.

Subjects to be covered will include: Education software, business software, programming, monitors, printers, peripherals, music, publishing and graphics.

Before July 9th, advance tickets will be available at the specially reduced price of £2.00. We shall be welcoming all those employed in education free of charge on the opening day, Thursday 23rd July 1987. In addition to the free day, educationalists will be eligible for half price tickets – £1.50 – for the Public days on the 24th through to the 26th. These tickets are available on the door or in advance by using the coupon below. Seminar tickets are £3.00.

How to get there

Underground
Barbican, Moorgate, St. Paul's, Bank, Liverpool St.
British Rail
Holborn Viaduct, Cannon St., Broad St., King's Cross, St. Pancras, Liverpool St.

Show Hours

Thurs 23rd – 10.00 to 18.00 hrs Trade & Education Day. Free
Fri 24th – 10.00 to 18.00 hrs
Sat 25th – 10.00 to 18.00 hrs } Open to the general public. £3.00
Sun 26th – 10.00 to 16.00 hrs }

Advance ticket application (for use before July 9th)

I am employed in education; please send _____ free tickets for the Trade and Education day.

* I am employed in education, please send me _____ tickets at half-price, £1.50 each, for the 24th, 25th or 26th July 1987.

* Please send me _____ advance Public day tickets @ £2.00 each for the 1987 ACORN USER Exhibition.

I enclose cheque for £ _____ made payable to Redwood Publishing Ltd. Alternatively please charge my Access/Barclaycard no. _____

Card expiry date _____

Signature _____ Date _____

Please send tickets to: Name _____

Address _____

Send all cheques to Redwood Publishing Ltd,
141-143 Drury Lane, London WC2B 5TF.

Please send me details of the seminar programme. ☐

Please send me a subscription form for ACORN USER ☐

Educational Computing ☐

* Delete as necessary

PEARTREE COMPUTERS LTD

Pear tree House, No 1 Blackstone Road, Stukeley Meadows Industrial Estate, Huntingdon, Cambs PE18 6EF. Telephone (0480) 50595

OPUS PCII

SYSTEM 1

- ★ Fully compatible 16-bit micro
- ★ CPU allowing 4.77/8MHz turbo processing
- ★ Highly compatible U.S. registered BIOS
- ★ 360K floppy disk drive
- ★ High quality AT-style U.K. specification keyboard
- ★ Hercules-compatible high resolution graphics card
- ★ Monochrome monitor with tilt and swivel base
- ★ 256K of RAM
- ★ 8 expansion slots
- ★ Battery-backed clock/calendar
- ★ Joystick interface
- ★ Approved 150 watt power supply IBH001

£499.00

SYSTEM 2

- ★ Standard system features plus:
- ★ RAM expanded on the motherboard to 1024K
- ★ 384 RAM disk implemented
- ★ RAM disk software
- ★ Serial card IBH002

£599.00

SYSTEM 3

- ★ Standard System 2 plus:
- ★ Second 360K floppy disk drive IBH003

£699.00

**PLEASE USE OUR CODES
WHEN ORDERING**



SYSTEM 4

- ★ Standard system features plus
- ★ 20 Megabyte Winchester drive
- ★ Winchester controller card
- ★ RAM expanded on motherboard to 1024K
- ★ 384K RAM disk implemented
- ★ RAM disk software
- ★ Serial card IBH004

£995.00

COLOUR AND EGA OPTIONS

- ★ Opus colour option add £200
- ★ Opus EGA option add £500

MICROSOFT DOS 3.2

- ★ 100% IBM-compatible DOS for use with Peartree PCs
- ★ Supplied with GW-BASIC V3.2 IBH069

£50.00

We are also registered **Amstrad** and **Commodore Amiga** dealers.

Phone us for all your upgrade requirements. We can build a system to suit your unique specifications.

Maintenance contracts also available.

Telephone **0480 50595** for further details and prices.

All prices are exclusive of VAT.

WORD PROCESSING

IBS002	WORDSTAR 3.40	£199.95
	- Industry standard word-processor - Document or ASCII text editing - On-line help facility	
IBS0041	WORDSTAR PROF REL.4	£379.00
	- Latest release of Wordstar Professional 87,000 word spelling checker 220,000 word thesaurus	
IBS004	NEWWORD 2	£99.00
	- Compatibility with Wordstar - Built-in mailmerge and spelling checker	
IBS005	MICROSOFT WORD 3.1	£329.95
	- Outline document processor - Built-in spelling checker and thesaurus - Best support for laser printers and EGA displays	
IBS009	WORDSTAR 1512	£60.83
	- Amstrad PC1512 only - Built-in mailmerge - Compatibility with 'standard' Wordstar	
IBS006	MICROSOFT WORD JUNIOR	£60.83
	- Basic compatibility with Word 3.1 - Full mouse support - Mailmerge facility built-in	

SPREADSHEETS

IBS012	SUPERCALC 4	£259.95
	- Extended graphing facilities - New financial features - Fully data compatible with versions 2 and 3	
IBS013	LOTUS 1-2-3- RELEASE 2	£319.95
	- Industry standard spreadsheet - Full graphing facilities	
IBS011	SUPERCALC 3.1	£60.83
	- Amstrad PC1512 only - Full graphing facilities	
IBS017	MICROSOFT MULTIPLAN JUNIOR	£60.83
	- Fast calculations and screen update 63 by 255 matrix	

DATABASES

IBS022	DBASE III+	£449.95
	- Industry standard database system - Powerful extended command language with pull-down menus	
IBS021	DBASE II	£299.95
	- Industry standard database system - Command language	
IBS024	PARADOX	£459.95
	- Very powerful relational database - Full support for LANs	
IBS020	DELTA 4 (budget version)	£69.95
	- Up to 80,000 records per file - Both standard and user-designed screen layouts	
IBS019	CARDBOX	£52.13
	- Famous electronic card index system - Excellent for mailing lists	

INTEGRATED SOFTWARE

IBS026	SMART SYSTEM	£449.95
	- Integrated suite containing database, word processor, spreadsheet, time manager and communications modules - Latest network-ready version 3.1 now available	
IBS015	FRAMEWORK II	£399.95
	- Integrated suite containing database, spreadsheet, graphics, communications, text outliner, and 'Fred' programming language - Supports full data exchange with Lotus 1-2-3, Wordstar, dBase II and III+, and many more	
IBS027	PC FOUR	£67.95
	- Integrated suite incorporating word processor, database, spreadsheet, graphics package and including a full tutorial - Allows swapping of datafiles between modules	
IBS028	ABILITY	£89.95
	- Low-cost fully-integrated system with word-processor, spreadsheet, database, communications and business graphics - Supports imports from Lotus 1-2-3	

COMMUNICATIONS

IBS029	DATATALK	£129.95
	- Full-featured viewdata and ascii terminal communications software - Support for many modems - XModem and own file transfer protocols	
IBS030	CROSSTALK XVI	£99.95
	- Industry standard ascii communications software - Allows capture of data direct to a memory buffer	
IBS031	CHIT-CHAT	£89.95
	- Low-cost viewdata and ascii communications software - Menu driven with built-in telephone directory	
IBS0311	DIALUP	£89.95
	- VT100, VT52, Viewdata, ANSI and DIALUP terminal emulation - Supports XMODEM and KERMIT protocols	

UTILITIES

IBS032	SIDEKICK (not copy protected)	£49.95
	- World-famous memory-resident desktop system - Incorporates notepad, telephone directory, calculator, calendar and ascii table - Full support of colour and hard disks	
IBS033	NORTON UTILITIES	£59.95
	- Allows recovery of deleted data from disks - Other utilities include disk editor and file management - Excellent manual	
IBS034	TURBO LIGHTNING	£56.95
	- Memory-resident spelling checker & thesaurus - Configurable for many applications including Wordstar - Pull-down menus for ease of use	
IBS035	MICROSOFT WINDOWS	£66.95
	- Screen management and front-end system - Allows multi-tasking - Supports colour with EGA monitors - Fully Microsoft Mouse compatible	
IBS037	COPY II PC	£39.95
	- Makes back-up copies of most copy protected programs - Comes with other utilities including Nokey and NoGuard	
IBS038	FASTBACK	£129.95
	- Very fast hard disk back-up program - Uses own disk format to store 400k per floppy disk	
IBS039	SEAWAYS	£37.95
	- Turns text on its side when printing - Useful for printing wide spreadsheets - Recommended by Lotus for use with 1-2-3	
IBS040	DISK OPTIMIZER	£34.95
	- Re-arranges your hard disk for the fastest access time - Includes other utilities such as file examiner	

GAMES

IBS062	FLIGHT SIMULATOR	£39.95
IBS063	LODE RUNNER	£24.95
IBS064	PSION CHESS	£39.95
IBS065	THE JET	£34.95
IBS066	HITCH-HIKER'S GUIDE TO THE GALAXY	£24.95

LANGUAGES

IBS041	MICROSOFT C	£299.95
	- Full standard 'C' compiler - Produces very fast and compact code - Complete with Symbolic debugger	
IBS042	MICROSOFT MACRO ASSEMBLER	£99.95
	- Fast and powerful full-featured macro assembler - Symbolic debugger now included - Supports 8088/8086/80186/80286 instruction sets plus 8087/80287 math co-processors	

IBS043	MICROSOFT FORTRAN	£229.95
	- Subset of ANSI standard Fortran 77 - Optimising compiler for better use of available memory - Same data format as other Microsoft languages	
IBS044	MICROSOFT COBOL	£499.95
	- Full ANSI standard implementation - Modular programs possible - Includes compiler, macro assembler, linker and librarian	
IBS045	TURBO PASCAL	£59.95
	- World-famous implementation of Pascal - Integrated editor/compiler with run-time error detector - Now supplied with 8087 and BCD support as standard - Huge range of toolboxes and support products available	
IBS046	ZORLAND C	£29.95
	- Full Kernighan and Richie implementation - Produces optimized code in standard Intel format	

HARDWARE

MONO15	NEC MULTISYNC	£599.95
	Fully MDA, EGA, CGA compatible	
MONO17	TAXAN SUPERVISION 760 14" EGA MONITOR	£499.00
	640 X 350 resolution	
IBP013	KAGA TAXAN EGA CARD	£199.00
	Supports EGA, CGA, and Hercules modes	
IBP002	VEGA 7 EGA CARD	£299.95
	Full-featured 'Autoswitch' EGA display card	
IBP003	PARADISE AUTOSWITCH EGA CARD	£299.95
	- Compatible with EGA, CGA, Hercules and Plantronics standards 'Autoswitch' automatic standard selection	
IBP004	AST SIX-PACK-PREMIUM	£359.95
	- Supplied with 512k RAM, serial and parallel ports, clock, expandable to 2Mb - Complete with software and a full manual	
IBP005	AST PREMIUM-PAK	£299.95
	- Piggy-back board for fitment on AST's Six-Pack-Premium - Supplied with 1Mb of RAM	
IBP006	SIX-PACK-PREMIUM RAM UPGRADE	£44.95
	Upgrades your AST Six-Pack-Premium from 512k RAM to 1Mb	
IBP007	MICROSOFT MOUSE	£149.95
	Both card and serial port versions available	
IBP011	EVEREX EXCEL STREAM 20	£995.00
	- Backs up 5Mb per minute - Supports both file and image back up - Menu driven	

PLEASE USE OUR CODES WHEN ORDERING

We accept Barclaycard/Visa/Access/Mastercard/postal orders or cheques. We accept government and educational orders. Leasing available, please apply for written details.

You may purchase any of the items listed, by cheque made payable to
PEARTREE COMPUTERS LTD.

All you have to do is to list your requirements on a sheet of paper, post it to us quoting ref, and we will despatch your goods within 24 hours, whenever possible.

Please add the following amounts for postage and packing:

Items below £10.00	add £1.50
Items below £50.00	add £2.50
Items below £100.00	add £3.50
Items over £100.00	add £10.00
Independent courier for items over £100.00	

All prices exclude VAT.

Access/Barclaycard holders—call us on our new special line: **(0480) 50595**

Prices are correct at time of going to press. Peartree Computers reserves the right to change prices without prior notice.

All prices are exclusive of VAT.

System Science

C COMPILERS

AZTEC	
AZTEC C86/COMM — MS-DOS & PC-DOS	£325.00
large mem, linker, ASM, 8087 support	
AZTEC C86/PERS — ASM, link (MS-DOS)	£149.00
AZTEC C86/COMM — MAC, AMIGA	£325.00
AZTEC C for CP/M80, APPLE DOS, PRODOS	£ Call

LATTICE	
LATTICE C Compiler ver 3-	£295.00
8087, all mem. models.	
LATTICE Screen Editor	£95.00
LATTICE C SPRITE Debugger	£129.00
LATTICE dbC-II or III Dbase library	£175.00

TURBO C NEW
MICROSOFT C 4.0 with Code View
large mem, source debugger, 8087
DESMET C-ASM, LINK, 8087 Editor
FS Debugger, large mem options

£ Call
£295.00
£119.00
£ Call

INSTANT C full prof. interpreter £345.00
RUN/C-PROFESSIONAL Interp. £125.00
RUN/C — Interpreter excellent tutorial £60.00
LIVING C — Interpreter PC & Apricot £75.00

C LIBRARIES

GRAPHICS
Metawindows — many languages £99.99
Essential Graphics Library £175.00
GraphicC — source, colour, EGA £245.00
Multi-Halo — specify compiler £175.00

SCREEN and DATA ENTRY
PANEL Entry screens — most languages £215.00
Vitamin C — Screen, print layout code £195.00
Windows for Data, Windows for C £215.00

ISAM & DATAFILE
CTREE — Faircom (source) B tree lib. £245.00
RTREE — Reports generator for C TREE £195.00
Btrieve — database library, many lang. £175.00
BtrieveN — Novell, PC-NET networks £425.00

COMMUNICATIONS
GREENLEAF COMMUNICATIONS £125.00
Ints, Ring Buff., Status & Control
BLAISE ASYNCH MANAGER £125.00
Port control, XMODEM protocol

GENERAL
GREENLEAF GENERAL FUNCTIONS £125.00
Dos, Disk, Video Strings, Date, Keybd.
PforC — source lib, comms, dbase, screen etc. £245.00
The C programmers toolkit

BLAISE C TOOLS PLUS — source £125.00
DOS, Dos, screen, windows, keyboard etc.
C Scientific Subroutines — source £125.00
Matrix, polynomial, diff. eqn. etc.

PHOENIX
PLINK-86 overlay linker £275.00
PLINK-86 Plus — overlay caching £325
PMATE-86 programmers editor £120.00
PFC-C Link utility £195
PFIIX-86 Plus debugger £225.00
PDISK — backup, disk cache & utils £95.00

BRIEF multi-file editor £145.00
dbRIEF addition for DBASE programmers £145.00
EPSILON — Emacs style editor £145.00
PETER NORTON EDITOR £79.00
PC-LINT by Gimpel £99.00
CLIPPER — DBase III Compiler £495.00

ASSEMBLERS and CROSS-ASM

Microsoft 8086 macro Asm (SYMDEBUB & LINK) £115.00
2500AD 8086 and linker (MS-DOS) £89.00
DR Assembler Plus Tools £175.00
Cross Assemblers £ Call
68xx, 68000, Z80, 8080, 6502, 8048, 8051 etc £ Call
Simulators — Z80, 8048, 8051 etc £ Call
Visible Computer 8088 — Assembler Interpreter £75.00

LMI Forth-83

PC-FORTH, asm, Editor, DOS access £125.00
Options: Floats, 8087, Graphics
UR-FORTH high perf., 8087, graphics £245.00
PC-FORTH+ provides 32 bit pointers £225.00
8086 FORTH for MS-DOS and CP/M-86 £95.00
METACOMPILERS 8080, Z80, 8096, 6303 etc etc £95.00
Z80 FORTH-83 for CP/M (Amstrad PCW)

BORLAND
TURBO PASCAL £69.00
TURBO PASCAL JUMBO PACK £165.00
Turbo Tutor £29.00
TURBO PROLOG new £69.00
TURBO LIGHTNING £69.00
Superkey or Sidekick £69.00

TURBO DATABASE TOOLBOX £49.00
TURBO GRAPHICS TOOLBOX — PC-DOS £49.00
TURBO EDITOR TOOLBOX — PC-DOS £49.00
BLAISE POWER TOOLS PLUS £75.00
BLAISE ASYNCH PLUS £75.00
TURBOPower UTILITIES £75.00
TURBOPower EXTENDER £75.00

FORTRAN/PASCAL/BASIC

Fortran Graphics, Scientific Libraries £ Call
Microsoft FORTRAN-77 with Codeview £275.00
Pro-FORTRAN-77 £395.00
RM-FORTRAN-77 £375.00
PRO-PASCAL MS-DOS £295.00
Microsoft Pascal £185.00
QUICK BASIC — Microsoft (PC-DOS only) £75.00

LISP and PROLOG

TURBO PROLOG (PC Only) £69.00
micro-PROLOG PROF (full mem., wind.) £245.00
micro-PROLOG entry level version £95.00
MuLISP/MuSTAR (Common LISP) £195
Golden Common LISP (PC-DOS only) £495.00
MuMATH/MuSIMP Symbolic maths £275.00
WALTZ LISP — Franz like (MS-DOS and CP/M) £125.00

COMMUNICATIONS, DISK & PRINT UTILITIES, etc.

CROSSTALK for IBM £120.00
MOVE-IT for MS-DOS and CP/M-80 £145.00
UNIFORM-PC (i/w, format CP/M disks) £65.00
CONVERT — PC add formats £89.00
MATCHPOINT — read Apple disk £175.00
UNIDOS — run CP/M software on PC £65.00
VENTURA Desktop Publishing system £1000.00

PETER NORTON UTILITIES DISK £59.00
FINAL WORD 2 — authoring WP £275.00
MicroTEX — scientific typesetting from £395.00
Dan Bricklin's DEMO program £65.00
MICROSTAT — comprehensive statistics £315.00
STATGRAPHICS £495.00
WINDOWS Software Dev. kit £395.00

ADVANTAGE C++ £395.00
— New ATT C pre processor
— Object Oriented Programming
— custom data types
C++ (the book) by Stroustrup £16.95

C Cross Development Software
Introl — 6809, 6301, 68000, 68020, 68HC11
Manx — Aztec C for 8080/286, 68000, 6502
IAR — 8051, Z80/64810, 6301, 8096 (soon)
80386 C and Pascal compiler, assembler linker
Cross assemblers from 2500AD, Avocet and IAR

All prices are exclusive of VAT. Please add £3.00 p&p, plus VAT to your order

6-7 West Smithfield,
London EC1A 9JX
Tel: 01-248 0962
BTGOLD 76: CJJ028

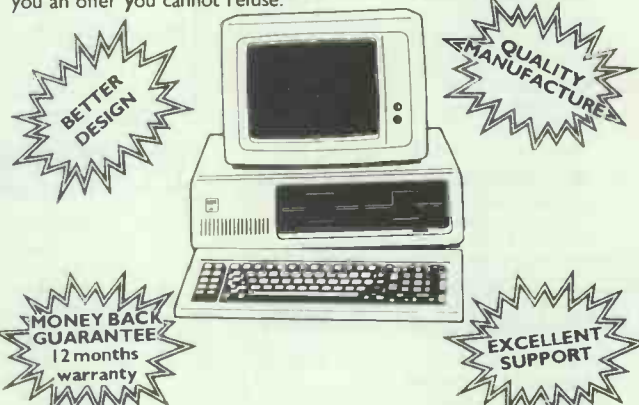


BAD NEWS FOR YOU KNOW WHO

How compatible is you know who?

We have tried to run some IBM/PC TM cad-cam applications, special vision boards and some computer interface cards on some of the leading so called compatibles. To be fair we really picked the tough tests. At the end of the day we had to accept that limited compatibility is the best description for these compatibles. Apart from the question of compatibility, the ideal system must be able to grow with you. When you consider the limited slots in some of the compatibles and the limited upgrade options you must be put off by their take it or leave it attitude.

The systems below have been designed and manufactured for the discriminating user that wants a no nonsense compatibility and an affordable price. Couple all this with our after sales service, support plus one of the best guarantee around, we believe we are making you an offer you cannot refuse.



IBM PC/XT TM COMPATIBLE, 3 times faster!!

Only £449

- ★ 8088-2 microprocessor with 8087 co-processor option
- ★ Keyboard select turbo speed 4.77-8 MHz
- ★ 640Kb of memory, Clock, Calendar
- ★ Monographic/Printer Card
- ★ Hi-Res TTL Monitor
- ★ 8 expansion slots
- ★ 125W power supply
- ★ AT style keyboard and case
- ★ Floppy disk controller
- ★ One 360k disk drive
- ★ Users Service manual
- ★ 20Mb hard disk (add £290)

IBM/AT compatible Supercharged Speed 12MHz!!

Only £895

- ★ INTEL 80286-10 microprocessor
- ★ 512k ram expandable to 1Mb
- ★ 8 expansion slots
- ★ 200W power supply
- ★ Monographic/Printer card
- ★ Hi-Res TTL Monitor
- ★ Hard disk and floppy controller
- ★ One 1.2Mb floppy disk drive
- ★ Super AT Keyboard
- ★ Baby 286 turbo case
- ★ RS 232 plus printer port
- ★ 20Mb hard disk (add £250)

16 MHZ 32 bit 386 system, Most Powerful PC yet!!

Only £2199

- ★ INTEL 80386 microprocessor
- ★ 512k RAM expandable to 16Mb
- ★ Multiple Operating Systems
- ★ Hardware and software compatible with AT systems
- ★ Monographic/Printer card
- ★ Hi-Res TTL Monitor
- ★ Hard disk and floppy controller
- ★ One 1.2Mb floppy disk drive
- ★ RT enhanced keyboard
- ★ 200W power supply
- ★ Super Stylish AT size case
- ★ RS 232 plus printer port
- ★ 20Mb had disk (add £250)

Colour Options: 14" colour RGB monitor upgrade (add £150)
14" Hi-res EGA monitor and card (add £297) to above prices.

The best add-ons for your IBM PC compatible

- | | | | |
|--|------|--|------|
| ★ Color Graphic Card | £35 | ★ 360 disk drive | £70 |
| ★ EGA graphics Card | £115 | ★ 20Mb Hard disk | £250 |
| ★ EGA card plus Hercules compatibility | £155 | ★ 20Mb Hard disk with controller for XT's | £329 |
| ★ Monochrome Graphics card with printer port | | ★ Multi I/O card 2 floppy disks, 2 serial ports, printer port, game adaptor, and real time clock | £52 |
| ★ Monochrome Monitor | £80 | ★ XT 4.77/8 MHz motherboard | £120 |
| ★ RGB Colour Monitor | £260 | ★ AT baby 286 motherboard | £320 |
| ★ EGA Colour Monitor | £380 | ★ XT/AT keyboard | £70 |
| ★ Hard disk and floppy disk controller (AT) | £179 | | |
| ★ Floppy disk controller | £18 | | |

Call us for all your other requirements, our prices even for unlisted items are usually the best!!!

Notes: Prices are exclusive of VAT and Delivery. Dealers and Exports are welcome.

IBM/PC/XT/AT, Hercules are trademarks of their respective companies.

ITCO LTD

Suite 13, Whitehall House, 6 Union Street,
Luton LU1 3AN, England

Tel: 0582 418851. Telex No: 825353/825562 Chacom G

WORLDWIDE PRICE LIST



All prices excluding VAT and DELIVERY. MAY A

LONDON

Worldwide House, Quicks Road,
Wimbledon, London SW19 1EX
Telex: 8955888 Fax: 01-543 7812

01 543 2211

BRIGHTON

Regent House, 2 North Road,
Brighton, Sussex BN1 1YA
Telex: 877649 Fax: 0273 671513

0273 609331

SCOTLAND

11-14 Maritime Street,
Edinburgh EH6 6SB
Telex: 728298 Fax: 031-554 2581

031 554 4361

IBM

IBM PC-XTS 640kb 2x360kb DD
IBM PC-XTS 640kb 1x360kb DD + 20mb HD
IBM PC-XT286 640kb 1x1.2mb DD + 20mb HD
IBM PC-ATX 512kb 1x1.2mb DD + 30mb HD

Call

IBM Personal System 2™

SEE SPECIAL OFFERS

Olivetti 0% Finance available Call for Details. Licensed Credit Brokers

Olivetti M15 720kb 1x720kb Laptop 999.00
Olivetti M19 256kb 2x360kb + K/B + Dos Mono/Colour 825/955.00
Olivetti M19 256kb 1x360kb 20mb HD Mono 1125.00
Olivetti M24 640kb 1x360kb 975.00
Olivetti M24 640kb 2x360kb 1065.00
Olivetti M24 640kb 1x360kb + 20mb HD 1370.00
Olivetti M24SP 640kb 1x360kb + 20mb HD 1495.00
Olivetti M28 512kb 1x1.2mb + 20mb HD 1915.00
Olivetti M28 512kb 1x1.2mb + 40mb HD 2425.00
Olivetti M28SP 1mb 1x1.2mb + 70mb HD 2915.00
Olivetti M24/M28 Mono Display Amber-Green-White 169.00
Olivetti M24/M28 Colour Display 395.00
Olivetti Keyboard Extended/IBM 120.00
Olivetti Enhanced Colour Adaptor 455.00

COMPAQ

Portable 4.77mhz 256kb 1x360kb
Portable 6/8mhz M2 256kb 2x360kb
Portable 6/8mhz M4 640kb 1x360kb + 20mb
Portable 12mhz M1 640kb 1x1.2kb
Portable 12mhz M20 640kb 1x1.2kb + 20mb
Portable 12mhz M40 640kb 1x1.2kb + 40mb
Deskpro M1 128kb 1x360kb
Deskpro M2 256kb 2x360kb
Deskpro M3 640kb 1x360kb + 20mb + RS232 + Clock
Deskpro M4 640kb 1x360kb + 20mb + RS232 + Clock & Tape
Deskpro 8/12mhz 286 M1 256kb 1x1.2mb
Deskpro 8/12mhz 286 M40 640kb 1x1.2mb + 20mb
Deskpro 8/12mhz 286 M40T 640kb 1x1.2mb + 40mb + Tape
Deskpro 8/12mhz 286 M70T 640kb 1x1.2mb + 70mb + Tape
Deskpro 16mhz 386 M40 1mb 1x1.2mb + 40mb
Deskpro 16mhz 386 M70 1mb 1x1.2mb + 70mb
Deskpro 16mhz 386 M130 1mb 1x1.2mb + 130mb
Deskpro 286 & 386 Colour Systems Extra

Amstrad	Mono/Colour
Amstrad PC 512kb 1x360kb DD + K/B	449/619.00
Amstrad PC 512kb 2x360kb DD + K/B	559/729.00
Amstrad PC 512kb 1x360kb DD + 10mb HD K/B	799/969.00
Amstrad PC 512kb 1x360kb DD + 20mb HD K/B	899/1069.00

Epson

Epson PC 256kb 2x360kb + K/B 549.00
Epson PC + 640kb 2x360 kb + K/B 1025.00
Epson PC + 640kb 1x360 kb 20mb HD + K/B 1225.00
Epson AX + 512kb 1x1.2 kb 20mb HD + K/B 1799.00
Epson AX + 512kb 1x1.2 kb 80mb HD + K/B 3175.00

IBM Compatible Monitors & Adaptors

Hercules Mono/Graphics Plus Adaptor 180.00
Hercules Colour/Graphics Adaptor 100.00
Hercules InColour/Graphics Adaptor 285.00
Orchid EGA 256kb + Printer Adp 220.00
AST 3G EGA 256kb 220.00
Interquadram Quad EGA + 256kb 280.00
Interquadram ProSync 370.00
Vega deLux Enhanced EGA 390.00

Plotters

Epson HI 80	A4 4pen	349.00
Hitachi 672	A4 4pen	499.00
Hewlett Packard 7440	A3 4pen	750.00
Hewlett Packard 7475	A3 6pen	1360.00
Hewlett Packard 7550A	A3 8pen	2850.00
Hewlett Packard 7570A	A1 8pen	3799.00
Houston DMP56B	A0 1pen	5399.00
Roland DXY 980A Plotter	A3 8pen	930.00
Roland DXY 880A Plotter	A3 8pen	655.00
Roland DPX 2000 Plotter	A2 8pen	2575.00

Laser Printers

Canon Laser LBP-8 A1 S or P	8ppm	1675.00
Canon Laser LBP-8 A2 S or P	8ppm	2799.00
Canon Laser II S&P	8ppm	1975.00
Hewlett Packard LaserJet S	8ppm	1495.00
Hewlett Packard LaserJet Series II	8ppm	1999.00
Hewlett Packard LaserJet 500 S + P	8ppm	3465.00
Kyocera F1010	10ppm	2999.00
Kyocera F2010	10ppm	4380.00
Oki Laser Line 6	6ppm	1645.00
Qume Laser Ten	10ppm	2300.00
Qume Laser Ten + Plus	10ppm	2900.00

Maths Co-Processors

Maths Co-Pro 8087 5mhz/8mhz	120/145.00
Maths Co-Pro 80287 6mhz/8mhz	175/250.00

Mouses

Summa Graphics Mouse	110.00
Microsoft Mouse (Serial or Bus)	140.00
Logitek Mouse	99.00

IBM Compatible Turbo Upgrades

AST Flashpack 9.54mhz NEC V30	295.00
Orchid Tiny Turbo 80286 8mhz	399.00
Orchid 286 Turbo 80286 8mhz 1mb Memory	778.00
Orchid JET386 Turbo 80386	795.00

Modems & Telex

Sage Chat Chat + Modem	275.00
Breakout Modems come with Crossstalk XV1 & Breakout	
Breakout Ext or Int V23 V21	450.80
Breakout Ext or Int V23 V22 V21	599.00
Breakout Ext or Int V23 V22 V22bis V21	799.00
Procom 20 Internal Telex Card	699.00
Dowty Microtelex	795.00

Tape Backup

Christy Reel One	675.00
Everex 20mb Internal	630.00
Everex 20mb External	725.00
Everex 60mb Internal	899.00
Everex 60mb External	925.00
Talgrass TG40/60 External	1199.00
Identica 60mb External	799.00

Ink Jet Printers

Epson SQ2500	180/540cps	1199.00
Canon BJ-80	110/220cps	388.00
Hewlett Packard Thinkjet 80col	160cps	399.00
Hewlett Packard Quietjet 132col	40/192cps	553.00

Terminals

Qume QVT101	ASCII	294.00
Qume QVT101+	ASCII	340.00
Qume QVT103	ANSI	505.00
Wyse WY-60	ASCII	510.00

Daisywheel Printers

Brother HR20D	22cps	335.00
Brother HR25XL	28cps	515.00
Brother HR40	40cps	775.00
IBM Wheelprinter	25cps	795.00
IBM Quietwriter Mod3 Graphics	80/273cps	
Juki 6100	45cps	265.00

Tatung EGA Monitor	430.00
ADI EGA Monitor	450.00
NEC Multi Sync Monitor EGA/Colour/Mono/PGA	550.00
IRMA Card 3270 Emulation Adaptor	939.00
IRMA Graphics Card 3270 Emulation Adaptor	1525.00

IBM Compatible Memory Upgrades

384kb Multifunction XT	199.00
Intel/EMS Compat Ram Adaptor Upgrade 1.5mb XT	399.00
AST SixPac Plus 384kb Multifunction XT	275.00
AST SixPac Premium 2mb EMS Multifunction XT	430.00
AST Advantage 1.5mb Serial + Parallel AT	425.00
AST RAMVantage 3mb AT	650.00
AST Rampage! 2mb EMS XT	350.00
AST Rampage! 2mb EMS AT	595.00
Interquadram Quad Board 640kb XT	320.00
Clock Card with Batt Back up + Ser + Parallel XT	85.00

Olivetti DY300	35cps	599.00
Olivetti DY800	80cps	1175.00
Qume 11/55	55cps	1275.00

Hard Disks

10mb to 20mb Hard Disk Exchange	320.00
360kb to 10mb Hard Disk Exchange	260.00
360kb to 20mb Hard Disk Exchange	320.00
360kb to 30mb Hard Disk Exchange	340.00
Fitting on the above	15.00
Outright Sale on the Above	50.00
Bernoulli Box 20 + 20mb	2155.00
Large Capacity Hard Disks	Call

Printers Dot Matrix

Brother M1109	25/100cps	175.00
Brother M1409	45/180cps	295.00
Brother M1509	45/180cps	380.00
Brother M1709	50/240cps	445.00
Brother 4018	100/480cps	1150.00
Brother TwinWriter 5	40/160cps	970.00
Brother 2024L	96/160cps	650.00
Epson LX86	16/120cps	210.00
Epson FX800	32/200cps	322.00
Epson FX1000	32/200cps	420.00
Epson EX800 opt Colour	50/300cps	415.00
Epson EX1000 opt Colour	50/300cps	559.00
Epson LQ800	60/180cps	469.00
Epson LQ1000	60/180cps	625.00
Epson LQ2500 opt Colour	90/270cps	785.00
Honeywell 4/21	40/200cps	415.00
IBM Proprietary	40/200cps	363.00
IBM Proprietary XL	40/200cps	395.00
Proprietary X24	67/240cps	445.00
Proprietary XL24	67/240cps	590.00
NEC P5XL	88/264cps	915.00
NEC P6	77/216cps	410.00
NEC P7	77/216cps	490.00
Oki Microline 84p	50/200cps	629.00
Olivetti DM100	25/120cps	199.00
Panasonic KP 1090	20/100cps	185.00
Panasonic KP 1091	29/120cps	245.00
Panasonic KP 1092	33/180cps	320.00
Panasonic KP 1505	51/260cps	520.00

Scanners

AST Turbo Scan	1475.00
HP ScanJet inc. Adaptor	1395.00

Software

Data Base/Accounts		Energraphics	240	Wordcraft Elite	600
Cariboo Plus	244	VXN Execursion	396	Wordstar	170
Dataease	480	Gem Draw +	125	Wordstar 4	205
dBase II	270	Gem Graph	125	Wordstar 2000R2	265
dBase III plus	357	Gem Wordcraft	89	Wordstar 2000 +	285
Clipper dBase Comp	430	Freelance Plus	275	Writing Assist	
Delta 4 Prof	390				
IBM Filing Assis	99				
Multisoft A/Cs from	390	Relief	60	Framework II	345
Pegasus A/Cs from	175	Wordstar 1512	60	Open Access	290
Sage Bookkeeper	85	Delta 4 1512	87	Smart Suite v3.1	388
Sage Accountant	125	Domino 512	87	Symphony	357
Sage Accountant +	155	Supercalc 3	80	Javelin	380
Sage Fin Cont	240	Sage PC Write	84	Lotus 123	247
Paradox	430	Sage Deskset	69	Lotus HAL	110
IBM Teamwork from	305	Sage Retrieve (DB)	84	Multipan v2.0	169
		Sidekick	25	Supercalc 4	225
Desktop Publishing		Word Processing		Utilities & Games	
Fleet Street Editor	210	DisplayWrite 4	350	Crosstalk XVI	110
ParagonMaker	595	Manuscript	299	Flight Simulator	35
sc/LASERplus	299	1-2-3 Report Writer	99	Gem Collection	94
Ventura	795	Symphony Text Outliner	89	Gem Desktop	47
		Multimate Adv	395	Norton Util V4	65
		Multimate	295	Sidekick (NCP)	55
		Samma III	355	MS Windows	75
		Samma Plus	435	Top View	115
		Word Perfect	270	Lotus Metro	85
		Word 3	260		
		Wordcraft 3	380		

Network Systems Available Please call for details

Special Offers

20mb Olivetti

M24 Base Unit
Compat 20mb Hard Disk
1 x 360kb Floppy Disk
Monitor - Keyboard
640kb Memory + Dos 3.1
Serial + Parallel Ports
Clock

Mono £1575

Colour £1795

30mb Hard Disk

Mono £1640

Colour £1860

IBM Personal System 2™

PS/2 Model 30-002
8086 8mhz
1 x 720kb 3.1/2"
Int. Colour Adp MCGA
Clock + 640kb Memory
Mouse Port
Serial + Parallel Ports

PS/2 Model 30-021
8086 8mhz
1 x 720kb 3.1/2"
1 x 20mb Hard Disk
Int. Colour Adp MCGA
Clock + 640kb Memory
Mouse Port + Lock
Serial + Parallel Ports

PS/2 Model 50-021
80286 10mhz
1 x 1.44kb 3.1/2"
1 x 20mb Hard Disk
Int. Colour Adp VGA
Clock + 1mb Memory
Mouse Port + Lock
Serial + Parallel Ports

Mono £1299 Mono £1674 Mono £2575
Colour £1546 Colour £1921 Colour £2950

All Prices Subject to Change E&OE.

Make headline news ... on your PCW

THE revolution which has sent a storm through the printing industry now comes to your computer. With the Desktop Publisher you can unleash the graphics potential of your PCW to design newsletters, flyposters, adverts, letterheads and company reports – then print out the final artwork with headlines, text and graphics exactly where you want them.

User friendly

And it's so easy to use. Simply move the pointer round the screen, then click on the option you require using the keyboard or the AMX, Electric Studio or Kempston mouse.

Drop-down menus give you split-second access to all the many facilities available.

How it works

Start by planning your layout: Decide the number and width of columns, and position windows for graphics, captions and headlines.

Then load in your text written in LocoScript, or any other word processor that can output an Ascii file. The built-in text editor can produce perfect fully-justified text with bold and italic characters shown on the screen just as they will be printed out.

You can design artwork using the feature-packed graphics program that is included. You can

draw lines, boxes, triangles and ellipses, fill areas or paint with one of 16 patterns, and zoom in for precise pixel editing. There's even a built-in font editor so you can design your own custom character sets.

When you are ready you can preview your masterpiece in miniature, then print it out in top-quality mode or use the faster draft mode.

What you get

The double-sided disc contains the three main programs, a selection of useful clip art, extra fonts and tutorial page.

There's also an extremely comprehensive, carefully-written manual with a hands-on guide that will ensure you are up and running in no time.

**And all for the
incredible price
of only £29.95**

The complete Desktop Publishing System

This package includes The Desktop Publisher software **PLUS** an AMX Mouse and a serial interface to connect it to the back of your Amstrad PCW.

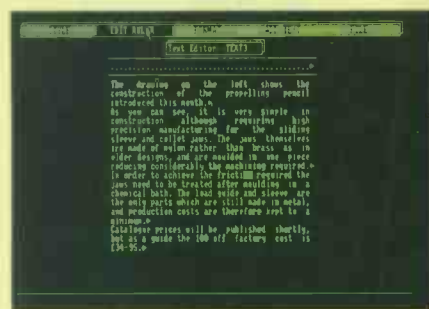
You now get the added flexibility of the precision-engineered Mouse – for a total price of just £79.95.



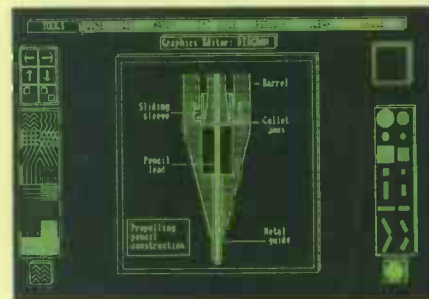
Bouncy	Poster
Elegance	School Book
hobbic	Slimline
Italic	Slimline Italic
Limelight	Typ-Dee
M.A.S.H	Typeset
new century	Typeset Italic
Old English	

The full range of fonts

How to use The Desktop Publisher



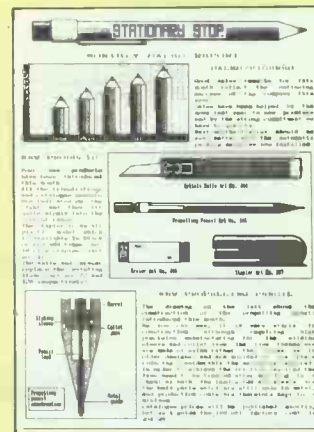
Edit the text...



Draw the graphics...



Preview the page...



... the finished result

Please send me:

- ☐ The Desktop Publisher £29.95 *
* Add £2 Europe (inc. Eire), £5 Overseas
- ☐ The Desktop Publishing System £79.95 †
† Add £4 Europe (inc. Eire), £12 Overseas
- ☐ I enclose cheque payable to Database Software
- ☐ Please debit my Access/Visa card no.

Expiry Date

ORDER HOTLINE: 061-480 0171

DATABASE SOFTWARE

Europa House, 68 Chester Road,
Hazel Grove, Stockport SK7 5NY

Name

Address

Signature

LOW COST PC COMPATIBLES

No pressure selling

**XT, AT & 80386 compatibles.
Available ex-stock.**

Optional 28 day trial.

XT

A fully-compatible IBM-XT Compatible with 20mb hard disk and fully-featured. There are no additional costs for monitors, boards or graphics-display adaptors; you purchase a complete system, ready to run.

£795

AT

All the features of the XT with the 80286 Processor. No hidden costs, no surprises, a tested compatible PC-AT. Call us for full details.

£999

80386

Our top-of-the-range system, able to run UNIX and Xenix with a very fast processor. Again, no hidden costs and a 28-day-trial option.

£2995

CONTACT US NOW TO ARRANGE DELIVERY AND TRIAL



For orders and enquiries or to discuss custom specified systems, contact:

Hi-Spec Systems Limited
Brettenham House South
5 Lancaster Place
London WC2E 7EN
TEL 01-379 5562
FAX 222 7471
TLX 931770 WIBUG

TEST AND BE SURE THEY RUN YOUR SOFTWARE

All offers are subject to availability.

SURPLUS COMPUTER STOCKS

MORGAN COMPUTER CO. DISPOSAL OF SURPLUS INVENTORY, LIQUIDATED STOCK, DEMO & USED COMPUTER MERCHANDISE

APRICOT

Apricot 9 inch mono mon	£35
Apricot Pertmaster	£95
Apricot 128k expansion card	£55
Apricot internal modem	£95
Apricot Portable 256k	£395
ACT F10 daisywheel printer	£350
Micro Modeller	£100
File Transfer	£45
Calcmaster	£65

HEWLETT PACKARD

*HP 7550A A3 plotter	£2500
HP 150 inc 15mb hard disk	£1250
HP 150 model II inc d/drive	£1500
HP 7470A Plotter RS232 HP-1B	£695
HP 7475A Plotter RS232 HP-1B	£995
*HP Tilt unit 92240A	£20
HP 125 terminal & kbd	£250
HP 86a cpu	£450
HP 150 mkl touch screen opt	£95
HP TMS prop I font cartridge	£50
HP 110 Lapheld inc Lotus 123	£595
HP monitor 829134	£95
HP 85 Surveying Pac	£45
Acoustic hood 26764A	£100
HP83 Computer (demo)	£150
HP 7225 Plotter HP-1B	£225
HP 82905B RS232 printer	£250
HP 2674A thermal printer	£95
HP Think Jet HP-1B HP-IL	£195
CP/M system for HP80 series	£100
Graphics Presentation Pac HP87	£55
Visicalc Plus	£45
*HP-1B cable, 1 metre	£25
Linear Programming Pac	£25
*Memo Maker HP150	£45
*Multiplan HP150	£100
*Wordstar HP150	£100
*Mailmerge HP150	£75

PRINTERS

Honeywell L34 CQ	£300
NEC P7	£350
Juki 6100 daisywheel	£150
Juki 5520 colour dot matrix	£195
Fujitsu DMPG 9 IBM compat	£150
Siemens ink jet PT88	£125
Brother HR1	£99
Brother HR5	£65
*Ricoh RP1200N daisywheel	£195
*Brother M1109 RS232 & para	£175
Ricoh RP1300 parallel d/whl	£250
Ricoh RP1600 parallel d/whl	£495
Microline 193 parallel 132 col	£195
Dyneer DW20 daisywheel para	£195
Qume 11/40 plus demo	£395
Qume 11/55 demo	£550
*Silver Reed EXP400 D/W RS232	£150
*Silver Reed EXP500 D/WRS232	£175
*Silver Reed CF-120 EXP500	£120
*S/Reed T/F EXP500 & EXP400	£85
*Ziyad s/feeder for Qume	£50
*NEC Pinwriter P2 18 pin	£225
C Itoh M1550 latest model	£195
Triumph Adler 7020 RS232	£150
Ricoh 1600Q d/whl	£550
Brother Sheet Feeder	£125
Brother HR15 parallel d/whl	£175
*Serial 8056	£45
*NEC 3550 Qume interface	£350
IDS Prism 132 dot matrix	£195
Dec LQPO2 slight demo	£500
Honeywell L32i IBM compatible	£175

Part exchanges accepted.

PHILIPS

*P2012 64k 2 x 640k drives	£425
*P2010 64k 2 x 160k drives	£325
*10 mb upgrade inc controller	£495
Fitting extra	£35
*256k 16 bit/ MS-DOS upgrade	£110
Fitting extra	£25
*Technical Reference Manual	£35
*CP/M Reference Manual	£35
*Carrying case	£25
Printer cable	£15
*Cardbox database	£45
*Sorcim Supercalc spreadsheet	£75
*Dataman database	£65
1 year 24hrs on-site contract	£169
Ditto for P2010	£125
CP plus CP/M front end	£25
Plannercalc spreadsheet	£35

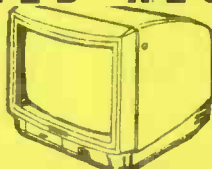
TWO IN ONE



BROTHER TWINRITER

Unique double printer, dual printhead, daisywheel speed 40cps £495
160cps dot matrix (DEMO)

MED RES!



MICROVITEC CUB D1456
Medium resolution colour monitor (apprx 650 x 580) for IBM compats, (SLIGHT DEMO) £125

FLEA MARKET

PARTS ONLY, NO WARRANTY GIVEN	
Major parts Sanyo 555	£45
Compaq mono monitors	£45
ACT Sirius complete	£295
Linokey 2 inc disk drive	£450
Assorted computer boards	£5
Decwriter II	£95
IBM 5 1/4 inch 360k floppies	£30
No-name 132 col printer fast	£75
Osborne I brown case	£95
*NEC 64k Dram chips each	£1
110v 1000W transformer	£10
*OKI IBM Plug'n Play	£25
Portascribe O/H projector	£125
Tandy Model III 16k	£45
*DRE ICL 2348 hard disk	£995
War surplus 5 1/4 foppies 10s	£6
Bit 24 for BBC	£15
*Scotch DC300 A data cart	£10
110v Nec Spinwriter	£250
*Omega cassette recorder	£15
Diabolo typewriter/printer	£95
Xerox/Remington typewriter	£50
Apple disk drives uncased	£35
Ricoh 1600	£99
*IBM DOS 1.1	£10

EPSON

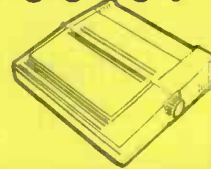
P 80 printer demo	£75
CX 21 Acoustic coupler	£65
Tractor feed for SQ 2000	£35
*PX8 inc software	£395
*TF-20 dual floppy	£250
*TF-15 dual disk drive	£295
Sheetfeeder 7334 for LQ-1000	£95
Sheetfeeder 8344 for LQ-1500	£125
P40 thermal printer demo	£45
LQ 1500 demo	£395
PX-8 (very slight demo)	£325
*PX Ramdisk 128k	£125
*RS232 interface LQ-1500	£35
SQ 2000 demo	£795
RX-100 + demo	£200
HX-20 inc microcassette demo	£195
MX/FX 80 serial adaptors	£20

HP PORTABLE



HEWLETT PACKARD HP 110
Laptop c/w Lotus 123, inc MS-DOS 384k Rom & 278k Ram, AC adpt. (DEMO) £595

100 CPS!



COPAL DOT MATRIX OFFER
Direct from the liquidator, 100cps, 80 col, friction or tractor, full documentation, (NEW) £99

MISC

Compaq 286 Deskpro 30mb	£1895
Apple Europlus CPU	£195
*Keytronic kbd for IBM PC	£75
Superbrain inc software	£250
ARC AT compat	£995
Apple IIe	£325
Kaypro 2000 EXP box	£250
Televideo 1605 pc compatible	£595
Televideo 1605H ditto inc 10mb	£795
Atari 130 XE	£95
PR1 acoustic coupler	£25
Compaq Plus inc 256k 10mb	£1100
Compaq Portable 256k	£895
Apple Macintosh 128k	£595
*Buzzbox modem inc PSU	£45
*Dacom Auto answer modem	£65
Tandon PCA 20 mono AT comp	£1500
Polaroid Palette demo	£750
Fat Mac 512k demo	£795
Compaq Deskpro 10mb	£995
Kaypro 2000 inc software	£695
ACT Sirius inc mon & kbd	£495
*Steebek-Dowty SB1212 V22	£250
*Apple Profile 5mb	£350
Apple II/III disk drives	£95
Kimtron terminal	£250
IBM PC 64k, inc monitor & kbd	£550
IBM PC 512k complete	£695
IBM XT 640k 10mb complete	£995
IBM PC 256k 10mb complete	£795
IBM ATX 512k 20mb colour	£2500
IBM AT co-processor	£95
IBM SDLC card	£50
IBM AT serial cables	£35
IBM Async Comms card	£50
IBM base colour display	£150
PC Express card	£150
*Orchard PC turbo 186	£295
*AST Colourgraphplus	£50
AST Rampage AT	£200
*AST Sixpak inc 64k Sidekick	£150
IBM Convertible as new	£1295
*Quadboard 384k card etc	£125
Dyneer colour monitor	£195
Mountain 30mb internal drive	£450
IRMA board	£495
*Microsoft Pascal compiler	£195
IBM Quietwriter 1	£450
*Intelligence Res PC Express	£150
Tecmar AT multifunction card	£150
Ideadisk 10mb & 5mb backup	£500
*5250 card, cable, program	£395
*IBM uncased 5 1/4 floppies	£65
Displaywrite 3	£200
DOS 3.1 tech ref man	£20
AT/X HMS	£50
*IBM Pascal	£75
*Calc-it 3D Spreadsheet	£95
*Show-it graphs package	£45
*Ask-it compliments Keep-it	£25
*Sort-it ditto	£25
QED	£95
PFS Graph	£20
PFS File	£20
PFS Report	£20
*Micropro Dastar	£65
*Micropro Wordstar 2000	£195
*Keep-it database	£95
*dBase II Multi user	£350
*dBase III plus	£295
*Edit-it simple text editor	£35
*Peachtree Dec Manager	£45
*Easy Junior A/C package	£150
*Word Plus PC inc BOSS spell	£75
*Calcmaster	£75
*Fox & Geller Quickcode	£75
*Superterm 400	£95
*Superterm VT100	£95
Word Perfect vers 3.00	£225
*Visicalc IV	£65
*Visiword	£35
*Visi Desktop/plot	£20
dUtil	£45
Quickcode	£65
*Easywriter II	£85
*Multiplan	£65
*OmniFile	£95
Lotus 123	£150
*Multimate word processor	£95
*Graphwriter	£250
Executive Writer VP software	£35
Number Works VP software	£35
Framework integrated s/ware	£195
Cadplan	£550
Hardware man Portable	£50
DG Blast	£100
GTO IBM XT	£35

* indicates brand new goods

Morgan Computer Co.

179 TOTTENHAM COURT ROAD, LONDON W1. 01-636 1138

OPEN MONDAY TO SATURDAY
PRICES SUBJECT TO CHANGE
GOODS SUBJ. TO AVAILABILITY

ACCESS AND VISA ACCEPTED
PRICES SUBJECT TO 15% VAT
MAIL ORDER (CARRIAGE EXTRA)

A Viglen PC.



FROM
£449
+VAT

What IBM Compatibility is really about

IBM compatibility means different things to different people. But to us it means that our range of PCs must take known IBM PC, XT and AT software.

So what's the difference (apart from the price) between Viglen and our somewhat larger brother?

Quite simply that in all cases Viglen offer higher memory capacities for our basic systems than those offered by IBM (sorry, big brother).

Viglen produce the full range of IBM Compatibles, from the PC through to XT and our top of the range 8 MHz AT286 compatible.

All Viglen Compatibles are *hardware switchable* from the super fast turbo speed of 8 MHz down to standard IBM processing speed. This feature ensures full compatibility with software, network hardware and display adaptors.

You can choose high resolution monochrome, colour CGA, EGA or VGA systems, single or dual disc drives or up to 40 megabyte Winchester. Our VPCXT and VPCAT come with 1 megabyte RAM expansion as standard.

Viglen VPC and VPCXT systems are supplied with a word processor, spreadsheet, and database enabling you to use our machines immediately without incurring high software costs.

All Viglen PCs can be supplied with MS DOS 3.2.
MS windows are standard on our IBM AT compatible, the VPC AT.

When you consider that we've been in the PC market virtually since it began and that all of our machines have a four layer PCB and assembled and serviced in the UK, you'll know what IBM compatible is really about.

It's about specifying Viglen PCs instead of a big name machine (with matching price) or a little known machine (with little use for your business). Each PC comes with a full 12 month warranty with an optional two-year on-site maintenance contract (8HR callout).

Simply call John Hegarty or our PC Sales Desk on 01-843 9903 for the address of your nearest Viglen Primary Contact. Special education discounts.

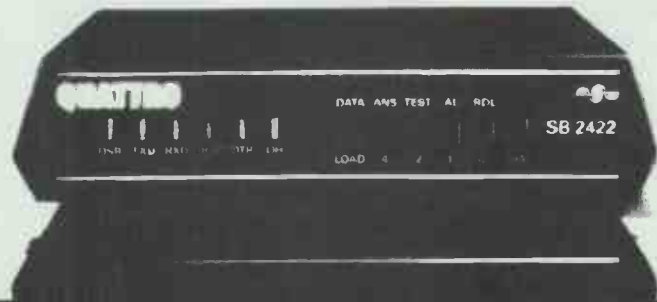
IBM is a registered trademark.

Viglen

The Perfect Partners

Unit 7, Trumpers Way,
Hanwell, London W7 2AQ.
Sales Hotline 01-843 9903
Telex: 919 304 VIGLEN G
Fax: 01-574 5126

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



We're being constantly ticked off for producing a universal modem with performance and features like these...

By offering more features in a single unit, Quattro allows you to communicate with the vast installed base of 300, 1200, and 2400 bps Hayes-compatible modems - giving PC users access to mainframes, minis and on-line services using communications software such as Smartcom II and Breakout.

V23 (1200/75 bps) lets you in and out of Prestel services, and Quattro's sophisticated features make it ideal for bureau work, use at unattended sites and point-of-sale applications - situations where automatic speed detection, error-free data transfer, autoanswer and security features are essential.

If you want to know more about what makes Quattro tick, information on other high-performance modems in our range, and details of your nearest authorised Dowty distributor, just complete and return the coupon.

Quattro. It's all that you want a modem to be.

Dowty Information Systems Ltd.
Newbury Business Park,
London Road, Newbury
Berks. RG13 2PZ. Tel: 0635 33009

DOWTY

✓	V22bis - 2400 bps
✓	V22 - 1200 bps
✓	V23 - 1200/75 bps
✓	V21 - 300 bps
✓	Full duplex operation
✓	Autoanswer/autodial/autologon
✓	Autobaud speed detection
✓	Constant speed interface
✓	Hayes compatible
✓	PSTN or leased line selection
✓	ARQ error correction
✓	Synchronous and asynchronous
✓	Stand-alone, rack-mounted and internal PC board (QuattroCard) versions
✓	Self-diagnostic
✓	Security option
✓	MNP error correction (T-LINK)

Please send me further details of:

☐ Quattro ☐ QuattroCard ☐ Trio ☐ TrioCard ☐ Duo
☐ Nearest authorised Dowty distributor

Name _____

Position _____

Company _____

Address _____

Tel: _____

Hayes is a registered trademark of Hayes Microcomputer Products Inc.

**We'll point you in the
right connection!**

DATA SWITCHBOXES

RSD

NEW

Slimline switchboxes enabling you to quickly and easily switch between micros and printers

RS232 (Serial) metal cased Centronics (Parallel) metal cased
25-way 'D1' to 2-way £29.50 36-way Centronics 1 to 2-way Para..... £29.50
25-way 'D1' to 3-way £37.50 36-way Centronics 1 to 3-way Para..... £43.50
25-way 'D1' to 4-way £48.00 36-way Centronics 1 to 4-way Para..... £48.00
PARALLEL CROSSOVER 36-way Centronics 2 to 2 changeover crossover £39.50
BUFFER AUTOSWITCH



Parallel printer leads



£8.75

Centronics interface with 64k memory, copy, bypass & reset functions. Stores printing information leaving computer free for other tasks. Print sequence may be interrupted and used, later returned to original work. With 9V AC adaptor. Also comes in 256k version.

£165.00

Up to 4 computers can share one printer with no change of cables. Automatically scans ports and locks onto any port that transmits printing, then rescanning the other ports in sequence. With 9V AC adaptor, also available for 8 computers/1 printer. 4-way £165 8-way £195

RS232 CABLES, MODEM LEADS MADE TO ORDER FOR ALL TYPES OF COMPUTER AND MODEMS.

75p P&P in UK. Access & Visa accepted. Add 15% VAT to all orders

Cheques made payable to



RSD Connections Ltd., Dept PCW7

PO Box 1, Ware, Herts.

Tel: 0920 5285/66284



LOWEST PRICES IN UK?

MICROS

Sinclair Spectrum 128K + 2 (Software) £139
Sinclair Spectrum 128K £117
Sinclair Spectrum Plus £87
Sinclair QL £126
Commodore 64C Compendium £174
Commodore 128 £205
Commodore 128D £435
Amstrad CPC 6128 G Monitor £260
Amstrad CPC 6128 C Monitor £347
Amstrad PCW 8528 ?PDA
Amstrad PC 1512 SD Mono £449
Amstrad PC 1512 SD Colour £619
Amstrad PC 1512 DD Mono £559
Amstrad PC 1512 DD Colour £729
Amstrad PC 1512 HD20 Mono £899
Amstrad PC 1512 HD20 Colour £1069
Amstrad PC 1512 business pack (PC 1512 DD Mono, DMP3000 Printer, Best selling Wordstar Supercalc) £699
Atari 520 STM package £390

PRINTERS

Epson LX 86 - The Best Seller £199
Star NL10 - The Best Seller £205
Citizen 120-D-A Hot Seller £156
Panasonic 1080 - The Hot Seller £150
MP 135 - Cheap & Good Quality £139
Amstrad DMP 2000 NLQ £135
Amstrad DMP 3000 NLQ £140
Amstrad DMP 4000 NLQ £305
Citizen 1200 for Commodore £161
Commodore MPS 1000 £211
Brother M 1190, 120 cps, 80c £175
Brother M1409, 180 cps, 110c £295
Brother HR20, 20 cps D-Wheel £335
Brother HR25 XL £529
Brother M1509 136 col 180cps £375
Brother M1709 136 col 240cps £535
Canon PW1080 BNLQ 160cps 80c £239
Juki 6100 20cps 110c D-Wheel £250
Juki 5510 NLQ 180cps 80c £235

PHOTOCOPIERS & FAX MACHINES

Canon FC3 £450
Canon FC5 £650
Canon PC14 £760
Canon Fax-220 £2268
Sharp Fax-FO-200 £1615

PSION

Psion II CM £82
Psion II XP £115
8K Datapak £11
16K Datapak £126
32K Datapak £90
64K Datapak £69
128K Datapak £147
Formatter £39

CASIO

Scientific £8
FX82A £8
FX100 £11
FX451 £17
FX570 £14
FX580 £22
FX3600P £15
FX3800P £17
FX8000G £78
FX7000G £43
FX4000P £26

Pocket Computers

PB1000 £120;
FX5200P £35
FX720P £47
PB410 £35
FX730P £69
FX750P £78
PB700 £103

TYPEWRITERS & CANON

Typewriter 7 £175
Typewriter 6 II £148
Typewriter 5 II £129
Canon 5200 £159
Canon 5300S £315
Typestyles £22
Ribbons 1 bx £10
Ram 4k, 8k, 16k PDA

DISK DRIVES & MONITORS

Commodore 1541C £164
Commodore 1571 £233
Amstrad 3" DD1 of FD1 £20A
Commodore Green Monitor £70
Commodore 128 Colour Monitors £260

Textbase

Numbase £43
Finance Pack £26
Maths Pack £26
PC Four £60
Pocket Spd Shl £41
RS232 Link £41
Comms RS232 £52

Data Bank

SF3000BX £56
BC 3000 £56
PF 7000 £34
PF 3200 £37

ACCESSORIES

RP8 £14
RP16 £29
RC2 £21
DR4 £26
RC4 £31
OR40 £33
ORB £60
FA3 £20
FP-12-S £44
FA7 £60
FP40 £86
FP100 £225
MD100 £286

CALCULATORS

Casio £199
CW11 £100
DR110S £69
DR120S £79
HR100 £30
HR16 £29
Watch DBS10 £28
Watch DBS60 £29

DISKS

DISKS

FREE Senator Ripple retractable ballpen with every order (while stocks last)

ACCUTRACK FLEXIBLE DISKS

Engineered for critical accuracy and reliability by

Dennison Magnetic Media

top quality

certified 100% error free
lifetime warranty
post and packing free

why pay more?

Cash with order only. Please complete the order below and send it to —

Moor House Marketing

Moor House, Ratcliffe Wharf Lane

Forton, Preston, PR3 0AN

or telephone 0524 792101 with

Access Card No.

PCW 7	Per box of 10 disks			Amount	
	Prices				Qty
	1	2-9	10+		
5¼"					
48tpi SS/DD	10.95	10.45	9.95		
DS/DD	13.95	13.45	12.95		
96tpi SS/DD	13.95	13.45	12.95		
DS/DD	16.95	16.45	15.95		
HE (IBM-AT)	26.95	25.45	23.95		
3½" SS	19.95	19.45	18.95		
DS	23.95	22.95	21.95		
Remember, post & packing free					
Total					
VAT @ 15%					
Payment					

Remember,
post & packing
free

Name

Address

Access Card

Number

Signed

Expiry

Date

Date



K.K. STATIONERS

187 Edgware Road
Marble Arch
London W2 1ET
Tel: 01-723 1436

126 Edgware Road
Marble Arch
London W2 2D2
Tel: 01-402 4592



DISKS DISKS DISKS



Acorn's ARM CPU is top of the cut-price processor league; and everyone's favourite word processor, WordStar, could be upgraded to coincide with the launch of a new Amstrad. Guy Kewney presents the facts in this month's news round-up.

Driving towards a revolution — Acorn in gear

A revolution could be about to happen in the cost of driving high-powered computers. Just look at these figures.

For a minimum order of 100, a 20MHz Motorola 68020 costs around £300; 16MHz Intel 80386s cost £240. But a 10MHz Acorn Risc Machine (ARM) CPU, which will comfortably outperform either, and without the need for expensive high-speed static RAM, costs a mere £44.

The 32-bit ARM processor is at the heart of the new range of Acorn machines being launched this month, some of which will form the new BBC Computer series. And a plug-in ARM card for PC-compatibles is reportedly in the wings.

The price and performance

of the chip set has already aroused the interest of Atari, Apple and IBM, who all have evaluation systems.

The Acorn-designed set comprises four chips — the CPU, video/sound chip, I/O processor and memory manager, and is available to third-party hardware developers from Californian manufacturer VLSI Technologies Inc (VTI) for £130. Given that the full chip set does away with the need for many of the usual support chips found in conventional micros, Acorn is selling what is practically an off-the-shelf micro for half the price of bare, rival CPUs.

Add to this the ARM's ability to work with dirt-cheap 150ns dynamic RAM, and you can see why other manufacturers are taking notice.

Of the four chips, the video/sound (VIDC) chip is likely to be a crowd-puller. It can display up to 1000x1000 pixel resolution in mono, or 256 colours in 640x512 resolution from an overall palette of 4096 colours. The

sound side of things offers eight stereo voices of near CD quality.

There will be a catch, though. The VIDC steals processing time off the ARM itself for video display, locking it out of the system for half or even three-quarters of the time on the more memory-hungry screen modes.

Memory itself could also cause problems on those screen modes, with the entry-level Acorn machine having only 512k RAM. The memory management chip itself can only handle 4Mbytes, so all systems using the chip set will have some restrictions.

Acorn's success with the chip set and its own ARM-based machines will probably depend on the speed with which the chip set is adopted by other manufacturers. At present VTI is the sole manufacturer of the chips, and most manufacturers are likely to wait for a second source of supply to come on-stream before taking the plunge.

New Amstrad, new WordStar

It looks likely that a new 8-bit Amstrad will be launched just in time to run a nice new version of the world's favourite word processor, WordStar, perhaps in September.

MicroPro, the author company of WordStar, is a transformed outfit since it re-absorbed the bright go-getters who split away from it originally to launch New Star and New Word.

And, as you can read in this issue (page 158), it has now re-released New Word 3 as WordStar version 4. (That's the real WordStar 'Professional', as opposed to WordStar 2000 which is no more WordStar than it is Supercalc.)

That program will be released in an 8-bit version in August. At that time, roughly, you can expect rumour to be rife, or perhaps even to be confirmed, that

Turn your Atari ST into an audio editing console, by plugging in a £50 piece of hardware and running a single program.

This temptation appeared at the Atari Show (London, 24-26 April 1987) and seemed too good to be true. It was launched by Eidersoft, and I had an amazing fight to get near enough to the machine to use it. And, it turns out, it is true.

The best description of Pro Sound Designer would be a 'desktop publisher' for sound. It includes a 'scanner', a 'font editor' and a 'text editor with cut and paste', and a musical 'graphics' editor — all working not on words or images, but on raw sound.

It lets you record sound from tape, radio or any other electronic source, and store it in the ST's memory. Then you can edit it, play bits of it back, reverse, speed up, slow down, repeat, overlay/echo, cut, paste, and generally fiddle. And the quality is amazing.

If that isn't enough, it also lets you get at the Atari ST sound chip.

The amount of music you can squeeze in depends on the quality you want, of course. The designers sample the analogue sound at anything between 3KHz and 30KHz, so the best frequency bandwidth is up to around 15KHz, which is as good as the BBC gives you on broadcast. But it's only 8-bit sampling.

The reason this product has appeared on the ST is simple: the ST has 1Mbyte or more of RAM in it. You need this internal memory to have any reasonable amount of sampled sound.

PRO SOUND DESIGNER



PRO SPRITE DESIGNER

Without doing a full evaluation — which I hope PCW will soon be able to do — there's no way of providing a feel for this product.

What use is it? Use? No more than any other musical instrument or noise maker you may have at home. It's entertainment, almost pure and simple. Ignore those people who say you can use it for answering the phone, or burglar alarms, or serious stuff like that. Buy it for fun.

Details on (0708) 856468. Eidersoft also does hard disks for the ST, sprite editors...

the PCW 8256 range will have been upgraded to something (possibly) called the PCW 9512.

That will mean a £100 price cut in the old 8256, probably, to £300.

The main difference between the old and new PCWs will be the printer.

Current PCWs have a printer built into the main unit, and no way of driving standard printers. It was a great way of saving cash and lowering the price.

Unfortunately, these days the quality of print they give compares rather weakly with what you can get from other suppliers.

There will also be at least one new Amstrad printer to go with the new machine — some say a daisywheel (not my idea of a clever idea) and some say a high-quality dot-matrix printer. Both could be true.

Ignore stories from the US about WordStar 2000 being 'dropped', by the way. That program, once described as an 'elephant on motorised roller skates' by an unappreciative friend of mine (Ezra Shapiro, hi!) rumbles on in the form of WordStar 2000 Plus. It has an integrated comms segment, and a mail-list segment, and an indexing add-on. These are sold as a £119 'extra' in the UK, and may well carry on being sold that way for a while. Either way, WordStar 2000 will be with us for some time.

Also WordStar Easy has disappeared in the US, and that was killed in the UK months ago, when Wordstar 1512 was released on a gullible public. So it won't affect local policy.

Softly, softly

One problem with the version of Basic that you get with an Amstrad PC is that it's graphics-based and runs under GEM.

If you want a Basic interpreter that's compatible with IBM's BasicA, you'd have to buy Microsoft's GW-Basic or a compiler like Turbo Basic.

So imagine the delight that appeared on people's faces when a version of GW-Basic called Prado Basic started appearing on bulletin boards, and was advertised as shareware that users were encouraged to copy and pass on to friends.

I took a look at Prado Basic, and immediately thought it bore more than a passing resemblance to the real Microsoft product. A

quick look through the code with DEBUG proved it: there's a message buried in there that says 'Licensed material — program copyright IBM'.

If you already have a copy of Prado Basic, keep quiet. If there's a copy on your bulletin board, take it off.

Robert Schifreen

Rabbit, rabbit...

I'd dearly like to be able to recommend that Atari ST users buy a game called Goldrunner.

It's had several good reviews and it really isn't bad to play — you're flying through orbiting 'space rings' dodging missiles and objects, and bombing the ground.

The trouble seems small, when first described: speech.

'Welcome to Goldrunner,' says a digitised voice when you start. You jump. 'Wow!' you say and rush off to find a friend. 'Listen to this — it talks!'

And so it does.

After you've dodged a couple of bombs, you jump again. 'Keep going,' says the helpful machine. You bomb a whole section of stuff. 'You're doing GREAT,' it enthuses.

Then you reach a really tricky section. 'Be careful,' warns the machine. Well, you try. Concentrating like mad, you are thrown by the interjection of an imploring 'Don't fail now!' and so, of course, you crash. 'Oh, NO!' says the machine.

If a human stood behind me and rabbitied on like this while I tried to play, it would become a dented human.

The game does have the ability (not mentioned in the instructions, of course) to be muffled. You press one of the ST's function keys and the music stops (and what banal music they always do put in these games, to be sure). You press the same key and the sound effects come back. Sometimes. Sometimes, the sound effects go, and the chat stays. Aargh!

I like sound effects. I can tell whether the bombs have hit, or whether I've got my finger on the button properly, and so on. But on Goldrunner, the sound effects come bundled with the helpful chatterbox. You can have chat without effects, but not effects without chat.

Do yourself a favour and play something else. It's a great game, but no human could put up with it.



Those who remember Future Computing's original claims that the company would 'always have an IBM emulator' — or those who have never heard of Future Computing — might be amused to see this big box, which includes nearly 1000Mbytes of storage, 800-Mbytes of which is optical diskery.

It's a multi-user mini, based on the Intel 80286 or 80386 chips. Future now calls itself Future International and the system is sold by Appropriate Storage, of Croydon, where Future used to be, on (01) 688 2883. No, it isn't personal computing, is it?



I'm using this picture of a North Star multi-user system to illustrate a product called Mirage, now available on the Atari ST.

Mirage is (like the North Star operating system) a multi-user operating system. It has been crammed into a single ROM cartridge, for use on the ST.

Now, no-one should run away with the idea that an Atari ST with a simple 68000 in it will be a match for the North Star, which has the Intel 80286 chip. The Intel chip probably isn't much more powerful in raw instructions per second, but it is vastly more capable of running multi-user software because of its protected-mode instructions.

And Mirage doesn't have the amount of software which the North Star Dimension 50 can run, because multi-user programs for the ST haven't been written by many people, yet.

But it just goes to show that, if you have the skill to do it yourself, it is possible to do amazing things that would cost a fortune in the conventional way.

Full details of the bumpy path to multi-user through Mirage, from Sahara Software, on (01) 735 3806.

Full details of the £6850 (upwards) North Star, on (0442) 41266.

The secret of Borland's success is "Quality, Speed, Power, & Price"

We're one of the biggest software companies in the world – and we got that way by making "Quality, Speed, Power, & Price" essential characteristics of every Borland software program. Look at Borland software – then look no further.



Turbo Prolog™

Our new Turbo Prolog has drawn rave reviews – because Turbo Prolog brings 5th-generation language and super-computer power to your IBM PC and compatibles. Turbo Prolog is a high-speed compiler for the artificial intelligence language, Prolog, which is probably one of the most powerful programming languages ever conceived. We made a worldwide impact with Turbo Pascal, and you can expect the same results and revolution from Turbo Prolog, the natural language. Minimum memory: 384K.

Reflex® and Reflex Workshop™

No matter what business you're in, if you use Lotus 1-2-3® or dBASE® you need Reflex and the new Reflex Workshop to give you all the tools and views to see what your numbers mean. The new Reflex 1.1 with expanded memory support allows you to manage huge databases of up to 8 megabytes of RAM, 32,000 records, and 250 fields per record with "Reflex Lightning Speed." The Reflex Workshop gives you a wide range of analytical tools written for specific applications like Finance/Accounting, Administration, Sales and Marketing, and Production and Operations. You can use the tools "as is" or modify them to suit your business needs. Minimum memory: 384K.

SuperKey®

Turns 1000 Keystrokes Into 1

If you use SideKick, you need SuperKey. They're designed to work together. SuperKey's an amazing keyboard enhancer for your IBM PC and compatibles. With easy-to-write macros, you and SuperKey can turn 1000 keystrokes into 1. Minimum memory: 128K.

SideKick® Instant Desktop Management!

Powerful desktop management program and the #1 best seller for the IBM PC. SideKick includes notepad, calendar, calculator, appointment scheduler, telephone directory, autodialer, and ASCII table. It's RAM-resident – which means SideKick is always there ready to react, call someone or find information urgently. And it does all this while you run other programs. Minimum memory: 128K.

Traveling SideKick®

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



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

Turbo Database Toolbox®

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

Turbo Editor Toolbox®

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

Turbo Lightning® Solves All Your Spelling Problems!

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

Lightning Word Wizard™ Technical Reference Manual For Turbo Lightning!

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

System Requirements:

Reflex: The Database Manager, IBM PC, AT, XT or true compatibles. PC-DOS (MS-DOS) 2.0 and later. IBM CGA, Hercules Monochrome Card or equivalent. 384K.
Reflex Workshop: Requires Reflex, The Database Manager, 384K.

Turbo GameWorks®

Turbo GameWorks is what you think it is: "Games" and "Works." Games you can play right away (like Chess, Bridge and Go-Moku), plus the Works – which is how computer games work. All the secrets and strategies of game theory are there for you to learn. You can play the games "as is" or modify them any which way you want. Source code is included to let you do that. Minimum memory: 192K.

Turbo Tutor® 2.0

The new Turbo Tutor can take you from "What's a computer?" through complex data structures, assembly languages, trees, tips on writing long programs in Turbo Pascal, and a high level of expertise. Source code is included. New split screens allow you to put source text in the bottom half of the screen and run the examples in the top half. There are quizzes that ask you, show you, tell you, teach you. Minimum memory: 192K.

Turbo Graphix Toolbox®

Includes a library of graphics routines for Turbo Pascal programs. Lets even beginners create high-resolution graphics with an IBM®, Hercules™ or compatible graphics adapter. Our Turbo Graphix Toolbox includes all the tools you'll ever need for complex business graphics, easy windowing, and storing screen images in the memory. It comes complete with source code, ready to compile. Minimum memory: 192K.



Reflex: The Database Manager

Reflex is the acclaimed, high-performance data analyst that's so advanced it's easy to use!

Having problems manipulating database information? Try Reflex: The Database Manager.

Having problems analysing spreadsheets? Try Reflex: The Database Manager.

Whether you manage mailing lists, customer files, or budgets: **Reflex is for you.**

REFLEX EXTENDING DATABASE MANAGEMENT WITH BUSINESS GRAPHICS.

Reflex: The Critics Choice

"Aptly named, Reflex quickly becomes second nature. In fact it's what good software should be — powerful, a pleasure to use and inexpensive."

Amstrad Professional Computing
Few much more expensive packages can compete with such an offering.

Which PC?

Reflex is an attractive and highly usable package. It has powerful display and analysis tools.

Dr. Kathy Lang, PC User

No. 2 best selling database software in the UK
PC Business World, March 1987

Reflex: don't use your PC without it!

**SPECIAL
OFFER**
FOR LIMITED PERIOD ONLY!
**BUY REFLEX 1.1
AND WE'LL GIVE YOU
REFLEX WORKSHOP
FREE**



**NEW UK
VERSION
ONLY
£129.95**

YES!

I WANT THE BEST!

Copies	Product	Price	Totals
___	Reflex: The Database Manager	*129.95 £	___
___	Reflex Workshop	69.95 £	___
___	Reflex & Reflex Workshop	**129.95 £	___
___	Upgrade to Reflex UK Version	***10.00 £	___
___	Upgrade to Reflex UK Version plus Reflex Workshop	***69.95 £	___
___	Turbo C	89.95 £	___
___	Eureka: The Solver	69.95 £	___
___	Turbo Basic	69.95 £	___
___	Turbo Prolog	69.95 £	___
___	Turbo Numerical Methods Toolbox	69.95 £	___
___	Turbo Database Toolbox	49.95 £	___
___	Turbo Graphix Toolbox	49.95 £	___
___	Turbo Tutor 2.0	39.95 £	___
___	Turbo Editor Toolbox	49.95 £	___
___	Turbo GameWorks	49.95 £	___
___	Turbo Lightning	69.95 £	___
___	Lightning Word Wizard	49.95 £	___
___	Turbo Lightning & Lightning Word Wizard	99.95 £	___
___	SideKick	69.95 £	___
___	Travelling SideKick	69.95 £	___
___	SideKick & Travelling SideKick	125.00 £	___
___	Superkey	69.95 £	___
___	Turbo Jumbo Pack	245.00 £	___
___	Add VAT at standard rate	£	___
___	Outside UK add £10 postage	£	___
___	Amount enclosed	£	___

Prices include shipping to all UK cities

Carefully describe your computer system:

Mine is: ___ 8-bit ___ 16-bit

I use: ___ PC-DOS ___ CP/M-80

___ MS-DOS ___ CP/M-86

My computer's name and model is:

The disc size I use is: ☐ 5 1/4" ☐ 3 1/2" ☐ 3"

Payment: Access Visa Money Order Cheque

Credit card expiration date ___/___

Card Number

Name: _____

Position: _____

Shipping Address: _____

Postal Code: _____

Telephone: _____

CODs and purchase orders WILL NOT be accepted by Borland. Outside UK please make payment by credit card or International Postal Money Order

* New UK Version

** Time Limited Promotional Offer

*** You must return your original discs

**NOT COPY PROTECTED
60-DAY MONEY-BACK GUARANTEE**

If within 60 days of purchase you find that our products do not perform in accordance with our claims, call our customer service department and we will gladly arrange a refund

All prices are suggested list prices and are subject to change without notice.

E7

Reflex: The Workshop

For Finance/Accounting

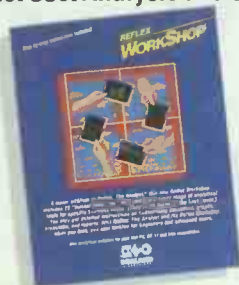
- Business Expense Tracking
- Petty Cash Tracking
- Line of Credit Tracking and Analysis
- Accounts Receivable Tracking and Ageing Analysis
- Purchase Order Entry and Analysis
- Purchase Order Tracking System
- Leasing Inventory/Management
- Asset Inventory Tracking
- Cost Management Trial Balance
- Commercial Real Estate Tracking and Analysis

For Administration:

- Mail Lists
- Appointment Scheduling
- Applicant Tracking and Inquiry System
- Facilities Planning
- Project Scheduling

For Production & Operations

- Manufacturing Quality Assurance Tracking
- Assembly Repair Turnaround Tracking
- Product Cost Analysis and Control



For Sales & Marketing:

- Sales Lead Tracking and Analysis
- Store Check Inventory Analysis
- Sales Analysis
- Trend Analysis



**BORLAND
INTERNATIONAL**

DEPARTMENT E7
ONE GREAT CUMBERLAND PLACE
LONDON W1H 7AL
(01) 258 3797

Vive la difference

Borland products are trademarks or registered trademarks of Borland International Inc. Other brand and product names are trademarks of their respective holders.

Copyright 1987 Borland International

The First Choice

MICROCOMPUTER SYSTEMS • PERIPHERALS • SOFTWARE • MAINTENANCE • TRAINING



OLIVETTI M24

Superior performance and excellent display from Europe's no. 1 PC compatible. 640K RAM; 20MB compatible hard disk; serial/parallel; 7 slot bus; Keyboard; Mono display; MS DOS.

£1295

NEED EXTRA SUPPORT?

£29.95

Software Support Contract
Mayfair Micros are now able to offer a premium level of support to users who are inexperienced or unfamiliar with the MS DOS operating system and the major application packages.
For just £29.95 you can take out a 12 months software support contract to cover your PC, MS DOS operating system and applications program.
Your contract gives you unlimited access to the Interlex on-line telephone support service and stops you wasting valuable time.

Upgrade to Olivetti colour display: **£220**

PHONE NOW FOR DETAILS

**MAYFAIR
MICROS**

**01-871 2555
Telex 936066**

Blenheim House, Podmore Road,
London SW18 1AJ.

MICROCOMPUTER SYSTEMS

EPSON

£

PC PLUS 640k 20MB MONO	1399
PC AX 640k 20MB MONO	1999
PC AX 640k 40MB MONO	2499
PC AX 640k 60MB MONO	2999
PC AX 640k 80MB MONO	3499
EGA COLOUR OPTION EXTRA	450

OLIVETTI

M19 256k TWIN 360k DRIVES	845
M24 640k SINGLE 360k DRIVE	1035
M24 640k 20MB HARD DISK	1995
M24 640k 40MB HARD DISK	1695
M24 SP (10MHZ) 640k 20MB	1570
M28 512k 20MB HARD DISK	POA
M28 512k 40MB HARD DISK	POA
COLOUR MONITOR EXTRA	220

SPERRY

MICRO IT 512K 20MB	2345
PC/IT 512K 40MB (+80287)	2995
EGA COLOUR OPTION EXTRA	450

TANDON

PCX 10 256K 10MB	999
PCX 20 256K 20MB	1175
PCA 20 512K 20MB	1645
PCA 30 512K 30MB	1925
EGA COLOUR OPTION EXTRA	450

HARD DISKS/TAPE BACKUP

20MB HARD DISK UPGRADE	395
40MB HARD DISK UPGRADE	795
IRWIN 20MB INTL TAPE UNIT	450
IRWIN 40MB INTL TAPE UNIT	545
WANGTEK 60MB INTL TAPE UNIT	695
CHRISTIE 20MB EXTL STREAMER	795

PRINTERS

EPSON

LX86 120CPS + NLQ	205
FX 800 200 CPS + 40CPS NLQ	325
FX 1000 AS ABOVE 130COL	399
LQ 800 180CPS + 60CPS LQ	445
LQ 1000 AS ABOVE 130COL	595
LQ 2500 270CPS + 90CPS LQ	795
FX 1000 250CPS + 50CPS NLQ	525

NEC

PINWRITER P6 180CPS + NLQ	395
PINWRITER P7 AS ABOVE 130COL	475

OLIVETTI

DY 300 30CPS DAISYWHEEL	495
DY 450 45CPS DAISYWHEEL	725
DY 800 80CPS DAISYWHEEL	875
DM 290 160CPS + 35CPS NLQ	350
DM 296 220CPS + 90CPS NLQ	525
DM 600 200CPS + 70CPS LQ	725

LASERS

EPSON GO 3500	POA
CANON LBP 8 II	1695
HP LASERJET	1495
HP LASERJET SERIES II	1995

(HP Lasers incl. 12 month on-site warranty)

SOFTWARE

CROSSTALK XVI	95
CLIPPER (DBASE 3 COMPILER)	425
DBASE 3 PLUS	345
PFS: FIRST CHOICE	149
GEM COLLECTION	80
LOTUS 123	245
LOTUS SYMPHONY	340
MIGENT ABILITY	99
MULTIMATE ADVANTAGE	275
SMART SYSTEM	450
WORD 3	275
WORDPERFECT	245
WORDSTAR 2000/2	260

All prices exclude VAT and delivery

Atari just window shopping

Atari is *not* going to take over Inmos, the Bristol-based Thorn-EMI subsidiary which makes the Transputer.

Having got that straight, let's look at recent events which might have made it seem possible that Atari would even consider such a move. Let's start with the recent Atari Show, in Hammersmith, London.

'There is a limit to the number of times Jack Tramiel can pull a rabbit out of a hat, before people notice it's always the same rabbit,' commented one attentive Atari watcher after the show.

What he was noticing was that since Atari launched its first 68000-based ST — the 'Jackintosh' machine, which was going to destroy the Macintosh — it has made several other announcements. But nearly all of these are simply of other ST models with a bit more memory. The rest are video games machines which it had in stock when it crashed under Warner, or upgrades to those, or 8-bit machines like the 800 and the 600 and the 1200, which are over five years old.

What he was also noticing was that Atari has no semiconductor plant, no disk manufacturing plant, and no American presence. In short, Atari in Spring 1987 is a one-trick pony. It is all front and no substance; it is a cash mountain made out of paper money, waiting to blow away in the first real wind.

At first sight, that isn't fair. The show featured an amazing amount of new software from UK authors — games, and even some quite serious business software. There was the announcement of the laser printer, and there was the launch of the IBM PC compatibles.

But behind it all, there was a distinct atmosphere of anticipation — of people waiting for the Tramiel family to get it right. So many things have been done which couldn't have been predicted, that no-one is going to be brave enough to stand up in public and say 'Jack Tramiel is blowing it.' But privately there are anxious moments, when they will admit that they do wonder whether things are

really going quite as well as they looked when the first STs appeared.

In particular, the questions that need serious answers are: 'When will the laser printer be ready, and working? When will the Mega STs be available? If the PC was virtually ready for launch back in January, where is it? Where is the Unix machine?'

And above all: 'Where are we going from here?'

The answer is: new chips, and new software.

The STs are not the last word in technology. They are nice-enough boxes, properly priced for what they are and likely to be around for five more years yet. But Motorola has pronounced sentence on the chips inside them. The Atari based on the 68020 is going to be a multi-user machine, and the 68030 is not being considered for any current Atari plan because it will be the last in the range, and by then, Atari will want to have its alternative in place.

That's a long way into the future. So far, in fact, that it seems silly to start worrying in public about how Atari will cope. And yet... when is the next rabbit going to come out?

A hint about the 'next rabbit' was given in this column last month, when I reported on negotiations between Atari and a designer of Inmos Transputer-based machines.

At press time those negotiations remain unresolved. But an Atari Transputer machine for next year remains a real possibility, despite official 'denials' that the company is interested in the Transputer.

Even more important, however, is the question of what Atari is going to do with all that money. One option that was seriously considered, came to light after Tramiel was seen in Bristol.

Don't get excited — Atari can't buy Inmos — or at least, not without a lot of help. Nor was it trying to. What it was asking was a simple question: 'You have a semiconductor plant in Colorado Springs, USA, and we wondered what you would like to sell it for.' The answer was: 'You wouldn't want it. It's old (4in silicon wafers) and mothballed, and has no staff.' That was that.

Oh, Inmos is likely to be bought — and within a year,

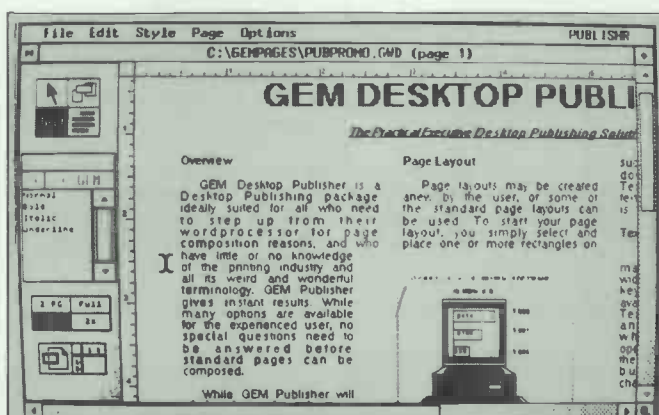
to be sure. And it is likely to fetch something like \$200 million, which is roughly the amount of cash Tramiel has to spend, he says. But the marriage, otherwise, would be a hopeless mis-match.

For a start, Atari needs a lot of things — a smallish stake in several related companies — rather than one basket with all its eggs roughly packed inside. And Inmos needs a freer hand, and a deeper pocket, than Tramiel would provide.

However, a 10 per cent stake in Inmos would be very much to Atari's taste. A 30 per cent stake in Tim King

and Jack Lang's Perihelion, too, would please the Tramiel family. Other software companies, hardware design companies, chip design firms, disk design partnerships, and so on, might also be in line for a share of that cash heap, in exchange for a heap of shares.

Until that happens, however, we can't expect to see much more of the Atari hat — let alone the rabidity of its contents. Too much depends on which, who, where, and when, for decisions to be taken in advance.



There are very many, very expensive desktop publishing products around, among which Fantasy stands out as a ridiculous contrast. And now it has been amazingly upgraded.

Rivalling that product is the latest from Digital Research, which expects its desktop publishing package to be out 'shortly' and which is concentrating on making the thing easy to use.

Both products differ from most in allowing the user to get on with the job, without knowing too much about the skills of traditional typesetting.

According to the Control-Alt-Deli importer of Fantasy, the new version includes a vast number of new fonts, all expandable to amazing sizes. More important, it has a proper control front-end.

Nigel Grant, boss of the Deli, says it now has a text editor built-in, and a proper windowing-style interface with pull-down menus, not the previously slightly cryptic escape code commands.

His list of new fonts amounts to 300 different typefaces, across the various sizes. A sample list: 'Five new fonts for Hewlett-Packard's LaserJet laser printer: for example, Souvenir 5pt to 30pt for £40, sans serif 14pt to 44pt, £24; 14 fonts there. Then there's the genuine H-P LaserJet font Roman at £24 for 14 fonts and a Calligraphy-type face with nine fonts for £24 from 6pt to 34pt.'

The interesting thing about Digital Research's product (which, admittedly, wasn't yet working when the company showed it to the world in early May) is that it was written by the people who went on to write the best-selling Ventura Publisher.

This is nowhere near as ambitious as Xerox's Ventura. It's not even trying to do kerning (fitting adjacent letters like AW tightly together). Proportional spacing is not kerning, and anyone, trained or not, can see the difference when the two are put side by side.

Even the old version of Fantasy had an automatic kerning facility that beats most packages around today.

Grant is on (0908) 662759.

Someone's watching you

It's a horrible feeling, arriving home and finding you've been burgled. You keep asking yourself why you couldn't have come in half an hour earlier and beaten them to it. And you start thinking about all the personal things that they've seen.

I found out at the beginning of May that my Telecom Gold mailbox had been monitored since Christmas 1986. Someone at Gold appeared to have been spooling all my sessions to a file.

The way I found out was quite simple. I typed STAT, which is a Gold command that tells you whether you have any files open. I write CPL programs on Gold, and the STAT command is useful for me to make sure I've closed everything.

The output of the STAT command looked like this:

```
>STAT
USR=VNU209 SYS83

File  File   Open  File
Unit  Position Mode  Type  RWlock  Treename
127   101779   W    DAM  NR&TW  <S83-1>SECURITY>VNU209.0

User      NO  Line Disks
VNU209    4*  REM <S83-5> <S83-1> (FROM X.25)

>
```

The Treename is the file that Gold thought I had opened. But although the file was indeed open, I hadn't opened it. The fact that the file was in a directory called SECURITY, and that the file name was my mailbox number with a zero on the end, made me suspicious. I called Gold's helpline to ask what it meant.

'Oh,' they said, 'it seems that we're monitoring your mailbox. Let me find out why, and get back to you.'

Quite a few people got back to me.

Shortly before Christmas, I was told, someone logged onto Gold using my account, and tried to access a directory that Gold felt he shouldn't even have known existed. So, Gold started monitoring my mailbox. Then, the person who started the monitoring left, and no-one removed the tap.

I asked whether Gold had a warrant from the Home Secretary, which you'd normally have to obtain to intercept electronic mail. No. I asked why they didn't call me last year, and make sure it really was me who tried this unauthorised access, and not someone who had illegally obtained my ID. They said they don't do that sort of thing. But a colleague of mine received just such a phone call some months ago — so they do. I asked which directory I had illegally tried to access. It turned out to be one whose name and access method appears in all Prime manuals, the computers which Gold uses.

Bob Adams, Gold's operations manager, promised an investigation. He said he'd look into everything, and that a full report would be produced for the management at Gold, and that I would get a copy.

When the report didn't arrive, I called again. Having considered the situation, said Alan Freeman, PCW's rep at TG, Gold has decided that it

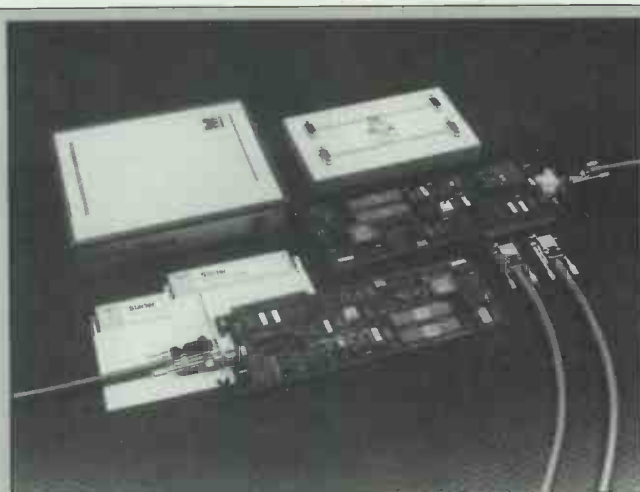
can't comment any more. There will be no report, and the matter is now closed.

The matter is *not* closed. It is now in the hands of OfTel, who are considering the event in terms of the Interception of Communication Act 1985, and also looking closely at the small print in British Telecom's operating licence.

A week after I complained, the tap was removed. Or rather, the strange file name stopped appearing on the STAT command.

Meanwhile, if you use Telecom Gold to send private or confidential information, think again. And you can't even use Gold's encryption system to protect your data, because someone may be watching you encrypt a file and be able to see which encoding key you choose.

Robert Schifreen



These are the components of Robert Madge's Token Ring, a local networking system which he tried to impress me with by wheeling in Kay Nishi, Japanese super-guru, to vouch for its excellence.

Nishi obliged by describing Madge as a 'visionary, a rare genius who can design in both hardware and software,' and added that his company, Ascii, would be selling Madge's network in Japan.

Madge reckons that he has legitimised the Token Ring with this product, 'in the same way that Compaq legitimised IBM's PC by producing the first clone.' He also reckons his is much cheaper.

I was impressed. I can't squeeze the details of networking in here, but you can contact Madge Networks on (02404) 5651. Or, in Japan, call Nishi.

You have been warned

When you walk into a dealer and order a PC-compatible, they will not tell you, voluntarily and unprovoked, that the machine you've ordered is made by a disorganised bunch of wallies who can't even create correct invoices, let alone get the machine specification right.

They may, at best, admit that delivery could be a couple of days late.

In fact, there are a couple of PC clone makers at the moment who (as a public service) really ought to be exposed to prevent innocent people buying their stuff, so disorganised are they.

Naturally, there is no way the laws of libel will allow this. Nor will the dealers involved let me quote them (for the same reason) on who is causing the problem.

In one case, distributors are the culprits.

I had a call from a dealer who had ordered two machines from a distributor, and was subsequently invaded by credit factors who wanted payment for three invoices, each for the same set of two machines.

The credit factors are people who pay the distributor for the original invoice, and collect the debt.

Normally, said my dealer friend, you can't fob them off with a claim that the invoice is duplicate. They've heard that one before. On this occasion, however, there was no problem.

'Oh, no, not again,' said the debt collector from the factors. 'They're terrible.'

Can I tell you who? No, I can't. My friend won't let me quote him.

Another dealer found that an (anonymous) supplier of clones had messed up his supply of two clones so badly that he was billed for seven when he'd ordered two.

'These people are on their way down,' he said. 'They can't possibly stay in business. They can't do a simple thing like finding out what machines they have in stock, like knowing the price, or like invoicing their customers.'

Who are they? 'I'm sorry, I can't say.'

Now, more than ever, don't buy something unless you can see it working first, and take it home from the store. And ask your dealer, please, how the company's invoicing system is working. You have been warned.

FAMOUS HIGH ST NAME: £3/4 MILLION CLEARANCE

COMPAQ



TAPE STREAMER

Compaq internal tape streamer, 10mb, easily fitted, for Deskpro. Takes DC 1000 cassette **£150**

*HP150 Wordstar	£100
*HP150 Mailmerge	£75
IBM colour monitor	£195
*HP150 128k ram upgrade	£100
*HP150 256k ram upgrade	£135
*IBM Brainstorm	£25
*Microsoft Word for Macintosh	£195
*Micropro Planstar	£35
*ABC programme generator	£75
Brother HR25 RS232 & Cent	£195
*HP150 Pertmaster	£95
Brother HR15 XL	£150
Delta 4	£195

MAC SOFT



MACINTOSH JAZZ PACKAGE
Software from Lotus, inc word processing, spreadsheet, database, comms, (NEW) **£150**

ASHTON TATE



FRAMEWORK II

IBM integrated package inc word processing, spreadsheet, comms, database, (NEW) **£250**

WP PACKAGE



IBM DISPLAYWRITER II

Industry std. WP software - used in many office environments worldwide (NEW) **£75**

5mb HARD DISK



FLOPPY DISK PRICE

5mb full height internal hard disk for IBM, BBC. Controller extra. (NEW) **£95**

Part exchanges accepted.

IBM PRINTER



IBM QUIETWRITER

IBM Quietwriter model 1 produces better than daisywheel printout fraction of noise **£450**

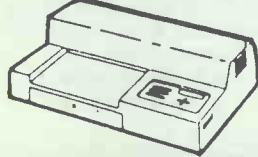
IBM 512k PC



EX SHOWROOM MODELS

Min spec 2 X 360k floppy, Dyneer mono mon, 512k, IBM kbd, DOS, basic & manuals. **£695**

PLOTTER



HP 7550A PLOTTER

Hewlett-Packard 8 pen A3 plotter. RS232 and HB-IB i/f. (DEMO, manuals) **£2000**

Apple 20mb hard disk demo	£995
*HP150 internal printer	£95
*IBM Displaywrite II	£75
*IBM Displaywrite III upgrade	£75
HP 40mb internal hard disk	£500
V22 Quattro modem	£295
Assorted acoustic hoods	£125
*IBM Writing assistant	£35
*IBM Filing assistant	£35
Dataproducts DP55	£495
Wordstar 2000 IBM	£95
10md hardcard for IBM	£195
Brother Twinriter	£495

BULK STORAGE



TALLGRASS 20mb+ 20mb

external 20mb hard disk plus 20mb tape backup includes interface card & software **£550**

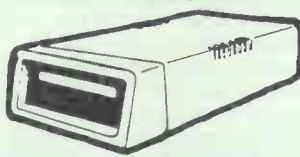
APPLE MAC



EX-DEMONSTRATION AREA

Apple Macintosh models from 128k to Mac plus, inc software & manuals, (DEMO) from **£595**

IBM BACKUP



ALLOY TAPE STREAMER

17.5mb external tape streamer. includes interface card, software, tape cartridge **£295**

COMPAQ



COMPAQ PORTABLE

IBM compatible, minimum spec 512k, twin floppies, printer card, diags, manuals, (DEMO) **£750**

HP 150



HEWLETT PACKARD 150

Complete system inc terminal, dual floppies, keyboard and manuals, (DEMO) from **£695**

TOP QUALITY



DYNEER DAISYWHEEL 36

Takes 15 inch paper, 36 cps, tractor feed and sheetfeeder as optional extra, (DEMO) **£250**

COMPAQ



COMPAQ PORTABLE II

IBM compat, 512k, 2x360k, 80286 processor, 9" text & graphics mon (DEMO) **£1200**

*IBM 15mtr Network cable	£18
HP150 Programmers tool kit	£95
Apricot Easy Junior V2.2	£95
*dBase III C tools	£125
HP150 Lotus 123	£150
*CDC internal 30mb drive	£495
Lotus Symphony version 1	£125
DOS 3.2 tec ref manual	£25
Mountain 20mb hard card	£395
HP 110 external drive	£250
Apricot Xi 10mb	£995
IBM Proprinter XL	£250
Brother HR 35 serial	£295

*IBM Network adaptor	£350
Ricoh 1300 parallel printer	£250
Epson SQ-2000 sheetfeeder	£125
Apple Macintosh 800k drive	£250
*Gem Collection software	£45
Brother 2420L dot matrix	£395
V21 acoustic coupler	£25
Ricoh 1300 tractor feed	£35
IBM Wheelprinter	£495
Qume Letterpro 20 RS232	£225
Crosstalk for IBM	£75
IBM pro graphics monitor	£1000
IBM pro graphics adaptor	£300

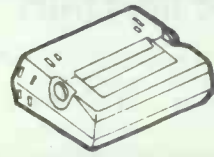
KIMTRON



3 USER SYSTEM

Uses your AT or compat. Includes card, 2 Kimtron terminals, software + installation. **£995**

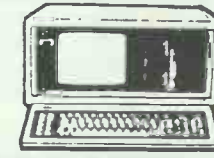
FAST DAISYWHL



LATE MODEL RICOH 1600

60 cps office quality daisywheel printer. Double daisy-wheel 100+ ctrs, (DEMO) **£350**

PORTABLE 286



COMPAQ PORTABLE 286

IBM compatible, 640k, 1 X 1.2mb floppy, 20mb hard disk, printer card, (DEMO) **£1750**

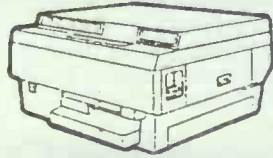
MODEM



PC COMMUNICATIONS

Missing Link internal modem for IBM. Ideal electronic mail, Prestel etc. Auto-dial. **£195**

HP LASERJET



HP PART NUMBER 2686

Hewlett Packard laserjet printer, RS232 inc cartridge & A4 tray, mans, (DEMO) **£1150**

* indicates brand new goods

Morgan Computer Co.

179 TOTTENHAM COURT ROAD, LONDON W1. 01-636 1138

ACCESS AND VISA ACCEPTED
PRICES SUBJECT TO 15% VAT
MAIL ORDER (CARRIAGE EXTRA)

OPEN MONDAY TO SATURDAY
PRICES SUBJECT TO CHANGE
GOODS SUBJ. TO AVAILABILITY

Opportunity knocks

Tandon has announced 25 per cent price cuts. Officially, this is because the cut in the IBM XT price (because IBM is dumping the XT because of the new PS/2) gives Tandon an 'opportunity'.

In fact, this is the sound of a trumpet blowing.

Tandon is busy re-engineering its ordinary PC-compatibles so that it can slug it out with the cheapest of cheap clone makers, and so it has cut the price of the old PC-compatibles to get rid of them.

Simple as that; but it might mean a few bargains.

Wake up, Lotus

Like religious zealots, Lotus has taken to its logical extreme its own belief that unprotected software may not be used (see last month's piece on the lawsuits). It has stamped on a company which provides a way of unprotecting Lotus 1-2-3 and Symphony.

The company, Trisoft, sold Unlock in two forms, to cope with these products. Mainly, these things were bought by people who had a legitimate copy of Lotus 1-2-3, but didn't like having to put their original into the floppy drive to start the program up every day.

Illicit copying of software is a worrying trend, and I have no doubt that the arrival of the Amstrad buyer has increased it. But making protected software is not the answer, and it really is time Lotus woke up. Soon, it will be too late.

Bypassing passwords

My Mercury phone arrived at home a couple of weeks ago, so I can now make cheaper long-distance calls by going through the Mercury network.

Actually, you don't need a special phone to use Mercury — it's just that you have to tap in your 10-digit password before each call and the Mercury phone lets you program this into a memory to save your finger wearing down.

As anyone who sells you

some Prestel software for your PC will tell you, it's not a good idea to program passwords into phones because someone will find a way to get them out. With Mercury, if someone found your access code they could type it in from their home and you'd find yourself being billed for all their calls.

So, I called Mercury's customer assistance number (0800 424 193 — 24 hours a day) and suggested that perhaps their phone manuals should recommend you don't program the full password into your phone, but type it in by hand.

They assured me that the phones being supplied were totally secure and there was absolutely no way that anyone without an oscilloscope and a soldering iron could possibly get the information out.

I called them back a few minutes later, with some bad news. Their security department appeared to have overlooked one important point. I explained to them how, given one minute alone in a room with a Mercury phone and with no tools whatsoever, I could find out the secret number.

The next day I was told that the particular phone in question, the M203, was no longer available. I was also told that the other phones in the Mercury range would not have the fault I described. As for those people who already had M203 phones, these, said the spokesman, were mainly Mercury staff and there were no plans to replace them with safer models (the phones, not the people).

The following week, PCW's editor Derek Cohen received his Mercury phone. It was an M203.

Robert Schifreen

Art, but at a price

Adobe, inventor of the Postscript page description language at the heart of Apple's desktop publishing system, has burst itself upon the Macintosh software scene with a Postscript-based draw package called Illustrator.

On the surface, the program seems very simple and very slick. Like MacDraw, Cricket Draw and other object-orientated graphics packages, Illustrator

provides you with some pretty sophisticated tools for creating images out of circles, lines, boxes and textures.

One of the applications built into Illustrator allows the user to trace over a bit image, such as that produced by a scanner, and turn it from a page of dots and fuzziness into line art.

At the launch, two problems became quickly apparent.

Firstly, whatever tools you use and whatever your starting image, everything ends up looking like a Roy Lichtenstein pop-art drawing.

Secondly, some of the tools are fiendishly difficult to use. The most sophisticated — Bezier curves — allows you to define a curve in terms of a number of points. Deciding where those points should be to define part of the outline of an apple, for example, could take a long time. The demo disk shows how quickly you can draw the correct curve, but then it's obvious that the operator already knew the answers.

At £450 Adobe Illustrator is not cheap, and the fearsome copy protection which distributor McQueens has insisted on retaining (there's not even a hard disk install) may put even more people off.

But the demo disk animation and graphics are fascinating, and the digitised rendition of Mozart is certainly worth a listen.

McQueens is on (0896) 4866.

Derek Cohen

Nothing to be proud of

Tramiel himself summed up a perfectly acceptable attitude to the Atari PC compatibles: 'I'm not proud of those machines.'

The machines are one step forward from the Amstrad PC, and one step back.

The step forward is in having built-in high-resolution Enhanced Graphics Adaptor (EGA) output. The step backwards is in using the old 8-bit chip, the 8088, which is noticeably slower in everyday use than the 8086 in the Amstrad.

There was also another step backwards, in providing a non-expandable box, but Atari corrected that by showing an expandable PC



While my colleagues were getting excited about the PCs Limited machine (the Dell 286¹², Benchtest, page 112) which is an AT clone running at 12MHz (fast), I was desperately trying to get my fingers around an AMT (Applied Microsystems Technology) equivalent.

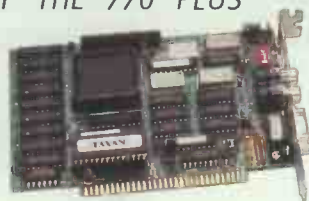
Phone connections baulked it. Well... another time, perhaps. But in the meantime, here is the 12MHz AMT 286xii, at £2500 for a 40Mbyte hard disk system. 'Ideal for Unix,' AMT says.

AMT reckons it will soon have 'the cheapest 80386-based model in the UK,' and the company will talk to interested parties who call (01) 450 3222.

IF YOU WORK WITH COMPUTERS, YOU'LL BE AWARE OF RAPID ADVANCES IN GRAPHICS SOFTWARE. YOU'LL ALSO KNOW OF THE CONSEQUENCES. NEW STANDARDS NEED NEW HARDWARE TO BENEFIT FROM THEM. AND NEW HARDWARE IS OFTEN UNABLE TO SUPPORT THE OLD STANDARDS. WHICH MEANS THAT THE MONITOR YOU BUY TODAY MAY BE UNABLE TO RUN THE SOFTWARE YOU USED YESTERDAY. WORSE STILL, IT MAY BE INCAPABLE OF ADAPTING TO THE GRAPHICS STANDARDS OF TOMORROW. IT'S A PROBLEM. BUT NOW THERE'S A SIMPLE SOLUTION. TAXAN'S NEW MULTIVISION

TAXAN'S NEW MULTIVISION 770 PLUS IS ONLY COMPATIBLE WITH 3 GRAPHICS STANDARDS.

770 PLUS COLOUR MONITOR. MULTIVISION 770 PLUS WILL ADAPT TO ANY HORIZONTAL SCANNING FREQUENCY BETWEEN 15 AND 35KHz. WHICH MEANS IT WILL SUPPORT ALL MAJOR GRAPHICS STANDARDS. WHAT'S MORE, YOU'LL FIND THAT YOUR PICTURE SIZE REMAINS CONSTANT AS YOU SWITCH BETWEEN THE VARIOUS GRAPHICS STANDARDS - A FEATURE OF THE 770 PLUS UNMATCHED BY THE COMPETITION. TO COMPLEMENT THE MONITOR, TAXAN HAVE



DEVELOPED THE 565 AUTO EGA-480 DISPLAY ADAPTER. THIS VERSATILE CARD ENABLES THE MULTIVISION 770 PLUS TO SUPPORT HERCULES™, IBM™ MONOCHROME, CGA, EGA AND OUR NEW 640 x 480 AND 132 COLUMN TEXT MODES. THE MULTIVISION 770 PLUS IS, THEN, MORE THAN CAPABLE OF SUPPORTING THE STANDARDS OF BOTH THE PAST AND PRESENT. BUT WHAT ABOUT THE FUTURE? WELL, THE 770 PLUS IS PERHAPS THE FIRST TRUE MULTIPLE SCAN MONITOR. IT CAN ADAPT TO ANY VERTICAL SCANNING FREQUENCY BETWEEN 50 AND 90 KHz. WHICH MEANS THAT, IN ADDITION TO SUPPORTING THE VERY LATEST DISPLAY STANDARDS OF THE IBM PERSONAL SYSTEM/2™ AND THE APPLE MACINTOSH II™, IT SHOULD EVEN BE ABLE TO SUPPORT THOSE THAT HAVE YET TO BE INVENTED. SO, WHEN THE TIME COMES TO UPDATE YOUR MONITOR, LOOK INTO TAXAN'S MULTIVISION 770 PLUS. YOU'LL FIND THAT THE PAST, PRESENT, AND FUTURE LOOK EXTREMELY BRIGHT.

TAXAN

A KAGA COMPANY

PERFECTING THE IMAGE

TO FIND OUT MORE ABOUT THE TAXAN RANGE OF PRODUCTS, CALL US ON 0344 484646.

The new IBM PC Marry into the future with

The IBM Personal System/2™ range will change the face of personal computing. But even though they have been designed for the future, we haven't forsaken the good things we have created in the past.



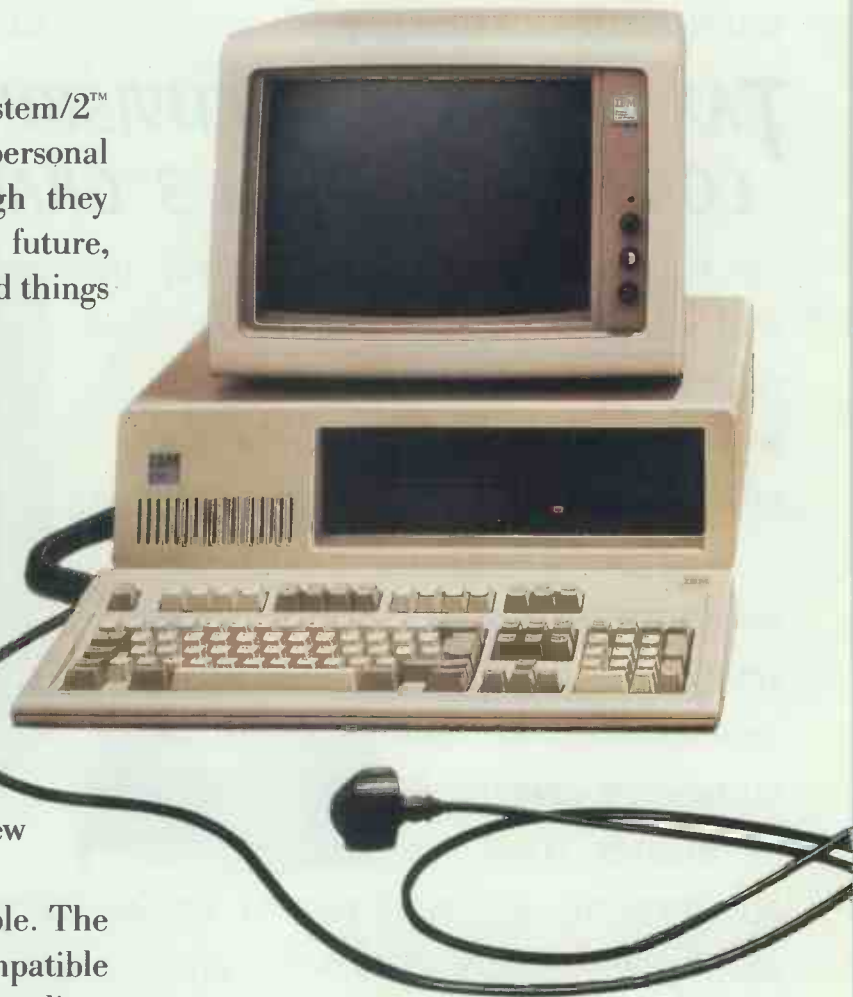
*Introducing the new family:
designed for today and tomorrow.*

We've taken great care to ensure that existing IBM PCs can get along perfectly with the new Personal System/2 models.

Take software for example. The Personal System/2 is compatible with most of the software application programs written for the IBM PC family.

And, since the Personal System/2 family uses new compact 3.5 inch diskettes, we offer a series of easy-to-use converters, so that your software applications and data can be simply transferred to your Personal System/2 models.

There are presently three types of converters. One allows current IBM PCs to read data stored on the new diskettes, another allows the Personal System/2 to run programs and read files written on your current



5.25 inch floppies, while a third lets you transfer data directly from the existing family to the new.

So if you're already using IBM PCs your investment is protected.



*The new family can work hand in hand
with your current IBM system.*

Today it is essential that computer users can communicate with each

Personal System/2. Without divorcing the past.



products and service. Improved manufacturing and testing methods, combined with surface mounted technology, result in better performance, lower power consumption and increased reliability. And, since many of the functions previously on optional adapter cards are integrated, you have less connections to worry about.

The place to learn about the future is from the people that have helped you in the past. Our IBM Authorised Dealers will tell you more about the IBM Personal System/2; how you can fit it into your present information processing network today, and what it can do for you tomorrow.

other. With the new Personal System/2 no product is an island.

The Personal System/2 is able to connect in all directions. It connects up to more powerful IBM systems, down to less sophisticated personal computers, back to previous models of the IBM PC family, forward to products we may announce in the future, and sideways to outside information sources.

One Personal System/2 feature is a perfect example of our commitment to the past; IBM's continuing dedication to the highest quality

The IBM
Personal System/2
family.



Model 30-002



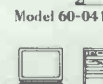
Model 30-021



Model 50



Model 60-041



Model 60-071



Model 80-041



Model 80-071



Model 80-111

For more details and a list of IBM Authorised Dealers, contact Wendy Castle at The National Enquiry Centre, IBM United Kingdom Limited, 414 Chiswick High Road, London W4 5TF. Or telephone 01-995 7700 during working hours.

Name _____

Position _____

Company _____

Type of Business _____

Address _____

Postcode _____

Phone (Work) _____



For under £5,000*

A new A1 plotter including stand

THE DPX 3300

1985 - A3

1986 - A2

1987 - A1

The Roland DG Plotter Range Grows!

A choice of 6 plotters from
A3-A1 with full supporting range
of Cables, Paper, Film and Pens.

PLUS optional maintenance
contract through

olivetti CES



*£4,800 + VAT

Roland DG

983 Great West Road, Brentford, Middx. TW8 9DN
Telephone: 01-568 4578 Fax: (01)8471528 Telex: 934470



MULTI-USER SYSTEMS

DESK TOP PUBLISHING

ON SITE TRAINING

ON SITE SERVICING

AFTER SALES SUPPORT

**CALL FOR A PRICE
AND GET
PROFESSIONAL ADVICE
(0280) 816087**



Visit our demonstration
showroom and see the
complete Apricot range
including the Xen multi-
user system.

Also see Apricot's high
performance Desk Top
publishing system
incorporating Aldus
PageMaker and both the
Kyocera and the Apple
Laserwriter Plus printers.

Bristle Hill Buckingham
Bucks MK18 1EZ
(0280) 816087



apricot

Panasonic
Office Automation

EPSON

Amstrad

FRASER
Associates Limited

with expansion slots. There was a story to that too, but in the end I had to agree with Tramiel. Nothing to be proud of.

Asked whether these machines will sell well, I have to shrug my shoulders and say 'we'll see.' They're cheap enough, and if the market for PC clones is as big as people think it is, they should get their share. But I really do wonder just how many people in this country are equipped to learn MS-DOS, or GEM, and I suspect that the number is lower than many pundits imagine.

Is anyone listening?

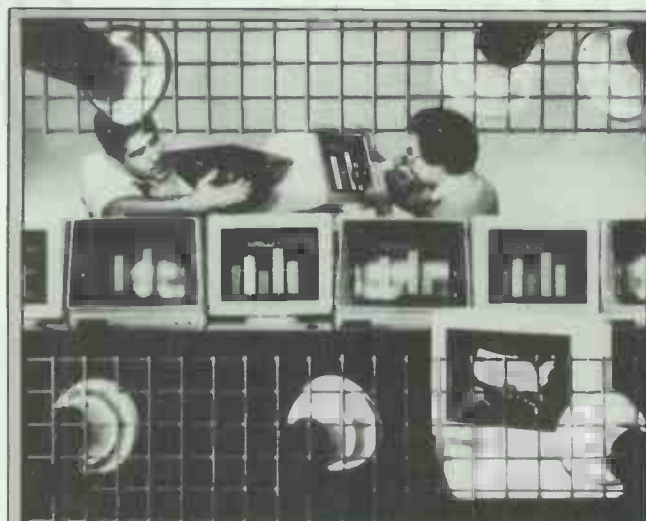
First the good news: Prestel has fixed the bug which caused some interruption in messaging and chatline services.

Now the bad news: in doing so they uncovered a worse bug which meant that messages took two hours or more to get through.

Now the news of questionable value: Prestel has found the second bug and claims to have fixed it.

The problems experienced by Micronet members chatting to each other late at night were of a particularly infuriating nature. The chatlines would seem to work, with other people's messages appearing one after the other. But when someone logged on to an afflicted computer centre sent a message, it never appeared.

'I'm here. Can anyone read this?' they would type in furiously. And the other people online would chat away merrily to each other, oblivious of their poor time-warped comrade who could see what was going on but not join in.



Flatter than any colour TV yet seen, this new display from Zenith is totally flat, has amazingly high resolution, and is compatible (says the company) with the new video VGA standard for IBM's System /2 micros.

Can you get it? No! It will start being available some time soon through Zenith's own computer outlets, on Zenith systems, and the company wouldn't even quote a price at press time.

But it has to be seen to be believed, and Zenith assures me that when it is readily available, the price will be 'very similar' to IBM's new display prices.

Steal one if you can't buy it. They're amazing.

Then, amazingly, about two hours later the message would appear like a signal from outer space. One chatliner even adopted the handle 'Tim E Warp'.

Prestel claims to have solved the problem, but it's too early to say whether it has succeeded. It may have tweaked the software only to unleash an even more fearsome pest.

The next couple of months should, however, see major changes in the hardware side of Prestel. At present the Information Retrieval Centres (IRC) are only loosely linked to each other, but a proper X25 network is being installed which will pass callers on from one IRC to another if there are overloads on one particular

unit.

Once installed, this system will also provide all users with higher-speed error-corrected modems to dial into and centralised accounting, which eliminate the need to maintain passwords on each IRC individually.

And as for the poor messaging service, which at present handles 700,000 messages a month (mainly in the evening and week-end off-peak periods), they've given up trying to patch the software.

A completely new system, with extra facilities like message forwarding, distribution lists, a scratchpad area and multi-frame messages, is promised for the first quarter of next year.

With a bit of luck, it won't come with its own set of time-warp features.

Derek Cohen

of in the story where it should have been).

The following exchange types offer tone dialling: System X, AXE10 (also known as System Y) and UXD5. Also, some but not all TXE4 exchanges accept tone dialling. Your local BT sales office should know what exchange type you are on.

In any case, recent rumours suggest that BT hopes to have everyone's telephones capable of tone dialling within three years.

The mystery of page 261

Apologies if you looked eagerly last month for page 261 to see how you could influence nominations in this year's British Micro Awards being presented at the PCW Show in September. I'm assured that the ad is in this issue but as I file this copy, its exact location hasn't been decided.

PCW: editorial assistant wanted

Do you fancy being the PCW editorial office SideKick? Our editorial assistant, Debbie Wallace, is moving on to more creative pastures in the VNU studio, and we're looking for someone to be the glue that holds the office together.

You will need some keyboard and numeracy skills, and have an interest in both computers and magazine production.

To be blunt, much of the time you'll be opening the post, answering the phone and doing the numerous jobs that keep PCW in touch with its readers and the rest of VNU.

But there will be an opportunity to help look after some of the regular sections of the magazine like Transaction File and Program File, and you can learn useful skills like proof-reading.

Interested? Send some details about your education, work experience and any computer activity to: Derek Cohen, editor, PCW, 32-34 Broadwick Street, London W1A 2HG.

1987 Business Survival Guide

In a review of Samna Word IV in the 1987 *Personal Computer World Business Survival Guide*, it was suggested, in relation to the product, that it might be difficult to obtain good support and training.

Since the article was published, it has been drawn to our attention that these comments were based on information that was somewhat out of date. We are advised by the distributors, Samna International Ltd, that the company now provides a highly responsive telephone support service and comprehensive customer training.

Samna IV costs £550 and is distributed and supported in the UK by Samna International Ltd of Southbank House, Black Prince Road, London SE1 7SJ. Tel: (01) 587 1121.

From the cutting room floor

The story in last month's Newsprint about tone-dial access on British Telecom phones referred to a list of exchange types that offered that facility. We've just found the list on the floor (instead

30MB for the price of 20MB!

PC 1512's + 30MB HardDisk
NOW AVAILABLE
mono version — £799 (ex vat)
colour version — £899 (ex vat)



Spot The Difference

If you were looking to buy a rubber duck, which would you choose?
Offered two items, identical in all but price you would naturally choose the cheaper.
Unfortunately, Kudos doesn't sell rubber ducks. We do however stock a large range of top quality peripherals and IBM AT compatibles at prices which will make choosing easy.

The Kudos HarDisk 20

A complete 20MB hard disk upgrade for your Amstrad PC or IBM compatible

for
only
£299
(ex VAT)



A 20 megabyte hard disk drive has the storage capacity of 40 floppy disks and is 12 times faster than a floppy disk drive. It enables you to store a whole programme data library inside your machine. Floppy disks need only be used for backup storage. In essence, a hard disk drive can transform the way you work with your machine.

The Kudos HarDisk 20 includes: Seagate ST227 20MB hard disk drive, WD controller card, fully documented installation manual, cables, utility disk and software. Our 12 month no quibble guarantee for Amstrad PC 1512 covers a mounting bracket, front and rear bezel and a 12 inch utility disk in the package at no extra cost.

The Kudos HarDisk 20 is easy to install. However, your dealer can fit the upgrade for you. Alternatively you can call on our distribution centre and we'll install it for you free of charge (ex VAT).

Take for example the Kudos HarDisk 20. It's a complete 20MB hard disk system that suits most PC's (including the Amstrad) and its only £299 (ex VAT). Until now Amstrad owners have had to pay as much as £650 for a 20MB hard disk system.

And following the same low pricing policy we can also supply RAM cards, graphics cards, multifunction cards and tape streamers - all for less than you'd expect.

Simply put, our prices are the lowest you'll find anywhere, but we don't expect you to take our word for it. We want you to look around, compare prices and see for yourself. To order the Kudos HarDisk 20 or to find out more about our product range complete the coupon below or ring 01-200-6511. Sorry we can't help with the rubber ducks.

If you're a government department, education authority or PLC, just send us an official order and your goods will be despatched on the same day.

If you're a dealer and would like a Dealer Datafile call Grant Bisher on 01-200-6511.

For Kudos Systems Ltd, 72 Capitol Way, Edgware Road, London NW9 0EW. Please rush me:

(Qty) Kudos HarDisk 20 at £299 + VAT + CARRIAGE

I enclose a cheque for £

My computer is (please state make and model)

Please send me your latest information pack ☐

Name _____

Company _____

Address _____

Postcode _____ Telephone _____

KUDOS
Systems
LIMITED

Kudos Systems Ltd
72 Capitol Way
Edgware Road
LONDON
NW9 0EW

Tel: 01-200 6511
TLX: 8813241
Fax: 01-205 3911

Personal Callers
Welcome - Call in
and save on delivery
charges.

KUDOS
Systems
LIMITED



All tradenames and product names are the property of their respective manufacturers/owners.

If you're a government department, education authority or PLC, just send us an official order and your goods will be despatched on the same day. If you're a dealer and would like a Dealer Datafile call Gary Munz on 01-200 6511.

Kudos Systems Ltd
Capitol House
Capital Way
Edgware Road
London NW9 0EQ
Tel: 01-200 6511
TLX: 8813241
Fax: 01-205 3911

Personal Callers Welcome -
Call in and save on delivery
charges.

Are we quackers?

Last month we ran the advertisement opposite and it certainly generated a lot of orders. Many people asked if we could supply 30MB hard disk drives.

The answer is yes.

We are now able to offer exactly the same package but with the massive storage capacity of 30MB (The equivalent of over 80 floppy disks), at the same price! — **£299 (ex. VAT).**

The Kudos HarDisk 30 includes: Seagate ST238 30MB hard disk drive (65-85ms access time), Western Digital half-size controller card, manual, connecting cables, utility disk and, of course, our 12 month no-quibble guarantee.

For Amstrad PC1512 owners a mounting bracket and modified front bezel are included in the package at no extra cost.

To order the Kudos HarDisk 30 (ex stock) or to find out more about our product range, complete the coupon below or ring 01-200 6511.

To: Kudos Systems Ltd, 72 Capitol Way, Edgware Road, London, NW9 0EW

Floppy disks don't fit the bill — please rush me:

(Qty) Kudos HarDisk 30 at £299 + VAT + Carriage = £357.65

I enclose a cheque for £
number

or debit my VISA card

My computer is

(please state make and model)

Please send me your latest information pack ☐

Name

Company

Address

Postcode

Tel

THE WEST COAST CONNECTION



Rumour is rife in the corridors of Apple that the production of a portable Macintosh is now in the hands of researchers. Tim Bajarín reports on the latest happenings in the American computer industry.

A portable Macintosh in the lap of research

For a long time now, Apple Computer has been watching the development of the laptop market and looking into making a version of the Mac that would be portable.

Apple officials to date have said that the technology is not available to make a portable Mac, but company insiders say that Apple is stepping up its research in this area and it could have a portable Mac in the marketplace by March 1988.

According to these sources, Apple has been talking with Epson about its new flat-panel screen: a full 80x25 lines, high-resolution screen that resembles a gas

plasma display.

Apple is also reportedly talking with Datavue and looking at making its Keystyle 80 keyboard a part of this new Mac.

Apple is very aware that companies like Dyna, Colby and Intellitext are hotly pursuing the 'portable Mac' concept, and may well have machines on the market by the end of 1987.

The key here will be Apple's continued agreement to license the ROMS to outside developers as they have with Dyna.

If Apple wanted the portable Mac idea for itself, it would just have to

discontinue letting these ROMS go to other developers.

But these Apple sources believe Apple will continue to license these ROMS to a select group of developers, while stepping up its own launch plans.

Because of Apple's manufacturing capability, the company could easily underprice all of the competition, and in fact control the entire portable Mac market. Although there are people who would kill for a portable Mac, the real issue in the long run will be price. Apple would have to sell this product at around

the \$3495 mark, and have a pricing parity with products like the Toshiba T3100.

The laptop market is very large, and no doubt Apple will eventually play a large part in it.

● In other laptop-related news: Hewlett-Packard will soon release a new 80286-based laptop. It is reportedly equipped with a new colour LCD screen that has been getting rave reviews when shown to beta test sites.

Also, IBM is reportedly working on its own 80286-based laptop. It is supposed to come out as the Personal System/2 Model 15, and be introduced by the Autumn.

Also, look for Compaq to bring out an 80286 laptop by the end of the year that looks much like the Toshiba T3100.

A dynasty in the making?

It's been over two years since Jack Tramiel, original founder of Commodore, had a major run-in with Irving Gould, then, and still, chairman of the board of Commodore.

As the story goes, Mr Tramiel wanted to get his boys more involved in the company and asked that they be given executive positions.

At the same time, Mr Tramiel felt that he had strong board support to accomplish this, and began lobbying to move others out and replace them with his own kin.

As you can imagine, Mr Gould felt that Tramiel was overstepping his bounds, and since he had more board cronies than Tramiel, he was able to fire Tramiel and force him out of the company. There has been very bad blood between these two ever since, and various suits and countersuits have been filed against each other since Tramiel left.

Although the most interesting suit, dealing with Atari's claims of ownership of the original Amiga chips, has been settled, there is still no love between these two companies.

In the meantime, Tramiel had started his own company, and then eventually folded this venture into Atari when it was offered to him.

Mr Tramiel's success at Atari is amazing. In just over two years, he has paid off the Warner debt, the firm from whom he bought the company, and has made the company profitable.

His ST computer has been very successful, and his game computers are adding daily to the company's profits. He has taken the company public and raised an additional \$30 million in capital for expansion, and no-one in the financial community is willing to bet against this durable man and his company.

On the other hand, Commodore Computer has a debt of over \$100 million still outstanding with the banks, and although the company has been barely profitable for the last two quarters, its position is very shaky.

The key figure in the Commodore success formula had been Thomas Rattigan. This former PepsiCo executive had taken the company and given it solid



An Atari family affair: Jack Tramiel and sons

strategic planning and product stability. The banks liked him as well; unlike Irving Gould, known as a hard-nosed businessman who can only be in his New York offices two days a week due to his US resident status. The banks are less favourable to him, and preferred the style and stature of Rattigan to Gould.

But, two months ago, Gould also felt threatened by Rattigan's continual rise in company power, and got the board to fire him. Although some new senior management has been brought in, this firing will cause Commodore to lose valuable time in its attempt

to keep the company alive.

Commodore's Amiga is technically a sound product, but its price and position has made it a failure to date.

While Atari has over 900 software packages for its ST, Commodore has less than half of that available for the Amiga. Add to that Commodore's attempt at the low-end PC market with models that sell well in Europe, but have been a disaster in the US market.

Although the new version of its model 128 has picked up some market steam, the recent US price cut by Atari now means the entry-level version of its model 520 ST, without a monitor, will sell

THE WEST COAST CONNECTION

for \$199 (if a disk drive is bought at the same time), allowing it to go head to head with the 128. If the two machines were compared, users would no doubt opt for the ST over the 128.

A few months back, Silicon Valley rumours had it that Jack Tramiel was convinced that Commodore was about to go under, and was interested in bailing Commodore out by offering to merge the two companies into one.

Although this may be more fiction than fact, this possible new pricing by Atari, which pits the ST against Commodore's bread and butter product, the Model 128, could be the straw that breaks the camel's back. While Atari could gain important market share with this tactical move, Commodore could be left holding the bag (and its inventory).

Regardless of whether Tramiel tries to go after Commodore or not, many feel that Commodore's only salvation will be to sell out to someone who could offer the banks a solid guarantee, and give the company some capital to remain a serious player.

Since this is just mid-year and the squeeze is not quite here yet, Commodore has a chance to prove its worth and viability but it is at its most vulnerable point. It would not be too surprising to see some corporate raiders make a charge for this battered company.

The game's on

In 1985, when the market for home computers began to dry up, so did the market for computer game machines. The pundits at that time declared those two markets dead, never to rise again.

Well, it looks like the pundits were wrong again.

The hottest market in the States today, besides business computers, is that of dedicated game machines. Companies like Nintendo and Sega are selling their computer game machines for \$125 a pop — and they are selling like hot cakes.

At the same time, game cartridges for these machines, selling at \$25 to \$35 a piece, are also hot items, and both companies are bringing out at least three new titles a month.

This market has been one of Atari's staples over the last three years, and has kept

Michael Dell's star rises to the mail-order challenge

One of America's fastest-rising business stars is Michael Dell of PC's Limited. This 22-year-old

entrepreneur started to buy parts for PCs and assemble them in his college dorm, and then go and peddle them to local businesses.

He would literally take orders from his customers for the type of PCs they wanted, then call an order into a parts supplier in Dallas, fly up to Dallas, get a car and trailer, bring them back to Austin, Texas and assemble them. And he was soon making between \$30,000-\$40,000 a month.

Dell felt that the way to go would be to develop a mail-order business, and, as a result, PC's Limited has gone from an enterprise with \$500,000 yearly revenues to over \$70 million in just three years. He has brought in



Success story — Michael Dell, boss of PC's Limited

senior managers to assist him and has recently cut a contract with Honeywell/Bull to service his machines nationwide: he will provide buyers of PC's Limited's products with a full one-year warranty on the machines.

the company afloat.

Why this resurgence?

When the home computer market began to falter, the serious players like Texas Instruments, Fairchild, Atari and Commodore began shifting gear and moved away from these game machines. TI and Fairchild got out completely, while Commodore and Atari went after the more powerful markets with the Amiga and the ST. But, although a PC approach to this game market also gives the user more versatility, the bottom line is that games are more for kids than adults.

So, while parents would buy PCs for their personal use, they would find that they would have to share it with their kids — who in many cases dominated the PC usage time.

In Silicon Valley, where some 20 per cent of homes have personal computers, a survey has shown that kids are very rough on the keyboards and mice and, since the average PC costs around \$1500, many parents have started buying the kids their own game machines.

At last year's Consumer Electronics Show, there were only 11 manufacturers of home- or game-type products. By comparison, this year's show, held May 30-June 2, had over 40 related vendors. As prices of these game machines come down, watch out for this market to take off.

If you compare PC's Limited's revenues to IBM's, Apple's or even Compaq's, the company would still be considered a small player. But, as friends of Dell's point out, don't sell him or his company short. He is a hard-working, bright businessman, and although very young, he has the makings of being a real business tycoon.

He is about to launch a PC's Limited sales effort in the UK selling under the Dell Computers name, and is looking closely at the German market as well.

PC's Limited is an up-and-coming computer manufacturer. It is a company that will show the big guys that the market is 'very big' and there is still room for smart players to make it 'big' in their own way.

Apple design

If you are one of the 2.5 million owners of Apple II computers, you may be feeling excluded from the desktop publishing revolution as there is little DTP software for the Apple II. This situation is about to change.

Data Transforms is due to release shortly its Printrix 1.0, giving Apple users desktop-publishing-quality print and page design. Priced at \$65, it is a real bargain for Apple II users.

The Apple version runs under ProDOS on the IIe, IIc, and IIGS, and supports more than 100 printers and 40 printer interface cards.

Features include direct printing of text files from AppleWorks, Apple Writer and Word Juggler and merging graphics into text stream.

Graphic files accepted include Fontrix Graphfiles, single-high-res-screen graphics, and Print Shop-style, four-sector clip art.

The basic Printrix package comes with 30 fonts and companion Fontpak disks can be purchased separately.

Two other companies, Springboard and Broderbund, will also have DTP software out for the Apple II by the end of the year.

Data Transforms is on (303) 832 1501.

Prodigious Mac

Serious Mac observers have felt for some time that the Prodigy Board had the potential of some day becoming really big.

The Mac system is very conducive to growth, and here in the US a company called Levo (on 619 457 2011) is looking at helping the new Mac SE grow up very fast. It recently unveiled Prodigy SE, a performance enhancement for the Mac SE which plugs into the SE-bus slot (internal expansion bus) and transforms the computer into a minicomputer-class workstation. This makes the SE capable of running Mac applications 100 times faster.

The board features a 16MHz, 32-bit Motorola 68020, 1Mbyte of RAM and a built-in, non-volatile RAM disk. The SE board provides an expansion bus for connecting additional internal devices. Expansion capabilities include up to 8Mbytes of RAM, a Motorola 68881 and paged memory management with a Motorola 68851. The basic board is priced at around \$2000.

With this type of performance added to the Mac's already impressive capabilities, it is easy to see how the Mac could eventually get a much stronger foothold in the corporate world and engineering market-place. **END**

A PCW without Protext is like a car with one gear.



Cars are useful. You sit down, drive away and — eventually — arrive at your destination. But some people comfortably speed along, while others don't.

The PCW is useful, too. You sit down, type away and — hopefully — produce a neat, accurate document. But some people crawl along using inferior software — while others use Protext.

Protext releases the power of your PCW. It is faster, easier and more flexible than any of its rivals.

And because Protext has been designed exclusively for the PCW, you don't need optional extras.

When it comes to text handling, Protext streaks ahead of the rest. Word search and replace is four or five times faster than rival packages can manage.

Naturally, you get full mail-merge facilities to produce top-quality personalised letters — with details read, reformatted and printed from separate files. And Protext works with any printer.

No stopping to check for spelling, either. Protext's integrated spell-checker scans your text files to produce consistently accurate, professional documents. It comes with an extensive dictionary — to which you can add thousands of your own words.

When you've seen how Protext moves, we know you'll never use anything else.

Arnor's Protext costs an economical £79.95. So if you have the words, we have the way...

Call 0733 239011 — 24 hr service



*"Accept no substitutes —
this is the word processor
for the PCW."*

POPULAR COMPUTING WEEKLY

Releasing your Amstrad's potential...

***Arnor Limited, Protext House, Wainman Road,
Peterborough PE2 0BU***

ARNOR

One good idea leads to another.



The Macintosh Plus



The Macintosh SE

And another.



The Macintosh II

In 1984, Apple introduced the Macintosh™. A computer based on the idea that people shouldn't have to work the way computers work. Computers should work the way people work.

In 1986, the introduction of the Macintosh Plus established Macintosh as the new standard in personal computing.

Which of course led to yet another great idea.

The Macintosh SE. The next step in the Macintosh evolution.

The Macintosh SE combines the same intuitive graphic interface of the Macintosh Plus with many of the technological enhancements corporate customers have been asking for.

Like a second 800K internal drive.

Or a built-in 20 megabyte hard disk with a single 800K internal drive.

The Macintosh SE comes with a full megabyte of internal memory that can be expanded to four megabytes.

There's an expansion slot to customise the Macintosh SE to your specific needs.

So you can add a card for a disk drive that lets you work with documents created on an IBM or IBM compatible PC. Or a card that enables your Macintosh SE to communicate through non-Apple networks to host mainframes.

Of course, the Macintosh SE runs all your Macintosh programs. Only faster. And, because it's a Macintosh, you'll never have to become a computer expert to use it.

In addition to the Macintosh SE, Apple proudly introduces the Macintosh II.

A computer so powerful and so flexible it challenges the very definition of what a personal computer can be. And do.

Inside the Macintosh II resides a new microprocessor. The Motorola 68020.

Which takes you through virtually every Macintosh program at four times the speed of a Macintosh Plus.

The Macintosh II also boasts a new coprocessor which enables it to perform mathematical calculations at two hundred times the speed of the Macintosh Plus.

But the biggest news is the Macintosh II's open architecture, with six expansion slots that allow you to customise your Macintosh to serve virtually any function you can imagine.

Internally, the Macintosh II offers you more memory options than a politician. From one to eight megabytes.

And although our internal forty megabyte hard drive is probably sufficient storage for most users, you can employ an internal drive of up to eighty megabytes.

The Macintosh II offers you a choice of viewpoints. A thirteen inch colour monitor or a twelve inch black and white.

Today, the Macintosh II will satisfy the needs of the most power hungry business user, scientist or engineer.

Tomorrow, it will also lead the way into startling new technologies. After all, one good idea inevitably leads to another.

Please send me more information about the new Macintosh range. Post to: Apple Computer (UK) Ltd., FREEPOST, Information Centre, Eastman Way, Hemel Hempstead, Herts. HP2 4BR or dial 100 and ask for Freefone Apple.

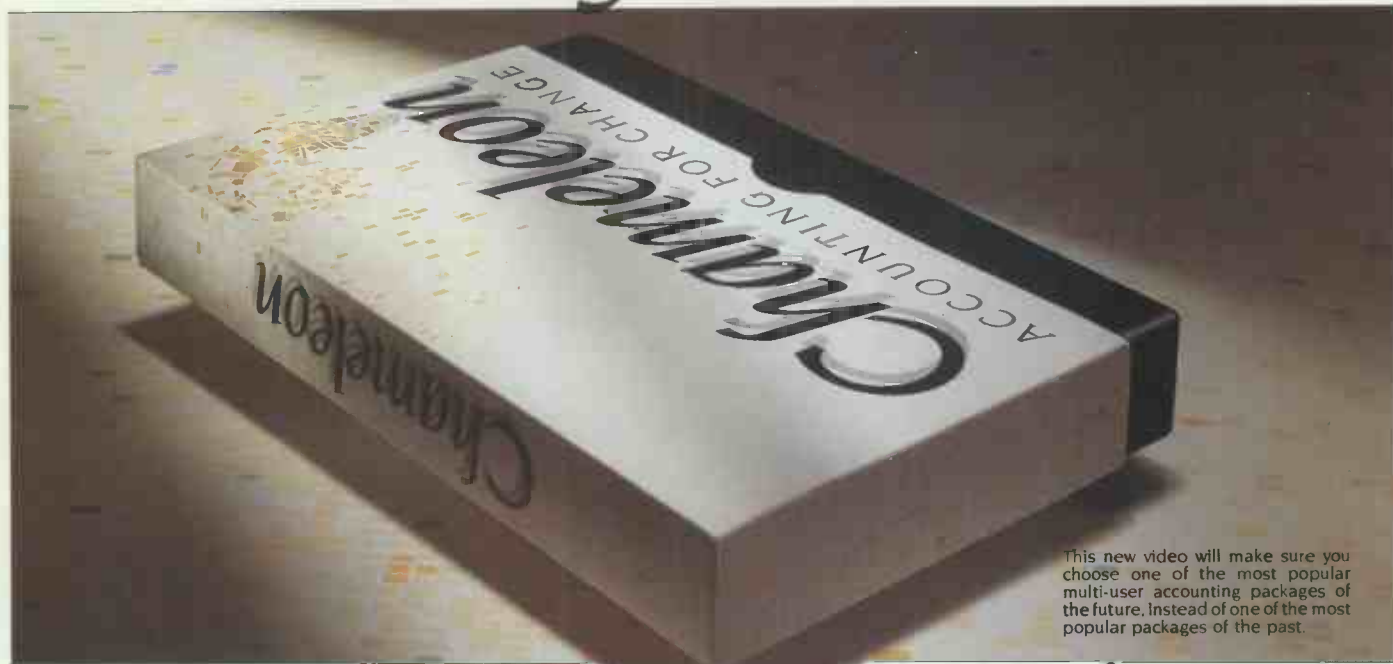
NAME	TITLE
COMPANY	
ADDRESS	
POSTCODE	
TEL. NO.	

Apple™ The power to succeed.



© 1987 Apple Computer, Inc. Apple, the Apple Logo and Macintosh are trademarks of Apple Computer, Inc. IBM is a registered trademark of International Business Machines Corp.

Unless you watch it,



This new video will make sure you choose one of the most popular multi-user accounting packages of the future, instead of one of the most popular packages of the past.

your new accounting package may turn out to be obsolete.

If you're about to change your accounting software, we recommend seeing our video first.

Because accounting software itself has just made an important change for the better.

With *Chameleon*. The most advanced and adaptable multi-user accounting software package yet devised.

Why you'll be seeing a lot more of Chameleon from now on

While even the most costly accounting packages expect you to work like a machine, *Chameleon* allows you to work like a thinking, responsive company. One where business changes by the minute, not the decade.

Instead of ploughing step-by-step through numerous menus, with *Chameleon* you can skip instantly from one accounting module to the next.

Or rapidly refer back to one ledger while you're working on another. Improving efficiency and productivity every moment of the working day.

Working in a constantly changing environment
You can change descriptions instantly.

Easily reformat reports. Create your own menus. Control workstation security and priority.

Or work in different currencies, or allow European colleagues to work in their own language, as you work in your language. And much, much more as you'll discover, when you see *Chameleon* in action on our video.

Don't change your software until you see how software's changed

Chameleon is the first accounting software that can adapt to the way you want to work now, an hour from now, and years from now.

And it's been developed by Tetra Business Systems. The company that's already created one industry standard business accounting product, Tetraplan.

To find out about *Chameleon*, use the reader reply service or phone 0494-450291. Or use the FREEPOST coupon.

You'll also receive our free *Chameleon* Information Pack. Unless you find out the facts now, your new accounting package may turn out to be an old one.

Post today to find out how accounting software's changing with *Chameleon*

☐ **Yes** Please let me have a CHAMELEON VHS VIDEO AND FREE INFORMATION PACK. I understand there's no commitment.

My current computer and model No. is

☐ I don't have a computer
BLOCK CAPITALS PLEASE

Name

Position

Company

Address

Postcode Tel

POST TO:

Tetra Business Systems Limited,
FREEPOST,
14-16 Temple End, High Wycombe,
Bucks, HP13 5BR.

NO STAMP NEEDED PCW 4

Chameleon
ACCOUNTING FOR CHANGE

LETTERS



Time difference

I refer to your article on the use of the real-time clock in the IBM PC ('Clock this!', PCW April). Throughout this article reference was made to the Hitachi 146818.

I would like to point out that Motorola designed and brought to market the MC146818 real-time clock. Hitachi was given the rights to second source this part from us. Although Hitachi may well have some penetration with IBM for the RTC, Motorola is the main supplier, with real-time clocks currently running in the three biggest-selling IBM PCs.

I would be interested to know what prompted your article to be biased towards the Hitachi chip and not that of Motorola. Did you in fact dismantle an IBM PC and find the HD146818 contained inside?

It may be of interest to you to know that the new PCs which IBM manufacture, are using an upgraded version of the original RTC, the MC146818A. Very briefly, the differences in the two parts are the result of changes made to the onboard MOTEL and chip Enable circuitry. These changes improve the bus timing characteristics, ease interfacing to the microprocessor bus and simplify the battery back-up circuitry design.

Mary Gallacher, product marketing engineer, Motorola Ltd, Glasgow

Robert Schifreen replies: I originally discovered clock chips in an Epson PC AX that I was using. I spoke to Epson, who told me that it was a Hitachi chip, and I then contacted Hitachi for a datasheet and full

specifications. Because other ATs in the office worked according to Hitachi's specification, I assumed that all the machines used the Hitachi chip. As far as I am aware, no-one had actually published an article about the AT clock chips before, and my only source of information was Epson and the Hitachi data. Had Hitachi told me that the chip was not really its, I would have passed on the information.

The same old story

When will we ever learn. Every single product Sir Clive Sinclair has introduced has suffered from the same essential problems.

His electronic products start from a bright concept and a snazzy black mock-up into which the technicalities have to be fitted. But the technology is never quite suited to its purpose because it is too cheap.

From Sinclair we are expecting a £230 machine with no external storage, no power unit and no modem. Yet Tandy currently sells a laptop with a built-in modem for £299 which is so reliable that it is trusted by the world's press for constant use.

The Tandy may have limited memory at present, but with the drop in the cost and bulk of memory, I think Tandy is overdue to include extra memory in the price.

Sir Clive says his keyboard will be silent, but if the Tandy's subdued clatter is too much for you, placing the machine on your lap reduces the noise considerably.

Once again Sir Clive is offering us a dream machine by mail-order, six months in advance or more. This means you can't handle it first, and that servicing will also be by mail.

In the meantime, serious computer dealers will have their business disrupted and

the long-overdue appreciation of portable computing in the UK will be put back further.

Diane Bailey, London NW3

Ins and outs

The PCW 'April Fool 1987' award should be given to Simon Goodwin's Computer Answers column ('Pet ports', April). Why? If you read his answer to James McNab's question about the Pet port you will find out.

Mr Goodwin seems very distressed that '1' means output and '0' means input on a user port (mainly because he finds it difficult to remember). Perhaps, Mr Goodwin, you should have found out why 'most micro firms' use this 'silly convention'. In fact, far from trying to 'make things as confusing as possible', using zero for input is a safeguard against momentary power failures, faults, rests, and so on, which usually 'zeroise' memory locations. Random output is far more dangerous than random input — see *Assembly language programming for the BBC microcomputer* by Ian Birnbaum.

Still, this is a very minor point in what is certainly the best magazine 'hardware help' page.

Graham Hill (age 16), Midlothian

Amstrad's black-out

In December 1986 I bought an Amstrad PC1512, twin-floppy monochrome monitor version, but within a couple of weeks I noticed that it had a tendency to cut out after about two hours. Dixons, from whom I bought it, promptly exchanged the whole machine but the second model had the same fault. I then phoned Amstrad (no easy task) whereupon I was told: 'Oh, you need a

capacitor upgrade.' I was lead to believe that a batch of monochrome monitors had gone out with the wrong-size capacitor on the power supply, hence the cut-out. This was mid-January. Dixons had just heard about this problem and exchanged the monitor.

After a couple of months I realised that my third monitor was really no better, although it would go for about four hours before dying. A further check with Dixons, who by now really knew what was what with this fault, revealed that I had not been given an upgraded monitor after all! On the 7 April I received my fourth monitor. This *had* been upgraded: the serial number shows that. But, in upgrading it, the screen must have been disturbed for the display was at a slight angle, inclining upwards to the right! A week later I collected monitor number '5'.

Throughout this sorry tale Dixons has been most considerate, but I wonder how many Amstrad users there are who have not run their machines long enough to notice the fault? Amstrad has not generally informed its suppliers. I know of at least one Amstrad supplier in Oxford (a specialist in computers!) who knew nothing of the problem until I told them recently. If users do not run their machines long enough they may not discover the fault until their guarantee runs out. Don't you think Amstrad should be prompted to inform its suppliers, if not its customers? Can you prompt the company?

For the record, the duff monitors are identified by having either a 7, 8 or 9 as the fifth digit of the serial number. Perhaps at least you could publish this information, but in the interest of all those who have bought the model I have, I think Amstrad should be moved to make a general announcement.

Michael Luntley, University College, Oxford

Confusion about PC-SIG

I was quite worried by the first ISD advertisements, as I confused PC-SIG with PD SIG and thought that my favourite library had gone mad! PD SIG carries most public domain software and gives a very prompt and efficient service at £1.50 a disk (if 10 or more disks are ordered — disks are £1.50 each if you need them). PC-SIG (Seltec) charges £13.80 for a single disk without the option of supplying your own.

This is certainly a rip-off, and possibly illegal; PD software is often copyright, with strong caveats against illegal profit making. The CPMUGUK library charges much the same as PD SIG, and I believe other libraries also charge about £2, setting a clear baseline. As Seltec advertises that no guarantee or personal support is given with the programs, it is hard to see how it can justify a factor ten increase in price.

I don't understand why Seltec thinks its service is legal; or why it believes the other libraries are somehow illegal. Could Seltec/ISD explain?

CW Rose, Woodbridge, Suffolk

Your letter reproduces many of the current confusions about the PC-SIG library. ISD is the distributor of PC-SIG library disks. PC-SIG holds copyright on the cataloguing, not the programs, which may be public domain or shareware. As you will read in 'Newsprint' in this issue, PC-SIG is concerned about prices and copyright of its libraries, and is making moves to reduce the cost of its disks. To be fair to Seltec, which is not the same as ISD, whatever it may be charging £12 for, at least it doesn't claim to be distributing the PC-SIG library.

Number pleas

One thing that really annoys me about your otherwise thoroughly enjoyable and informative magazine, is the lack of consistent page numbering.

It is most frustrating to be searching for a particular article or advertisement only

to find yourself amidst a series of unnumbered pages. I have in fact counted as many as fifty consecutive unnumbered pages.

Please, please, please can we have more page numbers.

David E March, self-appointed chairman of Frustrated Page Thumbers Inc, Harlow, Essex

We have a whole drawerful of page numbers here in the office, which have fallen off or failed to appear on pages. Volunteers welcome to restore them to their rightful homes.

London's burning



Further to Guy Kewney's piece on computer pollution (Newsprint, PCW May) I do know where some PCBs get burned — in the backyard of a firm which operates in Biggin Hill (London SE19: it's a street name not the Kent village).

The place is more or less opposite the houses numbered in the 70s and has wire-mesh gates. The firm has huge bonfires at the back, usually late at night, and employees have frequently locked the gates and gone off home leaving them burning. The smell is awful, and complaints to the authorities need backing up by council officials being present (which, late at night, is virtually impossible). The smoke is acrid and thick and causes a great deal of local malcontent.

Peter Skuse, London SW6

Acorn accuracy

I am sorry that such a normally well-informed commentator as Guy Kewney should have written such an inaccurate piece as he has done in the March issue of PCW, under the title

of 'The Italian job'.

The inaccuracies start in the first paragraph. Olivetti invested in the company in 1985. Since then Acorn has needed funds from no other source, let alone Olivetti, and has been trading profitably for some time. Indeed, Olivetti is currently showing a capital gain in excess of 100 per cent on its investment.

Far from provoking groans from BBC Micro owners, the interfacing capabilities that the machine provides are seen as positive benefits since they cost extra on other machines, if indeed they are available. Third parties keep on making ever more ingenious peripherals, and they wouldn't do so if people didn't buy them. Data capture, alternative I/O devices, sound, and so on, are all taken for granted by the several hundred thousand owners and significantly more users of these machines.

The Master is an extremely reliable machine, with a mean failure rate that puts it among the leaders, particularly when the usage demands of a school are considered. This fact can be confirmed by the independent quality auditors engaged by the BBC. The Master series was never seen as a stop-gap by Acorn; and, in fact, since its launch early last year, has been extremely profitable — so much so that it has enabled us to devote extra resources to our RISC-development activity. The notion that the machine has cost Acorn money obviously didn't come from our accounts department.

Whispers from echoes in boardrooms are never as reliable as being in the boardroom itself. Olivetti has no desire to close Acorn down. What it has said is that it would be quite content to see its shareholding reduced at some point in the future if it became appropriate for Acorn to raise more equity.

I am glad to see that Guy doesn't fall for the 'we should adopt the world standard of MS-DOS' argument. We all recognise that MS-DOS is a commercial standard, which is why we have a low-cost DOS add-on. But the fact is that education has more sophisticated requirements than can be catered for by MS-DOS.

As operating systems

become increasingly transparent to the user, users will only have to learn about new applications. The reason for this is that machines such as our RISC-based computer will offer the kind of power that will enable applications to be written in high-level languages, without undue concern for the operating system of the target machine.

Michael Page, corporate communications manager, Acorn Computers Ltd, Cambridge

Yes? No.

Remember that computer (the Philips:Yes) that was heavily advertised, reviewed in the computer press, was far too expensive and was never seen in a shop? Well, I know a bit about it.

In December 1986 I met someone who had been working in Austria on the MS-DOS handbook for the Yes, a good year after the ads had suggested that the machine was in the shops.

The Yes is being offered for sale to Philips' Dutch personnel. (If you remember, something with no memory, no screen and half a disk drive cost an arm and leg.) Translating a bit of paper here, it says:

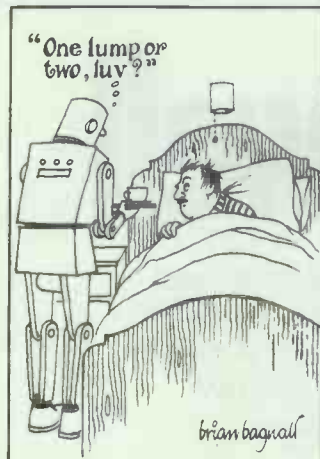
'The remaining stocks of the Philips Personal Computer:Yes, which is now out of production, are to be sold. Members of (nonamesnopackdrill) have the chance to buy this very advanced system including monitor and very attractive extras for an especially low price.'

Philips employees get: 640k RAM, 2 x 720k 3 1/2in disk drives, MS-DOS 3.1, DOS Plus 1.1, Pascal MT+, RM Cobol compiler, MS-Basic, GW-Basic, DR Logo, Turbo Pascal, Logistix, Clipper Backup, WordStar (£15 extra), GEM desktop, GEM Draw, GEM Graphics, Open Access, BIS 3270 emulator, Micro SNA 3270 emulator, Acculink, BIS 3780 emulator, Micro SNA 3770 emulator, Yestalk (a Hayes-compatible comms program) and a BM-7502 monitor.

Price? 960 Dutch Guilders including VAT (about £300).

Pity it was never sold to the public at that price. **Name and address supplied.** (PS Now to go talk to the man who sold me this roll of non-heat-sensitive heat-sensitive paper.)

More tea, David?



No article about flowcharts, expert systems or project development is complete without the mandatory example of tea- or coffee-making, and David Tebbutt's review of Pertmaster's *In Control!* in the May issue of *PCW* is no exception.

My complaint is not about Mr Tebbutt's logic but about

his tea-making. He may have used the finest software. His use of resources may veritably have been optimised. Doubtless he will have met the timescale and cost constraints of the project. But he will have failed to meet its quality constraints, for the result will be undrinkable!

One of the most important requirements of tea-making is that the water should be actually boiling at the moment of impact. How can this be achieved if the milk is put into the cup (already containing the tea bag) before the boiling water is poured on? As soon as the boiling water hits the milk it will cease to be boiling, and it will be merely hot water that strikes the milk-sodden tea bag. (Adding the sugar while the kettle is boiling is hardly going to improve matters.)

Making tea in the cup is a misguided practice anyway. And if David Tebbutt's example had featured a teapot, he could have

provided your readers with a far more interesting network diagram!

David Lewis, London N3

Driving the point home

Nick Walker, in his review of the Compaq Portable III (*PCW* May), seems rather confused about the problems of compatibility between 360k and 1.2Mbyte disks. He states: 'Even disks that were formatted on the straight PC clone were sometimes unreadable after files had been added by the Compaq.' This is hardly surprising since this is the worst possible thing to do!

The salient difference between the formats is that 1.2Mbyte disks have a track 'pitch' half that of 360k disks. When a high-density drive is used to format or write a 360k disk, the head is stepped two tracks at a time so that only the even-

numbered tracks are used. This will produce a 'compatible' disk as long as the gaps between the tracks (corresponding to the odd-numbered tracks of a 1.2Mbyte disk) are not recorded. If any signals are present in these gaps, they will be picked up by the (wider) heads of a 360k drive and interfere with the wanted signal.

To produce a disk which can reliably be read by a 360k drive, you should start with an unrecorded disk (either new or bulk-erased), format it on the high-density drive (in 360k mode) then write the data. In this way you ensure that the gaps between the tracks are free from interfering signals. Subsequent writing to the disk with a 360k drive is, of course, acceptable but you should not write to it with a high-density drive thereafter. **Richard Russell, Gravesend**

Thanks for the advice. However, no method is 100 per cent reliable.

If it's a question of style...

I was intrigued by your review of various 'style checkers' in the May issue ('Putting on the style'). While I find word processing and spell-checking to be invaluable aids to written work, I view this latest computerised incursion into the literary domain with some trepidation, and was relieved that your reviewer, Jonathan Green, concurred with me.

The concept of 'style-checking' seems fundamentally flawed. Style is such a complex and personal issue that, to my mind, no computer program can be capable of any but the crudest analysis. The FOG index is OK as far as it goes, but surely the only adequate test of readability is the reaction of a human reader. The computer's total lack of any real comprehension of a written work relegates 'style-checking' to nothing more than clever word-counting: this is not what style is about at all. While the use of one of these programs may improve readability to a certain extent, I believe it will actually inhibit the growth of an author's genuine style. For this reason, unlike your writer, I find the whole idea objectionable.

Furthermore, because people tend to believe that if a computer tells them

something, it must be true, these programs could well cause grammatical errors among those not totally confident with their English. Even your reviewer falls into this trap; the piece tested on page 147 contains two instances of a punctuation mark appearing after an inverted comma. This is correct in both cases as only a fragment of a sentence is quoted each time. Only if a whole sentence, or at least a clearly marked clause, is within quotes should the punctuation be placed before the closing quotation mark. The computer, in robotic fashion, marks both of these occurrences as 'wrong'; your writer, at least in the first case, appears to agree with it. I can well imagine some inexperienced students I have known reinforcing their poor grasp of English with these programs — religiously 'correcting' their 'errors' because the computer told them to. This makes these programs downright dangerous, even in education where the fact that they really operate only on grammar is not necessarily a limitation.

Unless we wish our language to degenerate into nothing but tedious pap with miniscule, one-clause sentences containing nothing but two-syllable words, I believe we should leave

these 'style checkers' well alone.

My style checkers are invariably human; I think their opinions are infinitely

...the human touch is best

Coincidentally, I read your review of style checkers ('Putting on the style', *PCW* May) just as I finished a review of Grammatik for BOOG (the former Osborne Owners' Group). I have been using this program for some three years.

Perhaps Jonathan Green is already an accomplished writer. I found that he has missed the point as, in referring to style checkers, he suggests that they picked up silly or not very useful points. This is because he used the directory with which they came. But the directory of Grammatik (the only one of which I have experience) is capable of being tailored to any use, particularly the needs of the user. Unlike spelling, style is a matter of taste, and if I choose to include particular points such as 'vague adverbs', it is because I am having a blitz in getting rid of 'very's' and 'rather's' which add precisely nothing to my meaning.

He is wrong in that individual error types can be included or omitted at will; and the range of categories, including user-defined types, can be created to suit individual needs. Equally, displaying to the screen and

more perceptive and valuable than any mechanical analysis. **James Fryer, Haringey, London N4**

waiting for Return to be pressed on errors, are fully user-definable through the configuration screen — or better still, in the configuration file.

The other error of fact is that, contrary to Mr Green's statement that Grammatik picks up only single words, it will pick up phrases in which every word is spelt correctly, but which is otherwise wrong. A simple example would be 'can not' in place of 'cannot', and more complex phrases like 'under the circumstances' can be detected and reported.

PCW is usually excellent in its use of English, but even you sometimes include an 'it's' when you mean 'its'. Grammatik would at least alert the author to this common error.

In short, people working on their style, like me, can benefit from these 'style checkers'. The reports, however limited, make us think how we could write more clearly; and, by including good advice from Fowler and elsewhere, keep us improving! **Michael J Davis, Rochdale** (*Our production editor is insistent that 'it's' and 'its' are always used correctly in PCW. Ed*) **END**



BANKS' STATEMENT

Fond farewell

With the launch of IBM's Personal System/2, and the company's aspirations towards corporate mainframe success, has the company set a new standard for other manufacturers to follow?

Martin Banks assesses the situation.

There is certainly one thing you can always say about IBM. Once that company decides to stick its toes in the water, it somehow manages to stir it up so much that no-one can see clearly for months afterwards. It did it once before, you will remember, with the launch of the PC. In April, it did it again with the announcement of the Personal System/2.

It has been interesting to read through all the information IBM handed out on this machine. (At the time of writing, I am still reading. Never let anyone tell you that IBM never says anything about new products. When the information comes, it can be quite an arduous task to wade through it all.) It has also been interesting to read some of the initial responses, especially from the compatible-and-clone makers.

Olivetti, for example, promptly said that it was 'underwhelmed' by the announcements, and felt that there was nothing in the new Model 30, Model 50, Model 60 or Model 80 that Olivetti hadn't already done or couldn't clone quite easily. Compaq expressed similar opinions.

This may well be the case, but I suspect that we will find, when the waters have settled (at a time not totally unrelated to when the machines themselves start to appear) that IBM has actually moved the game somewhere else. It is possible that, despite keeping the PC/XT and AT going as current products, IBM has kissed the old PC market a fond farewell. And with that act, it will have also kissed the compatible-and-clone-makers goodbye as well.

The reason, if I am right, is quite simple. Compaq, Olivetti *et al* can clone the new machines as accurately as they like. With MS-OS/2, they will even have a close resemblance to the currently promoted operating system. All that will be as nought, however, for they will not be able to clone one vital factor — the typical IBM customer.

Big Blue has always been after the

big, corporate market-place, but over the last few years it has lost its sense of direction. The PC took it down a tangential route. It had sufficient importance to the corporate user, however, to remain a significant product for the company. But it was a digression, nonetheless. IBM also failed to develop a coherent environment across its product range, which meant that users could not grow from a small IBM machine to a bigger one without major changes and upheavals.

This didn't matter when no other computer company offered such an environment, but when Digital Equipment announced the VAX family running the MVS operating system, users suddenly had that option. An examination of Digital's balance sheet, compared to IBM's, shows how popular the idea has proved.

But do you, as a personal computer user, want to know about mainframes and minicomputers? These days perhaps you should, for this is what lies behind the IBM Personal System/2 family. The customers IBM wants to sell to want to buy IBM if they can. Now they *can*, for that is what these machines are all about. They are the new, far-reaching fingertips of a coherent product family with mega-mainframe systems sitting at the top. That is what corporate customers want, and it is what the likes of Compaq and Olivetti cannot provide — even if they *can* clone the hardware. And then, can Microsoft clone the software for them?

This may seem a strange question as Microsoft has been working with IBM to produce OS/2 and will be launching a generic version, MS-OS/2, when the IBM system comes out. This is not necessarily the important point, however, for I suspect that OS/2 may not be the important operating system for IBM.

I have written here before about how Unix could take over from DOS as the next generation operating system, and that perhaps IBM's own version, AIX, could prove interesting.

I now think this is about to happen.

AIX is a real bells-and-whistles version of Unix, and is already available on IBM's 6150 RT/PC. It was not made immediately apparent at the PS/2 announcement by IBM, but this operating system is also to be made available on the top-end machine, the Model 80. If, over the years, you have grown to understand the peculiar semaphore of nods, nudges and winks which constitutes real communication with IBM executives, this same operating system will appear on mainframe machines at some time in the future.

There are several things which should be understood about AIX. Firstly, it is available, which is more than can be said about OS/2. Secondly, it offers users more facilities than OS/2. In particular, it is said that the Model 80 variant will allow direct multi-tasking of existing MS-DOS applications. This will be done by running them as DOS 3.3 tasks, with AIX controlling their operation and providing all necessary inter-task communications.

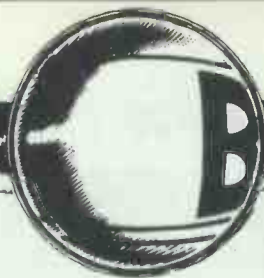
This is what many users want, and is more than is possible with even the extended version of OS/2. It must be remembered that the first version of OS/2 does not have things like the Presentation Manager windowing system and can run only one MS-DOS task at a time, in 'go-faster PC' mode. If users want multi-tasking, then they must change their applications software to the specific OS/2 versions.

The last thing about AIX is that it is IBM's own system. It should take little guessing as to which operating system IBM will favour, long-term.

And if this all happens, the PC market as we know and love it could start to disintegrate as each of the other main players tries to take over the leadership role vacated by IBM. They will all, inevitably, try different ideas to gain market leadership; and will, equally inevitably, divide and dismember the loyalties of their long-suffering end-users.

END





BENCHTEST

Atari DTP

The Mega ST range represents the pinnacle of ST design to date with lots of RAM, fast graphics and a mature operating system. And Atari has high hopes for this series in the desktop publishing market. Nick Walker and Owen Linderholm evaluate the Mega ST4 and two contenders for the DTP 'crown'.



The Atari 1040ST was proclaimed a bargain in 1986, offering 1Mbyte of RAM for less than a thousand pounds. One year on and Atari is offering a new range of STs with twice that amount of RAM for the same price. The new Mega ST range is Atari's renewed attempt to establish the ST as a serious small-business computer, one of whose target markets is desktop publishing (DTP). Atari intends to poach potential Apple Macintosh DTP purchasers by offering an equivalent system for considerably less cost. On paper the Atari ST looks good against the Macintosh with a higher-resolution white screen monitor, two or four times more RAM and similar processing power. The success of Atari DTP packages depends on the price of Atari's laserprinter, the quality of the software offered for it and the public acceptance of the Atari name as a purveyor of business hardware.

We were privileged to take an early look at both the Atari laserprinter and the 4Mbyte Atari Mega ST4. To gain an insight into the potential of Atari DTP we also took a look at the two leading packages — Fleet Street Publisher from Mirrorsoft and Publishing Partner from Softlogik.

Hardware

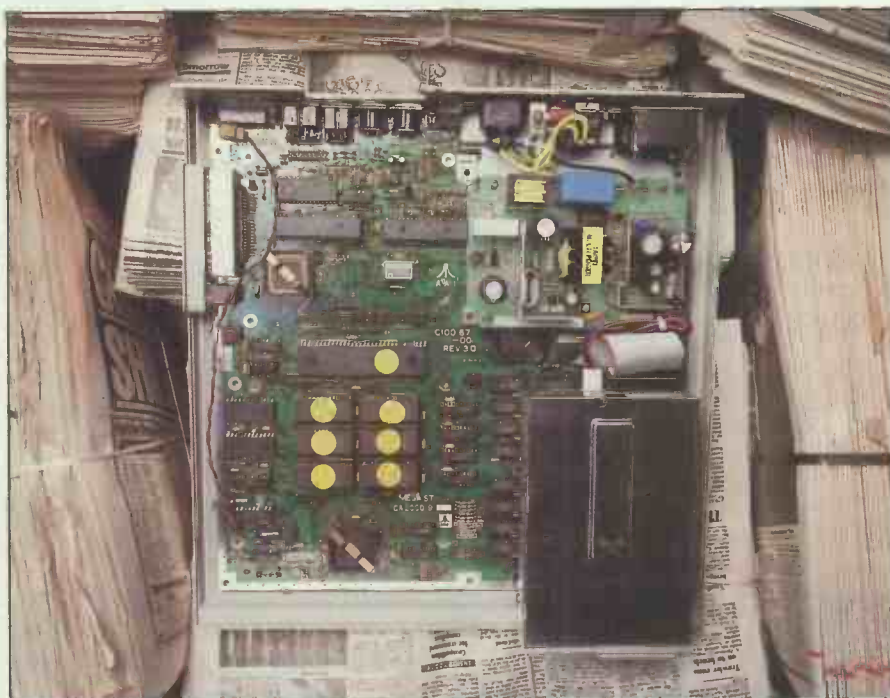
The Mega ST does seem delightfully small, even though the footprint is larger than a 1040. I'm so conditioned to an IBM PC-size box that the Mega ST seems positively minute in comparison. Not having to accommodate IBM PC-type expansion cards means that the Mega ST has a very low profile — being only two and a half inches high. The 'high-tech' slanted function keys, LEDs and light grey colour scheme have been maintained on the Mega which gives it the ST family look. I must admit that when the new Atari 'tilt and swivel' monochrome monitor was mounted on the machine it did look suitably professional.

Like its predecessors the Mega ST is positively bristling with ports. Looking at the back of the machine it has the following: 25-pin RS232 serial port; parallel (Centronics) printer port; MIDI in; MIDI out; video out; external floppy disk drive port and a high-speed DMA (Direct Memory Access) port. Also to be found on the rear of the machine is a reset switch, power input, the fan outlet and an 'empty hole' with a panel over it labelled 'expansion'. On the right-hand side there is a recess that contains the cartridge port (up to 128k of ROM) and the keyboard socket. The only other external features of interest are the two joystick/mouse ports at the rear of the keyboard and the floppy disk slot on the front of the system unit. The internally-mounted fan is very noisy for its size.

The heart of the Mega ST is a



The Mega ST4 contains a very comprehensive collection of ports compared to the 1040ST — the only difference is the addition of a fan



For a prototype machine the Mega ST4 is very well-finished. The gold-edged chip to the left is the blitter — the fifth of Atari's custom chips

Motorola 68000, true 16-bit processor (16-bit external address and data lines, 32-bit internal word size) driven at 8MHz. I was disappointed to see there is still no socket for the Motorola 68881 maths co-processor. In answer to the reader who wanted to know why I was enthusiastic about the 68000, its use of a maths co-processor is a perfect example of the Motorola's superiority over, say, the Intel range of processors. Add a maths co-processor to a Motorola system and all software makes use of it; an Intel co-processor will only work with a small proportion of the available software and then only when re-configured. Five large cus-

tom chips perform a lot of the tedious memory manipulation leaving the processor free to get on with its number-crunching. They are not named as on the Amiga but generally their functions are: bus organisation and processor support; graphics processor; blitter and DMA.

RAM on the Mega ST4 is 4Mbytes made up of 32 1Mbit DRAM chips with a refresh rate of 120ns. Previous STs were limited to a maximum of 4Mbytes, addressable RAM due to the way the hardware memory management operated. The new memory manager chip found on the Mega STs removes this limit and allows RAM to be expandable to the 68000's

Atari laserprinter

The laserprinter supplied with the review machine was a prototype but I was assured by Atari that it was a prototype of the model the company would be selling in Europe. The engine of the Atari laserprinter is a TEC, which is a Japanese engine that has not been used in any printer other than TEC's.

For Atari the printer has been re-boxed and much of the internal circuitry has been removed. It is both smaller and lighter than the majority of laserprinters, but even so it's an imposing box that dwarfs the Mega ST. Along the front there is a row of five graphic LEDs signifying: printer online and ready; printer not ready; toner low; paper jam and paper out. Below the LEDs there is a paper tray capable of taking 150 sheets of paper up to foolscap size, but no bigger. Once printed the paper lands face down on top of the printer and so keeps the original printing order.

Otherwise the printer is fairly boring to look at — there is a Centronics-type port on the back and a number of catches to get inside.

The most significant difference between the Atari laserprinter and similar products is that practically all the internal memory and processing power of the printer has been removed. The usual method of sending data to a laserprinter is in some form of code (Postscript and DDL are examples that use graphics; Epson and Diablo codes are frequently used for text only) and then the onboard processor and memory within the laserprinter will convert this into bit-image, for printing.

On the Atari system all the page definitions need to be done within the ST and sent down to the laserprinter pixel by pixel, which at a resolution of 300dpi (dots per inch) will take a lot of processing power and memory. Not surprisingly the Atari laserprinter will only work with 2Mbyte or 4Mbyte STs and even with my simple experiments it took up to

15 minutes to calculate a graphic image before printing. Atari claims an eight pages per minute output for the printer, but even a simple page comprising just one dot could only be produced at four pages per minute.

The other problem that Atari has created for itself is the 1.5Mbytes of data that needs sending down a wire to the laserprinter. An ordinary Centronics printer port would be too slow, so Atari sends the data down the DMA channel. Normally data sent down the DMA channel is not meant to travel more than about three feet, so Atari supplies a converter box to amplify and buffer the data. An additional problem is that switching off the laserprinter while it is connected to the DMA channel will cause the ST to crash.

The port on the back of the printer looks like a Centronics but is in fact a custom port with a different pin-out. Connecting it to an IBM-compatible as a standard Centronics proved to be a trauma which it took the laserprinter half an hour to get over. Atari claims that the final model will have two ports, one for Centronics and one for Atari DMA. I couldn't find anyone at Atari who knew how much memory was left on the laserprinter's PCB but my rough calculations with pure text files suggest it is about 2k.

Laserprinter manufacturers claim there is a lot of difference in print quality between an expensive laserprinter and a cheap one. Well, all I can say is that I can't tell the difference — the print quality of this cheap Atari printer is to me as good as that of a £5000 Apple Laserwriter. A colleague of mine who is familiar with most of the commercially available laserprinters was also unable to tell the difference.

The prototype nature of the review model meant that the page counter was disconnected, the socket was badly soldered in place and there was a true Centronics port dangling within the machine. All these problems will, I'm assured, be sorted out. However, the engine will remain the same and it is this that gives cause for concern. It is all too easy, when replacing the toner cartridge to misplace it and spill toner over the printer. Also the drum is too accessible and could be damaged by both fingers and light if the printer were left open for any length of time. The most worrying problem is that when the printer is open, pressing one of the side catches will cause the toner cartridge to fall, which could seriously damage the printer. There are a lot of warnings of this problem both on the printer and in the manual; even so, I say proceed with extreme care.

Print Engine

- o Electrophotographic
- o Semiconductor Laser
- o 300 dpi Horizontal
- o 300 dpi Vertical
- o Letter, Legal, A4
- o Transparencies
- o Auto or Manual Feed

Shifter
(data)

MCU
(control)

A sample of the laserprinter output produced using EasyDraw 2



The laserprinter looks nice but the insides are cut-down to the minimum

maximum of 16Mbytes. This new chip will not be made available to existing ST owners. It was nice to see that the RAM chips were socketed allowing this expansion to be internal when 4Mbit RAM chips become generally available. ROM on the Mega ST totals 192k containing the BIOS (basic input/output system); ABIOS (advanced BIOS); TOS and GEM (Graphics Environment Manager from Digital Research).

Getting inside any Atari computer is not an easy job due to the excessive amount of metal shielding needed to conform to FCC radio interference regulation. Removing the outer plastic cover was easy, but then I was faced with a metal box covering the entire PCB and held with about twenty metal tags.

Carefully twisting the metal tags with pliers took half an hour, after which all I needed to do was disconnect the floppy disk drive from its mountings. Having removed the cover I soon realised why Atari makes it so difficult to get inside — to the back right of the PCB is a totally exposed mains-driven power supply capable of delivering a hefty 240 volts if still plugged in.

No-one at Atari had mentioned a real-time clock for the Mega ST, so I was surprised to find a battery carrier in the outer case and a wire leading to the PCB. I plugged in two batteries and it worked fine, although access to the battery carrier is very awkward without removing the outer cover.

In the middle of the board there is the pin-out of what on earlier machines was once a slot designed to take an expansion card. A phone call to Atari confirmed that this is still the case. Apparently someone at Atari had forgotten to solder the socket onto the review machine. At the time of writing the configuration of this slot is still undecided — it will give full access to the internal bus as well as access to other areas such as the cartridge port. Expansion cards that need to talk to the outside world

can do so by removal of the plastic cover on the back of the case. Despite the incomplete specification there are already some American add-on manufacturers developing internal modems and hard disks for this socket.

The disk drive in the Mega ST is a standard 800k, 3½in floppy taking a double-sided, double-density floppy disk.

The monitor supplied with the review machine was the 640x400 pixel 'paper-white' monochrome model. This is now packaged in a tilt and swivel casing which makes it a lot easier to position. Owners of existing 520/1040 STs will also appreciate this, as it lifts the monitor clear of the back of their machines. The screen quality is quite acceptable but not as clear or as bright as the screen of, say, an Apple Macintosh.

I was hoping to praise Atari on improving its reliability record, as the number of readers complaining of continually failing systems has dropped. Unfortunately, the two monochrome monitors supplied with the Mega ST failed in exactly the same manner after about six hours of constant use.

The keyboard on the Mega ST4 is identical to that of the Atari ST consisting of 96 keys comprising ten function keys across the top, a numeric keypad to the right, the main QWERTY section on the left and some cursor control keys between the two. For a low-cost keyboard it feels well-made and is pleasing enough to use, although I prefer a positive key click such as on IBM keyboards. A mouse comes as standard with the ST and is the only way of driving much of the available software. Atari will also sell an external Mega-style 20Mbyte hard disk.

Software

The operating system supplied with the Mega ST is called TOS (Tramiel Operating System) and is in fact a version of CP/M68k. However, for the ordinary user, the only way to access

this operating system is via GEM, a WIMP (window, icons, mice and pull-down menus) environment from Digital Research. The operating system is now in ROM so that switching on immediately takes you to the GEM desktop.

TOS has gone through numerous revisions with each new ST machine and is now a fairly robust operating system. For those interested in such things the changes in this latest revision include better support for the blitter chip and correction of the bugs that caused the RS232 and VT-52 emulation to crash.

Also the new TOS has been designed to work with the memory management schemes of both the old ST and the new Megs. Rumours that the access and read times of disk drives have been improved with this version of TOS are untrue.

The only visible difference between GEM on the Mega and GEM on the earlier machines is an extra entry to the 'options' menu on the GEM desktop. This allows you to switch the blitter on and off for programs that are either incompatible with it or too fast with it switched on.

Obviously there was no application software designed to work specifically with the laserprinter. The software houses I spoke to said as soon as they were convinced that Atari had truly decided on a specification they would produce drivers for it. The picture is also complicated by the fact that Atari will be using a Ricoh engine in its laserprinter for the US market. In order to use the printer Atari has produced a GEM GDOS driver which operates via the GEM utility 'Output'. This takes a GEM metafile and uses the full resolution of any output device available for it. The only two applications that we could find that produced meta-files were CAD 3D from Antic software and EasyDraw from MiGraph. I'm sure that the number of applications that will produce metafiles will increase with the advent of the laserprinter.

Atari desktop publishing packages

Publishing Partner

Publishing Partner is a desktop publishing program for the Atari ST. It was designed with the ST in mind and the authors took one and a half years to research the program with typesetters and printers. The program was announced at almost exactly the same time as Fleet Street Publisher and the two programs are natural rivals. Publishing Partner has been available in the United States for a short time and has been well-received there.

Desktop Publishing on the Atari ST

is a very big topic at the moment with the advent of the Atari laserprinter and SoftLogik is obviously aiming to have Publishing Partner become the official Atari DTP package.

Given this situation, it is hardly surprising that there will be some difficulty in getting users to purchase a desktop publishing program until the Atari laserprinter is in the shops or until Atari endorses one or more products.

SoftLogik has solved this problem to some extent by providing comprehensive support for dot-matrix printers. Not only does the company

supply drivers for any dot matrix you can name, but if it doesn't already have a driver, it will write one for you. The big problem with dot-matrix printing for desktop publishing is that the print quality is not good enough for quality output. SoftLogik has to a large extent got around this problem by driving dot-matrix printers to the very limit of their capability and producing dot/pixel densities of up to 240x216 dots per inch on 9-pin printers and 360x360 dots per inch on 24-pin printers. This last resolution is in fact better than most laserprinters, although the actual

VERSION 2

FOR IBM PC/AMSTRAD 1512

FOR IBM PC/AMSTRAD 1512

Now Zorland C is even more compatible! It is probably the most up-to-date ANSI standard C compiler on the market today! Why waste hours waiting for programs to compile! ZORLAND C is 3 TIMES FASTER! Even major companies like IBM, XEROX and FUJITSU use ZORLAND C!

Environment! Our new environment is truly amazing! Gives TOTAL control! It's a wonderful way to program in C! Compile in memory! Edit FIVE files at once! Keyboard Macros! "123" style menus! On-Line Help! Compiling C programs has never been so easy!

takes you step-by-step into the World of C! Start with the "idiots" guide and then (hopefully!) — move on! Build-up to the more advanced features! Lots of examples! Over 210 functions explained! Write your own libraries!



Only
£29.95!
LODGING INTERNATIONAL

NEW! ZORLAND WINDOWS gives your program that professional look — just like "Framework" and "123"! Fast Exploding and Zooming windows with automatic saving and buffering in memory. "Pop-Up" and "123" style menus — comes with fantastic demo progs and 50 page manual! **FULL SOURCE CODE!** Only £29.95 + vat!

NEW! **ZORLAND OPTIMIZER!** will "fine-tune" your progs during compilation by running a **THIRD** pass to **OPTIMIZE** your code using state-of-the-art "Global Optimizing" techniques found only on mainframe C compilers! Now you can squeeze that last ounce of speed out of your code! Does **NOT** replace assembly code! — Does **NOT** replace good programming! **Only £29.95 + vat!**

Now ZC Users have their own monthly magazine containing articles on a whole range of topics for ZC enthusiasts! You can submit an article for publication with the opportunity of winning a £250 prize for "Article of the Month". Each issue contains at least 30 pages full of interesting articles for C programmers!

★ ZC USER GROUP! FREE!
Subscription to ZCNEWS gives you free membership! Here to help you get technical support and quality control that you need! Telephone hotline provided for members who need to talk through any problems.
ZCNEWS/ZC USER GROUP £15.75 p.a.

C Primer Plus — £19.95
This 500 page book from USA is highly recommended for those new to C! It takes you through the basics in an easy to follow, easy to read, enjoyable style. It has many example programs that utilize sound, graphics and disk files.

Advanced C Primer — £19.95
This 500 page book starts
where most other books stop! It
gets right down to the nitty
gritty of File I/O, PC Memory,
BIOS & DOS calls, Graphics
displays and integrating your
Assembly Language routines
into your progs.

Save £300!

TECHNICAL SPECIFICATIONS — POWER PACK — A complete FULL K&R specification C compiler with ALL the UNIX V extensions and ANSI enhancements! Supports & emulates 8087/80287 maths co-processor, assembly language interface, Compact, Small, Data & Large models, includes FULL SOURCE CODE to the library, over 210 functions! Including trigs, fast screen access, disk sector read/write, dos/bios calls, interrupts, etc. 64 bit precision. MS-LINK compatible linker and librarian are included together with many UNIX programming utilities like MAKE and TOUCH. Powerrrrrrrfull!!!

BENCHTEST

per cent to 999 per cent. You can also have the program display rulers along the edges of the window, show a grid over the page, show column outlines, pictures and even text-routing paths.

The 'Style' menu controls text styles from normal through outline to upside down via all sorts of other options. All of these can be used in combination. The menu also controls fonts and point sizes. Then comes 'Format' which is a catchall for the various other facilities available. You can control super- and sub-scripts from it and their spacing relative to normal characters. You can also convert marked blocks of text to upper or lower case; justify blocks as left, centred or right; switch justification between character and word; alter margins; adjust line and character spacing and control manual kerning and hyphenation. Unfortunately, automatic kerning and hyphenation are *not* available.

The final menu is 'Edit'. This lets you delete, search, replace, copy to and from a buffer and control an insert mode toggle. It is also possible

control a whole range of functions. Unfortunately, the operation of the program does not always live up to the promise of all these features. In particular, text layout can be very peculiar. One of my tests of the program was a simple three-column layout on A4 paper of a shortish story along with a picture and a large headline in a greyed box. Since the story was quite short and I wanted it to fill most of the page, I increased the point size and varied the fonts until the story filled most of the page. Unfortunately, this led me to further problems. The spacing between characters now varied wildly from line to line. To solve this, I adjusted the character spacing but was unable to get the text looking right. One thing that did solve the problem was to set the text range left rather than justified. However, this seemed rather backward since the program should be helping you to overcome restrictions, not creating them.

The graphics layout commands were fine, although it would be nice to see some way of importing GEM files so that object-orientated dia-

vered the operation of the program comprehensively and had several hints and tips on use. The manual was produced using Publishing Partner itself and an Apple Laserwriter. However, if you look carefully, you can observe the character-spacing problem even in the manual.

The documentation also included several additions to cover upgrades and it is obvious that SoftLogik provides a thorough support service.

Conclusion

Publishing Partner is a very interesting program and ideally demonstrates the power of the Atari ST, especially in terms of printer fonts. However, it suffers from a lack of completeness and sophistication, as is common with early versions of advanced programs for relatively new machines.

The potential is there, in combination with the Atari ST and hopefully the Atari laserprinter, for a powerful desktop publishing package at a very low price. To achieve this, SoftLogik will have to put right some of the omissions and faults.

Publishing Partner especially needs automatic hyphenation, kerning and character/word adjustment. These, plus some of the advanced features on Macintosh or PC-publishing programs would make it a front runner.

Fleet Street Publisher

Fleet Street Publisher has been available for some time and is an extension of Mirrorsoft's previous program, Fleet Street Editor. It, too, is regarded as a contender for the Atari desktop publishing crown. However, this is only regarded as a possibility in the UK. Mirrorsoft has carefully targetted the program. Since it is completely GEM-based, it also has its eyes on the potentially extremely lucrative Amstrad PC market.

Fleet Street Publisher has taken a different approach to desktop publishing from Publishing Partner, but not radically different.

Fleet Street Publisher comes on three disks: the system disk, with the basic necessary parts of the program; a font disk; and a graphics library disk. These are included in a wallet at the back of the ring-bound manual and all fit in a slipover box cover. Although upgrades are not yet available, Mirrorsoft promises that they will be in the form of additional printer drivers, additional fonts and clip art.

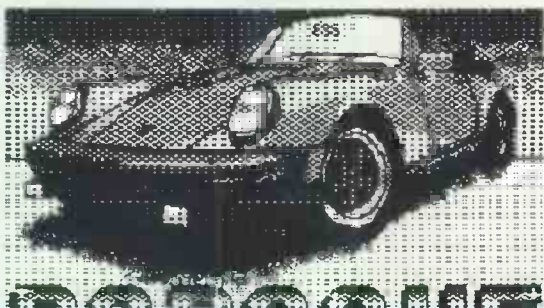
Fleet Street Publisher uses a standard GEM-based screen. Despite this, the editing screen is fairly similar to that of Publishing Partner; the main difference being that more than one editing window can be open simultaneously and that the windows are

Personal Computer Evening News

THE NEW LONDON NEWSPAPER!!

Fleet Street was today rocked by the news of yet another newspaper launch. What was so special about this one? After every thirty seconds nowadays the answer, of course, is the new Scourge of the Street of Shame: Owen Underholm.

For the past month Owen Underholm has been terrifying the press barons with his new tactics involving ultra-modern technology. His use of Atari ST computers and desk-top publishing has revolutionised production. It is estimated that Owen Underholm can produce a one page newspaper in only three days!



Adjustment to the same page in Publishing Partner. The character spacing is much better, but still not satisfactory

to set up and save macros so that simple keystroke combinations can

grams could be imported to a page. This is especially strange since the

within the program are However, doing involve using Atari hasn't real-clarifying the use for software de-

with Publishing is not yet support er. I called Soft- to find out when provide a driver it would not be the Atari laserprin-

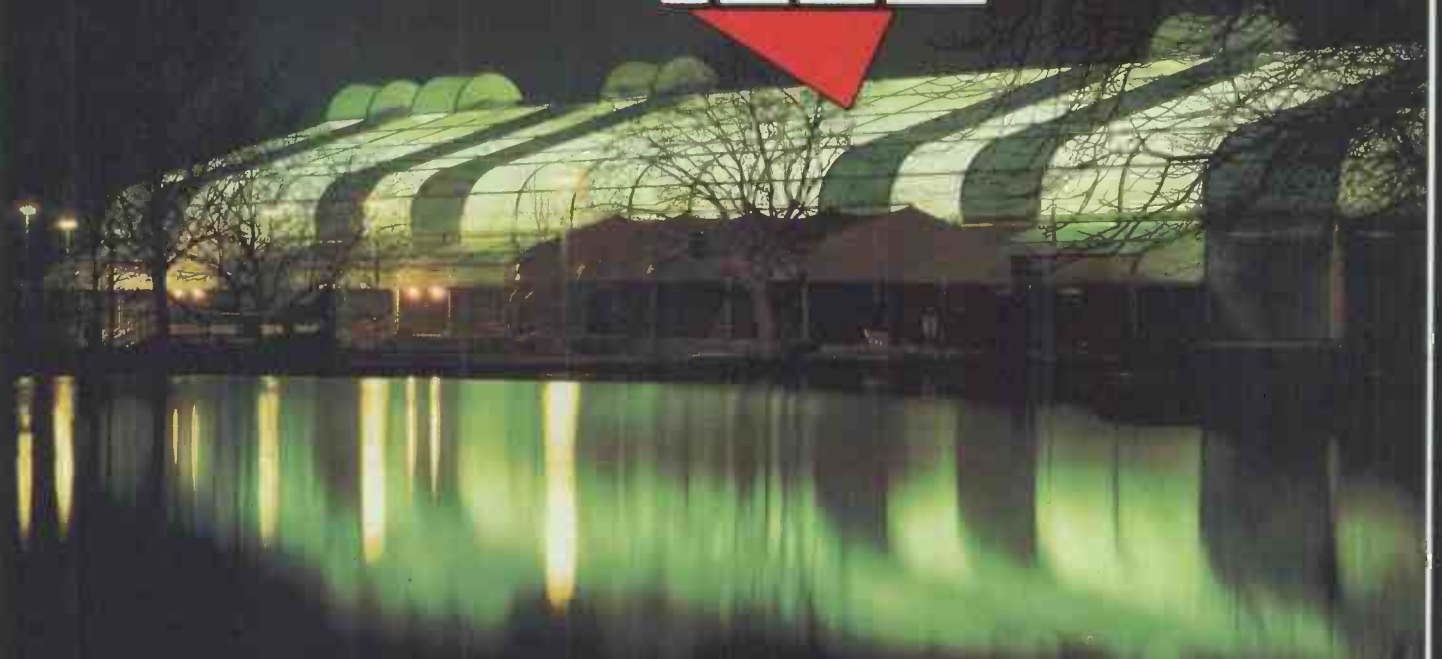
on

that came with was decent. It co-

The 7th official

AMSTRAD COMPUTER SHOW

Organised by
Database Exhibitions



Friday July 10 10am-6pm
Saturday July 11 10am-6pm
Sunday July 12 10am-4pm

Alexandra Pavilion
London N22

The BIGGEST Amstrad event ever!

If you've an Amstrad computer – or thinking of getting one – you just **HAVE** to visit this mega event in the computing world.

The move to Alexandra Pavilion – one of London's largest and most prestigious venues – means there is 50% more space – with many more stands and many more exhibitors than ever before. It's the fastest growing computer show of them all!

FREE THEATRE PRESENTATIONS

To meet the exceptional demand, we've **DOUBLED** the number of seats in the Amstrad Theatre. In continual sessions every day of the show, Britain's top experts will be there to answer your questions – and help you make the correct choice from the multitude of new products you'll see on display at the show.

HOW TO GET THERE

It's so easy to get to the show – by car, rail, underground or bus. Alexandra Palace has its own British Rail station, whisking visitors to and from King's Cross in just nine minutes. And there's a free bus service shuttling between station and show every 10 minutes.

If you're travelling by road the show is only 15 minutes away from Junction 25 on the M25 – and all car parking is free.

This advance ticket

saves £1 a head –

and cuts the queues

Advance ticket order

Please supply:

- ☐ Adult tickets at £2 (save £1)£
☐ Under-16s tickets at £1 (save £1)£
Total £
- ☐ Cheque enclosed made payable to Database Publications Ltd.
☐ Please debit my credit card account:

Access/Visa

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Admission at door:

£3 (adults), £2 (under 16s)

AMSTRAD
COMPUTER
SHOW

Alexandra Pavilion
Alexandra Palace, Alexandra Park
Wood Green, London

July 10-12, 1987

Post to: Amstrad Show Tickets,
Europa House, 68 Chester Road,
Hazel Grove, Stockport SK7 5NY.

Name.....

Address.....

Signed

PHONE ORDERS: Ring Show Hotline: 061-480 0171

PRESTEL ORDERS: KEY *89, THEN 614568383

MICROLINK ORDERS: MAILBOX 72:MAG001

Please quote credit card number and full address + Ref PCW 6

BENCHTEST

standard GEM ones and can be freely moved around the screen.

On the left of the screen is a toolbox, a clipboard and a trash icon. The toolbox is a thin rectangular area containing several icons for different basic functions. The clipboard and trash are standard GEM icons except that they cannot be moved. Each independent window displays the title of the document.

The toolbox contains icons for picture block mode, picture edit mode, box rule mode, text edit mode and text block mode. The program starts by displaying a dialogue box showing the date and time so that these can be properly set on machines which don't have a battery-backed clock. The program then displays a standard page with the program in text input mode.

Along the top of the screen is a set of standard GEM menus giving access to a wide range of controls for the program. To start up a new document you choose 'New Page' from the Options menu. A dialogue box pops up for you to name the new

text entry mode very similar to that in Publishing Partner, with all the usual functions. Graphics input, however, is very different. The only drawing tool available is a simple one-pixel 'paintbrush'. This is really completely unsuitable for any graphics work and can only be used for very minor touch-ups. The box rule mode allows you to draw lines and boxes in a wide range of sizes and styles and treats them as objects so that they can easily be resized and moved.

The feel of the functions and tools is very much as expected. The only minor difficulty I had was in 'picking up' very small objects with the mouse. Otherwise, the program has the best operation and feel of any program I have come across for the Atari ST. It is one of the very few programs for the Atari which has the classy feel of an Apple Macintosh program.

Fleet Street Publisher, in common with Publishing Partner, has a wide range of commands. Most of these are accessed from the drop-down

also said to be on the way.

The 'Help' option loads in one of a list of prepared files giving hints and tips on certain areas of the program. Each of these is a properly laid-out page rather than simply a text file.

'Option' performs a variety of functions: the magnification at which a page can be viewed can be adjusted, but not as flexibly as in Publishing Partner; rulers given in cms, inches or picas can be displayed; text can be searched for a given string, full text pages can be set up for text editing and new document pages can be set up; various text attributes and document attributes can be assigned to be preserved or changed when text blocks are moved or function key macros used; the program can be set to continually display information about the document at the cursor position; and, finally, printer controls can be set.

The 'Typography' menu controls a very impressive range of layout functions. The first option controls typefaces, sizes and 'leading above and below the base'. This last option refers to relative positioning of lines. The 'Spacing' option covers character spacing — an area where Fleet Street Publisher is far superior to Publishing Partner. A dialogue box controls changes in continuous spacing and in minimum and maximum character spacing allowed. Another option covers indents for paragraphs, hanging indents, and so on. There is also an option for one shot commands for special cases. Automatic hyphenation is available and, although not perfect, is certainly adequate. The other commands available are for justification, upper/lower-case conversion, tabulation, colour, underlining and small-sized capitals.

The final menu controls overall layout and is used to change the size and position of all the different text, picture and box rule objects. The other options control what page aids are visible, the overall page layout and text linked between columns.

In use

Fleet Street Publisher is obviously not designed for large documents. Each page is stored separately, although double page spreads are more easily and sensibly stored as double-sized single pages. This means that multiple page documents are stored as several files. Obviously documents with a large number of pages shouldn't really be laid out with the program.

However, as a program to lay out small documents up to small newsletter size, it is very good. The only major failing at the moment is the very limited range of output printers.

With Fleet Street Publisher you can:

- Change the widths of each font, in half point increments, without affecting its overall height.
- Adjust the leading above and below the baseline.
- Kern characters on the screen at their actual size.
- Vary the interword and the interletter spacing.
- Vary the baseline.
- Automatically produce two levels of sub- and superscripts which are proportional in size to the body text.

All of these features are essential requirements for producing output with a professional look.

A sample of output from Fleet Street Publisher using a pre-release 24-pin dot-matrix driver

document and is immediately followed by another to control the layout of this page. This allows you to choose from standard paper sizes with A4 the default. You can also set up any non-standard size, alter margins and choose the number of columns and the gutter size (a gutter is the technical printing term for the distance between columns. Technical printing terms appear everywhere in the program. Fortunately, the manual explains them clearly).

When the dialogue box has been completed, your page appears and you are ready to start work. The toolbox functions operate in a similar way to those in Publishing Partner. Text and graphics boxes set up areas for text and graphics while text input puts you into a word-processor type

menus. The menu headings are: 'File', 'Option', 'Typography' and 'Layout'. The 'File' menu controls file operations, text import and merging, picture import and merging, access to keyboard macros, output and help files.

The 'Output' option brings up a dialogue box which is used to select the device to which output is directed. At present, the program only supports FX80 printers fully and other 9-pin dot-matrix printers to a lesser extent. Output can also be directed to GEM bit-image files but not object-orientated GEM files. New printer drivers are being written and at present a 24-pin dot-matrix driver is near completion. Drivers for laser-printers and Postscript-driven Linotron-typesetting machines are



YOU'D BETTER BELIEVE THIS...

Imagine you were 19 years old and you'd quit college to make a go of it selling computers. By the time you were 22 you are running a growing company with a \$70 million annual turnover.



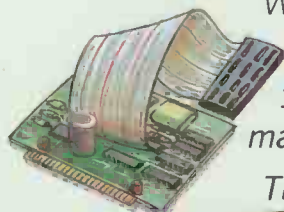
In just three years Michael Dell has achieved that and more with PC's Limited.

As a far from callow 13 year old, Michael started a mail order business selling stamps from home. Later, at high school he earned himself \$17,000 a year working two days a week using his Apple II and ingenious marketing to sell newspaper subscriptions.

In his college room, he souped up the IBM machines that he'd bought from dealers who were only too pleased to be shot of them and sold the faster, more powerful results to his customers direct... and at a very special price.



Within a year of Michael Dell starting PC's Limited sales were worth \$6 million.



Soon the company was designing and building its own machines. They now sell some 7,000 computers a month.

The early relationship that Michael Dell established with the end user is still central to the business: in America a PC's Limited computer can only be bought direct from PC's Limited.

And in the UK?...



BENCHTEST

Another serious problem is with the sizes of fonts. Fonts are stored separately for a range of different sizes and intermediate values are generated from these. This results in ragged and unprofessional-looking letters.

I found the program extremely easy to use and exceptionally easy to learn. A great deal of the credit for this must go to the manual which is excellent. However, I quickly became frustrated at not really being able to print out high-quality output.

My test file of an A4 page with three columns, picture and headline was extremely easy to prepare and

lay out. Especially impressive was the way the program handled details of the text layout. The text always looked carefully spaced and easy to read. The automatic hyphenation was acceptable and the screen lettering as well as the printer output easy to read. Fleet Street Publisher does not support automatic kerning, a facility which would be especially useful for headlines. Graphics layout was more difficult and rather fiddly. The graphics commands were certainly worse than Publishing Partner's, although they did the job — just. The Atari laserprinter is not yet supported, nor indeed is any laserprinter. This is a serious flaw.

Documentation

I wish all computer documentation was like this. The manual is clear and easy to read. The level of information provided goes up on a steady curve as you go through the manual. A section is devoted to a sample session to produce a reasonably complicated page; then the full range of commands are explained in detail. Finally, there is a large and very useful section of tips and ideas for using the program for real projects.

The manual itself is typeset, reflecting the inability of the program to interface with laserprinters or typesetting machines as yet.

Conclusion

Fleet Street Publisher is aimed at a somewhat lower level than Publishing Partner. Because of this, the lack of features such as automatic kerning is not a disaster.

What is a disaster, however, is the lack of printer drivers. Until the program can easily be installed for, and used with, a wide range of printers it cannot gain wide market acceptance. Nevertheless, at the lower end of the desktop publishing market there isn't a program that can beat this one in operation.

Fleet Street Publisher costs £115 (excluding VAT) and is distributed by Mirrorsoft on (01) 377 4837.

Publishing Partner costs £139 (excl VAT) and is available from Silica Shop on (01) 309 1111.

Bill Beret Returns After Fraud Scandal

By Otto Blunt

Legendary pop star and self-ordained Bhuddist monk Bill Beret returned to Britain yesterday from a long vacation that took him all over the world. But the holiday also saw him fall into very deep trouble when he was arrested on fraud charges in South America.

Bill now returns to his bachelor mansion in fashionable Peckham.

More pictures Page 4

Owen Linderholm starts new London paper!

In a bold move today, a new newspaper was launched on the

Output from Fleet Street Publisher on a 9-pin printer in a condensed mode, which is the only way to produce solid black lettering on this printer

Prices

The Mega ST2 with 2Mbytes of RAM and a monochrome monitor costs £995; a similar system with 4Mbytes of RAM costs £1295. No official price had been agreed for the laserprinter at the time of writing but it will probably cost in the region of £1500. There will be a special bundle of Mega ST2, mono screen, laserprinter and desktop publishing software available later in the year. Once again prices haven't been decided, but the whole system will be considerably less than the sum of the individual components.

Conclusion

In the two years since its launch the Atari ST has evolved into a very desirable small-business computer. The Mega ST is the most developed form of the ST design, and although the laserprinter was an early prototype and had a number of shortcomings, in its final form there will be little to distinguish it from models costing £1000 more.

Application software for the Atari ST is just beginning to fully exploit the power of the system and use the capabilities of GEM. The two packages reviewed here, Publishing Part-

Technical specifications

Processor:	Motorola 68000 running at 8MHz
ROM:	192k
RAM:	4Mbytes expandable to 16Mbytes
Mass storage:	One 800k, 3½in floppy disk drive
Keyboard:	96-key, full-stroke
Size:	System unit: 14.2ins×14.2ins×3ins Keyboard: 18.8ins×7.6ins×1.5ins
Weight:	18lbs (system unit)
I/O:	RS232 serial, Centronics parallel, MIDI in, MIDI out, video out, external floppy disk, DMA fast data port, cartridge port and two 9-pin mouse/joystick ports
DOS:	TOS (version of CP/M68k) and GEM (Graphics Environment Manager)

ner and Fleet Street Publisher, have their faults but neither would disgrace an Apple Mac or IBM PC. There should be no shortage of quality DTP software capable of using the laserprinter as soon as its technical specification is made available to the software houses.

The future of the system all depends on availability and price. Our feeling is that if the complete DTP system costs less than £2500, it could make a serious impact on the DTP market. It *must*, however, be made available in the very near future. The DTP market is very com-

Benchmarks

Intmath	1.4secs
Realmath	3.4secs
Triglog	7.6secs
Textscrn	39.9secs
Grafscrn	93.1secs
Store	55.5secs

Benchmarks carried out in STBasic.
For a full explanation of the PCW Benchmarks, see the December 1986 issue, page 164.

petitive and there is no shortage of manufacturers looking to develop systems that could push Atari out of the running. **END**



...OR YOU WON'T BELIEVE OUR PRICES.

Now you can get your hands on one of these remarkable and inexpensive machines because PC's Limited has just launched the Dell Computer Corporation in the UK.

We, too will only deal direct with the end user to give you the product and support you want at an almost unbelievably low price.

And we mean low: The Dell 286⁸ 20MB costs just £1299. The frighteningly powerful 386¹⁶ 70MB with full colour EGA monitor can be yours for £3899.

Naturally, all our machines are IBM compatible, benefitting from our three years' working with the IBM standard. They'll get the best from all the popular software, Lotus 1-2-3 and the like.

Dell will change the UK micro market for a simple reason: Pound for pound, Dell Computers offer more power and speed than any other pc's.

We also guarantee our machines and a year's on-site service is included in all our prices.

The only way to ensure that you receive details about the Dell range is to ask for them. Use the form below, telephone us or visit us on Stand 21A at the PC User Show.

But if you just can't wait to own a Dell you can telephone your order to the number below.

And we want you to read our small print.
Every Dell computer is covered by a 30-day money back guarantee. If, after trying the machine on your desk, you are not entirely satisfied, return it within 30 days and we will refund your money in full.
Our machines come with a full year's warranty against defects in workmanship or materials. Any such faults will be rectified free of charge.
Our free Technical Hotline means truly expert telephone support is just a 'phone call away.
And a year's on-site maintenance contract is included in the price of every Dell computer. Should the need arise, an engineer will be with you before the end of the next working day.



DELL COMPUTER CORPORATION

Dell Computer Corporation, Farley Hall, London Road, Bracknell, Berkshire RG12 5EU. Tel: (0344) 863423.

To Andrew Harris, Chief Executive,
Dell Computer Corporation, Farley Hall, London Road, Bracknell, Berkshire RG12 5EU.

Please send me details of the following Dell Computers ☐ 286⁸ ☐ 286¹² ☐ 386¹⁶
All models are available with mono or EGA monitors.

Name _____

Position _____

Company _____

Address _____

Postcode _____

Telephone _____

It would help us to send you the most useful information if you would also complete the following:

Type of business _____

No. of employees using pc's _____

No. of pc's in company _____

No. of pc's likely to be purchased over the next 12 months _____

Type of pc's currently used _____

PCW 1

All prices do not include VAT. Lotus 1-2-3 and IBM are registered trade marks of their respective operating companies.



CHECKOUT

HP-28C calculator

Gone are the days when a pocket calculator just provided a quick way of performing mathematical calculations: technological development has produced powerful units with increased programmability and functions. Nick Walker looks at the HP-28C

In the first few years of PCW, there were very few ways for the enthusiast on a limited budget to afford a personal computer. The wealthier people could perhaps afford a 16k Apple II or a 4k Tandy TRS-80, but those of us with less money had to settle for build-it-yourself kits or programmable calculators. Such was the interest shown by programmable-calculator owners that PCW ran its own column to cater for it, called 'Calculator Corner' and later 'Pocket Computer Corner'.

For a while, pocket computers and programmable calculators offered more power than most home computers of a comparable price. The advent of cheap computers such as the Sinclair Spectrum *et al* offered significantly more power for less cost, making programmable calculators seem limited and expensive. Nevertheless, development has continued and there are now some very sophisticated machines that prove to be truly useful as pocket number-crunchers.

The market for programmable calculators has had its share of success and disaster stories, following a similar path to the home computer market. The four leading manufacturers were, and still are, Casio, Hewlett-Packard, Sharp and Texas Instruments. Less successful competition came from Commodore, National Semiconductor, Rockwell and Sinclair — all of which have now withdrawn from the scene. The programmable-calculator market called for LSI and VLSI chips, which accounts for the number of chip manufacturers in the list.



Since the boom years of programmable calculators they have developed in two ways. Firstly, an increase in programmability has produced machines that come close to the power of a laptop but in a pocket-size box; and, secondly, increasing the amount of functions within the calculator's hardware, thus widening the number of problems it can solve without the need for prog-

ramming. The HP-28C falls into the second class, offering more built-in ability than any calculator I have ever seen.

Hardware

The HP-28C is an elegant, traditionally-shaped calculator which opens like a book to reveal two keypads. On the left is an alphabetic keypad arranged in straight

A,B,C... fashion; the right-hand keypad contains the numeric keys, arithmetic keys and a further 35 function keys. Above the right-hand keypad is a bulge which contains an LCD screen and the battery compartment holding ordinary 'pen-light' batteries rather than the 'hearing-aid' ones usually found on programmable calculators. To conserve power, the HP-28C will automatically switch itself off if it hasn't been used for ten minutes.

Considering how slim the keypads are, and the amount of space occupied by the screen and the batteries, there seems to be no room for any circuitry. And as there was no way I could get inside the unit, I can only assume a very high level of integration to enable the HP-28C to function in so little space.

There is a feeling of quality to be found in every feature of the 28C, as in all Hewlett-Packard electronics. The attention to detail is superb: the wonderfully positive click of the keys — even the feel of the catch on the case — all reek of quality. This quality must, of course, have a beneficial effect on the reliability of HP equipment. This praise may appear to be rather 'over the top', but after months of using dubious Taiwanese equipment, it's a joy to find a manufacturer who still cares about quality.

The screen is a 32 × 138 pixels, fully addressable LCD capable of displaying a full character set and graphics. A row of annunciators (graphical symbols) above the screen indicate, from left to right: suspended program; Shift key activated; locked alphabetic key entry; busy, not ready for input; low battery; radians mode; and data being sent to the printer.

Also included with the review calculator was a fairly ordinary thermal roll printer, 24 characters wide and not particularly fast. It does have one particularly novel feature — it works via an infra-red link so there is no physical connection between the machine and the printer. Just place the printer anywhere on the desk and it will print when commanded.

Software

Anyone unfamiliar with HP calculators will initially encounter problems when operating the HP-28C. Enter '1 + 1 =' on the HP-28C and you obtain a 'Too few arguments' message on entering the '+' error message; and if you persevere, you receive a 'Syntax error' on entering the '='. This is because the HP-28C, like all HP calculators, uses a stack-based system of algebraic entry called Reverse Polish Notation (RPN).

The majority of calculators use variations on the 'algebraic' calculator interface. The name derives from the fact that the keystrokes used closely parallel the way in which the

calculation is specified on paper. That is, to evaluate '1 + 2 - 3', you press '1 + 2 - 3 ='.

This interface works nicely for expressions which contain operators (+, -, *, /) that work in the middle of two arguments — infix notation. More sophisticated calculators allow you to enter parentheses to specify precedence. However, the introduction of prefix functions, like SIN, LOG, and so on, leads to two different variations. Ordinary algebraic calculators use a combination of styles: for example, 1 + SIN(23) is entered as 1 + 23 Sin =; the + is entered as prefix but the SIN is entered postfix. This approach has the advantage of being able to show intermediate results, but has the disadvantage of losing the correspond-

'I'm not usually given to rash compliments, but I feel quite justified in claiming the HP-28C to be the 'state of the art' in calculator design.'

ence with ordinary mathematics which is the primary advantage of the algebraic approach. 'Direct formula entry' calculators have an immediate execution mode, allowing you to key in the entire expression in its ordinary algebraic form, then compute the result when you press a termination key (usually Return or Enter).

All Hewlett-Packard calculators use RPN (so-called because it was developed by a Polish logician named Jan Lukasiweicz (pronounced Wookashyee'veech) which isn't a name that lends itself to acronyms). The basic idea of RPN is that you enter numbers or other 'objects' into the calculator first, and then execute a command that acts on those entries; thus, for '1 + 2 - 3' you would enter '1 2 + 3 -'. The 'stack' is just the sequence of objects waiting to be used. Most commands return their results to the stack, where they can then be used as arguments for subsequent operations.

Using the RPN method, simple arithmetic is most likely the biggest stumbling block for algebraic calculator users trying to learn to use RPN calculators. RPN is very efficient, but it does require you to mentally rearrange an expression before you can calculate results. The four-line display on the HP-28C is used to display the last four items on the stack, which makes it much easier to comprehend.

Unlike other HP calculators, with the HP-28C you really don't need to

concern yourself over whether RPN logic is better or worse than algebraic logic. The HP-28C has a facility for the evaluation of expressions in a direct formula entry mode, by enclosing the expression quotes. Additionally each result you compute is retained on the stack, which allows you to save results for later use. You can choose the logic that is best suited for the problem at hand, and intermix algebraic expressions with RPN manipulations.

For those familiar with existing HP calculators, there are some differences in the operation of the HP-28C. The most dramatic difference is the size of the stack. Previous HP calculators used a fixed four-level stack, whereas the HP-28C has a dynamic stack that grows as you enter items. Additionally, in the old system the stack was always full, even when you cleared the stack; all you were doing was filling it with zeros. As I have stated, the HP-28C can generate a 'Too few arguments' error that previous HP RPN calculators could not.

The other differences are only alterations to the commands that manipulated the four levels in order to allow them to work with a dynamic stack.

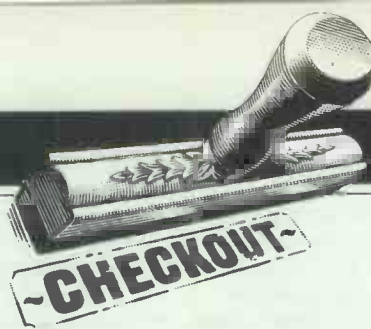
At first glance the HP-28C seems lacking in many of the usual calculator functions because, with the exception of a few more frequently used functions, it operates via a series of menus that correspond to the top six keys on the calculator. There are 24 menu groups, each of which can consist of five lots of six commands, giving a total of over 500 functions. One of these menus is a user menu which contains an entry for each variable currently in existence. Selecting the variable results in a number of actions depending on its type, as I'll explain later.

Distinguishing features

I'll skip the basic scientific-calculator details — the HP-28C is equipped with all of them. I'll concentrate instead on the features that distinguish the HP-28C from similar products.

I was amazed when I started to program the HP-28C. Most computer users criticise pocket computers and calculators for being five years behind the times when it comes to programmability. But the HP-28C is programmable in an object-orientated manner, putting it on a level with current programming trends.

A program is a series of objects and commands contained in a single object. When you evaluate the program, the objects are put on the stack and the commands are executed. Programs are most usable when stored in a variable. The unquoted name of a program variable acts as a command. Running the program just consists of selecting the variable



name from the 'User' menu, or you can call the program as a subroutine by including its unquoted name in another program. In a consistent fashion, variables can also be numerical objects (numbers), alphabetic objects (strings) or expressions.

The difference between a *program* stored in a variable and an *expression* stored in a variable is not immediately obvious. An expression represents a mathematical calculation in a form similar to written mathematical notation. When evaluated, an expression takes no arguments from the stack and returns a single result to the stack. The best way to think of an expression is as the symbolic result of a calculation; as such, it can be used anywhere that a simple variable can be used.

As far as programming the HP-28C is concerned, there are two things you need to understand. Programs can include any commands including loops, IF statements, stack commands and user-memory commands. Expressions can only consist of functions such as '+' or 'SIN'.

You also need to know that programs stored in variables will execute when selected from the user menu, whereas selecting an expression *doesn't* cause the expression to be evaluated. Instead, the expression is returned to level 1 of the stack.

One of the most delightful features of the HP-28C is its ability to plot a mathematical function. Any mathematical function stored in the variable EQ will be plotted on the 28C's 32×138 pixels display. If EQ contains an algebraic expression without an equals sign (=), the command DRAW will plot a single curve which corresponds to the expression for each value of the variable within the plot range. If EQ contains a normal algebraic equation, DRAW will plot two curves, one for each side of the equation. The intersection of the curve will then be a root of the equation. If EQ contains a program, it will be treated as an algebraic expression and plotted as a single curve. (This presumes that the program obeys the syntax of an algebraic expression.) It is also possible to obtain a scatter plot in conjunction with the data held in the 28C's statistical data area.

The 28C's graphing capabilities extend to more than just the ability to draw the graph of a function. It is possible to re-scale, zoom in on areas of interest, change resolution, and even select points for digitisation (turn back to numerical coordinates) by means of a movable cross-hair. The selected point is then deposited on the stack for use in further calculations.

The ability to select a point on a graph really comes into its own when it comes to using a feature known as the 'Solver'. The 'Solve' menu contains commands that enable you to find the solution for algebraic expressions and equations. By solution I mean a mathematical 'root' of an expression — a value of one variable in the expression for which the expression has the value zero. For example, entering the equation $x^3 + 3x^2 - 2x = 6$ would result in a value for x of 1.41421... The Solver uses an interactive method to obtain a numerical solution, and the best way to provide it with a 'guess' from which to work is to take the value of a likely looking point on the expressions graph.

It was by accidentally pressing the wrong key when using the Solver that I discovered the one feature which really makes this calculator stand out from the crowd. While attempting to evaluate the numerical solution to an equation, I hit the wrong key and was promptly confronted with a symbolic (still expressed in variables) equation and not any equation I had entered. It's at times like this that you have to consult a manual, and I discovered that the HP-28C can perform many of its operations symbolically (that is, in the case of the Solver, obtain a function that represents the roots of a function). And that was it. The next few days were spent with various pure mathematics text books, putting the 28C through its paces.

As all mathematicians know, a symbolic result is usually preferable to a numerical result. The functional form of the symbolic result gives much more information about the behaviour of the system represented by mathematical expression, than can a single number. Also, a symbolic solution can contain *all* of the multiple roots of an expression. Even if you are only interested in numerical results, solving an expression symbolically can result in significant time-savings in obtaining the numerical roots.

There isn't room within this review to examine the full capabilities of this feature. It does, however, allow you to expand and collate terms, and isolate and perform a whole range of other symbolic operations. There is also a facility for the solution of simultaneous equations, again in symbolic and numerical ways. In many cases I was able to solve equa-

tions by a sequence of commands that mimic the steps you would go through in, say, an A-level pure maths paper.

If this isn't enough, it is also possible to perform calculus in both a symbolic and numeric manner. For polynomial expressions you can find the derivative and the indefinite integral. For expressions including only arithmetic, trigonometric, logarithmic, exponential and hyperbolic functions, you can find the definite integrals. For *any* expression you can find definite integrals. You can differentiate an expression step by step as you would on paper, watching how the calculator applies its rules of calculus; or you can differentiate an expression all at once. The final results are identical.

I haven't been able to cover half of the functions that the HP-28C is capable of in this review but, for the record, other features of particular interest include: complex-number operations; vectors and matrices; statistics; binary, hexadecimal and octal arithmetic on user-definable word sizes; unit conversions with over 100 pre-defined units; and the ability to define your own units.

Documentation

Two ring-bound manuals are included with the HP-28C: a getting started manual and a reference manual. Both are excellent, although I would recommend a new user to work their way through the entire getting started manual as it covers most of the calculator's capabilities. When you have discovered the features you want to use, the reference manual is easily understandable and gives the finer details.

Price

The HP-28C costs £199.95 which may sound expensive, but it would cost much more to buy software with similar functions to use on a desktop computer — and there's no way that will fit in your jacket pocket.

Conclusion

If you regularly deal with any form of mathematics, be it in an engineering context, a pure mathematical context or even as a hobby, the HP-28C will prove to be an invaluable aid. Its capabilities cover a range so broad that I doubt anyone will use it to its full capacity, but just one of its many features will justify its purchase by many users.

I'm not usually given to rash compliments, but I feel quite justified in claiming the HP-28C to be the 'state of the art' in calculator design.

Hewlett Packard is on (0344) 424898.

END

INTRODUCING

The **TWIN** Classic

A program so similar to 1-2-3™, that if you know how to use 1-2-3™, then you know how to use the

- A spreadsheet amazingly similar to 1-2-3
- Fantastic presentation level graphics
- 1-2-3 Macro compatible
- Reads and writes 1-2-3 files directly
- Site licensing plans available
- No copy protection.

**SPECIAL
INTRODUCTORY
OFFER**

£49.95

PC MANAGEMENT

"Clones Challenge LOTUS"
The first clone for LOTUS 1-2-3 is out, and is being sold under the claims of "amazingly similar to 1-2-3" which it is. Software clones of this kind could have a major effect on the market for all PC software. The TWIN was developed by MOSAIC SOFTWARE."

PC MAGAZINE

"Companies currently using 1-2-3 could safely introduce TWIN into the same environment. In spreadsheet and database functions it is a true 1-2-3 clone. Represents excellent value for the money. A powerful spreadsheet with very good graphics."

WHAT'S NEW IN COMPUTING

"The TWIN offers the chance to buy a program which has a spreadsheet compatible with 1-2-3 and a number of improvements as well."

30-DAY MONEY BACK GUARANTEE

YES, you may try the TWIN on your IBM PC/XT, Amstrad PC1512 or compatible (min 512k RAM is needed) for 30 days. If you find that TWIN does not perform in accordance with our claims and provided that all goods returned to us (in a good condition) within 30 days of purchase, we will refund your purchase price.

The TWIN offers so much more for so much less!

The TWIN advantages . . . above and beyond 1-2-3's features, the TWIN has the following additional capabilities.

1. No copy protection for full backup
2. Supports the 8087 coprocessor chip
3. Spreadsheet can import its own and 1-2-3 print files
4. Displays available memory on status line
5. User selectable 16 color display for spreadsheet and graphics
6. Financial functions IRR, NPER, and RATE
7. Bi-level analysis and presentation level analysis
8. Up to 15 different types of graphs
9. 11 text fonts displayable on screen
10. 2 and 3 dimensional graphs
11. Horizontal bar charts
12. Pie-bar combination graphs
13. Logarithmic scales
14. 2 vertical Y axes
15. Optional "Fill in the blanks" for complete user control
16. On-screen slide presentation. Single or sequence of graphs
17. Simple configuration of hardware
18. Point at range names
19. Meaning of function keys is displayed in ready mode
20. Space/backspace operate cursor movement in flip menus
21. Reads and writes DIF files without leaving program

ORDER YOUR COPY TODAY *New UK version **Time limited promotional offer



SOFTWARE INC.

**DEPT 2
P.O. BOX
NORTHAMPTON**

MOSAIC and the TWIN are Trademarks of MOSAIC SOFTWARE INC. Other brand and product names are Trademarks of their respective holders.

YES! I'M IMPRESSED! PLEASE SEND ME A TWIN CLASSIC at the Special Offer price of £49.95. I enclose a cheque/money order for £59.40 (includes VAT & Postage) Cheques made payable to MOSAIC SOFTWARE INC.

NAME _____

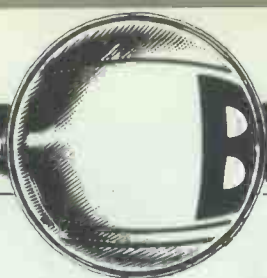
TITLE _____

ADDRESS _____

POST CODE _____

TELEPHONE _____

Post to: **MOSAIC SOFTWARE INC.
P.O. BOX 97 NORTHAMPTON NN4 0YY**



BENCHTEST

Dell 286¹²

The concept of mail-order computer shopping was somewhat clouded by the failure of Sinclair to successfully operate such a system, but it's big business in the US. Now, the Dell Computer Corporation aims to restore UK users' faith with the 286¹², a fast but inexpensive AT clone available mail-order in a variety of configurations. Robert Schifreen phoned in to test it out.



In the US, where credit cards are the norm and someone usually summons the police if you try to pay cash in a supermarket, customers have more faith in buying mail-order. Over the last three years, some 60,000 people have phoned a company called PCs Limited and exchanged their credit card number for the promise of a complete PC system with monitor arriving on their doorstep within a week.

In early June this year, PCs Ltd set up in business in the UK. The company calls itself the Dell Computer Corporation, after its 22-year-old founder and chairman, Michael. As in the US, you can't walk into a dealer in the UK and buy a Dell machine — you have to order it over the phone and it will be delivered by courier to your door.

From its American range, Dell has brought two models across the Atlantic. Both are 80286-based AT clones, and basic configurations comprise a single-floppy drive and a 20Mbyte or 40Mbyte hard drive. One, the model 286⁸, runs at 8MHz; the other, the 286¹², runs at 12MHz and is switchable to 6MHz. The machine I'm reviewing here is the EGA version of the 286¹², which includes an EGA card and a monitor as well as a very fast (28ms) 40Mbyte hard disk. It will retail for £2199 including delivery, which is a few hundred pounds cheaper than any comparable system I know of. Not having to find and maintain dealers seems to make good business sense — if Dell can overcome the British prejudices and confusing legislation about mail-order purchases, the company seems set to make a killing.

Hardware

The machine is delivered in two boxes. The smaller holds the monitor which, for my review machine, was an NEC Multisync. On its own, this retails at some £695 and, much as Dell would like to, it seems improbable that this will be the monitor that is shipped to customers. American customers are supplied with Taxan monitors and it may well be that the same are used in the UK.

The larger box holds the system unit and, separately packed inside it, the keyboard. There's also a genuine copy of Microsoft MS-DOS 3.20 and GW-Basic 3.20 complete with manuals, plus a manual which explains how to set up the machine and install cards. (You can have the system without GW-Basic but it's more expensive that way.) An envelope contains thin manuals for the VEGA EGA card and the DIO multi-function I/O card, as well as the VEGA utility disk (for doing CGA/Hercules emulation) and a program for splitting the 40Mbyte hard disk into two 20Mbyte partitions (MS-DOS versions less than 3.30 don't usually allow more



The machine's motherboard is neatly laid out, with no stray last-minute wires. Hopefully, production machines will make better use of the SmartVu panel, visible here at the front of the machine

than one DOS partition on a hard disk, and even 3.30 won't let any partition be larger than 32Mbytes). Although the multi-I/O card supports a game port, the socket is not connected — a fly-lead is included should you be of the opinion that no business PC is complete without a pair of joysticks. There's also a 9–25 pin RS232 converter cable. There is no diagnostics disk, though Dell says that the IBM Advanced Diagnostics will work.

The cardboard box that holds all this is about twice the size of the computer in all dimensions, with hunks of foam in all its important little places to stop the computer from rattling around as the unfortunate delivery person struggles with it to your door. Despite my two (one unsuccessful) back-breaking attempts to get the thing into a London taxi to experiment with at home over a weekend, the system behaved well throughout the review period and gave no problems whatsoever.

Should your system not be so lucky, there's a year's telephone support and also a 24-hour on-site service warranty for the same period. Both are included in the price.

Also, should you decide that, having received the machine, it isn't exactly what you wanted, there's a 30-day money-back guarantee period.

It took me around five minutes to take everything out of the boxes, plug in the mains cables and switch on. The system unit is fully assembled and tested — there are no cards to plug in or DIP switches to set.

The system is around the same size as IBM's AT, and finished in the same grey and beige. The case is all

metal and happily supported the NEC monitor without sagging. The power switch is on the right-hand edge of the machine, so you could stand the box on its side under a desk if you wish. I tend not to do this, as I'm forever plugging cards and interface leads in and out.

Most of the front of the system box is taken up by a grille that acts as an air intake for the machine's fairly noisy fan. The system certainly needs air circulation — running the system with the cover off for an hour made many of the chips untouchably hot.

The floppy disk drive is fixed in the top right-hand corner of the case. There's room underneath it for two more half-height devices, as the hard drive is in the middle of the machine, to the left of the floppy one, and sits on top of the motherboard. The space under the floppy drive consists of two spaces but only one opening — the remainder of the space is inside the body of the case and can't usually be accessed. It could still be used for a hard drive, though, while the accessible slot could take a floppy drive or a tape streamer. Dell can provide 1.2Mbyte and 360k floppy drives and a 60Mbyte Wangtek tape streamer now, and promises a 3½in PS/2-compatible drive for later this year.

At the top left of the case is the standard AT-style keyboard lock (you only get one key) and two LEDs. The red LED tells you when the hard disk is being accessed, while the green one can act either as a power-on light or a speed indicator (the machine is switchable between 6 and 12MHz), depending on the setting of

BENCHTEST

a DIP switch inside the machine. I'd like to have been able to set this preference through the machine's set-up menu and had it saved in CMOS.

Most interesting on the front of the machine is the SmartVu panel, a four-character dot-matrix display designed by Dell. It's used by the system for error-message displays, and to tell you what speed the machine is running at.

Conspicuous by its absence is a reset switch — if the system crashes you have to switch off and back on again.

From left to right at the back of the machine, the mains output comes first: you can power a monitor from the system's 200-watt power supply if you want to reduce the spaghetti quotient. Next to that is the power input via a standard — though very long — 3-pin mains cable.

The setting-up manual informs you that the 286¹² is shipped for connection to a 110-volt American supply and that you must adjust the setting before using the machine in the UK. My review machine had already been adjusted, and Dell needs its head examined if production machines aren't similarly effected. Conversion between voltages involves no more than turning a dial anyway.

The keyboard connector is a 5-pin DIN plug. There's one standard IBM parallel printer port and two RS232 ports (a 9-pin one and a 25-pin one). The 9-pin port starts life as COM1 while the 25-pin one is COM2, though a DIP switch lets you make either of them into anything between COM1 and 4. The Centronics printer port is LPT1, but again you can change this to 2 or 3 if your favourite multi-everything card insists on being called LPT1.

In the left-hand slot is the VEGA EGA card. Software is supplied to provide CGA, MDA and Hercules emulation, although a proper mono system with matching card and monitor is available if you prefer.

The keyboard is AT-style and has 84 keys. In the US, PCs Ltd has just started shipping an enhanced 102-key version, but no arrangement has yet been made for the UK. The keyboard has a UK layout, with a pound sign above the number 3. On its base are two DIP switches. The first allows you to swap the position of the ESCape key and the Tilde (~) — the keys whose positions would be reversed if you were using a real AT-style keyboard. The other switch lets the keyboard act as an AT or PC unit, and this has to be kept on the AT setting or nothing works. An AT keyboard has a bi-directional link to the computer — you can send com-



The system comes with an EGA card, a parallel printer port and two serial ports as standard. The power supply is rated at 200 watts, so you can save a mains socket by connecting the monitor directly to the computer

mands to it, to alter the repeat rate or turn on the indicator lights, for example.

The keyboard is quiet in use, though some keys insist on being pressed and released fully before the press registers, which made rapid pressing of the backspace key difficult and hard on my typing finger.

The case is secured with strange screws that have hexagonal heads and no slits, so you need pliers or a spanner to remove them. The setting-up manual says that there are three of them, and supplies a helpful diagram to guide you to their exact location. Having removed the screws and pulled the case in all directions to no avail, a closer inspection reveals that there are, in fact, five. With these removed, the case slides off easily from the front.

The layout of the machine is tidy and uncluttered. The motherboard, designed and built by Dell in the US, occupies the left-hand half of the case. It is neatly laid out, with no stray last-minute wiring.

The 80286 CPU runs at 6 or 12-MHz with one wait state, and is made under license from Intel by AMD. There was no 80287 maths coprocessor on the review machine: this is an optional extra and plugs into the waiting socket.

The control chip set is made by Chips and Technologies, and consists of four square, socketed chips. One of these is stamped 10MHz, which I queried with Dell as the machine is supposed to run at 12MHz. I was assured that, although the chip was initially guaranteed to 10MHz, each had been individually tested to well in excess of 12MHz and there should be no problems. Future releases of

the set, which should be well in time for the launch proper, will all be guaranteed to the higher speed and will lose the 10MHz marking.

Dell's BIOS has been written by the company and is contained in two Eeproms of 32k each. In addition to providing IBM BIOS compatibility and containing the set-up routines accessed by pressing Ctrl-Alt-Return, there is also a complete EGA BIOS in there, too. Normally the EGA BIOS is found only on the EGA card, but as Dell has its own as well, which can be switched in and out from the set-up menu, it gives the company greater control should it wish to enhance the standard or if the EGA cards it ships do not work properly. But this is not the case at the moment. Programs like EGA Paint worked well.

There is a single bank of eight DIP switches. These let you specify whether you're using a system with 128kbit or 256kbit BIOS ROMs, what you want the green LED to do, and which monitor is the primary display. The PCB is labelled to tell you what each DIP switch does, which is helpful. But you have to take the machine apart to change them, which is not. If Epson can put its DIP switches at the front of the machine under a flap, so can other companies (sermon mode off).

All Dell machines come with 1Mbyte of parity-checked RAM as standard. This is contained in a bank of soldered 100ns chips, each of which holds 32k. Only 640k of RAM can be used by DOS — the remaining 384k must be configured as a RAM disk using the Ramdrive program supplied. If you'd rather have a bigger RAM disk and less memory available to DOS, a DIP switch lets

you split the megabyte into two equal 512k portions.

Like all IBM clones, there is no ROM Basic on the 286¹² motherboard. Trying to enter the ROM Basic (via the BIOS call that a real IBM machine uses) produces an error message onscreen and the system reboots itself.

There are eight full-length expansion slots, and all but two of these are of the 16-bit AT variety. The VEGA and serial/parallel cards each take up an 8-bit slot, and the combined hard-floppy disk controller takes a 16-bit one. The disk controller card is full-length, and this description is no exaggeration. It's actually too long and buckles slightly in the middle. I made the mistake of removing it to take a better look at the non-Intel 80286 chip it obscures and had great trouble putting it back. With one hand and a knee I had to stretch the system unit, while the other hand and various parts of my anatomy managed to drop the card into its slot. Dell has assured me that it will take a look at the problem, and that it will be fixed when a slightly newer chassis is made available towards the end of the summer.

The hard disk is a full-height drive made by Micropolis, with a formatted capacity of 40Mbytes. Its official speed is 28 milliseconds, which is around four times faster than a fast PC — and it shows. Some performance-checking software (DIS-KP.COM) rated it at 15ms in ideal

conditions. Because of MS-DOS's limit of 32Mbytes for a hard disk, a device driver is supplied that lets the disk act as two 20Mbyte drives, referred to as drives C and D.

The floppy drive is a 1.2Mbyte half-height drive made by Mitsubishi. It worked reliably and seemed more capable than others at formatting a disk to 360k capacity and allowing

'British people have never liked buying computers mail-order ... despite what Sir Clive asked you to believe.'

that disk to be read in a standard PC. Some 1.2Mbyte drives write each track twice in this situation, but this one does not.

Both drives run at the same speed as the machine, so if you switch to high speed (12MHz) the disk access speed increases accordingly. For time-sensitive copy-protection systems like that of Lotus 1-2-3, you need to run the machine at the slower speed while the program's key disk is being checked. When this has been done, you can switch to the full 12MHz.

Turning on the machine, the first thing you notice is the stream of

messages that appear on the SmartVu display. This four-character dot-matrix device is Dell's invention and shows you how the self-test and boot process is progressing, and how much of the machine's RAM has been checked so far.

The manual contains no technical information on the SmartVu, though a couple of hours studying the BIOS revealed that it's a clever device capable of displaying any of the 127 standard ASCII characters, in a choice of four brightnesses and a similar number of background brightnesses. A simple Basic program allowed me to have scrolling messages proclaiming that I was the owner of the machine. In the future, Dell plans to ship its own licensed version of MS-DOS, which will enable it to add its own utilities to the system disk.

Programs to turn the SmartVu display into a general-purpose display or a clock are promised. Meanwhile, it remains under-used — confined to displaying the number of the cylinder which the hard disk's head is currently hovering over. On my machine the hard disk was formatted, though this will not be the case in future. Formatting a disk allows DOS to check it for errors and mark any damaged areas as unusable. The advantage of formatting the hard disk after delivery, therefore, is that any errors induced during transit will be marked as such. The disk's heads are parked before shipping, though, so I'd be surprised if anything went wrong.

With the machine up and running, the first thing the manual suggests you do is to switch to the higher speed. The machine is switchable between 6 and 12MHz and normally powers up in the lower speed, though this default can be changed with a DIP switch.

To change speeds, you press Ctrl-Alt and Backslash at the same time. Doing this produces a beep from the speaker, and the SmartVu display changes to 12MHz to show that the higher speed is active. Pressing the same key combination again changes the speed back. The system didn't mind me changing speeds during program execution, or even in the middle of a disk access.

The way that the Ctrl-Alt-Backslash key combination is recognised is by having a special piece of code in the machine's BIOS that constantly monitors the keyboard and switches speeds when necessary. It struck me, then, that if I loaded the MS-DOS UK keyboard driver program, KEYBUK, which works by taking over the machine's default keyboard handler and replacing it with its own, there would be nothing to check for this special key combination and I wouldn't be able to change the speed of the machine.

I was correct. The generic MS-DOS

Technical specifications

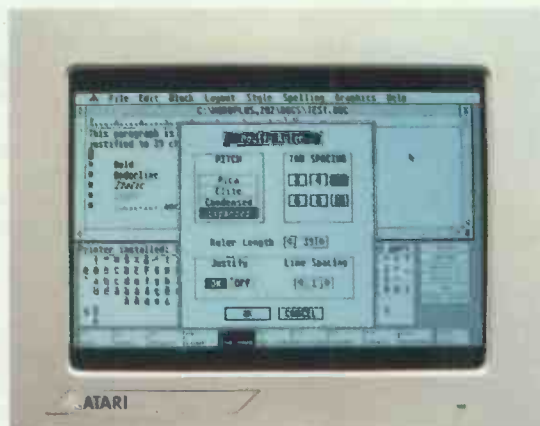
Processor:	80286 switchable 6 & 12MHz with one wait state
RAM:	1Mbyte
ROM:	64k
Mass storage:	Standard configuration one × 40Mbyte, 28ms hard drive; one × 1.2Mbyte floppy drive
Storage options:	360k drive, 3½in drive, tape streamer; additional hard disks extra
Keyboard:	84 keys; separate numeric pad/cursor keys
Monitor:	EGA card and monitor supplied as standard; other configurations available
Standard interfaces:	Two RS232C ports, one parallel port, EGA card, game port
Expansion	Can accept LIM expansion boards
Size:	6.5ins × 18.5ins × 16.5ins
Weight:	55lbs
Bundled software:	MS-DOS 3.20, GW-Basic 3.20, VEGA utilities, split disk partition utilities
Price:	£2199 + VAT (see panel for other prices)

Other configurations

Speed	Hard disk	Monitor	Price (excl) VAT
8MHz	20Mbytes	Mono	£1299
8MHz	20Mbytes	EGA	£1699
8MHz	40Mbytes	Mono	£1599
8MHz	40Mbytes	EGA	£1999
6/12MHz	40Mbytes	Mono	£1799
6/12MHz	40Mbytes	EGA	£2199
6/12MHz	70Mbytes	Mono	£2099
6/12MHz	70Mbytes	EGA	£2499

To be announced: an 80386 machine at 16MHz, with a 40, 70 or 150Mbyte hard disk

Taxmen, bank managers and accountants are easy to defeat.



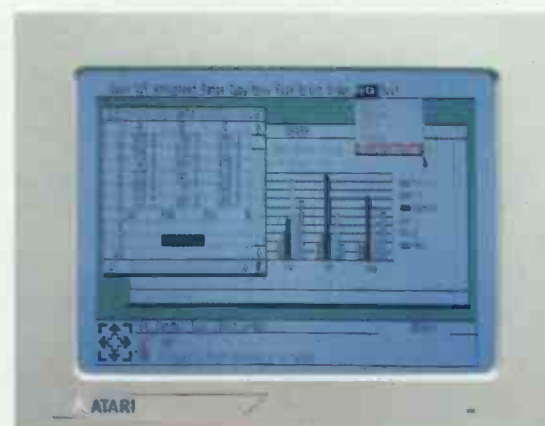
1st Word Plus – G.S.T. Professional word processor featuring U.K. spellings and integration of graphics including 1st Mail for full control of form letters etc.



Superbase Personal – Precision Software. All the features of GEM combined with full relational database power. Easy to set up, flexible, plus unique picture index facility.



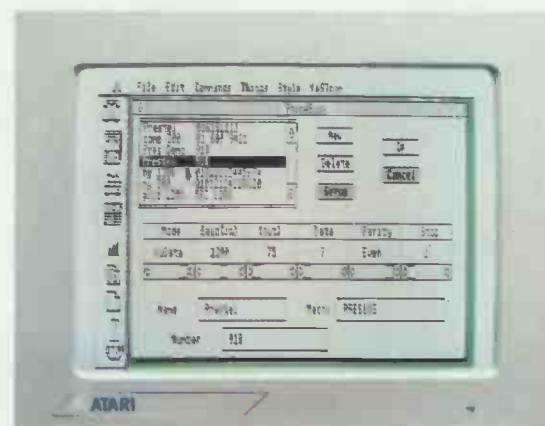
Fleet Street Publisher – Mirrorsoft. The complete desk-top publishing package. Gives you page make-up combining text and graphics for sophisticated, professional looking documents.



VIP GEM – Silica Distribution. VIP Professional is an Integrated spreadsheet, database, and graphics package. GEM environment plus Lotus 1-2-3 compatibility.



Neochrome – Atari. A powerful, sophisticated painting program for unsurpassed graphics. Work boldly on full screen canvas or in minute detail using Neochrome's magnifier.



Fastcom – Atari. A professional communications software package giving access to most major databases worldwide. (Integrated ASCII/Viewdata package).

These other fiends may be a bit trickier.



Gauntlet – U.S. Gold. Enter a world of monsters, mazes, mystery and combat in the ultimate role-playing fantasy game.



Tai Pan – Ocean. Voyage to 19th Century Hong Kong for action and excitement with pirates, smuggling and mutiny.



Metrocross – U.S. Gold.* It takes lightning reflexes to get past the potholes, obstacles and forbidden zones to reach the other side. And that's just the beginning!



Arkanoid – Imagine.* The latest smash-hit coin-op game! Are your reactions quick enough to handle 33 different play screens?

Mixing business with pleasure is no problem with an Atari 520 ST. Not when you've got over 1,000 software titles to choose from.

You'll find all the latest games and a huge range of business titles from the top business software houses. And the range is growing all the time.

You won't be short of power, either. The Atari 520 ST is twice as powerful as most business micros.

So you'll be able to create spectacular colour graphics. Even animate them to make your own films. If you're musically minded, you can compose and play a full symphony.

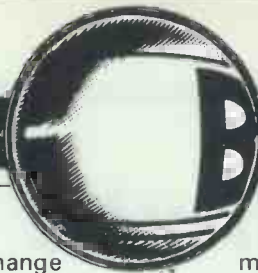
Or, for those who'd rather write programs than music, the 520 ST supports over thirty programming languages.

In fact, whatever you're looking for in a computer, you'll find it in the Atari 520 ST.



ATARI 520 ST

WORKS HARD · PLAYS HARD



KEYBUK program means that I couldn't change speeds, so I couldn't use it. The side-effect of this was that the '@' and '' keys swapped places, but I wasn't really bothered. Dell promises me that it will have its own version of KEYBUK by the time the machines are delivered.

Another key combination that the new KEYBUK program will need to cope with is Ctrl-Alt-Return. This enters the set-up procedure which allows you to configure the machine for the right amount of memory and the drives that are installed, and also contains a routine to park the heads on the hard disk.

This routine, which is normally found in a separate SETUP program, is much better suited to being built into the BIOS and callable from anywhere, though the choice of key combination may interfere with other pop-up programs that also use it. One omission from the menu of options in the SETUP system is a way of turning off the SmartVu display — it always shows the current position of the heads on the hard disk. While an engineer may gain deep and meaningful pleasure from watching a stream of rapidly changing numbers, I don't, and soon resorted to a piece of black tape to stop my eyes constantly wandering from the screen to the green display.

Software

Dell won't generally be supplying CGA machines — you receive an

EGA or mono system with a monitor. Almost all software that works with a colour monitor can be installed for use with an EGA instead. For packages that can't, you will have to rely on the CGA emulation program that is supposed to make the system work like a CGA and colour monitor. This program definitely works — with Flight Simulator, for example — but it isn't fool-

'... if Dell can overcome the British prejudices and confusing legislation about mail-order purchases, the company seems set to make a killing.'

proof. Some games I tried insisted on trying to write directly to the memory in the place that it would be found on a CGA card, resulting in a blank screen and my having to re-boot. Admittedly, most business software is better behaved than this and should work properly. If you do find problems, a real CGA card and monitor is available, though Dell's prices may not be so good because the company won't be supplying in volume.

Apart from some problems with the CGA emulation, all my software ran perfectly. Having a very fast hard disk is a pleasure. Drain, the public domain program that makes your computer sound like a washing machine, worked fine. True, making your computer sound like a washing machine is a strange thing to want to do, but it does test the timer circuitry, as this is how the sound effects are made.

Procomm, a communications package which makes extensive use of the BIOS, worked fine; but Burger Time, an arcade game, didn't.

Putting the EGA into 43-line mode from the DOS prompt, via a public domain utility called EGA43, worked fine. What's more, DOS gave me a full 43 lines onscreen before scrolling. Some machines, though I don't know why, will still scroll after 25 lines and leave the bottom half of the screen blank.

Copywrite, a naughty program that lets you copy — sorry, back up — protected software and accesses the floppy disk controller chips directly, had no problems.

Documentation

The 286¹² was supplied with Micro-soft's MS-DOS and GW-Basic manuals. A spiral-bound manual produced by Dell explains how to unpack the machine and set it up, and plug in cards. The VEGA card, and the DIO card that contains the serial and parallel interfaces, were accompanied by a slim manual explaining installation and DIP switches.

Technical information, including details on Dell's BIOS, the SmartVu, and the way that speeds are changed, was sorely missed, though a proper *Technical Reference Guide* will be available later this summer at additional cost.

Conclusion

I like this machine. It has a fast processor, with a hard disk to match. It has a higher specification than just about any standard machine, with two serial ports and 1Mbyte of RAM as well as a parallel printer port and an EGA card/monitor.

My only query concerns the ability of the EGA card to cope with some of the non-standard ways in which software tries to program the CGA card. If you plan to use a certain piece of software on the machine, you'd be advised to check with Dell that it is known to work.

A complete system costs approximately £2400, when VAT is added. It's not cheap in the same way that an Amstrad is cheap, but if you want value then you've found it. For the money, it's unbeatable.

END

How to order

No dealers will be stocking the Dell machines — you have to order by phone. You describe the configuration you want, and will be told the price and a delivery date. Delivery will be within a week, by courier to your door. You will normally have to unpack and set up the machine yourself, though Dell can do it for you — for an extra charge.

The number to call is Bracknell (0344) 863423. There will be a Freephone 0800 number, BT permitting.

Benchmarks

All using supplied GW-Basic and running at 12MHz. No 80287.

Intmath	1.1 secs
Realmath	1.4 secs
Triglog	9.7 secs
Textscrn	41.0 secs
Grafsrn	7.0 secs
Store	(hard disk) 3.0 secs (floppy) 9.0 secs

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

In perspective

There is no shortage of people who will sell you a cheap-ish AT clone. Built into the price, though, is the dealer's assumption that he will probably have to deliver the system personally, set it up and train someone how to use it.

Now that so many businesses have at least one PC, Dell is aiming at the company which already knows how to open a box and doesn't want to pay someone to do it for them.

British people have never liked buying computers mail-order, though the Sinclair ones weren't really business machines — despite what Sir Clive asked you to believe.

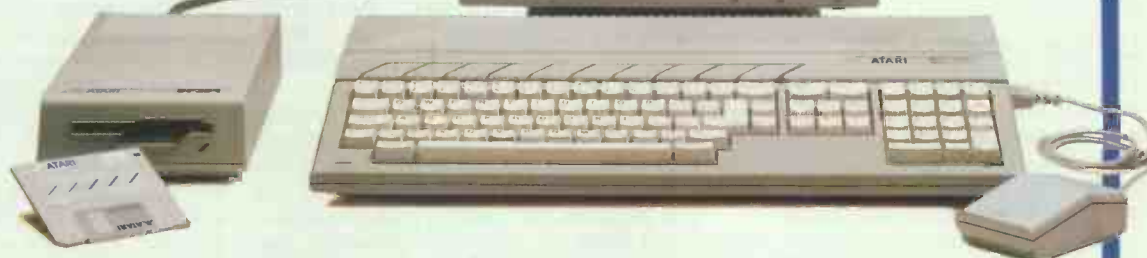
Dell's machines definitely are aimed at businesses and, if the company can adhere to delivery times and get to know its customers over the phone as well as a dealer gets to know someone who walks into his shop, these machines will do well.

**To help you defeat
the taxman**



**and destroy the
aliens,**

**we've massacred
the price.**



For a limited period, the Atari 520 STM is even more of a knockout than usual. We're offering it for just £449.95 (inc. VAT) complete with SF354 disk drive, SM125 mono monitor,* a mouse worth £24.95 and 1st Word, worth £49.95.

So as well as saving you from the enemy, the 520 STM will also save you £184. You'd better hurry though, because it won't be long before our stocks are wiped out.

ATARI 520 STM
WORKS HARD · PLAYS HARD



*Offer includes mono monitor. The 520STM plugs into a standard colour T.V.



Intel Inboard 386/AT

The Intel Inboard 386/AT and the Orchid Jet 386 are 32-bit accelerator boards which enable the PC/AT to run 80386 software, and allow 80286 software to run at greatly improved speeds. Peter Jackson examines the approaches taken by both manufacturers in the design and implementation of these boards.

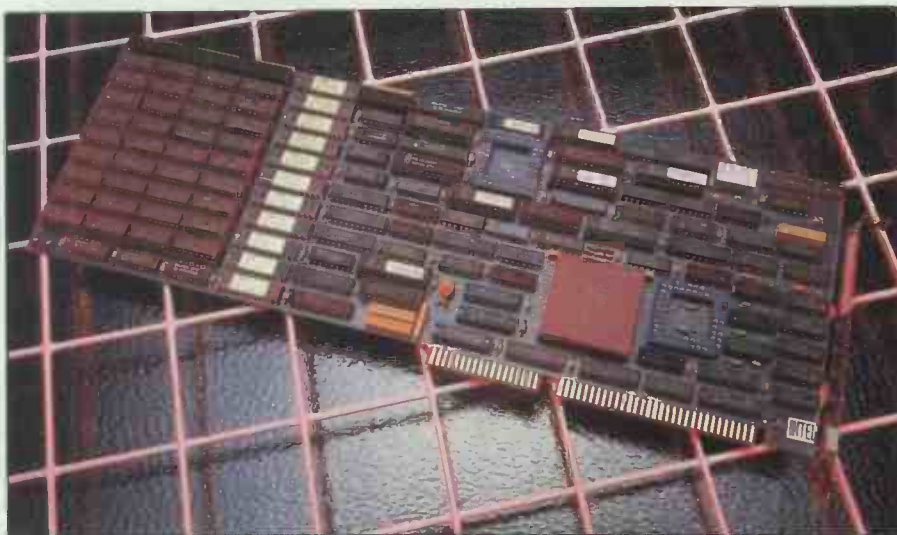
As the pace of 32-bit PC launches continues to accelerate, the pace of the old 8-bit PCs and 16-bit ATs starts to look a little worse than sluggish. And just as plug-in accelerator boards emerged to upgrade the PC's old 8088 engine with a fast 8086 or even an AT-compatible 80286 processor, the appearance of 32-bit accelerators for the AT was just a matter of time.

These boards offer better performance now, just as their 80286 predecessors did. But they also hold out the promise of running the forthcoming OS/2 — and running it rather better than an 80286-based AT — as well as supporting the inevitable 32-bit operating systems that are concealed even deeper in the mists of the future. With, of course, the advantage that this is all possible without throwing away an expensive AT and buying an even more expensive 80386 machine from Compaq, RML or Apricot.

Design problems

The problems faced by the designers of both the Intel Inboard 386/AT and the Orchid Jet 386 were identical, and all caused by the quirks of the 80386 chip itself combined with the quirks of the IBM PC architecture.

The memory interface is the most crucial part of the design, since the performance of any microprocessor depends on how much information it can get from memory in one go, and how quickly it can get it. The 32-bit 80386 can accept data from RAM in 32-bit batches; while the 16-bit 80286, reasonably enough, accepts it 16 bits at a time. So if an 80386 replaces an 80286 in a computer system, and uses the 16-bit RAM of the older processor, the 80386 needs two memory accesses to get 32 bits to work on and is crippled in performance from the start by the extra 'wait



states' involved.

Worse, if part of that 16-bit RAM is on an expansion board rather than the motherboard, another slice of slowdown is inserted. And even worse still, it turns out that the 80386 is actually *slower* than the 80286 in using the same 16-bit memory.

In systems built from scratch around the 80386, like the Compaq DeskPro 386 or the similar machines from Zenith, Kaypro and Apricot, this is avoided by putting the processor and RAM on their own separate, fast 32-bit bus so that memory transfers run at full speed.

With that in mind, the 80386 board makers need to put as much performance enhancement aids on their boards as they can, to avoid disappointing customers who expect full-throttle 32-bit performance.

Intel Inboard 386/AT

The obvious solution to the memory speed problem is to include a slab of fast 32-bit RAM on the accelerator board, and that is what Intel has done on the Inboard. A megabyte's

worth of 120ns or faster 256kbit RAM chips can be plugged into sockets on the board, and a separate piggyback board is available to provide up to 2Mbytes more. However, because of the 32-bit organisation of the RAM, the entire megabyte needs to be added to the Inboard in one go.

The Inboard RAM can be used in three ways. First, it can be ordinary 'extended memory', a linear lump of memory extending above the 1Mbyte addressing range of MS-DOS. Second, it can be used as Lotus-Intel-Microsoft (LIM) 'expanded memory', which makes banks of extra RAM above the 1Mbyte line available to programs written to the LIM specifications. And third, it can be used as 'conventional memory' to fill up the RAM capacity to the 640k maximum recognised by MS-DOS. There must be a minimum 256k RAM on the AT motherboard, but the Inboard can provide the rest of the memory needed to get to 640k. And even if there is already 640k on the AT motherboard, the Inboard RAM can be used to provide all the conven-

Orchid Jet 386

Like the Inboard, the Jet 386 is an accelerator aimed at speeding up existing ATs; and also like the Inboard it includes its own 64k of fast cache RAM — actually using Inmos 55ns 16kbit static chips — to speed up memory and disk accesses.

Apart from those similarities, the design is very different. The Jet 386 does not try to mimic the 80286 in the 80386 at all, but provides a socket to take the 80286 chip itself when it is removed from the AT motherboard. Combined with a second crystal on the Jet to provide the 6MHz frequency needed by the 80286, this makes the Jet look precisely like a 6MHz AT for software that actually requires it.

And of course, on late-model ATs with 6MHz speed checking in the ROMs, this makes it possible to fool the test and install the Jet successfully in those machines.

Switching between the 80386 and the 80286 can be done physically by flicking a switch on the Jet's back panel, or in software. More, this means that an 80287 installed on the AT motherboard can be used if required; the Inboard will not allow this. Like Intel, Orchid provides a socket to take an 80387 processor

and an optional 80287 module to fill this socket until the 80386 becomes more common and cheaper.

There is no room for RAM on the Jet, although there is a piggyback connector that will take a board with up to 8Mbytes of 32-bit RAM. Up to 4Mbytes of total RAM can be cached, so both conventional and extended memory can benefit from the advantages of cache speed. On top of that, Orchid provides disk cacheing software to accelerate that part of the system when the Jet is installed.

Installation, as with the Inboard, involves removing the 80286 from the AT, plugging in an L-shaped adaptor card — a much better solution for old ATs with a half-hidden processor — and then running two cables from the adaptor to the Jet. The Jet must be installed in Slot 8, the slot nearest the processor and the hard disk drive, since the cables are too short for it to go anywhere else. The AT disk controller board, normally in Slot 8, must be moved to Slot 6 and the cables rearranged to suit the new configuration.

Orchid provides a levering tool to extract the 80286, and although this is nowhere near as sophisticated as Intel's gadget, it still seems to work. If no 80287 is to be used, Orchid provides a bulky and hard-to-fit noise

suppressor module to go in the empty 80287 socket in the AT.

The software that comes with the board includes a single driver, JET386.SYS, and a JET.COM program. As with the Intel software, JET386.SYS is installed as an MS-DOS driver in the CONFIG.SYS file, but does not allow keyboard speed-switching. Speed is changed by typing JET ON or JET OFF at the MS-DOS prompt, or by flicking the back panel switch; options to the JET command allow the cacheing to be turned on or off.

As with the Inboard, everything ran with no problems. The Lotus 1-2-3 macro took, this time, 31 seconds, slightly slower than the Inboard thanks to the use of slower motherboard RAM rather than fast 32-bit RAM. But the speed difference is not that significant, showing that the 256k of motherboard RAM used by the Inboard does slow things down.

The lack of keyboard speed-switching, and its replacement by a physical switch, is less convenient but the disk cache software is a nice extra to have. The Orchid Jet 386 is another solid enhancement product that may not have the sophisticated memory management options of the Inboard, but that almost matches its performance and is cheaper.

tional memory above 256k; obviously, using 32-bit memory for conventional RAM speeds things up even further.

Various combinations of these memory types can be set using different switch settings on the board, splitting the 1Mbyte RAM space between conventional, expanded and extended memory as required. For now, extended memory is only useful for RAM disks, Xenix and for a few odd applications, so most users will want to use the conventional RAM option for extra speed and use the rest as either LIM expanded memory or a RAM disk.

Besides this main RAM — which is not compulsory, but strongly recommended — Intel also provides a separate 64k block of very fast cache RAM that uses expensive 45ns chips and sits between the processor and main memory. Cache RAM is now often used to speed up disk performance, by storing the most-often-used disk data in the cache rather than on the physical disk. Then, whenever the processor wants that data, it can get it straight from the fast cache rather than from the relatively slow hard disk.

Intel has taken this further by cacheing its fast 32-bit RAM with even faster RAM. The most often-used sectors of RAM are stored in the cache, changing dynamically as the RAM contents and the processor's needs change, to speed up

memory access still more and squeeze even more speed out of the 80386.

The rest of the Inboard is conventional by accelerator board standards. There are two big sockets on the board: one to take the cable linking the board with the 80286 socket on the AT motherboard; and the other to accept the 80387 maths co-processor. Given the current shortage of 80387 chips, and their high price, Intel is offering a module that plugs into this socket but uses the cheaper 80287 maths chip instead.

Installation too is straightforward by accelerator standards, although Intel recommends that users get the dealer to install the Inboard to avoid a potentially expensive disaster. The procedure is to unplug the 80286 from the AT motherboard, plug the Inboard connector cable into the newly empty socket, and connect the other end of the cable into the appropriate socket on the Inboard. Then the Inboard goes into a spare 16-bit slot in the AT's expansion bus array, and that's just about it. A noise suppressor module is provided to plug into the 80287 socket on the AT motherboard, but when this is omitted the Inboard still seems to work satisfactorily. A new plug-in 16-MHz crystal is provided to boost the speed of the AT to 8MHz if required, replacing the 12MHz crystal in the older 6MHz ATs. This is essential for the Inboard to work, which prompts

questions about its compatibility with the later-model 6MHz IBM ATs. These included a ROM-based speed test which refused to boot the machine if it was running faster than 6MHz, and this was done specifically to stop people plugging in faster crystals. Intel fails to mention this issue at all.

On the review machine, installation was not quite as smooth as it should have been. First, it was an old-model 6MHz AT, with the old 512k motherboard where the 80286 chip is partly concealed by the hard disk drive and its cabling. However, the Intel manual explains clearly how to release the hard disk and slide it out of the case slightly to gain access to the chip. Second, the 80286 resisted removal despite the use of the ingenious screw-driven extraction tool provided with every Inboard, and required a lot of juggling and wriggling before it would come out.

Separate clip-on cable and installation kits are available for those AT clones which have surface-mounted 80286 chips rather than socketed ones, like the Compaq DeskPro 286 and the Tandy 3000. But there is nothing that Intel can do about machines like the Epson AX, where the 80286 is too far from the expansion slots; or the Olivetti M28, where the processor is actually on the underside of the main circuit board, the opposite side from the slots.

Installing the Intel software is also



straightforward. If the Inboard RAM is to be used for conventional memory, the AT's Setup program from the IBM diagnostics disk needs to be run to tell the system how much conventional memory there is, and how much extended memory. Then, Intel's SPEED.COM, SPEED.SYS, IEMM386.SYS, EMM.SYS, INVOC.SYS, QUIKMEM2.SYS, EGA.EXE and CHKOP.EXE are copied from the Inboard floppy into the root directory of the AT hard disk.

SPEED.COM is a program that runs from the MS-DOS prompt, and is used to switch between the Inboard's four speed modes. Mode 1, the slowest, runs the 80386 at the system board's new 8MHz speed, with the 64k cache disabled. Mode 2 runs at 8MHz but enables the cache; Mode 3 runs at 16MHz without the cache; and Mode 4 runs at top 16MHz speed with the cache enabled.

Intel claims that most users will only use two speeds: mode 1 to handle speed-sensitive software or to boot software with certain copy-protection mechanisms; and mode 4 to obtain the real speed benefits of the 80386.

SPEED.SYS is the alternative way of speed-switching, and makes it possible to switch between the four modes using keyboard combinations. Once SPEED.SYS has been installed as a device driver — by including the line DEVICE=SPEED.SYS in the CONFIG.SYS file in the root directory — holding down the Left Shift-Ctrl-Alt key combination and pressing the key 1, 2, 3 or 4 changes the board into one of the four speed modes. This is useful for copy-protected software like Framework II, which must be booted at 8MHz but which can be run at full speed by switching modes while the software is running.

IEMM386.SYS and EMM.SYS are expanded memory drivers: the first to emulate Lotus-Intel-Microsoft expanded memory in the Inboard's extended memory; and the second to allow Above Board-style expanded memory boards to work with the Inboard installed.

When the software has been installed, the machine acts as a superfast AT. All the software tested ran well in all four speed modes, including word processors like Word Perfect, spreadsheets like Lotus 1-2-3, databases like dBaseIII and Powerbase, and integrated packages like Open Access and the Smart Suite. It all ran faster too, although it is hard to compare processor-bound applications like 1-2-3 with keyboard and disk-bound programs like Word Perfect.

Intel includes extra compatibility notes in an addendum to the manu-

al, and there are some things worth mentioning: for example, despite the manual and publicity the Inboard will not work at all in Compaq Portables, and an IBM EGA card will not work in a Compaq DeskPro 286 when the Inboard is installed. The other problems that are known about include old versions of the Crosstalk XVI communications package, which is speed-sensitive and needs patching to work. Both Intel and Crosstalk Communications will provide patches.

Running a typical program like Lotus 1-2-3, with a complex macro that copies, deletes, moves and recalculates large lumps of a big 500 x 500 spreadsheet model, shows the type of performance improvement that can be expected. On an ordinary 4.77MHz PC, even with an 8087 maths processor installed, the macro takes 2 minutes 45 seconds. On an ordinary 6MHz AT, it takes 53 seconds, while it takes 26 seconds on the 12MHz Compaq Portable III with its fast RAM. On the Intel Inboard, at the fastest mode 4 speed, the same macro took 23 seconds; but at the slowest mode 1 speed it took an extraordinary 96 seconds, not even twice as fast as the 8087-enhanced old PC and worse than an old 6MHz AT. Both of these tests used fast Inboard RAM to fill up conventional memory between 256k and 640k, and used 256k of the memory remaining as Above Board expanded memory.

The Inboard tries hard to do everything as right as it can, considering the design problems of putting a 32-bit processor into a 16-bit machine. For those who want fast performance now, a really quick 12MHz AT like the Compaq Portable III will do the job as well as the Inboard, but at a much greater price and without the prospect of sophisticated 32-bit software to come.

As a combination of speed enhancement now, and 80386 software compatibility for the future, the Inboard 386/AT is a solid piece of work.

Benchmarks

The BasicA Benchmark timings may be surprising: the two 80386 boards are both slower than the 6MHz 80286 that they replace in running the BasicA programs.

The reasons for this have already been presented here. When it comes to using conventional AT memory, an 80386 is slower than an 80286 whatever the clock speed the processor is running at. And even though

the Benchmarks were run with the Inboard providing 384k of conventional memory, and both boards had their cache RAM enabled, BasicA runs in the bottom, slow 64k of RAM on the AT motherboard. It is the vital processor/memory bandwidth that gives the 80386 a lot of its speed, and software that only uses conventional memory on the AT is not going to go any faster with an accelerator board.

The Lotus 1-2-3 test, on the other hand, uses the Inboard's fast RAM and the cache on both boards to enhance performance. And that is perhaps a better real-life measure of speed than Basic Benchmarks.

Conclusion

Both boards do what they are designed to do: speed up AT performance by a factor of around two, using existing disk drives and peripherals. The use of cacheing, more and more common these days, conceals the slowness of the AT's 16-bit RAM and the relatively slow hard disk performance compared with the ESDI drives on the Compaq DeskPro 386.

But the real benefit of boosting an AT will be found when the piggyback RAM boards are installed, and the boards are running 80386 control software like PC-MOS/386 or Merge 386 which allow multiple Unix and MS-DOS tasks to be run separately and independently. And then there are the forthcoming 80386-specific applications like Q&A 386 from Symantec and Paradox 386 from Ansa, not to mention semi-80386 operating systems like Concurrent DOS 386.

It is this software that will, in the end, make it worthwhile to have an 80386 rather than an 80286. And an Inboard or a Jet 386 is a good way to get into the 80386 business for the minimum possible outlay.

The Intel Inboard 386/AT costs £1695 (excl VAT); the Orchid Jet 386 costs £999 (excl VAT). Intel is on (0793) 488388; Orchid is on (0256) 479898.

Benchmark timings

Inboard 386/AT

Intmath	4.3secs
Realmath	4.1secs
Triglog	43.2secs
Textscrn	37.0secs
Grafsrn	—
Store	3.7secs

Orchid Jet 386

Intmath	5.8secs
Realmath	5.4secs
Triglog	59.6secs
Textscrn	48.7secs
Grafsrn	—
Store	5.1secs

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

A laser printer for the cost of a daisy wheel?

Imagine the superb results and versatility that a laser printer offers—but at the economical price of a daisywheel printer system*.

Wouldn't you be interested?

Until now it's been a fairly academic exercise, but Mekom, the U.K.'s leading laser specialists, have turned theory into reality with the launch of the new low-priced Centronics PP-8 laser—8 pages per minute of superb 300 d.p.i. quality for just £1595 (excluding VAT).

Compare that to a daisy-wheel printer—but don't forget the acoustic hood and sheet feeder, unless

you want your office to grind to a halt—and you'll

see why the PP-8 has one of the lowest costs

per copy, at 1.7 pence, of any printer on the market.

Add to that the extra flexibility that a laser can provide—a range of resident and optional plug-in fonts for different type-styles; upgradeable memory for graphics applications; superb paper handling—the list is endless.

So before you decide on your next printer consider the PP-8 from Mekom.

We're not called the Leaders in Lasers for nothing!



Centronics PP-8
ONLY £1595[†]
(excluding VAT)

Only Mekom could do it!

MEKOM

Computer Products Limited

Head Office and Midlands Region,
Enfield Hall, Enfield Road, Edgbaston,
Birmingham B15 1QA. Telephone: 021-454 2288

Northern Region
850 Birchwood Boulevard, Birchwood, Warrington,
Cheshire WA3 9QZ. Telephone: 0925-821776

Southern Region
Giltspur House, 6 Giltspur Street, London EC1A 9DE
Telephone: 01-248 1711

LEADERS IN LASERS

Please complete and return to: Mekom Computer Products Ltd
Enfield Hall, Enfield Road, Edgbaston, Birmingham B15 1QA.

Please send me details of the low-priced Centronics PP-8 ☐

Please call me to arrange a free, no strings attached
demonstration of the PP-8 ☐

Please send me details of other Mekom products and
services ☐

Name: _____

Position: _____

Company: _____

Address: _____

Telephone: _____

Printer currently used: _____

[†] Centronics PP-8 base model with 256K RAM. Model illustrated shows optional plug-in font card. (Retail Price £100 each).

*Typical Daisywheel system including Daisywheel Printer, Acoustic Hood and Sheet Feeder.

A Cray on every desktop

The supercomputers of today could become the desktop machines of tomorrow as the prohibitive factors in their development and manufacture are overcome. Nick Hampshire looks at what the future holds.

Are there any limits to the potential power of personal computers? They have been in existence for barely ten years, but during that period the processing power and memory of personal computers has grown at a phenomenal rate. This growth in processing power and memory capacity has resulted in an increasing convergence between the capabilities of the personal computer and the multi-user mainframe. Indeed the new generation of personal computers are now starting to pose a serious competitive threat to mini and super-mini computers. Will their power continue to increase to a level where they would pose a similar threat to the most powerful of today's computer, the so-called supercomputers?

Some of the most powerful computers in existence today are machines like the Cray 2 or the Cyber 205 which are capable of performing at speeds which are ten thousand times that of the most powerful personal computer. However, if this article had been written ten years ago, then the most powerful machines would have had only a few hundred times the power of an 80386 desktop. Going back a further ten years to 1967, and a mainframe had not much more processing power and frequently far less memory than is possessed by an 80386-based personal computer.

The fact that the power of personal computers has developed so rapidly in just ten years would lead to a superficial conclusion that this rate of development will continue over the next decade. If this happens then it is very likely that personal computers could be produced with the power of a Cray 2 and a price tag comparable to a current top-range PC.

The great reductions in the cost of computing power has been almost

exclusively produced by the massive amount of electronic circuitry which can now be condensed onto a single silicon chip. The greater the complexity of circuitry which is contained on a single chip, then either the lower the cost or the more powerful the resulting machine, frequently a combination of both.

However, semiconductor technology is beginning to encounter fundamental physical limits in the continual drive to put more and more circuitry on a single chip. This means that over the next decade the rate of increase in power of low-cost minimal chip count personal computers will slow down very considerably. The driving force behind the technological development of the personal computer market will no longer be the semiconductor industry; it will instead be computer science. Rapid developments in computer science are bringing new computer architectures, new forms of computer software, and new types of man/machine interface. It is these developments which will put the affordable personal supercomputer in the offices, factories and laboratories of the world.

Necessity

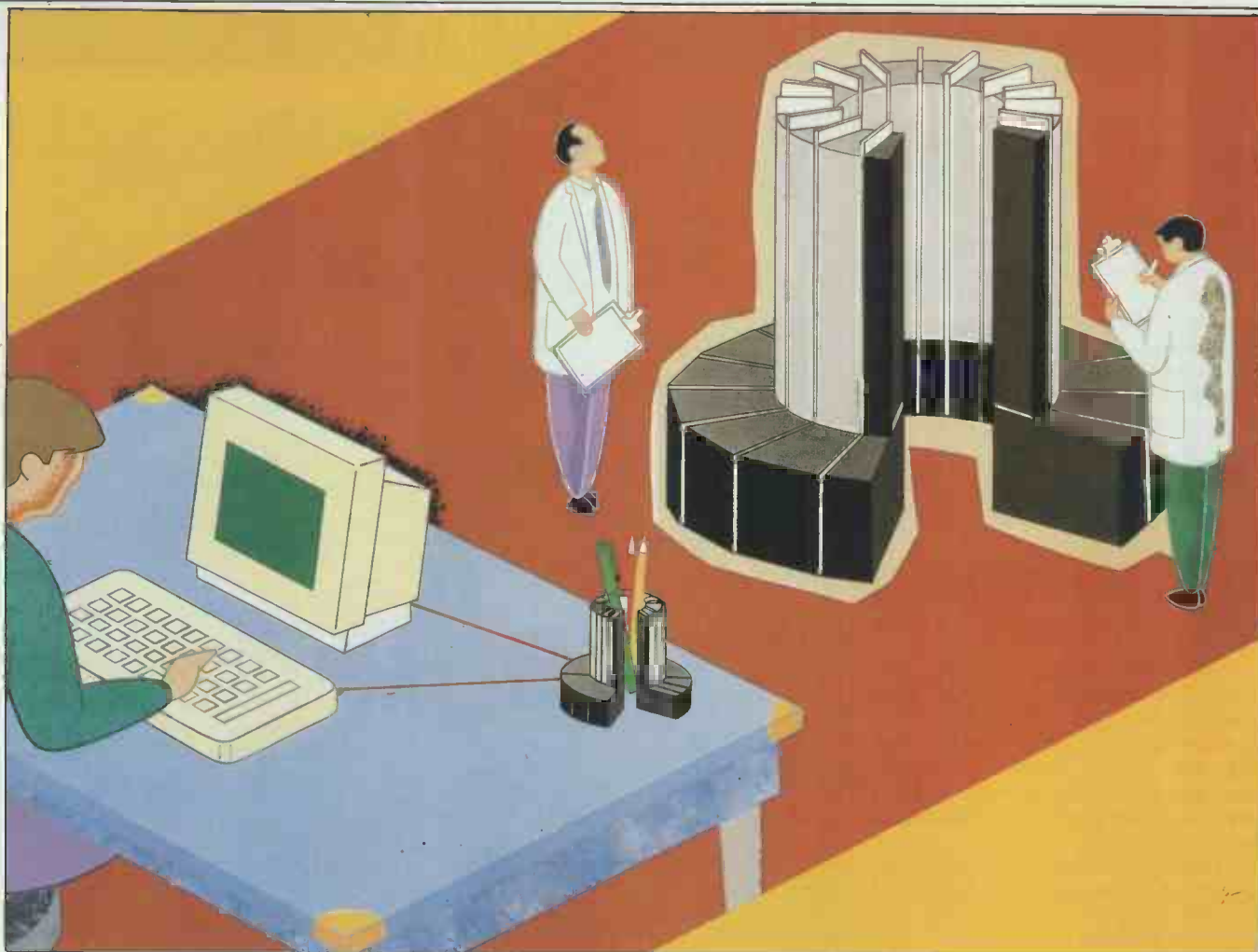
Supercomputers like the Cray 2, and very large mainframes like the Amdahl 580 series, are very expensive — \$10 million plus, and also relatively uncommon — only a few hundred machines in the whole world. This combination of scarcity and high cost has meant that such machines have usually been acquired for very specific purposes: a considerable proportion of the world's supercomputers are employed in weather forecasting. Scientific researchers, particularly those involved in high energy and nuclear physics are users of such machines. Probably the

largest users are the military, particularly in the US where they are applied, among other things, to the computationally enormous problems associated with analysing the vast quantities of data involved in missile detection and warning systems.

The small number of existing machines, most of which have dedicated applications, has meant that there is generally very little experience of using such sophisticated and very powerful hardware. There is, firstly, very little software available which fully utilises the capabilities of the machines — most users have produced bespoke packages for their own applications. There are also very few people who fully understand the complexities involved in programming such machines, particularly since there are very few programming tools available to make the programmer's task easier.

With the scarcity of high-level programming tools it is very expensive to create applications programs for supercomputers. It has been estimated that it requires over 50 man-years of work just to optimise a 100,000-line Fortran program so that it would fully utilise the power of a Cray.

The consequence of the very high cost of hardware and software development is that very few attempts have been made at using these machines for anything other than fairly straightforward number-crunching applications. This has started to change in the last few years, particularly in the use of supercomputers to generate very high-quality graphics images, and examples of these have been seen in some of the recent Hollywood science fiction film productions. However, like other users of supercomputers, film companies have large budgets



and can, therefore, afford the investment.

If the price of supercomputing hardware was to come down to a level where it could be afforded by a large number of people as a personal machine, it is unlikely that its application would be confined to those areas where supercomputers are currently used. Of course, it would be silly to use such powerful machines for simple tasks like word processing; they will instead open up new applications for computers. Indeed, there is a fairly universal rule that the complexity of people's applications will expand in order to fully utilise the maximum power and memory capacity of the available hardware. Equally the prospect of a large software market will prompt software houses to produce and market the tools which are essential if such hardware is to be properly utilised.

The reasons why people will want to use affordable personal supercomputers is fourfold: for purely number-crunching applications such as simulations and modelling; for applications which involve very high-quality graphics outputs; for applications which will support new sophisticated man/machine interfaces such as full interactive voice I/O and natural language comprehension; and, finally, in order to support the new generations of AT software.

Differences

Mainframes, minicomputers and personal computers all use a common architecture: they are all single instruction, single data stream processors. The principle differences between a mainframe and a personal computer are speed, multi-user capability and data storage capacity. It is these three factors which account for the enormous price range from a few hundred pounds for a bottom-range PC to a few million pounds for a top-range mainframe.

The much higher processing speed of a mainframe computer is basically achieved in two ways. The electronic components used in mainframes are frequently constructed using semiconductor technologies such as ECL (Emitter Coupled Logic). These forms of semiconductor are capable of operating at speeds which are 20 or 30 times faster than the equivalent MOS (metal on silicon) semiconductors found in personal computers. The use of such high-speed semiconductors has its disadvantages; they produce large quantities of heat which means that computers constructed using ECL or similar semiconductors require very elaborate and expensive chip-cooling systems. Blowing air over the chips is totally inadequate — most mainframes pump liquid refrigerant through heat-

sinks attached to each chip; this alone is a very expensive component of a mainframe computer.

Higher processing speed is also achieved by using more sophisticated architectures with techniques such as 'pipelining'. These techniques are starting to be employed on some of the most advanced personal computers. Chips like the 80386 use pipelining and the new IBM PS/2 uses high-speed data channels. The function of all of these techniques is to overcome the problem that memory access is usually far slower than the actual processor. (This means that the processor wastes a lot of time simply waiting for memory access.) Pipelining means that while the processor is performing one operation another portion of the processor is simultaneously doing the next memory access, and the processor no longer needs to wait for memory since it is already accessed and ready for the processor.

Because mainframe computers are primarily intended as multi-user machines, another very large component of the cost of such a computer is the large amount of communications circuitry involved. The multi-user environment and the nature of most applications which are run on mainframe systems also means that the machines need reasonably large amounts of core memory and very

large amounts of online disk or tape data storage. This large amount of data storage hardware is yet another contributor to the high price of mainframe systems.

However, despite the high speed and enormous data storage capacity of mainframe computers, the actual processing power and storage available to any one user is frequently little better than that of a reasonably powerful PC. This fact has been one of the prime contributors to the growing trend towards distributed processing and local area networking. One of the main justifications for the use of mainframe computers is in situations where very large databases need to be accessed and updated by a large number of separate users — for example, an airline booking system.

Applications which require raw processing power are, however, now increasingly being performed by supercomputers. These do not employ the single instruction, single data stream architecture; instead, they are either parallel processors or vector processors.

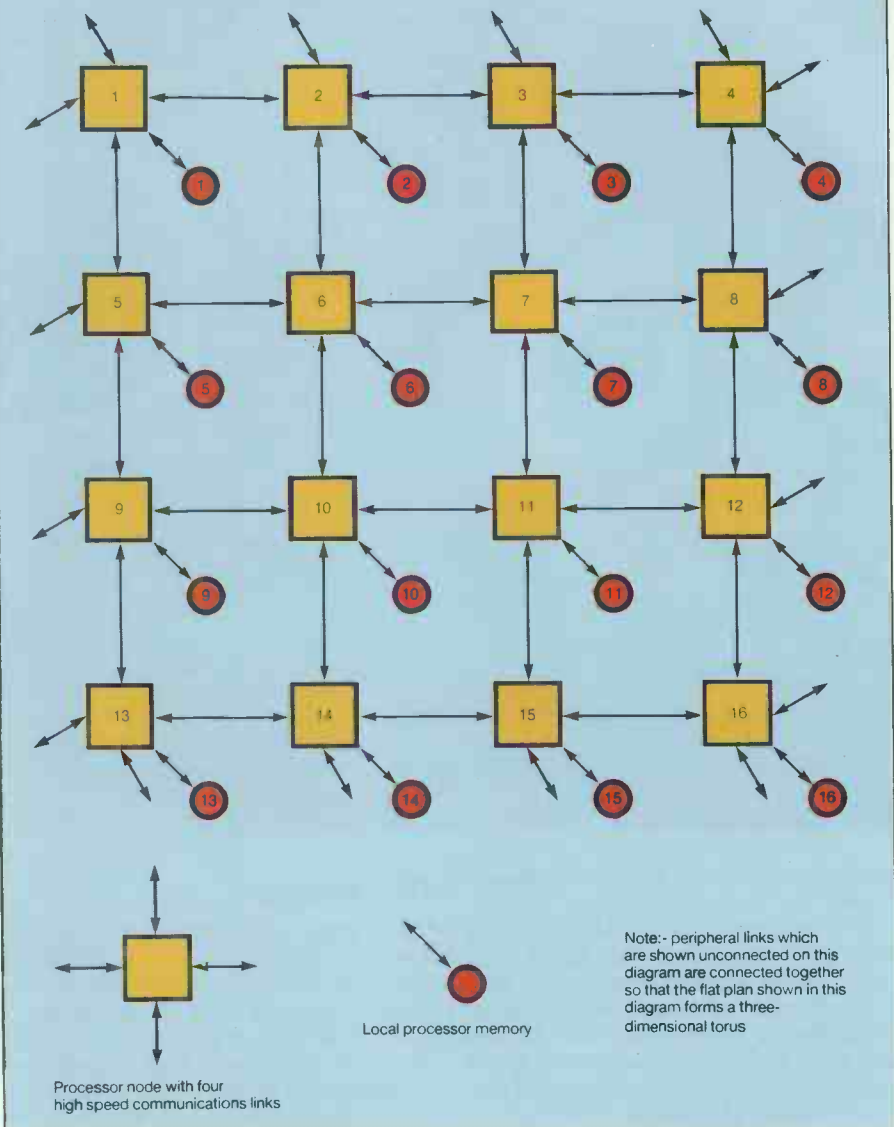
A parallel processor is constructed by adding more arithmetic operation modules into the system, so that operands may be operated on in parallel. This increases the speed at which the machine can perform calculations but it also means that certain functions have to be performed in order to achieve this high performance. These are functions like monitoring processor occupancy in order to ensure a smooth flow of the programming steps and the optimum utilisation of the processors.

In a vector processor a single arithmetic operation module is segmented so that an instruction is carried out in a pipeline of independent steps, each step being timed by the basic processor timing cycle. Essentially vector processors are only a sophisticated variation of the architecture employed in conventional computers, from PCs to mainframes.

Older generations of supercomputers, such as the Cray 1 and the Cyber 205, are vector processors. Their very high speed is attributable not just to the vector architecture but also to the use of very high-speed semiconductor technology, and very careful attention to the construction of the machine in order to ensure that the length of connections between any two components is kept to a minimum (the longest piece of wire in a Cray 1 is 18ins long).

Newer generations of supercomputers are now being constructed using parallel processing architectures. These have the enormous advantage

A typical parallel processor system



that the computational power of the machine is dependent on the number of processors and not necessarily on the speed of any one processor. Consequently individual processors can be constructed using low-cost conventional semiconductor technology; these do not require elaborate cooling systems, massive power supplies or ingenious construction techniques to minimise wire length.

Parallel processors are, therefore, potentially relatively cheap to build — even today it would be possible to build a parallel processor with the computational power of a \$10 million Cray 2, for under £100,000 (that is, transputer-based systems). There is no reason to assume that this cost will not follow the normal downward curve as such machines become more highly integrated and the components are produced in bigger volumes. It will be parallel processors of this form which will constitute the personal supercomputer.

Development

A parallel computer basically consists of a two- or three-dimensional array of memories which are joined together at nodes consisting of processing elements (shown above). The interconnections between the processors with their associated memory can be fixed as a network, or in some machines is user-definable with the interconnections being made in much the same way as a telephone exchange.

One of the key components which has made powerful parallel systems possible is the development of processors like the Inmos Transputer. These processors have been especially designed to allow the easy and flexible construction of multiprocessor systems. What makes a Transputer different from conventional microprocessors is the four high-speed communications channels which are built into the proces-

sor. These allow data to be transferred between nodes in a parallel system concurrently at 10Mbytes per second per link. The chip also includes a full 32-bit floating point arithmetic unit and 4k of very high-speed static RAM. The most advanced version of the Transputer chip, the T800, is capable of performing four million full 32-bit floating point calculations per second without any external arithmetic circuitry. Individually this chip has the same power as a supermini: an array of as few as 64 gives a supercomputer with very considerable power.

Problems

The software problem posed by parallel computers is how to divide a particular task into a number of separate processes which can be performed concurrently by each of the processors in the system. All our computing experience and knowledge acquired over the last 35 years has been with sequential machines. Working with parallel computers requires entirely new techniques and methods of thinking. The clear procedural structure which lies behind every program on a sequential machine is almost impossible on a parallel machine. Each of the separate processes into which a task is divided will take different times: some processes will require data produced by other processes, some will require data from external sources — the software problem of controlling and managing a large number of interrelated processes is enormous.

The enormity of the problem is compounded by the fact that it is almost impossible for the human brain to conceptualise what is happening in such a complex system. This makes it very difficult to design and debug.

The initial techniques adopted for dealing with multi-processor systems were to simply dedicate each processor to a specific class of process. This technique is found in many existing personal computer systems, where one processor may be used to handle communications, another for the graphics display and a third as the main arithmetic processor. Similarly multi-user systems have been constructed using multiple processors, where each user is allocated his own dedicated processor rather than time-multiplexing several users' access to a single processor. This type of multi-processor system is very primitive and is certainly not what is meant by the term parallel processor, even though all the processors may be working in parallel.

In a true parallel processing system such as that shown diagrammatically on page 126, the problem of controlling all the individual processes has to a large degree now been

solved. It involves the use of a host processor which is responsible for booting up the system, performing hardware monitoring, performing housekeeping functions and running the control software.

Probably the best-known piece of control software for use in parallel computer systems is Occam. This was designed by Inmos to act as a development environment for Transputer-based parallel computing systems. Occam handles the concurrency of a system and is designed to manage a number of independent processes which can run either concurrently or sequentially and communicate with each other via self-synchronising data channels. The great advantage of Occam is that it is independent of the number of processors in the system. Programs using it will work equally well using

*'Parallel processors
will enable systems to
be designed with a
whole new range of
man/machine
interfaces. Voice input
is one such
interface ...'*

one processor or a thousand, the only difference being that with a thousand Transputers it should run nearly a thousand times faster.

Alice — a working parallel system

An example of a true parallel computer is 'Alice', which is an acronym for Application Language Idealised Computing Engine. It was first conceived back in the early 1980s by a team at Imperial College, London, and has come into existence thanks to the Government-sponsored Alvey initiative. This created a link between Imperial College, the University of Manchester, ICL and Plessey under 'Flagship', a £15 million project which will culminate with the construction of a 'fifth generation' computer with considerably more power than the Alice prototype.

The design of Alice is intended to overcome some of the programming limitations of both conventional computers and previous parallel computers, both in terms of speed and power as well as reducing the enormous cost and complexity of software development. Some of these limitations can be overcome by writing programs in what are known as declarative languages; Alice is specifically designed to run declarative languages.

Alice is a parallel processor built around the Inmos Transputer. In its present form Alice has 16 processing elements, each processing element consisting of five Transputer chips

and 128k of memory. Memory consists of 16 storage elements, each element having a controlling transputer and 2Mbytes of RAM. The processors are connected with the storage elements by a sophisticated electronic switching network, which operates like a telephone exchange and allows any processor to access any storage element. The whole machine is front-ended by an ICL 2900 mainframe computer which performs all the I/O, file-handling and system monitoring. Even restricted to these simple tasks, the 2900 could be the bottleneck in the system.

In operation the data on which the program is operating is divided into small blocks and distributed through the various storage elements. These blocks of data with their associated control information form what are known as the 'packet pool' — each piece of data being a packet. All the processors are continually accessing this pool looking for data on which to operate. When a processor finds data on which it can operate it removes it from the pool and processes it, an operation which is referred to as a 'reduction'. Having completed this reduction, the packet is returned to the pool in its rewritten form and the processor looks for another packet on which it can operate.

The way Alice operates means that so long as there is data available within the packet pool then all the processors will be operating in full parallel. Obviously the operating system software and high-level languages employed by this kind of machine are very sophisticated. The machine utilises Occam to perform control of process concurrency, and is already running a high-level language called 'Hope' which was first developed by Edinburgh University and which makes full use of the machine's power.

Advanced software

The development over the last few years of declarative and other non-procedural programming techniques for use on parallel processing systems, is opening up whole new areas of potential computer applications. Foremost among these is the area of artificial intelligence and the associated improvements in the man/machine interface; these are things like voice input, natural language comprehension and machine vision.

Declarative languages are designed to be structurally transparent to the user; this means that they can be verified and optimised mechanistically. They are also designed to divide a problem into a large number of sub-problems; and it is this feature which facilitates their use in parallel computers which employ multiple instruction and multiple data parallelism. A declarative language achieves these goals by separating the task that the

program is to perform from the way that the computer performs that task. Declarative programs do not, therefore, specify the flow of control within the program, just the flow of data. A well-known first generation declarative language is Prolog.

These concepts are mainly being used in artificial intelligence systems, foremost among which are the so-called 'expert systems'. These programs use declarative techniques to separate 'knowledge' from 'control' and are used to encapsulate human problem-solving techniques in specific problem areas. The 'knowledge' which such programs contain is derived from a human expert and stored as a set of rules; the structure of the expertise inherent within these expert systems is very loose and can in no way be regarded as having the kind of strict procedural flow found in conventional programs. As such they are ideal candidates for parallel processors since expert systems are easily divided into a large number of small components whose main connection with each other is via a database.

The advent of small personal parallel supercomputers will increase the power and versatility of such systems to a level where the designers can start to incorporate such features as 'common sense reasoning', which is currently impossible because of machine speed and size limitations. Systems of this power will offer users levels of intellectual and skill amplification as well as expertise encapsulation and dissemination, which will show the true potential of expert system and artificial intelligence technology.

Parallel processors will enable systems to be designed with a whole new range of man/machine interfaces. Voice input is one such interface; the techniques are well-understood, but the current range of hardware is just too slow to be able to handle the search techniques necessary for real-time comprehension of speaker-independent continuous speech.

Pattern recognition problems such as this are ideal for parallel processors where each processor can perform a search on a limited part of a very large database.

Researchers at IBM are already starting to follow this route and have demonstrated a practical voice recognition system which has a vocabulary of 20,000 words. It uses an IBM PC RT as the host processor with a parallel array of eight very high-speed processors which perform the actual recognition. However, even this very powerful system is only able to recognise real-time speech

from a single individual.

The problems associated with machine vision are very similar to those for voice recognition, only far more complex.

Experimental parallel processor systems have already shown that in limited and controlled conditions it is possible to build practical image recognition devices. However, general-purpose machine vision systems are very unlikely within the foreseeable future; the computational problems are too large for even the largest parallel system. The personal parallel computer will prove very useful in image analysis; these are applications like the analysis of satellite images, or photomicrographs. These much more powerful machines will make such analysis far quicker and also allow a greater range of tests to be performed on the image than is currently possible.

'Natural language comprehension is another area where parallel processors will have a considerable impact . . . progress has been limited by . . . computer power.'

Natural language comprehension is another area where parallel processors will have a considerable impact. Natural language comprehension is the ability of a machine to recognise commands and other inputs which are given in the normal linguistic terms which we use to converse with each other, rather than the very formal command syntax currently used for computer input. The basic techniques are already quite well understood but, as with voice input and image recognition, progress has been limited by restrictions on available computer power.

It is, therefore, quite likely that once parallel computer systems with a reasonable power and at a relatively low price start being commercially produced in volume, they will be accompanied by the new generation of man/machine interfaces. These will remove most of the psychological barriers which many people feel when using computers. Communicating with computers will become virtually identical to communicating with other people.

Besides the more exotic applications which are currently impossible on existing serial computer systems, parallel processors will also offer users the facility to greatly expand the power of existing applications: the use of computers for modelling com-

plex systems, such as engineering structures, chemical processes, design simulations and financial and economic systems. These are all applications which currently require a mainframe computer to run on. Given a high-powered personal parallel supercomputer, the users of these types of applications programs will be able to make much greater use of them since they will be freed from the constraints of limited machine time.

Another computationally very intensive process is the graphics generation for CAD, desktop publishing and real-time graphics simulations. These are all applications which are currently severely limited by available processor power. Many are only possible by making a frequently undesirable concession that limited processing power necessitates a long processing time. As with modelling, long delays in producing images inhibits the user from being more adventurous with his use of the system. Parallel processing techniques are already being applied in this area — plug-in Inmos Transputer boards have been used to create small but very powerful parallel processor systems which run with an IBM PC host with a very high-resolution graphics card to generate high-quality images. This type of system has been applied to the generation of computer images for animated films and advertising graphics.

The future

Parallel processing supercomputers, and the software which is necessary to make full use of them, are under development in many universities and computer companies around the world. At the top of the market there are already products like the Computing Surface from Meiko whose arrays of transputers can rival a Cray 1. At the bottom end of the market come self-assembly systems which use Inmos's IMS-B003-1 cards and plug into a PC.

Personal supercomputers are at a very early stage of their development, but as more people gain experience in using such systems and developing software for them, so the price will come down and the hardware become more readily available. Personal supercomputers are at a stage in their development now which is very similar to that of personal computers ten years ago: the next ten years are likely to see great advances in this area.

Technical author Nick Hampshire has edited three magazines and written numerous articles. He has just started working for Intelligent Systems International on documentation for its new product.

END

Pas de deux



Canon technology has set the industry standard for laser beam printers throughout the world and the introduction of the compact new LBP-8 Mark II heralds a new generation of technical excellence and sophistication. Lighter and smaller it might be, but its performance is enough to make most of its established rivals look decidedly flat-footed. Even though they charge more for the pleasure. And the LBP-8 Mark II is aptly named, because so many of its features have been advanced twofold. Just look at the repertoire: **Twice The Paper Capacity** The LBP-8 Mark II paper cassette has a capacity of 200 sheets. So you waste less time re-loading. It can handle varying weights from 60 to 135 gsm, plus envelopes, and there are face-up and face-down modes for easy collating. **Twice The Fonts** The LBP-8 Mark II can mix 32 different fonts and 64 shading patterns on a single page. It has 8 resident fonts. But, if you want to be more creative, there is an expanding library of slot-in cartridges which will soon give you access to more than 100 type styles and point sizes. **Twice The Memory** The LBP-8 Mark II has a built-in memory of 512K for better graphics and font downloading. For full page graphics the memory is expandable to 1.5 MB. **Twice The Emulations** The LBP-8 Mark II has the ability to emulate just about any of the most popular printer brands currently in service. And that means it can use the software they use. **Twice The Life** The LBP-8 Mark II will go on running for 300,000 pages before it needs a major overhaul. And its unique maintenance-free toner cartridge will print 4,000 pages before it has to be replaced. A simple 30-sec job.

Canon LASER BEAM PRINTER MARK II

— POST TODAY —

To: Canon (UK) Ltd., Text & Data Products,
Canon House, Manor Road, Wallington,
Surrey SM6 0AJ. Telephone: 01-773 3173.
Please beam me more information about the
Canon LBP-8 Mark II

Name

Company

Position

Type of Business

Address

Postcode Tel NLPCW2



SCREENTEST

Graphicworks

*From humble beginnings as a comic-book graphics program for the Macintosh, Mike Saenz's Comicworks has evolved into Graphicworks, an art package with some DTP facilities.
Ian McKinnell sees how the scales balance.*

The Apple Macintosh was never aimed at the average computer user — it was the first computer for the visually aware. It had style. People who'd previously classed computing on the same level as train-spotting saw the bit graphics-based program, MacPaint, and were transfixed. For some people, MacPaint didn't come with the Macintosh: the Macintosh came with MacPaint.

One of those people was a comic-book illustrator, Mike Saenz. Mike is an American, and in the US the words 'comic-book' have a different association. To you and me they may conjure up images of the *Beano*, Desperate Dan and the Bash Street Kids; but to an American they mean Superman, Ironman and the Incredible Hulk, and they and their ilk have a fanatical following.

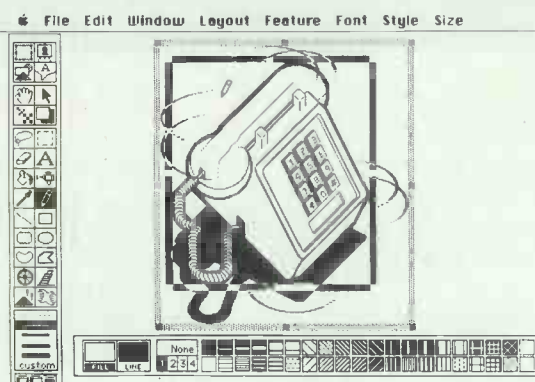
Modest beginnings

Mike was one of the first people to own a Macintosh, three and a half years ago. He took the Macintosh home and decided to draw a comic-book with it, and in retrospect this could have been called a brave decision. It could also be called lunacy, for those were the days when MacPaint was the only graphics software in town when the Macintosh came in only one flavour — 128k; and when Mike didn't even have an external disk drive. Eventually, months and months of work produced *Shatter*, published by First Comics and now a very hot collectors' item which changes hands for serious money. It was a sci-fi cops & robbers story inspired by the imagery of the film *Blade-Runner*. It was a breakthrough:

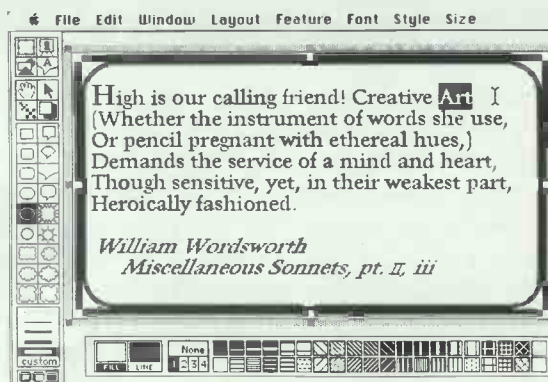
the first comic-book ever to be generated on computer, and it attracted a great deal of media coverage. It was also, perhaps, the first major example of desktop publishing, an idea that also attracted a great deal of attention in the marketing departments of this world.

After such a baptism of fire, Mike was, to say the least, aware of MacPaint's limitations, and had ideas of his own about how a graphics program should work and what facilities it should have. Armed with these ideas he approached Macromind, producer of the seminal Videoworks and Musicworks programs for the Macintosh, and eventually they began work on the program that was to become Comicworks.

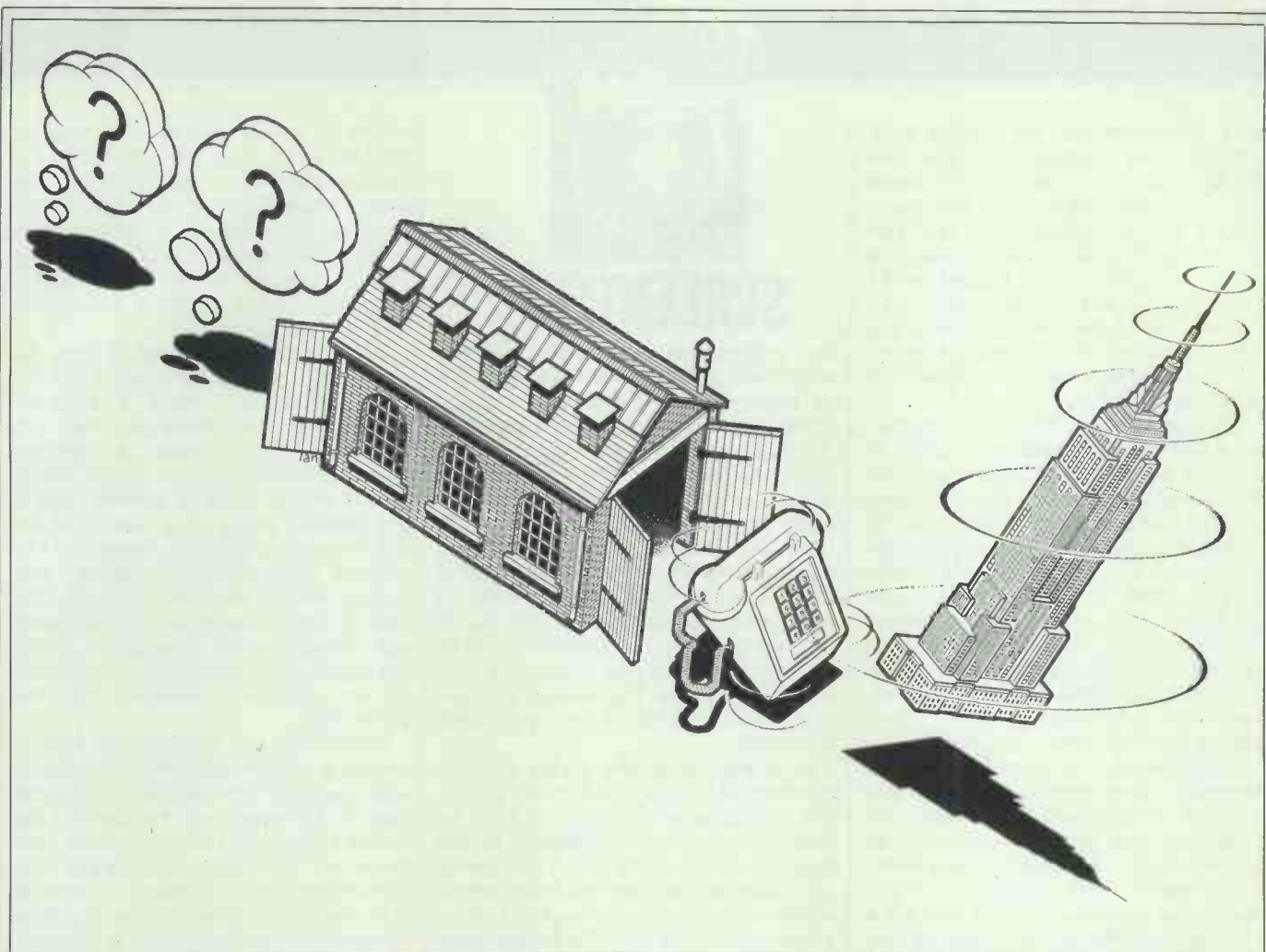
Comic-books consist of two items — words and pictures. In convention-



The bones of the Graphicworks system are 'panels' which contain 'easels', 'balloons' and 'graphic primitives'. In this case the panel, represented by the light grey outline, contains three easels



Text is contained within 'balloons'. As can be seen from the toolbox down the left-hand side, a wide variety of styles are available and most of these can be edited — you can also have no borders or fill patterns



al books and magazines these two elements sit together politely like strangers on a train, each in their separate compartments. In comic-books their relationship is much more promiscuous: in fact anything goes, and so the tool needed to work with them has to be very versatile, allowing much more flexibility than MacPaint can offer with text, but not impose the straight-jacket that a program like Pagemaker demands. The result is desktop publishing, but from an illustrator's point of view.

It's difficult to take a program seriously that has the word 'comic' in the title. It makes it seem like a fun, but ultimately a frivolous package, which isn't the case — Comicworks is a serious and useful program, although it does have a fun element. The marketing men had made a blunder, for by trying to define the program too narrowly (how many Macintosh users produce comic-books?) they were in real danger of alienating a potentially huge audience of people using the Macintosh to produce graphics. Even its relatively cheap price (£75 — and much cheaper still in the US) counted against it; after all, if it was a serious graphics tool, wouldn't you expect to pay far more? And finally, the packaging was... well, not the kind of thing you could leave lying around the office without being laughed at.

A package in disguise

Comicworks was originally released in the summer of 1986. The marketing men's answer to its identity problems appeared shortly after, in the form of a package called Graphicworks, 'the only graphics, text and layout tool you'll ever need'. Everything about the program had an uncanny sense of *déjà-vu*, from its packaging to the actual program. It was, of course, Comicworks in disguise. The only difference was its packaging — now much more sophisticated, with subtle duo-tones of airbrush, scalpel and technical pen, and with a completely different set of clip-art. Gone were Mike Saenz's weird and wonderful bug-eyed monsters and spaceships, their place taken by invoices, business reports and menus.

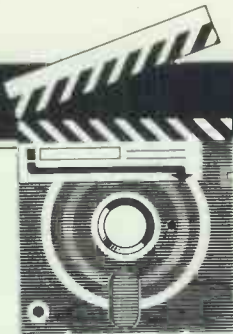
Despite its identity problems Comicworks/Graphicworks was a versatile program, and had the good fortune to be released not long after the Mac Plus was launched, when Apple had made the decision not to bundle MacPaint with the new machine. If users wanted a graphics program, they now had to make a choice and put their hand in their pocket. Comicworks/Graphicworks was not only cheaper than MacPaint, it was much more powerful and capable of far more.

But the original program also had a few problems, and the new version reviewed here, Graphicworks 1.1 (from now on referred to as Graphicworks) tries to redress these, as well as add a number of new features. It has also given the marketing men a chance to reposition the product a little more, to repackage it more conventionally, to put the price up (£99.95), and to distance it from its roots. Comicworks is still available, but only in version 1.0, at the old, cheaper price.

Graphicworks

Graphicworks is a unique program that has many original features. Although the Graphicworks desktop looks like that of most other graphics programs, following the convention of the toolbox along the left-hand side and patterns at the bottom, you soon find that Graphicworks works on a number of different principles. The biggest difference — and this can cause enormous confusion for new users — is that graphics and text cannot be placed directly onto the page.

The skeleton of Graphicworks is its system of 'panels', 'easels', 'balloons' and the new 'graphics primitives' or 'draw' tools. Unlike MacPaint, Graphicworks documents are not 'flat'. They are not all on the same level, but 'layered' — each element



SCREENTEST

of a document can be treated individually. For example, if you are working with a landscape, the trees can be drawn separately and positioned on the background, and can be changed again at any time. The basic element of a Graphicworks document is the panel, which can contain up to 64 easels (where the paint elements of the program live), balloons (where text is entered) or graphics primitives.

To begin a document in Graphicworks, it's first necessary to position a panel on the blank page (normally this panel has a thin, black outline, though this is easily altered). It is not possible to paint or type directly into this panel. For a painting it's necessary to create an 'easel' which can be of almost any size — even bigger than the panel. This easel is in effect an individual MacPaint window — all the paint tools can be used, and images cut and pasted from other easels, or from other programs.

Graphicworks is compatible with MacPaint and comes with an extremely useful desk accessory, Art Grabber+, so that images can be copied from MacPaint documents from within the program. High-resolution documents produced by a scanner (in TIFF format) can be imported into a Graphicworks easel and still retain their original resolution, although Graphicworks proved unable to open a TIFF document produced by a Dest scanner.

Impressive features

Regardless of any other pretensions, Graphicworks is first and foremost a paint, or bit-mapped graphics, program *par excellence*, offering far more facilities than any other paint program available. It has all the conventional tools that will be familiar to most Macintosh users — the lasso,

the eraser, the paintbrush, together with the small but vital features, such as trace edges — that many of the other paint programs have omitted. A considerable number of easels can be contained in a panel, and there are a number of ways for the pictures to work with each other by their 'ink' modes. For example, it is possible to have them matted so that they act as if they were a series of cut-out shapes stacked one on top of the other. But a number of other effects are available, such as 'or' which will make the image transparent, and 'xor' which reverses black and white.

It is also possible, using a combination of image and a mask, to create an image with 'holes' in it — so that, for example, it's possible to see through a car's windows. This facility of Graphicworks can be very useful when creating effects such as drop shadows, but it is unfortunate that the Laserwriter cannot understand many of these effects and will not print them as they appear onscreen. However, any part of a Comicworks screen can be instantly transformed into paint image using the FKEY facility included in Graphicworks' system, and pasted into the easel in place of the existing images. Alternatively, the entire document can be saved as a MacPaint document, where such effects will be preserved.

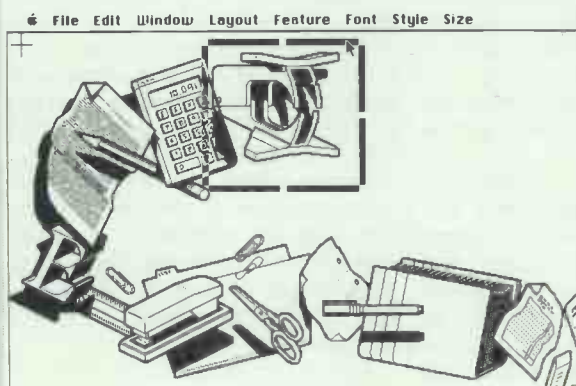
This new version of Graphicworks also has new special-effects tools — perspective, skew, distort and free

rotate — which will be very familiar to users of Click Art Effects, and whose absence in the original was sorely missed. Also, there are new options for working at higher than screen resolution to take full advantage of the Laserwriter, and a facility allowing colour printing using the Imagewriter II.

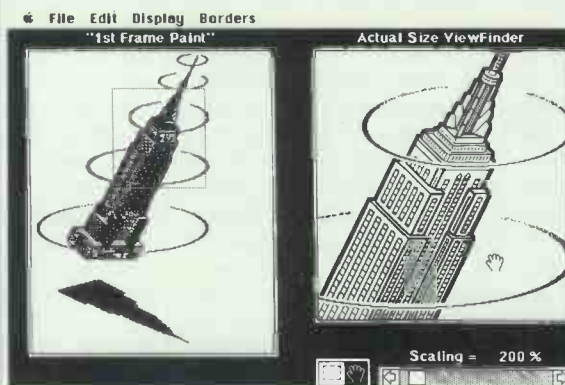
But I've saved the best till last. All other paint programs have a 'spray can', which is simply a stippled paint-brush. Graphicworks has an 'airbrush' which gives a random spray adjustable from 1 to 96 pixels across and of variable density, and is the nearest thing to a real airbrush this side of Quantel's Paintbox. For serious Macintosh illustrators, this feature alone can perhaps justify the cost of the package. As a paint package, Graphicworks is without doubt the most comprehensively equipped of any currently available for the Macintosh.

Graphicworks' approach to text is certainly unique and where its heritage becomes obvious, as the words have to be typed into 'balloons'. Like easels these can be of any size, and there are a number of different balloon styles, from 'thought' balloons like small cumulus clouds to plain rectangles. There are also a number of reshapable balloons, where a pointer can be pulled out, and all can be in a variety of line widths.

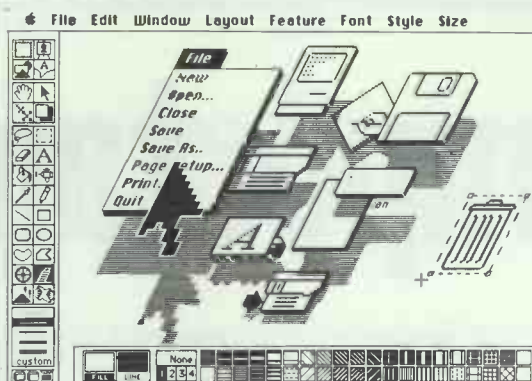
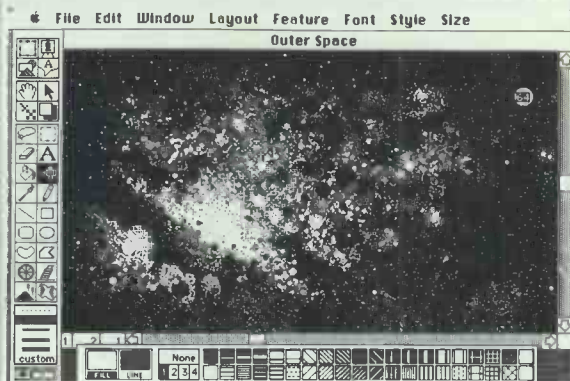
But perhaps most important of all, it is possible to have no border at all. Text can be pasted in, via the clipboard, from any word-processing program (MacWrite, for example), or entered within the program. Any or all of the entered text can be in any variation of font and style, can be changed and edited at any time, and will print at the highest resolution of the printer. Text is easily reshaped by moving one of the 'handles' that



Included in Graphicworks is a separate program, Postermaker from Strider software. This takes an image and enlarges it up to 3200 per cent!



Images can all be handled separately, so that at any time an image can be picked up and its position changed, without affecting the others around it



Most paint programs have a spray-can — Graphicworks has an 'airbrush'. It's the nearest thing to a real airbrush you're likely to find this side of Quantel's wonderful PaintBox

Click Art Effects has been incorporated into the new version of Graphicworks. Using the FullPaint and SuperPaint tools, objects can be rotated, skewed (as shown here), and distorted to any extent

appear at each corner when the balloon is selected, and the text will automatically word-wrap to fit the new width.

Although this text facility was originally intended as a 'free-form' tool so that text can be placed anywhere, it can be used for more conventional use in columnar form, though each column will have to be a separate balloon. One limitation of the program is that text cannot be 'justified' (all lines made the same length).

A completely new set of elements are included in this release of the program— 'object orientated' (or draw) graphics primitives such as circles and boxes. These have a number of advantages over 'paint' (or bit-mapped) images, the first being that such shapes print at the highest resolution of whatever printer you have hooked up to it (unlike paint images). Draw images are also far more memory-efficient and can be easily reshaped at any time.

The disadvantage is that draw images can never offer the freedom and expression of a painting program. The draw facilities are fairly limited, but Graphicworks also allows PICT (draw) images to be pasted in from programs such as MacDraw or CricketDraw, although they cannot be edited other than resized.

Not plain sailing

Graphicworks is virtually three programs all working on the same document, although the 'joins' are much less obvious than with most integrated programs. However, the approach of using individual panels, easels, balloons, and so on, does present a number of problems; the worst of which being that it is not an intuitive approach. It is extremely difficult and frustrating to get to grips with, and many potential new users may retire, confused. It is not a program that can be learned quickly — it could take days.

The original Graphicworks had two main problems. Firstly, it could be slow to use, with response times far from instant even when using a simple facility such as 'FatBits', where the picture is enlarged for working on an individual pixel level. The delay may only be a fraction of a second (though sometimes longer) but it can be very irritating, and it interferes with a natural flow of work. This problem is still evident in the new version.

Graphicworks' other problem (and here it begins to get complicated) is its relationship with Apple's Laserwriter. The combination of bit-mapped and object-orientated graphics is never really a happy one. Much of the problem stems from the fact that bit-mapped graphics are device-dependent — that is, they can only work at the same resolution as the Macintosh screen, 72 dots per inch. The Laserwriter works at 300 dots per inch. A quick calculation shows that 72 into 300 won't go, which leads to a number of problems not just confined to Graphicworks. Suffice it to say that the problems are basically speed (Graphicworks can be slow. And I mean *slow*). A fairly complicated document could take half an hour to print. A very complicated document could well take longer) together with the relative sizes of bit-mapped and object-orientated graphics, which may not appear in the proportion they do onscreen.

Macromind is very aware of the problems and has taken a number of steps to improve Graphicworks' printing problems. However, it is still far from perfect. The easy way out is to print the whole page in bit-mapped form, so it looks exactly as it does onscreen, and to regard Graphicworks purely as a paint program. The hard way needs plenty of patience. There is a third way, however, an option more relevant

perhaps to most users, and that is by sticking to an Imagewriter dot-matrix printer. Graphicworks works fine with Apple's Imagewriter.

Documentation

The manual is not as helpful as it could be, and any confusion is exacerbated by the manual being produced for the original version of Graphicworks and containing a lot of information now far from relevant, with only a thin 26-page booklet referring to the changes in version 1.1. There are also a few new features that even this booklet fails to mention, such as the space bar changing the current tool to the grabber.

Conclusion

Graphicworks is not a DTP program with a few art tools. It's an art package with a few DTP facilities.

And the acid test? As an illustrator I do a lot of work using the Macintosh and I have had a copy of the original Comicworks for almost a year. However, I confess that for a paint program it was not my first choice, mainly because it didn't have the special-effects facilities (particularly skew) built into other paint programs.

When I did use Comicworks it was mainly for its unique ability to work with separate paint images using matte and masking ink effects, so as to be able to move each element around *ad infinitum* until satisfied with the composition; particularly as Graphicworks was the first paint program to take advantage of the larger screens now available in profusion for the Macintosh. Now that those special effects are included, I can see myself using Graphicworks 1.1 much more.

Graphicworks costs £99.95 and is distributed by Mirrorsoft on (01) 377 4837.

Ian McKinnell is a photographer and graphic artist. He was one of the UK's first Macintosh owners.

END

Importance of style

It is every programmer's dream to write clear, well-designed programs but good programming style takes practice. In this article Mark Burgess explains the significance of 'structured' programming with a working example to guide you through.

It is a sad but certain fact that the general standard of programming today, both in the popular press and in the industry, is diabolical and that the quality of its presentation is even worse. In May 1980 PCW took positive steps to combat this menace by publishing Alan Tootill's letter on the presentation of assembly language programs. This has resulted in a high standard of presentation for assembly language routines alone. The time has now come to do the same for all possible languages and to improve not only the presentation, but the quality of programming itself.

The underlying problem has its roots in the way in which computing is taught. It is only too common to read articles extolling the virtues of structured programming; it is less common to read an article explaining precisely what this means! This article is intended to remedy this oversight, by explaining the significance of structure and then by offering some simple guidelines for developing and presenting program text.

Two totally independent skills are involved in computer programming. These are:

- (1) solving problems (of structuring); and
- (2) writing down problem solutions in a particular programming language.

The most difficult of the two is the former.

Structure

Structure is a very simple and elegant idea, but one which has far-reaching implications. Its real importance derives from the fact that it is a major simplifying tool for solving problems and hence writing programs. Problems are most clearly understood when they can be viewed as a list of things to be done, and structuring is a way of ordering the individual tasks to be performed in a coherent way. The ordering of tasks is what distinguishes a program from gibberish and it is, therefore, something which must be addressed seriously

in programming. It is almost impossible to solve a difficult problem without first planning a strategy.

Consider the simplest possible structure: a *numbered list*. No-one would consider writing out such a list of things to do in a random order. It would be absurd to do so and would obscure the object of the list. Computer programs are just lists, however, although slightly more complicated than simple numbered lists, but in almost every published instance their procedures are ordered in a quite random way, making a mockery of very fundamental program logic.

Consider the structure of a computer program, then. Just as a simple list can be written out in point form (1..10), a computer program can always be drawn as what one might call a *structure diagram*: this is a generalisation of the list, with a very simple form, and it imitates the very operation of the computer program. Structure diagrams are excellent tools both for helping to design programs and for keeping them sound and logical, and thus they are described in some detail in this article.

A computer program naturally generates many patterns; the simplest and most important ones are considered here. By recognising and welcoming these patterns, programming can be made almost trivial, even in the most insidious cases. It is possible to distinguish, for instance, between large-scale and small-scale patterns and structures: a program which is very logical in small areas may in fact be a complete mess when taken as a whole (a randomly ordered list of clear tasks). It is not good enough that programs merely be made up of more than one procedure or function: this in itself is not structuring. The procedures and functions of a program must themselves be logically ordered so that a program has a true logical structure which reflects exactly what it does.

What then are the simple patterns

which make programming so easy? They are called *hierarchies* and *trees* in the jargon and they permeate programs in an extreme way. Two other words which appear in connection with the two above are *nesting* and *levels*; these will become more apparent as things proceed. Loops, for example, are said to be nested when one loop is executed inside another loop, which is executed inside another loop, and so on, a given number of times. The idea of a hierarchy can be understood with the help of the following analogy:

Consider an artist who is making a drawing of an object which lies under his/her microscope. The artist has the power to zoom in and out by altering the magnification of the microscope and can, therefore, examine as large or as small an area as is necessary. To begin with he/she uses the lowest possible magnification in order to sketch the general shape (or structure) of the object. Next he/she proceeds by zooming in on a small part of the object and fills in the general details. This is repeated until the original general shape is filled with general detail. Having done this, the artist goes back and adds the very finest details at the highest magnification and keeps on doing this until the picture is finished.

The connection with programming is straightforward. Each part of the drawing process is actually a procedure to be carried out. The magnification relates to the *level* at which the artist is working (hence the terminology) and so the structure diagram for the drawing process also splits up into levels. Low magnification is called *high level* because one looks down on the object as a whole; high magnification is called *low level* because it is down among all the detailed working parts. The value of the structure diagram shown here is that it shows how the low-level parts of the drawing (the details) are related to the high-level parts, hence showing the overall scheme of the prog-

ram in as much or as little detail as is desired. In this respect, structure diagrams are far superior to old-fashioned flow diagrams, which are actually steps in the wrong direction, encouraging the programmer to think at the low level first.

This approach to problem-solving is called 'Top Down analysis' for obvious reasons. Its significance is that it reflects the way that we think most efficiently. We see outlines first and fill in details afterwards, rarely the other way around.

Each procedure in a program (or its structure diagram) branches out into other procedures which lie in the level below. The procedures in a particular level actually serve the root procedures in the higher level which use them, like the slaves of the Roman households. A structure diagram manifestly displays the chain of command and neatly pieces together a task as the sum of its parts. It is quite possible to follow exactly what the artist (or computer) does merely by tracing the diagram.

To summarise the form of structure diagrams (and, therefore, the form of well-structured programs): a structure diagram consists of one main procedure at 'LEVEL 0', which branches out into a new LEVEL called 'LEVEL 1' and contains all those procedures which are contained by (used in) LEVEL 0. All the procedures used in LEVEL 2 are found in LEVEL 1, and so on, until there are no more procedures left. (There are no procedures left when a particular task can be easily performed, using only the functions offered by the programming language.) While it is obviously not possible for programs written in a language, using a normal screen editor, to look exactly like their structure diagrams, they can retain the essential features (see the example program, page 137). The structure diagram can be squashed sideways so that the levels are preserved and the tasks or procedures are listed, one after the other, inside their respective levels. This shows, at least, the status of every procedure in the hierarchy and means that procedures can be found very easily: any procedure which is called in LEVEL 1 would be found in LEVEL 2 and, conversely, any procedure defined in LEVEL 2 would only have been called in LEVEL 1.

The above scheme is not quite complete, it turns out, and must be appended slightly in order to work faithfully in all instances. The question naturally arises as to what happens to procedures which are used throughout all the levels, such as special printing routines or graphics routines to draw certain shapes: some logical scheme has to be found for these.

The key to this lies in the re-usability of such procedures. With a

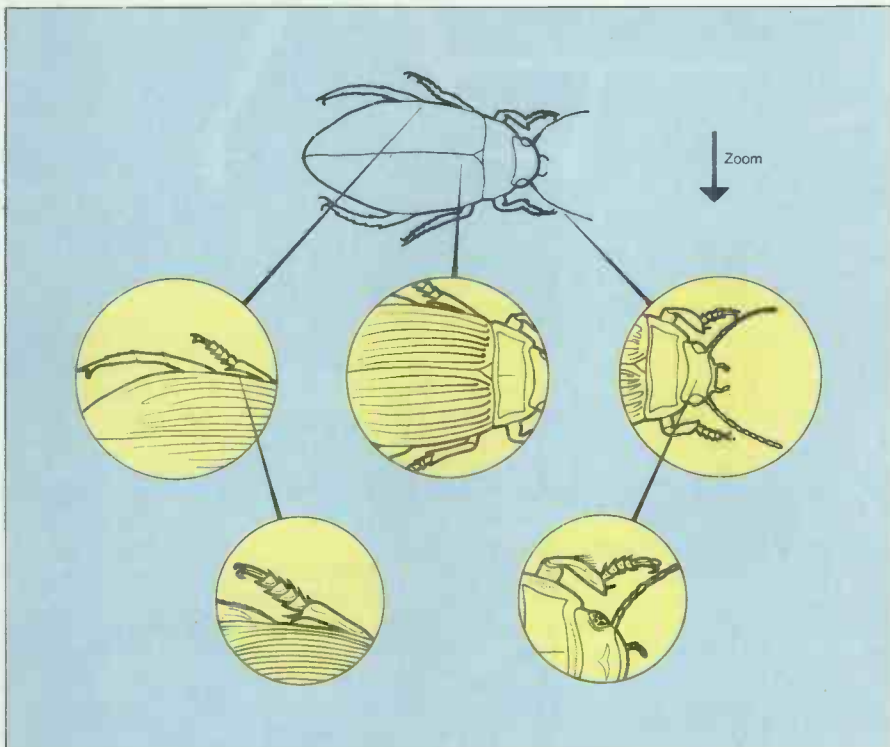
little consideration it can be seen that they are routines of a very general nature, which behave as basic tools for the main procedures. This motivates their inclusion in a special level, or set of levels called 'toolkits'. A good reason for doing this is that toolkit routines are a type of routine which come to be needed again and again, in many different programs perhaps, and can subsequently be isolated and re-used. Toolkits automatically result in routine libraries, some of which hold details relating to particular computers only. Programs constructed in this way are highly portable, since it is only necessary to replace a particular toolkit in order to carry a program over to a new machine.

A corollary to the toolkit is the 'zone', for very awkward programs — see the example program for details. Zones are important when programming in complex operating environments, such as WIMP environments. They can be regarded as logically in-

simply drawing a picture. A structure diagram is nothing to do with language and can be written down in any language at all (provided it has a sufficient vocabulary); each language is as good as the next and learning new ones is a trivial matter of looking up equivalent words in the manuals.

Presentation

So far only tidiness and clarity have been discussed. Another crucial facet of programming is *presentation*. Programming languages are as much for communicating ideas to people as they are for communicating ideas to computers. In the next section, some rules are described which can be illustrated with the help of an example program (see the program listing). The chosen program is a graphics demonstration (to be written in C, for the Commodore Amiga) and will be developed with the aid of the guidelines given. You should try to convert it to run on other computers — and in other languages.



Each level of magnification reveals new complexity

dependent parts of a program: places for interfacing to an operating system, for instance. They could also be an alternative to the use of object languages.

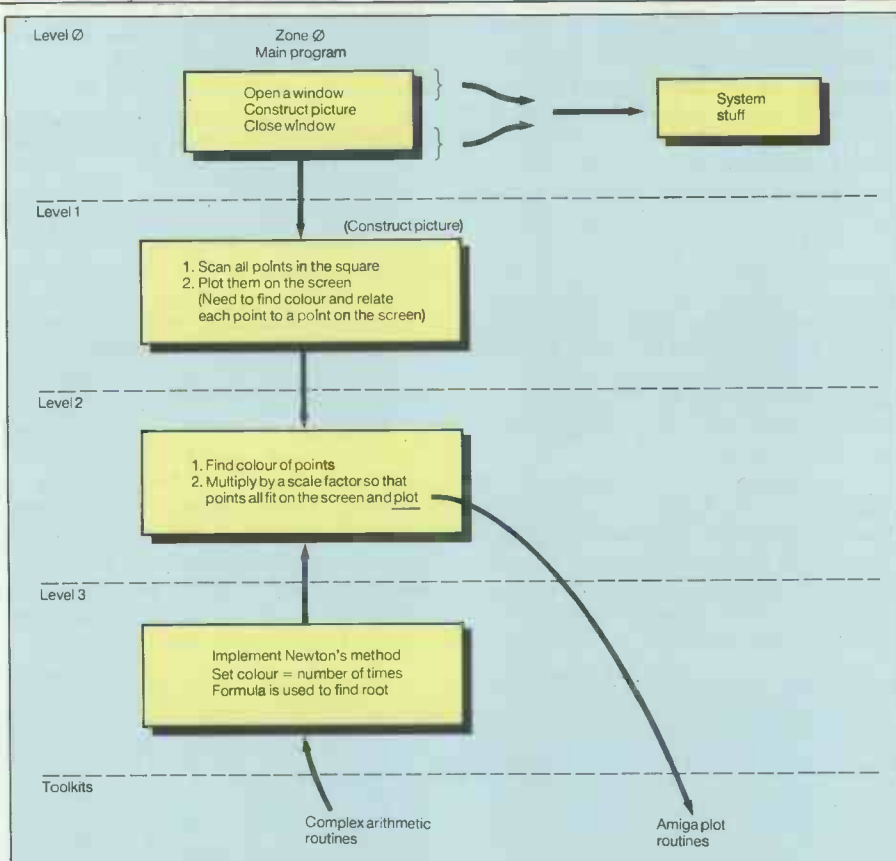
The writing of a computer program is identical to the construction of a structure diagram: Indeed, a program is just a structure diagram which has been written down in a programming language, rather than as an annotated picture.

This, in fact, is the crucial point. It means that, by understanding structure diagrams, programs can be written without the need for a particular language: they can be written by

Guidelines for presenting programs

These guidelines essentially say: be neat and take a pride in programming; be consistent and write clearly! The examples given are for Algol-like languages (Pascal, Algol, Modula2...) and C, but they are simple to implement in Basic, BCPL... in fact, any language at all which allows comment to be included in a program file.

The first step is always: **solve the program problem with the help of a structure diagram** and some sound planning.



Structure diagram for plotting complex numbers on the Commodore Amiga

LAYOUT & USE OF SPACE

All procedures and functions must be written down in their correct levels (as described in the main text). A procedure should never be longer than a page of A4 (that is, about 70 lines) and should rarely need to be that long. Both the levels and the procedures themselves should be clearly segregated, with a banner heading each level/toolkit. An area should be reserved on the right-hand side of the page (or screen) for comments and notes (see more under Comments). Each new program statement should be on a new line. Don't make programs nebulous by hiding statements in among comments.

NAMES AND IDENTIFIERS

The names of procedures should clearly reflect their functions. The names of variables should clearly reflect their usage. *Never* choose names without good reason. *Never* use GOSUB if PROC or a procedure will do instead.

Take advantage of actual/formal parameters (permitted in all good language implementations) to make the labelling of variables consistent and sensible: that is, when variables are passed as arguments to several different procedures, make sure that a consistent name is given to particular quantities, throughout the whole program. In other words: try not to

confuse the reader.

Examples

(a) If a procedure works out the total of a list of figures, call it something like FIND TOTAL or TOTAL or FIND TOT or something short and descriptive.

(b) if a variable stands for the total value of something, call it TOTAL, not X.

COMMENTS & DOCUMENTATION

Each procedure should have at least one brief comment describing its function. Any further comments should also be brief. Do not lecture: this obscures the program code. Procedures ought to be self-explanatory anyway if the names of variables and procedures have been chosen judiciously. Further comments should be written in the documentation to the program. Documentation must include a specification of the program: it must describe exactly what the program does and does not do and should contain notes of any known instances when the program will fail to work sensibly, either bugs or limits of the program specification.

Example

```

find_total (array : a);
begin
    ... {Comments should be separate
        from program code}
end;
  
```

LOOPS AND NESTED LOOPS

Loops and their surrounding brackets should be indented and should be clearly visible. Always put a block bracket (that is {, }, begin, end...) on a line of its own. For example,

```

for n := 1 to 10 do
begin
    writeln ('...');
end
  
```

When loops are *nested* (that is, when there are loops inside other loops), indent for every loop and make the level of nesting clear.

Write:

```

for ( n=1; n <= 10; n++)
{
    while ( a < b)
    {
        printf ("...");
        printf ("...");
    }
    printf ("...");
}
  
```

in preference to

```

for ( n=1; n <= 10; n++)
{ while (a < b) {
    printf ("...");
    printf ("..."); } }
  
```

GOTO

It is never *necessary* to use GOTO. If the need ever *seems* to arise, it is a sign that the program is either poorly constructed or inappropriate for the given language.

FINAL POINT ABOUT BLOCK BRACKETS

Block brackets (like begin, end and C's { and }) are essential punctuation in a program. It is best to adopt a consistent practice in their use so that a program looks the same all over. This means that every time such brackets are used, the same structure should be adopted: for example, write:

```

complex = record
    real : x, y;
end;
  
```

in preference to

```

complex = record real : x,y; end;
  
```

Perhaps the clearest use of brackets is the method which has been adopted here.

SPECIAL NOTE FOR USERS OF PASCAL/ALGOL...

In Algol-based languages, a programmer is required to define every variable, procedure and function before it is used. This makes the appearance of the final program slightly odd: the main program lies

at the end of the text and the toolkits are all found at the top. In other words, the structure diagram in Pascal/Algol is upside down. This doesn't really matter: the rules still apply — and in fact they reveal their usefulness in a very obvious way. If the levelled structure is adhered to strictly, then the requirement that everything be defined before it is used, is automatically satisfied.

The example program

(1) The problem

The example program is deliberately complicated, to illustrate as many of the ideas as possible. It follows a theme which has been explored recently in many of the popular computer magazines and lends itself neatly to the illustration. The objective is to plot out a diagram in the complex number plane. (For the benefit of non-mathematicians, this is just a flat square, with coordinates traditionally called (z) where z is actually made up of two parts, labelled by x and y like: (z.x,z.y) — instead of the more usual (x,y) coordinates. They are, in effect, the same.) The diagram is based upon finding the cube roots of 1, which are complex numbers.

For every point in the square region from bottom left (X0, Y0) to top right (X0+range, Y0+range), the program will use Newton's method of finding the cube root, starting with that point as a first guess. Newton's formula for obtaining a better approximation (z) to the cube root of 1, starting with a random guess (zp) is:

$$z = \frac{2 * z^3 + 1}{3 * z^2}$$

where $z^3 = zp$ cubed and $z^2 = zp$ squared. The rule for multiplying the zp 's is part of complex-number theory and must be defined in the program. Since z and zp are complex numbers, they have two parts, and this is subsequently two formulae:

$$zp.x = \frac{2 * z^3.x + 1}{3 * z^2.x}$$

and

$$zp.y = \frac{2 * z^3.y}{3 * z^2.y}$$

The program must obtain quite a good estimate of the cube roots, and so it should reapply Newton's formula to z in order to obtain a new z, and keep doing this until z doesn't change very much (the formula has reached the actual value of the root and can't get more accurate). The diagram will be made up of points of colours (1... numofcolours) which show how many times the process had to be repeated in order to get close to the answer. (The resulting pattern is pretty, if not interesting.)

(2) The solution/structure diagram

To implement this process, a structure diagram is drawn. It is worth remarking that one purely practical thing which must be done in a graphics program is to make a window or define a screen mode in which graphics can be drawn. This is nothing at all to do with the main problem, so it ought to be kept apart from the main core of the program. The scheme above for structuring allows us to use a new zone for this. The simplest way to see the usefulness of doing this is to just look at the listings and observe how this keeps the irrelevant detail out of the way of the main program logic. (Imagine how messy the program would look if it were included in the middle of the main logical structure.)

Try to follow the structure diagram and relate it to the listing. Points to notice in the listing are:

- the rules for multiplying and dividing z's (that is, complex numbers) are defined in a toolkit, so that they can be used again in later programs;
- logically separate parts of the program are separated either by blank lines, separate procedures or different zones; and
- the program contains very few comments, but variable names are clear and relate to what is happening.

Finally, notice how the structure of the program relates to the structure diagram.

(3) Program Documentation

Here is part of a summary of each procedure. This is rather shorter than ideal, for the sake of brevity in this article.

ZONE 0

main () Trivial

create picture () This scans through every point in the square and calls PlotArgandPoint at each point. It passes the point z so that it can be used in Newton's formula. It also passes a parameter called 'scale' which adjusts the values of the complex numbers, so as to fill the screen. To do this it makes use of the constants 'screensize' and 'range' as defined in the program. These device-dependent (or computer-dependent) constants are defined at the start of the program.

PlotArgandPoint () This accepts a complex number z and the scale factor relating the numbers to the points on the screen. It then calls 'num-of-repetitions-to-root ()' to find out what colour it should plot, and multiplies z so that the points all fill the window size. It then passes the adjusted coordinates to an actual plotting routine for the screen.

num of repetitions to root () This repeats Newton's method of finding the roots and counts the number of times it must repeat the process in order to get close to the root. The technical details of this are not really relevant to this article, but would be included here otherwise.

The toolkit routines and Zone 1 can also be described, either separately or collectively, depending upon the clarity of their coding.

Conclusion

The example program shows the way in which a program can be structured. The structuring is not only a matter of pride and professionalism but is extremely important in keeping control of programs, especially when they become large and complex. The rules are not only aesthetically pleasing in this respect, but are an important tool for coping with the increasingly complex operating environments which are now being developed.

It is to be hoped that something akin to these rules will become a standard of practice and will improve the rather low programming standards which exist now, in the way that Alan Tootill's remarks raised the standard of assembly language programming.

Example program to plot a diagram in the complex number plane

```

/* ***** */
/* 3 */
/* Roots of Z + 1 == 0 */
/* (H. Burgess 1986 / Lattice C for Commodore AMIGA) */
/* ***** */

/* Program plots a rectangle in the complex plane, starting at */
/* (X0,Y0) and ending at (X0+range,Y0+range). Colours are given */
/* to each pixel to indicate the number of iterations of Newton */
/* Raphson method required to reach the cube roots +/- a const. */
/* called 'toobig' with (z) as a starting estimate */

/* ***** */
/* Include some library files for linking */
/* ***** */

#include "stdio.h"
#include "math.h"
#include "limits.h"
#include "zone1.c"

/* ***** */
/* Manifest Constants / Macros */
/* ***** */

#define range 4.0 /* square box centred on 0,0 */
#define toobig 0.01
#define X0 -2.0
#define Y0 -2.0

#define numofpixels 100.0 /* choose resolution */
#define numofcolours 16 /* maximum no of colours */
#define screensize 160.0 /* max resolution */
#define divbyzero 0 /* for readability */
#define pixsize screensize/numofpixels /* size of one pixel */

/* ***** */
/* Structures */
/* ***** */

```

PROGRAMMING

```

typedef struct          /* Define a datatype called complex */
{
    long float x,y;
}

complex;

/*****
** LEVEL 0 : Main Program
**
*****/

main ()
{
    open_graphics_window ();
    create_picture ();
    wait_for_window_close ();
}

/*****
** LEVEL 1
**
*****/

create_picture ()          /* generate complex diagram */
{
    long float increment,scale;
    complex z;

    increment = range/numofpixels;
    scale = screensize/range;

    for (z.x = Xo; z.x <= Xorange; z.x += increment)
        for (z.y = Yo; z.y <= Yorange; z.y += increment)
        {
            PlotArgandPoint (z,scale);
        }
}

/*****
** LEVEL 2
**
*****/

PlotArgandPoint (z,scale)    /* Adjust complex numbers to x,y coords
                                choosing appropriate scale */
{
    complex z;
    long float scale;

    { int colour = 0;

    colour = num_of_repetitions_to_root (z);

    z.x = (z.x-Xo)*scale;
    z.y = (z.y-Yo)*scale;

    ActualPlot (z.x,z.y,colour);
    }
}

/*****
** LEVEL 3
**
*****/

num_of_repetitions_to_root (zp)    /* Find root and count repet'ns */
{
    complex zp;

    { int reptcount = 0;
    complex z,z2,z3,top,bottom;
    complex multiply(),divide();

    if ((zp.x == 0) && (zp.y == 0)) return (divbyzero);

    do {
        reptcount++;
        z = zp;
        z2 = multiply (z,z);
        z3 = multiply (z2,z);
        top.x = 2*(z3.x) + 1;
        top.y = 2*(z3.y);
        bottom.x = 3*(z2.x);
        bottom.y = 3*(z2.y);

        zp = divide (top,bottom);
    }
    while (fabs(zp.x-z.x) > toobig || fabs(zp.y-z.y) > toobig);

    return (itcount % numofcolours);
}

/*****
** TOOLKIT Graphics (AMIGA)
**
*****/

ActualPlot (x,y,colour)    /* Plot a point (x,y) on the screen */
{
    long float x,y;
    int colour;

    { struct RastPort *r = wG -> RPort;
    int ix,iy,p;

    SetAPen (r,colour);          /* set colour pen */
    ix = (int)(x*0.5);          /* round to nearest integers */
    iy = (int)(y*0.5);          /* */
    p = (int)(pixsize*0.5);      /* */

    RectFill (r,ix,iy,ix+p,iy+p);    /* Plot and fill a rectangle */
    }
}

/*****
** TOOLKIT Complex Number Arithmetic
**
*****/

complex multiply (a,b)      /* return a times b */
{
    complex a,b;

    { complex z;

    z.x = (a.x * b.x) - (a.y * b.y);
    z.y = (a.y * b.x) + (a.x * b.y);

    return (z);
    }
}

/*****
**
*****/

complex divide (a,b)        /* return a divided by b */
{
    complex a,b;

    { complex z;
    long float denominator;

    denominator = (b.x * b.x + b.y * b.y);
    z.x = (a.x * b.x + a.y * b.y)/denominator;
    z.y = (b.x * a.y - a.x * b.y)/denominator;

    return (z);
    }
}

/* end */

/*****
**
*****/

/* ZONE 1 : GRAPHICS open a graphics screen & window
** (AMIGA system details)
**
*****/

#include "types.h"
#include "intuition.h"

#define WINDOWGADGETS (WINDOWresizing;WINDOWdrag;WINDOWdepth;WINDOWclose)
#define true 1

extern struct Window *OpenWindow();
extern struct Screen *OpenScreen();

int IntuitionBase = NULL;
int GfxBase = NULL;
USHORT class;

/*****
** STRUCTURE ASSIGNMENTS
**
*****/

struct NewWindow nwGraphics =
{
    20, 20,          /* top left x,y */
    480, 160,        /* width,height */
    1, 2,
    MOUSEBUTTONS,
    CLOSEWINDOW,
    WINDOWresizing : RMTTRAP,
    GIMMEZEROZERO : WINDOWGADGETS,
    NULL,
    "Graphics Window",
    NULL,
    NULL,
    50,40,200,100,
    CUSTOMSCREEN
};

/* SEE "INTUITION" MANUALS */

struct NewScreen NewScr =
{
    0,0,          /* top left x,y */
    640,400,4,    /* width,height,type */
    1,0,
    HIRES,
    CUSTOMSCREEN,
    NULL,
    "Graphic Screen",
    NULL, NULL
};

struct Window *wG;
struct Screen *Scr;

/*****
** LEVEL 0
**
*****/

open_graphics_window ()    /* Opens INTUITION and a gfx window */
{
    GfxBase = OpenLibrary("graphics.library", 0);
    if (GfxBase == NULL)
    {
        printf("graphics library open failed\n");
        exit(0);
    }

    IntuitionBase = OpenLibrary("intuition.library", 0);
    if (IntuitionBase == NULL)
    {
        printf("intuition library open failed\n");
        exit(0);
    }

    Scr = (struct Screen *) OpenScreen (&NewScr);
    if (Scr == NULL)
    {
        printf("Couldn't open new screen\n");
        CloseLibrary(GfxBase);
        CloseLibrary(IntuitionBase);
        exit(0);
    }

    nwGraphics.Screen = Scr;    /* Must precede window open */

    wG = OpenWindow(&nwGraphics);
    if (wG == NULL)
    {
        printf("open window failed\n");
        CloseScreen (Scr);
        CloseLibrary(IntuitionBase);
        CloseLibrary(GfxBase);
        exit(0);
    }
}

/*****
**
*****/

wait_for_window_close ()    /* Wait for the user to close window */
{
    struct IntuiMessage *message;

    while (true)
    {
        while ((message=(struct IntuiMessage *)GetMsg(wG->UserPort))!=NULL);
        class = message->Class;
        ReplyMsg(message);
        if (class==CLOSEWINDOW) break;    /* Must reply to messages */
    }

    if (wG != NULL) CloseWindow (wG);
    if (Scr != NULL) CloseScreen (Scr);
    if (GfxBase != NULL) CloseLibrary (GfxBase);
    if (IntuitionBase != NULL) CloseLibrary (IntuitionBase);
}

```

END

Space-Maker

£149.95

+ VAT

Put your PC in its place



FREE
CHAIR

If you're losing ground to your computer, put it smartly in its place with the new Space-Maker desk from Opus. It'll accommodate your system beautifully and still leave lots of room for you.

What's more the Space-Maker is every bit as generous on price as it is on space. At just £149.95+VAT Opus have thought of everything including a free matching chair.

The Space-Maker is a desk for the new PC age, attractively styled and sensibly constructed, as good to work at as it is to look at. A top shelf accommodates both monitor and printer and below, the main desktop is equipped with two smooth-flow paper feed channels.

With an ingenious system to remove all that troublesome keyboard cable and shelves to house both your computer and manuals, there's a remarkable amount of useable desktop space available.

Open the Space-Maker's drawer and you'll find a few more surprises, like the built-in lockable diskette box to safeguard your software and a tidy-tray for all those odds and ends.

This British-built Opus desk also features scratch resistant surfaces, sturdy steel underframes, heavy duty castors and simple assembly. It's designed for all leading PC systems including those from Opus, Amstrad, IBM, Olivetti and Compaq etc.

So if your PC system needs putting in its place call Opus today on **0737 65080** or simply post the coupon below. Delivery in mainland Britain is free and generous education and government discounts are available. We also welcome dealer and export enquiries.

To: Opus Supplies Ltd, 53 Ormside Way, Holmethorpe Industrial Estate, Redhill, Surrey.

Please send me the following:

_____ Space-Maker Desk(s) at **£172.44 each** (inc. VAT)

I enclose a cheque for £ _____ or please debit my

credit card account with the amount of £ _____

My Access ☐ Barclaycard ☐

no. is: (please tick)

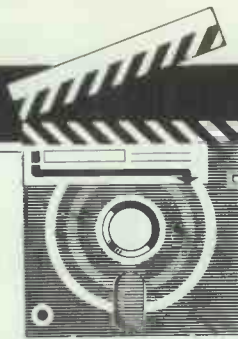
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

Name _____

Address _____

Telephone _____

Opus



SCREENTEST

AMX Desktop

Amstrad PCW 8256 users who do not wish to explore the CP/M facilities of their machine for running applications may benefit from the friendly approach of an inexpensive mouse and desktop program from AMS. Robert Schifreen tested it out.

When Amstrad's PCW 8256 was first launched, it was marketed as a complete everything-in-a-box word processor. It was only later that people realised there was a real CP/M-based micro in there, and that Locoscript wasn't the only software the machine could run. So along came WordStar, and other text-based software from various sources was ported across from other CP/M machines to the PCW.

Only text-based software, though, because machines originally designed to be word processors *don't do graphics*. Wrong. Actually, the machine turned out to do *only graphics* — all text is pixel-mapped on the screen. Now that software writers have gained a deep enough understanding of Amstrad's machine, graphics software has started appearing on it. The only limitation is that graphics programs tend to take up more memory than text ones, as all the data for the images needs to be stored somewhere.

Enter a company called AMS, which has got round this problem by cramming a graphics-based, mouse-driven desktop into just 75k of memory, and that includes half a dozen desk accessories. Because the PCW 8256 doesn't come with a mouse as standard, one is included, complete with the necessary interface box.

Installation

The whole package comes in a single box, similar in size to a couple of hefty novels stacked on top of each other. Included is a mouse, an interface box, a very thin manual (as such things should be) and a disk containing the desktop software.

The mouse is of the three-button

species. It looks a lot like the classy Logitech one as used, for example, in Epson's Taxi system for the PC — but it doesn't feel like it: it's very light for a start, and the ball is quite shiny and made of thin plastic. The click on the buttons is not very positive either, but despite all this, it was fully compatible with my desk and the bench in our computer room, and didn't need a special mouse mat.

The left-hand button is used to select menu items and files, while the right-hand one is used as a cancel button — for example, to remove menus from the screen. The centre button is not used by the desktop software, but is to be used by software developers.

Setting up the system involves plugging the mouse into the interface box and then fitting the box into the expansion connector on the back of the computer. Like Sinclair interfaces of old, there is a duplicate edge connector sticking out the back of the interface, so you can keep attaching peripherals to the machine until it becomes too deep to fit on your desk. The cable on the mouse is around four and a half feet long. This easily stretches round from the back of the machine and gives you enough leeway to work with.

Installing the interface took just a couple of minutes and presented no problems. With everything plugged in, there should never be any need to unplug the interface, though it seems sturdy enough to survive your doing that should the need ever arise.

Loading the desktop

With all the hardware ready, you turn on the PCW and boot up with a CP/M system disk. You then remove the

CP/M disk and replace it with the single AMX disk or, if you have two drives, you just insert it in the other drive.

The disk contains seven files, two of which are the desktop system: one main file and one overlay. Together, the two files total 75k and contain the complete system including the desktop, icons and desk accessories. Because the data for all the icons is embedded in the program, the system isn't as programmable as, say, Gem, which lets you design your own icons and desktop patterns and store the definitions as separate files.

The other five files contain the data for the diary, notebook, phone directory, and so on. These are not essential (you won't need lots of copies of the same file), so making an existing program disk into a desktop-driven version *should* involve no more than copying two files. Unfortunately, this is not the case.

Typing DESK starts up the desktop. A brief copyright message appears, during which time the two main files are copied from the AMX disk to drive M:, the RAM disk. Because the whole system can fit into the RAM disk, it frees any floppy drives (very useful if you have only one) for applications programs. If you quit the desktop, return to CP/M and then try to restart the desktop, the system will know if the two files are still intact on the RAM disk and won't bother loading them again unless it has to.

After loading, the desktop opens out on the screen, starting as a thin horizontal line across the centre and spreading rapidly and evenly up and down. The standard message at the

bottom of the screen telling you which drive is active remains, while the desktop fills the rest of the screen. There's still room for the printer line, which appears in its normal place when you activate the printer.

Mouse and icons

The pointer is shown on the screen as an arrow, and moves very smoothly in all directions as you move the mouse around your desk. For every inch that you move the mouse on your desk, the amount by which the pointer moves on the screen is very small compared to other systems, and I was initially concerned that I wouldn't have enough free desk space to make the product usable. A telephone call to the company revealed that the mouse is 'velocity-sensitive' which basically means that the faster you move it, the faster it goes. An option on the control panel (accessible via a menu on the screen) lets you set one of three movement ratios, but these only affect movement while you push the mouse fast. If you always push it slowly, you really will need a large desk, or you'll have to keep lifting up the mouse to cover any distance.

Anyone who has used Gem or a Mac will instantly recognise the layout of the desktop. The menu bar at the top of the screen has menus headed File, Edit, View and Special. There's also a menu represented by a picture of a mouse (a real one) that leads to the desk accessories, control panel and an Info box. The Edit menu is not really used like the rest of the desktop — it is only available within the accessories that allow text editing, like the memo pad and jotter. Unless one of these utilities is active, all options on the Edit menu are greyed out and can't be used.

Down the right-hand side of the screen are seven icons. First come drives A, B and M. If you try to access drive B and you don't have one, the standard CP/M message about in-

serting a disk appears and you have to press a key when you've done so. It's a shame you can't press a mouse button instead. Below the disk icons are pictures of a telephone, diary and memo pad. The first leads to a telephone directory desk accessory, while the other two icons are self-explanatory. These are known as the feature icons, which, for some reason, AMS sees as being different from desk accessories. The latter are available from a menu and comprise a notebook, alarm clock, calculator and puzzle.

Last in the stack of icons comes the trashcan. You can delete a file or a whole disk by using the mouse to select an icon and then dragging it to the trashcan. Some desktop systems allow you to whizz round the screen selecting groups of icons, but AMS's is not one of these. There are no 'are you sure?' boxes to click on after dragging a file to the trashcan. It just disappears from screen and disk, and that's that. Thankfully if you try to delete a whole disk, you are asked to reconfirm your intentions.

Opening a disk

Just like Gem, Windows, Taxi and other desktops, you open a disk by pointing to its icon with the mouse and double-clicking (a double-click is two clicks *in quick succession*). Once you have opened a disk icon, a window appears on the screen, and the icon you clicked to open the disk changes colour to remind you that it can't be opened again until you close the window. You can, though, open a different disk and have two windows on the screen. With two windows open, you can copy files from disk to disk by moving icons between windows. The name of the open disk appears in the title bar at the top of the window, and a line below that tells you how much space is free on the disk (there's 88k on the AMX distribution disk) and how many files are available. Each file is represented by an icon and the system looks at the extension of a file (the three let-

ters after the dot) to decide which type of icon is going to represent that file on the screen. For example, data files (extensions of .DAT) are portrayed by a filing cabinet, while a document (.DOC) is portrayed as a letter. Programs are represented by a small picture of the PCW screen, complete with slot for disk drives (always two, even on an 8256).

You can open the drive M: icon (the RAM disk) just like any other, though the two files that make up the desktop system are not visible as icons — they are hidden to prevent the user from inadvertently deleting them, as this would crash the system (the files need to be accessed while the system is working).

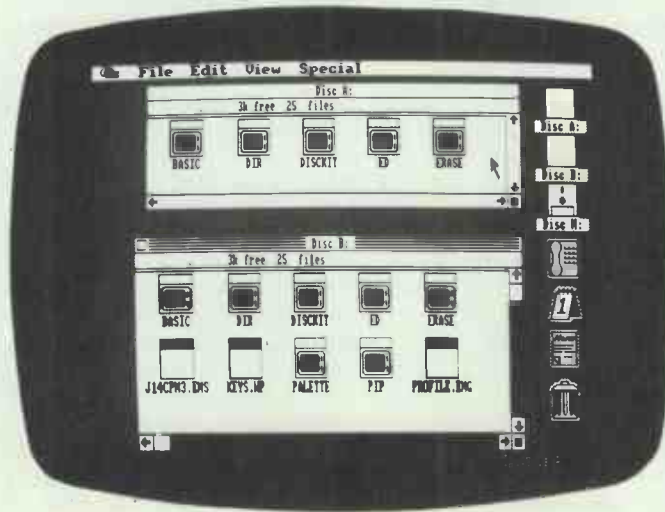
The position of a window can be altered by 'dragging' it to anywhere on the desktop. Scroll bars at the bottom and side of the windows are used to scroll the icons if there are too many files on a disk to fit in the current window. By dragging the bottom right-hand corner of the window in any direction, the window can be resized. But it's a shame that AMS has copied the Mac's way of displaying icons. Icons are always displayed in horizontal rows of six. If you make the window only half a screen wide, there won't be enough room to show a row of six so it will only show, say, three. But, even if there is loads of space at the bottom of the window (because it is long and thin), the extra icons won't appear there. Instead, there will be a lot of blank space, and missing icons that you have to imagine sticking out the side of the window. All this is done for reasons of memory space, says AMS, and unfortunately it does take some getting used to. Just remember that the message on the top of the window telling you how many files are on a disk will often not tie up with the number of icons actually displayed, so your best bet is to keep windows as wide as possible at all times.

Instead of using icons to represent files, a menu option means that you can have files shown as names as well. This way, the pictures are replaced by a textual single-column list of files that shows the name, extension and size in kbytes. The files are sorted alphabetically too.

To close a disk window, you click the small box at the top of the window called its 'close' box. The window is removed from the screen and the disk icon is restored to its former colour.

Launching a program

With a disk open and a list of files or a set of icons displayed, you can launch a program by double-clicking its name or icon. For example, pointing to the Basic icon and double-clicking is the same as typing Basic under CP/M. Once you've clicked, you are given the opportunity of typ-



Copying a file no longer requires the PIP program.

Instead, you open one window for each of the disks and then use the mouse to drag a file's icon from one window to the other; the file will then be copied. If you have only one drive, the selected file will be duplicated and you will be asked to type in a name for the new version

ing any parameters at the keyboard before the program is run. To run the program, the desktop program stuffs the name of the chosen program into the keyboard buffer, followed by an exclamation mark and the command M:DESK. This is a standard command in CP/M on the PCW machine, and will ensure that after the program has finished executing, the program called DESK.COM on drive M: will be run, effectively returning you to the desktop.

If the program you launch deletes one or more of the desktop program files on drive M: though, a message appears which indicates that you have to restart the desktop from the floppy disk.

On more versatile systems like Epson's Taxi for the IBM, you can set up links between data files (like DOC, DAT, TXT) and programs, so that clicking a DOC file would automatically load up WordStar and then call in the specified document. With AMX Desktop, though, double-clicking anything that's not a proper program results in an error message.

Clicking a file icon (or a program) once is called 'selecting' it. The icon turns black, and you can copy it to another disk by dragging it with the mouse to another window. This is far easier and faster than using the Peripheral Interchange Program (PIP), CP/M's normal method for copying files. Files can be viewed on the screen or printed by selecting an icon and then clicking the desired option from a menu.

Feature icons

Underneath the disk icons down the right-hand side of the screen are three feature icons. Double-clicking these leads to a telephone directory, diary or memo program respectively. These programs all work in small windows which occupy around a third of the desktop — and, apart

SCREENTEST

from the memo program, their size can't be adjusted. Furthermore, you can't have more than one feature icon active simultaneously, and if a disk window is open when you summon a feature icon, that window will be closed and won't be reopened afterwards.

There's no way that any of these facilities can compete with the functionality of a standalone piece of software, and they don't attempt to. Suffice it to say that if your needs are simple, they will be adequate.

Briefly, the telephone list/address book is just that. The window contains seven lines of 36 characters (though this scrolls) for someone's name and address, and a small two-line window underneath this lets you specify their phone number. New entries are added by clicking the Create option on the Special menu at the top of the screen, and there's also a Delete option there to remove the current entry.

A Find line at the bottom of the address book lets you type in a partial name and have the system dig out the correct record. There's also a complete alphabet written along the bottom line, and clicking a letter will display the first entry that begins with that letter.

All the data for the address book is held in a file called TELE.DAT which is maintained on the RAM disk until you exit, at which point it is copied to the floppy disk in the drive that was used to start the desktop. (While

you're typing in any of the windows, the mouse can be used to move the cursor.)

The desk diary is another utility that works in a non-expandable window, though its position can be moved. Again, you are given seven lines to enter details of an appointment. At the top of the window, the current day and date are shown, and this can be moved back and forth in increments of a day, month or year by clicking on an appropriate box. A calendar for the entire current month is also shown on the screen, and by clicking a particular number on it the appointments for a particular day are displayed.

While the diary is active, the Special menu is replaced by a Print one that will print a copy of the current diary file or just a selected part of it.

The memo pad, unlike the other two feature icons, is resizeable. You can make its window as big as the whole desktop, or just keep it in a corner of the screen. The desk accessories (from the mouse menu, not one of the feature icons) can be used while this is active, though these appear on top of the memo pad so you won't have to resize the memo pad unless you want to.

If there's a file called MEMO.TPL on the current disk when you start the memo pad, it assumes that this is a template and always loads it for you. The supplied template is set out like a standard office memo, with spaces for you to fill in who the memo is from and to, the subject and the date.

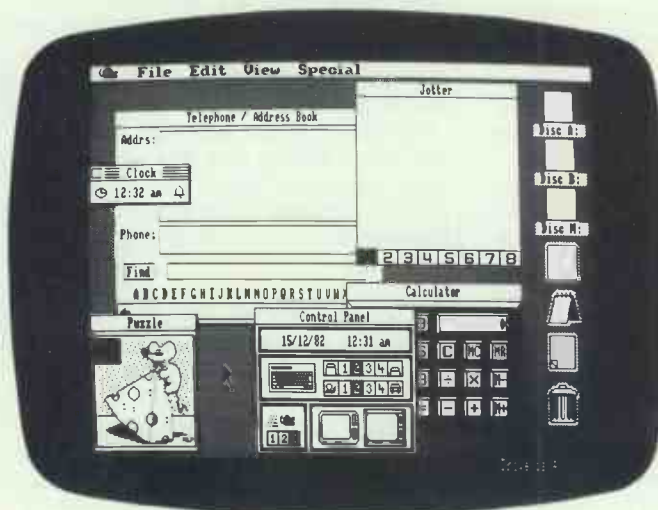
For this feature icon, the Print function has migrated to the File menu, while the Special menu is for saving a memo or opening a new one. These inconsistencies are annoying but soon forgiven.

Desk accessories

In addition to the feature icons are four desk accessories. These are utilities accessible from a pull-down menu (the mouse-shaped one). Like all the other parts of the desktop system, the code for these utilities is in the two main files, so it's not possible to modify the desk accessories or to add your own to the menus.

The jotter takes up around a quarter of the desktop size and is AMS's version of a notepad. It can be popped up over other windows, and contains eight pages, each of which is selected by clicking a number from the set in the bottom line. The desktop contains a clipboard which can be used to copy and move notes between the jotter, the memo pad, diary, address book, and so on.

The alarm clock looks very similar to that on the Mac: its window is only two lines high — the first of



The AMX Desktop allows you to have more than one window open on the screen at a time, though only one can be active. Here, the clock is the active window, as shown by the horizontal lines at the top of it.

If you activate one of the feature icons, any open windows on the screen will be closed and you'll have to open them again afterwards

which is the title (Clock) while the second contains the time. Clicking the clock-shaped character (which tells you you're looking at the current time) makes it change to a small alarm clock that indicates that you are looking at the time the alarm is set for. In the same way, a picture of a calendar brings up the date. This is where you set the system time and date each day, as the Amstrad doesn't have a battery-backed clock calendar. In addition, one alarm can be set — though you can't specify a date — so the alarm has to be some time between now and midnight. When the alarm goes off, the machine beeps and a small window appears to tell you that the time has come. This only works if you are actually using the desktop at the time — the window won't pop up in the middle of an applications program. If an alarm does reach its allotted time while you're inside another program, the beep goes off when you next return to the desktop.

The calculator is a 10-digit floating point version with the four basic functions as well as a memory. It can be controlled with mouse or keyboard, though there's no facility for pasting the result of a calculation into another window.

The puzzle is one of those sliding-tile affairs, where you get a grid of 16 squares containing tiles numbered 1-15. By moving various combinations of tiles into the empty space, you are supposed to end up with the numbers in order. To make the thing harder, the numbered tiles alternate (each time you call up the puzzle) with a picture of a mouse standing on a lump of cheese. When you quit the desktop, you are asked if you want to save the current state of the picture from the RAM disk onto the floppy disk, so you can take your time over solving it.

Control panel

The control panel is another idea borrowed from the Mac. This window shows you the current date and time (though you have to use the Clock accessory to set them), along with the various system settings. You can choose from four different settings for the length of time a key must be held down (not a mouse button) before it starts auto-repeating, and there are a similar number of settings for how fast the key actually repeats once it starts. The mouse movement scale, described earlier, is also set from here, and there's an option to reverse the screen to make the desktop black on green, instead of green on black.

Changes to the control panel result in a patch version of the DESK.OVR file on the RAM disk, which is automatically copied to the floppy (if you want it to be) when you quit to CP/M.

How it all works

For those interested in how the interface works, a brief explanation is in order. Unlike the IBM machines, the PCW 8256 doesn't have any hardware interrupts. With desktop software on the IBM PC, for example, the graphics software can get on with its job and, if the user moves the mouse, the interface will interrupt the software and tell it that the pointer needs updating on the screen. This is like someone sitting at home watching television and waiting for a friend to arrive — when the doorbell rings you turn off the TV and answer the door.

With the Amstrad, the interface box and mouse are constantly talking to each other independently of the computer. The interface contains a counter inside, which is automatically updated when you move the mouse, to reflect the current position of the mouse. The software, every few hundredths of a second, has to check this counter and, if its value has changed since the last time, the pointer on the screen will need updating. This method is similar to what would happen if your doorbell had broken — instead of waiting for it to ring, you'd have to keep looking through the window every couple of minutes to make sure your friend wasn't outside.

As for the software, the Amstrad works in graphics mode anyway, so the hardware exists to produce graphics on the screen. GSX, the official way of doing this, was deemed to be far too slow and memory-intensive, so everything is done by writing directly to the screen memory. This gives the programmer greater control.

Transferring the system to program disks

One menu option is labelled Set Startup. In theory, this copies the two desktop system files onto any disk, and sets up a SUBMIT job that makes any program disk boot straight up into the desktop. Unfortunately, I couldn't get this to work, as I kept being told that there wasn't enough space on my disk for the copies. When I told AMS about the problem, I found I wasn't the first person to have discovered this. Rest assured that it should be fixed by the time you read this.

GSX

The official way of producing graphics on the PCW is via a program called the Graphics System Extension, or GSX. Programs that use GSX to produce graphics, like DR Draw, need a special driver in order to make use of the mouse to emulate the keyboard. Although the manual contains a chapter detailing the use of the GSX driver that is supposed to be included with the desktop disk, a small sheet at the front explains that the driver is not quite ready. Before you hand over any money, make sure that it is.

Screendumps

It's an undocumented feature of the PCW 8256 that pressing EXTRA and PTR will do a graphics dump of the screen. This worked fine with the AMX Desktop, and produced some reasonable-quality printouts.

Documentation

The manual for the mouse, interface and software comprises 37 pages of A5 text. It was written before the software was completely finished, and it shows. There are a couple of silly errors, like referring to a dialogue box (an error message in a window) as a dialling box. Nevertheless, the chapter on installing the mouse and interface is excellent and should be all you need.

Conclusion

There's not a great deal you can do with the AMX Desktop; although it certainly is more friendly than a solitary A> on the screen, and I had no problems using it to start programs by clicking an icon instead of typing a name; and the desktop faithfully reappeared automatically when I exited the program. But once you've left the safety of the desktop to run a program, the mouse might as well not be there. It is actually dead. It ceases to be. Indeed if it wasn't nailed to its perch ... anyway you get the drift. I am told that a keyboard emulator will soon be available (free to existing users, I hope) that lets the mouse emulate the cursor keys and allows each of the three buttons to be programmed to produce a single key or a whole string. Even when this arrives, though, it won't work with Locoscript, which unfortunately is non-standard.

Despite these limitations, AMS is certainly worthy of praise for fitting a mouse-driven desktop into just 75k of memory. For the money, you get a well-written piece of software that is both fun and educational to use. It works comfortably on a machine with just one single-sided drive and, if you want a computerised diary, address book and calculator, you've got one. You also get a mouse, whose purpose in life will multiply as AMS increases its range of software to include, around September, full desktop publishing using just the PCW's bundled printer.

Perhaps the mouse and desktop software are a little ahead of their time, but they could also signal a revival of interest in the PCW machines. For home and small office, and especially in the educational field, a PCW-based DTP system may be perfectly adequate. A Mac it isn't, but then it's not Mac-priced either.

The mouse, software and interface together for the Amstrad PCW 8256 or 8512 cost £79.95 (excluding VAT) from dealers. AMS is based in Warrington, on (0925) 413501

END

Sixth sense

It seems that at long last manufacturers are applying some 'lateral thinking' and adapting computer technology to benefit the disabled — but unfortunately such developments don't come cheap. Martin Banks looks at what's currently on offer.

Microelectronics has been responsible for many things in its relatively short life, not least of which has been the personal computer in all its many guises. It has also spawned some amazing developments in obscure areas, many of which have had considerable impact across a wide range of applications, notably those that beneficially affect the disabled in our community.

Obstacles

As always, the underlying problem with any developments for the disabled is money. In brutal marketing terms, the disabled do not constitute a large target for the majority of companies, even when there is a common disability to address, such as blindness or deafness. As consultant Julia Schofield points out, no two disabilities are the same, if only because the effect of the same disability on different individuals will itself be individual. It is difficult, therefore, to arrive at one solution that will serve the full needs of a large group of disabled people.

This makes the creation of specifically engineered solutions difficult, and more to the point, expensive. That is why the trend among systems developers working in the disabled field is now towards 'lateral thinking': looking at what is available on the general market and trying to work out whether it can be applied to the needs of the disabled, either directly or with the minimum of modification.

According to Schofield, the commercial computer market has now started to be the source of increasing numbers of potential tools that can be adapted for use by the disabled, especially with a little bit of thought. She gave as one example the spelling-checkers that have been developed as an adjunct to word-processing systems. Their obvious benefits to those who constantly use the written word can be equally applied to those that have physical problems with creating written communications at all. Coupled to a word processor, itself a major advance for the disabled, the spelling-checker can

quickly take the user to those words that require re-spelling, making their efforts that much simpler.

One increasingly common factor in this is the availability of the personal computer as a cheap and effective engine for such applications. According to Corri Barratt at the Royal National Institute for the Blind, the most popular machine by far is the IBM PC or one of its compatibles. This is because this machine is so dominant in the work place — and it is in integrating themselves with the work environment that most disabled people face the greatest problems.

The PC range has also generated the greatest single group of applications programs with which those seeking products to adapt can work. Word processors and spelling-checkers have, for example, proved easily adaptable to the needs of the disabled, even though they were never developed with that application in mind. Speech synthesis systems have grown as much from the commercial/industrial potential of applications such as spoken warning systems as from the desire to create a speech system for the disabled.

This, Julia Schofield thinks, is now inevitable and beneficial. Those applications of technology which gain commercial acceptance also become cheap enough to make their adaptation for the use of the disabled a viable proposition, whereas they would never see the light of day at all if their development had been initially targetted at the disabled market-place.

One trend in many modern work practices is working to the advantage of many disabled. This is the trend towards greater intellectual and reduced manual content in productive work, which is making it increasingly possible for technology to give them the means to create their own independence by getting a job. Cheap personal computers are the ideal tool for providing the communications capabilities needed to be productive in one way or another. Using the technology, it is even possible for those with major physical disabilities to perform significant tasks.

Communications has always been among the most significant disabilities, and is the area where the technology is best suited to providing some satisfactory solutions. In terms of disability, communications means speech, hearing and sight, the three ways in which we take in and give out information. In all three there have been significant developments in the potential capabilities of the technology available. In some cases, however, the developments have so far failed to get too far past the stage of theoretical applicability to the problems of the average individual.

One area that fits this particular description is hearing. For the hard of hearing there are a wide range of options available that all work by amplifying sound to a level where the wearer can hear it. But for the totally deaf the only input medium they have is through their eyes. For those that have not learned either sign-language or lip-reading, which according to Julia Schofield are skills which are not so widely known now, the written word is the only way of receiving information. This makes receiving direct communications with another person difficult, as speech is then precluded.

Theoretically, technology has the means to solve this problem, and has realised many others to at least some extent. Systems have been developed that can hear the spoken word and convert this input into a textual output. It is an area where much work is being done, but where there are still many problems to be solved to achieve a workable solution for the disabled.

Speech systems

One of the leading companies in this field is IBM. It has been working on speech-recognition systems for many years, and has made some significant developments in that time. One application of the technology which is important to the deaf is the capability to convert speech into text. The company announced a system which could achieve this some three years ago. It had two major disadvantages, however. First, and most obvious,



obvious, was the fact that the software ran on a large mainframe computer system well beyond the means of an individual. The second was that it was slow, taking up to 20 seconds to convert a word to text.

As a measure of what the technology can achieve, however, IBM has continued to pursue the idea, and recently came up with a new version which offers dramatic improvements. The size of the hardware required has been cut dramatically from a mainframe to a PC, while the speed of conversion has been raised sharply. Most words now appear after a second or two. In addition, the vocabulary the system can handle has been raised from 5000 to 20,000 words.

Like all speech-recognition systems, however, it is still speaker-dependent, which means that it has to learn the voice of the speaker to work at all. While making the system highly applicable to many aspects of the work environment, especially for the physically disabled, systems such as this continue to hover tantalisingly close to providing the deaf with a workable speech-to-text system without being able to yet provide it. Ironic as it may seem, it is extremely difficult to produce a speech-recognition system which is speaker-independent, and therefore usable by anyone wishing to communicate ver-

bally with a deaf person. Until such systems appear, the rest of the technology remains essentially unusable by the deaf.

For those with speech and sight disabilities there is more on offer from the technology. Speech-synthesis systems, for example, have been developed to a very high level now, and are at last starting to become available in small and inexpensive forms.

The typical speech system these days is an add-on box designed to connect directly to the serial or parallel port of a personal computer, with the IBM PC proving to be the favourite host, closely followed by the BBC Micro. The systems work to a number of different phonetic rules, but all offer the user the facility of being able to have the machine 'speak' for them. As well as the synthesiser, therefore, the system depends upon a program which will drive it, applying the word keyed into the computer to the specific phonetic rules used by the synthesiser to create the correct sounds.

Speech synthesisers were among the earliest applications of microelectronics technology to the needs of the disabled. Among the first was the American Votrax system. In its initial form this cut the communications needs of the disabled down to the bare minimum and provided them

with a small vocabulary of commonly used words and phrases of the 'yes', 'no', 'I'm hungry' variety, each accessed by pressing the required key on a large, lapheld keypad. The latest versions of this system are still available today.

As in every other area of technology the user does tend to get what they pay for in speech synthesisers. To get an output that sounds reasonably human in tone quality, and can speak with human-like inflections is quite possible, but the cost will be dramatic. This is because the software and processing power required to provide these facilities is expensive. A simple synthesis system, however, is now relatively cheap. The drawback is that the speech tone is poor and takes a good bit of practice to understand. It is interesting to hear one of these machines and realise quite how much understanding comes from voice inflections and speech timing as from the raw sound itself.

This can be a drawback for those with speech disabilities, of course, for the majority of listeners will face this difficulty every time the system is used. As with most applications of technology, however, speech-synthesis systems can be expected to improve in quality, as well as reduce in price.

One of the least expensive now on

COMPUTERS IN ACTION

the market comes from Dolphin Systems in Liss, Hampshire. This is the Mimic synthesiser which was actually developed by the Technical Department of the Royal National Institute for the Blind. The RNIB's objective was to develop a simple speech system that would 'tell' the blind what was appearing on a computer display. Versions of the system have now been produced for the BBC Micro, the IBM PC and, potentially interesting for the speech impaired, the NEC laptop.

At a price of £235 this is a small, battery-powered machine that is quite easy to work with as soon as you have got used to the voice. Coupled to an NEC lap-portable it offers the potential of a workable speech system for well under £1000. This compares well with some of the other speech-synthesiser systems that cost well over £2000 and are, in some respects, more restrictive in application by being designed specifically for use in the work place.

Since taking on the production and marketing of the Mimic system, Dolphin Systems has put considerable efforts into additional software developments. The company has now come up with a product called PC Read. Aimed at the IBM market, this package allows the user to define individual window areas on the screen and then enter text into them. Each text block can be whatever the user decides, from a simple 'yes' or 'no', through to a complex phrase.

To access a window with the speech synthesiser, the user calls up a facility called Screen Review. This allows the user to position the cursor over the window area desired and have the contents read out by the synthesiser. As an additional feature, the PC's function keys can be programmed to take the cursor directly to a specific window. If the user wants more than ten windows the alpha keys of the keyboard can also be brought into play. They can be programmed in the same way as the function keys, with the ALT key being used to determine their roles. Alternatively, the system also allows the user to verbally 'review' whatever is on the screen at the current location of the cursor.

Perhaps the most significant aspect of the PC Read development, particularly so in the view of the RNIB's Corri Barratt, is the cost. 'A lot of the products aimed at the disabled are relatively expensive, because of the work involved in adapting them and because it is not mass market. But the Dolphin has aimed at getting the price right down.

At £64 I don't suppose they could get PC Read much cheaper,' he said.



Developed by the Royal National Institute for the Blind and produced by Dolphin Systems, the battery-powered Mimic speech synthesiser is ideal for use with the NEC laptop, the BBC Micro and PC-compatibles

This is an interesting example of taking common development from the commercial computing world and adapting it simply and cheaply to the use of the disabled. It will eventually become a matter of history whether the same lateral thought processes are applied to some of the latest developments in speech-based computer systems. What, for example, could be made of the Spicos dialogue system developed jointly by Siemens and Philips.

Spicos is an experimental system which offers some interesting long-term potential. It not only recognises continuous speech, which is something most other speech-recognition systems find difficult, but it can respond via a speech synthesiser. In short: you ask Spicos a question and it can answer. In theory, it can cope with 1.5 trillion questions-and-answers.

Like all experimental systems it has its drawbacks. It is currently very slow, taking five minutes to analyse a query, search through its files and formulate an answer. It also takes a Digital Equipment VAX 11/780 super minicomputer to run on. The system also works only in German for now, though an English-speaking system is being developed, as is a version

capable of answering queries in real-time.

Given the pace at which technology develops and the cunning minds of those working in the disabled field, it will be interesting to see what becomes of Spicos in five years or so.

New lease of life

Adapting commercially available products can also give a new or alternative lease of life to something that has lost its mainstream sparkle. Take the Microwriter, for example. This one-handed keyboard device was first developed as a word-processor keyboard by the writer, Cy Endell. Though extremely clever in design, using just five keys to produce a full character set, its difference from the standard QWERTY keyboard meant that it never took off as a mass market product. It has, however, found considerable interest among the blind, many of whom are trained to relate the physical sensations of Braille to an alpha or numeric character. Many disabled people have now acquired QWERTY keyboard skills, however, which makes them much more likely to find some form of remunerative employment. Keyboards themselves are also readi-

ABBEEY LIFE	CADBURY SCHWEPES	HOUSE OF FRASER	PROCTER & GAMBLE
ABBEEY NATIONAL	CHANNEL FOUR	IBM	PRUDENTIAL CORPORATION
AIR PRODUCTS	CHASE MANHATTAN	ICI	RACAL ELECTRONICS
AMERICAN EXPRESS	CHEMICAL BANK	IND COOPE	RANK HOVIS-McDOUGALL
ANGLIA BUILDING SOCIETY	CITIBANK	JOHNSON & JOHNSON	REDLAND
ARTHUR ANDERSEN	CLAVERLEY	KODAK	REUTERS
AUDI VOLKSWAGEN	COOPERS & LYBRAND	LEGAL & GENERAL	ROBSON RHODES
BAKER PERKINS	COSTAIN GROUP	LITTLEWOODS	ROLLS-ROYCE
BALFOUR BEATTY	CT BOWRING	LLOYDS BANK	ROYAL INSURANCE
BARCLAYS BANK	DAILY TELEGRAPH	LOGICA	SHELL
BASS	DOROTHY PERKINS	LUCAS	SIMON ENGINEERING
B.A.T. INDUSTRIES	DOWTY GROUP	MARCONI	SINGER LINK-MILES
BEECHAM GROUP	DU PONT	MARS	STC
BICC	ERNST & WHINNEY	MASSEY-FERGUSON	
"EXPERT SYSTEMS. WHO NEEDS THEM?" TATE & LYLE			
BLACK & DECKER	ESSO	METAL BOX	TAYLOR WOODROW
BLUE CIRCLE	EUROPEAN FERRIES	MIDLAND BANK	TEXACO
BRITANNIA BUILDING SOCIETY	FLETCHER DENNYS	MOBIL	THORN EMI
BRITISH AEROSPACE	FORD	NABISCO	3M UNITED KINGDOM
BRITISH AIRPORTS AUTHORITY	GEC	NATIONAL & PROVINCIAL	TI GROUP
BRITISH AIRWAYS	GENERAL MOTORS	NATIONAL GIROBANK	TOUCHE ROSS
BRITISH CALEDONIAN	GEORGE WIMPEY	NATIONAL WESTMINSTER BANK	TREBOR GROUP
BRITISH GAS	GKN	NESTLÉ	TRUSTHOUSE FORTE
BRITISH NUCLEAR FUELS	GLAXO	PHILIP MORRIS	TSB
BRITISH PETROLEUM	GOLDEN WONDER	PHILIPS	UNIGATE
BRITISH RAIL	GRAND METROPOLITAN	PILKINGTON BROTHERS	UNILEVER
BRITISH STEEL	H.M. GOVERNMENT	PLESSEY	UNITED BISCUITS
BRITISH SUGAR	HERON INTERNATIONAL	POST OFFICE	WELLCOME FOUNDATION
BRITISH TELECOM	HEWLETT-PACKARD	PRICE WATERHOUSE	WHITBREAD & CO
	HOECHST UK		WOOLWORTH

The names listed above represent some of the most successful companies and organisations in the UK.

They also happen to be just a few of the people who have an expert system from Expertech.

To find out why you need an Expertech expert system call (0753) 821321 for details of our free seminars or fill in the coupon.



Post to: Expertech Ltd, Expertech House, 172 Bath Road, Slough, Berkshire SL1 3XE. Telex: 849881 EXPERT G.

NAME _____

POSITION _____ COMPANY _____

ADDRESS _____

TEL. NO. _____

PCW 7

Expertech. Xi
COMMUNICATING KNOWLEDGE *Plus*

COMPUTERS IN ACTION

ly adaptable to provide the special facilities the disabled need. This is one indirect reason why the IBM PC family and compatibles have become extremely popular engines for disabled solutions. The keyboard is a separate item from the machine, which makes it a much easier system to modify and adapt to specific disablements.

There is, for example, the Audio-Data keyboard for use with the PC. This incorporates two slider controls working in X and Y orientations. These control the movement of the cursor, so that blind people can get a much more accurate 'feel' of where the cursor is on the screen. This keyboard also includes a speech synthesiser, so that the words or characters at the cursor location can be read out to the user.

The other prime source of input and output for the blind is, of course, Braille. This hard-copy character system, sensed by the user through the fingertips, can be adapted by modern technology, but only with some difficulty and not inconsiderable expense. So-called 'soft-Braille' systems have been developed, but the cost has so far proved prohibitive.

The reason is the way Braille works. The character is formed by a matrix of nine 'bumps' embossed into paper. The presence or absence of any one bump in the matrix helps to form the information transmitted to the reader through the fingertips. To produce an electronic response, a 'soft' version of this has been produced as a single cell with nine pins that can be pushed up above a surface plate by small solenoids. In practice, the mechanism is rather like the print head of a nine-pin matrix printer. This system works extremely well, but at around £100 per cell, makes any reasonable reading machine very expensive.

The first successful reading machine, the Optacon from Telesensory Systems Inc in the US, did not even use Braille. Still a popular system, this can read only one character at a time, and works by translating a visual character image into discrete pin movements. The basis of the machine is the hand-held miniature TV camera used to scan over text. This scans one character at a time and the system converts this input into a matrix of 144 points. If part of the character appears at a specific point, the machine causes one pin in a matrix of 144 to rise above a plate where the reader's finger rests. With practice, it becomes possible to sense the actual shape of the character being transmitted through this system to the finger.

Even with only one output cell the



This Braille Screen Reader from IBM combines a mouse with a single Braille cell mounted into its top surface, all in a self-contained unit

Optacon is an expensive system, costing around £3000. A Braille reading system costs more. One of the latest, the Delta System from Sys-telec in France, costs around £5000. This uses the same approach as the Optacon, utilising a miniature camera as the text input system. Output is in the form of 12 Braille cells, which is the prime cause of the system's expense. In operation, the readers rest their fingers on the cells and the information 'passes' beneath them as the camera moves across the text.

An interesting variation on this idea has recently come from IBM, in the form of the Braille Mouse. This is an adaptation of the standard cursor-controlling and function-key-providing rodent that has a single Braille cell built into it. The user works the mouse in the traditional way to position the cursor at the desired point on the PC screen, and the Braille cell then gives a read-out of the character at that location. Two advantages come with this experimental system. One is that it requires no additional software, being a completely self-contained unit. The other is that it is expected to be relatively cheap.

The way ahead

Though much has been achieved in the adaptation and application of computer technology to the problems of the disabled, there is still much that can be done, especially in the area of making systems that are both usable and inexpensive. There is also considerable scope for the UK to play a major part.

'The majority of the equipment currently available for the disabled comes from either America or Europe,' said Corri Barratt, 'especially from Sweden and West Germany. The UK has now fallen a very long

way behind in the development and adaptation of new products.'

There are several areas where he would like to see UK effort being applied in the future. 'The one big need for the blind is the availability of a low-cost, portable reading system,' he said. 'What is needed is something that is the size of the Optacon machine, which is as big as a reasonably-sized hardback book, uses Braille if possible, and is cheap enough for the majority to purchase.'

As with Julia Schofield's remarks about applying lateral thinking to existing commercial products, Barratt sees considerable opportunities for developers providing suitable access systems to these commercial applications, particularly word processors and spreadsheets. One specific area he highlighted was an access system that would put the manuals for a commercial product onto disk, in a readily addressable form. This would make learning a new application much easier for a wide range of disabled people.

The need for rapid development and adaptation of new products is made greater by the lull in overall PC developments that stemmed from the adoption by most people of the IBM PC as a standard. This has allowed technology for the disabled to catch up and find a new relevance, particularly in the work-place.

The growth of that standard, and its development into aggressively priced machines such as the Amstrad PC1512, is encouraging to Barratt. He sees this as one of the main engines of the future for developments that aid the disabled. 'When it is possible to buy a PC costing £500 this should put some pressure on the further development of reading or speaking systems that currently cost more than £2000,' he said.

END

When your Computer needs PROTECTION



try the POWERBANKS

POWQUIP POWERBANK — AN UNINTERRUPTIBLE POWER SUPPLY

PROVIDING THE COMPLETE ANSWER TO ALL OF
YOUR PROBLEMS

PROTECT YOUR COMPUTER HARDWARE & SOFTWARE
SAVE YOUR TIME & COSTS

For further information — contact us at:

POWER EQUIPMENT LIMITED

Kingsbury Works, Kingsbury Road, London NW9 8UU
Tel: 01-205 0033 Telex: 8952887 POWQIP G

NEW

**THIS IS WHAT YOU NEED. NO MATTER YOU ARE
PROFESSIONAL OR NOT**

SABA SERIES

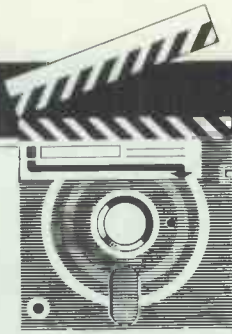
MULTIFUNCTION TURBO PRINTER BUFFER
WITH 4 PORTS AUTO DATA SWITCH MAKES
YOU USING YOUR DEVICES
PROFESSIONALLY.

- 256K BYTE MEMORY STANDARD, 1M BYTE OPTIONAL.
- TURBO SPEED, 12MHZ (1400 CHARACTORS
PER SECOND).
- NEAR LETTER QUALITY FUNCTION.
- ITALIC MODE.
- HEXDUMPER TRANSFERRING KEY.
- COPY FUNCTION.
- AUTOMATICALLY SELECTIONS



CONTACT IMMEDIATELY FOR DETAIL INFORMATION

POWELL ELECTRONIC INC.
2F1-6, No. 312, Sec. 4, Jen Ai Road, Taipei, Taiwan, R.O.C.
P.O. BOX 43-248 Taipei, Taiwan, R.O.C.
Telex: 12944 INSWELL
Tel: 886-2-704-4487, 706-6946, 701-8930
Fax: 886-2-705-4032



SCREENTEST

Turbo Prolog Toolbox

Borland International may be a comparative newcomer to the Prolog market, but its latest product, the Turbo Prolog Toolbox, complements the Turbo system beautifully, and will be a boon to application developers. Mike Liardet considers its capabilities.

Readers who followed the 'Teach Yourself Prolog' series which we ran between February and May this year may perhaps have been sufficiently enthused to try Prolog in a real application, instead of just using it for experimental prototyping systems such as those developed during the series. Prolog is unsurpassed as a programming language for some types of application, as was illustrated by the many examples we gave, and hopefully many readers will now be seriously considering it for full-blown projects.

It is worth inserting a note of caution at this point: Prolog programming projects are subject to the same general constraints as projects in any other programming languages. In particular, in Prolog as in any other language, about 90 per cent of an application's code will be concerned with the interface to the user and the various peripherals, while only about 10 per cent will actually do the real computational or processing work at the heart of the system. It is this 90 per cent part of an application's code, dominated by the user interface, that transforms what might be just a clever idea into something easily usable in a normal working environment.

This '90/10 split' is a well-known phenomenon, and in response to it, many of the conventional programming languages now have a large number of application-utility 'subroutine libraries' (see, for example, the Vitamin C and PforCe article in PCW, September 1986). With an appropriate library, for a comparatively modest investment, a wide variety of utilities are made available to handle user interaction, database access, and communications with

other software, and so on.

Unfortunately, until now, there have been precious few really useful application-utility libraries for Prolog, so a Prolog programmer, who had just developed the clever processing part of a system, would be largely on his own resources for turning it into a fully functioning application. Possibly the established Prolog purveyors believe that practical tools, for menus or whatever, are simply too mundane to be of interest in the exciting world of Artificial Intelligence and Expert Systems. But that is where Borland International, a comparative newcomer to the Prolog market with Turbo Prolog, disagrees. And in line with this thinking, it has recently released Turbo Prolog Toolbox, to augment the Turbo Prolog system with the vital facilities that an applications programmer will need.

Overview

Although very extensive, the Toolbox facilities are fairly conventional, and primarily concerned with aids to develop the user interface in an application. The product is definitely not an Artificial Intelligence Toolbox, and most of its facilities are concerned with the familiar menus, help screens, graphics, communications and file access, and so on. Not everything is covered though. For example, there is no database facility, mouse control or graphics printing, and no pop-up 'memory-resident' facility that would make applications such as Sidekick work. Also the Toolbox does not offer any windowing facility, as Turbo Prolog already has this!

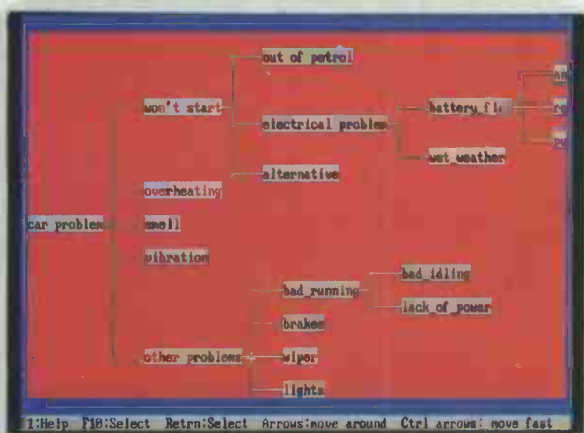
The only really unusual facility in the Toolbox is a 'parser generator'. This would be particularly useful for

handling 'knowledge representation languages', commonly used in expert systems, or indeed for more conventional projects such as programming language compilers or command interpreters.

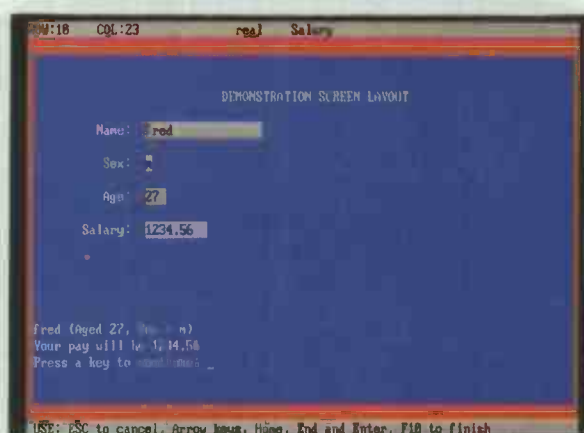
The Toolbox is supplied on two disks, together with a manual. The manual is split between a reference section, with descriptions of all the predicates supplied, and a tutorial, which shows how the various types of problem should be tackled. The disks contain, in effect, a library of over 80 'predicates' (a predicate is the Prolog equivalent of other programming language's subroutines or functions), along with over 40 example programs to illustrate their usage. Most of the Toolbox facilities are written in Turbo Prolog itself, and their complete source code is provided. For reasons of efficiency, a few of the predicates are written in C or assembler, and for these there is no source code but merely 'object' files.

When working with the Toolbox, the best way to regard all the 80-plus predicates is simply as an extension to the hundred or more built-in predicates that are already present in Turbo Prolog. As with the real built-in predicates, their internal workings need be of no concern to the programmer, but the availability of the source code can be useful occasionally for customisation or just to see how other programmers tackle particular problems.

Most PCs that can already run Turbo Prolog should also be able to use the Toolbox. The minimum memory requirement for Turbo Prolog with Toolbox is 512k, whereas for Turbo alone it is 384k. Apart from that the requirements are the same, with a



'Treemenu' contains a tree-structure argument which is automatically formatted onscreen. It can be clipped and scrolled so that the whole structure can be seen



'Option(3)' in the 'option' clause uses Turbo Prolog's built-in 'consult' predicate to access a file which contains information on the screen layout to be used

twin-floppy PC being needed as a minimal system. The Toolbox will not work with Version 1.0 of Turbo Prolog, and users of 1.0 will need to upgrade to 1.10. This is well worth doing in any case, as Version 1.10 has a number of improvements over 1.0, not least a number of bug-fixes, even faster compilation, and some extra built-in-predicates.

The facilities provided by the Toolbox fall into five categories: user interface, graphics, serial communications, interfaces to other software and the parser generator. I shall deal in some detail with the user interface and graphics facilities, and then summarise the others.

User interface

The Toolbox's user interface facilities include predicates for handling help-screens, status lines, screen and report layouts, and menus. In addition to all this, Turbo Prolog already has windowing capabilities. The demonstration program shows some of the many user interface predicates in action, but in particular, omits the help-screen facilities.

Once the Toolbox has been installed alongside the Turbo Prolog system, the demonstration program can be run in the normal way, by selecting 'Run' in the main menu. Of course, if it were a real completed application, it would not be used this way, but run as an 'EXE' file — that is, as an independent executable program. It is quite easy for Turbo Prolog to create EXE files and I shall describe how this is done when describing the graphics demonstration program.

The demonstration program has a number of 'include' directives, in the first thirty lines. When the Run option is processing the program, it reads in any 'include'd files and processes them in the normal way, as if they had been typed in as a part of the program. These 'include'd files,

'tdoms.pro', 'tpreds.pro', and so on, are all supplied as a part of the Toolbox, and contain the definitions and declarations for the predicates required by the demonstration. Although all these files are normal readable source files, there is no need to actually look at them. The manual describes how the predicates in them should be used, and also which files to 'include' for the various predicates. This is more than sufficient information for most requirements.

organised as a main menu offering three options, two of which demonstrate other types of menu facility, and one of which uses a screen layout to get user input. Because it is a demonstration system, none of the options actually *do* anything, but for a real application it would be relatively easy to embed all the appropriate actions alongside the interactive facilities.

The execution of the program starts with the goals following the 'goal' directive. These goals create a window that completely fills the screen area, set up a status line message (on the bottom line of the screen), handle the master menu (with the 'menu' goal), and then perform whichever action the user selected in the master menu (with the predicate 'option'). The 'repeat' and 'fail' goals are a Prolog device to ensure that all the goals between are repeated *ad infinitum*, rather like an infinite loop in a conventional programming language.

The 'makewindow' predicate, like all the windowing predicates, is actually a part of the standard Turbo Prolog system, and could be used without the Toolbox. The various arguments allow a choice of colours and display attributes for both the border and the window area itself — a title, size and position. For this particular goal there is no border or title, and the window fills the entire

screen area.

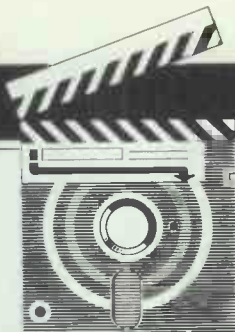
The 'makestatus' predicate displays a 'status' line at the bottom of the screen, with the message indicated.

The 'menu' predicate takes a list of options, in this case 'Treemenu'; a title ('Which would ...'), a position for it to be displayed (row 10, column 7), some display attributes, and the initial option on which to have the 'menu bar' (option 1, the first option here). When it is executed it produces a display with the menu options contained in a window. The user can use the arrow keys, along with 'Home' and 'Page-Up', and so on, to move the menu bar around in this window, until it rests on the option he wants. Pressing the 'Enter' key selects this option, with the option number selected being returned in the last argument of menu (that is, into Sel). The menu is automatically erased once a selection is made. If the user pressed escape, this is returned as selection 0, otherwise the option number (1 to 3 in this case) is returned. In the demonstration selection, 0 results in the next goal being:

option(0)
and this (see the definition of 'option') just calls on 'exit' to terminate the program.

There are several variations on the basic menu predicate, most of which are not illustrated in the demonstration program. For example, very large menus can be handled, where all the options can be scrolled through a comparatively small menu window; tables of options can be given (like Turbo Prolog's file directory menu, when 'load'ing programs); the menu can be left onscreen when it is finished, and multiple choice menus are allowed, and so on. Among the many possibilities I have chosen to feature just two: 'Treemenu's' and 'Pull-down menus', selected as the first and second options on the main menu.

The clause with head 'option(1)'



SCREENTEST

handles the treemenu. It has only one goal: 'treemenu'. One of tree-menu's arguments is a tree structure, and this is automatically formatted on the screen. Not all of it may fit on the screen, but it can be automatically clipped and scrolled in a fairly obvious way in order to see the rest of it. The tree menu is a rather unusual menu facility, but could be useful in, for example, an expert systems application. Many Prolog programs generate or work with tree structures. It would be interesting to interface the decision tree in the 'Pool Ball' problem (see the Teach Yourself Prolog article in *PCW*, April 1987) to this facility.

Each 'node' in the tree data structure has a unique identifying number associated with it (for example, 'alternative' is numbered '10'). The treemenu facility allows the user to move the cursor around to point at different points in the tree, and when one is selected it calls the goal:

```
treeaction(Num)
```

with Num being set to the identifying number of the option. It is up to the calling program to define 'treeaction'. For a real application treeaction would probably be defined by many clauses, for each node in the tree.

One of the problems with tree-menu is that the cursor does not skip from one node to another, but instead is allowed to roam freely around the screen. Without a mouse, as an alternative to the arrow keys, this makes interaction with it rather slow.

The clause with head 'option(2)' handles the pulldown menu option. The pulldown goal in this clause is the one that deals with the pulldown menu. The menu works very like the main menu in the Turbo Prolog system. It gives a list of options displayed across the top line of the screen, and a selection is made either by the arrow keys or the initial letter of an option. The pulldown happens after an option is selected. A further menu drops down from the option selected, and a further selection can be made. Once a second selection has been made in the pulldown menu, the pulldown predicate calls the goal:

```
pdwaction(Main,Sub)
```

with Main and Sub being set to the main option and sub-option numbers that were selected. As with treemenu and the treeaction predicate above, it is up to the calling program to define pdwaction. The pdwaction clause corresponding to the 'Quit' option on the menu has a 'fail' at the end. The failure causes pulldown to terminate. None of the other pdwaction clauses fails, and pulldown continues to maintain control after the execution of each of these is completed.

The third option on the main menu in the demonstration shows how a screen layout can be used. This option is handled by 'option(3)' in the 'option' clauses, and uses Turbo Prolog's built-in predicate 'consult' to access a file ('xperson.scr') containing information on the screen layout to be used. Although it is quite feasible to create screen layout files directly, the Toolbox offers a special utility that enables them to be designed interactively. When using this utility, explanatory text and prompts can be sprayed arbitrarily around the screen, and 'fields', where data is to be entered, are positioned in appropriate places. During the layout design the field type (integer, real or text) and maximum field size can be specified.

All the work in the screen interaction is done by the 'scrhnd' predicate. The user can use the arrow keys to jump between fields, and freely make changes to any of them. On termination of the screen input, the values entered by the user can be picked up by the program, by using the 'value' predicate. This associates a textual name for a field, assigned when the screen layout was designed, with a Prolog variable which can receive the value. The demonstration program just prints out these values, but a real application would probably store them on file somewhere. Note that the Toolbox does not offer any special database facilities (other than an interface to dBase), so this part of an application would have to be written from scratch.

Graphics

The Toolbox's graphics predicates can generate bar graphs, mathematical plots and pie charts, for example. They can work in colour and also handle either the standard IBM color graphics adaptor, or the EGA card. The facilities can operate with the normal windowing system, with text and graphics freely intermixed. With all these facilities it should be possible to build highly sophisticated graphics applications, although some extra work would be needed to develop graphics printing facilities, which are not included in the Toolbox.

Along with some of the graphics facilities a number of other predi-

cates in the Toolbox are written in C or assembler, and they are supplied not as source code, but in a few 'object' files. Object files can only be used with a Turbo Prolog program if it is first compiled into an object file itself. Following the compilation, all the various object files can then be 'linked' into an executable program, which can then be 'run'. This compilation and linking is the way many programming languages are used. It may sound complicated, but it is actually very easy to do — with Turbo Prolog at least. In Turbo Prolog, information about the files to be linked can be set up in a 'project' file, the 'Compile to EXE' option is specified on the main menu, and thereafter the program can be run at any time, by selecting 'Compile' instead of the usual 'Run'. On the surface, everything is the same as usual, but object and executable files are being created on the disk, behind the scenes.

The graphics demonstration program comprises mainly a huge list of goals, which demonstrate many of the Toolbox's graphics predicates. Let's now examine, working steadily downwards from the 'goal' directive, some of the more interesting of these goals.

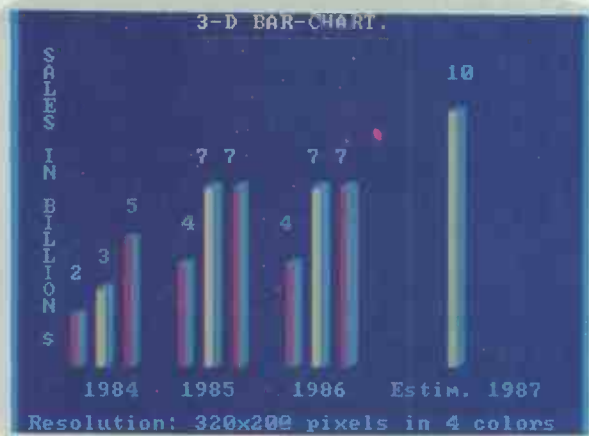
The 'graphics' predicate, used near the top of goals list, is a Turbo Prolog facility, not in the Toolbox. It allows one of five graphics modes to be selected, from 320 to 200 resolution in four colours through to 640 by 350 in three colours (for the EGA card). A variety of different background colours can be selected as well.

The 'gwrite' predicate is used to write text onto the screen, in graphics mode. Position and colour can be specified, and vertical or horizontal writing is possible.

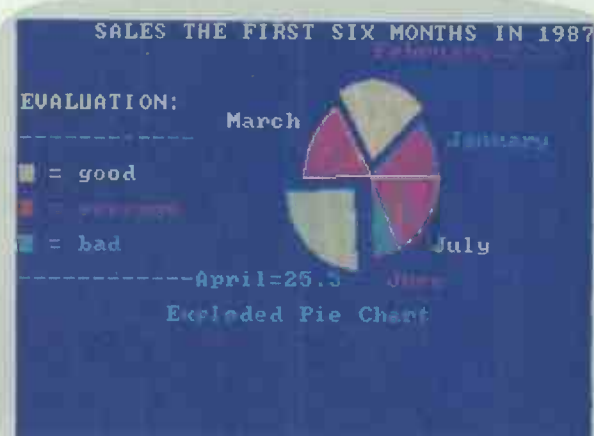
The 'bargraph3D' goal is self-explanatory. The first four arguments specify the amount of space to be left in the four margins of the screen. The next two arguments specify how the three-dimensional bars are to be drawn, and the final argument is a list of 'bar' structures to be drawn. Each 'bar' structure specifies the height of bar to be drawn, its label and colours. The spaces included in the list enable gaps to be introduced between bars.

Following the code to generate the 3D bar graph the mathematical plot code follows, immediately after the comment to that effect. This plot is done in 640 by 200 resolution, black and white only, and the 'graphics' goal sets up this display mode.

The 'defineScale' goal defines the coordinate system to be used in the plot (X values from 0 to 100 and Y values from -100 to 100 in this



The Toolbox's demonstration program shows some of the graphics predicates in action, one of which results in this 3-D bar chart generated by the 'bargraph3D' goal



A slice of pie of negative size indicates that the slice is to be drawn slightly out of the pie — the exploded pie effect. This can be used for emphasis

case). This coordinate system need bear no relation to the actual screen resolution in operation.

The axes are drawn by the 'makeAxes' goal. 'makeAxes' enables a variety of different axis-markings to be specified. The axes are then labelled by the 'axisLabels' goal.

The 'function(0)' goal actually plots the graph. The 'function' predicate is defined at the bottom of the demonstration program, using 'scalePlot' to actually plot the points. It can plot a point with given colour at a given position.

After the mathematical plot, the code for a pie chart follows. Although it is not apparent in the display this is actually drawn in a window. Drawing graphs in windows can be useful for handling multiple graphs onscreen. Each window can be changed and erased independently of the others. This means that it would not be necessary to redraw all the graphs just to erase one of them, for example.

The 'pieChart' goal, in the first three arguments, specifies how big the pie is to be and where it is to be positioned, and to do this virtual screen coordinates are used. Immediately following these arguments is a list of the slices for the pie. In a slice structure the size of each slice is given, along with its label and display colours. The sizes do not all have to total a hundred — the underlying software compensates for this. A negative size is used to indicate that the slice is to be drawn slightly out of the pie — giving the exploded pie effect, and this can be used for emphasising exceptional figures.

Other facilities

The two demonstration programs illustrate the use of no more than a third of the predicates in the Toolbox, but with perhaps another third of the system being simply permutations and variations on the predi-

cates used in these demonstrations. Let's now take a look at the remaining Toolbox offerings.

The Toolbox includes facilities for handling serial communications. With the Toolbox communications tools a Turbo Prolog program could perform file transfers to another computer, or do terminal emulation, or allow connection to a (Hayes-compatible) modem. The predicates work with the PC's serial ports, and are buffered and fully interrupt-driven. The manual takes care to explain how the PC should be connected to the remote device and, as with all the other facilities, gives a number of example programs illustrating how the predicates might be used. It warns that to use the communications facilities effectively, it is necessary to be familiar with communications in general, and the IBM PC communications hardware in particular — but the manual does itself a disservice there as it provides as clear an introduction to PC communications as I have yet seen.

Most PC systems will use one of the standard software packages: for example, Lotus 1-2-3, Ashton-Tate dBase. It is not unusual for an application to need to pick up data from one of these packages' data files, and the Toolbox has facilities for doing this. It can handle Borland Reflex, Lotus 1-2-3 and Symphony, and Ashton-Tate dBase III, working with the 'internal' formats of their files in all cases. Of course, other software packages can also work with these standard file types, so the range of software that can be accessed is rather larger than this.

The 'parser generator', included with the Toolbox, is the sort of facility that only a Prolog Toolbox would offer, essentially because it is a lot more easy to implement in Prolog than it is in any other programming language. The manual makes some extravagant claims about this facility,

not least that it can produce parsers that run almost as fast as the Turbo Prolog system itself (which is very fast).

To do the parser generator full justice would need an article in itself. In brief, it can be supplied with a 'grammar' specifying a programming language, or a command language, for example. This grammar is devised by the application developer. From this grammar, the parser generator can automatically generate a Turbo Prolog program that can recognise and parse statements in the language specified by the grammar. This generated program can be used as a major component in the implementation of a programming language. For a simple language, it would only be necessary to add a small amount of code, to the generated parser, either to execute the resulting parse-tree structure directly (thus producing an 'interpreter' in the application), or alternatively to generate executable code (and this would be a compiler).

Conclusion

It is clear, from the type of facilities in the Toolbox, that Borland expects Turbo Prolog to be used as a serious application development tool. Turbo Prolog already offers the sort of run-time performance that quality applications need, and the Toolbox fills an important gap with its extensive range of well-designed application utilities.

At the price, any Turbo Prolog application developer would be mad not to use the Toolbox. Even if only three or four of the predicates were used it would easily pay for itself in time saved. But, in practice, it is likely that most developers will be seduced into using a considerable number of the facilities.

Turbo Prolog Toolbox costs £69.95 and is available from Borland International on (01) 258 3797.

END

CP/M makes progress

The CP/M operating system has acquired a bad name for itself and, despite being the 'backbone' of the successful Amstrad machines, it is finding it hard to shake off its old 'unfriendly' tag. Mike James looks at how the operating system has improved in the shape of CP/M Plus.

CP/M is part of the micro pioneering folk memory — it was unfriendly, inflexible and often didn't work. It frustrated so many people and made so many enemies that the name CP/M is still a swear word in some circles. What they don't seem to know is that things changed with CP/M version 3, or CP/M Plus — a mature version of CP/M, just right for small systems. The reason that they don't seem to know is that CP/M Plus appeared just as everyone was changing to IBM PCs and MS-DOS!

But now, rising from the grave courtesy of the Amstrad CPC and PCW range, CP/M Plus has a new generation of users who can't understand why the old timers spit at every mention of CP/M! Some of the bad comments that the PCW, for example, has attracted have been due to the stigma of having CP/M as an operating system. In fact I know of one ex-PCW owner who changed to a PC solely on the advice that MS-DOS was a better operating system than that 'primitive' CP/M! If you are still handing out such advice, are a little ashamed of liking CP/M or just unaware of what CP/M Plus can do, then read on.

A short history

CP/M (Control Program for Micro-processors) was the first commonly used Disk Operating System (DOS) for the 8080 and Z80 range of machines — which in those early days was practically all there was apart from a few eccentrics like the Apple II and the Pet. Version 1 of CP/M was incredibly primitive by today's standards and it was quite difficult, some say impossible, to write any decent commercial software to run under it.

Version 2.2 was the first to be of any real use to anyone. From the programmer's point of view it was a lot better — you could have larger files and it supported random access. From the user's point of view it was still a frightening piece of software. The worst thing about it was the quality of its error messages, and many will remember the infamous "BDOS ERR ON A: BAD SECTOR" message which could mean anything from a total disk crash to just forgetting to close the disk drive door!

So many people felt that CP/M 2 wasn't good enough that they produced their own improvements and upgrades and many of these ideas were incorporated in CP/M 3, or CP/M Plus as it is usually known. CP/M Plus is a considerable revision

and almost deserves a completely new name to distance it from the bad press of both of the earlier versions.

Although there are plenty of machines still using CP/M 2 (and very few using version 1) the most successful CP/M-based machines on sale today — that is the Amstrad CPC and PCW range — use CP/M Plus. If you are in the position of using a machine with CP/M 2 and want to upgrade to Plus, then you will have to get in touch with your machine's manufacturer to see if they have a suitable version.

A first impression

When you sit down in front of Plus it looks exactly like any other version of CP/M — with the familiar A> prompt waiting for you to type a command. The first hint that anything is different is the increased speed of disk operations. CP/M used to be known as a snail among operating systems but Plus has improved performance between 2–10 times by using some very sophisticated techniques. Another change that affects disk files, but few users, is that a single file can now be as large as 32Mbytes as opposed to an 8Mbyte limit under CP/M!

A more practical change concerns

Banking on memory

There are two ways of using CP/M Plus — banked and non-banked memory. Memory banking is a standard way of getting around the 64k memory limit imposed by all the common eight-bit processors.

Essentially all that happens is that there are a number of alternative 64k banks or blocks of memory but the machine can only access one of them at a time. Changing from one bank to another is called 'bank switching' and this is usually where all the difficulties and complications arise. You obviously cannot treat a set of memory banks as if they were a single large area of memory because only one is accessible at any given time. To allow communication between different banks it is usual for one area of memory to be shared: that is, when you change your banks one 'non-banked' area of memory stays put.

Some applications programs tried to take advantage of banked memory but the number of different hardware schemes used by different manufacturers and any lack of standards severely hampered such developments. CP/M Plus has managed to provide a way around this problem by providing a standard interface to all the non-standard hardware. A banked version of Plus can be seen in Fig 1 and you can see immediately that the main payoff is that the TPA can be as large as 60k. You can have as many as 16 banks but a minimum banked system only needs bank 0 for the operating system and bank 1 for application programs. The best-known examples of banked systems are the Amstrad CPC6128 which has two banks, the PCW 8256 which has four and the PCW 8512 which has eight. Although in theory banks two, three, and so on, could be used by application programs their most common use is to provide a RAM disk.

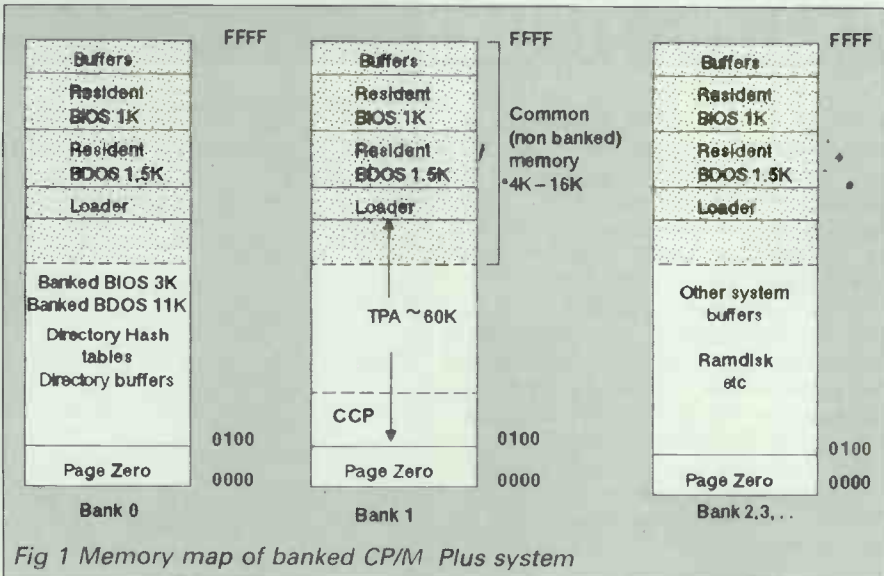


Fig 1 Memory map of banked CP/M Plus system

'disk logging'. This is CP/M's jargon for what happens when you change disks. Version 2 could get into a mess if you changed disks without telling it to re-log the drive (by pressing CTRL-C, also called a 'warm boot'). The biggest danger was losing your work because CP/M marked a drive as R/O (Read/Only) in an attempt to defend the innocent disk that you had failed to log on. Plus has improved this situation by logging a disk each time its directory is read. You can still screw up the system by changing a disk while a file is in use but then most operating systems find this a difficult situation!

Passwords and time and date stamping

The whole area of file-handling has been improved by the provision of password protection and time and date stamping. Password protection is only available in the banked version of CP/M Plus, but this includes a great many cases. You can set a password for any file and also specify for what operations that password has to be supplied.

For example:

```
SET [PROTECT=ON]
```

```
turn password protection on
SET MYFILE [PROTECT=READ]
specify that a password is
required to read the MYFILE
```

```
SET MYFILE
```

```
[PASSWORD=ELIFYM]
```

```
set the password to ELIFYM
```

and from this point on each time you want to read MYFILE you will have to include its password as in

```
TYPE MYFILE;ELIFYM
```

You can password protect a file at three levels: reading, writing and deleting. You can also password protect an entire disk and set a default password so that you don't have to keep on typing it after every file name. If you forget the password to the entire disk, then you will have a lot of trouble getting access to your files — so don't do it!

Date and time stamping allow you

to keep track of which version of a file you are looking at. You can enable date and time stamping for when the file is updated — that is actually changed and either for when it is accessed or created.

For example, following

```
SET [CREATE=ON]
```

```
SET [UPDATE=ON]
```

all files will be saved along with their time and date of creation and last update. Before you can start time and date stamping you have to initialise the directory using INITDIR, but Amstrad users be warned that this command makes a disk unusable with Locoscript or AMSDOS. You can see the time and date information on each file using the extended form of the DIR command

```
DIR [FULL]
```

To make date and time stamping possible CP/M Plus has to admit that a modern system might just have a built-in hardware clock. CP/M 2 ignored this possibility and left it to individual machine manufacturers to solve the problem of integrating unnecessary extras such as clocks! CP/M Plus, on the other hand, makes it easy to include a full date and time clock and it provides an extra command DATE to allow the user to set and examine the current setting.

To complete the file protection and general file utilities CP/M Plus supports the original CP/M file attributes of RO (Read Only), SYS (SYStem), DIR (DIRectory) and R/W (Read/Write) and extends it to include an archive and four user-defined attributes. The old attributes are handled better in that new easy-to-use commands are provided to make use of them. For example, SET MYFILE[RO] makes MYFILE Read-Only and DIRSYS displays any system files that are on disk.

Another useful change is that system files in user area 0 can be executed from any user area. This clearly saves having to make a copy of a program for each user. The archive attribute is set whenever a file is

created or changed. You can use the PIP command to copy only files with the archive attribute set and as they are copied PIP resets the attribute. You should be able to see that this gives you an ideal way of keeping your files backed up without copying unnecessary files.

Devices

I/O redirection is usually something that only advanced operating systems offer but CP/M Plus has it. In fact Plus's ability to control I/O devices in general is rather good once you have managed to untangle the idea of logical and physical devices. A physical device is a real piece of hardware that is connected to your machine. A logical device, on the other hand, is a description of the purpose that a physical device can be put to. For example, CONIN is a logical device that is used for system input. This is normally assigned to the physical device that corresponds to the keyboard but you can assign it to another physical device if you want to. There are five logical devices in every CP/M Plus system —

CONIN: the console input

CONOUT: the console output

AUXIN: an auxiliary input

AUXOUT: an auxiliary output

and

LST: the printer output

The physical devices that are available vary from system to system. To find out what they are in any given case all you have to do is type DEVICE [NAMES]. If you just type DEVICE you will see a list of their current applications. You can change any of these assignments using

```
DEVICE logical device=physical device
```

For example, on the Amstrad machines the serial port is physical device SIO, so to send all future printer output to the serial port you would type:

```
DEVICE LST:=SIO
```

As an extension of this idea of using different I/O devices you can also replace the input normally provided by the keyboard by a disk file and then send the output that normally goes to the screen or printer to a disk file. Following the command

```
GET CONSOLE INPUT FROM FILE AUTO
```

the contents of file AUTO would be read in and treated as if it had been typed at the keyboard. This sort of thing has an obvious use in running your machine automatically — but more of this idea later. Following the command

```
PUT CONSOLE OUTPUT TO FILE LOG
```

all of the output that would appear on the screen is stored in the file LOG. A similar command can be used to redirect printer output. This is obviously useful for capturing the output of programs for further pro-

OPERATING SYSTEMS

cessing by, say, a word processor.

The subject of automatic running of your machine using the GET command was briefly mentioned above but there is a much more sophisticated method based on the use of the SUBMIT command. If you type SUBMIT filename, then the file that you have specified (with the default extension .SUB) will be read by CP/M Plus as a set of commands typed at the keyboard. So far this is nothing new on GET and CP/M 2 for that matter. But CP/M Plus will also accept the name of .SUB as an instruction to use the SUBMIT command to run it. For example, you can type SUBMIT DOJOB or just DOJOB and, as long as there is a file called DOJOB.SUB on the disk, both will work. This means that you can almost create new commands. You can also alter the order in which CP/M Plus looks for such commands. Normally if you type BASIC, CP/M Plus will go and look first for a file called BASIC.COM and load and run it, but if you type SETDEF [ORDER=(SUB,COM)] it will look for the file BASIC.SUB first. This means that you can replace existing commands with more suitable submit files. The SETDEF command can also be used to define which disk drives will be searched for commands and in what order.

Another auto-run feature of CP/M Plus is PROFILE.SUB. If this file is present on disk when CP/M Plus is first started it will be read and obeyed as a standard submit file. Using this you can arrange for your machine to be set up just as you want before you begin using it. For example, if the PROFILE.SUB file contained the single line BASIC you would find yourself in Basic each time you started the system.

Non-resident residents

One of the best features of CP/M 2 was its provision of resident or built-in commands such as DIR. A resident command is really just a program that is already loaded into memory ready to run, so it will come as no surprise to discover that non-resident commands are programs that are stored on disk and have to be loaded before they can be run!

The advantage of resident commands is that they are faster but they are also more limited. CP/M Plus has kept the best of both worlds by introducing a set of commands which have the commonly used options resident and the less common non-resident.

This has enabled the original version 2 commands to be extended without slowing everything down. For example, when you type DIR you are using a resident command and a

directory appears at once, but if you type DIR [FULL] CP/M Plus loads a non-resident command file DIR.COM and then proceeds to give you full details complete with file sizes, attributes and time and date stamps. All of the familiar CP/M 2 commands have either been extended in this way or completely replaced by more logical commands — see the table. For example, the old STAT command has gone and its functions have been replaced by options in DIR and new commands SHOW and SETDEF.

All-in-all the commands provided are more logical and more flexible. Perhaps the only exception to this is the infamous PIP (Peripheral Interchange Program). Once you get to know PIP you'll like it for its flexibility but until you know it you wonder why a simple COPY command couldn't have been provided.

Errors

A disk error is never a very nice thing to have but at least CP/M Plus has managed to do away with the appalling error messages that frightened most users as soon as they appeared — or rather the Amstrad implementations have. Now you are gently warned something along the lines of "track 3, sector 5 data error — Retry, Ignore or Cancel". To which you can answer 'R' if you think that the fault can be put right, 'I' if you think it doesn't matter (it usually does) or 'C' if you want to give up!

Unfortunately this nice error-handling isn't part of CP/M Plus, it's something that Amstrad has added. Other versions of CP/M Plus have a much improved and larger set of error messages than CP/M 2's but you can still come across messages such as "CP/M Error on A: Disk I/O BDOS Function = 15 File=MYFILE" which is more informative but not really friendly!

HELP commands

You might be a little irritated by the way the Amstrad PCW or CPC use the unhelpful phrase: 'These options/commands are not described here.' You can obtain more information by using the CP/M Plus utility HELP.

Conclusion

There are many more good features of CP/M Plus that I haven't had the space to go into in this article but I hope that you are beginning to see that CP/M Plus isn't the half-thought-out operating system that CP/M 2 resembled. Although still not ideal it is a good operating system for eight-bit machines and it makes excellent use of their cheap and cheerful technology. CP/M Plus is a response to many years of user criticism; it was late but not too late!

END

CP/M Plus commands

DATE	Sets or displays date and time
DIR	Directory listing but now with many extra options
DIRSYS	Directory of system files only
DEVICE	Assigns logical to physical devices and sets device characteristics
ERASE	Now includes a CONFIRM option that will prompt for verification before deleting a file
GET	Gets console input from a file
HELP	Displays information on CP/M Plus commands
INITDIR	Initialises a directory for date and time stamping
PUT	Puts printer or console output to a disk file
SET	Sets file operations including disk labels, file attributes, type of time and date stamping and password protection
SETDEF	Sets system options including drive and file search order
SHOW	Displays disk and drive information
TYPE	Lists a file and pauses after each page

There are also a number of advanced commands that form an assembly language development system

LIB	Library manager
LINK	Linker for modules produced by RMAC
MAC	Macro assembler
RMAC	Relocatable macro assembler
SID	Symbolic debugger
XREF	Cross referencer

BDOS calls

41	Test and write record (for MP/M compatibility)
42	Lock record (for MP/M compatibility)
43	Unlock record (for MP/M compatibility)
44	Set multi-sector count
45	Set BDOS error-handling mode
46	Get free disk space
47	Chain to program
48	Flush buffers
49	Get/Set system control block
50	Direct BIOS call
59	Load overlay
60	Call RSX
98	Free temporarily allocated blocks
99	Truncate file
100	Set directory label
101	Return directory label
102	Read date and time stamps and password mode
103	Write XFCB
104	Set date and time
105	Get date and time
106	Set default password
107	Return serial number
108	Get/Set program return (error) code
109	Get/Set console mode
110	Get/Set output delimiter
111	Print block (character string)
112	List block (character string)
152	Parse filename



A Minstrel 4 eight-user package – £15,465 complete INCLUDING LASER PRINTER

We've built a proven reputation as leading Specialists in multi-user networking. Each Minstrel computer provides performance and flexibility for 2 to 16 users operating their own individual processors.

- From 2 to 4080 Simultaneous users (up to 16 per machine)
- From 0 to 4080 printers (up to 16 per machine)
- Up to 147,900,000,000 characters of on-line storage (580Mb per machine)
- Network in up to 254 IBM PCs of any description.

Currently, we're offering an eight user Minstrel

system with integral tape back up, a laser printer and a Minstrel office automation Softpack. All for £15,465 excluding VAT. 145Mb formatted capacity Winchester Disk Drive is £3,725 extra. Each additional 2 users are £2190 complete.

Additional high performance software for accounting, point of sale, hospital administration, databases and many other applications are also available.

For further information simply call us or send the coupon below.

HM Systems plc

HM Systems plc,
220 The Vale, London NW11 8HZ.
Telephone: 01-209 0911.
Telex: 266828-HMSG

Please send me full details on Minstrel multi-processor systems.

Name

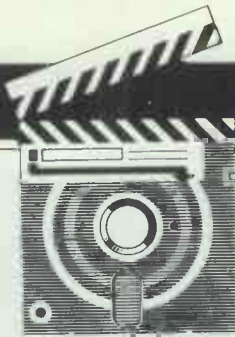
Title

Company

Address

Phone

NEW MINSTREL 4 E.P. OUT NEXT MONTH .. FASTER AND BETTER!



SCREENTEST

WordStar 4

With more powerful and 'friendlier' word-processing packages appearing on the market, it's hard to believe that WordStar — with its complex command structure — retains a huge following. Owen Lindholm looks at MicroPro's latest update of this old favourite.

In these days of WIMP systems, when even IBM has decided to standardise on a windowing system, it is strange for a manufacturer to continue to provide a piece of software that is regarded as the typical example of user-unfriendliness. The program I'm referring to is, of course, WordStar, the old friend of many micro experts and the bugbear of many novices. Nevertheless, WordStar is arguably the most used program in the world; and although it hasn't sold as many copies as other programs, it is the most widely pirated program. Estimates and sur-

veys reveal that three times as many copies have been pirated as sold.

The reason why MicroPro, the company behind WordStar, continues to provide new versions, is to get more unregistered users to pay for the program; later versions of the program have been less copied because of additions like licence numbers. Also, the later versions of the program have all been considerably enhanced both in terms of power and speed.

One additional thorn in the side of MicroPro was a company called NewStar, set up in the US by ex-

MicroPro employees. That company re-wrote WordStar to be quicker and more powerful, and sold the program as NewWord at a much lower price than WordStar. NewWord is similar to WordStar but it has an extended range of commands and facilities and operates significantly faster. MicroPro recently purchased the company and its last product, NewWord 3 (reviewed in PCW, July 1986).

I have used WordStar for five years in various forms, ranging from WordStar 2 to NewWord 3, the immediate precursor of the subject of this review. WordStar Professional version 4 is essentially NewWord 3 with some additions and cosmetic changes, and the similarities are obvious with WordStar 4 looking more like NewWord 3 than WordStar 3. The most major change is the addition of a 220,000-word thesaurus program. This is the Word Finder thesaurus, available separately from Microlytics, and which comes bundled in. Some major improvements have also been made to the spelling-checker and to the more powerful commands.

Until recently, WordStar was the established market leader in word-processing. Newer programs are now jostling it and, indeed, overtaking it with programs such as Microsoft Word 3 and Word Perfect providing a huge range of features for the 'power' word-processor user. Nevertheless, many people want one important feature that such programs lack — WordStar-compatibility.

The big advantage WordStar has over other word-processing programs is that many users are already familiar with its complex command

WordStar command structure

Like many other programs, WordStar is controlled by a set of nested menus. The opening menu lets you edit, print, index, quit, and perform file operations like copying; obviously the major selection is editing. This prompts you for a file name and opens the file for editing. While editing, a series of menus are available from the main editing menu.

At this point, you can enter text and the preset options for WordStar will control how the text is stored, displayed and how basic movement, insertion and deletion commands work. Five other menus are available from this one to cover onscreen formats and display; saving, block operations and file operations; printer controls; quick cursor movements and miscellaneous operations; and shorthand macros.

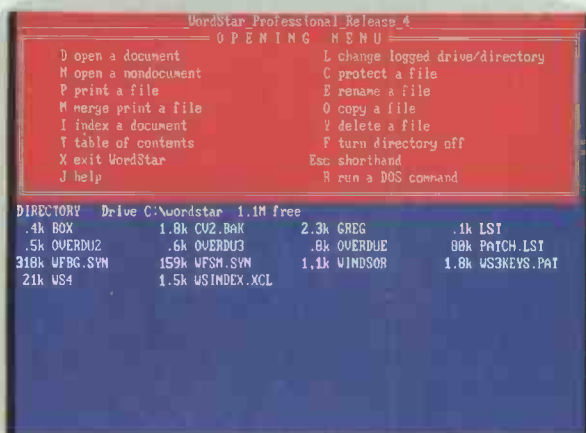
To give some idea of how the commands work in practice and why they are often regarded as clumsy, here is a summary of what I need to do to create a short document of four paragraphs; say, for the picture captions to this article.

First, hit 'D' from the main menu to edit a document. Then enter a file name. The program moves to the editing screen. Here I need to enter CTRL-O, 'S', '2' and hit Return to let WordStar know that I want double line-spacing. I now need to enter a header line so that anyone looking at this document will know what I'm writing about. The header line goes at the top of the document. Here it is in full:

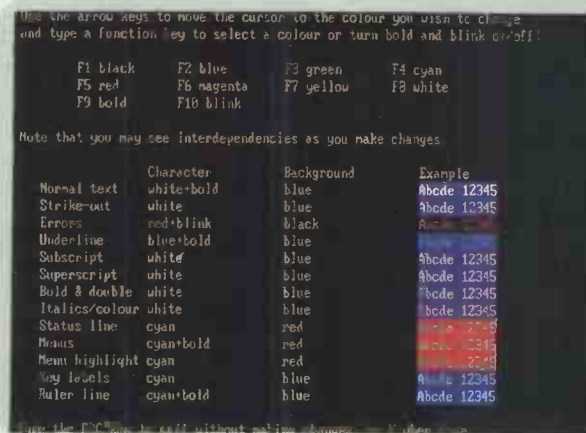
'he picture captions/Owen Linderholm/July 87/#'

The '#' symbol is to let the program know I want a page number there. I'm ready to start now, so I move down a few lines by hitting Return. I enter my text and correct it until I am satisfied. Deletions involve ordinary backspacing or CTRL-G when the cursor is on the character to be deleted. Moving chunks of text around involves marking them with CTRL-K, 'B' at the start of the block and then CTRL-K, 'K' at the end. Then move the cursor to where you want to go and type CTRL-K, 'V' to move the block.

To finish and print out the document, hit CTRL-K, 'D' to save and exit the editing mode, then 'P' followed by ESC prints the document. Hardly intuitive and straightforward.



The WordStar Professional 4 opening menu installed for an unusual colour preference. Notice the display of file sizes and free disk space. Menus and new options are available from this opening menu



Using WSCHANGE to install WordStar is very easy. This screenshot shows how to set up display attributes and colours for all the different layout possibilities and character attributes

structure and, therefore, are reluctant to learn a new set of commands. Although WordStar has fallen behind the times, it is still a good program; it does its job well, and it is extremely robust.

Installation

The program comes in a smart maroon box holding a large packet of disks, registration forms, a licence agreement, a command summary card, printer information, the *Word Finder* manual and a leaflet describing what's new in WordStar Professional 4 (from now on known as WordStar 4) besides the main program manual. The disks are: two for Word Finder, an installation disk, the program disk and the dictionary and the tutorial disks.

The installation instructions are thorough, to say the least. They give you all the important information first so that you are unlikely to make a mistake, although it does take a while to sort out what to do next. There are two levels of configuration for WordStar 4, just like NewWord 3. The first, enough to get you going, is to run a program called WINSTALL. This sets up WordStar 4 to work properly with your computer and printer. The second level, WSCHANGE, lets you change colours, screen formats, operation and other things relevant to the program.

One of the nicest aspects of the way the documentation and manual have been written is that novice users are separated from those who already know the program and who only need to learn the new commands and features. This means that you can dip into the manual at your specific level of familiarity.

The WSCHANGE program gives access to practically every feature of WordStar 4 and lets you configure it exactly to your requirements; system variable values for the program can

even be changed. This means that you can use the program with displays other than the usual 25-line by 80-column format. I tried it with EGA's 43-line mode and it worked perfectly. WSCHANGE also lets you set up the cursor keys, create printer driver libraries, decide how much memory the program and dictionaries should take up, choose a page layout and more besides.

New commands

The range of options available in WordStar 4 is impressive. It is hard to imagine a useful word-processing operation that is not available, although many people do expect esoteric functions from word-processors that cannot yet be provided. That said, several features are missing from WordStar which are now becoming standard among powerful word-processing packages. These include: footnotes, column-based editing, 'outlining', interfacing with desktop publishing and the ability to edit several documents at once.

One of the major changes in WordStar 4 is the facility to 'unerase' the most recently deleted portion of text. The amount of text that can be undeleted is effectively limited by the amount of spare memory you have, but to make full use of the option, you will need to use WSCHANGE to alter the size of the unerase buffer.

Another significant change is the addition of the shorthand menu which is accessed by the ESC key. This brings up a secondary menu of keys and associated commands that you can alter and add to at will. Any combination of WordStar commands can be allocated to a single key, so you could set up ESC-S to swap the current word with the previous word (CTRL-T, CTRL-A, space, CTRL-S, CTRL-S, CTRL-U). Note that this only works if the cursor is at the start of the word.

One of the major omissions in previous versions of WordStar was the inability to access files in other directories or subdirectories. This has now been rectified and it is easy to access all files on all disks in a simple and logical way.

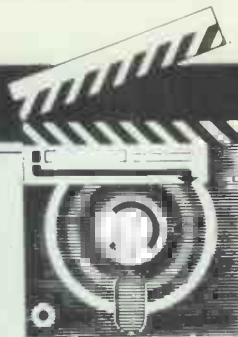
WordStar 4 supports mathematical commands within the word processor, including the ability to add up numbers within a marked block. You can also run other programs from within WordStar 4 now as long as there is room for them within memory.

The function keys can also have a combination of WordStar commands assigned to them and the bottom two lines of the display can be set up to display what the function keys do. This means that you can customise WordStar for your own purposes so that frequently used commands can be accessed by a single keystroke.

WordStar 4 is only available on IBM and compatibles. As a result, some ability to access IBM-character graphics has been added so that users can display and print the IBM 'box-drawing' characters.

The spelling-checker on this version has been considerably improved and is the best I have come across by a large margin. This one not only allows you to add words to a personal dictionary — as do most spelling-checkers — but also 'temporarily' remembers them. For example, if you haven't bothered to tell the dictionary that 'PCW' is a word you often use, then when the spelling-checker finds it, it will query it and bring up a list of suggested alternatives (none in this case). However, if you tell it to skip on to the next spelling mistake, then WordStar will assume that PCW is a real word within the document and all further references to it will be ignored.

Even more impressive, if you mistook the name 'PCW' and typed



SCREENTEST

'PCQ' instead throughout the document, you would get a query. When you enter the replacement, 'PCW', it is automatically replaced; and whenever the spelling-checker encounters 'PCQ' within the document, 'PCW' will be given first in the list of potential correct spellings. In other words, as it checks a document, WordStar temporarily adds words to the dictionary and links new words in as possible corrections. It is also possible to tell the spelling-checker to leave a word alone just once, but to query it when it reappears — useful for unusual words that are like misspellings. This is all on top of a list of 87,000 words which have all been properly anglicised. It is a great relief not to have all my 'ise's' queried with 'ize's' suggested as alternatives (as is the case with American spelling-checkers).

Another simple but useful touch is the addition of file-sizes to the opening menu and the file directory. You are also told how much space is left on the disk. No more worries about whether the file will fit on the disk!

It is possible to display 'soft spaces' on the display as dots. These are the 'imaginary' spaces that the word processor inserts to pad out a line to justify it. Another minor change is that the DEL key on the IBM keyboard now deletes the character at the cursor position rather than the one preceding it in line with usual MS-DOS practice.

The embedded 'dot-commands', which are instructions to the printer when the file is being printed, have been considerably extended in scope. IF... THEN constructions can be used and a much wider range of options is included. These include the addition of sheet-feeder controls, extra merge-printing commands, variable formatting and some new standard variables.

A new option from the opening menu, '?', displays how much memory is being used by WordStar. Background printing is now fully supported and allows more flexible control of printing while still editing.

'WordStar Professional version 4 is essentially NewWord 3 with some additions and cosmetic changes, and the similarities are obvious ...'

Additions to the 'Quick' menu options include the ability to move to the next occurrence of a specified character and to delete up to the next occurrence of a character.

There are some new printing commands, too. The major changes are in the addition of the WSCHANGE program for complete, in-depth customisation and in the addition of a wide range of printer drivers, especially for laser printers.

Word Finder

Word Finder is a RAM-resident thesaurus program that has been available for several years. As mentioned above, the WordStar version of it is bundled with WordStar 4. The prog-

ram has not been changed for use with WordStar since no changes were needed. Operating it is simple; simply press ALT-1 when the cursor is on the word you need to find a synonym for. The thesaurus itself is extensive, containing 220,000 words. Any alternative word can itself be looked up, so that a chain of possibilities can be created.

Once you have found a word, it can be easily replaced. The only problem with Word Finder is that it cannot produce synonyms for phrases, only single words. As a quick example of Word Finder's power, here are some of the first set of synonyms for 'power' (the program produced 88 words in all): current, electricity, administration, forces, authority, clout, pull, weight, tumult, mastery...

Installation of Word Finder is a bit more complicated. You have to fill in an electronic name and address form to be issued with a licence number. However, following the instructions is not difficult and it would be impossible to make an unrecoverable error.

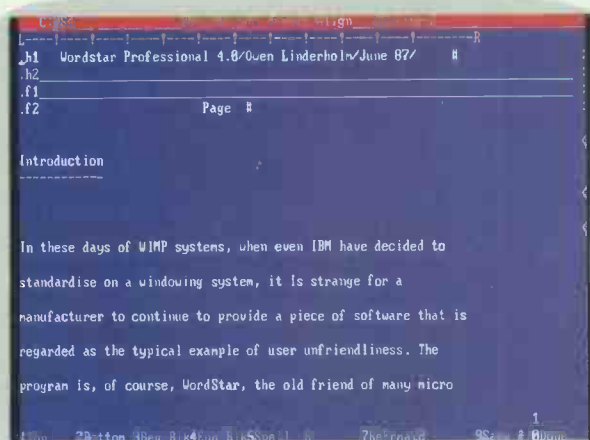
The disadvantage of using Word Finder is that it uses up some extra memory, and you will need at least 360k to use it with WordStar 4. If you want to keep the WordStar spelling-correction dictionary in memory (much faster), then you will need a bit more memory.

One problem to be aware of is that memory-resident programs like Word Finder stay in memory, so if you leave WordStar 4 to run another application, you may need to remove Word Finder from memory in order to leave room for the new application.

WordStar 4 comes with a tutorial program that is a bit 'simple and twee' but does serve its purpose. The object of this program is to reassure novice users that computers are nothing to be scared of and to introduce them gently to the basics of using WordStar.

In use

I consider myself a long-term user of WordStar and NewWord and had no difficulty at all getting to grips with WordStar 4. At first I thought it provided a rather sluggish response compared with NewWord 3, but after I had started customising it with WSCHANGE, I realised that I had reduced the forced delays in NewWord 3. The same option is available in WordStar 4, so I changed the delays to a shorter interval. Immediately, WordStar 4 had the fast keyboard response I was used to. It should be pointed out that WordStar 4 is about twice as fast as WordStar 3 — a very



This is the standard editing screen in WordStar. No menu commands are visible because the program has been configured for an experienced user. Inexperienced users can force menus to be displayed at all times. The main uses to which the function keys have been set are displayed at the bottom of the screen

YOU ASKED FOR IT - ISIS-200 XT TURBO

You asked for quality, high spec, great display, fast maintenance, wide compatibility and looks to enhance your office environment.



ISIS-200 specifications are:

IBM-XT* compatible
4.77mhz/8mhz switchable
NEC V20 processor
512k RAM expandable to 640k on-board
Hercules-compatible mono graphics

Centronics Port
Asynchronous Comms port (RS232)
Battery-backed Clock/Calendar Card
101 key keyboard

12 inch amber screen monitor
on tilt and swivel stand
1 or 2 360k branded Japanese drives
20mb NEC hard disk drive (optional)

Quality components cost a little more, but you save it on the warranty and reduced down-time. Each unit includes a free 12 month on-site maintenance agreement with Datafax Ltd of Basingstoke*, renewable on expiry. Datafax gave us a great price after they had inspected the machine.

Price includes delivery and 12 months repair service at your premises within 24 hours. Available ex-stock.

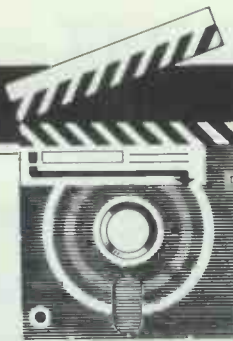
PRICES:	ISIS-200 with Single 360k floppy drive	£549.00
(Ex VAT)	ISIS-200 with Dual 360k floppy drives	£619.00
	ISIS-200 with Single floppy and 20mb Hard disk	£919.00
	Microsoft MS-DOS v.3.20. and GW Basic	£ 50.00

Payment by Access, Visa or Cash with Order. 14 day credit to PLCs, Government and companies listed in Dun & Bradstreet's "Britain's Top 20000."



Call or write: ELR INTERNATIONAL LTD, ISIS House, 2 Walnut Tree Park, Guildford, Surrey GU1 4TR.
Tel: (5 lines) 0483 505605 Telex: 859428 ELRINT Fax: 0483 33503

*On-site warranty available Midlands and South England only at present. *IBM and XT are registered trade marks of International Business Machines Inc.



SCREENTEST

significant improvement.

The other most important part of word-processor installation turned out to be very easy. This is, of course, installing the program to work with your printer. WordStar 4 had an Epson LQ-1500 printer driver available and it worked immediately. This is very important since three of us share the same printer in the PCW office, so I was not able to alter the DIP switches. The biggest problem was finding the correct printer name from the huge range of 65 drivers available.

It is also easy to alter the colours and screen display of WordStar 4 to suit your requirements. I use a combination of pink text (highlighted red), a black background, and light blue for function key labels and ruler information lines. We have diffused fluorescent lighting in our office, and I find these colours on the screen make the text easier to read.

I only had one major problem with WordStar 4: I couldn't get the indexing or table of contents to work. However, after various attempts at reconfiguring the program, it still didn't work. Eventually I tried re-installing the program, with success. Mysterious gremlins like this are very frustrating, but since it was possible to fix it without damage, it can't be too serious a bug.

One other minor problem with NewWord 3 that has successfully transferred to WordStar 4 is that under certain conditions — when the display hasn't been fully installed — odd page-breaks can appear in the middle of your text. They aren't really there since when the screen is redrawn because of moving, they disappear. However, you might start deleting things if you thought the page breaks were real.

I am sticking with WordStar for the moment, but I can't help feeling that the day will come when I switch to some other word processor; the attractions of WIMP systems are alluring and the arrival of desktop publishing are both strong indications that the time for change is coming.

Documentation

The manual accompanying WordStar 4 is an updated version of the old one. It is clear and comprehensive and there is a good index covering all the features. Diagrams are scattered through the text, especially in the tutorial section, and there are even a few cartoons.

As computer manuals go it is both easy to read and to understand. It could, however, be a bit more lucid in the section dealing with customisation, and the section on hints

and tips for WordStar could definitely be enlarged. WordStar users, continually struggling against the unfriendliness of the program, are always on the look-out for tips to make their lives move bearable.

Conclusion

WordStar 4 is a worthy improvement on previous versions. The one area where the program could do with a complete overhaul is in the area of user-friendliness and user-interface. Unfortunately, this is the one area where MicroPro cannot improve the program. Whatever happens, it is unlikely that the WordStar command structure will change.

MicroPro will have to watch out, since its dominant position in the

word-processing market is slowly being eroded by users switching to friendlier or more powerful programs. The other area where MicroPro is losing out is in that of new users. Since they don't have to 'unlearn' their conditioned WordStar responses, such users will have no inhibitions or qualms about trying other programs.

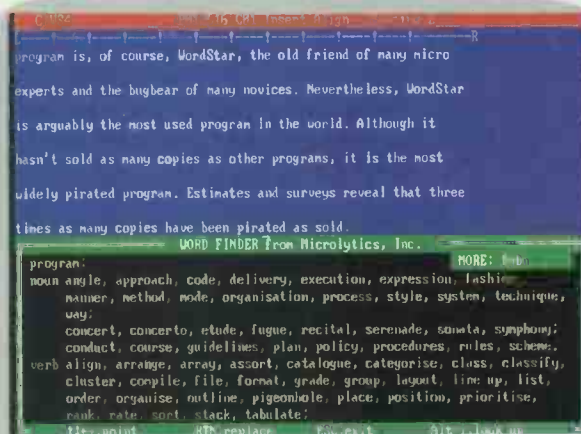
WordStar 4 is also rather on the expensive side; although its pricing is in line with other major word-processing programs, it seems a bit expensive for a program that is essentially several years old. Bear in mind that NewWord 3, the program on which WordStar 4 is based, is considerably cheaper.

WordStar 4 is a very useful upgrade for WordStar fans who *cannot* or *will not* switch. It provides a wide range of new features while maintaining WordStar's standards. If WordStar compatibility is high on your list of desirable attributes, then WordStar Professional 4 should fit the bill nicely.

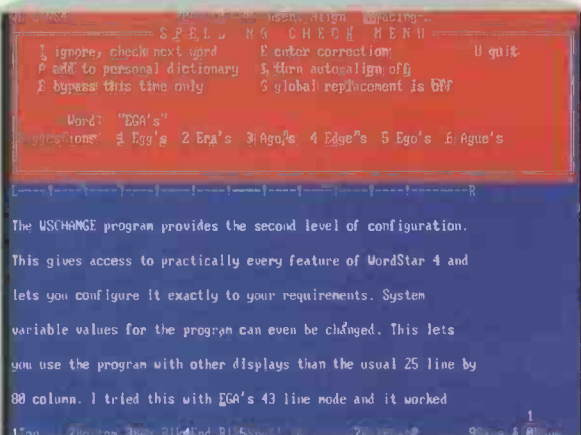
WordStar Professional 4 costs £399 and is available from dealers. MicroPro can be contacted on (01) 879 1122

END

This screen shows WordFinder, the memory-resident, pop-up thesaurus program provided with WordStar 4. When you hit ALT-1, the window pops up displaying alternatives for the word at the cursor position. WordFinder can nest words it looks up, so any word appearing in the pop-up window can itself be looked up



The internal spelling-checker in operation. The spelling-checker scans through the document finding words it does not recognise. Whenever one is found, a menu of options and suggested alternatives appears. The scanning process is visible and can easily be interrupted



ADVICE-LINE

07357-4466 for PRINTERS GALORE!

**LOW, LOW PRICES but with
FULL BACK-UP SERVICE**

Call our Engineers for advice on printer selection.

OKI MICROLINE PRINTER SPECIALISTS

Superb range of dual mode printers, speeds of 100 cps NLQ and 400 cps draft. Competitive performance and features with unique Print Menu giving user friendly operation. PC Compatibility. Call for engineering advice. Competitive prices to match any competition. DEALER ENQUIRIES WELCOME.



CALL
FOR PRINT
SAMPLES

MICROLINE
OFFICIAL
APPOINTED
DISTRIBUTOR

£1895
£2995
£86
om £179
8 £1995
£POA

BROTHER PRINTERS

As Brother Master Dealers we recommend these Daisywheel Printers for office or home use. Sheet feeders available for simple word-processing application.

EPSON PRINTERS

All models of Epson Matrix printers at reasonable prices. We are always pleased to help with selection of the most suitable model to suit your application and budget.

JUKI PRINTERS

Excellent value for money printer range - see our Discount panel for the best prices around. Speeds from 20 to 60 cps.



OKI LASERLINE 6

NOW
LASER JET PLUS COMPATIBLE AT £1895 + VAT
An ultra quiet compact H.P. compatible laser printer. Low noise, long life and a wide range of emulations. Large capacity input and output stackers. Face down output stacking. High reliability. TRADE ENQUIRIES WELCOME

OTHER LEADING PRINTERS



● CENTRONICS ● NEC
● STAR ● TOSHIBA

DEALER ENQUIRIES WELCOME.

LASER PRINTERS

PERFECT FOR LOW COST DESK TOP PUBLISHING

Many models are available. H.P. Canon, Centronics, OKI etc. We can advise on the Laser for your particular requirements.

Fleet Street Editor Software £130.00

ACOUSTIC HOODS

High quality wood or metal.

AMSTRAD Appointed Dealer

AMSTRAD 1512 Sgile Disc Mono £449
AMSTRAD 1512 Dual Disc Mono £659
AMSTRAD 1512 Sgile Disc Col. £619
AMSTRAD 1512 Dual Disc Col. £729
AMSTRAD 8256 Sgile Disc + Ptr £399
AMSTRAD 8512 Dual Disc + Ptr £499
10m, 20m etc.

SPECIAL SUMMER PACKAGE

● P.C. 1512 Dual disk mono
● D.M.P. 3000 PRINTER
● SUPERCALC 3 Spreadsheet
● WORDSTAR 1512 WORD-PROCESSING
ONLY £699 + VAT.

SOFTWARE

WORDSTAR 1512 £59
SUPERCALC 3 £59
VOLKSWRITER deluxe £39
WORDS & FIGURES £39
SAGE SOFTWARE £POA



Amstrad
printer cable
£12.00

SAVE £150
ON SPECIAL
PACKAGE

OKI MIC PRINTE SPECIA

Superb range of 100 cps NLQ or performance or Menu giving Compatibility. Competitive pr
DEP

Ring
for a
DEMO
now!

THIS MONTH'S DISCOUNT OFFERS

EPSON PRINTERS

LX86 £210
FX800 £335
FX1000 £429
LQ800 £450
LQ1000 £595
EX800 £395
EX1000 £525
LQ2500 £799

JUKI PRINTERS

6100 £259
6200 £435
6300 £675
6500 £999

CABLES

IBM parallel £12
BBC £10

LASER PRINTERS

Canon Laser LBP-8A1 £1895
Canon Laser LBP-8A2 £2995
Canon Toner Cartridge £86
Canon Font Cartridge from £179
Centronics Line Printer 8 £1995
H.P. Laser £POA

OTHER PRINTERS & PLOTTERS

Canon PW1080A 160 cps £255
Roland DXY 880A A3 Plotter £750
Star NL - 10 £245
Epson FX 105 + £350
Centronics GLP & Tractor £145
Hitachi 672 Plotter A3 Size £495
OTC 700 700cps £1995

DAISYWHEEL SPECIALS

1/2 PRICE
DAISYWHEEL
SPECIAL OFFER
DYNEER NOW ONLY
DW20 20cps £199
RRP £569
Dyneer DW-40 40cps £749
Dyneer 20 Tractor Feed £115
Quendata Tractor Feed £75

**MICRO
GENERAL**

COMPLETE RANGE OF PRINTER BUFFERS, INTERFACES, CABLES
AND RIBBONS AVAILABLE. PLEASE CALL FOR ADVICE 07357 4466.
Specialists in MICRO and PRINTER technology
(Dept PCW7) Unit 25, Horseshoe Park, Pangbourne, Reading, RG8 7JW

ALL PRICES EXCLUDE VAT & CARRIAGE.
Prices subject to change without notice.
TELEPHONE ORDERS taken 9-5.30 Mon to Fri. & 9-12.00 Sats.
Delivery Charge of £9 + VAT on all printers and computers.

386

Expansion Planned for More Market Demand

Several companies in Taiwan have started to make 80386-based products. Algol Enterprise Co., Ltd. is one of the first companies in Asia to offer a 386-based product. Another new offer turned out by the company is portable computer.

The company took some capital and time to invest in designing and making its 80386 product, an AT-compatible main board featuring a 16MHz 80386 CPU, at the end of 1986. Full production started at the beginning of March of this year, with a targeted output of 300 units a month. Development of the 386 AT board started last July and the company has received several inquiries, mostly from European companies.

The board only runs at 16MHz and incorporates 2M of RAM, expandable to 4M. A choice of 128K or 256K of ROM is available. There are seven AT-compatible slots and one 32-bit slot for the memory bus. Also included is a socket for an 80287 or 80387 math coprocessor. The board features an 80386 as well as an AT-compatible chip from Chips and Technologies of the U.S. The size of the 386 board is the same as that of an AT-compatible main board and can be interchanged.

Established in 1983, the company has been offering 16-bit personal computers, interface cards and power supply system at a monthly production capacity of 3,000 sets and PC boards at 10,000 pcs per month. According to Danny Jan, director of the company, Algol hopes to double its production output in the near future if the demand for the above computer products continues to be brisk.

All the computer products offered are compatible with IBM. "We also provide a full range of interface cards capable of handling all the tasks you need for your computer system," said Mr. Jan. "They are suitable for IBM PC/XT/AT."

Equipped with automatic test system, the company's computer products undergo a 72-hour

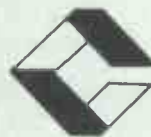
burn-in test to ensure reliability. "We enforce stringent QC throughout the production stages," company manager Titus Liu noted. "That's why our defection percentage rate is between 2% and 3%," he said. "Each production line is manned by an experienced supervisor whose main job is to see the on-going process is at without fault before they are passed on to the next line."

With a skilled workforce of 100, the company's 16-bit personal computers, interface cards, power supply system and PC boards turned out are of high quality because 70 percent of them are exported to European countries and the remaining 30 percent go to the United States. According to Mr. Liu the company plans to diversify its exports to other areas of the world in the not too distant future.

The company's 360,000 square-foot factory located in the Taipei suburb of Peitou is equipped with modern production facilities where the 100 workers work efficiently. "We attribute skilled workmanship and punctual deliveries to our fully automatic production facilities," Mr. Liu pointed out.

In order to further upgrade the quality of the company's computers, cards, etc. and to add extra new lines, Algol always emphasizes on constant R & D. The company spends thousands of dollars on R & D every year, thus meeting the current world demands. "We will never let our customers down when it comes to product quality and services," concluded Mr. Liu.

For further information on the above products, contact the company today!



Algol Enterprise Co., Ltd.

P.O. Box 83-35, Taipei, Taiwan, R.O.C.

Fax: 886-2-8314657 Telex: 23682 ALGOL

Tel: (02) 8343255, 8341491

Presenting the
Digitask Turbo 286
emulation, without
the astronomical
price (from £1,000)
Call for details

Dealer enquiries welcome

Origin—Woodlands Hill,
California, U.S.A.

DIGITASK

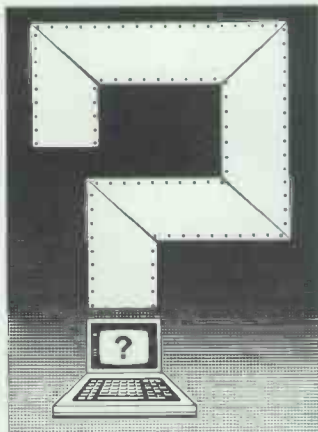
Unit M, Charlwoods Business Centre,
Charlwoods Road, East Grinstead,
West Sussex RH19 2HH

Telephone (0342) 24631
Telex 957418



COMPUTER ANSWERS

*Our technical team takes its toolkit to your problems.
The address to write to is: Computer Answers, PCW,
32-34 Broadwick Street, London W1A 2HG.*



Computer Answers is PCW's help column. We offer advice about all kinds of specific hardware and software problems through the pages of the magazine. We also welcome further information in response to published queries.

Making the right resolution

I have a problem with my programs for the Atari ST. Some of them need to be run when the computer is in medium resolution and some when it is in low resolution. Why is this? Also, is there any way I can switch resolutions in a Basic program?
Martin Barr, Glasgow, Scotland

The Atari ST has three resolution modes: low-resolution colour, medium-resolution colour and high-resolution monochrome, each of which are independent and operate differently. It is difficult to change screen resolutions without resetting the computer and until recently no-one has been able to do so. This meant that early programs for the ST would only run when started from the resolution for which they were designed. When they are run from the wrong resolution mode, they generally display some sort of message such as 'This program must be run in low-res!'

More recently, some programs seem to be able to switch resolutions without resetting the computer and

with these you shouldn't have any problem.

Your second problem stems from the first. Atari Basic was one of the very first programs for the ST, so it would not be possible to switch resolutions without resetting the machine and, therefore, erasing Basic from memory. So the answer is: you can't do it.

Slow print run

I use an Epson LQ-1000 wide-column printer. I have discovered that, if I print long lines in condensed mode, the printer gives up printing bi-directionally. It reverts to a rather confused uni-directional print method for any line longer than 213 characters, which slows down printing somewhat. Is there anything I can do about this problem?
B Rice, South Wimbledon, London

Robert Schifreen replies:
The LQ-1000, like nearly all matrix printers, composes the dot patterns for an entire line of print in a special line buffer and then prints the whole line at once. However, if you are using condensed mode, and you create a particularly long line, the printer may not have enough room in the line buffer to assemble the dot patterns for the whole line.

If this happens, the printer will need to take the line in two parts, printing what it can, then stopping the print head while it recomposes the last few characters.

In order to maintain perfect registration so that the break in printing is invisible, the print head will return to the spot where it started (which could be either the left or right side of the page) before printing the second part of the line, and carefully skip over the first part it printed. So although alternate lines are printed bi-directionally, the two passes on extra long lines are printed uni-directionally. This slows down printing, but ensures that the print quality is kept high.

It would not be possible to change the length of the line buffer without comprehensive modification

of the printer's hardware and firmware, so there is no easy solution to the problem. It does not happen on the LQ-2500, which has been designed with a larger line buffer.

Relocation problems

Is it necessary to have the RAM disk installed in order to run GEM on the Amstrad PC 1512? I recently moved my (twin-floppy) machine and it now won't install the RAM disk. Attempts to do so result in the 'drive not ready' error from GEM.

What's wrong?
Steve Dalton, Barrow-in-Furness

For reasons best known to Digital Research and Amstrad, running GEM on the Amstrad PC destroys any previously created RAM disks. I suspect this is done in order to disguise the fact that GEM uses over 200k of RAM — and that's *before* you run any GEM application.

As for the effect of moving the machine, I can only assume that before you moved it, you accessed drive C: from MS-DOS or DOS Plus and are now accessing drive C: from GEM.

Wait for Mercury

I've just got a Mercury telephone account which I want to use for accessing long-distance bulletin boards and doing other long-distance data transfers.

To dial the number I have to do the following: dial 131; wait for the Mercury carrier; change to tone dialling; dial my authorisation code and the number I want.

How do I do this with my

autodial modem?

G Hamilton, Harpenden, Herts

You don't say which modem you are using, but the following scheme, using Hayes commands, should provide a guide for the command set for your modem.

The problem you will encounter is that you can't start dialling the authorisation code and number until the Mercury carrier has started. Because British Telecom exchanges can take anywhere between 1–10 seconds to get through to the Mercury network, you need to get the modem to wait an indeterminate time for the carrier.

Mercury has told PCW that a wait of eight seconds will usually ensure that the carrier has started and that it hasn't 'timed out', which happens ten seconds later.

To specify a pause in a dial string, in Hayes-command language, you insert a comma. The length of this pause is held in register S8. To set the register type AT S8=8.

Fig 1 is the dial string we have successfully used on a Hayes Smartmodem and a Dowty Quattrocard.

(See 'Mailbox', page 175, for more news on Mercury.)

Don't panic!

It's no good. If only I could figure out how to stop the Babel fish being cleared away by the cleaning robot, I could then understand the Vagon Captain's poetry which would enable me to obtain the Atomic Vector plotter before being thrown out into space. Help, please!
Sarah Marston, Norton, North Yorkshire

I assume you're talking about the Infocom adventure game *Hitch-Hikers' Guide to*

```

AT S8=8 D P 131 T 1234567890 0999123456 <CR>
Put      dial      switch      BBS number
modem    set       to tone
into     pause     use      Mercury
command to 8      pulse   access
mode     secs    dial    number

```

Fig 1

the *Galaxy*. The Babel fish problem is sufficiently early on in the game and has caused so many people problems that I think we are justified in printing the full solution, so here it is.

If you didn't collect the junk mail from your doormat on leaving the house, you need to start from the beginning again and do so. Once in the Vagon hold what you need to do is: put your dressing-gown on the coat hook to cover the hole in the wall; put the towel over the grating in the floor; put the satchel in front of the panel in the wall to stop the lower-room cleaning robot in its track; and place the junk mail on top of the satchel. Then press the button on the Babel fish vending machine.

The Babel fish will then: fly out of the vending machine, run down the sleeve of the dressing-gown, hit the towel, bounce and fly through the air in a graceful arc. In the meantime the lower-room cleaning robot will hit the satchel and send the junk mail flying.

This will keep the upper-room cleaning robot sufficiently busy that the Babel fish will continue on its natural course and, providing you keep still, land in your ear.

Work of art

I have designed myself a graphic in GEM Draw on my PC which I want to include in a word-processed file. A laborious way is to print part of the text, exit my word processor, print from GEM and then return to the word processor for the rest of the text. Is there an easier way? **Frank Gorton, London E14**

Ideally you need a word processor which allows you to include graphics files at print time. These files are not processed by the editor, but passed straight through from the disk file to the printer.

For these files to work, they must contain all the escape sequences necessary to turn the printer into graphics mode, the actual graphics data, and the codes to turn it back again into text mode.

Unfortunately, GEM doesn't allow you to print to disk — a sad omission given its range of output devices. However, there are public-domain programs such as LPTX600 which will intercept all printer output and redirect it to a file.

The other work you need to do is to edit the graphics file that LPTX600 produces. GEM adds lots of line feeds at the end of the file to do a form feed — which you probably don't need.

To edit the graphics file you need a text processor which will cope with non-ASCII characters. PC-Write will include both graphics files at print time and allow you to edit them beforehand.

Load the graphics file you have created and go to the end of the file. The last line will contain a sequence with the following ASCII codes: <27> <2> <12> <12> <26> (Escape, character 2, form feed, form feed, end-of-file).

Delete the two form feed characters from this line as well as the end-of-file character. Above this line, there will be a large number of identical lines about three or four characters long, whose only function is to advance the paper. Delete as many of them as you don't need.

The technique needs a few trial runs to make sure you don't remove too much of the graphics file, but as the sample here shows, it's possible to include a graphics file and then revert to straight text, all from one print run.

This method will allow you to include technical drawings within a document, or put a distinctive heading at the top of your letters.

Readers' responses

In the March issue of *PCW* we published a piece about how to stop your Amstrad interfering with radios and televisions. Two readers have embroidered on the techniques explained.

From: EA Johnson, Worcester

I had no success with the interference filter, but discovered the reason and was able to remedy it.

Tests with a signal generator and an oscilloscope showed that the filter design was good but that it required a low-impedance earth to be connected to its earthing point (the junction of two capacitors). However, the earth contact in the mains socket, while of low impedance at 50Hz, is higher at radio frequencies. And so the filtering failed.

The solution was to connect the earthing point of the filter to the central heating piping which, in my bungalow, is buried in the concrete and is low impedance to earth.

For reasons of safety, I would not have done this had the mains supply not been protected by a Residual Current Circuit Breaker (RCCB).

From: RSJ Good, Loughborough

I found that the noise which interferes with FM and not very much with medium-wave broadcasts comes mainly from my printer (I use an Amstrad PWC 8256). Just disconnect it and see what happens. A piece of PVC-insulated wire looped through a ferrite ring and attached to the extended aerial can eliminate the noise.

The wire has to be moved about to get the best effect.

I am typing this with the end of the wire resting on my lap and listening to Radio 3 without any interference.

A bad taste

We have just replaced the daisywheel printer in our office with a laser printer, as the daisywheel one was too noisy.

Although the laser printer is quiet, and the print quality is better, I find that my nostrils are sensitive to the toner particles and I get an awful taste in my mouth as

soon as I walk into the room.

What can I do to make sure the toner stays in the printer?

Brian Parry, Edinburgh

Robert Schifreen replies:

Laser printers work by charging a drum with static electricity and then using the charge to attract or repel toner particles. With all that charge around, it's impossible to prevent minute particles of toner from being catapulted out of the printer and into your office.

Although no-one has yet decided that this is harmful, it does irritate some people.

There are two possible ways to suck the particles out of the atmosphere. First, buy an ioniser. The problem with this, though, is that you'll find an area of your wall going black as it is bombarded with toner. Putting the ioniser in an up-ended cardboard box may help.

Secondly — and much prettier — is to put a fountain in the middle of the office. The humidity that the water adds to the atmosphere will stop the particles floating in the air.

We have a laser printer and an Epson SQ-2500 ink-jet in the *PCW* office, and we all agree that the ink-jet is the quieter of the two and less environmentally invasive.

Perfect garbage

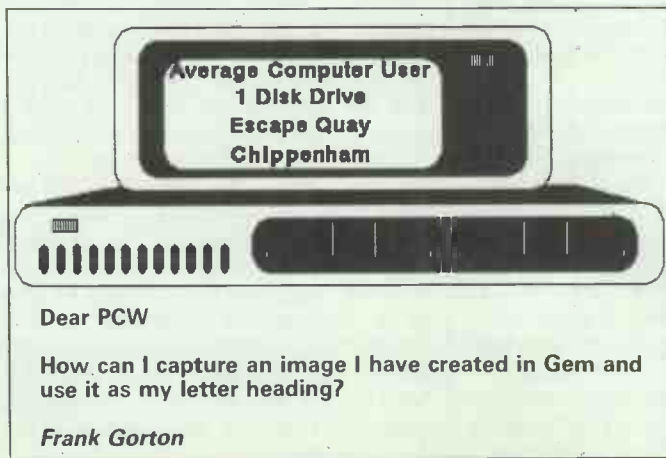
I use Word Perfect version 4.2 on my PC clone and find it to be one of the best word processors I've used.

Unfortunately my printer is a Toshiba P321 and if I use Word Perfect's Toshiba driver I just get a load of garbage printed. I have found that the generic text printer driver will work, but it means I can't use any of the Tosh's fancy features or fonts.

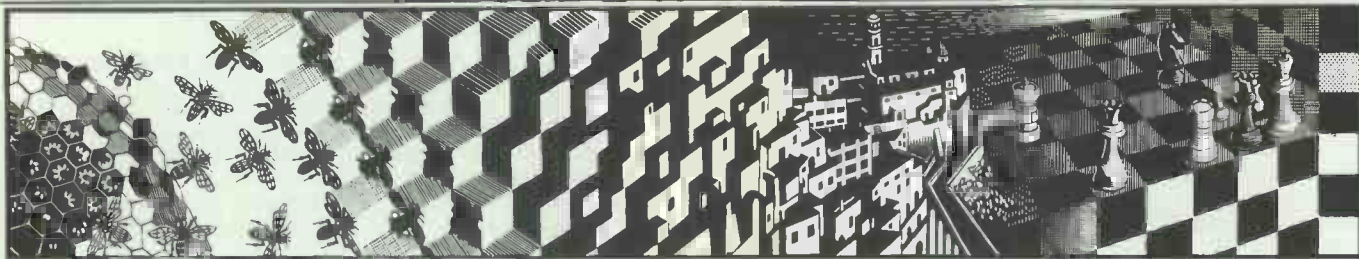
Peter Hibbert, Aberystwyth

Robert Schifreen replies:

There is a problem with the Toshiba printer driver. The driver that is supplied is actually labelled P321/351, and was designed to work with both these Toshiba printers. However, the P351 comes with Qume emulation and the P321 does not. The problem is that Word Perfect is trying to drive your P321 as though it had Qume emulation; hence the garbage. Both companies are working on the problem, so call Word Perfect on (0932) 231164 or Toshiba on (0932) 785666 for the latest fixes. **END**



SCREENPLAY



Stephen Applebaum dons his trendiest gear for a trip to Tonetown, rescues innocent people from a cruel warlock and still has time to squeeze in a murder party. How, and why, does he do it? Find out, in the best of this month's games.

Time of your life

Title: Tass Times in Tonetown
Computer: Atari ST
Supplier: Activision
Format: Disk
Price: £24.99

Tonetown is a unique world on the other side of your imagination: it is oddly familiar, and yet so different, that survival there depends on your ability to assimilate into the subculture created by the ultra-hip inhabitants.

To be acceptable to the denizens of Tonetown you must be chic, urbane and a little on the weird side. Tourists are definitely not 'cool'. Their 'Jonboi Waltune' (red-neck) outfits are reviled by the locals and can even lead to a bad case of rigor mortis if not traded in for the right gear; such is the extent of the hatred their dowdiness inspires in the sartorially aware Tonetownians.

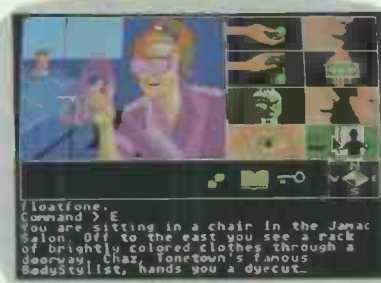
Cool is tass and tass is a dyecut dyeorama hairdo, a Tropicwear jumpsuit or the Daglets singing 'Tass', their smash hit single.

On the surface, Tonetown is a Sybaritic paradise: there's music, 'acid' cocktails, glo burgers and even a wood where 'magic' mushrooms grow wild. But below this exterior of unmitigated superficiality there flows an undercurrent of dread.

Everything bad that happens in Tonetown — and there is plenty — can be traced back to Franklin Snarl, an evil character who resembles a cross between an alligator and a shagpile carpet. He, it would be fair to assume, is solely responsible for the disappearance of Gramps, the reason for your foray into Tonetown.

Having discovered a way of passing between dimensions, Gramps has got himself stuck in Tonetown and is unable to return to his cosy, winterised log cabin. His only hope of making it back is if you, too, enter Tonetown and show him the way.

You are escorted throughout the adventure by Ennio the Legend, an



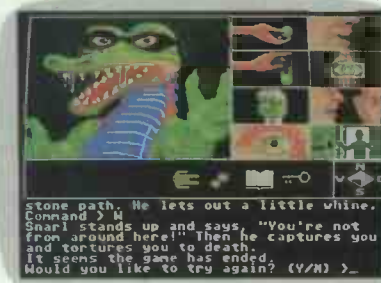
esteemed reporter employed on the *Tonetown Times*, who would not warrant a mention were it not for him being a dog. In fact, Ennio is the incarnation of Gramps' faithful hound Spot's alter ego.

Excellent as it is, *Tass Times in Tonetown* will most likely be ignored by adventure purists since it goes against virtually everything they believe in; not only does it have graphics, but also a system that allows commands to be executed without the necessity for typing them in beforehand. (It is worth noting here that the graphics can be turned off and the game played as a straight adventure. But if you are going to do that, why buy the game in the first place?)

All the most commonly used commands have been put onto the ST's 10 function keys. This means that if you want to drop an object, for example, all you need to do is press the key programmed with the 'drop function' and then either type in the name of the object or point to it on-screen using the mouse.

Tass Times in Tonetown's display is divided into a number of different sections, the largest being a graphical representation of the current location. There are quite a few such pictures in the game, many of which are animated. The opening frame, for instance, depicts the interior of Gramps' cabin, where a clock complete with swinging pendulum ticks away noisily on one of the walls.

Some of the aforementioned pictures contain objects which can be picked up and kept for use later on in



the game. An inventory of all that you are carrying is displayed in a strip running along the bottom of the picture. In addition to the graphics, each location is also described using text. This gives the story so far, telling you what is happening in the picture and who the characters are.

On the right-hand side of the display are a number of icons, some of which represent the same operations programmed onto the function keys: 'talk to' and 'tell me about' are different though, and allow you to communicate with characters.

To talk to someone, you must know his or her christian name, as this is the accepted form of address. Some people's first names are not available from the program itself, and in this case you must refer to the copy of *Tonetown Times* supplied as part of the overall *Tass Times in Tonetown* package. The newspaper is not simply a piece of otiose gimmickry, cynically tossed in at the last minute to beef-up the package (a practice currently pursued by some companies I could mention). Rather, it is an extra dimension that contributes to the adventure's atmosphere.

Tass Times in Tonetown is one of the most enjoyable computer adventures I have played. The graphics are excellent, the storyline is unusual and, most important of all, it is accessible. And because many of the clues needed to progress in the game have been conspicuously 'hidden' in the newspaper, not even the most naive adventurer could get so stuck as to give up. Definitely one for the collection.

Fantastic adventure

Title: Phantasie II

Computer: Atari ST; Commodore 64/128; Atari 800 series; Macintosh

Supplier: US Gold

Format: Disk

Price: £24.99

Sequels have always been big business at the cinema box office. One has only to look at the number of *Rocky* and *Star Trek* films made to realise that if people like a formula they will lap up as much as they can until surfeited. Much the same is true of the computer games industry, where 'big' products are marketed in a similar way to films, albeit on a smaller scale; even here in certain sectors, the sequel is almost *de rigueur*.

Some sequels to popular arcade games have been made over the years, though they have not always fared well because it is difficult to maintain the feel of the original and still make the sequel different enough to be of interest to fans.

Conversely, the fantasy role-playing game has provided rich pickings for the sequel merchants; a trend that must be attributable in part to the ease with which the thread of a story can be continued from one program to another.

One of the latest follow-ups to a successful role-playing game is Phantasie II, a program riding the wave created by ... wait for it ... Phantasie I.

Like its predecessor, and in fact almost every game of its ilk, Phantasie II features a beautiful isle whose inhabitants have been made the thralls of an evil sorcerer — in this case, a warlock named Nikademus. The source of Nikademus' power lies in a terrible orb. If the orb is destroyed, Nikademus will be rendered powerless and his reign of terror ended. If not, the good people of fair Ferronrah will remain his slaves till death releases them from his grip.

Before setting out on the quest to destroy Nikademus, you must first recruit a band of six hale and hearty adventurers. Aficionados will be able to use experienced fighters left over from their adventures in Phantasie I. Those of us, however, who have come into the fray rather later must go through the procedure of building a motley crew from scratch.

Parties of adventurers are traditionally multi-racial affairs, comprising humans, dwarves, elves, gnomes and halflings. All are available in Phantasie II along with a new race, the nebulously named 'random creatures' — so called because when chosen, the computer randomly selects a race from an exhaustive list of mythical beasts which includes

goblins, minotaurs, pixies and sprites.

Unlike the other types of being which can be trained in almost any trade, random creatures, who, because of their sheer grossness are generally disliked by humans, can only become thieves or fighters and are charged inordinately large sums of gold for training.

All the beautiful people — that is, members of every race bar random creatures — can become not only fighters and thieves but also monks, priests, rangers and wizards.

Some races have a bent for particular trades. How you combine the two has either a positive or negative effect on the character's physical and mental attributes. It is therefore important to get the mixture right, else you could, for example, find that your wizard's magic peters out just at the moment when a fireblast from his wand could save the team from a grisly death. But, *c'est la vie*.

Characters can be created in any of the towns on Ferronrah; which means losses picked up in battle can easily be overcome by inducting new characters from the nearest town's Guild, the training ground for would-be heroes. On the other hand, battle-hardened survivors who have earned experience points by mutilating some of Nikademus' minions can be presented to the 'board' for training. At a cost, of course.

This set-up is rather hard on random creatures, since to progress they must earn far more gold, and take more risks, than their fellows.

Once you have built your team of adventurers and vested them in protective rigs from the local armoury, it is time to leave the safety of the city walls and enter the hurly-burly without. Whereas the towns are presented as a pretty, three-dimensional view down the main thoroughfare, the graphics' outside are rather drab. The main playing area features a map with a cross-hair cursor representing your party. Most of Ferronrah is woodland and therefore much of the map is a monotonous mass of green, broken up in places by a path or a range of mountains or a river. Small inns dotted about the map offer oases of calm where your group can recuperate. Yellow castle symbols represent villages, while a small archway is the

opening to one of several underground labyrinths.

Phantasie II's programmers must have spent a long time wondering how to show the subterranean environment that presents itself to our heroes as they descend through the dark portal that opens to the surface. They could have used a 3D maze as in *The Bard's Tale* and *Wizardry*, or a simple two-dimensional bird's-eye-view as in *Rogue*. But no; instead they opted for a plain grey square devoid of detail. When you move the cursor, however, a chunk of grey disappears, revealing a corridor; and sometimes a small yellow square representing a door appears.

Much the same happens above ground, where vast areas of the map are shrouded in a black mist which miraculously evaporates as you move your team through it.

When you meet up with a group of the sorcerer's evil hordes, a frustratingly all-too-frequent event, you can either run or fight. Choosing the latter activates combat mode, whereby you have to inform the computer of the action you wish each character to perform. Fighters can be commanded to attack in different ways, while the fey members of the bunch can be ordered to cast spells at the foe.

The regularity of these skirmishes means that your entire crew is often wiped out in a few minutes. When this happens, they arrive on the Astral plane where His Sable Majesty presides over their fate. The luckier characters are resurrected or made one of the undead. Useful in battle but short on chat, the undead cannot be trained like their living counterparts. (And the random creatures think *they* have problems.) Their role is that of pawns to be thrown to the enemy before the living members of the group.

Phantasie II leaves me thinking that there should be something more. What, I can't quite put my finger on, since as role-playing games go it really isn't bad: it is difficult, there are numerous spells to be gained and a morass of puzzles to be solved. Technically Phantasie II is not much to cheer about, although there is enough action and complexity to make you want to pick it up and start again, even after your best team of adventurers has been ravaged for the umpteenth time.



Murder made easy

Title: Make Your Own Murder Party
Computer: Commodore 64/128
Supplier: Electronic Arts
Format: Disk
Price: \$38.95

Murder parties have apparently been popular in the US and some European countries for over a century. These peculiar events entail a bizarre game of charades, where visitors play the different characters involved in a murder investigation: the aim of the game being to uncover who has committed the crime.

Make Your Own Murder Party is quite a departure for Electronic Arts. It is a difficult package to define, since it does not slot neatly into any of the accepted divisions of software; anyone thinking they were buying a detective adventure, for example, would be sadly disappointed, and no doubt want his or her money back. People looking for something a little unusual, on the other hand, might just find it to their liking.

The preparations for a good murder party are time-intensive and laborious. Not only do you have to think up a good scenario, but also design and send out invitations as well as write personalised clue books for each of the guests. With Make Your Own Murder Party this is all handled by the computer; leaving you with the less onerous tasks of deciding who to invite and what you are going to give them to eat and drink. And since a murder party is a kind of cross between human *Cluedo* and *The Mouse Trap*, you are also responsible for creating the right ambience. A murder party could be scuppered from the off if the atmosphere is not right, as players might find it difficult to act out their respective roles unless they had something other than the game to stimulate their imagination.

Make Your Own Murder Party comes complete with two mysteries entitled *The Big Kill* and *Empire*. The first tale is about the 'apparent' suicide of an actor, while the second one surrounds the murder of a wealthy widow.

Both scenarios require a minimum of six players including yourself. Who you choose to invite depends mainly on the personalities of the characters in the story.

To help you decide, Electronic Arts provides a file containing 'close-ups' on the personalities of the characters in both stories. Reading these provides useful information on each of the characters' strengths and flaws which you can match as closely as

possible to those of your prospective guests.

Casting guests in the right parts is important, as it wouldn't do to ask a timorous person to, say, take the role of a playboy, as they would be unlikely to do the part justice and therefore detract from the game's realism.

Having completed the guest list, you are ready to get down to the business of designing the party, a procedure akin to forming a band of adventurers in a fantasy role-playing game. When you create a party, you first tell the computer the date of the drama, the time it is to start and the location. Then you cast the roles, keying-in personal information about each of the guests requested by the computer. It pays to be truthful here because the computer bases the clues on the information you give it. And the more players are able to identify with the information in the game, the more relaxed they are likely to be when playing.

Most of the information fed into the computer is incorporated into clue-booklets, a personalised form of which is given to each player. Inside the booklet is contained two different kinds of information, some which must be read out and some which must only be disclosed if the player cannot do otherwise.

The booklets, together with the invitations, envelopes and a special set of materials for the host — designed to help the evening run smoothly — can be output to a variety of devices including a laser printer. Because of the sheer volume of written material needed for a game, the time taken to print everything can be quite extensive. Of course, this is entirely dependent on the speed of your printer.

A Murder Party!

You've just been invited to a party where the object is murder...

Years ago, back in the heady days of the Woodstock Nation, you rented a room in an old Victorian house in Berkeley. It turned out to be more than just a place to hang your macramé: your housemates were the most far out people you'd ever met.

There was Babsie: a true innocent, she saw magic everywhere; Zing, inquisitive, loyal, and adventurous; Liptoi, who turned an alternative lifestyle into a small fortune; and Wallaby, whose quest for justice inevitably led to Berkeley.

But the guru and guiding light was Jeremy Summers. Loved by everyone who met him, he went on from a life of quiet contemplation to become, incredibly, a great film star.

And now, years later, even though you and the others have drifted into separate orbits, you continue to feel somehow linked with one another. Perhaps that link ran most strongly through Jeremy, the one who brought you together in the first place. What will happen to that binding force now that Jeremy is dead, a suicide, a person you'd least figure to take his own life...? And why would he kill himself?

You'll have a chance to find that out when you spend a few hours with your old pals. Take the time to get reacquainted with them. Read the profiles on the next couple of pages, and pay close attention to your own profile (including the "bitter truth"). Who knows? Maybe the answers lie hidden there...

Those lucky enough to own a laser printer can have everything ready for *The Big Kill* in a matter of 35 minutes or for *Empire* in 45 minutes. A printer that works at only 15cps takes much longer — at two and a half and three hours respectively.

When the 'big night' comes around and the guests arrive, the host begins by handing each one a clue-book. One of the books is a page longer than the others and reveals its owner to be the killer. Players must therefore be disciplined enough not to turn the pages of their clue-books unprompted.

A game takes place over four rounds during which players reveal the information given on the current page of their clue-books. At the end of each round, players question each other further, which is when the second kind of information, mentioned earlier, might possibly be revealed. When all the rounds are finished, the host requests that the guests write down who they think is the murderer on a special verdict sheet at the end of their booklets. The winner is the one who guesses the villain of the piece, motive, the means and the opportunity.

Make Your Own Murder Party is an excellent idea, well-executed (if you will excuse the pun) and painstakingly detailed. But having never held a murder party of my own, I cannot tell whether or not it is better or worse than the 'real thing'.

What I can say is that the amount of information included in the package would take a long time to put together without the help of such a program, so on the level of time-saver alone, Make Your Own Murder Party is a good investment. **END**

MIR MICRO-RENT

MICRO-RENT DO MORE!

MAC-PLUS

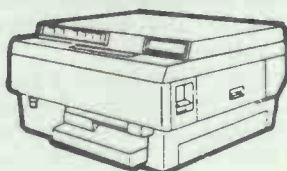


TANDON



H-P LASERJET

£58 PER WEEK *



IBM PC AT



Micro-Rent do more than offer you the best rental deals on microcomputers. They rent printers, hard-disk systems, monitors - even some software!

Micro-Rent - the complete rental service - saves you time and money, and solves your problems fast.

Buying? Ex-rental machines often available at reduced prices.

AND NOW - FAX MACHINE RENTAL FROM £40 PER WEEK!

Ring for details

01-700 4848

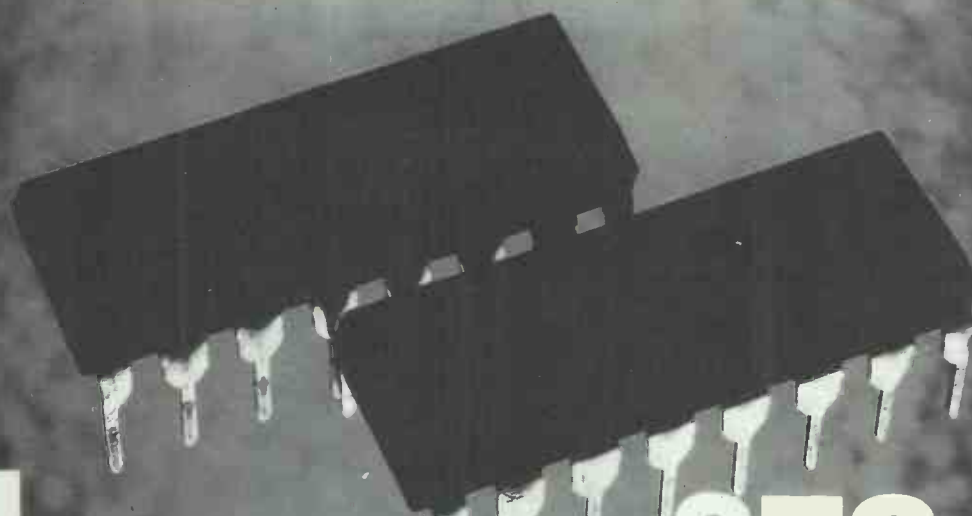
MIR
MICRO-RENT

St. Marks Studios, Chillingworth Road, London, N7

APPLE · APRICOT · IBM PC & XT · OLIVETTI
MACINTOSH · TANDON · SIRIUS · COMPAQ
LASER PRINTERS · DESK-TOP PUBLISHING

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

Memories are made of this!



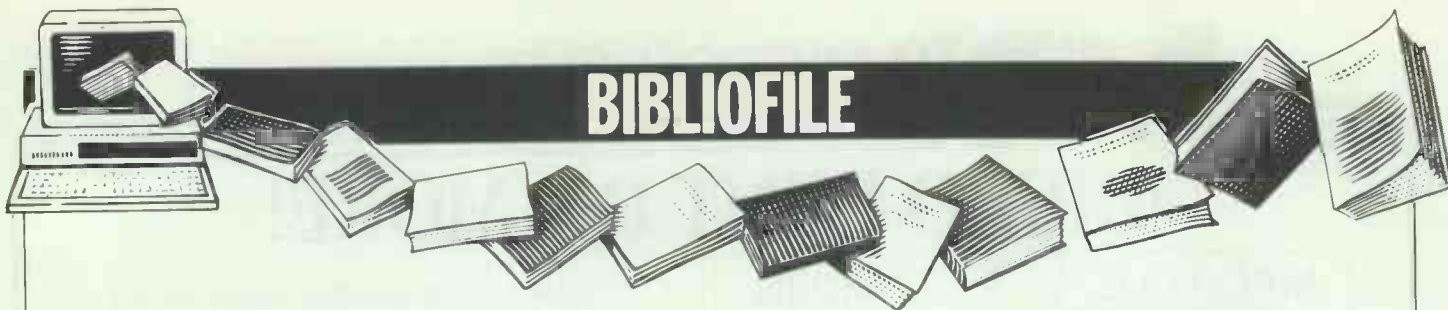
1 MEGABYTE £79
64 K DRAMS OR 256 K DRAMS (150 NS)

Order only in complete multiples of one megabyte. Excludes delivery & VAT



Tel: 0342 24631 Telex: 957418

Unit M, Charlwoods Business Centre, Charlwoods Road
East Grinstead, West Sussex RH19 2HH



In our crop of books under review this month, there's something for everyone — from philanthropic researchers to xenophobic managers.

Management Guide to Office Automation

Management Guide to Office Automation

Author: Joseph St John Bate
Publisher: Collins
Price: £14.95

If I worked in an office where the senior managers were as considerate as those in Joseph St John Bate's *Management Guide to Office Automation*, then I'd be a very happy worker indeed. I would have thought that 90 per cent of all office staff are presented with a *fait accompli* as regards office automation — that is, 'make a space on your desk on Monday morning; the word processor will be delivered then.' 'What word processor?' might come the shocked reply.

Joseph St John Bate's objective is to help managers overcome such unwarranted fear: 'It is curious that automation has been portrayed as a frightening and unnatural invention,' he assures us, when 'automation is seen in nature. Most of our body is automated...' It's a very benign approach, and it works well.

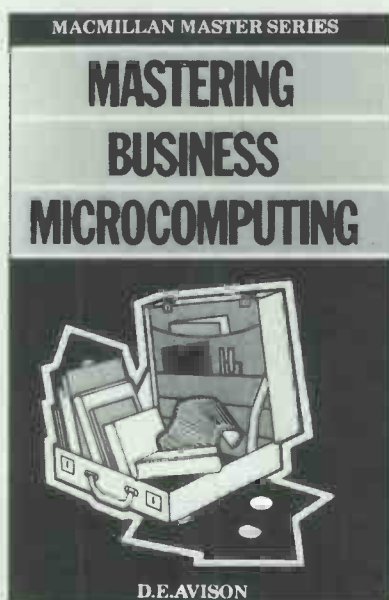
To help management inject a human aspect into the idea of 'office automation', this book should be compulsory reading whenever that dreaded phrase is mentioned. You'd

probably have to take a sabbatical week off first, as there is certainly a mountain to read and digest — over 200 pages, with only the odd few graphs and statistical tables to lighten the load. Reading the Contents page might also put you off ever starting — for example, Chapter 7 on 'Technology in Support of Knowledge Workers' sounds like something out of 1984. But you would be well-advised to persevere with this book as the author does talk a great deal of (slightly long-winded) sense.

He even takes a kindly view of managers themselves, stating that they are usually the first people to be frightened stiff of new technology, as they are expected to be keyboard experts plus resident engineer/analyst/programmer. That, I thought, was carrying the sympathy too far!

Lorna Kyle

Mastering Business Microcomputing



Author: DE Avison
Publisher: Macmillan Master Series
Price: H/c £12.95; Paperback £3.95

There is a plethora of books on the market that claim to be 'the businessman's guide to microcomputing'. Some good, some adequate,

some a waste of time and money. Thankfully, DE Avison's *Mastering Business Microcomputing* does not fall into the latter category. If anything, it is among the elite of books that I have read dealing with this topic. It concentrates on applications which are of most interest to managers of small/medium-sized companies, and the author's 'aim is to keep the book readable and to avoid unnecessary technical detail'. He also keeps clear of any preferences in hardware and software.

Each chapter opens with a concise and pertinent introduction to the individual sections, informing the reader of the information to be discussed and exactly where to find it in the chapter. Chapter 1 covers the nail-biting subject of choosing a microcomputer system and deserves to be re-read until all the salient points are driven home. I was pleased to see emphasis placed on the quality of documentation, help facilities and the availability of a disk tutorial system within a package, as so often with the purchase of a microcomputer and/or application packages, the 'new' user doesn't realise until it is too late that most of his knowledge will be self-taught.

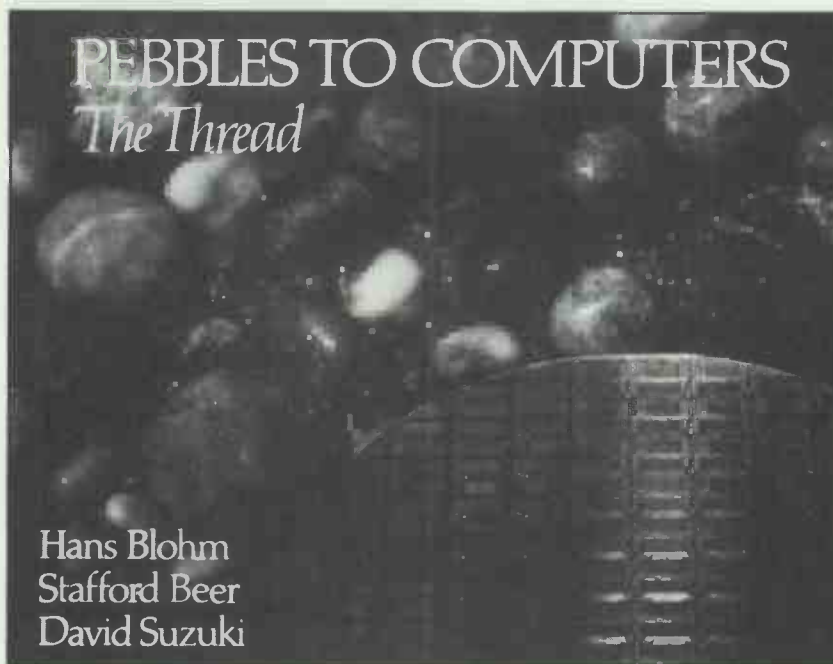
'Word processing and the electronic office' is the first application to come under close scrutiny — logical enough, as it is one of the main areas of microcomputing. Plenty of diagrams and illustrations here, showing possible screen formats and text layouts, and also the real aspects of people and ergonomic factors are discussed: 'If human factors are given the importance that they deserve, then the business stands a far greater chance of the computer system being a success.'

File management, spreadsheets, financial modelling, graphics, accounting applications and integrated systems are all treated with equivalent detail in individual chapters, and the advantages and disadvantages of different systems are discussed clearly and fairly.

Mastering Business Microcomputing is a very useful book to learn from initially and a handy reference book for all times: a worthy addition to the Macmillan Master Series.

Lorna Kyle

Pebbles to Computers: The Thread



Authors: Hans Blohm, Stafford Beer, David Suzuki
Publisher: Oxford University Press (Canada)
Price: £12.95

The cover of this book reminds me of those delicious-looking cookery books you get at the checkout in Sainsbury's: you may be tempted to buy, but it's often just a pure indulgence. And frankly this is how I would sum up *Pebbles to Computers*, only this time the *indulgence* is on the part of the authors.

The book purports to be not so much a history of computers *per se*, although it does include brief biographical details of the major personalities involved in their development, ranging from Leonardo da Vinci to Alan Turing. Rather it represents a chronological dossier of humanity's efforts 'to create order out of chaos' by recording information about its environment, with the pebble being the earliest 'mark of distinction'. 'A pebble' the authors remark 'is an entity.' 'It is one of the simplest, most familiar things that demonstrate a unity. All computing is based on this idea.' It's powerful stuff, but a bit hard to swallow.

Messrs Blohm and Beer (not so much Suzuki) have obviously spent some time meditating the meaning of life, the universe and everything else as they link together the efforts of past and present cultures in an attempt to show how everything in the cosmos is interwoven — ramming the point home by a tacky red thread which encircles key words on every page.

Pebbles to Computers is glossy and beautifully illustrated (Blohm is

first and foremost a photographer, of microchips no less) but for my money I expect a book to offer more than randomly linked pictures and text (and somehow my philistine nature will not allow me to dwell too long on the similarities in design between an ancient Aztec courtyard and an integrated circuit board).

I don't like this type of book with its self-congratulatory style and its liberal smatterings of anthropology, philosophy, aesthetics and scientific truths. Although it looks very appealing (apart from that *awful* red thread), there's nothing to really get your teeth into.

Joanna Murchison

Dirk Gently's Holistic Detective Agency

Author: Douglas Adams
Publisher: William Heinemann & Co Limited
Price: £9.95

There's no doubt from reading this book that Infocom has already got its hands on it. And considering that the HitchHikers Guide to the Galaxy, by the same author, is the company's best-selling adventure after Zork, it's not really surprising.

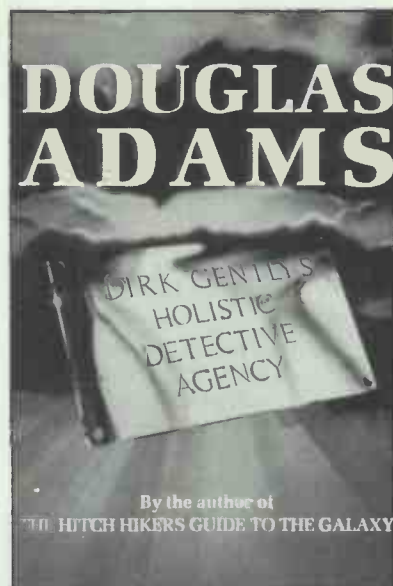
Every event, feeling or movement is accompanied by a long description, written in pure Infocom-ese. My favourite is that of the bathroom. After a couple of dozen sentences about lavatories, basins and bathroom cabinets, the text ends: 'There was also a large horse in the room, taking up most of it.'

The story, for it is fiction and not

like a normal computer book, is set in the present day. It's also set in the past and future, too, as each of the 36 short chapters takes us to a different place and time. Fans of *The Singing Detective* should feel quite at home.

Like earlier Douglas Adams books, this one gives more than a passing mention to computers. Our hero, for example, has a network of half a dozen Macs, as well as a Laserwriter. Most of the time, the screens show a picture of a revolving sofa stuck halfway up a staircase, though the exact reason for this is not clear.

Staying with technology, my favourite character is the Electric Monk. In the same way that dishwashers perform the tedious job of doing your washing up, and video recorders watch all the boring TV programs that you don't want to watch yourself, the Electric Monk is a



robot-like device that will believe anything it is told, to save you having to believe it yourself.

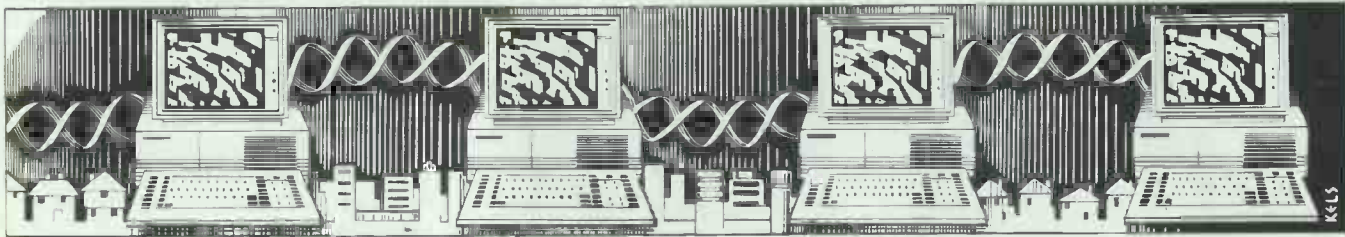
Although such a device is certainly useful, not many have been sold yet as everyone's waiting for the Monk Plus to be launched.

Holism, by the way, is the theory that the fundamental principle of the universe is the creation of wholes. And Dirk Gently's holistic detective agency has a brass plaque on the door that says: 'We solve the *WHOLE* crime. We find the *WHOLE* person. Phone today for the *WHOLE* solution to the problem. Missing cats and messy divorces a speciality.'

If you like Douglas Adams' books and/or Infocom adventures, you'll find this a good read. It's handy for the coffee table, too, to let guests dip into during dull moments. I'd even go so far as to say that, if you don't have a coffee table, it's worth buying one just to put this book on.

What's the plot? Oh, I've no idea.

Helen Rappoport



On a high

Peter Tootill examines the advantages of high speed modems.

This month we present a survey of some higher speed modems for use on ordinary telephone lines (often called the public switched telephone network, or PSTN). This complements the survey of budget modems we presented in the December 1986 issue.

Until two or three years ago the most common standard for dial-up computer systems was V21 (300 bits/sec). V23 has been used by Prestel for a few years — this is 1200 to the user but only 75 back — and it's reasonably good for receiving data but not for uploading prepared messages: for example, V22 modems are more recent and more expensive. They provide 1200 bits/sec in both directions at the same time (full-duplex). Even at this sort of speed a

screen full of 80-column text takes around 15 seconds. The latest modem standards provide 2400 bits/sec (V22bis) and a staggering 9600 (V32). V22bis modems are widely available and prices are falling. They currently cost between £500-£1000 (see the table). V32 is very new and pricey at around £3000.

Error correction

At the higher data speeds some sort of error correction becomes essential and is usually included in terminal software (Xmodem and Kermit are examples). This is fine for transferring files — but if you get a poor line you can have great difficulty even signing on to a system. Try entering your password when the telephone line is trying to help by adding the

odd curly bracket!

Again, if you are carrying out an online search of a database, looking for articles on a particular topic, a noisy phone line can corrupt your search commands and you can waste a lot of (possibly expensive) online time repeating it until it gets through unaffected. Error-correcting modems deal with this problem by filtering out line noise and ensuring that only *real* data passes between your terminal and the system you are using. The usual way of doing this is to cut the data into blocks and send it with a CRC check, which is called ARQ (Automatic Repeat on request — see the April 1987 issue for more information on error-correcting protocols). The new V32 standard uses a feature called trellis code

Selection of high speed modems

MAKE & MODEL	MODES 1,3,2 B	TYPE	PRO	DI	NO	MO	CS	S	ARQ	LED	SY	PHONE NO	PRICE	NOTES
Case 400/24	X X X X	SC*	H/P	M	4	A	Y	N	T/MNP	9	A/S	(0923) 58000	£795	Security dial back Data compression gives 400 bps
CDS V22bis comp	XX Bell	SC	P/V	A	—	A	Y	N	P	22	A	(0923) 58000	£995	
CDS V32	V32	SC	P/V	A	—	—	Y	N	P	22	S(A)	(0923) 58000	£2850	Epad, asynch port options
Dacom Unity Quad	X X X X	PC	H	A	—	A	Y	Y	MNP	—	A	(0923) 58000	£599*†	
Dacom 1-2-3	X X X	SC	H	—	—	A	N	Y	—	5	A	(0923) 58000	£399	V22bis version planned: £299 Serial port. Options: V.26,27&29; & IBM 3270 Emulation
Dataflex Stradcom	X X	PC	H	A	—	A	N	Y	—(V)	—	A	(01) 543 6417	£199†	
Dataflex Chameleon	X X X X	PC	H	M	—	A	Y	Y	—(V)	—	A/S		£599+	
Dowty Quattro	X X X X	SC/PC*	H/P	M	20	A	Y	N	T/MNP	6	A/S	(0635) 33009	£795*	Also voice synthesis, answering etc MNP coming soon
Gandalf DMV2422	X X X X	SC/PC	H/P	A	20	A	Y	N	T/MNP	6	A/S	(0925) 818 484	£795*	
Hayes Smartmodem 2400	X X	SC/PC	H	M	4	A	N	Y	—	8	A/S	(01)848 1858	£725	LCD display, front panel controls LCD display, front panel controls
Lion Orator	X X X X	PC	H/P	A	—	A	N	N	P/E/V	8	A	(024026) 3951	£800+	
Micom-Borer 3024	X X	SC*	P	M	20	A	N	Y	(T)	8	A/S	(0734) 866 801	£580*	ARQ planned
Miracle WS3000	X X X X Bell	SC	H	M	64	A	N	Y	—	10	A	(0473) 216 141	£650*	
Pace Series Four	X X X X	SC	H	M	64	A	Y	Y	—	10	A	(0274) 488 211	£499	
Racal VI 2422	X X X	SC*	H/V	A	20	A	Y	?	M	10	A/S	(025672) 3911	£795*	
Tandata Tm602	X X X	SC	P/V	M	—	M	Y	N	—	5	A	(06845) 68421	£399+	
Tandata Tm722	X X	SC	H	M	10	A	Y	Y	MNP	7	A/S		£499	
Trinitas Phasor 2221	X X	SC/PC*	H	M	48	A	Y	Y	—	7	A	(0473) 215 719	£295	

Notes:

MODES = 1 = V.21 (300); 3 = V.23 (1200/75); 2 = V.22 (1200/1200); B = V.22bis (2400/2400). **TYPE** = PC = IBM card, SC = self-contained, * = rack-mounting version available. **PRO** = protocols. H = Hayes, V = V25bis, P = Proprietary. **DI** = dialling (dialling selection method). A = automatic selection, M = manual. **NO** = size of internal phone number store. **MO** = auto-answer mode. A = Automatic, M = Manual selection of incoming call speed. **CS** = Constant Speed Interface. **S** = loudspeaker. **ARQ** = Error correction method. MNP/E = Epad. P = Proprietary. V = Vasscom. T = Tulse. **LED** = number of LED indicators. **SY** = Synchronous/asynchronous or both. **Prices**: Exclude VAT, * = a range of version available. Highest price model quoted. † = software included.

modulation (TCM). TCM interleaves the data with additional information to allow the receiving modem to decide the most likely format of the correct data. This system avoids the data going in fits and starts as tends to happen with the block-based system, which can be very intrusive.

Selection

The table on page 174 is a selection from the range available. Many manufacturers have a number of models in the V22/V22bis area and we have listed those that provide V21 and V23, as well as V22 and V22bis standards; otherwise a typical V22bis modem is included. Two unusual modems from Dacom have also been included — a V32 modem (one of the first, if not the first available in the UK) and the V22bis data compression modem. The latter gives up to 4800 bits/sec by using data compression techniques. The Lion Orator is a totally different animal to the others — Lion calls it an 'integrated services communications manager'. It handles voices as well as data and can act like a telephone-answering machine, storing incoming voice calls on disk. (Review, PCW April.)

Most of the modems listed are available through normal retail outlets, but in case of difficulty, the manufacturer's telephone number is included. You will also find the Dowty (originally called the Steebek) Quattro rebadged by a number of other modem manufacturers and not all these versions have been included. These companies may have commissioned variations in the specification, so they may not be identical to the Quattro. From a quick look at the outside of the boxes and the specifications, Gandalf, X-Tec, Jaguar, PC Communications and Modular Technology appear to be examples.

News Item

Mercury now offers cheaper telephone calls for domestic and small-business subscribers. Mercury is the new competitor for British Telecom and as yet has not been selling its services very hard. Because of this, you may not have realised that Mercury has now introduced a service (for trunk calls only) for the small business and domestic subscriber called Mercury 2200. If you are in one of the areas served by it, all you need to use it is a BT phone line and a special Mercury telephone.

If you have more than one line, you need a 'smart box' adaptor instead of the telephone. This checks the destination of all outgoing calls, and routes them via Mercury if that would be cheaper than using a BT line. The advantages of using Mercury are: cheaper phone calls (see

Ready Reckoner

Mercury 2200 call charge Ready Reckoner. All costs in £(incl VAT).

Rate	Pence/min	Call duration (mins)					Download cost at 1200 bps			
		1	5	10	20	60	10k	50k	100k	200k
T5 Cheap	2.50	0.03	0.14	0.29	0.58	1.73	0.06	0.29	0.58	1.15
T5 Std	7.45	0.09	0.43	0.86	1.71	5.14	0.17	0.86	1.71	3.43
T5 Peak	9.72	0.11	0.56	1.12	2.24	6.71	0.22	1.12	2.24	4.47
T4 Cheap	2.50	0.03	0.14	0.29	0.58	1.73	0.06	0.29	0.58	1.15
T4 Std	7.50	0.09	0.43	0.86	1.73	5.18	0.17	0.86	1.73	3.45
T4 Peak	10.00	0.12	0.58	1.15	2.30	6.90	0.23	1.15	2.30	4.60
T3 Cheap	2.50	0.03	0.14	0.29	0.58	1.73	0.06	0.29	0.58	1.15
T3 Std	7.45	0.09	0.43	0.86	1.71	5.14	0.17	0.86	1.71	3.43
T3 Peak	9.72	0.11	0.56	1.12	2.24	6.71	0.22	1.12	2.24	4.47
T2 Cheap	4.10	0.05	0.24	0.47	0.94	2.83	0.09	0.47	0.94	1.89
T2 Std	8.75	0.10	0.50	1.01	2.01	6.04	0.20	1.01	2.01	4.03
T2 Peak	11.73	0.13	0.67	1.35	2.70	8.09	0.27	1.35	2.70	5.40
T1 Cheap	3.75	0.04	0.22	0.43	0.86	2.59	0.09	0.43	0.86	1.73
T1 Std	8.48	0.10	0.49	0.98	1.95	5.85	0.20	0.98	1.95	3.90
T1 Peak	11.16	0.13	0.64	1.28	2.57	7.70	0.26	1.28	2.57	5.13
Eire Cheap	22.00	0.25	1.27	2.53	5.06	15.18	0.51	2.53	5.06	10.12
Eire Std	33.00	0.38	1.90	3.80	7.59	22.77	0.76	3.80	7.59	15.18
USA Cheap	48.10	0.55	2.77	5.53	11.06	33.19	1.11	5.53	11.06	22.13
USA Std	52.80	0.61	3.04	6.07	12.14	36.43	1.21	6.07	12.14	24.29
USA Peak	57.72	0.66	3.32	6.64	13.28	39.83	1.33	6.64	13.28	26.55

Notes:

T5 (Tier 5) = Local area (not usually available via Mercury)

T1 = over 56km, Mercury access areas. T2 = over 56km, other areas

T3 = under 56km, Mercury access areas. T4 = under 56km, other areas

Calls are charged to nearest 0.1p. Min charge Tiers 1 to 4 is 3p (excl VAT), Tier 5 is 7p (excl VAT) Download costs are approximate only, and are for file of given size using Xmodem protocols.

the 'Ready Reckoner' box): itemised phone bills: individual bills for individual cost centres: and cleaner telephone lines. I have produced a Ready Reckoner for calculating the cost of phone calls using Mercury 2200 in the same format as last month's, which was based on BT charges. Local call charges are quoted but you don't normally use Mercury for them. The savings on trunk calls are generally around 10 per cent on the ones I've looked at, but Mercury claims 15 per cent overall — they can be as high as 30 per cent in a few cases.

Access to Mercury 2200 is available from over 60 national telephone exchange areas. They are mainly in the central part of the country, based on a figure of eight loops centred on Birmingham and stretching from London and Bristol in the South to Manchester, Leeds and Sheffield in the North. Extensions to York, Hull, Newcastle and Edinburgh have recently been completed and others are planned. Another service, Mercury 2100, is aimed at larger businesses. These are connected directly to the Mercury network (usually by a microwave link). Calls are cheaper than 2200 but you need at least 10 lines in London and around 30 outside this area to make it viable.

As a Mercury 2200 subscriber you gain access to the network via your ordinary BT line by dialling 131, which connects you to the local Mercury node. You then dial your personal identity code and the number

you want to call. The last two states require a tone-dialling telephone. The Mercury system then routes the call to its node nearest the point you are calling and sends it out on BT lines again. The procedure may sound a bit tortuous but it is simplified by the Mercury telephone — all you do is press a special blue button (which automatically dials 131 and sends your identity code) and the number you are calling. It does, however, add around 8-10 seconds to the time taken to make a call.

It is said that if your quarterly phone bill is over £100, then you will save money in the first year by becoming a subscriber. This covers the cost of the telephone (£40 incl VAT) and the identity code (£8.62 a year, including VAT). The phone is good value as it includes 50 memories and 'on hook' dialling as well as the Mercury access feature. You can, if you wish, dispense with your BT telephone if it is rented. If you have several phone lines, then Mercury will rent you a smart box which automatically diverts calls via Mercury without extension users needing to do anything. If most of your money is spent on local calls, then Mercury is of no use to you.

(For information on programming auto-dialling modems and software to use Mercury, see Computer Answers.)

Correction: The phone number for Marctel as printed in PCW May, page 174, is incorrect. It should be (01) 346 7150.

You can contact Peter Tootill electronically on: Telecom Gold 83: VNU202, Prestel 219991119, or CompuServe 72746,3202.

END

Days to date

The method used is not fast and it fails to take into account the absence of leap days in century years not divisible by four. However, the routine does the job intended and Stephen uses it in a printer listing program to include the date in a header to each page.

```

; STRUCTURAL CONCEPTS
; PROGRAM
;
; x = 0.
; y = radius.
; d = 3 - 2 * radius.
; WHILE x<y
; {
;     CPOINTS (x,y).
;     IF d>=0

```

```

[
    d = d + 4 * (x - y) + 10.
    y = y - 1.
]
d = d + 4 * x + 6.
]
x = x + 1.
}
IF x=y
[
    CPOINTS (x,y).
]
]

;SYSTEM REQUIREMENTS
;PROCESSOR      Z80
;HARDWARE      Screen or other output device.
;SOFTWARE      "CPOINTS" - subroutine to plot points (x,y) = (DE,BC).
               CPOINTS should not change registers.
               To plot a full circle, CPOINTS must plot the points:
               (ox+x,oy+y), (ox+x,oy-y), (ox-x,oy+y), (ox-x,oy-y),
               (ox+y,oy+x), (ox+y,oy-x), (ox-y,oy+x), (ox-y,oy-x),
               where (ox,oy) is the centre of the circle.

;PROGRAM DETAILS
;INPUT          BC = radius, 0 to 7900H (see I/O ERRORS).
;OUTPUT         None.
;STATE CHANGES Circle plotted to output device.
               All registers and flags unchanged.
;I/O ERRORS     Radius > 7900H may cause 16-bit overflow problems.
;OPTIMISATION   None.
;INTERRUPT EFFECT May be interrupted and re-entered.
;LOCATION NEEDS  Not specific. Relocatable. PROMable.
;PROGRAM BYTES  67
;STACK BYTES    12 or (10 + CPOINTS stack use).
;CLOCK CYCLES   Not given.

ARC45  PUSH AF          ;Save registers used          F5
       PUSH BC          ;in ARC45.                  C5
       PUSH DE          ;                          D5
       PUSH HL          ;                          E5

       LD DE,0          ;DE is x. Initialise x = 0.   11 00 00
       LD HL,3          ;HL is d.                   21 03 00
       AND A            ;BC is y and also radius.    A7
       SBC HL,BC        ;Initialise d = 3 - 2 * radius. ED 42
       AND A            ;                          A7
       SBC HL,BC        ;                          ED 42

LOOP   PUSH HL          ;Save d while using HL in     E5
       LD H,D           ;comparison x-y.             62
       LD L,E           ;                          6B
       AND A            ;                          A7
       SBC HL,BC        ;                          ED 42
       POP HL           ;Restore d to HL.            E1
       JR NC,FINAL      ;If x>y then exit LOOP.      30 22

       CALL CPOINT      ;Plot 8 corresponding points. CD 10 h1

       PUSH DE          ;Save x while using DE.      D5
       BIT 7,H           ;If d<0 then deal           0B 7C
       JR NZ,NEGATIV    ;with d negative.           20 0C

       EX DE,HL         ;Else DE = x - y.           EB
       AND A            ;                          A7
       SBC HL,BC        ;                          ED 42
       EX DE,HL         ;                          EB
       DEC BC           ;                          0B
       PUSH BC          ;Save y while using BC.      C5
       LD BC,10         ;to add 10 to d.             01 0A 00
       JR BYFOUR        ;                          18 04

NEGATIV PUSH BC         ;Save y while using BC      C5
       LD BC,6          ;to add 6 to d.             01 0A 00

BYFOUR  ADD HL,BC       ;If d>=0 then               09
       ADD HL,DE         ;then d = d+4*(x-y)+10     19
       ADD HL,DE         ;(and y decremented)       19
       ADD HL,DE         ;else d = d+4*x+6.         19
       POP BC            ;Restore y to BC.           C1
       POP DE            ;Restore x to DE.           D1
       INC DE            ;x = x + 1 every loop.      13
       JR LOOP          ;Repeat until arc completed. 18 05

FINAL  CALL 2,CPOINT    ;Plot any x=y points.       CC 10 h1

       POP HL           ;Restore all registers      E1
       POP DE            ;used in ARC45.            D1
       POP BC            ;                          C1
       POP AF            ;                          F1
       RET              ;Exit circle completed.      C9

```

Z80 wipeout

Kim Bastin of Stockholm offers the following information on the Z80 block transfer instruction, LDIR.

I was modifying a public-domain encyphering program and planned to have it end with a "silent bang" by filling the TPA with RST 0 instructions (code 0C7H), thus overwriting any memory copy of the encyphered file and then executing a warm boot. Accordingly, I wrote the short code sequence RESTO

the portion of memory from 100H to the first byte of the LDIR instruction but no further. Yet a warm boot occurred as planned.

Evidently the LDIR instruction is refetched from memory on each iteration. When its first byte is overwritten with the code 0C7H, the instruction RST 0 is fetched and executed instead. Presumably LDDR, CPIR, CPDR, INIR, INDR and OTDR are also refetched in the same way until the counter reaches zero.

Since there was no necessity to overwrite the entire TPA, just the portion above the encyphering program, I settled for the sequence RESTWB (Fig 2).

One could also implement something along the lines of the original plan by placing LDIR in the top two bytes of the TPA and jumping to it with location (0100h) = 0C7H, HL = 100H, DE = 101H and BC = 0. This would fill the entire TPA and then reboot when LDIR was overwritten.

Fig 1

```

;
;... N.B. This doesn't work.
;
RESTO  LD BC,(6)          ;Get TPA end + 1 and subtract ED 4B 06 00
       DEC BC            ;101H by decrements to give 0B
       DEC B             ;BC = repeat count for all TPA. 05
       LD HL,100H        ;Source at start of TPA.      21 00 01
       LD DE,101H        ;Destination at start + 1.   11 01 01
       LD (HL),0C7H      ;Source = "RST 0", propagate 36 C7
       LDIR              ;RST 0 through entire TPA     ED 80
;
ENDCODE
;
;then warm boot from here.
;

```

Fig 2

```

;
;... N.B. This works.
;
RESTWB LD DE,CODEEND      ;Point to 1st destination byte. 11 10 h1
       LD HL,(6)          ;Get TPA end + 1 and       2A 06 00
       OR A               ;(clear Cy for SBC)        E7
       SBC HL,DE          ;calculate byte count above ED 52
       LD B,H             ;program and copy into BC   44
       LD C,L             ;as repeat counter.        4D
       LD HL,RESET        ;Point to source value and 21 10 h1
       LDIR              ;propagate to end of TPA.    ED 80
;
RESET  RST 0.             ;Copy, then warm boot.      C7
CODEEND
;
;Program + 1 address.
;

```

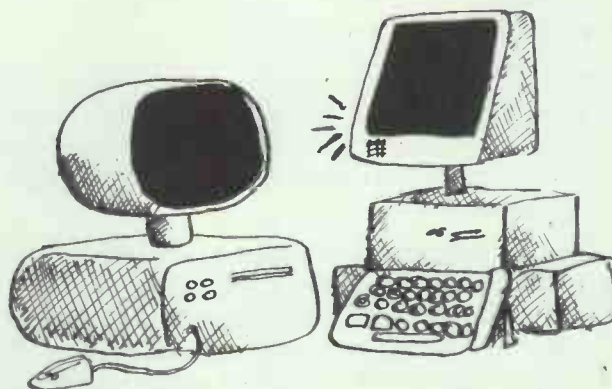
Memory wipeout challenge

It would be interesting to see the shortest and/or fastest solutions to Kim's wipeout problem in all codes, given the following conditions:

- (1) The program must overwrite all user memory and terminate with a warm boot, or reset.
- (2) After overwrite, entry at any point in user memory

must cause only a warm boot or reset.
 (3) Either the start or end address of user memory (or both) must be read from system parameters.
 (4) The program must originally reside in user memory but not necessarily at any specific address.

END



'How about going back to my place and getting networked?'



AGAINST THE IBM CLONE We Create the Competitive Edge

JEC-3233 is an enhanced personal computer which is characteristic of its new design. By using ASIC and SMT technology, we represent the system in CPU card design to achieve the smallest package with the greatest performance, and offer you the best advantages:

- 1) Enhanced performance and expansion functions.
- 2) Various options supported with full compatibility.
- 3) A practical system for business networking and management.
- 4) The most competitive price in the market.
- 5) Compact footprint enhances working space and reduces delivery costs.
- 6) Easily maintained and transported.

JEPSSSEN Enterprise offers a full range of enhanced PC products including PC/XT system, PC/AT system and their add-on cards such as video display cards, multi I/O cards, disk drive controllers ... and many others

Our R & D team constantly offers new products to keep ahead of the market and accepts designs from the customers. We will meet your requirement in design, production and service. Most of all, we guarantee the strictest quality control from our production line.

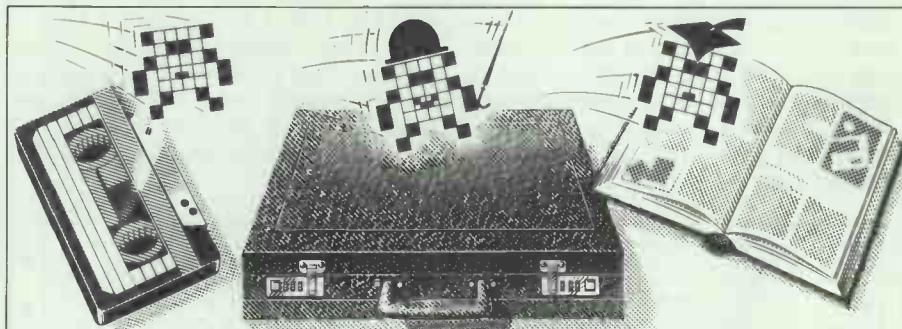
JEC-3233 AT A GLANCE

Microprocessor	80286 10MHz (option 12MHz) with one wait state - Optional 80287 Math co-processor
Memory (RAM)	1MB standard
Permanent Memory (ROM)	128K standard
Storage Devices (Optional)	- One 5-1/4" half-height 1.2MB high density FDD - One 5-1/4" half-height 360KB FDD - One half-height 20MB HDD
System Expansion	Seven expansion slots
Standard Port	- Parallel printer port - RS-232C serial port - Game port - Built-in real time clock
Display	- Standard monochrome display - Optional color display
Software Supported	- Operating system: - MS-DOS 3.1, CP/M86 - Xenix 286 version - Programming languages: - GW-BASIC, PSCAL C, any other IBM PC/AT compatible language - Existing standard application software base: - Autocad, Framework... etc.
Dimensions/Weight	16cm(H) x 31cm(W) x 42cm(D). 10 Kgs (22 lbs.)

IBM PC/XT/AT are registered trademark of the International Business Machines Corporation. MS-DOS, GW-BASIC are registered trademarks of Microsoft Corporation. CP/M-86 is a registered trademark of Digital Research Inc.

JEPSSSEN ENTERPRISE CO., LTD.
Manufacturer/Exporter

ROOM 1105, NO. 415, HSIN-YI RD., SEC. 4, TAIPEI, TAIWAN, R. O. C.
P.O. BOX: 43-71 TAIPEI TEL: (02) 7069137-8, 7068694-5
TELEFAX: 886-2-7069879 TLX: 14296 JEPSSSEN



-  Games
-  Scientific/mathematic
-  Business
-  Toolkit/utilities
-  Educational/Computer Aided Learning

To be precise

Owen Linderholm's introductory feature gives ideas on how greater accuracy can be obtained from numerical calculations on a computer, plus there's this month's selection of readers' programs.

One problem that many people encounter when performing numerical calculations on a computer is obtaining sufficient accuracy from these calculations. Mike Mudge in his 'Numbers Count' column has undoubtedly had many readers cover this ground far better than I can. However, my purpose in this month's programming tip is not to produce the most efficient algorithm, but merely to produce a working algorithm while illustrating how it works.

The problem with arithmetic in standard computer languages such as Basic is that numbers are represented by bytes in the computer's memory. A typical technique is to use four bytes for real numbers, one

for the exponent and three for the mantissa. The mantissa represents the digits of the number — for example, 31415926... in PI. The exponent represents the number of powers of ten of the number; or, in other words, where the decimal point goes.

The number is thus stored as 314159 coded into binary in three bytes and 0 for the exponent stored in one byte, representing 3.14159×10^0 . If more bytes were available to store the number, then the number of digits represented in the mantissa could be expanded to give higher precision. Obviously, since the number is crammed into four bytes, it cannot represent a wide range of real numbers so the precision is limited.

The purpose of precision

Why would you want to do arithmetic to more than eight decimal places? If you're a millionaire you might want to do your accounting down to the last penny, to the greatest accuracy. For the rest of us paupers, the most common use is to make a computer solve mathematical problems, which is why Numbers Count readers would be particularly interested.

There are various ways around this problem, but all result in a significant loss in speed. You have to create a new way of storing high-precision numbers and write new routines for all the standard arithmetical functions to operate on the high-precision numbers. A typical size that is used is 255-digits accuracy, compared with the 8, 12 or 16 in most ordinary computer languages.

There are various techniques for storing high-precision numbers. The most common is to store numbers as strings and then operate on them, and perform calculations in exactly the same way as people do in long-hand. The disadvantage of this technique is that the length of strings is limited and, therefore, the precision possible with this technique is limited.

Another possibility is to use arrays. With care, the precision possible is only limited by the storage space available. The problem is that the technique is complicated and is wasteful of storage space.

In my program I have chosen to use the string technique. The program is to add and subtract numbers

PCW is interested in programs written in any of the major programming languages for all home and small business micros. When submitting programs please include a cassette or disk version of your program, brief but comprehensive documentation, and a listing on plain white paper — typed if you have no printer. Please ensure that the software itself, the documentation and the listing are all marked with your name, address, program title, machine (along with any minimum requirements) and — if possible — a daytime phone number.

Check through the previous Program Files to see the kind of programs we prefer. As a rough guide, 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 (remember that other readers have to type them in). All programs should be fully debugged and your own original, unpublished work. We prefer to receive programs with a maximum 80-column width printed in emphasised typeface. If possible, please include printed sample output.

We will try to return submissions if they are accompanied by a stamped, addressed envelope of the appropriate size, 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 the Program of the Month.

Send your contributions to Owen Linderholm, Program File, PCW, 32-34 Broadwick Street, London W1A 2HG.

PROGRAM FILE

of infinite precision, although in practice this is limited to the maximum string length available in your Basic. Multiplication and division are more complicated and will be covered within the next few months.

The technique

First, input numbers are 'normalised'. This involves making sure that the strings are of the same length and that the number of digits before and after the decimal point is the same. A sign is also added to the front; this lines up corresponding digits in the numbers which, in turn, makes processing them simpler. In order to pad out the numbers, zeros are added.

When normalised, addition becomes a simple problem, solved by repetitively adding pairs of digits and looking after a carry if there is one. The only problem is with the sign of the numbers, which is dealt with by sorting it out first and turning the calculation into a subtraction if necessary. For example, $10 + -4$ is really $10 - 4$, a subtraction.

Subtraction is much more difficult. There are really two cases: the first is when the number being taken away is smaller; the second when it is larger. In the former case, it is simple enough to do subtraction in the same way as addition — a digit at a time while looking after the carry. This, however, doesn't work in the second case.

In the first case, the result is obtained by taking the second digit from the first and adding 10 if the result is negative. If you consider $2 - 9$, you can see that this won't work. $2 - 9$ equals -7 , then add 10 to get 3, which is *not* the right answer.

The solution is to look at the carry. Whenever the result of a subtraction is negative, as in the above case, the carry is set to 1. If the result is positive, it is set to 0. If, after the last subtraction, the carry is set to 1, the result should be negative so some action must be taken. In fact, you need to take the 'nine's complement' of the number. This involves going through the number digit by digit and subtracting each digit from 9. When this is done, add 1 to the result. This gives the final answer to the subtraction.

The above method sounds complicated, so let's try it with an example. $10 - 1413$ becomes $+0010 - 1413$ when normalised. The result of this after normal subtraction is 8597 with the carry set to 1. The nine's complement of this number is 1402 and adding 1 gives the nine's complement of this number is 1402 and adding 1 gives 1403. The final part of the process is to put a minus sign in front to give -1403 , the right answer.

Neither of the two routines has

been optimised and there is a great deal of room for improvement. There was one persistent bug which I managed to iron out, which applied to adding 1 to the nine's complement. The 1 has to be added to the right-most digit and I was, initially, simply adding 1 to the number. If, however,

the number was something like 0.11110, then I was getting 1.1110 as the result rather than the correct answer. The problem was solved by normalising 0 with the result and then changing the last digit to a 1, with a little adjustment for the decimal point.

```

REM/Program to add and subtract numbers to infinite
REM/precision by performing operations on the numbers as
REM/strings. Main program inputs two strings which are
REM/assumed to be numbers and a command to add or subtract
REM/them. It then calls the appropriate routine and repeats.
REM/Variables used:
REM/  N1$,N2$ - the two numbers to add or subtract.
REM/  R$ - the result.
REM/  I$ - temporary command string.
REM/  P1,P2 - position of decimal point in the two numbers.
REM/  I - temporary loop variable.
REM/  A1,A2 - number of digits after decimal point in 2 nos.
REM/  C - carry
REM/  D1$,D2$ - individual digits in nos as strings.
REM/  R1,R - temporary result values.
REM/  T$,T1$,T2$ - temporary storage strings.
REM/  D1 - temporary digit value.
1000 PRINT "Enter number 1: "; INPUT N1$
1010 PRINT "Enter number 2: "; INPUT N2$
1020 GOSUB 2000
REM/Normalise routine.
1030 INPUT "(A)dd or (S)ubtract: "; I$
1040 IF I$="A" THEN GOSUB 3000 ELSE GOSUB 4000
REM/3000 - Addition routine, 4000 - Subtraction routine.
1050 PRINT "Number 1 normalised was: "
1060 PRINT N1$
1070 PRINT "Number 2 normalised was: "
1080 PRINT N2$
1090 PRINT "Result: "
1100 PRINT R$
1110 GOTO 1000

```

```

REM/Normalise routine. This makes the two strings N1$ and
REM/N2$ the same length and ensures that they have the same
REM/number of digits before and after the decimal point.
REM/If either number has a sign then ignore it, otherwise
REM/add a plus since plus is usually assumed.
2000 IF LEFT$(N1$,1)="/" OR LEFT$(N1$,1)="/" THEN 2020
2010 N1$="+"N1$
2020 IF LEFT$(N2$,1)="/" OR LEFT$(N2$,1)="/" THEN 2040
2030 N2$="+"N2$
REM/Next section finds the decimal point in N1$ if there is
REM/one. If not it sticks one on the end.
2040 P1=0
2050 FOR I=1 TO LEN(N1$)
2060 IF MID$(N1$,I,1)="/" THEN P1=I
2070 NEXT I
2080 IF P1=0 THEN N1$=N1$+"." : P1=LEN(N1$)
REM/Next section does decimal point for N2$.
2090 P2=0
2100 FOR I=1 TO LEN(N2$)
2110 IF MID$(N2$,I,1)="/" THEN P2=I
2120 NEXT I
2130 IF P2=0 THEN N2$=N2$+"." : P2=LEN(N2$)
REM/This line finds the number of places after the
REM/decimal point.
2140 A1=LEN(N1$)-P1 : A2=LEN(N2$)-P2
REM/Fill N1$ before d-p with zeros to length of N2$.
2150 IF P1>P2 THEN 2190
2160 FOR I=1 TO P2-P1
2170 N1$=LEFT$(N1$,1)+"0"+RIGHT$(N1$,LEN(N1$)-1)
2180 NEXT I
REM/Fill N2$ before d-p with zeros to length of N1$.
2190 IF P2>P1 THEN 2230
2200 FOR I=1 TO P1-P2
2210 N2$=LEFT$(N2$,1)+"0"+RIGHT$(N2$,LEN(N2$)-1)
2220 NEXT I
REM/Fill N1$ after d-p with zeros to length of N2$.
2230 IF A1>A2 THEN 2270
2240 FOR I=1 TO A2-A1
2250 N1$=N1$+"0"
2260 NEXT I
REM/Fill N2$ after d-p with zeros to length of N1$.
2270 IF A2>A1 THEN 2310
2280 FOR I=1 TO A1-A2
2290 N2$=N2$+"0"
2300 NEXT I
2310 RETURN

```

```

REM/Addition routine. Adds numbers in N1$ and N2$ and puts
REM/result in R$. This is done by first checking it should
REM/be an addition, then repetitively adding the digits and
REM/any carry. Finally, check if there is a carry at the end
REM/and add it in as an extra digit.
REM/The following line checks to see if the addition should

```

Program of the Month Macintosh Worm Plotter

by Jack Weber

About one hundred million years ago, simple worms crawled through the sediment of an ancient sea floor. Their soft bodies left no fossil remains but they did produce one indirect record of their activities — the winding paths they excavated through the mud have, in places, been preserved as 'trace fossils'.

Far from random, these fossil worm paths display intricate patterns that have intrigued palaeontologists, mathematicians, biologists and computer programmers. Their interest was aroused by the realisation that these worms were following very simple sets of rules yet managing to solve, very flexibly, the complex problem of how to cover a patch of nutrient in an efficient manner. Leaving out a region, re-tracing a path or simply heading too far from the feeding patch are all wasteful and to be avoided; but finding a simple behaviour pattern that meets all these needs is quite a challenge.

Most of the computer work on worm paths was done some fifteen years ago, although they were first commented on back in 1928. In the late 60s mathematicians became interested in creating various new designs of worms and examining the rules they might follow. This program allows us to simulate the activities of one such group called 'simple isometric worms', but the techniques used could be extended to many other types of worms.

The simple isometric worm

Whereas the creators of real trace fossils could turn through various angles, their computer cousins have usually been constrained to moving over a square grid (quadrille worms) or over a grid with three axes at 60° angles (isometric worms). At each node of the grid, a quadrille worm has three possible paths ahead of it; an isometric worm has five. As it moves around this grid, the worm leaves behind an eaten path which it may cross but never retrace. A basic distinction is between 'look-ahead' worms which can count the number of eaten segments at the nodes ahead and select their direction accordingly, and 'simple' worms which just respond to the distribution of eaten and uneaten segments at their present position.

The simple isometric worm moves one segment at a time and sees how many segments at its new node have already been eaten. If all five have gone, it has no way to move

```

• REM/really be a subtraction.
3000 IF (LEFT$(N1$,1)="-" XOR LEFT$(N2$,1)="-") THEN 3120
• REM/Initialise carry then repetitively add digits. Skip if
• REM/d-p or sign. Add result to R$.
3010 R$="":C=0
• 3020 FOR I=1 TO LEN(N1$)
3030 D1$=MID$(N1$,LEN(N1$)-I+1,1)
• 3040 D2$=MID$(N2$,LEN(N2$)-I+1,1)
3050 IF D1$="." OR D1$="+" OR D1$="-" THEN R$=D1$+R$:GOTO 3090
3060 R1=VAL(D1$)+VAL(D2$)+C
• 3070 IF R1>9 THEN R1=R1-10:C=1 ELSE C=0
3080 R$=RIGHT$(STR$(R1),1)+R$
• 3090 NEXT I
• REM/If carry left over, then add in a 1 at start after sign.
3100 IF C=1 THEN R$=LEFT$(R$,1)+"1"+RIGHT$(R$,LEN(R$)-1)
• 3110 RETURN
• REM/Arrive here if it should have been a subtraction. Sort
• REM/out signs and call subtraction routine to get result.
3120 IF LEFT$(N1$,1)<>"-" THEN 3160
3130 T$=N1$
• 3140 N1$=N2$
3150 N2$=T$
• 3160 N2$=""+RIGHT$(N2$,LEN(N2$)-1)
3170 GOSUB 4000
• 3180 RETURN

• REM/Subtraction routine. Operates in a similar manner to the
• REM/addition routine except that the procedure at the end if
• REM/the carry is set is more complicated.
• REM/The following line checks if it should really be an
• REM/addition.
4000 IF (LEFT$(N2$,1)="-" OR LEFT$(N2$,1)="-") THEN 4130
• REM/Initialise carry, then repetitively subtract digits and
• REM/put results in R$, setting carry if necessary. Skip if
• REM/character is d-p or sign.
4010 R$="":C=0
4020 FOR I=1 TO LEN(N1$)
4030 D1$=MID$(N1$,LEN(N1$)-I+1,1)
4040 D2$=MID$(N2$,LEN(N2$)-I+1,1)
4050 IF D1$="." OR D1$="+" THEN R$=D1$+R$:GOTO 4080
4060 IF VAL(D1$)<(VAL(D2$)+C) THEN R1=10+(VAL(D1$)-VAL(D2$)-C):C=1
• ELSE R1=(VAL(D1$)-VAL(D2$)-C):C=0
4070 R$=RIGHT$(STR$(R1),1)+R$
• 4080 NEXT I
• REM/If carry not set then skip, otherwise do 9's complement.
4090 IF C>1 THEN 4190
• REM/Do 9's complement in similar repetitive way to
• REM/subtraction.
4100 T$=R$:R$=""
4110 FOR I=1 TO LEN(T$)
4120 D1$=MID$(T$,I,1):IF D1$="." OR D1$="+" THEN 4150
4130 D1=VAL(MID$(T$,I,1))
4140 D1$=RIGHT$(STR$(9-D1),1)
4150 R$=R$+D1$
• 4160 NEXT I
• REM/Do addition of 1 to last digit by converting 0 to
• REM/normalised form and changing last digit to 1 and adding.
4170 T1$=N1$:T2$=N2$:N1$=R$:N2$="0":GOSUB 2000
4180 IF RIGHT$(N2$,1)="-" THEN N2$=LEFT$(N2$,LEN(N2$)-2)+"1."
• ELSE N2$=LEFT$(N2$,LEN(N2$)-1)+"1"
4190 GOSUB 3000
• REM/Finally, sort out sign.
4200 N1$=T1$:N2$=T2$:R$=""+RIGHT$(R$,LEN(R$)-1)
4210 RETURN
• REM/If subtraction should have been an addition, then sort
• REM/out signs and call addition routines.
4220 IF LEFT$(N2$,1)="-" THEN N2$=""+RIGHT$(N2$,LEN(N2$)-1):GOTO 4240
4230 IF LEFT$(N1$,1)="-" THEN N2$="-"+RIGHT$(N2$,LEN(N2$)-1)
4240 GOSUB 3000
• 4250 RETURN

```

This month's programs

Firstly, a blunder occurred in the BBC Hints and Tips section of Program File, PCW May. The key definition string should read: ... F.F%=&482TO&4F4S.2 ... My apologies to those who tried it and couldn't get it to work.

The Program of the Month is yet another by the prolific Jack Weber. This one is again for the Macintosh in Microsoft Basic, but the general idea should prove possible to adapt for other computers by any reasonable programmer. The program is on the subject of worm (write once read many) tracks. This may not sound very exciting, but is in fact concerned with generating complex, repetitive patterns.

The accompanying documentation is a perfect example of what I would

always like to receive. It is, however, very long and I would ideally like to see shorter programs and routines which are presented in the same impeccable manner.

The second program is an unusual one and marks the debut of a new machine in Program File — the Psion Organiser. The program is to play a simplified version of Space Invaders. For the BBC there is a drawing program based on icons and pointers, called Artwork.

Other programs featured this month are a BBC Micro tip which goes some way to solving the problems generated by the machine's assembling source program and its assembled object code; plus, also for the BBC there's Drop-Out, a computerised version of Milton Bradley's two-dimensional matrix-lever game.

PC-SIG LIBRARY

Over 700 disks

ALL DISKS £6 — END JUNE 30TH

**Finally, Software
you don't have
to be rich to own**

We're ISD, UK's Sole Authorised Distributor for PC-SIG. We offer the world's largest library of public domain and user supported software, (whose authors request a donation from satisfied users). Only £6 per disk, you buy software that's been selected from leading authors, thoroughly analysed and professionally supported.

- ☐ 499 PROCOMM Professional communications programme written in compiled MicroSoft C and assembly code.
- ☐ 523 SIDE WRITER Perfect for spreadsheets, this application prints text files sideways.
- ☐ 528 NEW YORK WORD Powerful word processing with split-screen editing, mail merge, auto hyphen, and more.
- ☐ 574 FREECALC Word Processing and spreadsheet application for forecasting and budgeting.
- ☐ 78 PC WRITE Our most popular word processor. "I'm more at ease with PC WRITE than WordStar".
- ☐ 521 FREE FILE Easy-to-use and learn relational data base manager.
- ☐ 414 UNPROTECT Various routines to disconnect protection schemes.
- ☐ 522 INSTANT RECALL Memory-resident programme for storing and retrieving a wealth of information.
- ☐ 417 PROLOG VERSION 1.9 complete with editor and documentation.
- ☐ 405 DESKTEAM Desk organisational tool with phone dialer, notepad, calendar, and calculator.
- ☐ 478 HARD DISK UTILITIES The best and most useful utilities for the hard disk user.
- ☐ 133 ULTRA UTILITIES A must for every PC owner. For recovering lost or accidentally erased files.
- ☐ 558 PC-PROMPT A memory resident help utility that provides formatting for DOS commands online.
- ☐ 429 ELEMENTARY C Application for learning C Language.
- ☐ 424 PAŞCAL COMPILER Popular compiler written in Turbo Pascal.
- ☐ 423 PROJECT MANAGEMENT PC management system capable of handling 1000 tasks.
- ☐ 404 EZ-FORMS Programme for generating tailor-made forms.
- ☐ 398 ESIE EXPERT SYSTEM Artificial intelligence shell to build a custom knowledge base.
- ☐ 480 PC OUTLINE Like Thinktank, this is a great way to organise, outline, and classify ideas.
- ☐ 515 THE DRAFTSMAN Create data graphs or slide shows from Lotus 1-2-3, Symphony, or Visicalc.

STARTER SPECIAL

☐ QUICK START EVERYTHING
FOR THE NEW USER, includes

CATALOGUE LISTING OVER 600 DISKS

403 COMPUTER TUTOR 5 PC FILE III
78 PC WRITE 273 BEST UTILITIES
199 PC CALC 476 PATRICK'S BEST
405 DESKTEAM GAMES

£70 VALUE — ONLY £40

Only £6 per disk

QTY	DESCRIPTION	PRICE	VALUE
	DISKS		
	QUICK START	40.00	
	SHIPPING		2 00
ENCLOSE CHEQUES ONLY WITH NAME, ADDRESS & TELEPHONE NO.		SUB TOT	
		VAT	
		TOTAL	

ISD INTERNATIONAL SOFTWARE DISTRIBUTORS LTD.
P.O. Box 872, Sutton Coldfield, West Midlands B75 6UP
021-378 2229

DEALER ENQUIRIES WELCOME | MEMBERSHIP AVAILABLE
SOLE UK AUTHORISED PC-SIG DISTRIBUTOR

PROGRAM FILE

and dies. If four have gone, there is only one way to continue. If fewer than four are eaten, then the rule that governs its behaviour tells it which of the available paths to take. It is this rule that distinguishes the different worms, from the trivially simple to the infinitely complex.

At first sight it would seem that every possible arrangement of eaten and uneaten paths must be allowed for in the rule, but in fact we can exclude many of them. Consider first what happens when the worm is at a node that has never before been visited. There are five uneaten paths to choose from. We can ignore the path straight ahead because that simply sends the worm heading off towards the horizon in an endless straight line. That leaves us with the choice of a sharp turn or a gentle turn to either left or right; but left and right just produce mirror images of the same pattern, so we can decide to always go right and simply choose between a sharp or a gentle turn.

We know that the worm will never encounter a node with two eaten paths lying in a straight line. Similarly, if it is a 'gentle' worm it will never encounter a node where only two eaten paths form a sharp turn, and

vice versa. This allows us to lump together certain options because no worm can ever have to choose between them. In fact, we find that there are two options at a node with five paths free; four options with four paths; nodes with three paths divide into four sub-fields with three options each; and there are two options where two paths are free. Michael Beeler of the Massachusetts Institute of Technology has drawn up a standard table of these choices (Fig 1) and a notation to describe them. The four main fields are numbered 1 to 4 (corresponding to 5,4,3 & 2 uneaten paths) and each choice within a field is denoted by a letter; field three has four sub-fields so it needs four letters. A typical worm rule would be written like this — 1a2c3acba4a, showing which choice applies to each field. This program follows Beeler's conventions.

Worm's eye view

At every node that it reaches, the worm must look around to check the number and arrangement of eaten paths. This presents some interesting programming problems because the worm's eye view is always relative to the direction it is currently facing; so,

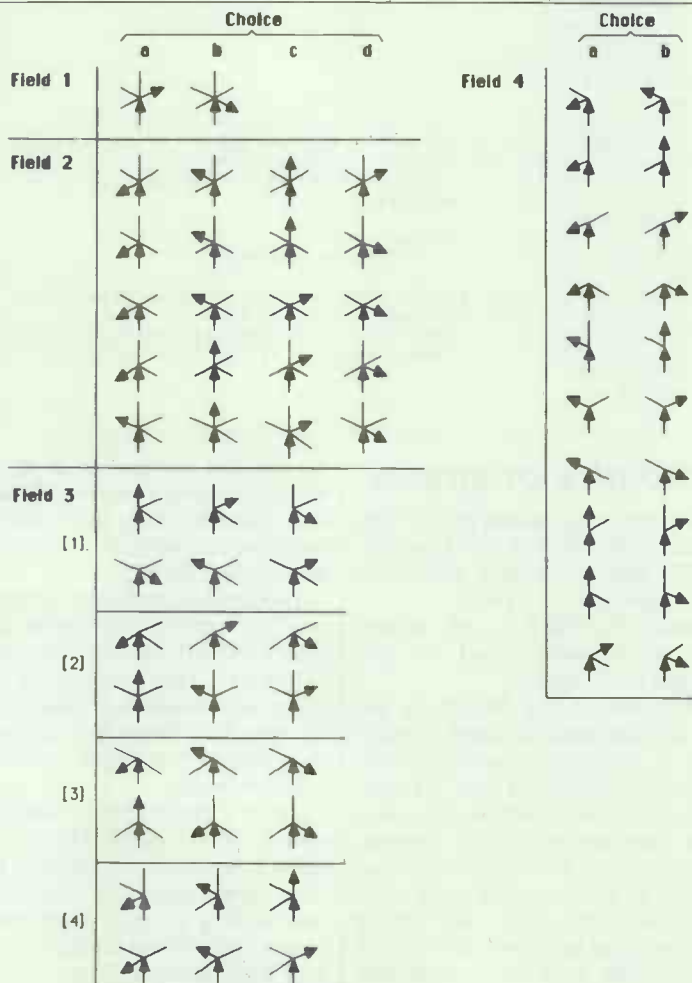


Fig 1 Choices available in each of the four fields

PROGRAM FILE

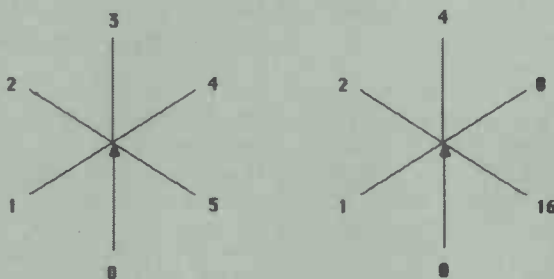


Fig 2 Path numbers and their weighted values

the layout of paths that radiate from that particular node on the screen must, in effect, be rotated to compensate for the way the worm is pointing. This is done by using two techniques — modulo-6 arithmetic and a system of weighted values for each path.

The six paths that radiate from every node are numbered [0..5] clockwise, starting from the path vertically below the node (Fig 2). The subroutine 'Plot' calls one of the 'Scan' subroutines to check pixel values at a point on each of these six paths and puts the values into an array. At the very least, one of these paths will be eaten because it will be the one by which the worm has just arrived. Its number is available in the variable 'direction%'; so, if direction% = 2, then the worm has come in from the upper left.

In order to see how the worm views the pattern stored in the array, we need to create a temporary, new numbering system in which path zero is the one just used by the worm and the rest go clockwise from there. This is done in the line:

$j\% = (6 + i\% - \text{direction}\%) \text{ MOD } 6$
where $i\%$ is the normal path number and $j\%$ is its value relative to the worm. So, for example, if direction% = 4, then path 5 in our global view becomes $(6 + 5 - 4) \text{ MOD } 6 = 1$ in the worm's view. And similarly, all the other paths will be correctly counted clockwise from the worm's current direction.

Having converted to the worm's view, we must now represent the pattern that it sees in a way that uniquely identifies every possible combination of eaten and uneaten paths. This is done by assigning weighted values to each path and adding up the values of all paths that have been eaten. We can ignore the path just consumed, so its value is zero. The others [1..5] are given values 1,2,4,8,16. If all five have been eaten, the sum is 31; every number below this represents a unique arrangement. Because having to calculate 2^5 five times at every node would slow the program unacceptably, the array 'p%(n)' is set up to store the weight-

ed values as a look-up table. Another array, 'a%(s)', holds the number of the path to be taken for each sum from zero to thirty. Again, this is rotated by modulo-6 arithmetic to allow for the worm's current direction; the variable 'drawpath%' is set to the path (in our global view) that must be drawn next and direction% is updated.

The program draws the worm's progress at a healthy speed of over 500 segments per minute until a sum of 31 is encountered, showing that the worm has reached the end of the line. A little thought reveals that this will happen only when the worm returns to its starting point for the third time. Every other node will have 0,2,4 or 6 paths eaten, depending on how many times the worm has previously passed through it. Only the origin has an odd number of paths — 1,3 or 5 — and only on the third visit is this enough to kill the worm.

Four scales of plotting are available and the worm can be made to start anywhere on the screen. Both these facilities can help to keep a plot entirely within the screen area. If the worm does get too near the edge, the whole display will scroll by one third of a screen. Some worms will produce enormous plots that cover many screens, so a 'Birdseye View' option is available that will show, at any stage, the overall pattern scaled down to fit into the screen.

Operation & translation

As with all Macintosh programs, ease of use is achieved with pull-down menus, windows, buttons, and so on. On other machines the menu options could be put into function keys or, indeed, any keys, as the keyboard is not otherwise needed. The subroutine 'Algorithm', which is used for entering the rule that the worm will follow, employs edit fields and buttons but could just as easily use INPUT statements. The subroutine 'Ruleload' which converts the rule string into an array of path numbers need not change. The 'Scaling' and 'Origin' subroutines can easily be converted to keyboard entry.

MICROMART

PACE ELECTRONICS

Why not increase the speed of your PC by using the 8087/80287 Numeric Data Processor

8087/2 (8MHz)
prices 1-10 PCS.....£135
80287/8 (8MHz)
prices 1-10 PCS.....£198

Upgrade your memory
256K DRAMS 256K x 1.....£1.85

All prices excluding VAT/P&P
If you purchase Super Calc 4/Ability/Smart we offer discount on 80 87 products. Competitive prices.

Pace Electronics offer the PC user technical support and advice on the above products.

PACE ELECTRONICS LTD
84 HIGH STREET, STONY STRATFORD,

MILTON KEYNES MK11 1AH
Tel: 0908 562664 Telex: 826679
PACE G

LOWEST PRICES FOR 3½" FLOPPY DISKS!

FROM £1.40

ATARI AND AMIGA COMPUTERS

RING FOR QUOTE OR
SEND S.A.E., FOR FULL LISTS

BARCLAY CARD +
ACCESS ACCEPTED

BERCOL SUPPLIES
26 BEAUMONT GROVE
ALDERSHOT
HANTS
GU11 1YH
TEL. 0252 312150

PUBLIC DOMAIN SOFTWARE

(For your IBM/PC, Amstrad, and all compatibles)

LATEST VERSIONS JUST ARRIVED FROM THE USA

Including: Databases, Word Processors, Languages, Compilers, Assemblers, Utilities, Disassemblers, Spreadsheets, Communications, Stock Control Programs, Accounts Packages, etc. All disks.....£5 each

PC Write 2.7!! (Shareware program)

This is the very latest version which includes: 2 documents on screen, 50,000 word automatic spelling checker, proportional spacing, special fonts, support for over 300 printers, including lasers, 45 turbo fast help screens. Disks contain 17 page Tutorial and 45 page Manual. Without doubt the most powerful WP available.

PC Write 2.7 Two Disks£10 the pair
(please include £1.50 for Post & Packing)

Learn to program the easy way!

We have programs to teach you how to program your PC in all the mainstream languages. Includes: BASIC, Assembler, Forth, Prolog, Pascal, 'C'. Comprehensive Tutorial included.

All for only £5 per disk!!

We also sell computer books — hundreds of titles in our range. Send large (A4 size) stamped addressed envelope for a copy of our giant catalogue.

THE LANGUAGE LABORATORY
55, FELTWEEL ROAD, SOUTHERY,
DOWNHAM MARKET, NORFOLK PE38 0NR

MICROMART

MEDIA CONVERSIONS

DISK/DISK • TAPE/DISK • TAPE/TAPE

We can transfer your data between over 1000 different Minis, Micros and Mainframes.

Tape

1/2" - 800, 1600, 3200, 6250 BPI
1/4" - QIC-11, QIC-24, (QIC-02).
DEC 'DOS', TAR, ANSI, CPIO, IBM Labelled/Unlabelled.

Floppy

8", 5 1/4", 3 1/2", 3" CPM, CPM86, MDOS, MSDOS, PCDOS, UNIX, XENIX, IDRIS, TAR, RT11, IBM, BEF, ISIS, FLEX, OS9, APPLE, ACORN, TORCH, VICTOR-SIRIUS, ATARI etc.

WP/Typesetting

Many formats including DISPLAYWRITER, OLIVETTI, WORDPLEX, LINOTYPE etc.

Overnight - Most formats returned by next day's post.



Prices from £10 per disk.
Usual terms C.W.O.
Ring or write for a full format list.

A.L.DOWNLOADING SERVICES

VOYSEYHOUSE
BARLEYAUX, WYPASSAGE
LONDON W4 3PT
01-994 5471

WE ARE IN COLOUR!!! COMPLETE BUDGET-PRICE COLOUR VIEWDATA TERMINALS

Deccafax colour terminals with 14" display for PRESTEL or other 1200/75 V23 systems

Deccafax Terminal 781/VP1

£108.75 inc VAT

or with 8-Channel Remote Control Colour TV and Teletext

Deccafax Terminal 780/VP2

£175 inc VAT

VP1 Plinths are new; other items are used but in good working order.

ALSO

Deccafax Plinth VP1 £19.95 inc VAT

Deccafax Plinth VP3 (RS232) £15.95 inc VAT

AND FOR MESSAGES OR TELEX VIA

PRESTEL:-

Alpha numeric Keyboard £63.00 inc VAT
Carriage on plinths, add £5, complete terminals according to distance.

S.a.e. for details to:-

M.E.M., 166 Maney Hill Road, Sutton Coldfield,
West Midlands, B72 1JW
Tel: 021-354 7375

BRANDED DISKS Incredible prices

All disks supplied in original packing
and fully guaranteed

Prices per box of ten

3 1/2" Verbatim Datalife	SSDD 135tpi MF 350	£21.75
3 1/2" Sony	SSDD 135tpi OMD3440	£19.45
3 1/2" Memorex	DSDD 135tpi MX3460	£24.30
5 1/4" Verbatim-Datalife	SSDD 48tpi MD525	£12.75
5 1/4" Verbatim Datalife	DSDD 48tpi MD550	£15.35
5 1/4" Verbatim Verex	SSDD 48tpi MD200	£11.00
5 1/4" Verbatim Verex	DSDD 48tpi MD250	£12.45
5 1/4" Maxell	DSDD 48tpi MD2-D	£15.00

All inclusive prices. No extra to pay.

Please make cheques or postal orders payable to:

ORIOLE LIMITED

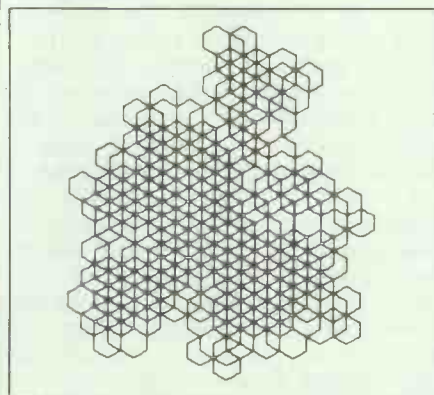
Government and educational orders welcome

Dept. PCW, P.O. Box 297, London N3 2TS

PROGRAM FILE

Two areas — scanning and scrolling — may present problems on other machines. The 'Scan' sub-routines look at pixels lying on the six paths around a node; they must, of course, be certain of hitting a line if it is there. According to their line-drawing algorithms, different machines may put the steps into a 60° line at slightly different places. Trial and error will be needed to find the correct point to use. Unfortunately some machines are inconsistent, in which case the only solution is to check more than one point to be certain of not missing a line.

The Macintosh contains very powerful routines to help with scrolling, but most computers should be able to move bit images around the screen and to save to disk any areas that are lost from view. The screen is treated as nine rectangular blocks [3x3] so that scrolling in any direction entails saving a row of three blocks and loading in another three on the opposite side. On the Macintosh, the bit maps of these blocks are put into integer arrays and saved as resources. Microsoft Basic cannot directly handle resource files but the Toolbox Library provided with Basic version 3.0 contains all the necessary routines. Note that the volume name 'MyDisk:' which appears in several places in the program will have to be changed to the actual disk name being used.



Path produced by worm 1a2a3aaaa4a

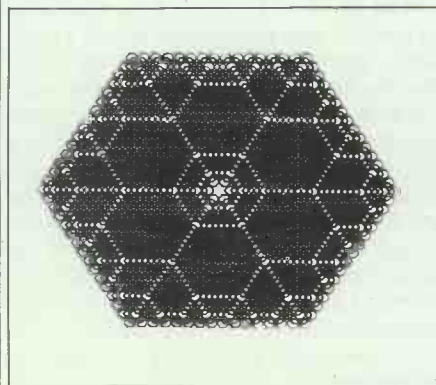
The resource IDs are kept in the array 'map%(x,y)'. This is dimensioned (27,45) so that the overall plotting area covers 9 x 15 screens, but there is no reason why it should not be made larger. The program keeps track of where it is by using the variables 'horiz%' and 'vert%' to hold the position of the screen's current centre block. Initially they are set to 14 and 23, which is the middle of the available plotting area. If you are not familiar with resources, studying the Toolbox manual that comes with MS-Basic as well as *Inside Macintosh Vol 1* should help to make them clear. Users of other machines will not have these facilities but can

probably adapt the system of using blocks and a block map to keep track of the files containing their screen images.

The Birdseye View option finds the farthest blocks that have been used left, right, up and down, and calculates from the overall extent of the plot a scaling factor that will reduce it to fit the screen. This is easy on the Mac because it will automatically draw images scaled up or down to any extent. Other machines may need some added calculation to cope with this.

Worm activities

There are 1296 simple isometric worms but many produce the same patterns so that only 299 distinct plots exist. The shortest is nine segments long, many are infinitely long, while the longest known finite path



Path produced by worm 1a2d3cbaa4b

lasts for 220,142 segments. It results from the rule 1a2d3cbac4b (use the smallest scale and be prepared to wait a few hours). Back in the early 70s, other paths were tested for millions of segments without it becoming clear whether they would ever reach an end; perhaps someone has resolved this since then or it may be waiting for a user of this program to attempt.

Taking these techniques as a starting point, it would be quite easy to explore other types of worm. Look-ahead worms would apply the scan routine to all five nodes that lie ahead; several interacting worms could be put together; and straight-ahead moves could be allowed if their number were restricted. There are many possibilities.

References

For further ideas, see:

Mathematical Games by M Gardner (*Scientific American*, November 1973, pp 116-123).

Fossil Foraging Behavior: Computer Simulation by DM Raup & A Seilacher (*Science*, vol 116, 21 November 1969, pp 994-995).

Tools For Thought by CH Waddington (Jonathan Cape, 1977).

PROGRAM FILE

- Worm Plotter
- © Jack Weber - April 1987
- Plots worm paths on an isometric grid
- Variable scale of plotting
- Movable origin
- Auto scrolling of large patterns
- Overall pattern can be viewed at any time

Runs on any Apple Macintosh under MS Basic v3.0 with Toolbox Library

```

ON BREAK GOSUB Quit
BREAK ON
GOSUB Initialise
GOSUB Algorithm
restart:
GOSUB Begin
MENU STOP
WHILE sum% < 31 AND flag% = 0
  GOSUB Counter
  GOSUB Plot
  MENU ON
  MENU STOP
WEND
MENU ON
WHILE flag% = 0
WEND
GOTO restart
END
  
```

```

Initialise:
DIM a%(31), map%(27,45), p%(5), rec%(3), screen%(1113), simp$(4), spot%(5)
  Declare name of file containing Toolbox Library routines for this program
  LIBRARY "MyDisk:Wormlib"
  CALL TEXTFONT (3)
  CALL TEXTSIZE (12)
  WINDOW 1,,(7,21)-(505,321),3
  WINDOW 2,,(7,324)-(505,339),3
  Put worm options into menu bar
  MENU 6,0,1,"Worm"
  MENU 6,1,0,"Change rule"
  MENU 6,2,0,"Change scale"
  MENU 6,3,0,"Move origin"
  MENU 6,4,0,"Birdseye view"
  MENU 6,5,1,"Quit"
  ON MENU GOSUB Menuhandle
  ON DIALOG GOSUB Dialoghandle
  Provide default scale and origin of plot
  scale% = 3
  xo% = 250: yo% = 150
  All variables used by Toolbox library routines must be initialised by Basic
  ld% = 0
  handle% = 0
  ref% = 0
  Create array of weights (0,1,2,4,8,16) for defining combinations of paths
  p%(0) = 0
  FOR i% = 1 TO 5
    p%(i%) = 2^(i%-1)
  NEXT
  Create and open a resource file and obtain its file reference number
  OpenResFile "MyDisk:Wormscreen",ref%
RETURN
  
```

```

Menuhandle:
  A menu selection has been made - find what it is and set flag to stop plot
  menunumber% = MENU(0)
  IF menunumber% < 6 THEN RETURN
  flag% = 1
  menuitem% = MENU(1)
  ON menuitem% GOSUB Algorithm,Scaling,Origin,Birdseye,Quit
  MENU
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 Dorfield
  
```

MICROMART

DUST COVERS
IN WASHABLE PROOFED NYLON FABRIC
FINISHED WITH TONING PIPING

NEW
IBM - System 2 dust covers

Monoscreen	£9.00
For other System 2 covers please enquire	
AMSTRAD PC 1512 dust covers	
2 Piece Cover	£9.00
Please state colour or green monitor	
IBM dust covers	
IBM PC	£9.00
IBM AT	£9.50
OLIVETTI M24, M28 dust covers	
Monoscreen	£9.00
Colourscreen	£9.50
APRICOT XEN dust covers	
12" Monitor	£9.00
Other dust covers	

BBD DUST COVERS are specialist manufacturers of high quality tailored dust covers. We make a wide range of covers for other Business computers, Printers, Photocopiers etc and we match printer covers wherever possible.

Make cheques payable to:

BBD COMPUTER DUST COVERS
The Standish Centre, Cross Street, Standish,
Wigan WN6 0HQ
Tel: (0257) 422968 Dealer enquiries welcome
XT 47. Access Visa

SECOND HAND SYSTEMS BUYING/SELLING

**APRICOT, APPLE, IBM,
SIRIUS, OLIVETTI,
XEN & TELEVIDEO . . .**

We buy and sell all types of
computer equipment
from Micros to Mainframes

*Cromwell Business
Computers*

**BARNWELL HOUSE, BARNWELL DRIVE
CAMBRIDGE CB5 8UJ**

Tel: (0223) 241446 Telex: 817847

KT COMPUTERS

**Micro AXt Compatible 6/8/10Mhz
8/12 opt.**

**640K RAM 20 Megabyte HD
1 Floppy 1.2 Megabyte DD
14" monitor MS DOS 3.2**

£1250

Dealer Price

250 Diskettes 96TPI Quote Density DS £125

Various IBM Compatible cards
Epson Printers, cables, Network etc.

Park Royal Business Centre,
9/17 Park Royal Road,
London NW10 7LJ.

Tel: 01 981 8746.

Telex 265 871 (Monrel G)
Quote Ref: 76 WKJ 241

PASCAL COMPILER ROM £19.95

Feed up with slow Basic? Want the speed of machine code without the hassle? Then why not try Pascal.
Our Pascal compiler is easy to use, suitable for the absolute beginner and produces Standard machine code which runs under AMSDOS. It supports: IF, THEN, ELSE, REPEAT, UNTIL, DO, WHILE, CASE, READ, WRITE, FOR, PROC, MEM, ARRAY, SHR, SHL, MOD, CONST, VAR, CALL, AND, OR, BEGIN, END, plus all the usual arithmetical operators etc.
The user manual, supplied with each copy, shows how to write programs, it contains dozens of programs to try out including serious software and games such as SPACE INVADERS.
Supplied on Eprom with User Manual only £19.95

EPROM EXPANSION BOARD £14.75

Models 4 EPROMS. Suitable for Maelstrom, Project etc. etc.
Specially designed circuit enables the use of any speed of Eprom. Top quality, silk screened PCB measures 7.5" x 1.2" and adapts with through edge connectors to allow the use of Disk II and other computers.
Complete kit of parts, with instructions to build it yourself £14.75 inc P&P.
Ready built and tested only £19.95 inc.

EPROM PROGRAMMER £36.95

Why not transfer your favourite programs onto Eprom. The unit enables the user to program 2764 (8K) or 27128 (16K) Eproms. The unit is completely self contained in a small impact resistant case. It plugs directly into the expansion bus (near of Amstrad) no external power supply is required. The software is supplied on floppy. Run to Rom, Rom to Rom, Rom to Disk, Disk to Rom, Editing, Verification, Single location of Block programming, A BASIC to ROM program is also supplied which will convert a Basic program and add your RS# name. The program once placed in Eprom will be available at switch on and will run via the RS# name.
EPROM PROGRAMMER Unit with software and 12 months guarantee. Only £36.95 inc P&P.
Now available in kit form with through edge connector (untested) only £30.25. Blank Eproms 27128 (16K) at £3.75 each.

ALL ITEMS ADVERTISED ARE AVAILABLE NOW, AND RUN ON 464/664 AND 6128 MACHINES

Cheques, P/O's made payable to:

JOHN MORRISON

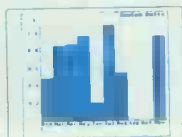


4 Rein Gardens, Tingley, W. Yorkshire WF3 1JR

Tel: (0532) 537 507

Return of good service on Access or P/O's please allow 3 days for cheques.

Send large s.s.a. for further information on the above products.



Can your Database do this?

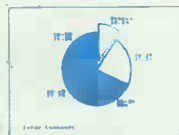
Ours couldn't either so we linked it to ViewPlot, ViewSheet, View, Interchart, Intersheet, Interword and Wordwise+.

We also have further utilities which include MAILSHOT for mail-merge and up to 4 across labels, REPORTER for simple or complex reports, including totals, averages etc.

Send now for further details of SYSTEM DELTA Card Index, Inter/View Link, Mailshot or Reporter.
Verticle Market applications also available.



MINIRVA SYSTEMS
69, SIVILL STREET
ENLIS, EN4 0PL
Tel: 0392 37756



MS-DOS FLEX UNIFLEX OS-9 OS-9/68K CROSS ASSEMBLERS

A suite of cross assemblers supporting the following devices:

1802 1805 6303 6502 6503 6800 6801
6802 6803 6804 6805 68HC05 146805
6808 6809 68HC11 8020 8021 8022 8031
8035 80C35 8039 80C39 8040 8048
80C48 8049 80C49 8050 8051 8080 8085
8748 8749 8751 Z8 Z80 68000

Extensive directives support modular, conditional and structured programming. Supplied with conversion utilities and powerful macro preprocessor.

COMPLETE SUITE £295 + vat
INCLUDING FULL 'C' SOURCE
(not 68000)

Micro Concepts Tel 0242 510525
2 St. Stephens Rd · Cheltenham · Glos.

PROGRAM FILE

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, 2-5 are mutually exclusive "radio buttons", 6+ are "check boxes"

IF number% = 1 THEN done% = 1: RETURN

IF number% > 5 THEN BUTTON number%, (1+BUTTON(number%) MOD 2): RETURN

FOR I% = 2 TO 5

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 last to first

edfield% = (edfield% MOD fieldrange%)+1

EDIT FIELD edfield%

RETURN

Dialogwindow:

WINDOW 3, ((55,50)-(455,220),2

RETURN

Algorithm:

Offer window for entry of four worm fields

GOSUB Dialogwindow

CALL TEXTFACE (69)

CALL MOVETO (140,20)

PRINT "Simple Worm"

CALL TEXTFACE (0)

BUTTON 1,1,"OK", (315,135)-(375,155),1

BUTTON 6,2,"Normal format", (25,135)-(150,155),2

CALL MOVETO (25,45)

PRINT "5 paths free"

CALL MOVETO (250,45)

PRINT "a,b"

CALL MOVETO (25,65)

PRINT "4 paths free"

CALL MOVETO (250,65)

PRINT "a,b,c,d"

CALL MOVETO (25,85)

PRINT "3 paths free (enter 4 sub-fields)"

CALL MOVETO (250,85)

PRINT "a,b,c"

CALL MOVETO (25,105)

PRINT "2 paths free"

CALL MOVETO (250,105)

PRINT "a,b"

EDIT FIELD 4,simp\$(4),(320,90)-(370,105),1,3

EDIT FIELD 3,simp\$(3),(320,70)-(370,85),1,3

EDIT FIELD 2,simp\$(2),(320,50)-(370,65),1,3

EDIT FIELD 1,simp\$(1),(320,30)-(370,45),1,3

edfield% = 1

fieldrange% = 4

Allow entry of fields until OK button is pressed

getrule:

done% = 0

valid% = 1

DIALOG ON

WHILE done% = 0

WEND

DIALOG OFF

Entry finished - check if correct number of letters was entered in each field

rule\$ = ""

FOR I% = 1 TO 4

simp\$(I%) = EDIT\$(I%)

length% = LEN(EDIT\$(I%))

rule\$ = rule\$+EDIT\$(I%)

edfield% = I%

IF I% <> 3 AND length% <> 1 THEN GOSUB Badrule

IF I% = 3 AND length% <> 4 THEN GOSUB Badrule

NEXT

IF valid% = 0 THEN GOTO getrule

Check that only permitted letters have been entered

FOR J% = 1 TO 7

letter% = ASC(MID\$(rule\$,J%,1)) MOD 32

PROGRAM FILE

```

IF J% < 4 THEN
  edfield% = J%
ELSEIF J% < 7 THEN
  edfield% = 3
ELSE
  edfield% = 4
END IF

IF (J% = 1 OR J% = 7) AND letter% > 2 THEN GOSUB Badrule
IF J% = 2 AND letter% > 4 THEN GOSUB Badrule
IF (J% > 2 AND J% < 7) AND letter% > 3 THEN GOSUB Badrule

NEXT

IF valid% = 0 THEN GOTO getrule
A valid rule has been entered - convert it into an array of actions
GOSUB Ruleload
See whether the "Normal format" button is checked
format% = BUTTON(6)
Display the rule in the counter window at bottom of screen
WINDOW OUTPUT 2
CALL TEXTFONT (0)
CALL MOVETO (280,12)
PRINT "Simple worm";
CALL TEXTFONT (3)
CALL MOVETO (380,12)
PRINT "1";MID$(rule$,1,1);"2";MID$(rule$,2,1);"3";MID$(rule$,3,4);"4";MID$(rule$,7,1);
WINDOW 1
WINDOW CLOSE 3
If normal format was not selected, offer entry for scale and origin of plot
IF format% = 1 THEN
  GOSUB Scaling
  GOSUB Origin
ELSE
  scale% = 3
  xo% = 250: yo% = 150
END IF
RETURN

Badrule:
  An invalid entry was detected - select and clear its edit field
  BEEP
  valid% = 0
  EDIT FIELD edfield%,"",(320,10+edfield%*20)-(370,25+edfield%*20),1,3
RETURN

Ruleload:
  Converts the rule into an array that shows which path to take
  given any possible combination of eaten paths that may be met
  First field
  letter% = (ASC(MID$(rule$,1,1))) MOD 32
  a%(0) = 3+letter%
  Second field
  letter% = (ASC(MID$(rule$,2,1))) MOD 32
  a%(16) = letter%
  IF letter% = 4 THEN a%(8) = 5 ELSE a%(8) = a%(16)
  IF letter% = 3 THEN a%(4) = 4 ELSE a%(4) = a%(8)
  IF letter% = 2 THEN a%(2) = 3 ELSE a%(2) = a%(4)
  IF letter% = 1 THEN a%(1) = 2 ELSE a%(1) = a%(2)
  Third field
  letter% = (ASC(MID$(rule$,3,1))) MOD 32
  a%(3) = 2+letter%
  IF letter% = 1 THEN a%(5) = 5
  IF letter% = 2 THEN a%(5) = 2
  IF letter% = 3 THEN a%(5) = 4
  letter% = (ASC(MID$(rule$,4,1))) MOD 32
  IF letter% = 1 THEN a%(6) = 1: a%(17) = 3
  IF letter% = 2 THEN a%(6) = 4: a%(17) = 2
  IF letter% = 3 THEN a%(6) = 5: a%(17) = 4
  letter% = (ASC(MID$(rule$,5,1))) MOD 32
  IF letter% = 1 THEN a%(12) = 1: a%(10) = 3
  IF letter% = 2 THEN a%(12) = 2: a%(10) = 1
  IF letter% = 3 THEN a%(12) = 5: a%(10) = 5
  letter% = (ASC(MID$(rule$,6,1))) MOD 32
  IF letter% = 1 THEN a%(24) = 1: a%(20) = 1
  IF letter% = 2 THEN a%(24) = 2: a%(20) = 2
  IF letter% = 3 THEN a%(24) = 3: a%(20) = 4
  Fourth field
  letter% = (ASC(MID$(rule$,7,1))) MOD 32
  a%(28) = letter%
  a%(25) = 1+letter%
  a%(19) = 2+letter%
  a%(7) = 3+letter%
  IF letter% = 1 THEN
    a%(11) = 3: a%(13) = 2: a%(14) = 1: a%(21) = 2: a%(22) = 1: a%(26) = 1

```

MICROMART

DISKS ★ MAJOR BRANDS ★

- ★ SKC TDK 3M MAXELL
 - ★ Factory fresh in sealed original boxes of 10 disks
 - ★ Why risk your valuable Data/Disk Drives with Unbranded/Unknown Disks when you can buy Major Branded Disks at wholesale prices
 - ★ All Brands at same price (subject to availability)
- Minimum order 5 Boxes (50 Disks). Price per Box:
- | | | |
|-----|----------------------|----------------------------|
| 5¼" | DS/DD...£7.50 | DS/HD 1.6Mb for 'AT'...£14 |
| 3½" | SS/DD...£9.50 | DS/DD...£14 |
| 3" | CF-2 Maxell...£17.50 | |

NEW Latest Brand ★ HIGHLAND ★ by 3M
Boxed/Branded Disks made by 3M. Factory fresh sealed boxes of 10 Disks, complete with Tyvek envelopes. Labels, WP tabs. Minimum order 5 Boxes. Price per Box:

5¼"	SS/DD £4.50	DS/DD £5.00
-----	-------------	-------------

Official Govt/Educational/Company/Export orders welcome. Telex: 923729 ROLAND G (attn: Startex)
FAX: 01-446 1963

Terms: CWO. Prices exclusive of VAT. P & P free UK. Overseas extra.
Callers by appointment. Tel: 01-446 6786

STARTEX Rowlandson House, 289-293 Ballards Lane, London N12 8NP. Telephone: 01-446 6786

IT REALLY IS MAGIC!



Thinking of buying a Computer, Accessories, Printers or Software? Why not save up to 40% Contact Rocketfield, PCW1, 86 Birch Hall Lane, Manchester 13. Tel. 061-224 4032

WE GUARANTEE THE LOWEST PRICES

Don't forget to ask for your 'Magic' Order form

ROCKETFIELD®
computer systems



How To Save Money

Don't spend it. But you've got to live. So you've got to spend money on food, clothes, fuel and so on. So how do you save? You use the tools at your disposal: your computer, your intelligence, your skill. You use the Home Finance Program designed to help you save money. The HFP. It runs on Amstrad PCWs and the CPC6128. It's fast, easy-to-use, and comes with a comprehensive manual. It will even have your name on it.

Send the name of your household and cheque/PO for £24.95 to

Datavise (PCW)

20 Drumnaquoile Road, Castlewella, Co Down BT31 9NT

or see for further details

MICROMART

SPECIAL OFFERS

Ferranti PC 2860 AT	£1750
Amstrad PC1512 DD, MM 640k, inc WP, DB, SS, GP Plus	
Epson LX80 NLQ Printer	£679
Epson LX80 NLQ Printers	£145
Psion II Organiser from	£79.50
Ferranti PC 1860	£825
Ferranti PC 1860 20M	£1,095
IBM Compatibles from	£448
Bondwell portables (BW8 & BW18)	
Fully IBM compatible. Introductory offer price	P.O.A.
Bondwell 5 1/4 drive BW8	£150
SBC COMPUTERS intro price	P.O.A.
Sage Software	Phone for best prices
Upgrade Kits 20Mb hard drive kits	£295
360k Floppy Drive for IBM etc	£85
Amstrad Memory Upgrade	£18
Colour monitors	from £175
Disks 40-3 1/2" with Storage box	SPECIAL PRICE
Several ex-demo printers/modems etc	SPECIAL PRICE
VAT and carriage extra	

COMPUTER FACILITIES

(A Springall Ltd)
2 Kings Highway, London SE18 2NJ
Tel: 01-854 5313

UK & EXPORT

Amstrad PC1512:

All models now available including hard disc versions. 12 months warranty.

Sinclair QL:

Ask for details of our extensive range of QL hardware and software. We also have our own high quality software including: QL Pascal; Forth; Assembler; Monitor; Typing-Tutor; Task Swapper; Boot 128k; I to I Dump and Microdrive Toolkits — Dealer Enquiries Welcome.

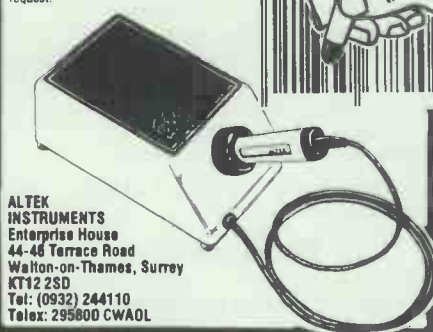


Overseas customers: Please ask for our export terms

Compware, 57 Repton Drive,
Haslington, Crewe CW1 1SA.
Tel: Crewe (0270) 582301
Telex: 265871 MONREF G (Quote MAG70076)

READ & PRINT BAR-CODES USING ANY COMPUTER

Complete identification system including microprocessor controlled scanner hardware plus software to print barcodes on Epson (or similar) dot matrix printer. Most Industrial & commercial codes can be read. Packages available for virtually any computer. Our systems are in regular use by many private & public sector organisations worldwide. Prices start from £250. More information on request.



ALTEK
INSTRUMENTS
Enterprise House
44-46 Terrace Road
Walton-on-Thames, Surrey
KT12 2SD
Tel: (0932) 244110
Telex: 295800 CWAOL

PROGRAM FILE

```

ELSE
a%(11) = 5: a%(13) = 5: a%(14) = 5: a%(21) = 4: a%(22) = 4: a%(26) = 3
END IF
Only one path clear
a%(15) = 5: a%(23) = 4: a%(27) = 3: a%(29) = 2: a%(30) = 1
RETURN

Origin:
Allows user to select x and y co-ordinates at which the pattern will start
GOSUB DialogWindow:
CALL TEXTFACE (69)
CALL MOVETO (120,20)
PRINT "Set origin of pattern"
CALL TEXTFONT (0)
CALL TEXTFACE (0)
CALL MOVETO (25,85)
PRINT "x"
CALL MOVETO (130,85)
PRINT "y"
CALL TEXTFONT (3)
EDIT FIELD 2,STR$(yo%),(155,73)-(200,88),2,3
EDIT FIELD 1,STR$(xo%),(50,73)-(95,88),2,3
edfield% = 1
fieldrange% = 2
BUTTON 1,1,"OK",(315,135)-(375,155),1
BUTTON 6,1,"Centre",(315,70)-(375,90),1
Allow entry until the OK button is pressed
getorigin:
valid% = 1
done% = 0
DIALOG ON
WHILE done% = 0
IF number% = 6 THEN
EDIT FIELD 2,"150",(155,73)-(200,88),1,3
EDIT FIELD 1,"250",(50,73)-(95,88),1,3
number% = 0
END IF
WEND
DIALOG OFF
Check that selected origin is not too near edges of window
IF VAL(EDIT$(1)) < 8 OR VAL(EDIT$(1)) > 490 THEN
edfield% = 1
GOSUB Badstart
END IF
IF VAL(EDIT$(2)) < 8 OR VAL(EDIT$(2)) > 292 THEN
edfield% = 2
GOSUB Badstart
END IF
IF valid% = 0 THEN GOTO getorigin
Get starting co-ordinates from the edit fields
xo% = VAL(EDIT$(1))
yo% = VAL(EDIT$(2))
WINDOW CLOSE 3
RETURN
Badstart:
An invalid entry was detected - select and clear its edit field
BEEP
valid% = 0
EDIT FIELD edfield%, "",(edfield%*105-55,73)-(edfield%*105-10,88),1,3
RETURN

Scaling:
Offer choice of four plotting scales
GOSUB DialogWindow
CALL TEXTFACE (69)
CALL MOVETO (130,20)
PRINT "Select scale of grid"
Draw specimen pattern at each scale
FOR I% = 4 TO 10 STEP 2
xd% = INT(.866*I%+.4)
yd% = I%/2
LINE(60+(I%-4)*48,65)-STEP(-2*xd%,-2*yd%)
LINE -STEP (0,1%)
LINE -STEP (2*xd%,-1%)
LINE -STEP (-xd%,-yd%)
LINE -STEP (0,2*I%)
LINE -STEP (xd%,-yd%)
NEXT
BUTTON 1,1,"OK",(315,135)-(375,155),1
BUTTON 2,1,"tiny",(30,100)-(100,120),3
BUTTON 3,1,"small",(121,100)-(191,120),3
BUTTON 4,1,"normal",(212,100)-(282,120),3

```

PROGRAM FILE

```
BUTTON 5,1,"large",(308,100)-(378,120),3
BUTTON scale%+1,2
  Allow entry until the OK button is pressed
done% = 0
DIALOG ON
WHILE done% = 0
  IF number% > 1 THEN scale% = number%-1
WEND
DIALOG OFF
WINDOW CLOSE 3
RETURN
```

Begin:

```
  Initialise all variables then draw first segment of a new worm plot
WINDOW 1
  Make all menu items active
FOR i% = 1 TO 4
  MENU 6,i%,1
NEXT
CLS
CALL TEXTFONT (3)
size% = 2*(1+scale%)
flag% = 0: sum% = 0
x% = xo%: y% = yo%-size%
direction% = 0
count% = 0
tally% = 1
horiz% = 14: vert% = 23
left% = 13: right% = 15: top% = 22: bottom% = 24
hblock% = 166: vblock% = 100
xorigin% = 0: yorigin% = 0
SetOrigin xorigin%,yorigin%
SetRect rec%(0),xorigin%,yorigin%,xorigin%+498,yorigin%+300
ClipRect rec%(0)
xd% = INT(size%*.866+.4): yd% = size%*.5
LINE (xo%,yo%)-(x%,y%)
RETURN
```

Counter:

```
  Display length of path at bottom of screen
WINDOW OUTPUT 2
count% = count%+1
CALL MOVETO (10,12)
PRINT count%
WINDOW OUTPUT 1
RETURN
```

Plot:

```
  Find next path and draw it
sum% = 0
  Check all paths radiating from present node
ON scale% GOSUB Scantiny,Scansmall,Scannormal,Scanlarge
  Calculate sum of weights of pattern as seen by worm
FOR i% = 0 TO 5
  j% = (6+i%-direction%) MOD 6
  sum% = sum%+SGN(spot%(i%)-30)*p%(j%)
NEXT
  Convert path given by the rule to be relative to worm's last path
drawpath% = (a%(sum%)+direction%) MOD 6
  Move present position to (ox%,oy%), find co-ordinates of next position
ox% = x%
oy% = y%
IF drawpath% = 0 THEN y% = y%+size%: GOTO draw
IF drawpath% = 1 THEN x% = x%-xd%: y% = y%+yd%: GOTO draw
IF drawpath% = 2 THEN x% = x%-xd%: y% = y%-yd%: GOTO draw
IF drawpath% = 3 THEN y% = y%-size%: GOTO draw
IF drawpath% = 4 THEN x% = x%+xd%: y% = y%-yd%: GOTO draw
IF drawpath% = 5 THEN x% = x%+xd%: y% = y%+yd%: GOTO draw
draw:
  If next position is too close to edge, scroll window
IF x% < xorigin%+size% THEN xscroll% = 166: yscroll% = 0: GOSUB Screenscroll
IF x% > xorigin%+498-size% THEN xscroll% = -166: yscroll% = 0: GOSUB Screenscroll
IF y% < yorigin%+size% THEN xscroll% = 0: yscroll% = 100: GOSUB Screenscroll
IF y% > yorigin%+300-size% THEN xscroll% = 0: yscroll% = -100: GOSUB Screenscroll
  Draw next segment
LINE (ox%,oy%)-(x%,y%)
direction% = (drawpath%+3) MOD 6
RETURN
```

Scantiny:

```
spot%(0) = POINT(x%,y%+3)
spot%(1) = POINT(x%-2,y%+2)
```

MICROMART

RT²

gives you real time on a pc

RT² provides multitasking, timing, memory allocation, semaphore, and i/o support for real-time applications. It is fast, modular, compact and configurable, and fully documented. Using RT² you can get the following benefits:

- ★ reduced costs and improved performance
- ★ high performance interrupt-driven code
- ★ support for both Microsoft and Intel high-level languages
- ★ flexible licensing to suit small or large users

Enquire now!

Alan Cohen

Alan Cohen (Computer Consultants) Ltd
225a Finchley Road, London NW3 6LP
Tel: 01-453 5493

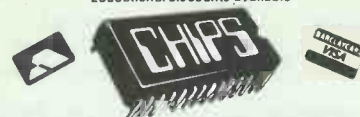
WANTED FOR CASH!! ALL TYPES OF COMPUTER EQUIPMENT

ATARI, AMSTRAD, IBM PC, BBC,
COM 64 etc.
BULK QUANTITIES ACCEPTED.

**WE BUY, SELL
AND PART EXCHANGE
NEW AND USED**

FULL MAIL ORDER SERVICE
WITH GUARANTEE

Educational discounts available



(DATA DIRECT LTD)
53 RUGBY ROAD, WORTHING, SUSSEX
Tel: :0903) 40509 24 hours

FLOPPY DISKS

All prices plus VAT

Free delivery

		PRICE EACH UNIT			
		10-40	50-90	100 +	
8"	DS DD	FD2D	2.25	2.13	2.00
	SS DD	MD1D	1.11	1.09	0.99
	DS DD	MD2D	1.30	1.23	1.16
5 1/4"	DS 96TP1	MD2DD	1.57	1.48	1.40
	DS 1.6MGB	MD2HD	2.46	2.33	2.19
	SS 250K	MF1D	1.65	1.57	1.47
	DS 500K	MF2D	1.94	1.83	1.73
	SS 500K	MF1DD	2.19	2.08	1.96
	DS 1000K	MF2DD	2.39	2.26	2.13
NEW	DS 1.6MB	MF2HD	5.94	5.62	5.30

Polanka Video Limited
Unit X5 · Acton Business Centre
School Road · London NW10 6TD
01 965 4413

MICROMART

JULY MADNESS ON 3 1/2" DISCS

Ten 3 1/2" DS/DD discs

£13.95 + 95p P.&P.

with a lifetime warranty

"QL Turboquill is essential"

- Sinclair QL World 1987

QL Turboquill £9.95 + 55p P.&P.

And for expanded memory QLs only

QL Turboquill + ... £12.95 + 55p P.&P.

Taskmaster £25.00 inclusive

Mailmaster £23.95 inclusive

ATHENE CONSULTANTS

33 HOLLY GROVE, FAREHAM, HANTS
PO16 7UP Tel: 0329 282083

SOFTWARE

	RAP	WAVE
RULE by Basil, Tides, RPS etc. 5.25" DS/DD 401P1 . PC125	---	11.00 (10)
RULE by Basil, Tides, RPS etc. 5.25" DS/DD 961P1 . PC125	---	12.00 (11)
AMSOFT CF2 3" BLANK DISCS DS/DD - AMSTRAD CPC/PCW 80110	49.50	72.00 (10)
WABASH DATATECH 3.5" DS/DD 1551P1	80110	18.00 (10)

HARDWARE

Bondwell BW34 640K RAM Double drive, Mono	769.35	404.00 (A)
Bondwell BW36 640K RAM Single Drive + 20Mb		
H. Disk Mono	1263.85	1011.00 (A)
Amstrad PC1512 Double Drive Mono	642.85	560.00 (A)
Amstrad 1512 Double Drive Colour	838.35	735.00 (A)
Amstrad PCW/8512 Inc. Printer, Monitor & Sware	573.85	513.00 (A)
128k Memory Upgrade kit for PC1512	57.50	20.00 (D)
HEMISCRIBE 28MB FAST HARD CARD (LOW POWER CONSUMPT) - PC432.54		417.00 (A)
Brother HIR15 Daisywheel Parallel Printer	649.99	378.00 (A)

All prices include VAT. Max. UK carriage and insurance charge £5 per parcel/£500. Add carriage as follows: (A) £5.00 (B) £4.00 (C) £3.00 (D) £2.00 (E) £1.00 (F) 50p.

Despatched by return of post. Prices in this advert are for current stock.

W.A.V.E. (Dept. PCW 487)
Walney Audio Video & Electrical
53 Shearwater Crescent, Barrow-in-Furness,
Cumbria LA14 3JP. Telephone: 0229 44753

DISCS

Prices per 10 discs		10	50
3"			
Amssoft/Panasonic	CF2	£26.95	B
Amssoft CF2 In Proto Box		£31.95	
3 1/2"			
Maxell ssdd	MF1DD	£22.43	PL
Maxell dsdd	MF2DD	£32.63	PL
Verbatim ssdd	MF350	£19.98	PL
Sony ssdd	D3440/B	£19.99	L
5 1/4"			
Maxell ssdd 40t	MD1D	£13.66	PL
Maxell dsdd 40t	MD2D	£14.99	PL
Maxell dsdd 80t	MD2DD	£22.86	PL
Maxell dshd 80t	MD2HD	£30.62	PL
Verbatim ssdd 40t	525	£12.80	BL
Verbatim dsdd 40t	250 d/life	£12.65	BL
Verbatim dsdd 40t	550	£15.67	BL
Verbatim dsdd 80t	557	£19.99	BL
Verbatim dshd 80t	180HD	£32.92	BL
Unbranded ssdd 40t	QC1D	£6.99	L
Unbranded dsdd 40t	QC2D	£8.99	BL

All prices include 15% VAT and Postage + Package (For guaranteed next day delivery please add 50p per 10 discs). Educational, government, and company orders welcome. Every disc is certified and warranted, has hub rings, sleeves, labels unless stated.



Key to packing: PL=plastic lib. box and labels.
BL=box and labels. L=bulk/loose. B=box only.

RUGBY MICRO SPARES
30 Oxford St., Rugby CV21 3NF.
Telephone: 0788 71643

PROGRAM FILE

```
spot%(2) = POINT(x%-2,y%-1)
spot%(3) = POINT(x%,y%-3)
spot%(4) = POINT(x%+2,y%-1)
spot%(5) = POINT(x%+2,y%+2)
```

RETURN

Scansmall:

```
spot%(0) = POINT(x%,y%+3)
spot%(1) = POINT(x%-3,y%+2)
spot%(2) = POINT(x%-3,y%-1)
spot%(3) = POINT(x%,y%-3)
spot%(4) = POINT(x%+3,y%-1)
spot%(5) = POINT(x%+3,y%+2)
```

RETURN

Scannormal:

```
spot%(0) = POINT(x%,y%+4)
spot%(1) = POINT(x%-5,y%+3)
spot%(2) = POINT(x%-5,y%-3)
spot%(3) = POINT(x%,y%-4)
spot%(4) = POINT(x%+5,y%-3)
spot%(5) = POINT(x%+5,y%+3)
```

RETURN

Scanlarge:

```
spot%(0) = POINT(x%,y%+4)
spot%(1) = POINT(x%-5,y%+3)
spot%(2) = POINT(x%-5,y%-2)
spot%(3) = POINT(x%,y%-4)
spot%(4) = POINT(x%+5,y%-2)
spot%(5) = POINT(x%+5,y%+3)
```

RETURN

Screenscroll:

Scroll worm plot, first saving to resource file the area lost
FOR I% = 0 TO 2

IF xscroll% = 0 THEN

xget% = xorigin%+1%*166

yget% = yorigin%+100+yscroll%

ELSE

xget% = xorigin%+166+xscroll%

yget% = yorigin%+1%*100

END IF

mx% = horiz%+SGN(xscroll%)*(1%-1)*ABS(SGN(yscroll%))

my% = vert%+SGN(yscroll%)*(1%-1)*ABS(SGN(xscroll%))

GOSUB Blocksave

NEXT

Every fifth scroll, write all outstanding resources to disk

tally% = (tally%+1) MOD 5

IF tally% = 0 THEN UpDateResFile ref%

SCROLL (xorigin%,yorigin%)-(xorigin%+496,yorigin%+300),xscroll%,yscroll%

Move window origin to compensate for scroll

xorigin% = xorigin%-xscroll%

yorigin% = yorigin%-yscroll%

SetOrigin xorigin%,yorigin%

SetRect rec%(0),xorigin%,yorigin%,xorigin%+496,yorigin%+300

ClipRect rec%(0)

Update outer bounds of whole plot

horiz% = horiz%-SGN(xscroll%)

vert% = vert%-SGN(yscroll%)

IF horiz% = left% THEN left% = horiz%-1

IF horiz% = right% THEN right% = horiz%+1

IF vert% = top% THEN top% = vert%-1

IF vert% = bottom% THEN bottom% = vert%+1

Read from resource file the area revealed by scrolling

FOR I% = 0 TO 2

IF xscroll% = 0 THEN

xput% = xorigin%+1%*166

yput% = yorigin%+100-yscroll%

ELSE

xput% = xorigin%+166-xscroll%

yput% = yorigin%+1%*100

END IF

mx% = horiz%-SGN(xscroll%)*(1%-1)*ABS(SGN(yscroll%))

my% = vert%-SGN(yscroll%)*(1%-1)*ABS(SGN(xscroll%))

GOSUB Blockload

NEXT

RETURN

Birdseye:

Show complete worm plot scaled down to fit the screen

First save whole of window to resource file

PROGRAM FILE

```

FOR i% = 0 TO 2
  FOR j% = 0 TO 2
    xget% = xorigin%+i%*166
    yget% = yorigin%+j%*100
    mx% = horiz%+i%-1
    my% = vert%+j%-1
    GOSUB Blocksave
  NEXT
NEXT
tally% = (tally%+1) MOD 5
IF tally% = 0 THEN UpDateResFile ref%
Open window to show birdseye view
WINDOW 4,"Bird",(7,21)-(505,321),3
BUTTON 1,1,"OK",(410,260)-(470,280),1
Find if plot is larger in x or y - use this size to fit both dimensions
hextent% = right%-left%+2
vextent% = bottom%-top%+2
IF hextent% > vextent% THEN extent% = hextent% ELSE extent% = vextent%
hblock% = 498/extent%
vblock% = 300/extent%
Read whole plot from resource file and display
FOR mx% = left% TO right%
  FOR my% = top% TO bottom%
    xput% = (mx%-left%)*hblock%
    yput% = (my%-top%)*vblock%
    GOSUB Blockload
  NEXT
NEXT
MENU
MENU ON
Wait for user to press OK button
done% = 0
DIALOG ON
WHILE done% = 0
WEND
DIALOG OFF
MENU STOP
WINDOW CLOSE 4
Restore full-size plot from resource file
WINDOW OUTPUT 1
hblock% = 166
vblock% = 100
flag% = 0
FOR i% = 0 TO 2
  FOR j% = 0 TO 2
    xput% = xorigin%+i%*166
    yput% = yorigin%+j%*100
    mx% = horiz%+i%-1
    my% = vert%+j%-1
    GOSUB Blockload
  NEXT
NEXT
RETURN

Blocksave:
Save one bit-map block from screen to resource file
GET (xget%,yget%)-(xget%+165,yget%+99),screen%(0)
Get a new resource id
Uniquelid "GNRL",id%
If a previous bit-map exists for this block, destroy it
IF map%(mx%,my%) > 0 THEN
  oldid% = map%(mx%,my%)
  GetRes ref%,"GNRL",oldid%,handle!
  RemoveRes ref%,handle!
  DisposeHandle handle!
END IF
map%(mx%,my%) = id%
SaveArray ref%,screen%(0),2226,id%
RETURN

Blockload:
Load one bit-map block from resource file to screen
IF map%(mx%,my%) = 0 THEN RETURN
id% = map%(mx%,my%)
LoadArray ref%,id%,screen%(0)
PUT (xput%,yput%)-(xput%+hblock%-1,yput%+vblock%-1),screen%(0),PSET
GetRes ref%,"GNRL",id%,handle!
ReleaseRes handle!
RETURN

Quit:
CloseResFile ref%

```

MICROMART

Budget

TYPESETTING

The pioneers in high quality, budget-priced typesetting of magazines, books, leaflets etc. from your disk (IBM, Amstrad, BBC etc.) or by modem via our own Typenet™ system or by Telecom Gold.

Send now for your free info pack to :

BUDGET TYPESETTING

53 Rowan Walk
Bromley, Kent BR2 8QW
Telephone (0689) 53546
Typenet (0689) 50866

BRANDED DISKS

(Box of 10)

3"	MAXELL CF2	£26.95
3.5"	SONY MF2 2DD 135tpi	£24.00
5.25"	MAXELL DS/DD 48tpi	£14.50
5.25"	MEMOREX DS/DD 48tpi	£14.50
5.25"	DYSAN (IBM AT)	£27.50

C.W.O. PRICES INCLUDE CARRIAGE & VAT. (C.O.D. ON REQUEST)

☆ QUANTITY DISCOUNTS ☆

EG 10 BOXES SONY MF2-2DD	£19.95/box
EG 10 BOXES DYSAN (IBM AT)	£22.95/box
1 BOX OF 10 3M D.C.600A DATA CARTRIDGE	£229

QUANTITY DISCOUNTS C.W.O. OR C.O.D. ONLY

JOHN HOLMES COMPUTERS

FULBECK, GRANTHAM,
Lincs NG32 3LD

Tel: (0400) 72818

OFFICIAL GOVERNMENT
AND EDUCATIONAL ORDERS
WELCOME



PLEASE READ THIS WHOLESALE PRICES TO YOU THE USER

5¼" PLAIN LABEL DISKS BY BASF, XIDEX, RPS etc

25=	£13.00	Prices include VAT + delivery
50=	£24.00	100% error free certified life-
100=	£45.00	time warranty. Suit all drives
200=	£85.00	SS/SD, SS/DD, DS/DD, and
500=	£198.00	DS/DQ. 48TPi = 96TPi include
1000=	£345.00	hub rings, enveloping and
		label sets.

3½" DS/DD Plain label disks. We only sell made in Japan items as they are the best ie: SONY, FUJI, MAXELL etc

10=	£16.00	Prices inc VAT + delivery
20=	£28.00	100% error free certified life-
50=	£65.00	time warranty includes labels
100=	£125.00	

LOCKABLE DISK BOXES

5¼" 50 capacity ref. YA50L	£9.50	Discount for quantity
5¼" 100 capacity ref. YA100L	£11.00	10% for 3 +
3½" 40 capacity ref. DS40L	£9.00	20% for 6 +
3½" 90 capacity ref. YA6090L	£11.00	25% for 12 +

ACCESSORIES

5¼" DS Head Cleaner + fluid	£4.00	
3½" Head Cleaner + fluid	£6.00	Discount for quantity
Tilt & Turn for 12" monitor	£12.00	10% for 3 +
Tilt & Turn 14" monitor	£14.00	20% for 6 +
IBM-centronics Printer 2MTS	£9.00	25% for 12 +

Remember prices you see is ALL you pay
ie: VAT + Carriage incl. Cheques and PO's to:

MANOR COURT SUPPLIES LTD
GLEN CELYN, PENYBONT,
LLANDRINDOD WELLS,
POWYSLD1 5SY
(059 787) 784



SHAREWARE

FOR AMSTRAD PCW 8256 PCW 8512 CPC 6128
AND PC COMPATIBLES

CP/M software — at £3.50 each, on top quality 3" Amsoft disks.
Please specify PCW or CPC.

Expert86 — our own expert system builder (PCW/CPC).

— described in detail in our advert last month

Scrivener — word processor (PCW/CPC)

Spooler — print spooler (PCW)

Kermil — excellent communications package (PCW/CPC)

Z8E — machine code debugger (PCW/CPC)

Small Compiler — for a good subset of C (PCW/CPC)

MS-DOS software — at £3 each

PC-Write — excellent word processor

PC-Style — document style analyser

PC-File — database package

PC-Calc — spreadsheet package

PC-Outline — ideas processor/document planner

As easy as — 123 look-alike

A86 — very good assembler

XLISP — version of the AI language LISP

PROCOM — superb communications package

FORTH — two disk set for £4.50

FLIGHT SIMULATOR

PC-CHESS

This is just a sample of what we stock. We have many more programs ready for immediate delivery. Send for our full catalogues — please specify CP/M or MS-DOS. No membership fees. Postage — please add 50p for the first disk and 10p per disk thereafter.

Also available — top quality blank Amsoft 3" disks complete with library cases at £2.49 each. Please add £1 to each order to help with postage costs. All prices include VAT.

**PROSPEC Computer Systems, PO Box 28,
Beeston, Nottingham, NG9 1PH**

PROGRAM FILE

KILL "MyDisk: Wormscreen"
MENU RESET
END
RETURN

List of Variables Used in Worm Plotter

a%	Array — each element holds path number to take for that value of sum%
action%	Number returned by Dialog function showing type of last user action
bottom%	Bottom-most block in resource file
count%	Number of segments drawn since start of plot
direction%	Path number by which worm arrived at current node
done%	Flag — set to 1 when OK button or Return pressed in dialog window
drawpath%	Path number to be drawn
edfield%	Number of currently selected edit field
extent%	The larger of hexent%, vextent% — used to scale Birdseye view
fieldrange%	Number of edit fields in window — used to wrap round Tab key presses
flag%	Flag — set to 1 when a menu selection is made to stop plotting
format%	Flag — set to 2 for normal display format, else calls Scaling & Origin
handle%	Handle to a resource
hblock%	X size of screen blocks — normally 166, scaled down for Birdseye view
hexent%	Number of blocks used left-right
horiz%	X value of centre block on screen
l%	General purpose loop counter
ld%	Resource id
j%	General purpose loop counter
left%	Left-most block in resource file
length%	Length of string in edit field — used to check valid entry
letter%	Temporary variable used when getting individual letters from rule%
map%	Array to hold resource ids for screen blocks
menulitem%	Number of item in menu selection
menunumber%	Number of menu bar selection
mx%	X value of block being saved or loaded
my%	Y value of block being saved or loaded
number%	Number returned by Dialog function of selected button or edit field
oldld%	Resource id of a block that is being replaced by updated version
ox%	X co-ordinate of node from which worm is moving
oy%	Y co-ordinate of node from which worm is moving
p%	Array holding path weights as a look-up table
rec%	Array used by Toolbox Library to hold rectangle corner co-ordinates
ref%	File reference of resource file
right%	Right-most block in resource file
rule%	String made up of all letters in the rule.
scale%	Plotting scale — 1 is smallest, 4 is largest
screen%	Array used to hold bit image of a screen block
simp%	Array to hold choice letter(s) for each field of the rule
size%	Segment length at current scale
spot%	Array to hold pixel values of scanned points — white=30, black=33
sum%	Sum of weighted values of all eaten paths at current node
tally%	Circular count of scrolls, used to update resource file periodically
top%	Top-most block in resource file
valid%	Flag — set to 0 if invalid entry detected in an edit field
vblock%	Y size of screen blocks — normally 100, scaled down for Birdseye view
vert%	Y value of centre block on screen
vextent%	Number of blocks used top-bottom
x%	X co-ordinate of current node
xd%	X length of 60° line at current scale
xget%	X co-ordinate of top-left corner of block to be got from screen
xo%	X co-ordinate of worm origin
xorigin%	X co-ordinate of current screen origin
xput%	X co-ordinate of top-left corner of block to be put to screen
xscroll%	Number of pixels to be scrolled left or right — ±166
y%	Y co-ordinate of current node
yd%	Y length of 60° line at current scale
yget%	Y co-ordinate of top-left corner of block to be got from screen
yo%	Y co-ordinate of worm origin
yorigin%	Y co-ordinate of current screen origin
yput%	Y co-ordinate of top-left corner of block to be put to screen
yscroll%	Number of pixels to be scrolled up or down — ±100



Psion Organiser II Space Invaders

by Vik Oliver

This program converts the Organiser display into a 4 by 16 grid of user-defined characters. There is a base, UFOs, rockets and missiles — all

with sound effects. The program displays one moving target at a time, and keeps score of any successful shots and of how many bases you

PROGRAM FILE

have left.

The program will run on an unexpanded Organiser but it uses all the RAM on the CM model unless the program is put on a ROM pack. The program comes in two parts: a utility to set up the user-defined graphics, and the main program.

The program is controlled by the up and down arrow keys to move your ship, which is on the left-hand side of the display. The EXE key is

used to fire the double-barrelled missiles. You have three ships and can only fire one missile at a time. Rockets cannot be shot down and must be dodged. UFOs may be shot, but when they explode, you must be out of their path or debris will destroy you too.

If you press MODE in mid-game, the game will pause and bring up your score, a quit option and the volume control.

```
UDG: (n%, a1%, a2%, a3%, a4%, a5%, a6%, a7%, a8%)
POKEB $180, 64 + (n% AND 7) * 8
POKEB $181, a1%
POKEB $181, a2%
POKEB $181, a3%
POKEB $181, a4%
POKEB $181, a5%
POKEB $181, a6%
POKEB $181, a7%
POKEB $181, a8%
```

Now the main invader program:

```
INVADER:
LOCAL i%, j%, k%, ba%, mbx%, mbh%
LOCAL snd%, mex%, meh%, mes%, rfl%, typ%, mbs%, bc%, sc%
udg: (0, 24, 31, 31, 24, 0, 0, 0, 0)
udg: (1, 0, 0, 0, 0, 24, 31, 31, 24)
udg: (2, 4, 14, 31, 14, 0, 0, 0, 0)
udg: (3, 0, 0, 0, 0, 4, 14, 31, 14)
udg: (4, 23, 0, 0, 23, 0, 0, 0, 0)
udg: (5, 0, 0, 0, 0, 23, 0, 0, 23)
udg: (6, 1, 14, 14, 1, 0, 0, 0, 0)
udg: (7, 0, 0, 0, 0, 1, 14, 14, 1)
CLS
snd%=0 : typ%=2 : mes%=5 : mbs%=5
ba%=0 : PRINT CHR$(0);
mbx%=0 : mex%=0
sc%=0 : bc%=3
rfl%=1
DO
DO
k%=key
IF k%<>0 OR rfl%<>0
rfl%=0
CLS
IF k%=3
ba%=(ba%-1) AND 3
ELSEIF k%=4
ba%=(ba%+1) AND 3
ELSEIF k%=13
IF mbx%=0
mbx%=mbs%*2 : mbh%=ba%
ENDIF
ENDIF
AT 1, 1+ba%/2 : PRINT CHR$(ba% AND 1);
ENDIF
IF mbx%<>0
AT mbx%/mbs%, 1+(mbh%/2) : PRINT " ";
mbx%=mbx%+1
IF snd%=1 : BEEP 1, mbx%*5 : ENDIF
IF mbx%=16*mbs%
mbx%=0
PRINT " ";
ELSE
PRINT CHR$(4+(mbh% AND 1));
ENDIF
ENDIF
IF mex%=0
IF RND<.2
meh%=ABS(ba%+INT(RND*3)-1)
IF meh%>3 : meh%=0 : ENDIF
IF RND>.6
typ%=6 : mes%=3
ELSE
typ%=2 : mes%=6
ENDIF
mex%=17*mes%
ENDIF
ELSE
AT (mex%/mes%)-1, (meh%/2)+1 : PRINT " "; CHR$(8); CHR$(8);
```

MICROMART

ATARI

Mega ST 2/4Mb.....	£Call inc VAT
Laser Printer.....	£Call
520 STFM.....	£359.95
520 STFM + Mono.....	£449.95
520 STFM + Philips col.....	£656.00
1040 STF + Mono.....	£629.95
1040 STF + col.....	£980.90
ST Turbo drive 20MB.....	£677.35

Delivery £12 inc VAT

ACCESS welcome

ORDER NOW FOR SOFTWARE DISCOUNTS

- ★ FULL SUPPORT ★
- ★ SOFTWARE & PERIPHERALS ★
- ★ ON SITE MAINTENANCE ★

Gould Computer Services

12 Stainburn Drive, Leeds LS17 6NX

Tel: 0532 692946

callers by appointment

SCREENWISE

UNIT 11, SOUTH STREET
COMMERCIAL CENTRE,
BISHOP'S STORTFORD HERTS
Telephone (0279) 59343 Telex: 817547



Networking



AMSTRAD PC & PCW MICROS WITH
TERMINAL EMULATION, FILE
TRANSFER AND NETWORKING.
COMPOSITE VIDEO OUTPUT.
TAPESTREAMERS. FULL RANGE
OF SOFTWARE. TRAINING
AVAILABLE.

FULL TECHNICAL SUPPORT
AND ADVICE—SERVICE AND
MAINTENANCE CONTRACTS

Tel: Sales 0279 59343

DEC VT 220 & VT 100 are trademarks of Digital
Equipment Corp.

TEKTRONICS is a trademark of Tektronics Inc.

MICROMART

SPECIAL OFFER

5¼" British Made Disks

	Track	10+	50+
SS/SD	40	0.45	0.40
SS/DD	80	0.59	0.52
DS/DD	40	0.69	0.62
DS/DD	80	0.79	0.72

Prices include envelopes, WP Tabs and First Class delivery within UK.

3½" Disks

		10+	50+
SS	1.35 TPI	1.95	1.50
DS	1.35 TPI	2.50	2.00

Plastic Library Cases
(to hold 10 disks) £1.20

5¼" Head Cleaning Disks £4.60

Prices include VAT & free UK delivery
Lifetime guarantee - 2 for 1
replacement or money back if not
satisfied.

Send cheque/P.O. to:

LONGWORTH LTD,
31 BRIDGE STREET,
NEWPORT, GWENT NP9 4BH
Tel: 0633-52538

PROGRAM FILE

```

mex%=mex%-1
IF (INT(mex%/mes%)=INT(mbx%/5)+1) AND mbh%=meh% AND typ%=2
CLS
mbx%=0 : mex%=0 : sc%=sc%+5
IF snd%=1 : BEEP 20,600 : ENDIF
ENDIF
IF mex%<=3*mes%
mex%=0 : PRINT " ";
rfl%=1
IF ba%=meh%
CLS
PRINT "*** KER-SPLATT ***";
IF snd%=1 : BEEP 20,700: BEEP 10,300 : BEEP 40,1400:ENDIF
VIEW(2,"BASES="+GEN$(bc%,32)+" SCORE="+GEN$(sc%,32))
bc%=bc%-1 : IF bc%=0 : RETURN :ENDIF
CLS
ENDIF
ELSE
PRINT CHR$(typ%+(meh% AND 1));
ENDIF
ENDIF
UNTIL k%=2
k%=MENU("LOUD, SHH, QUIT,"+GEN$(sc%,32))
snd%=k% AND 1
rfl%=1
CLS
UNTIL k%=3 OR k%=0
    
```

SALT DISK CO.

PO Box 345

40 GREENHILL MAIN ROAD,
SHEFFIELD S8 7RD

Tel: 0742 377744

Authorised
PC-SIG
DEALER

Public Domain Software for IBM-PC-Compati-
bles-Amstrad 1512 PC-SIG + PC-Blue Libraries

5 Disk Catalogue Set - £9

12 Disk Special Packs - £30

Above Prices including VAT & Carriage

Branded Blank Disks Excluding VAT -
Carriage Paid

LIFE-TIME GUARANTEE - 100% ERROR FREE
Over 80% Clipping Factor

	2 BOXES	10 BOXES
5¼ DSDD	60	55
QUAD	80	75
HIGH	180	170
3½" DOUBLE SIDED	160	150

5¼" Bulk Mid with Sleeve - Tab - Label
500 - 36p 50 - 40p

We stock GOLDSTAR - FUJI - SONY - MAXELL
Full Range

CHEQUE WITH ORDER PLEASE

Dealer Enquiries welcome

SANYO OFFER

MBC 555 IDEAL FOR WORDPROCESSING & TELEX TERMINAL
2 x 160K DRIVES, 128K RAM, FREE SOFTWARE INCLUDED—
WORDSTAR, CALCSTAR, MAILMERGE, DATASTAR, REPORT STAR, BASIC, DOS 2.11.
WILL DRIVE MOST STANDARD DOT MATRIX & DAISYWHEEL PRINTERS

SPECIAL OFFER PRICE

MBC555 CPU, KEYBOARD & S/WARE

PHILLIPS MONITOR ADD £75

QUALITY DOT MATRIX, 110, 120 CPS PRINTER ADD £149

£199

ALSO AVAILABLE AT UNBEATABLE PRICES

TOSHIBA T3100 10MB £2,550

SHARP PC700 Fully compatible portable 2 x 360k

drives + free printer **£795**

MINISCRIBE 30MB Hard cards **£375**

SEAGATE 20/30MB Includes controller &

cables **£299/£399**

SAVE POUNDS !!!

AVAILABLE EX-DEMO/USED IBM PC XT, AT OLIVETTI (MOST MODELS)
APRICOT PC XI XEN'S
LOTS OF PRINTERS BOTH DOT MATRIX AND DAISYWHEEL

**PRIMA
BROKERS**

Telephone (0602) 810884
810974
Telex: 342533 TINTW G
VAT Reg. No: 416 3665 52

44A ALBERT ROAD WEST BRIDGEFORD NOTTINGHAM NG2 5GS



BBC Artwork

by Daniel Tang

Artwork is a graphics package similar to the ones used with a mouse, but it uses a joystick or a keyboard. When using a keyboard use the cursor keys to move, the space bar for fire, and Shift to accelerate movement.

Artwork has the facilities to: draw, spray and paint; erase; flood fill; magnify; draw rectangles; circles; lines; triangles; arcs; write text; and load and save pictures.

These are represented by icons to the right of the screen. Along the bottom of the screen are the words 'system', 'separated' and 'continuous'. These can be selected by placing the pointer over the word and pressing fire; the selected word will then be highlighted in yellow.

The word 'system' is to allow system commands ('*' commands) to be typed in. When selected a * will be shown in the window (at the bottom of the screen) and the command can then be typed in. Press <RETURN> to enter the command. When cataloguing a disk using this facility, the icons will be deleted and the files will be shown in the space left. Press <SHIFT> to allow the file-names to scroll up the screen and press <RETURN> to end.

The word 'continuous' and 'separated' affect the line, arc, rectangle and circle facilities. When in continuous mode, the last point of the previous shape is taken as the first point of the next shape. When in separated mode, all shapes are separate from each other. When using cir-

cles with continuous selected, the centre will stay fixed, allowing concentric circles. When in continuous mode, the routine will end when the shape is dragged off the drawing area.

Also at the bottom of the screen is the colour palette and the 'select block'. A colour can be selected by positioning the pointer over a colour on the palette and pressing fire; the selected colour is then shown in the block beside the palette, the select block. The palette may be changed by placing the pointer over the select block and pressing fire repeatedly until the required colour appears.

To select a facility, place the pointer over an icon and press fire; the icon will then be highlighted. The selected facility may then be used as follows:

● Draw, spray and paint

Move the pointer to the required start position and press fire. By moving the joystick, a line of spray or paint will be left behind. When you want to finish, press fire again and the pointer will reappear. You may now either choose another icon or start the same option again (by pressing fire again).

● Erase

Move the pointer to the start position for erasing and press fire. A line will appear which can be moved around the screen and will rub out everything it goes over.

● Flood fill

Place the pointer anywhere inside

the shape to be filled and press fire. This will not always fill the whole shape, although it should for simple shapes. If it doesn't, just fill the part it has left — this shouldn't normally have to be repeated more than two or three times. Flood fill can also be used to change the colour of a solid shape by filling the shape with another colour, or can delete it by filling it with black.

● Magnify

When selected, a square will be shown. This should be placed over the portion that needs to be magnified. Press fire, and after accessing the disk a grid should appear. Each square inside the grid represents one pixel inside the original square. Any individual pixel can be changed to the colour shown in the select block by placing the pointer over the corresponding block in the grid and pressing fire. The colour of the select block can be changed in the normal way (see above). To exit from this facility, simply select another icon. This routine creates a file called 'A.magnify' which stores the part of the screen that is rubbed out by the grid. Sufficient space for this file should always be left on the disk that you are using.

● Draw rectangles

Press fire while in the display area to fix one corner. By moving the joystick, the rectangle can be dragged about until it is just the right shape and size. This is called 'rubber-banding'.

● Circles

Pressing fire while in the display area will fix the point of the centre of the circle. A series of dots will appear in the shape of a circle (dots are used for speed of drawing) and the radius can then be changed by pushing the joystick left or right. Press fire when ready to draw the circle.

● Lines

Move the pointer to the start position and press fire; a line can then be rubber-banded to the correct position. To draw the line, press fire again.

● Triangles

Press fire to fix one corner of the triangle; do this for another corner. A line will be drawn between the two points and the rest of the triangle can be rubber-banded to the correct shape. Press fire to draw the triangle.

● Arcs

Three points must be plotted by pressing fire. A dot will be drawn at each point, and when all three points have been plotted, an arc will be drawn that passes through all three points in the order in which they were plotted.

● Write text

Move the pointer to the start position

of the text so that the pointer represents the placing of the first letter of the text. Press fire, type the text and press <RETURN>.

● Load and save pictures

Pictures may be loaded and saved by selecting the icons at the bottom right of the display which show a disk, and an arrow signifying data direction (towards the disk for save and away from the disk for load). You will be asked for a filename; type it in and press <RETURN>. The icons will be rubbed out and the picture will be saved or loaded; the icons will then be redrawn.

If any errors occur while using the package (for example, disk full) it will be reported, usually in the window at the bottom of the screen. To continue after an error, press any key.

Any attempt to drag shapes outside the drawing area will result in the current drawing routine being aborted and the shape deleted. This can be used to exit from a procedure half-way through if the shape is incorrectly positioned.

If you want to use another input device, change PROCconvert to give an X, Y coordinate where X=0 to 1280, Y=0 to 1024, PROCclick to sense a button being pressed, and put either 0 or 1 into the variable E (0 if not pressed, 1 if pressed). If you require different keys, change the values on the INKEY statements in PROCconvert and PROCclick to the values shown on page 275 of the BBC Micro's User Guide.

The system needs Basic 2 whenever OSCLI is used (although it should be possible to make it work with Basic 1 by replacing OSCLI ("Drive"+X\$) by call\$="DRIVE"+X\$: CALL&C00,call\$), a proportional joystick, and should use a disk drive. Using a cassette is possible but will involve tedious rewinding and re-loading. The program is split into two parts: the first part draws the screen and icons; the second part handles the routines. While using the package, a disk containing both programs should be kept in the drive as some of the routines require re-loading.

When Program One is running it will check if a joystick is plugged in or not; this is done by checking the constancy of the resistance on channels 1 and 2. This means that if you are using a joystick and you move the joystick about while the program is loading, the incorrect input device will be selected. Therefore, it is advisable to plug in the joystick before loading the program and not to touch the joystick during loading. Part one of the program should be saved as 'art' and part two should be saved as 'art2'.

Variations on an

OPUS

The Incomparable Compatible

£ 499	Opus PCII Turbo 8MHz
£ 599	512k Twin Floppy
£ 675	256k 5Mb Hard Disk 512k 5Mb Hard Disk
£ 725	512k 10Mb Hard Disk
£ 845	512k 20Mb Hard Disk
£ 910	1024k Ditto with RAM Disk
£ 965	512k 30Mb Hard Disk
£1030	1024k Ditto with RAM Disk
£1149	512k 40Mb Ultra Fast hard Disk
£1215	1024k Ditto with RAM Disk

Hard disk installation IS included

Add for COLOUR UPGRADES

£ 199	CGA Card and Philips 8533 Med. Res. VDU
£ 399	EGA Card and ADC EGA VDU
£ 465	EGA Card and Taxan 660 EGA VDU
£ 645	EGA Card and NEC Multisync All Standards VDU

THE OPUS ULTIMATE

1024k RAM with RAM DISK implemented, 1.2Mb high Density Floppy Disk Drive, Ultra fast 40Mb Hard Disk, ALLOY 40Mb Tape Streamer, 8087-2 8MHz Maths Co-Processor, NEC Multisync Hi-resolution Colour Monitor, compatible with IBM, CGA, EGA, and PGA Cards fitted with EGA Auto-Switching card. Operates at 3 times the industry standard.

£2499

Multi-user networked high speed systems using OPUS and NEC Computers, with 40Mb Storage.

3 User £3444 4 User £4400

Please contact us for other configurations.

XT Upgrading to AT. Call for quote.

Maintenance Contracts on all systems.

NEC

At last! The APC IV from NEC.

This NEC AT has 80286 8MHz CPU, 640k RAM, 1.2Mb Floppy drive, 20Mb 40m/s Hard Disk. Supports up to 8.6Mb of RAM. Operates at 7.7 times the industry standard. Is equipped with NEC Multisync Colour Monitor and EGA Card.

Other hard disk and tape streamer options available.

Also the NEC Multispeed Laptop Portable with NEC V.30 CPU, switchable clock speed to 9.54MHz, 640k RAM, 85 key standard keyboard, Graphics 640x200 standard. Runs at almost 5 times the industry standard speed. Carriage and VAT excluded

Full range of NEC, Juki, Brother, Toshiba, Epson, Star and Laser Printers.

Full range of terminals.

Free hotline support and free computer online support.

Open 0900 to 1900hrs Monday to Saturday. Evening Answering service.

Credit Cards Accepted.

PACIFIC COMPUTERS (UK) LTD

565-569 Chiswick High Road,
London W4 3AY
Call 01-994 1054
Telex: 291432 Bellil G

MICROMART

COMPUTER PROBLEMS?

WE HAVE THE SOLUTIONS

Not all data switches and converters are the same. Check these features when selecting your next purchase.

DO THEY INCLUDE:

	Us	Them
Computer and Printer Cables	X	
Direct from manufacturer from stock	X	
Attractive styling and small size	X	
No quibble guarantee	X	
Experienced technical support	X	
Competitive pricing	X	
1st class postage and packing	X	
Customised versions available	X	

WE DO!

*Converters include printer cables. Additional Cables at reduced prices. Ring us for quotation or further information about our comprehensive range of data switches, data converters and low cost computer cables, or write for no stamp required!



TYPEPRO LIMITED

Freeport, 30 Campkin Road,
Cambridge CB4 1BR
Telephone (0223) 322394

GET YOUR MESSAGE ACROSS with

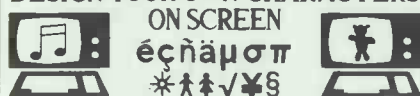
SIGNWRITER

instant high-quality display lettering
from a dot-matrix printer

- ♥ SIGNS ♦ PUBLISHING
- ♣ BANNERS ♠ LEAFLETS
- 😊 and adverts - like this one

ANY SIZE, ANY LAYOUT!

DESIGN YOUR OWN CHARACTERS



For IBM compatibles & Apricots: £80 + VAT
Amstrad PCW £49.95, BBC £29.95 (inc VAT) too!

WIGHT SCIENTIFIC

44 Roan Street, London SE10 9JT
phone 01 858 2699

Ask us about bibliographic databases, statistics,
label-printing, and desk-top publishing, too.

PostGraph

A plotter program for scientists, academics and professionals.

Draws high quality line graphs, scatter graphs and histograms

Designed for theses, research papers, project reports.

Complete with built-in text editor for data file preparation.

Imports data as ASCII text files from other programs

Previews plotter output on screen

Can copy preview screen to printer for rough drafts

Plotters supported:

EPSON HI-80 Plotter (all modes)

HEWLETT-PACKARD Graphics Language-compatible

WATANABE (and compatibles)

Requires: IBM-PC/XT/AT or compatible computer (including AMSTRAD PC1512) running PC-DOS/MS-DOS 2.x or 3.x with at least 300K of free memory. Graphics board (CGA, EGA or Hercules) needed for on-screen preview of plotter output (otherwise program will run in text-only mode). Epson or compatible printer with graphics needed for screen dump.

Not copy-protected. You may return the program for any reason within 30 days after purchase for a full refund.

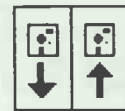
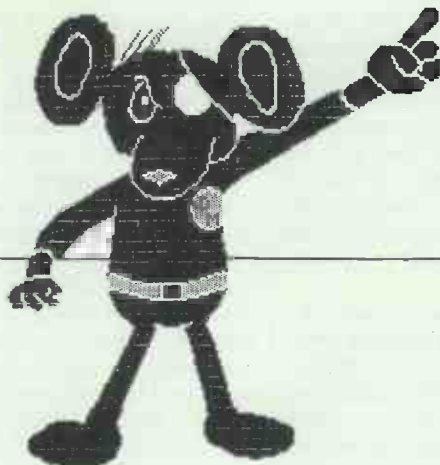
Price: £19.95

No VAT. Price includes airmail to all countries. Disk formats other than standard IBM 5.25 inch: please call. Orders, stating computer type, with cheque (all currencies acceptable) to:

Syntax Systems

6 Caberston Avenue, Walkern, Peablenesshire, EH43 6BA
Telephone: (089 587) 222

PROGRAM FILE



Sorted. Separated. Continuous.



```

10REM *****
20REM ****
30REM **** Artwork ****
40REM **** By ****
50REM **** Daniel Tang ****
60REM **** 1/2/87 ****
70REM ****
80REM **** Program 1 ****
90REM ****
100REM *****
110
120IF PAGE<>1100 MODE1:PROCKeyboard
130VDU28,31,31,39,0
140CLS
150CLOUR7
160GCOL0,7
170VDU24,0,0;1279;1023;
180VDU28,0,31,39,0
190PROCIcon
200IX=132
210FORVY=1T012 STEP3
220IFYV=7 VY=VY+2
230IX=IX+8
240PRINTTAB(33,VY)CHR$(IX);CHR$(IX+1);" ";CHR$(IX+4);CHR$(IX+5)
250PRINTTAB(33,VY+1)CHR$(IX+2);CHR$(IX+3);" ";CHR$(IX+6);CHR$(IX+7)
260NEXT
270PROCIcon2
280IX=164
290FORVY=15T023 STEP3
300IX=IX+8
310PRINTTAB(33,VY)CHR$(IX);CHR$(IX+1);" ";CHR$(IX+4);CHR$(IX+5)
320PRINTTAB(33,VY+1)CHR$(IX+2);CHR$(IX+3);" ";CHR$(IX+6);CHR$(IX+7)
330NEXT
340PRINTTAB(33,26)CHR$(164);CHR$(165);" ";CHR$(164);CHR$(165)
350PRINTTAB(33,27)CHR$(166);CHR$(167);" ";CHR$(166);CHR$(167)
360MOVE0,156
370DRAW992,156
380DRAW992,1024
390PRINTTAB(33,28)CHR$(140);CHR$(141);" ";CHR$(168);CHR$(169)
400PRINTTAB(33,29)CHR$(142);CHR$(143);" ";CHR$(170);CHR$(171)
410PRINTTAB(33,15)" "
420PRINTTAB(33,16)" "
430FORVY=1040T01232 STEP96
440MOVEVY,48:DRAWVY,208
450MOVEVY,272:DRAWVY,752
460MOVEVY,816:DRAWVY,1008
470NEXT
480FORVY=264T01008 STEP96
490IFYV=848 VY=808
500MOVE1040,VY:DRAW1232,VY
510IFYV<272 VY=VY+4:GOTO500
520IFYV<816 AND VY>807 VY=VY+4:GOTO500
530NEXT
540FORVY=40T048 STEP4
550MOVE1040,VY
560DRAW1232,VY
570NEXT
580MOVE1040,208:DRAW1232,208
590MOVE1060,490:DRAW1110,538
600FORVY=1232T01240 STEP4
610MOVEVY,40:DRAWVY,200
620MOVEVY,264:DRAWVY,746
630MOVEVY,808:DRAWVY,1000
640NEXT
650FORVY=416T0679 STEP68
660GCOL0,(VY-416)/60
670MOVEVY,10:MOVEVY,96:PLOT85,VY+60,10
680MOVEVY+60,10:MOVEVY+60,96:PLOT85,VY,96
690NEXT
700GCOL0,7
710MOVE416,10:DRAW679,10
720MOVE416,96:DRAW679,96
730MOVE416,10:DRAW416,96
740MOVE550,10:DRAW550,96
750MOVE0,0:DRAW352,0
760DRAW352,120:DRAW0,120
770DRAW0,0
780PROCExtra
    
```

PROGRAM FILE

```

790VDU5
800GCOL0,1
810MOVE0,152:PRINTSTRING$(31,CHR$255)
820COLOUR7
830COLOUR128
840GCOL0,7
850*FX16,2
860CZ=640:DX=512
870PAGE=1100
880CHAIN"art2"
890END
900
910DEFPROCicon
920REM ***** PENCIL *****
930VDU23,140,0,0,0,0,0,1,2,4,23,141,0,0,48,104,164,28,8,16,23,142,8,16,32,49,5
8,60,0,0,23,143,32,64,128,0,0,0,0
940REM ***** SPRAY *****
950VDU23,144,0,0,15,60,14,14,27,17,23,145,0,0,248,60,56,12,4,132,23,146,16,16,
16,16,16,0,0,23,147,228,132,228,132,228,132,228,252,0
960REM ***** ROLLER *****
970VDU23,148,0,0,31,63,31,0,0,0,23,149,0,0,224,248,232,8,16,32,23,150,0,0,0,1,
1,1,0,23,151,64,128,128,192,192,192,192,192,192,23,154,31,31,2
980REM ***** BRUSH *****
990VDU23,152,0,0,1,1,1,1,1,23,153,0,0,192,192,192,192,192,192,23,154,31,31,2
1,21,21,21,0,23,155,252,252,84,84,84,84,0
1000REM ***** RECTANGLE *****
1010VDU23,156,0,0,0,31,16,16,16,16,23,157,0,0,0,248,8,8,8,23,158,16,16,16,16,
31,0,0,23,159,8,8,8,248,0,0
1020REM ***** CIRCLE *****
1030VDU23,160,0,0,7,8,16,16,32,32,23,161,0,0,240,8,4,4,2,2,23,162,32,32,16,16,8
7,0,0,23,163,2,2,4,4,8,240,0
1040REM ***** RUBBER *****
1050VDU23,164,0,0,0,0,1,2,4,8,23,165,0,0,124,140,20,36,72,144,23,166,31,31,3
1,0,63,0,0,23,167,32,64,128,0,0,255,0,0
1060REM ***** FILL *****
1070VDU23,168,0,0,0,31,16,23,23,23,23,169,0,0,0,248,8,232,232,232,23,170,23,23,
23,16,31,0,0,23,171,232,232,232,8,248,0,0,0
1080ENDPROC
1090
1100DEFPROCicon2
1110REM ***** BIN *****
1120VDU23,144,0,0,1,31,63,16,18,50,23,145,0,0,128,248,252,8,168,172,23,146,50,1
8,18,18,16,16,31,0,23,147,172,168,168,168,8,248,0
1130REM ***** TRIANGLE *****
1140VDU23,148,0,0,0,0,1,1,2,23,149,0,0,0,128,128,64,64,32,23,150,2,4,4,8,8,16
31,0,23,151,32,16,16,8,4,252,0
1150REM ***** TEXT *****
1160VDU23,152,7,15,24,56,32,0,3,6,23,153,224,240,24,8,8,232,248,8,23,154,12,24,
24,56,56,24,31,6,23,155,8,8,8,24,56,232,140,6
1170REM ***** MAGNIFYING GLASS *****
1180VDU23,156,0,0,0,1,1,2,2,23,157,0,0,112,140,4,2,2,2,23,158,3,7,14,28,56,48
0,0,23,159,4,140,112,0,0,0,0
1190REM ***** WIGGLY LINE *****
1200VDU23,160,0,0,0,0,3,4,8,23,161,0,0,0,0,0,128,66,23,162,8,16,16,32,32,0,
0,0,23,163,66,36,36,24,0,0,0
1210REM ***** DISC *****
1220VDU23,164,0,0,63,32,32,33,35,23,165,0,0,254,2,58,58,130,194,23,166,35,33
32,33,33,33,63,0,23,167,194,146,2,130,130,130,254,0
1230REM ***** ARROWS *****
1240VDU23,168,0,0,1,3,7,15,31,1,23,169,0,128,192,224,240,248,252,192,23,170,1,1
1,1,1,1,0,23,171,192,192,192,192,192,192,192,0
1250VDU23,140,0,3,3,3,3,3,3,23,141,0,128,128,128,128,128,128,128,23,142,3,6
3,31,15,7,3,1,0,23,143,128,252,248,240,224,192,128,0
1260ENDPROC
1270
1280DEFPROCextra
1290VDU23,128,252,248,240,240,216,140,6,3
1300VDU23,130,0,0,60,60,60,60,0,0
1310VDU23,131,68,16,9,64,20,0,8,0
1320VDU23,132,3,7,14,81C,&38,&70,&E0,&80
1330VDU23,255,255,255,255,255,255,255,255,255
1340ENDPROC
1350
1360DEFPROCkeyboard
1370TX=0:CZ=ADVAL(1)+ADVAL(2)
1380FORAX=1TO300
1390TX=TX+ABS(ADVAL(1)+ADVAL(2)-CZ)
1400NEXT
1410TX=TX/300
1420IFTX>362 KZ=1 ELSE KZ=0
1430ENDPROC
>
XL
10REM Artwork
20REM Frog2
30REM Daniel Tang
40contX=0:PROCinvert(620,152,988,124):PROCnightlight
500N ERROR PROCerror:IFERL=4530 AND cx>1136 GOTO490 ELSE IFERL=4530 GOTO350
60VDU28,1,30,10,29
70VDU4
80CLS
90VDU5
100offx=0
110XZ=620:PROCcolour
120PROCmove
130IFXZ<996 GOTO120
140VDU24,0,0,1279,1023;
150IFendproc=0 GOTO230
160IFYZ>208 YZ=YZ-64
170IFYZ>752 YZ=YZ-64
180choiceZ=(YZ-112)/96)+1
190IFchoiceZ=0 choiceZ=1
200P=(choiceZ*96)+108
210IFchoiceZ>1 P=P+64
220IFchoiceZ>6 P=P+64
230IFcx>1136 GOTO380
240PROCinvert(1044,P,1132,P-88)
250VDU24,0,164,988,1023;
260IFendproc=0 SOUN1,-5,200,2
270IFchoiceZ=1PROCload
280IFchoiceZ=2PROCmagnify
290IFchoiceZ=3PROCtriangle
300IFchoiceZ=4PROCline
310IFchoiceZ=5PROCedit
320IFchoiceZ=6PROCrectangle
330IFchoiceZ=7PROCpaint(126)
340IFchoiceZ=8PROCdraw
350VDU24,0,0,1279,1023;
360PROCinvert(1044,P,1132,P-88)
370GOTO10
380PROCinvert(1140,P,1228,P-88)
390VDU24,0,164,988,1023;

```

MICROMART

MIX C ONLY £29.95

Plus 30 Day Money Back Guarantee

Get off to a fast start with MIX C. MIX Software's comprehensive book and nimble C compiler will have you programming in C before you know it.

The MIX C book is your teacher. You'll start right away compiling and executing programs. The tutorial takes you step by step through the C language. You'll learn by example with a book that's chock-full of sample programs. And the programs aren't just fluff. They teach you the important C concepts. An amortization program teaches you how to use pointers to functions. A data base program teaches you how to manage memory dynamically. It's the best hands-on training available.

You'll love working with the MIX C compiler. It's half as large and twice as fast as other C compilers. In fact it's the only full featured C compiler that can be operated comfortably on floppy disks. And as you would expect MIX C is easy to use. It produces a complete program listing with compile errors clearly identified and explained. If you've been frustrated by other C compilers don't throw in the towel until you've tried MIX C. There's a big difference.

Although it's small, MIX C is not a subset. MIX C supports the full K&R standard, including the extensions that are often omitted in other C compilers. MIX C comes complete with a comprehensive 450 page book, a standard library of more than 175 functions, a blazingly fast linker, and tools for optimizing your programs for minimal space or maximum speed. All of this is yours for the incredibly low price of £29.95. That's little more than the cost of most C books alone. So don't be left behind. Order your copy today and find out why everyone is switching to C.

CTRACE DEBUGGER £29.95

The perfect companion for MIX C is the exciting new C debugger from MIX Software. Ctrace is unlike any debugger you've ever seen. It brings your programs to life on the screen. You'll see your variable values changing as you watch your C source code executing. The animated trace shows you the flow of execution, statement by statement. It's like watching the bouncing ball as the cursor dances over your C program. Ctrace is very simple to operate. Commands are executed with a single keystroke. Pop up menus list the command options. Pop up messages alert you when anything important happens. There are 6 windows of information: source, output, variables, watch, memory, and symbols. You can view as many as 4 windows at once. The function keys make it easy to quickly choose among 8 different views.

The combination of Ctrace with MIX C makes C programming a real joy. MIX C provides the power of a compiler while Ctrace provides an execution environment that's more elegant than an interpreter.

SPLIT SCREEN EDITOR £19.95

Another great companion to the MIX C compiler is MIX Software's split-screen editor. It makes writing programs even faster and easier. With the MIX editor you can compile, link, and execute your programs at the touch of a key. Compiling is fast because the MIX C compiler reads the program directly from memory. Correcting errors is easy because the editor automatically positions the cursor to the first error in the program. The editor is similar to Micropro's WordStar but with additional programming features like split screen, macros, and much more. Use it for all of your programming needs.

ASM Utility £6.95

MIX Software's ASM utility is available if you want to link assembly language functions to your C programs. It works with Microsoft's MASM assembler. Call assembly language functions just like C functions. Call C functions from assembly language. Lots of useful assembly language functions are included as examples.

MIX C Examples Disk £5.95 containing all the examples contained in the Tutorial, tried and tested. Give your fingers a break...

The Complete MIX C-Works Only £69.95
includes Editor, C Compiler, Ctrace, Examples and ASM Utility.
MIX C is available for all AMSTADS including CPC PCW and PC
ma software, 1136 Commerce Drive Richardson, TX, USA
(214) 783 6001 have appointed Analytical Engines as their UK
Distributors and Technical Support Agents. Discounts for
educational establishments. Trade enquiries.
Send for our comprehensive MIX C brochure.

Postage £3 per order. UK £3 (rest of Europe Please add 15% VAT in the UK)

Analytical Engines Ltd, PO Box 35,
Eastleigh, Hampshire S05 5WU
Tel: 0703 262099

PROTECT YOUR SOFTWARE INVESTMENT

Felspar LIMITED

PO Box 323, London NW9
Telex 265871 MONREF G
(quoting ref: CQ0180).
Electronic Mailbox 87: CQ0180

COPY II PC Version 3.06 makes backups of most protected and unprotected software for IBM PC and compatibles. Allows some popular programs (Lotus, dBASE, etc.) to be run entirely from hard disk - without using a key disk. Back up your hard disk without un-installing!
COPY II PC OPTION BOARD the ultimate in floppy disk backup capability. There is virtually no protection scheme the Option Board cannot handle (except physical alteration of the diskette). With Transcopy driver software Version 4.0 and Transedit track and sector editor for IBM PC and compatibles with at least one 360K drive and one half slot. PC TOOLS1 resident disk and file utilities with powerful DOS interface for IBM PC and compatibles with DOS up to 3.2, single/multiple drives, 5.25" and 3.5" floppy, hard disks and RAM disks. Fully supports Lotus/Intel/Microsoft EMS.

SEND S.A.E FOR BACK-UP LIST & PRICES

COPY II MAC backs up nearly all protected Apple Macintosh programs fast and easy! Includes COPY II HARD DISK to run some popular programs entirely from hard disk, plus MACTOOLS utility program. Recover deleted and trashed files, repair "unreadable" disks.
COPY II PLUS the all-time favourite of Apple II series users. Copy parameters for most programs are already on the disk! Includes DOS 3.3 and ProDOS utilities, disk and drive diagnostics, Sector and Nibble editors.

COPY II ST a new addition, with fast sector copy and a powerful, filename-driven bit copy program to back up most software available for the Atari ST computers. Works with 1 or 2 single- or double-sided drives on the Atari 520 ST or 1040 ST.

Also now available - LOTUS 1-2-3 and dBASE ENHANCEMENTS. Quickcode for Lotus 1-2-3 Release 2, dBASE III and III+. Quickreport for all versions of dBASE plus Quickindex, Quickpack, Quickmac, dGRAPH, dUTIL, KEYMAC, PASSKEY.

MICROMART

COMPUTER REPAIRS

SPECTRUM 16/48	£19.95
SPECTRUM + ...	£19.95
QL	£27.95
COMMODORE 64	£35.00
AMSTRAD 464/664	£24.95
AMSTRAD 6128	£27.95
AMSTRAD PCW 8256/512	P.O.A.
AMSTRAD PC 1512	P.O.A.
PLEASE PHONE FOR DETAILS	

THE PRICES SHOWN ARE FULLY INCLUSIVE OF PARTS, LABOUR, POSTAGE, INSURANCE, VAT AND 3 MONTH GUARANTEE. SEND ITEM WITH CHEQUE AND DESCRIPTION OF FAULT TO:



BUREDATA
COMPUTER REPAIR AND MAINTENANCE

DEPT PCW, UNIT 6,
STANLEY HOUSE, STANLEY AVENUE,
WEMBLEY, MIDDX HA0 4JB.
Telephone: 01-902 5218

SHARE YOUR LASER PRINTER —AUTOMATICALLY!



DS4 DATASWITCH

- ★ 4-into-1 automatic RS232 data switch
- ★ Automatic or manual operation
- ★ No software overhead required in your system
- ★ Boosts and 'Cleans up' your signals

Phone or write for further details:
DEALER ENQUIRIES WELCOME.

R-TEK RESEARCH LTD
Unit 5, Greenwood Court, Ramridge Road,
Luton LU2 0TN

MICRO-TECH

**AMSTRAD AUTHORISED &
APPROVED BUSINESS
DEALER & SERVICE
CENTRE**

Business Computers & Systems
Word Processors & Printers
Electronic Mail Systems
Software, Stationery & Supplies
Business & Scientific Calculators

The micro shop with the **MEGA**
reputation

Fountain St., Bolton Rd., BURY
BL8 2NS. Tel: 061-797 6419
(24 hrs)

PROGRAM FILE

```

400IFendproc SOUND1,-5,200,2
410IFchoice=1PROCsave
420IFchoice=2PROCarc
430IFchoice=3PROCtext
440IFchoice=4PROCclear
450IFchoice=5PROCfill
460IFchoice=6PROCcircle
470IFchoice=7PROCpaint(1)
480IFchoice=8PROCpaint(2)
490VDU21,0;0;1279;1023;
500PROCinvert(1140,P,1228,P-88)
510GOTO150
520:
530DEFPROCinvert(IX,YX,PX,OX)
540GCOL3,7
550MOVEIX+4,YX
560MOVEPX,YX
570PLOT65,PX,OX
580MOVEIX,OX
590MOVEPX-4,OX
600PLOT65,IX,YX
610ENDPROC
620:
630DEFPROCdraw
640PROCmove:IFendproc ENDPROC
650GCOL0,colourX
660MOVE IX,YX
670HEPEAT
680PROCconvert
690DRAWIX,YX
700PROCclick
710UNTILE<>0
720REPEAT:PROCclick:UNTILE=0
730ENDPROC
740:
750DEFPROCline
760PROCmove:IFendproc ENDPROC
770AX=IX
780BX=YX
790GCOL3,7
800HEPEAT
810PROCconvert
820IFIX>992 OR YX<160 ENDPROC
830MOVEAX,BX
840DRAWIX,YX
850FX19
860FX19
870MOVEAX,BX
880DRAWIX,YX
890PROCclick
900UNTILE<>0
910REPEAT:PROCclick:UNTILE=0
920MOVEIX,YX
930GCOL0,colourX
940DRAWAX,BX
950IF contX GOTO770
960ENDPROC
970:
980DEFPROCmove
990endproc=0
1000VDU24,0;0;1279;1023;
1010GCOL3,7
1020HEPEAT
1030PROCconvert
1040MOVEIX,YX
1050PRINTCHR$128
1060FX19
1070FX19
1080MOVEIX,YX
1090PRINTCHR$128
1100PROCclick
1110UNTILE<>0
1120REPEAT:PROCclick:UNTILE=0
1130IF YX<120 AND IX<900 AND IX>416 PROCcolour:GOTO1010
1140IF YX<160 AND YX>119 AND IX<992 PROCsystem:GOTO1010
1150IF YX<160 AND IX<996 GOTO1010
1160IF IX>992 endproc=1:cont=IX
1170VDU24,0;164;988;1023;
1180ENDPROC
1190:
1200DEFPROCclear
1210VDU4
1220CLS
1230ORS=1:TO200:NEXT:FX21,0
1240PRINT" Are you sure?"
1250RS=GET$
1260CLS
1270IF RS="Y" OR RS="y" CLG
1280VDU5
1290PROCmove
1300ENDPROC
1310:
1320DEFPROCcircle
1330PROCmove:IFendproc ENDPROC
1340VDU29,IX,YX;
1350AX=IX
1360GCOL3,7
1370HEPEAT
1380PROCconvert:IFIX>994 UNTILTRUE:GOTO1610
1390KX=ABS(AX-IX)
1400URT=1:TO2
1410RESTORE1630
1420FORKX=1:TO6
1430READX,Y
1440UX=X+RX
1450PY=Y+RY
1460PLOT69,OX,PX
1470PLOT69,OX,-PX
1480PLOT69,-OX,-PX
1490PLOT69,-OX,PX
1500NEXT
1510NEXT
1520PROCclick
1530UNTILE<>0
1540GCOL0,colourX
1550MOVEO,RX
1560ORS=0:TO2*PI STEP0.1
1570DRAWIN(8)*RX,COS(8)*RX
1580NEXT
1590DRAWO,RX
1600IFcontX GOTO1340
1610VDU29,0;0;
1620ENDPROC

```

PROGRAM FILE

```

1630 DATA0,1,0.295,0.955,0.565,0.825,0.783,0.622,0.932,0.362,0.997,0.071:REM Fo
r faster circles
1640:
1650DEFPROCtext
1660PROCmove:IF endproc ENDPROC
1670FORS=1TO200:NEXT:FX21,0
1680REPEAT
1690MOVEX,Y%
1700GCOL3,7
1710PRINT" "
1720A=GET
1730MOVEX,Y%
1740PRINT" "
1750GCOL0,colour%
1760MOVEX,Y%
1770PRINT,CHR$(A)
1780X=X%+32
1790IFA=127 X%=X%-64
1800UNTIL A=13
1810ENDPROC
1820:
1830DEFPROCedit
1840PROCmove:IFendproc ENDPROC
1850REPEAT
1860PROCconvert
1870GCOL0,7
1880MOVEX,Y%
1890PRINTCHR$132
1900*FX19
1910*FX19
1920GCOL0,0
1930MOVEX,Y%
1940PRINTCHR$132
1950PROCclick
1960UNTILE<>0
1970REPEAT:PROCclick:UNTILE=0
1980ENDPROC
1990:
2000DEFPROCrectangle
2010PROCmove:IFendproc ENDPROC
2020A=X%:B=Y%
2030GCOL3,7
2040REPEAT
2050PROCconvert
2060IFX%>992 OR Y%<160 UNTILTRUE:ENDPROC
2070FORTY=1TO2
2080MOVEA%,B%:DRAWA%,Y%
2090DRAWX%,Y%
2100DRAWX%,B%
2110DRAWA%,B%
2120*FX19
2130*FX19
2140NEXT
2150PROCclick
2160UNTILE<>0
2170REPEAT:PROCclick:UNTILE=0
2180GCOL0,colour%
2190MOVEA%,B%:DRAWA%,Y%
2200DRAWX%,Y%
2210DRAWX%,B%
2220DRAWA%,B%
2230IFcont% GOT02020
2240ENDPROC
2250:
2260DEFPROCtriangle
2270PROCmove:IFendproc ENDPROC
2280A=X%:B=Y%
2290PLOT69,A%,B%
2300PROCmove:IFendproc ENDPROC
2310P=X%:Q=Y%
2320GCOL3,7
2330PLOT69,A%,B%
2340MOVEA%,B%
2350DRAWX%,Q%
2360REPEAT
2370 PROCconvert
2380IFX%>992 OR Y%<160 MOVEP%,Q%:DRAWA%,B%:UNTILTRUE:ENDPROC
2390FORTY=1TO2
2400MOVEA%,B%:DRAWX%,Y%
2410DRAWX%,Q%
2420*FX19
2430*FX19
2440NEXT
2450PROCclick
2460UNTILE<>0
2470REPEAT:PROCclick:UNTILE=0
2480GCOL0,colour%
2490MOVEA%,B%
2500DRAWX%,Y%
2510DRAWX%,Q%
2520DRAWA%,B%
2530ENDPROC
2540:
2550DEFPROCsave
2560VDU4
2570CLS
2580INPUT"Filename:"File$
2590CLS:PRINT" Saving.."
2600VDU28,31,31,39,0:CLS
2610DECLI("SAVE "+File$+" 3000 7380")
2620CHAIN"art"
2630ENDPROC
2640:
2650DEFPROCload
2660VDU4
2670CLS
2680INPUT"Filename:"File$
2690DECLI("LOAD "+File$)
2700CHAIN"art"
2710ENDPROC
2720:
2730DEFPROCfill
2740PROCmove:IFendproc ENDPROC
2750bgc%=POINT(X%,Y%)
2760GCOL0,128*bgc%
2770P=X%:PY=Y%:Q=Y%
2780GCOL0,colour%
2790PLOT77,X%,Y%
2800REPEAT
2810PROCmid
2820Q=Q%+4
2830REPEAT:AX=AX+4:UNTIL POINT(AX,Q%)=bgc% OR AX>B%

```

MICROMART

DESK TOP PUBLISHING

LIKE THE TECHNOLOGY
DONT LIKE THE CAPITAL COST

ACT BUREAU

BRINGS YOU THE BENEFITS
BUT NOT THE COST

- * COMPUTERS, SCANNERS, LASER PRINTERS
- * HIGH QUALITY ORIGINALS WITH TEXT AND GRAPHICS
- * WORD PROCESSING (M/S WORD)
- * FULL BUSINESS SUPPORT-DBASE111+, LOTUS 123, ALDUS PAGEMAKER
- * DATABASE/MAILLIST MANAGEMENT
- * COMMUNICATIONS LINKS
- * SYSTEMS CONSULTANCY

ACT SYSTEMS ISABEL HOUSE, VICTORIA RD
SURBITON, SURREY 01-390-6562

DISK-OUNT DISKS FROM MONAS OVERSEAS UK LTD

Unit 34, Cannon Workshops, Cannon Drive,
West India Dock, London E14 9SU Tel: (01) 987 3213

SPECIAL OFFER — SONY

3 1/2" DS/DD £19.00 per box.

Minimum 10 boxes

Cash with order only

3" AVAILABLE FROM £29 PER BOX

LOWER PRICES		BARGAIN 3 1/2" DISKS				
		PRICES PER BOX OF 10 DISKS (£)				
SONY	1	2-5	6-9	10+	FREE	
SS/DD	17.00	16.00	15.00	14.00	P&P ON ALL 3 1/2"	
DS/DD	23.00	21.00	20.00	19.00	DISKS IN UK	
NASHUA						
DS/DD	19.00	18.00	17.00	16.00		
5 1/4" DISKS						
NASHUA	1	2-5	6-9	10+	CALL FOR	
SS/DD	8.00	7.70	7.30	7.00	ALL YOUR	
DS/DD	9.50	9.00	8.50	8.00	COMPUTER	
DS/DD	12.00	11.00	10.00	9.00	MAGNETIC MEDIA	
DS/HD	18.00	17.00	16.00	15.00	REQUIREMENTS	
DYSAN						
SS/DD	14.20	13.20	12.30	11.50	EXPORT	
DS/DD	16.00	15.50	15.00	14.00	ENQUIRIES	
DS/DD	21.00	20.00	19.00	18.00	WELCOME	

P&P 1-5 Boxes: 50p per box 6 + Boxes free in UK

All prices ex VAT (Subject to availability)

PREMIUM QUALITY DISKS

	100	250	500	1000
5 1/4" DS/48tpi	29p	27p	25p	??
5 1/4" DS/96tpi	32p	29p	27p	??
5 1/4" AT/1.6mb	97p	95p	89p	??
3 1/2" SS/135tpi	79p	75p	??	??
3 1/2" DS/135tpi	89p	85p	??	??

Add Carriage @ £4.50, then add VAT
C.W.O. • Prices • Same Day Dispatch

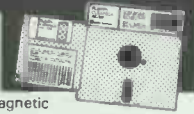
ABACOM COMPUTER SUPPLIES

225 Walton Road, Woking, Surrey GU21 5EF
Tel: 04862-71563/30300

PROTECT DATA EXTEND HEAD LIFE REDUCE ERRORS

WITH  FLOPPY CLEANICA

THE UNIQUE
MICROWAVE-MACHINED
SOFT POLYESTER
CLEANING DISC



• Safe design containing no magnetic materials or compounds • No messy liquids or 'one time' cleaning pads • Simple 15 second cleaning cycle for both double or single sided drives • Economic lifespan gives 150 operations with usage chart

FLOPPY CLEANICA is manufactured by Audio Technica, a world-wide name in precision made products, and maintains disc drive heads in optimum condition for minimum read/write error.
Order directly today by mail (cheque/p.o.) or credit card telexsales.

FLOPPY CLEANICA £19.95 INC. P&P
Please state 5.25" (ATC-205) or 3.5" (ATC-203) DRIVE

 **audio-technica**

Technica House, Lockwood Close, LEEDS LS11 5UU.
TELESALES (0532) 771441

Inashua

DISKETTES

	50+	500+	1000+
3 1/2"			
SSDD	1.16	1.12	1.07
DSDD	1.44	1.38	1.32
5 1/4"			
SSDD	0.47	0.45	0.43
DSDD	0.59	0.56	0.54
SSQD	0.73	0.70	0.67
DSQD	0.82	0.78	0.75
DSHD	1.36	1.30	1.24

FROM

CAROUSEL TAPES
3 Park Parade, Stonehouse
Glos GL10 2DB
Tel: 045382 2151
Prices ex. VAT. Inc Delivery

 **P.B. ELECTRONICS LTD**
*D. BOX 95, WARRINGTON WA1 1LD
(0925) 615635
TLX 837400 ONEONE G Quota Ref 7808001

EPSON LX86 £189.00

EPSON FX800	£299.00	EPSON LQ800	£426.00
EPSON FX1000	£378.00	EPSON LQ1000	£562.00
EPSON EX800	£380.00	EPSON LQ2500	£699.00
EPSON EX1000	£504.00	EPSON SQ2500	£919.00

EPSON COMPUTERS
CANON LASER PRINTER LBP-8 £1475.00
EPSON PC 2 F/DISK 236K £520.00 (LIMITED)
EPSON PC + 20MB 640K £1199.00 (LIMITED)

STAR		NL-10	£199.00
NR-15	£405.00	NX-15	£272.00
NB24-15	£525.00	ND-15	£339.00
NB-15	£655.00		

IMPORTANT

From the vast array of IBM® Clones on offer our engineers and other discerning corporates have chosen — **THE BEST OF THE CLONES**
As national advertised, starting at:

XT COMPATIBLE 8MHz, S/F DISK, HERCULES-MONO, 12 months warranty. (NORTON 1.7)	£550.00
AT COMPATIBLE 80286, 8/10 MHz, HERCULES-MONO, FAST 20MB DISK, 12 months warranty.	£1600.00

Prices exclusive VAT

ALL THIS AND CHOICE OF MAINTENANCE

PROGRAM FILE

```

2840IFAX<=BX PLOT77,AX,OZ
2850UNTIL AX>BX
2860OZ=PY-4
2870PLOT77,PX,OZ
2880REPEAT
2890PROCmid
2900OZ=OZ-4
2910REPEAT:AX=AX+4:UNTIL POINT(AX,OZ)=tgc% OR AX>OZ
2920IFAX<=BX PLOT77,AX,OZ
2930UNTILAX>BX
2940GCOL0,128
2950ENDPROC
2960:
2970DEFPROCmid
2980AX=&D: XZ=&70: YZ=&00
2990CALL &FFF1:REM DSWORD
3000AX=256*&71+&70
3010BX=256*&75+&74
3020ENDPROC
3030:
3040DEFPROCcolour
3050IFoff%>16 off%=0
3060IFXZ>687 off%=off%+1:VDU19,colour%,colour%+off%,0,0,0:ENDPROC
3070colour%=(XZ-416)/68
3080GCOL0,colour%
3090MOVE900,10:MOVE800,10
3100PLOT85,900,110:PLOT85,800,110
3110GCOL0,7
3120MOVE900,10:DRAW900,110
3130DRAW800,110:DRAW800,10
3140DRAW900,10
3150ENDPROC
3160:
3170DEFPROCpaint(T)
3180PROCmove:IFendproc ENDPROC
3190GCOL0,colour%
3200REPEAT
3210IFT=2 FORS=1T050:NEXT
3220PROCconvert
3230GCOL0,7:MOVEXZ,YZ:PRINTCHR$(129+T)
3240GCOL0,colour%:MOVEXZ,YZ:PRINTCHR$(129+T)
3250PROCclick
3260UNTILE<>0
3270REPEAT:PROCclick:UNTILE=0
3280ENDPROC
3290:
3300DEFPROCclick
3310IF XZ=0 E=ADVAL(0)AND3:ENDPROC
3320E=INKEY(-99)
3330ENDPROC
3340:
3350DEFPROCconvert
3360IF XZ=0 XZ=1280-(ADVAL(1)/50):YZ=ADVAL(2)/64:ENDPROC
3370IFINKEY(-1) SX=24 ELSE SX=8
3380IFINKEY(-58) OZ=DX+SZ
3390IFINKEY(-42) OZ=DX-SZ
3400IFINKEY(-26) CZ=CX-SZ
3410IFINKEY(-122) CZ=CX+SZ
3420XZ=CZ:YZ=DX:FXZ1,0
3430ENDPROC
3440:
3450DEFPROCmagnify
3460VDU4
3470VDU28,0,31,39,0
3480GCOL3,7
3490REPEAT
3500PROCconvert:XZ=XZ-200
3510IFXZ>992 OR YZ<160 VDUS:PROCmove:UNTILTRUE:GOTO3980
3520FORTX=1T02
3530MOVEXZ,YZ
3540DRAWXZ+64,YZ:DRAWXZ+64,YZ-64
3550DRAWXZ,YZ-64:DRAWXZ,YZ
3560=FX19
3570=FX19
3580NEXT
3590PROCclick
3600UNTIL E<>0
3610PX=XZ:OZ=YZ
3620FORBZ=0T015
3630FORAZ=0T015
36407(&B00+(16*BZ)+AZ)=POINT(XZ+(AZ*4),YZ-(BZ*4))
3650NEXT
3660NEXT
3670=SAVE"A.magnify"3000 6400
3680FORBZ=0T015
3690FORAZ=0T015
3700COLOUR (7(&B00+(16*BZ)+AZ))
3710PRINTTAB(AZ,BZ)CHR$255
3720NEXT:NEXT
3730GCOL0,6
3740FORYZ=1023T0511 STEP-32
3750MOVE0,YZ
3760DRAW512,YZ
3770NEXT
3780FORXZ=0T0512 STEP 32
3790MOVEXZ,1024
3800DRAWXZ,511
3810NEXT
3820VDUS
3830PROCmove:IFendproc GOTO3910
3840VDU4
3850COLOURcolour%
3860XZ=INT(XZ/32):YZ=INT(YZ/32)
3870IFXZ>16 OR YZ>16 GOTO 3820
3880PRINTTAB(XZ,YZ)CHR$255
38907(&B00+(16*YZ)+XZ)=colour%
3900GOTO3750
3910=LOAD"A.magnify"
3920FORBZ=0T015
3930FORAZ=0T015
3940GCOL0,7(&B00+(16*BZ)+AZ)
3950PLOT169,PZ+(AZ*4),OZ-(BZ*4)
3960NEXT
3970NEXT
3980COLOUR7
3990VDU4
4000VDU28,1,30,10,29
4010VDUS
4020ENDPROC
4030:
4040DEFPROCarc
4050an=-1
4060PROCmove:IFendproc ENDPROC

```

PROGRAM FILE

```

4070X1=X:Y1=Y2:PLOT69,X,Y
4080PROCmove:IFendproc ENDPROC
4090X2=X:Y2=Y3:PLOT69,X,Y
4100PROCmove:IFendproc ENDPROC
4110X3=X:Y3=Y4:PLOT69,X,Y
4120PLOT69,X1,Y1:PLOT69,X2,Y2:PLOT69,X3,Y3
4130IF X1=X2 AND X2=X3 GOTO,color%:MOVEX1,Y1:DRAWX3,Y3:GOTO4400
4140IFX1=X2 OR X2=X3 X2=X2+1
4150IF(Y2-Y1)/(X2-X1)=(Y3-Y2)/(X3-X2) GOTO,color%:MOVEX1,Y1:DRAWX3,Y3:GOTO4400
0
4160A=2*X2-2*X1
4170B=2*X3-2*X1
4180YC=(A*Y3^2-A*Y1^2-A*X1^2+A*X3^2-B*Y2^2+B*Y1^2+B*X1^2-B*X2^2)/(2*B*Y1-2*B*Y2
+2*A*Y3-2*A*Y1)
4190XC=(Y2^2-2*Y2*YC-Y1^2+2*Y1*YC-X1^2+X2^2)/(2*X2-2*X1)
4200R=SQR((X1-XC)^2+(Y1-YC)^2)
4210VDU29,XC,YC
4220s=ATN((X1-XC)/(Y1-YC))
4230m=ATN((X2-XC)/(Y2-YC))
4240e=ATN((X3-XC)/(Y3-YC))
4250IF (Y3-YC)<0 e=e+PI
4260IF (X3-XC)<0 AND (Y3-YC)>0 e=(2*PI)+e
4270IF (Y1-YC)<0 s=s+PI
4280IF (X1-XC)<0 AND (Y1-YC)>0 s=(2*PI)+s
4290IF (Y2-YC)<0 m=m+PI
4300IF (X2-XC)<0 AND (Y2-YC)>0 m=(2*PI)+m
4310IF(s<m AND e<m AND s<e) OR (s>m AND e>m AND e>s) OR (s>m AND e<m) t=s:s=e:e
t:t=s
4320IFs>e e=e+(2*PI)
4330MOVESIN(s)*R,COS(s)*R
4340GOTO,color%
4350FDRA=s TO e STEP0.1
4360DRAWXIN(A)*R,COS(A)*R
4370NEXT
4380IFan=1 an=-1:DRAWX1-XC,Y1-YC:GOTO4400
4390DRAWX3-XC,Y3-YC
4400VDU29,0,0
4410IF cont% X1=X3:Y1=Y3:GOTO4080
4420ENDPROC
4430:
4440DEFPROCsystem
4450IFX>232 AND X<620 AND cont% cont%=0:PROChighlight:ENDPROC
4460IFX>2620 AND cont%=0 cont%=-1:PROChighlight
4470IFX>232 ENDPROC
4480PROChighlight
4490VDU4
4500FORS=1TO200:NEXT:FX21,0
4510INPUT"e"AS
4520IFAS="." OR AS="C." OR AS="CA." OR AS="CAT" AS="." :VDU14,28,31,31,39,0:CLS
4530OSCLI("e"+AS)
4540IFAS="." A=GET:CHAIN"art"
4550CLS:VDU5,15
4560PROChighlight
4570ENDPROC
4580:
4590DEFPROChighlight
4600IF X>232 PROCinvert(236,152,988,124) ELSE PROCinvert(0,152,232,124)
4610GOTO,0:MOVE0,152:PRINT"System. Separated. Continuous."
4620GOTO,0,7
4630ENDPROC
4640:
4650DEFPROCerror
4660VDU4
4670REPORT
4680IFERR=17 END
4690A=GET
4700IFERL=2620 OR ERL=2700 OR ERL=4540 GOTO ERL
4710GOTO(ERL+10)

```

MICROMART

BLANK CASSETTES

	WITH LIBRARY CASES			
	C10	C15	C20	C30
20	7.50	7.70	7.90	8.70
50	16.00	16.20	16.90	18.50
100	29.00	30.00	31.00	35.00

Fully Inclusive (C.O.D. £1 extra)

DISKS

10 5 1/4 DS/DD	10 3 1/4 SS/DD
£6.50 inc. case	£16 inc. case

10 3" AMSOFT
£26 inc. case

MEMOTECH COMPUTERS AND ACCESSORIES

MTX 512 COMPUTER	£65.00
DMX 80 PRINTER	£150.00
RS232	£35.00
PASCAL ROM	£35.00
SPECULATOR ROM	£35.00
1 mb. DISK DRIVE & INTERFACE	£170
1 mb. DISK DRIVE & INTERFACE	£175

All the above prices are fully inclusive. We stock the entire Memotech Range. Order/Enquiries to:

UK HOME COMPUTERS
82 CHURCHWARD AVE, SWINDON,
WILTS SN2 1NN
24-hr Phone Service 0793 695034

DON'T learn by EXPENSIVE MISTAKES
use our knowledge and experience to
get the **RIGHT** system for YOUR
business

MICRO-TECH

061-797 6419

No 1 Amstrad dealer in the North West
Unbeatable Service & Total Support.
Supplies, Consultancy, Training,
Maintenance

CNC MICRO-MILL

Machining of plastics, aluminium, wood etc. Direct from your C.A.D. program. PCB drilling direct from C.A.D. Work area up to 500mm x 1000mm.

LEEWOOD DEVELOPMENTS
Leewood Works, Upton, Cambs
Tel: 0480 890860



BBC Assembler Tips

by Terry Blunt

The BBC Micro's built-in assembler is undoubtedly excellent, but has one notable failing — the assembling source program has to reside in the machine along with the assembled object code, often in the same area that the object code is to run from. From Basic 2 onwards this is partly alleviated by the ability to use offset assembly (OPT 4 - 7). However, the main problem still exists — namely, that of having the source code taking up valuable space.

If you are sufficiently involved in assembly language programming, you may feel it worth investing in a more sophisticated assembler that can assemble from source text files, sending the object code directly to other files. For those of us with more

modest aspirations, there is an alternative approach which goes a long way to solving the problem.

The method described here will work with Basic 1 and with tape, but is only really practical working from disk, preferably with Basic 2 or later.

Most of us have, without thinking about it, used the computer to perform simple calculations entered directly from the keyboard. What is not so obvious is that almost the whole of the Basic language structure is available from the keyboard; this includes the assembler. Try the following:

```

>P%=&C00
>[OPT 2:LDA #ASC"A":JSR
  &FFEE:RTS
>CALL &C00

```

MicroCom Systems OUTSTANDING SOFTWARE For IBM PC's and Compatibles

£350 PER DISK
SMALL QUANTITIES

£300 PER DISK
FOR TEN OR MORE

£1 OFF 5 DISKS OR MORE WITH THIS COUPON

- ☐ **BUSINESS 1**—EZ-Forms business form generation, completion and printing program.
- ☐ **CAD 1**—Altamira, a 4 color object oriented drawing program. Color required.
- ☒ **COMM 4a,b,c,d,e**—(5 disks) RBBS Bulletin Board System 14.10.
- ☒ **DATABASE 1a,b**—(2 disks) File Express menu driven general purpose database mgr.
- ☐ **EDUCATION 1**—Interactive DOS tutorial for new PC users. Makes learning DOS painless.
- ☐ **GAMES 1**—3-D PacMan, Kong, SpaceWar, JanitJoe, and more. Color required.
- ☐ **GAMES 2**—Qubert, Pango, Centipede, Monopoly, Zorae, and more. Color required.
- ☐ **GAMES 3**—Blackjack (you set rules), Arm Chair QB, and Empire (War Game).
- ☐ **GAMES 4**—Castle, StarTrek, and the original Colossal Caves Adventure.
- ☐ **GAMES 5**—The Hack adventure game from the universities. Like Rogue, only more complex.
- ☐ **GAMES 6**—Pinball, Othello, Dragons, Sopwith (fly one), and more. Color required.
- ☒ **INFO 1a,b**—(2 disks) Cooking recipes database with keyword/ingredient retrieval.
- ☐ **LANGUAGE 5**—Turbo Pascal interactive debugger, pop-up help, formatters, et cetera.
- ☐ **LANGUAGE 7**—Complete Pascal interpreter/compiler. Great for learning Pascal!
- ☐ **ORGANIZER 1**—DeskMate, a Sidekick clone, and the Judy calendar program.
- ☐ **PINUP 2**—Provocative high res digitized graphics pinups. Graphics required.
- ☐ **PRINTER 1**—Font and sideways utilities, spoolers, banner makers, and more.
- ☐ **UTILITIES 1**—A collection of invaluable general purpose DOS utilities. A must!
- ☐ **UTILITIES 2**—More invaluable DOS utilities. Too many to list here!
- ☐ **UTILITIES 3**—A comprehensive set of debugging and diagnostic utilities.

NEW RELEASES/UPDATES

- ☒ **CAD 2a,b**—(2 disks) An advanced 2D/3D drafting prog. 640k and color required.
- ☒ **COMM 1a,b**—(2 disks) Version 2.4 of the ever-popular Qmodem comm. program.
- ☒ **COMM 2a,b**—(2 disks) Procomm 2.42, an excellent modem program with terminal emulation.
- ☐ **EDUCATION 2**—Learn the Presidents, States (and capitals) and more. Color required.
- ☐ **EDUCATION 5**—Learn Origami, the Japanese art of paper folding. Color required.
- ☒ **FINANCES 3a,b**—(2 disks) Express Calc 3.12, a powerful spreadsheet program.
- ☐ **GAMES 8**—Striker helicopter attack, and Risk, world domination. Color required.
- ☐ **GAMES 9**—EGARisk, the game of world domination in very high resolution. EGA required.
- ☐ **GAMES 10**—Solitaire, Teed-Off golfing, and Sailing in the Bermuda triangle. Color required.
- ☐ **GAMES 12**—MyChess (9 levels), Backgammon, and Wheel of Fortune. Color not required.
- ☐ **GRAPHICS 1**—Record and play back screen images! Excellent for demo, etc. Color required.
- ☒ **INFO 2a,b**—(2 disks) Zip-Phone, national areacode/ prefix to zip-code cross reference.
- ☒ **LANGUAGE 3a,b**—(2 disks) The A86 2.18 macro assembler and debugger.
- ☐ **SHELL 4**—Automenu and HDM II 4.04 hard disk menus. Create custom full-screen menus.
- ☐ **UTILITIES 5**—Utilities for formatting, parking, and optimizing hard disk drives.
- ☐ **UTILITIES 6**—Advanced utilities including Dpath, Esc, Hotdos, Resident program utilities.
- ☐ **UTILITIES 7**—More Advanced utilities including MasterKey (undeletes files from hard disks).
- ☒ **WORD 1a,b**—(2 disks) PC Write 2.7, a powerful word processing system, w/spell checker.

Catalog available, add £2.35" format add £1/disk.

MicroCom Systems Cost of Items
P.O. Box 51657 Ship/Handling **£5**
Palo Alto, CA 94303
U.S.A. Total Enclosed

Phone Orders
0101-(415) 325-6500

PROGRAM FILE

You could find that the computer will print the letter 'A'. Notice that the assembling line must start with [OPT and all the statements are on that line. There is no need for the closing] as the assembler is automatically switched off at the end of the line.

This can be expanded using labels and variables, and spread over several lines:

```
>NEW
>base=&C00
>oswrch=&FFEE
>P%=base
>[OPT 2:LXD #&0A
>[OPT 2:label
>[OPT 2:LDA #ASC"A"
>[OPT 2:JSR oswrch
>[OPT 2:DEX:BNE label
>[OPT 2:RTS
>CALL base
```

All of that is a rather contrived way of sending 10 'A's to the screen. You could be forgiven for thinking that this is an unbelievably tedious way of assembling code, particularly as the idea is to assemble very large amounts!

Fortunately, there is a way of fooling the computer into thinking that it is receiving keyboard entry; this is done by *EXECing a file. What is needed is a word processor that can produce unformatted raw text with no added control codes or (time-wasting) padding spaces. Wordwise is ideal for this or, if you have the Master series, the text editor.

If the previous lines are typed in and saved to a file named, say, 'source', then all you have to do when you want to assemble the code is to *EXEC source. Note that the variable/label stack will start at LOMEM which will be PAGE+2, so if you want code to be assembled here you must either move LOMEM or use offset assembly, and save and re-load the object code.

As an example, suppose you want to assemble your brilliant new game at &1900 and you expect the code to be less than 8k. Construct the file 'source' as:

```
NEW:base=&1900:LOMEM=base+
&2000:P%=base (CR)
[OPT 2: {code} (CR)
[OPT 2: {code} (CR)
and so on.
```

It should be noted that the lines of code must not exceed 255 characters (about six lines of 40-column text) and for safety I usually stick to about half of that. The fewer lines you have, the faster the code assembles, but you gain nothing memory-wise as the source code exists in file form.

Astute readers will have noticed that I have only used OPT 2, whereas you usually have to use two-pass assembly within a FOR...NEXT loop,

the FOR variable used to set OPT. When assembling from the keyboard or from an EXEC file, only the current line exists in the computer's memory (at &700); so FOR...NEXT and REPEAT...UNTIL constructs can only be made to operate over this line, which I have already said can't be more than 255 bytes long.

The solution in quite simple to EXEC the code twice, adjusting the OPT variable accordingly. Using OPTs 1-3 and 5-7 cause confusion: you end up with repeated lines on the screen, so stick to 0-2 and 4-6. As you don't want to reset the whole system with NEW each pass, you also need to split the file into two parts. Call them 'init' and 'code'.

Taking this one step further, 'code' can be made to re-run itself, so:

'init' file:

```
NEW
base=&1900
LOMEM=base+&2000
zero=&70
oswrch=&FFEE
osbyte=&FFF4
N=0
*EXEC code
```

'code' file:

```
P%=base
[OPTN: {code} (CR)
[OPTN: {code} (CR)
and so on
IF N=0 THEN N=2:*EXEC code
(CR)
```

All you need to do now is to EXEC 'init', and let it get on with it. Notice that all constants should be set in 'init' in the same way that you would use a PROCedure in a 'real' program. I've spread the lines out in the example to make this clearer. Also, in 'code' the OPT variable will be entered for every new line: that's why I've made it a single letter.

Ideally you want the labels and variables to take up as little room as possible, therefore use minimum-possible abbreviations and lots of REMs and blank lines, as they use up no memory. The assembler drops out every line so REMs are quite possible and, in fact, clearer than comments. Purists will hate me for saying this, but don't use unnecessary variables. Use the actual addresses for OS calls, and so on, as below:

```
REM this is an A writer (CR)
(CR)
[OPTN:.a1:LXD #&0A (CR)
(CR)
REM loop to here for more A's
(CR)
[OPTN:.a2:LDA #ASC"A":JSR
&FFEE:DEX:BNE a2 (CR)
(CR)
REM no more A's so exit (CR)
```

PROGRAM FILE

(CR)

[OPTN:RTS (CR)

One problem that isn't obvious is the computer's response to errors. These will be reported in the usual way, but as you are assembling via the 'keyboard' there is no program for Basic's error-handler to stop, so it will keep on trying to assemble with the error message being scrolled off the top of the screen. Obviously you can't sit glued to the screen watching for errors as they occur, so an error-handler has to be added.

The lines in Fig. 1 should be put in at the very start of 'init' so that when the code RUNs, NEW will wipe out the variables used. The routine works quite simply by redirecting BRKV, where all errors pass. The new code closes the current EXEC file then puts BRKV back where it belongs. The result is that you see the error message at the bottom of the screen. You then know that the line above is the one containing the error.

With a little ingenuity, you will find that almost all assembly can be done from files like this, including lists and tables. Very occasionally there is a problem that has to be solved with a PROCEDURE, which can't exist in a file for the same reasons as FOR...NEXT loops. However, it is possible to tuck very small PROCedures away in memory and call them when required. If you have a block of PROCedures that is less than 512 bytes long and are careful about LOMEM, it is possible to have it residing at &900.

Below is an arrangement that does just that:

PROCedures:

10DEFPROCa:PRINT"PROCa":END PROC

20DEFPROCb:PRINT"PROCb":END PROC

Save as 'PROC'.

'init' file:

PAGE=&900 (CR)

LOAD"PROC" (CR)

(CR)

LOMEN=&7000: (and so on, as before)

To run the whole suite, *EXEC init. This, or any later files, can now call the PROCedures as they need to. If the PROCedures use variables, they will be put safely on the variable stack above LOMEM. Notice that I've used the maximum possible compression in the PROCedures to save memory space. Also, the LOAD command in 'init' must be on its own line. Finally, OLD must be used instead of NEW; otherwise, the computer will lose the program lines that have already been loaded!

When you develop really large source code you will find that it won't all fit into one text file. This is not a problem — you simply make files daisy-chain each other.

For example:

file 2:

REM basic tools (CR)

(CR)

[OPTN: {code} (CR)

and so on

*EXEC ftools (CR)

file 3:

REM filing tools (CR)

(CR)

[OPTN: {code} (CR)

and so on

*EXEC mtools (CR)

file 8:

REM subroutines (CR)

(CR)

[OPTN: {code} (CR)

and so on

IF N=4 N=6: *EXEC.btools (CR)

I used this method to produce a 16k EPROM using offset assembly. It requires eight files and takes around five minutes to assemble.

LOMEM=&7000:brkv=&202:P%=&C00 (CR)

(CR)

[C PT2:.store:EQUW &FFFF (CR)

(CR)

[OPT2:.err:PHP:PHA:PHX:PHY (CR)

[OPT2:LDA#&77:JSR &FFF4 (CR)

[OPT2:SEI:LDA store:STA brkv (CR)

[OPT2:LDA store+1:STA brkv+1:CLI (CR)

[OPT2:PLY:PLX:PLA:PLP:JMP(brkv) (CR)

(CR)

[OPT2:.set:SEI (CR)

[OPT2:LDA brkv:STA store (CR)

[OPT2:LDA brkv+1:STA store+1 (CR)

[OPT2:LDA#err MOD256:STA brkv (CR)

[OPT2:LDA#err DIV256:STA brkv+1 (CR)

[OPT2:CLI:RTS (CR)

(CR)

CALL set (CR)

Fig 1

MICROMART

NORTH WEST'S PC CENTRE

LIMITED SPECIAL OFFERS

AMSTRAD

PC1512 30Mb 640k. Mono £819 Colour £979

PC1512 20Mb hard disk. 640k

Mono £789 Colour £949

PC1512 Twin floppy Mono 640k

£539 DMP 3000 Printer £159

TANDON

PCX10 10Mb 640k RAM onsite

maintenance

£799

Tandon PCA40 40Mb hard disk. 1024k RAM £1899

Opus PCii 20Mb hard disk 1024k RAM£949

All other models available. Every computer comes with: FREE Memory upgrade to 640k. FREE 2 hours training. FREE 10 Disks full of the best Public Domain Software.

PUBLIC DOMAIN PC SOFTWARE

Library case and 10 disks full of the best PD software eg. Games, PC-write, File, Calc, Tutorial, Graphic, Dos-Help typing etc.

Wide range of printers and PC software available, eg. WORDSTAR 1512 £53
SUPERCALC 3 £53

DELIVERY IS FREE.

Please add VAT to all prices.

TIME COMPUTERS

Time House, 36 Granville Road,

(Off Preston New Road),

Blackburn.

Tel: (0254) 63414

Showrooms open Mon-Sat 9.30-5.30

DISKS

LIFETIME GUARANTEE

PAPERSTAT BRANDED DISKS

Highest specification and quality currently available in the UK

5¼" 48tpi × 18 £12.00

5¼" 96tpi × 18 £14.00

Includes plastic Library Case

FREE SAGEDISK WITH EACH ORDER

All prices include VAT, postage.

Write protect tabs, hub rings, envelopes

Free price list on request, printers computers and ribbons.

PAPERSTAT

181-183 Dean Road,
Scarborough YO12 7JH
0273 366066

MICROMART

ALL TYPES OF BUSINESS COMPUTERS AND PERIPHERALS from micros to mainframes

Bought, sold and exchanged.

For fast efficient service
call **Phil Rose** on
(0606) 783338.

or **Grant Penaluna**
(0606) 783338. Telex: 9469 240

Quoting 1902 5795

Fax: 0606 79367

DELOSTAR ELECTRONICS LTD

Delostar House, Barnton,
Cheshire CW2 4JS



WITH FISH
FINGERS AND
CHIPS THE WORLD
IS YOUR OYSTER!
(FOR LESS THAN £100)

SPECIALISTS IN PORTABLE COMPUTERS THE AMAZING
PSION ORGANISER II (EXPANDABLE TO 304K)
from £86.50 (+VAT)

Quantity discounts available

SOFTWARE APPLICATIONS INCLUDE:

BAR CODE READING - Down loads to your PC or main frame
SALESMAN'S QUOTATIONS, VAT ETC
FINANCIAL-PENSIONS, SCHOOL FEES, MORTGAGE
phone for software quote.

AMSTRAD PC's FANTASTIC PRICES eg.
20M COLOUR LESS THAN £1000

IBM Compatible software Lap.Tobs eg. Toshiba T1100 plus
1799+VAT

Portable Printers Serial/Centronics from £50+VAT
MINI BRIEF CASE FOR PSION ORGANISER

Takes Datapaks + Spare Battery £10 +VAT
Phone for latest prices. Terms cash with order.

MOBY COMPUTERS

MULBERRY COTTAGE CHARLTON LANE WEST FARLEIGH
MAIDSTONE KENT ME15 0PB (0622) 28401

(0622) 28401

ACCOUNTING & INVOICING SOFTWARE

From £49.00 + VAT

For Amstrad PC
IBM PC, XT & AT
Most compatibles
also Commodore

Available on Approval

E. A. SOFTWARE
62, High Street
Evesham, Worcs.
WR11 4HG
0386 49339

PROGRAM FILE



BBC Drop-Out by KA Povall

This program is a computerised version of Milton Bradley's game, Stay Alive, for the BBC Micro. This is a game involving a two-dimensional matrix with levers. The matrix holds marbles which can drop through holes in the levers. Each player has seven marbles and they take turns

manipulating the levers, trying to drop their opponents' marbles out of the matrix.

The program should also work on the Acorn Electron but it has not yet been tried. It is in two parts, the first of which is a loader program to load in the second part.

```

1 REM                               D R O P   O U T
2 REM
3 REM   A Computerised version of
4 REM   M. & B.'s game STAY ALIVE
5 REM   reproduced by courtesy of
6 REM   MILTON BRADLEY EUROPE LTD
7 REM
8 REM
9 REM   Author:      K. A. Povall
10 REM
11 REM   part-1 / SAVE as "Loader"
12 REM
13
14 VDU 23,224,255,252,243,239,223,223,191,191
15 VDU 23,225,255,63,207,247,251,251,253,253
16 VDU 23,226,191,191,223,223,239,243,252,255
17 VDU 23,227,253,253,251,251,247,207,63,255
18 VDU 23,228,0,0,3,15,31,31,63,63
19 VDU 23,229,0,0,192,240,248,248,252,252
20 VDU 23,230,63,63,31,31,15,3,0,0
21 VDU 23,231,252,252,248,248,240,192,0,0
22 VDU 23,232,0,0,127,127,127,127,0,0
23 VDU 23,233,14,30,126,126,126,126,30,14
24 VDU 23,234,0,60,60,60,60,60,60,60
25 VDU 23,235,0,60,60,126,255,255,255,0
26 VDU 23,236,126,129,189,181,161,189,129,126
27 VDU 23,237,255,255,255,255,255,255,255,255
28
29 ENVELOPE 1,1,0,0,0,0,0,0,126,-1,0,-3,126,126
30 ENVELOPE 2,129,0,-10,-1,0,2,6,-1,0,-1,126,74
31 ENVELOPE 3,131,-1,0,0,200,1,1,1,-1,0,-2,100,60
32 ENVELOPE 4,16,16,1,1,200,0,0,126,0,0,-126,126,126
33
34 PAGE=&1900
35 CHAIN "DROPOUT"
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000

```

PROGRAM FILE

```

56 PROC("MOVE",8,28,GX):PROC("LEVER "+L$,13,28,3)
57 PROC("IN or OUT ?",21,28,GX)
58 REPEAT:IX=INSTR("IIO",GET$,1):UNTIL IX>0
59 IF IX<3 AND OX(LX)=2 N$="IN I":GOTO65
60 IF IX>2 AND OX(LX)=0 N$="OUT I":GOTO65
61 IF IX<3 OX(LX)=OX(LX)+1 ELSE OX(LX)=OX(LX)-1
62 IF LX>0 AND LX<6 PROCG ELSE PROCH
63 GX=GX+1:IF GX=3 GX=1
64 UNTIL EX=7 OR FX=7:GOTO155
65 PROCC:VDU7:PROCA("Lever "+L$+" is. ALREADY "+N$,5,28,3)
66 COLOURGX:PRINTTAB(4,30)"press SPACE BAR to choose again"
67 REPEAT UNTIL GET=32:GOTO53
68
69 DEFPROCD
70 VDUS:GCOL0,128:GCOL0,CX:MOVE416+N$96,988-P$96:PRINTM$
71 ENDPROC
72
73 DEFPROCB
74 FORRX=0TOD3:VDU19,RX,0,0;:NEXT
75 VDU24,384,320,1088,1023;:GCOL0,128:CLG
76 VDU24,400,336,1072,1007;:GCOL0,128:CLG
77 VDU24,408,344,1064,999;:GCOL0,131:CLG
78 VDU24,72,320,276,1023;:CLG
79 VDU24,80,328,268,1016;:GCOL0,128:CLG
80 VDU24,0,16,1279,175;:GCOL0,131:CLG:PROCC
81 FOR UX=0 TO 6:ZX=UX+96:GCOL0,3
82 MOVEZX+432,212:PRINTCHR$(85+UX):MOVE1200,394+ZX:PRINTCHR$(78-UX)
83 GCOL0,2:MOVEZX+432,312:PRINTF$(2-OX(UX))
84 MOVE1096,972-ZX:PRINTF$(8-OX(UX+7)):NEXT
85 VDU4:FOR UX=13 TO 31 STEP3:FOR VX=1 TO 20 STEP3
86 PRINTTAB(UX,VX)G$:NEXT:NEXT
87 COLOUR0:FOR VX=1 TO 15 STEP3:COLOUR129
88 PRINTTAB(3,VX)G$:COLOUR130:PRINTTAB(6,VX)G$:NEXT
89 VDUS:FOR VX=412 TO 988 STEP96
90 MOVE96,VX:GCOL0,1:PRINTM$:MOVE192,VX:GCOL0,2:PRINTM$:NEXT
91 ENDPROC
92
93 DEFPROCF
94 FOR NX=0 TO 6:FOR PX=0 TO 6
95 IF HX(NX,PX+OX(NX))=0 AND BX(PX,NX+OX(PX+7))=0 THEN CX=0 ELSE CX=5
96 PROC:NEXT:NEXT
97 COLOUR128:PROCA("press SPACE BAR to start",7,28,3)
98 VDU19,1,1;0,19,2,6;0,19,3,3;0;:REPEAT UNTIL GET=32:PROCC
99 CX=1:LX=96:LY=988:RX=192:RY=988
100 FOR WX=1 TO 14:CX=CX+1:IF CX=3 CX=1
101 NX=RND(7)-1:P$=RND(7)-1
102 IF POINT(448+(NX+96),962-(PX+96))=3 PROC:PROC:ELSE101
103 NEXT
104 VDU4:PRINTTAB(3,0)" " :VDUS:GCOL0,3:MOVE112,1020:PRINT"LOSE"
105 ENDPROC
106
107 DEFPRODG
108 GCOL0,0:OX=INKEY3:SOUND1,-15,CX=100,1
109 IF CX=1 MOVERX,RY:PRINTM$:RY=RY-96:ENDPROC
110 MOVE LX,LY:PRINTM$:LY=LY-96
111 ENDPROC
112
113 DEFPRODH
114 VDUS:GCOL0,0:MOVE432+(LX+96),312:PRINTJ$
115 GCOL0,2:MOVE432+(LX+96),312:PRINTF$(2-OX(LX))
116 NX=LX:FOR PX=0 TO 6:PROCI:NEXT
117 ENDPROC
118
119 DEFPRODI
120 PX=LX-7:VDUS:GCOL0,0:MOVE1096,972-(PX+96):PRINTK$
121 GCOL0,2:MOVE1096,972-(PX+96):PRINTF$(2-OX(LX))
122 FOR NX=0 TO 6:PROCI:NEXT
123 ENDPROC
124
125 DEFPRODJ
126 IF HX(NX,PX+OX(NX))=0 AND BX(PX,NX+OX(PX+7))=0 PROCJ:ENDPROC
127 CX=POINT(448+(NX+96),962-(PX+96)):IF CX=0 CX=3
128 PROC
129 ENDPROC
130
131 DEFPROCK(A$,J$,K$,M$)
132 VDU4:AX=10:XI=11:YX=0:D=114:COLOURMX
133 FOR IX=1 TO LENA:8$=MID$(A$,IX,1):?D=ASC(8$):CALL&FFF1
134 VDU23,254,071,071,072,072,073,073,074,074
135 VDU23,255,075,075,076,076,077,077,078,078
136 VDU31,J$+IX,K$,254,31,J$+IX,K$+1,255:NEXT
137 ENDPROC
138
139 DEFPROCL
140 VDU24,11,27,1268,164;:GCOL0,128:CLG:VDU26,5
141 ENDPROC
142
143 DEFPROCLJ
144 CX=POINT(448+(NX+96),962-(PX+96)):IF CX=0 OR CX=3 ENDPROC
145 IF CX=2 GOTO150
146 CX=0:PROCD:SOUND0,1,4,1:OX=INKEY20
147 GCOL0,1:MOVE LX,LY+96:PRINTM$
148 LY=LY+96:FX=FX+1:5X=2:TX=1
149 ENDPROC
150 CX=0:PROCD:SOUND0,1,4,1:OX=INKEY20
151 GCOL0,2:MOVERX,RY+96:PRINTM$
152 RY=RY+96:EX=EX+1:5X=1:TX=2
153 ENDPROC
154
155 VDU4:SOUND1,4,30,36:OX=INKEY250:CLG:VDU19,2,0,0;:COLOUR2
156 FOR OX=0 TO 39 STEP2:FOR WX=4 TO 27 STEP2:PRINTTAB(OX,WX)M$:NEXT:NEXT
157 VDU28,2,25,37,6,17,131,12
158 PROC("C O N G R A T U L A T I O N S",2,3,1)
159 S$=P$(5X)+", On Winning That Game":PROCA(S$,17-LENS$/2,6,1)
160 IF 5X=1 OX=OX-FX ELSE OX=OX-EX
161 IF OX>1 S$="s" ELSE S$="S"
162 PROC("You Were Left With "+STR$OX+" Marble"+S$,3,11,0)
163 COLOUR1:PRINTTAB(4,15)"Would You Like To Play Again"
164 COLOUR0:PRINTTAB(13,17)"( Y - N ) " :VDU19,2,9,0;
165 REPEAT RX=INSTR("YyNn",GET$,1):UNTIL RX>0
166 IF RX>2 CALL I-4
167 PRINTTAB(0,15)SPC79"SAME PLAYERS ( Y - N )"
168 REPEAT RX=INSTR("YyNn",GET$,1):UNTIL RX>0
169 IF RX<3 GOTO50
170 FOR OX=1 TO 2:P$(OX)="" :NEXT:COLOUR128:CLS:GOTO32

```

END

MICROMART

THE DATABASE MANAGER (AtLast)

The Database Manager offers a unique combination of powerful flexibility, huge data capacity (subject to disc size) and simplicity of use. Clubs, schools, businesses, charities and individuals can all find applications for the Database Manager which would be difficult or impossible with other database programs.

WHAT THE REVIEWS SAY

AtLast's manual will be a major selling point, since it is rare for a "budget" package to have such a large and well produced one as this... superb value for money and hard to pick holes in. 8000 Plus

Powerful features... quite easy to use... as clever as the user makes it. Amstrad Professional Computing

For £30 you won't find a more powerful database... If you're new to the world of files, fields and records then AtLast is the ideal way to be introduced. The manual is light reading for the beginner. Amstrad Action

For CPC6128, PCW8256 & PCW8512: Only £29.95 inc. GENERIC CPM AVAILABLE PLEASE ENQUIRE.

FREE: 1 year's telephone support from the author if ordered direct from:

RATIONAL SOLUTIONS LTD

9 ROSEHILL ROAD, LONDON SW18 2NY

TEL: 01-874 6244



COMPUTER
CABLING
SERVICES

74 EDWARD ROAD,
WALTHAMSTOW,
LONDON
E17 6LU
TEL 01-570 0258
(0689) 46302

A SPECIALISED SERVICE TO THE COMPUTER USER

Data and Communication Cable Installation
Distribution Systems
Cable assemblies manufactured to order
Data Trunking Installation
All Work is Guaranteed

We can offer a FREE Site Survey within a fifty mile radius of Central London, with no obligation.
We pride ourselves on being able to give a rapid response to our customers' requirements, no matter how large or small their order.

MULTIPLY - The first real choice for CABLING

Call us now on

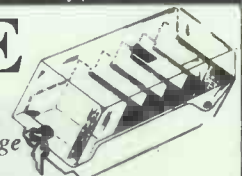
01-520-0258 (24 Hour Answerphone)

or Lodge Hill (0689) 46302

Sorry! Limited to one only per customer

FREE

large
(100 disk capacity)
lockable disk storage
box worth £13.95



When you buy 25 disks for
only £22.95 including
postage and VAT!

Disks are high quality 5 1/4" Double Sided Double density. Add 15% if you want quadruple density.

Nebulae, Dept MH, FREEPOST,
Kilroot Park Industrial Estates,
Carrickfergus, Co Antrim, BT38 7BR
Tel: (09603) 65020

7 Day Delivery, One year guarantee, & 14 day money back period.

We accept orders from all government bodies, schools, universities, PLC's etc.
We despatch on receipt of an official purchase order.

"It's a great machine".



From only
£499

A PC which can beat the likes of Amstrad, Tandy and Zenith in a press comparison of IBM-compatibles, deserves your attention. So does a company whose computer sales in Britain now exceed the entire production of some of its rivals.

The Company in question is Opus and its class-beating compatible is the PC II Turbo, now being built in Britain in monochrome, colour and EGA versions. 'PC User' Magazine which conducted the comparison test said of the PC II Turbo:

*"Even in its basic £499 form, it is a superior beast.
This is a great machine."*

• their words not ours

But what really makes the PC II Turbo stand out from the compatible crowd?
The answer it seems depends on which computer magazine you read.

"Performance is above average, thanks to the NEC V20 chip. The PC II exhibits excellent compatibility, no doubt due to its US-registered legal ROM Bios."

'What Micro?'



"The Opus PC II looks and feels like a solid beast. Expansion cards fit firmly inside, the keyboard doesn't feel like it might break if you hit it too hard and the monochrome display offers a clean and rock-steady picture."

'Which PC?'



"It is extremely solid and well built. It lacks the thrown together feel of many cheaper clones from small companies."

'Which Computer?'



NEED WE SAY MORE? ... YES NOW THE PC II TURBO IS EVEN BETTER

Even our £499 entry level PC is now equipped with a new dual-mode graphics card supporting both the Hercules monochrome and IBM colour graphics standards and featuring a mouse port and PAL-compatible video output. It keeps the PC II Turbo's standard specification out in front.

- Software switchable NEC V20 super processor 4.77/8 MHz
- Dual-mode mono/colour graphics card
- High resolution monochrome monitor, tilt and swivel base and anti-glare screen
- Quality AT-style keyboard
- 256K of RAM expandable to 1Mb on motherboard creating 384K RAM disk
- 360K floppy disc drive
- 8 expansion slots
- Highly compatible BIOS
- Parallel printer, mouse and joystick interfaces
- Real-time clock/calendar with battery back-up
- Keyboard security lock
- PAL-compatible video output
- 150 watt UL-approved power supply
- 12-month guarantee
- Comprehensive user manual.

Options include dual drives, 20 Megabyte Winchester and 1 Megabyte RAM expansion, maths co-processor and on-site maintenance cover.

We offer special education and government discounts and welcome dealer and export enquiries. For details call Opus today on **0737 65080**. Price quoted exclusive of VAT and carriage.

Opus.

PC II TURBO

A small price to pay for quality

Opus Supplies Ltd, 53 Ormside Way, Holmethorpe Industrial Estate, Redhill, SURREY RH1 2LW.

Your chance to buy, sell or swap equipment.

ACORN

● BBC B. Reliable tape deck, programmable quickshot joystick, dust cover, leads. Games include Planetoid, Meteors, Moonraider, Arcadians, Killer Gorilla, Starship Command, Sorcerer of Claymorgue Castle. All excellent condition. £200. Tel: 04574 4203.
● BBC. 32k SWR, Torch Z80, 2xDSDD. Cub colour monitor. SWR software, many games, Pascal, C, Modula-2, Wordstar books, magazines, manuals. £700 o.n.o. Tel: 021 471 3638, Eves.
● BBC B DFSO.90. View wordprocessor, Ultracalc spreadsheet, Viewstore database, various games, Elite, 80T drive, hardly used, worth £800.00, will except £300.00 (bargain). Tel: (01) 485 0991 (Mr Mahmood) during office hours.
● BBC B. With 40/80 track Teac drive, mouse and lots of software including View, spellcheck, Pascal and lots of games. Includes ATPL ROM/SWARM board. All £390 o.n.o. Tel: Mike 736-3919.
● BBC. 80T dual drives, 6502 2nd proc, DFS, ADFS, 1770DFS, speech recognition, speech synthesis, joysticks, 150-Pascal, MASM, view, viewsheet, 100s of games. More. £700 o.n.o. May split. Tel: (0908) 565263.

APPLE

● TWO APPLE II+. Six disk drives, monitor, wild card, copier, Visicalc. Visidex, purchase sales nominal stock, word process payroll. No sensible offer refused. For quick sale. Jack Gay

(01) 570-5163 Hounslow TW4 7D6.

● APPLE IIe CLONE. 128k, twin drives, Z80 CP/M, 80 column, TV interface, joystick: £250. Tel: Ian Wilson on Bedford (0234) 708540 Eves 222284 daytime.
● APPLE IIc. 128k RAM, 5.25 inch drive, monitor, extensive software. Bargain at £350. Tel: (0234) 751 255 Eves.
● MACINTOSH SOFTWARE: Excel. £180, Doublehelix. £200, Multiplan. £60, MWord. £70. Filemaker. £60. Macdraft. £90, Fontastic. £15, Overvue. £90. Sealed packages. Write to: Mellet, Bailen 32 08010 Barcelona, Spain. Tel: (93) 2457579.
● APPLE II EUROPLUS. 192k printer cards:— Grappler+, Zappier, PKSO. Other cards:— Z80, 80 column, RAM disk, Apple disk controller. Two drives. Sanyo monitor. Many languages, wordprocessors, spreadsheets, databases, £350 o.n.o. Tel: (0227) 361558.
● APPLE IIIE. 64k single disk drive and green monitor. Plus UHF card with all the manuals and some games. Good condition, £150. No offers. Tel: (01) 504 6541.
● APPLE Mac Plus. HD20, software, etc. £1700. Tel: (041) 942 5346.
● APPLE II EUROPLUS. Disk II, Monitor III. Microline printer. Language, parallel, 80-column, clock, disk cards. AppleWriter, MicroModeller, VisiDex, VisiTrend, VisiPlot, DOS3.3 software and manuals. Pristine condition. £490. 051-427 3144.
● MACINTOSH PLUS. Unused machine, full guarantee, together with

large bundle of serious and fun software worth £600. All unused and mint condition. Private sale, unwanted gift. 50% off. £1450. (01) 249 2388.
● APPLE II (COMPATIBLE): 64k, twin drives, 8D-col, CP/M, green monitor. Wordstar, MS-Basic, MS-Fortran, printer interface & cable. Shinwa CP-80 dot matrix printer. All for £250. Or separately. Original packaging. 0904-410619 Eves.

APRICOT

● APRICOT XI. 10Mb, 256k RAM, home use only, still boxed, original software and manuals. Lots of additional software, excellent condition, offers over £995. Tel: (0455) 46010 after 6pm.
● HARDWARE FOR SALE. Apricot modem board, £150.00. Brother M1009 printer, £100.00. Apricot mouse, £50.00. Mono 12" mon. £95.00. Also Apricot IBM software. Tel: Ray (0532) 778689 anytime. All prices o.n.o.
● APRICOT FI PORTABLE. 256k, 720k 3 1/4 drive, plus— personal printer NI-CAD, hires Apricot colour monitor, box of 10 disks, all manuals, as new. Cost £1200-£395 o.n.o. Tel: 0525 385474.

ATARI

● ATARI 520ST. Plus 2 350k disk drives, mono monitor and software. Offers around £480. Tel: Slough 23064.
● ATARI 8-BIT AND ST USERS GROUP. For details of our magazines, membership and monthly meetings, send a stamped s.a.e. to: Lea Valley Atari Users Group, 125 Cadmore Lane, Cheshunt, Herts. We

are non profit making.
● ATARI 520ST — £100. Atari ST mono monitor, £100. Dual Comana double sided, 3 1/2 inch disk drives. £150. Epson RX80ft+ printer, £100. Tel: 0992 22234 ask for Andrew or Jason. Offers for whole system considered.
● ATARI 800XL. 810 disk drive, 410 cassette, 1029 printer. Large disk/cassette collection. Includes Superscript W/P, MAC/65 assembler, DE RE Atari notes, Star Raiders II etc. £250. Reading 690032 Eves.

COMMODORE

● COMMODORE MONOCHROME MONITOR 40/80 columns, £80. Multimodem, £85. CBM modem, U-2-U, Viewdata software, £40. Super graphix printer interface, £50. Sinclair QL+ cartridges, £120 o.n.o. Tel: 0703 779642 after 6pm.
● COMMODORE 8096. 96k with screen and keyboard, twin disk drive, dot matrix printer with acoustic hood, daisywheel printer with sheet feeder. Wordcraft word processing program. £750 o.n.o. (01) 281 4821 (office hours).
● COMMODORE 64. Datasheet and joystick. £200 worth of software includes Forth language, machine code tutor, Colossus chess 2.0, Monopoly, three flight simulators, drum-kit simulator, etc. Bargain £165 o.n.o. Chelmsford 356518.
● AMIGA DEVELOPERS SYSTEM. Twin drives. 512k RAM, full set ROM/hware manuals. Development software. Best offer around £1100 secures. All excellent condition. Will deliver. Tel: Steve 0752 346555 (day time).

CP/M

● NEC PC8801. Matching high scan 14" colour monitor. Twin 40 tr D/S drives. CP/M. Wordstar, Multiplan, etc. Excellent condition, £450. May separate. Tel: 0656 3875 reasonable delivery from South Wales.
● EPSON QX-10. 256K, CP/M micro, plus Citizen MSP-20 printer and some software. Home use only £500. Will split. Tel: 0895 72621 or (01) 840 6562 after 6.00pm. Ask for Matthew Masters.
● TUSCAN S100. Dual 5 1/4 drives, green screen monitor, 64k static RAM. VB4 video board, 80X24 screen size, including CP/M/2.2. Pascal, Basic. All manuals, £175. Tel: 670 2383.
● NORTHSTAR HORIZON 12-SLOT S100 DUAL-DRIVE COMPUTER. VC404 terminal customised for Wordstar, Software, technical manuals, offers, £1000. Diablo-1650 Daisywheel printer with spare wheels. Offers £1000. Tel: 021-358-7572 between 7.30pm and 10.30pm.
● OSBORNE. Double density disks. Includes

Wordstar, Supercalc, MBasic, CBasic, comms, and utilities. Original documentation. Excellent condition, £250. Tel: Barry Webb, Swanley, (0322) 862627.
● EPSON QX10 COMPUTER. 256k RAM twin drives with CPM/plus and other software. Excellent condition. £475. Tel: 027582 2236 Eves.

IBM & COMPATIBLES

● SIRIUS 2.4MB. Good condition. Some software. £800. Tel: Simon Crouch office, 0323 35951, home 0323 897325.
● SIRIUS. Twin floppy, 2 x 600k, 256k RAM, MSBasic, Assembler, Progs Toolkit, Pulsar accounts, MSFortran + MSBasic compilers, manuals, etc. In perfect condition. Virtually unused, fair price, £750. Tel Eves. Bath (0225) 26329.
● TORCH G800. IBM compatible coprocessor for BBC. Includes 256k, 2x360k drives (Can be used on BBC). MSDOS and other software. Immaculate condition. £450 (cost £1100). Tarquin (Windsor) 842147 Ext 3.
● AMSTRAD PC1512. 20MB, colour, £1120. Single disk, mono, £475. Guarantee, games and software, free. Tel: 04862-66525 (Woking).
● IBM SOFTWARE. All originals, Portal, £20. Exodus, £15. Hitchhiker's guide, £18. Twoboxes of 10 genuine IBM 1.6MByte AT disks, unused, £15 each. Daniel Crow, 220 Bromham Road, Bedford.
● ZENITH 158. 360k floppy plus 20MB hard disk, £768k RAM, MS-DOS 3.1. Mitsubishi 14" colour monitor, manuals available. £1650. Owner buying up market. Richards 0670 824350.
● SIRIUS. 2 x 620k DRIVES. Manuals, CPM-86. MS-DOS, MS-Basic, 128k RAM, £600 o.n.o. Tel: David Gomme, Wendover (0296) 622690 daytime.
● IBM PC/XT COMPATIBLE. Twin floppies, 20mb hard disk, mono monitor, keyboard and DOS. Juki 6100 daisywheel printer and Wordstar. Supplied with all manuals at £1495.00. Contact Richard Weder on 0332 668076.
● IBM PC. 10MB hard disk, colour graphics, plus software, £850. Also IBM floppy drive £40. 20MB hard disk, £175. Mono graphics adaptor £40. (01) 341 5905 Eves.
● AMSTRAD 1512. Double disk, colour monitor and Ashton Tate dBasell. 6 months old. As new. Genuine reason for sale. Tel: 0604 407103 anytime. £650. No offers.
● AMSTRAD PC1512: DD/mono. 6 months old. D/ covers. Wordstar 1512, £495. Zenith Z-181 PC/compat. portable. 640k, D/ floppies, superb screen, bag, mains adaptor, car cig/ lighter lead, 4 months old. £1295. (£2129 new). (01) 444

IT'S BEEN USED BY ONE LITTLE OLD LADY TO PLAY KILLER GORILLA.



TRANSACTION FILE

AND ONE

8344.

● **COMPAQ DESKPRO.** 20Mbyte twin floppy Kaga R.G.B. III monitor, Symphony ver 1.1. dBasell, Basic compiler, Multimate, Sidekick, excellent working condition. All manuals, £1999 o.n.o. Tel: (0706) 223433. Private sale.

MISCELLANEOUS

● **AST.** 2MB memory upgrade (AT). New, half price, frame work V2, unused, half price, Lotus 1-2-3, unused, half price. Tel: 341-5905 Eves/Weekends.
● **OPEN UNIVERSITY MICROPROCESSOR COURSE PT502.** Including Hektor computer £100. Acorn Atom fully expanded, room board + W.P. & Toolbox plus extra hardware, software. £90. Amstrad DMP2000 printer, £110. Tel: Chester (0244) 42625.
● **DIGITAL DECWRITER THREE MODEL LA120.** Never used. Cost £1,500-00. New. £400.00. o.n.o. Tel: Ken Macdonald. 041-420-1000.
● **NCR DECISION MATE-V PC.** 10MB integral Winchester with floppy drive, CP/M, MS-DOS, various software etc. Also DMV with twin floppy drives and external 10MB Winchester. £650 each. Tel: 0624 897789 Eves.
● **NASCOM 2.** Uncased £60.00. Case and PSU. £25.00. Gemini IVC, £60.00. 64k RAM, £40.00. Two 1/2 Height disk drives, DSDD, £140.00. Will split without case and psu. Wanted GM829. 0375 670511.
● **HEWLETT PACKARD 9816S COMPUTER.** With 1.3 Mbytes RAM, floating point processor, extended keyboard, software, manuals, £1000. Also 225AU thinkjet printer, £200. All in excellent condition. Tel: (01) 947-3799, weekends only.
● **MICOM MULTIPLEXER 828.** Modem 4000 (V29), 2

syscope syscope VI monitors, keyboards, cables. All as new. Any fair offers. (01) 202 2122 week days. Lawrence.

MONITORS

● **ZENITH AMBER MONITOR.** ZYM1220 EA, composite input only. Tested, still in box. Suitable PC (CGA) or BBC. Cost £99, offers. Mathias (01) 959 1704.

PORTABLES

● **COMPAQ PORTABLE.** 10meg hard disk, Panasonic KX-P1092 printer, plus software. £1950.00.
● **Macintosh 512 external disk drive,** Imagerwriter I steebek 1200/1200 modem, £1295.00. Tel: (01) 722-1991 Eves. 01-722-1463.
● **EPSON PX8 PORTABLE COMPUTER.** 120 RAM disk plus all software, manuals and cables, £600 o.n.o. Guildford 0483 66146 Eves.
● **TOSHIBA PORTABLE.** IBM COMPATIBLE T1100 with external 5 1/4" floppy drive and internal 3.5" drive. MS-DOS V 2.11. Some software and 12x3.5" disk's. Offers over £1000. Tel: 0624 897789 Eves.
● **EXCHANGE EPSON PX8 LAPHELD.** With RAM disk and PF10 portable disk drive, for IBM PC, Epson PC or Amstrad 1512. Bryan Wells, Chesterfield 568435.
● **EPSON PX-8 PORTABLE.** With 120k RAM, rechargeable, 3 1/2" drive and video display controller UD80. Offers £700. Tel: 021-358-7572 between 7.30pm and 10.30pm.
● **EPSON PX8.** With 128k RAM pack, printer cable and ROM software. Wordstar, Calc, Cardbox, Oxlinc and utilities. £500. Tel: Oxford (0865) 817224 mornings.
● **DATAVUE 25.** Compatible laptop, LCD 25 x 80, 640k 1 x 5 1/4, 115/250v, battery. Serial/parallel. DOS, integrated software plus lots of public domain. With

manuals. £750 o.n.o. (No Vat) or swap for desktop. (01) 598-8070.

● **EPSON PORTABLE (LAPTOP) PX-8.** 80 column display, boxed, never used, includes software, £350. IBM AT. 20MB, 512k, additional 360k floppy. FX-80 printer, software, £1800. Wordstar, Framework, dBasell, £120. Jonathan (01) 959 4615.

PRINTERS & PLOTTERS

● **EPSON PX8.** With 128k RAM. Epson TF20 d/drive 2 x 360k. Oval VD80+++, DS9. All manuals, software, cables, spare disks, etc. included. Any offers? Simon Watts 0603 56161 X2982 day, 409768 Eves.
● **COMMODORE MPS 801** printer and spare ribbon. With easy script, easy spell and easy file, £110. Tel Pete on Codsall (09074) 4951 after 6pm (South Staffordshire).
● **BROTHER DAISYWHEEL.** With autoamtic sheetfeeder, 20CPS HR15XL serial, new, £350. 128k Apple 11E, enhanced, twin drives, 12" amber screen, £425. Epson MX82T3, £125. Apple cards, software, books, magazines. Tel: 0303-44388.
● **STAR NL10 DOT MATRIX PRINTER.** W/Epson interface. 6 months old. Boxed, as new. Complete W/manuals. £170. (01) 444 8344. Eves.

SINCLAIR

● **640K QL. 3.5"** Sinclair disk drive. Eprom blower, books, and software worth £450, including; Super toolkit, Supercharge Compiler, Ramdisk, Metacomco Assembler, C and Pascal. Bargain £295. Tel: (01) 688 5356 before 5pm.
● **SINCLAIR QL.** Super condition but must sell. Offers around £100. Tel: (01) 997 2161. Anytime.
● **SINCLAIR QL 640k.** Psion software, RAM disk and Multitasking software.

Various games. ICE ROM, joystick, microdrive cartridges, computer case, magazines. All mint condition, superb value, £260. Thame 6517 Eves.

SOFTWARE

● **ARTIFICIAL INTELLIGENCE SOFTWARE FOR IBM-PC.** Arity Prolog, V4.0, £100. TLC LISP with compiler, £80. Two of the best available, offers for both? 0273 478935.
● **MAKE LIFE EASY!** Save time, money, and wasted effort by using any (or all) of my utilities software on your system running MS-DOS Ver 2.0 or above. For list Tel. 041-883 5831.
● **XENIX OPERATING SYSTEM.** Suitable for any 80286 system. Unused with full 3 manual documentation and unused registration. £500 new, accept £300. Tel: 0949 20996 Eves.
● **SNAP V6.1 MARKET RESEARCH AND SURVEY ANALYSIS SOFTWARE.** For IBM PC and compatibles. With full documentation.

£741 value, for only £375. (01) 937 3595 9am to 5pm weekdays.

TANDY

● **WANTED:** Software TRS 80 model IV. CP/M, Montezume profile, etc. Might buy machine. Moore (01) 595 4458.

WANTED

● **WANTED WANTED WANTED.** Hewlett Packard portable HP110 and disk drive & HP1B. Tel: 07072 65226 day or night.
● **WANTED.** Will buy, rent, or swap Starlight for IBM PC. Tel: (01) 941 2668 Dave.
● **WANTED:** 512K disk interface for Sinclair QL. In exchange for Amstrad 464 mono+ single drive. 64k RAM expansion+ DMP1, or HR5 printer and software. Tel: Staines (0784) 59874 after 6.30pm.
● **WANTED:** PC software to run 44 bedroom hotel. Must have package to handle reservations. Call me, Peter Gardiner on Brussels 010-322 5382957 and I will call back.



'I know, I'll wipe out this data file. That'll take the smile off his face.'

TRANSACTION FILE ADVERTISEMENT FORM

All Transaction File ads must be submitted by readers on this form or a photocopy of this form. Maximum 30 words. Print one word per box, very clearly. Name, address and/or telephone number must be included in the 30 words. All ads must be accompanied by a flat fee of £5. Make cheques or POs payable to *Personal Computer World*. Ads accepted from private readers only. Ads cannot be repeated (unless sent in on another form) and we cannot guarantee to print an ad in any specific issue. Please help our typesetter to help you by printing your ad very clearly. Send your completed form to: Transaction File, PCW, 32-34 Broadwick Street, London W1A 2HG.

Please find enclosed my cheque/PO for £5.

Please tick the appropriate category for your ad from those listed below:

Acorn ☐ Amstrad ☐ Apple ☐ Apricot ☐ Atari ☐ Commodore ☐ CP/M ☐ IBM & Compatibles ☐ Miscellaneous ☐ Monitors ☐ Peripherals ☐ Portables ☐ Printers & Plotters ☐ Sinclair ☐ Software ☐ Sharp ☐ Tandy ☐ Wanted ☐

Brainteasers courtesy of JJ Clessa.

Quickie

If you write down every positive 2-digit number (that is, from 10 to 99), which digit will you have written the most number of times?

Prize puzzle

(1) Take a 4-digit palindromic number — that is, one which reads the same from right to left as it does from left to right.

(2) Reverse the digits and add the result to give a new number.

(3) Repeat step 2 with the new number until the result becomes palindromic.

To illustrate, suppose we have the number 3883;

$$3883 + 3883 = 7766$$

$$7766 + 6677 = 14443$$

$$14443 + 34441 = 48884$$

which is palindromic after three cycles only.

Two numbers, however, do not yield palindromic results even after 1000 cycles. What are they?

Answers on postcards, please, or backs of envelopes only, to reach PCW, Leisure Lines July 1987, 32-34 Broadwick Street, London W1A 2HG, no later than 31 July 1987.

April prize puzzle

A moderate response — over 100 replies. As usual there was a trace of ambiguity in the problem — does the digit zero follow the digit 9 in the definition of 'consecutive'?

We decided not, since the problem already stated '... digits 0-9 are used ...', which really precludes the ambiguity. Anyway, most entrants who realised the possible ambiguity, sent in the correct solution as well — which was 123341234.

The winning solution came from Scotland — from Mr D Poyner of Charlestown. Congratulations.

NUMBERS COUNT

This month Mike Mudge looks at Cyprian's Last Theorem.

This theorem is due to the Reverend DC Stockford of Downside Abbey, Stratton on the Fosse, Bath; acknowledgement is also due to Mr M Kochanski of 7 Courtfield Gardens, London SW5 0PA who has carried out significant empirical and theoretical studies related to the theorem.

Clearly $3^2+4^2=5^2$, the smallest integer-sided Pythagorean triangle, is familiar to many readers; however, it is less well-known, although equally trivial, that $3^3+4^3+5^3=6^3$.

The geometrical model of a cube with side 6 units, dissected into three smaller cubes with sides 3, 4 and 5 units respectively, is an interesting application of computer graphics. Clearly more than three portions have to be dissected and then some reassembled. What is the smallest number of parts needed?

Cyprian's Last Theorem

$\sum_{r=1}^k (x-1+r)^k = (x+k)^k$
has no $r=1$ solutions in positive integers other than $x=3$ with $k=2$ or 3.

Note. The notation on the left-hand side is simply shorthand for $x^k + (x+1)^k + (x+2)^k \dots (x+k-1)^k$ there are k terms.

As an appetiser readers are first invited to find 64 consecutive positive integers, the sum of whose cubes is a perfect cube. It is known that only one such set exists. What about the sum of the n^{th} powers of 64 consecu-

tive integers being an n^{th} power?

What about the sum of the n^{th} powers of k consecutive integers being an n^{th} power?

What about the sum of the n^{th} powers of two integers being an n^{th} power? ... Fermat's Last Theorem.

Readers are invited to send their thoughts together with complete or partial attempts at the investigations of the above questions to Mike Mudge, 'Square Acre', Stourbridge Road, Penn, Staffordshire WV4 5NF, tel: (0902) 892141, to arrive by 1 October 1987.

It would be appreciated if such submissions contained a brief summary of results obtained in a form suitable for publication in PCW. These submissions will be judged using subjective criteria, and a prize will be awarded by PCW to the 'best' contribution received by the closing date.

Please note that submissions can only be returned if a stamped addressed envelope is provided.

Review: January 1987

This problem involving Bernoulli's Numbers, Euler's Numbers and the connection with Regular Primes can be further studied by reference to *13 Lectures on Fermat's Last Theorem* by Paulo Ribenboim (Springer Verlag 1979). It proved to be a very popular problem among regular contributors but did not appeal to new readers.

Why was this so?

The very worthy prizewinner was John B Cook of 34 Joan Crescent, East Burwood, Victoria 3151, Australia. John used a Tandy TRS-80 Model 4P to compute $N(X)$ and $D(X)$, to find irregular primes as defined in the article, and to calculate and factorise $E(X)$, the latter up to $X=28$.

Test data, together with much other interesting material is to be found in *A Handbook of Integer Sequences* by NJA Sloane (Academic Press 1973).

It must be recorded, however, that Geoff Lockwood of 254 Crystal Palace Road, London SE22 9JH computed Bernoulli Numbers up to the 200^{th} halting then because the computation was taking two hours per number.

Geoff, however, unfortunately did not have time to consider the computation of the Euler Numbers but obtained some rather interesting results comparing true Bernoulli Numbers with the asymptotic formula in Ribenboim's book referred to above.

Mike Mudge welcomes correspondence on any subject within the areas of number theory and other computational mathematics. Particularly welcome are suggestions, either general or particular, for future Numbers Count articles; all letters will be answered in due course.

Isolated readers can be put into contact with others sharing the same interests. However, greater efficiency regarding published problems should result from contacting the prizewinner directly.

MICROCHESS

NO
OVER

A chess machine capable of beating a world champion may seem improbable, but it's already happened. Kevin O'Connell recounts the recent match between Hitech and Joel Lauthier of France.

Hitech wins match against human World Champion!! Regular readers of this column, who now know something about Hitech, the chess monster from Carnegie-Mellon University in Pittsburgh, will realise what a sensational headline that would make. The amazing thing is that it is true! No, Gary Kasparov is safe for some years yet, but Joel Lauthier of France, the World Under-14 Champion, has suffered a 2-0 defeat in a match at the hands of Hans Berliner's monster.

It seems that many computer chess fans in France were not at all convinced that Hitech could justify its US rating of nearly 2400 (about 2300 on the international scale) and so they arranged for the World Under-14 Champion, with an international rating of 2255, and a playing strength of nearer 2300, to play a two-game match against Hitech during the 2nd International Games Festival in Cannes.

Either those French organisers had not heard about what happened in Hitech's match against Dr Jana Myles (I reported in a previous issue of PCW how Hitech demolished Jana and thus became the first non-human to win a serious game against a Grandmaster); or they had heard about it but chose to believe that the result (2-0) was a fluke; or that it could not possibly happen to someone like Joel Lauthier who has some experience of playing against chess computers and so has an understanding of their strengths and weaknesses; or they simply believed, as do many in the chess world, that women do not really know how to play chess. However, Zsuzsa Polgar, the strongest woman player in the world, was well aware of the Myles match result and she believed that Hitech would probably beat Joel Lauthier, a view that was apparently not shared by any of the match organisers.

The course of the match was an almost exact re-run of the match against Jana Myles. In both games Hitech got a clear advantage from the opening and went on to win with some ease.

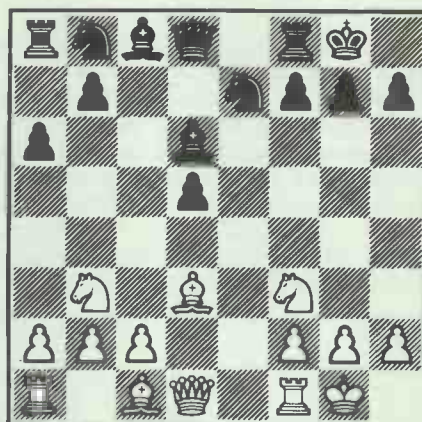
So last year Hitech beat a Grandmaster, this year a World Champion. That leaves Garry Kasparov...

The game which follows was the second one of the match.

White: Hitech. Black: Joel Lauthier (World Under-14) Champion.

Opening: French Defence.

1	e2-e4	e7-e6
2	d2-d4	d7-d5
3	Nb1-d2	c7-c5
4	Ng1-f3	a7-a6
5	e4xd5	e6xd5
6	d4xc5	Bf8xc5
7	Nd2-b3	Bc5-d6
8	Bf1-d3	Ng8-e7
9	O-O	O-O



This position is reasonably well-known in Grandmaster play.

10 Nf3-d4!?

Apparently a new idea, opening a route for the queen to start attacking the king-side, planning to switch the knight back once the queen has entered the fray.

10 ... Ne7-g6

This is too slow. Black should concentrate on developing pieces, and exchanging to relieve the pressure, with 10 ... Nb8-c6; for example, 11 Qd1-h5 g7-g6; 12 Qh5-h4 Nc6xd4; 13 Nb3xd4 Ne7-c6; 14 Bc1-g5 Qd8-b6; 15 Bg5-f6 (threatening mate in two) Rf8-e8; 16 Rf1-e1 Bc8-d7 with a comfortable position for Black.

11 Qd1-h5

What a difficult game chess can be. Last month we saw a program fall to pieces after playing this same move, also in a French Defence, but there it was inappropriate, while here it is a very strong move.

11 ... Nb8-c6

12 Nd4-f3!

This threatens 13 Nf3-g5 h7-h6; 14 Ng5xf7, followed by capturing on g6.

12 ... Nc6-e7

13 Rf1-e1 h7-h6

14 Bc1-e3 Bc8-d7

15 Nb3-d4 Bd6-f4

16 Re1-e2 Qd8-c7

17 Ra1-e1 Ra8-e8

This seems perfectly normal, but it fails. 17 ... Bd7-c6 is horribly passive but might have held the posi-

tion.

18 Bd3xg6! f7xg6

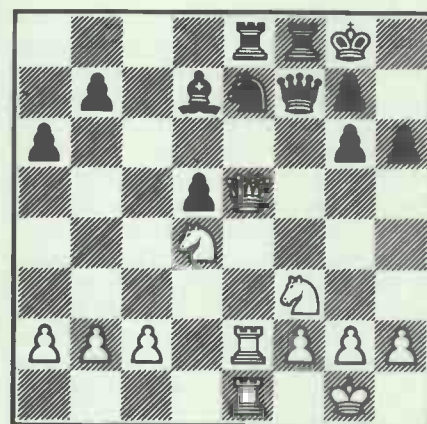
18 ... Ne7xg6 loses the d-pawn, to 19 Qh5xd5.

19 Be3xf4 Qc7xf4

20 Qh5-e5 Qf4-f7

20 ... Qf4xe5 fails to 21 Nf3xe5 Bd7-f5 (otherwise 22 Ne5xg6); 22 Nd4xf5 g6xf5; 23 Ne5-g6, winning at least an exchange (rook for knight).

21 Qe5xe7!



This wins rook, bishop and knight for queen — a handsome profit.

21 ... Re8xe7

22 Re3xe7 Qf7-f6

23 Re7xd7 g6-g5

24 Re1-e7! Rf8-c8

If Black proceeds with his idea of 24 ... g5-g4?, then 25 Re7xg7+ Qf6xg7; 26 Rd7xg7+ Kg8xg7; 27 Nd4-e6+ wins easily.

25 Rd7xb7 g5-g4

26 Nf3-e5 h6-h5

27 Nd4-f5!

27 ... Kg8-h8

27 ... Qf6xf5 fails to 28 Re7xg7+ Kg8-h8 (28 ... Kg8-f8; 29 Rb7-f7+); 29 Ne5-g6+.

28 Nf5xg7 Rc8xc2?

28 ... Rc8-f8 would merely have postponed the inevitable for a few more moves: 29 Ng7-f5 Qf6xf5; 30 Ne5-f7+ Rf8xf7; 31 Re7xf7 Qf5-c8; 32 Rf7-h7+ Kh8-g8; 33 Rb7-g7+ Kg8-f8; 34 Rh7-h8+.

29 Re7-e8+

Here Hitech announced mate in four moves.

29 ... Kh8-h7

30 Ng7-f5+ 1-0

Black resigned. The mate announced was mate in four because Black could still postpone the end for two moves from here by interposing on his second rank first the rook on c7 and then the queen.

USER GROUPS

Micro users of the world unite! This month Rupert Steele explains how the Directory of User Groups can help you.

The User Groups column exists to help put people needing information about their micros in touch with a relevant support group. For reasons of space, the Directory of User Groups alongside only covers the Amstrad and Special Interest categories, but next month we aim to produce the listing in its entirety to cover all machine groups. If you have any information about user groups which you would like to bring to the attention of readers, please let me know.

The Directory does not cover one important area of home computing; this is the local computer club where enthusiasts get together to hear a talk, see a demonstration, or just play with the machines. However, you can get in touch with your local club through the Association of Computer Clubs (ACC), which is listed under the 'Special Interest' section of the Directory. The ACC has a national database of such groups, and is also able to provide cheap insurance as well as other services. The ACC also runs the highly successful ClubSpot 810 area on Prestel in collaboration with Micronet and Prestel Microcomputing.

User Group news

I have received a good deal of material from WACCI, which has dropped the 'worldwide' claim from its title to become the 'Europe-wide Amstrad CPC Users Club'. The club prints a newsletter running to 40 A4-pages printed in condensed type — probably one of the most comprehensive user group newsletters that I have ever seen. Low on gloss, high on content, the newsletter is written in a very cheerful style and contains a variety of information.

WACCI also runs a software library. You supply the media (tape or disk) and the club returns it to you with whatever public domain items you have requested copied to it for a nominal fee. The library contains over 50 items, including some CP/M favourites such as assemblers, Basic compilers and disk-sector editors. The group also runs a 20 per cent discount software service, and may also be able to obtain similar terms for hardware purchases by members. There is also a monthly competition, with prizes donated by software houses; it is not unusual for the prize to be worth £50 or more.

Just like me, WACCI is a fan of Nick Godwin and his printer ribbon re-inking service 'Aladdink'. The

issue of the newsletter that was sent to me was printed with a re-inked ribbon which, WACCI claims, lasted better than a new one used the previous month. The print quality looked fine to me, so if you want to help eliminate over-pricing of matrix printer ribbons, drop Nick Godwin a line at Aladdink, 4 Hurkur Crescent, Eyemouth, Berwickshire TD14 5AP. If enough people start re-inking, the price of new ribbons will have to drop.

In summary, WACCI would look to be a good bet for anyone with an Amstrad CPC machine, and if future newsletters are as good as this sample, I would recommend the £12 subscription as money well spent. For more details, contact Jeff Walker, the editor, at WACCI, 75 Greatfields Drive, Hillingdon, Uxbridge, Middx UB8 3QN or call (0895) 52430.



For the more serious electronics enthusiasts, I have had details of AMRAC, the amateur Radio and Computer Club. The club's publicity officer, Trevor Tugwell, writes explaining that instead of using phone lines, radio amateurs connect up their computers using a two-way radio link — avoiding expensive telephone bills. The most popular frequencies are on VHF — 144.650 and 144.675 MHz, and these transmissions can apparently be picked up by anybody with the right sort of 'scanner radio'. As well as direct communications, many mailboxes and bulletin boards have been set up and are proving very popular.

Most amateurs are moving over to a system known as AX.25 Packet Radio. This provides error-correction to beat radio interference. The modems used operate at 1200 bits/sec using Bell-202 tones (1.2/2.2KHz — are these the same as the blanked-off switch positions on your old

WS2000?). If you need to buy the kit, you can get units for about £150 which also implement the AX.25 protocol. AMRAC publishes a bi-monthly newsletter devoted to this subject: it is a voluntary group and membership is £5 pa in the UK, £8 pa in Europe. Further details are available by sending an sae to the secretary, Phil Bridges, G6DLJ at 9 Hollydene Villas, Hythe, Hants SO4 5HU. Or you can telephone him on (0703) 847754 or use Prestel mailbox 703847754. There is also a telephone bulletin board on (0376) 518818 using 300 baud V21 protocol.

I am glad to say that I continue to receive mail about a variety of local clubs as well as the national groups now featured in the Directory. Paul Cuthbertson of 18 Morningside Crescent, Blackhall, Inverurie AB5 9FA has written to me with details of the newly re-vamped Grampian Amateur Computer Society. The new group will have a complete programme of courses, demonstrations and lectures in premises which it shares with the Aberdeen Amateur Radio Society. During the summer months it is organising visits to various industrial sites, with computer-controlled breweries and distilleries being top of the list. The club meets every Monday and the first meeting of the month is intended to be a 'special guest' lecture or 'in-depth' demonstration. At a recent exhibition, the club exhibited robot arms, fibre-optics, LANs, modems, CAD, communications gear and a fish weigher(!). Send an sae to Paul at the address above for more details.

And, finally, perhaps the *least local* local club that I have ever mentioned. I have received a letter from the software librarian of the Green Screen Club, described as the largest computer club in Zimbabwe. It provides an excellent newsletter, and there are also meetings in Harare and Bulawayo for the membership of 350, whose micros range from ZX80s (remember them?) to IBM PCs. So, if you're an expatriate or otherwise reading PCW in Zimbabwe, why not contact the club via the librarian, EM Stuart-Walker, Green Screen Club Library, PO Box UA 393, Union Avenue, Harare, Zimbabwe. PS: the club is looking for public-domain contributions to the library.

If you would like your user group or club to have a mention in this column, or you wish to be considered for the Directory of User and Support Groups, please write to Rupert Steele, 12 Philbeach Gardens, London SW5 9DY.

DIRECTORY OF USER GROUPS



GROUP	CONTACT	NOTES
Amstrad 1512 Independent User Group	PO Box 55, Sevenoaks, Kent, TN13 1AQ	£20 subs; PC clone only
Amstrad Professional User Club	John Ainsworth, Amstrad Prof User Club, Victoria House, 1-6 Low Row, PO Box 10 Sunderland, SR1 3PY. (0783) 673395	Business users only; £49.95 subscription
Amstrad User Software Database	AUSD, PO Box 11, Gosforth, Newcastle-upon-Tyne, NE3 1RP. (091) 285 6107	Fido bulletin board available
PCW Users Group	Robert Mobberley, 37 Clifford Bridge Road, Binley, Coventry, CV3 2DW. (0203) 441417	Monthly newsletter. SAE with postal enquiries
The PCW Computer Club	Ron Morland, 12 Deneve Avenue, Poole, Dorset BH17 7LR	SAE please for details
AP.Ex	Nick Godwin, 4 Hukur Crescent, Eyemouth, Berwickshire, TD14 5AP. Eyemouth 50965	Amstrad home machines. SAE please. Subscription £5
Advantage	Jeffrey M Green, 33 Malyns Close, Chinnor Oxon, OX9 4EW	Amstrad CPC 664. Subscription £8.75
Amstrad CPC Computing Newsletter	Chris Bryant, 11 Havenview Road, Seaton, Devon, EX12 2PF	Home users. Large SAE for sample newsletter
PCW File	Chris Bryant (as above)	Subscription £2 including free PD software. Large SAE for sample newsletter
WACCI (Europewide Amstrad User Club)	Jeff Walker, WACCI, 75 Greatfields Drive Hillingdon, Uxbridge, UB8 3QN. (0895) 52430	Newsletter; £12 sub; special offers
Amstrad Groups Federation	4 Sutton Road, Gorton, Manchester, M18 7PN	Umbrella organisation for Amstrad User Groups
Special Interest		
AMRAC-Amateur Radio & Computer Club	Trevor Tugwell, G6TJT, 6 Kestrel Drive, Mudeford, Christchurch, Dorset, BH23 4DE. Or phone Phil Bridges on (0703) 847754 (G6DLJ)	300/300 Bulletin Board on 0736 518818
Church Computer Users Group	Rev Nigel Hardcastle, 112 Rotherfield Rd, Garretts Green, Birmingham, B26 2SH. (021) 743 2971	Support group for those using computers in the running of churches
Local Authority Micro-Computer User Group	John New, Borough Engineers Dept, Municipal Offices, North Quay, Weymouth Dorset, DT4 8TA. (0305) 785101 (ext 272)	
Seafarers	Mr C E Watson, 29 Doods Place, Doods Road, Reigate, Surrey, RH2 0NS	
SNUG — Special Needs User Group	Jeff Hughes, 39 Eccleston Gardens, St Helens WA10 3BJ. (0744) 24608	Computing for the disabled handicapped, and so on
Society of Genealogists	Society of Genealogists, 14 Charterhouse Buildings, London, EC1M 7BA. (01) 251 8799	Use of computers in tracing ancestors. Monthly meetings
Comms file	TP Group, FreePost, London, N1 1BR (01) 833 3501	Comms users newsletter. Subscription: £75
Amateur Computer Club	Andy Leeder, Church Farm, Stratton St Michael, Norwich, NR15 2QB	Hardware Club. Large SAE for sample newsletter
Association of Computer Clubs	John Dale, 12 Poplar Road, Newtown, Powys, SY16 2QG. (sae please)	Umbrella group for all hobby clubs. National database of local groups
ClubSpot 810	Andy Leeder, Church Farm, Stratton St Michael, Norwich, NR12 2QB. *810#	Hobby Information Provider on Prestel. Clubs may be able to edit own free pages
Find-It	Orkney Computing, 60 Albert Street, Kirkwall Orkney, KW15 1HQ. (085 686) 268	Disk-based index to PCW and five other UK business micro mags. Runs on PC
Christian Micro Users Association	Philip Clark, 138 Bramwell Gardens, Sheffield S3 7PW	

An up-to-date list of UK bulletin boards, compiled by Peter Tootill.

(0001) 764 942 Infomatique, Dublin
MF:10pm-6pm ; WE:10pm-6pm, 3/1275
Amiga based
(0001) 854 522 Dublin Fido
24 hrs. 3-24
(0001) 885 634 DUBBS, Dublin
MF:8pm-8am ; WE:24hrs, 3-24
First BBS in Eire. Amiga based
(0001) 903 341 IACCBS, Eire
24 hrs, 300bd.
Irish ACC. Runs on Commodore 64
(01) 200 3439 Airtel TBBS, London
24 hrs, 3/1275. Has a pilots area.
(01) 200 7577 Hendon Fido, London
24 hrs. 3/1275. Also (01) 220 8281
Opus system (FIDO clone)
(01) 207 2989 Dark Crystal Fido, London
24 hours, 3-12
(01) 248 5747 Prestel, London
24 hours, 300 bd.
No graphics on this number.
(01) 346 7150 Marctel, London
24hrs, 3/1275
FBBS system.
(01) 348 9400 TBBS London
24hrs, 3-12
(01) 399 2136 MG-Net, London
Only open Sun 5pm-10pm. 300
(01) 429 3047 OSI Lives!, London
24 hrs RING BACK. 300.
(01) 450 9764 Techno Line, London
24hrs. 1275v. Commercial
(01) 452 1500 Techno-line 2, London
Evenings 24hrs 1275v Commercial
(01) 455 6607 NNBS London
24hrs 3/1275
(01) 542 3772 WBBS Wimbledon, London
Sat 7pm-Mon 8am 3/1275
(01) 542 4977 TBBS Revoreed, London
24hrs 3-24
(01) 543 7020 Dataflex Fido, S.London
24hrs 3/1275
(01) 573 8822 Tacom, London
MF:7pm-8am. All day Sun. 300
Interak micro section.
(01) 580 1690 Poly Fido, London
24hrs. 3-12
(01) 624 5338 Twilight Phone, London
24hrs. 300. Fido.
(01) 638 2034 CyberZone, London
24hrs. 300.
(01) 648 0018 MBBS Mitcham, London
24hrs. 3/1275
(01) 659 6992 Link Fido, London
24hrs. 3-12
(01) 735 6153 Brixton ITec, London
24hrs. 1275

(01) 863 0198 London Underground
24hrs. 3-12. Opus system.
Amiga, Atari ST, IBM sigs
(01) 883 5290 NBBS London
24 hrs. 3/1275
(01) 886 2813 Crystal Tower, London
24hrs. 3-24. Apple, IBM and more.
(01) 888 8894 Gnome at home, London
24hrs. 1275v
Home of the Micrognome
(01) 927 5820 Owlitel, London
24hrs. 1275v
(01) 941 4285 Metrotel, London
24hrs. 1275v
(01) 960 4742 ITCU Exchange & Mart
24hrs 1275v ITec's central system
(01) 968 7402 Communitel, London
24hrs. 1275v
(01) 985 3322 Hackney BBS, London
24hrs. 1275v
(01) 986 4360 Health data, London
24hrs. 1275v
(0204) 43082 Bolton BBS
MF:8pm-8am ; WE: 24hrs. 8am-8pm
RING BACK, 3-24.
(0206) 862 354 Pete's Place, Colchester
24hrs. 3/1275. Opus system.
(021) 430 3761 CBABBS, Birmingham
24hrs. Not Thurs. 300
Atari based. Mail to Canada
(021) 444 1484 TUG II, Birmingham
24hrs. 3/1275
Amstrad, Tandy, online Adventure
(021) 476 9881 Infocom BBS, Birmingham
24hrs. 3/1275
On-Line games, adult stories, BBC
(0222) 464 725 Cardiff ITec
24hrs. 1275v
(0223) 243 642 Acorn BBS, Cambridge
24hrs. 1275v
(0224) 641 585 ABERDEEN ITEC
24hrs. 1275v
(0224) 781 919 Aberdeen Commodore
24hrs. 300
Commodore 64 based
(0247) 455 162 SBBS II (Irish Man),
MF:9pm-11pm RING BACK
WE:11pm-9am RING BACK
3/1275
(0247) 467 863 Deep Thought Fido,
Bangor
24hrs. 3-24
PC-DOS, CP/M, BBC, Tech.help sigs
(0258) 54 494 TBBS Blandford, Dorset
24hrs. 300
Blandford Computers
(0268) 22 177 BITEC, Basildon ITec
24hrs. 1275v

Also on (0268) 25122
(0272) 421 196 Octopus, Bristol
MF:6pm-6.30am ; WE:24hrs. 3/1275
(0274) 480 452 OBBS Bradford
24hrs. 3/1275. Colour for BBC users
(0277) 228 867 NBBS Essex, Brentwood
24hrs. 3/1275
Subscribers only
(0295) 720 812 Bloxam Board
10pm-1am every day. 300
(0367) 81 507 Trinity 2, Faringdon Ox
24hrs. 3/1275
Sponsored by Courier Consultancy
(0376) 518 818 ARCNET, Colchester
24hrs. 300
(0384) 635 336 West Midlands, Stourport
6pm-8am every day. 300
TBBS system
(0392) 53 116 CBBS South West, Exeter
24hrs. 3/1275
(0394) 276 306 BABBS, Felixstow
24hrs. 3-12
(0395) 272 611 Trinity 1, Exmouth
24hrs. 3-12
(0401) 50 745 MBBS Leconfield
24hrs. 3/1275
(041) 956 6537 People's Palace, Glasgow
6pm-8am every day. 3/1275 Colour
(0443) 733 343 MGBBS Mid Glamorgan,
Ferndale
6pm-1am every day. 300
Used to be on 0443 755298
(0463) 231 339 Betelgeuse 5, Inverness
24hrs. 3/1275
(0482) 465 150 Hamnet, Hull
MF:6pm-8am ; WE:24 hrs. 3/1275
Radio Hams' area
(0482) 859 169 Forum-80, Hull
MF:7pm-11pm ; WE:1pm-11pm 3/1275
Midnight - 8am on Bell 103 tones.
(0483) 573 337 Compulink CIX, Guildford
24hrs. 3-24. Multi-user. CoSy system.
Also on 0483 573338
(04862) 25 174 PBBS 'Adult' BBS, Mitcham
24hrs. 3/1275
(0492) 49 194 Cymrutel, Colwyn Bay
24hrs. 1275
(0506) 38 526 Livingstone BBS
24hrs. 300
(051) 220 3761 Fido Compulink North,
Liverpool
24hrs. 3/1275
(051) 428 8924 Liverpool Mailbox,
Liverpool
24hrs. 3-24
Britain's first 24 hr system
(0524) 60 399 CNOL, Lancaster
24hrs. 300

Clinical Notes OnLine - BBS for medics
(0532) 600 749 L.E.M.S Fido, Leeds
10pm-8am every day. 3/1275
(0534) 39 389 Jersey Fido
24hrs. 3/1275
(0592) 860 313 JMBBS Amstrad BBS, Fife
9.30pm-8am every day. 300
Sponsored by John Menzies
(0602) 811 950 MacTel Green Box,
Nottingham
24hrs. 3-24
For Macintosh users
(0602) 817 696 MacTel HQ, Nottingham
24hrs. 3-12
For Macintosh Users
(0604) 20 441 Norview, Northants
24hrs. 1275v
(061) 427 1596 OBBS Manchester
24hrs. 3/1275
(061) 494 6938 Fido TeePee link,
Manchester
24hrs. 3-24
(061) 773 7739 Fido Manchester
24hrs 3/1275
Mektronic Electronic design cons
(0625) 33 703 Telemac 15, Macclesfield
24hrs. 3/1275
(0628) 824 852 C.A.T.S. Fido, Maidenhead
24hrs. 3/1275 V22/bis shortly.
(0642) 481 643 System 2000 Comp Club,
Redcar
7pm-7am every day. 300
(0642) 784 819 Fido Teeside, Cleveland
24hrs. 3/1275
(0698) 884 804 SABBS, Larkhall
24hrs. 300
Atari based system
(0702) 54 6373 C.View Rochford
24hrs 1275v
(0705) 524 805 Gosport Apricot BBS
24hrs. 300
(0705) 736 025 BBS09, Portsmouth
Weds:7pm-7am ; WE:24hrs 300
OS9, Sci-Fi sections
(0707) 52 242 RSGB, London
24hrs. 1275v
(0734) 484 847 Trinity 3, Reading
24hrs. 3/1275 TBBS system
(0742) 350 319 MacTel Sheffield
24hrs. 3-24 For Macintosh Users
(0762) 333 872 PBBS1 Portadown,
N.Ireland
10pm-1am RING BACK every day. 300
(0766) 4154 Prometheus (Opus),
Porthmadog
24hrs 3-24. ANSI colour graphics
(0767) 50 511 Fido Gamlingsay, Sandy, Beds
24hrs. 3-24

UK BULLETIN BOARDS

AND ONE

(0782) 265 078 Stoke ITeC
24hrs. 1275v
(0792) 203 953 FBBS Swansea
24hrs. 300
(0792) 297 845 Bulletin AT Fido.
MF:6pm-9pm WE:24hrs 3-12
(0832) 73 003 Intel-Ace, Oundle
Swansea
MF:6pm-8am WE:24hrs 1275v
(0865) 882 872 Banat Board, Oxford
24hrs. 3-24
Opus - colour graphics for ANSI
(0874) 711 147 Communitree
24hrs 300
(0883) 844 164 LABBS
24hrs. 3/1275
The Prisoner - 2 lines
(08926) 61 149 PD-Sig Fido 1.
Crowborough

24hrs 3/1275
PD software interest group
(0895) 420 164 CBBS, London NW
24hrs 300
(0895) 52 685 London West Tech
24hrs. 3/1275 TBBS system
(0903) 212 552 Lasermail Fido
24hrs. 3/12
Subscribers only.
(0905) 52 536 Access Fido, Worcester
24hrs 3-24
Midi section
(0906) 668 398 Key Board, M.Keynes
MF:8pm-8am exc.Tue and Thurs.
WE:12h
Spectrum Micron BBS
(091) 477 3339 Log On the Tyne Fido
10pm-7am every day. 3/1275
(0923) 675 644 SBBS - Watford

MF:9pm-11pm ; WE:11pm-6am 3/1275
(0924) 442598 Kirklees ITeC, Batley
24hrs 1275v
Information Technology Centre
(0925) 411 265 CSI Health Line,
Warrington
24hrs 3-24
(0934) 29 570 Avon Fido, Weston S/Mare
24hrs 3/1275
(0936) 77 025 NBBS Cheshire
24hrs 3/1275
(0942) 609 611 Pyramid, Leigh, Lancs
24hrs 300

Key to baud rates, etc

300 = 300 (V.21)
1275 = 1200/75 (V.23)
h = half duplex
v = viewdata graphics
12 = 1200/1200 (V.22)
24 = 2400/2400 (V.22bis)
3-12 = V.21,V.23,V.22
3-24 = V.21,V.23,V.22,V.22bis
MF = Monday-Friday times
WE = weekend times

Note to sysops

If you want your BBS to appear in the list please send all the above details to Peter Tootill either by post or on Telecom Gold to 83:VNU202. Include a voice telephone number for verification purposes (this will not be published.) Any additions or updates will be gratefully received.

DIARY DATA

A look ahead at computer shows throughout 1987. Readers are advised to check details before setting out on their journey.

ELECTRONIC PUBLISHING AND PRINT SHOW '87

30 June-2 July 1987

Wembley Conference Centre, Middx — Online International (01) 868 4466

(For all aspects of home and office desktop publishing, including professional page makeup systems)

PC USER SHOW

30 June-2 July 1987

Olympia, London — EMAP International Exhibitions (01) 608 1161

(For business PC users)

AMSTRAD COMPUTER SHOW

10-12 July 1987

Alexandra Palace, London — Database Exhibitions (061) 456 8383

(Covering the entire range of Amstrad machines — CPC, PCW and the PC1512)

IBM SYSTEM USER SHOW

2-4 September 1987

Olympia 2, London — EMAP International Exhibitions (01) 608 1161

PERSONAL COMPUTER WORLD SHOW

23-27 September 1987

Olympia, London — Montbuild (01) 486 1951

(Obviously the UK's No 1 computer show. Make sure you don't miss it!)

DEC USER SHOW

6-8 October 1987

Barbican, London — EMAP International Exhibitions (01) 608 1161

COMPUTER GRAPHICS '87

13-15 October 1987

Wembley Conference Centre, London — Online Conferences Ltd (01) 868 4466

(Includes a number of conferences)

AMSTRAD COMPUTER SHOW

23-25 October 1987

G-Mex, Manchester — Database Exhibitions (061) 456 8383

ELECTRON & BBC MICRO USER SHOW

13-15 November 1987

New Horticultural Hall, London — Database Exhibitions (061) 456 8383

COMPEC

17-20 November 1987

Olympia, London — Cahners Exhibitions (01) 891 5051

(Trade and business only)

COMPUTER RECRUITMENT FAIR

27-28 November 1987

Novotel, London — Intro UK Ltd (0491) 681010

THE WHICH COMPUTER? SHOW

19-22 January 1988

NEC, Birmingham — Cahners Exhibitions (01) 891 5051

END



ALTAIR

Electronics Ltd
Steelmark House, Unit 6
Crusader Ind. Est., Hermitage Road
London N4 1LS Tel: 01-800 8090

Suppliers of an extensive range of Hardware and Software for
some of the most respected names in the computing industry

TANDY OLIVETTI OPUS AST AMSTRAD
OKI ZENITH DAC Easy ARC STAR EPSON
XT / AT / 386 COMPATIBLES

TANDY

3000 HD Mono system 1.2meg floppy 20meg HD £2869
3000 HL Mono system 1.2meg floppy 20meg HD £2064
1000 Colour system Twin floppy £1029 20meg £1604
1000 Mono system, Twin floppy £799 20meg £1374

We supply the full range of Tandy electronic equipment



OLIVETTI

M28 512K 40MB HARD DISK £ POA
M28 512K 20MB HARD DISK £ POA
M24 640K 40MB HARD DISK £1695
M24 640K 20MB HARD DISK £1295
M24 640K SINGLE 360K DRIVES £1035
M19 256K TWIN 360K DRIVES £845

ARC

286 Turbo system unit £1195
Mono display add £229
Colour display add £499
EGA display add £679
20MB Hard Disk £299
Serial/Parallel card £89

Please call for quotation on any OLIVETTI/ARC systems not shown above

OPUS

THE PCII TURBO SYSTEM
Memory expandable to 1MB
4.77/8 MHz - Parallel/Serial Ports
8 expansion ports - Keyboard - Lock
Legal BIOS - HI RES Monitor

SYSTEM PRICES from £499 to £969

AMSTRAD

THE PC 1512
Fully compatible system
8MHz clock - GEM Software
10/20 MB Hard Disk drives
360k floppy - FREE MOUSE

SYSTEM PRICES from £449 to £1069

STOP PRESS-AT EGA FULLY COMPATIBLE SYSTEM ONLY £1999.00
Half size-640k-20Mb HD-1.2Mb Floppy EGA/CGA Monitor-Serial/Parallel Port

PLEASE PHONE 01-800 8090 FOR THE BEST PRICES ON A
FULL RANGE OF COMPUTERS AND PERIPHERAL DEVICES

PRICES EXCLUDE VAT AND P&P

EXPORT SPECIALISTS

Have you been let down by failed deliveries and
worthless promises of shipment???

We GUARANTEE DELIVERY !!!

We export all the leading names in business and
home computing.



Fully Tested IBM Compatibles from £370.00

Contact us NOW for the very best prices.

OMEGA PC LTD, 97 Kingsley Road,
Hounslow, Middlesex, TW3 4AH.

TEL: 01-577 3780
FAX: 01-577 0967
TLX: 295267 GURPAL G



MIGHTY MICRO

Mighty Micro Manchester Ltd, Sherwood Centre
218 Wilmslow Road, Fallowfield, Manchester, M14 6WL
Telephone 061-224 8117 (3 lines)



BUSINESS-COMPUTERS

Amstrad PC1512.....Master Dealer
Amstrad PCW Range.....Call
Atari 520ST FM.....£347.00
Atari 1040ST/F.....£522.00
Commodore Amiga.....Special Price
Ferranti PC1860 (NEW).....£895.00
Ferranti PC1860XT/20Mb.....£1195.00
Ferranti PC2860AT/20Mb.....£1995.00
Ferranti PC2860AT/40Mb.....£2900.00
Epson PC/FD.....£745.00
Epson PC/HD 20Mb.....£1439.00
Kaypro PC/768K + Monitor.....£1030.00
Kaypro PC/20Mb.....£1430.00
Kaypro 286i AT/20Mb/Mono.....£1750.00
Kaypro 286i AT/20Mb/Colour.....£1960.00
Kaypro P2000 Lapheld.....£950.00
Kaypro P2000 Large Screen.....£1150.00
Sharp PC7000.....£900.00
Sperry PC/HT100.....Call
Sperry PC/IT 44Mb hard.....£2549.00
Tandon PCX/Mono.....£985.00
Tandon PCX10/Mono.....£1067.00
Tandon PCX20/Mono.....£1223.00
Tandon PCA20/Mono.....£1645.00
35L computers.....Call

HOME COMPUTERS

Amstrad 464/6128.....Call
BBC Compact.....Special Price
BBC Master 128.....£400.00

HARD DISK WINCHESTERS

SEAGATE 10MG + CARD.....CALL
SEAGATE 20MB + CARD.....CALL
DYSAN 10MB HARD CARD.....CALL
OSIC 20MB HARD CARD.....CALL
OSIC 30MB HARD CARD.....CALL
OSIC 40MB TAPE STREAMER.....CALL

ALL EXCLUDE VAT

PRINTERS

Amstrad DMP2000.....£139.86
Brother M-1409.....£340.00
Brother M-1509.....£421.75
Brother M-1709.....£520.60
Brother HR15.....£347.00
Brother HR25 XLD.....£651.00
Epson LX86.....£226.05
Epson LQ800.....£475.00
Epson LQ1000.....£635.00
Epson LQ2500.....£836.00
Epson FX800.....£344.00
Epson FX1000.....£440.00
Star NL10.....£243.45
Star NX15.....£325.78
Star NB24/15.....£721.00
Citizen MSP-20.....£286.00
Citizen MSP-15E.....£339.00
Citizen MQP-45.....£695.00
Citizen 35 PREM.....£595.00
Juki 6000.....£173.86
Juki 6100.....£286.91
Silver Reed EXP400.....£173.86
Amstrad DMP4000.....£325.00
Panasonic 1081.....£173.91

ALL EXCLUDE VAT

LASER PRINTERS

Scanners + plotters.....Call
Cannon LBP-8A1.....£2185.00
Cannon LBP-8A2.....£3235.00
QMS PS800 A4 + Postscript.....£3780.00
QMS P8 A4.....£1945.00
OKI Laserline.....£1720.00
Centronics Page Pub.....£1950.00

ALL EXCLUDE VAT

AMSTRAD 1512 PC/MS-DOS SOFTWARE

WORD PROCESSING
Word Star 1512.....£60.82
1ST Word Plus.....£69.52
Word Perfect Jr.....£86.91
Volkswriter Deluxe.....£39.12
Vuwriter 1512.....£49.56
Word Star 3.3.....£211.25
Word Star Prof 3.3.....£273.75
Word Star 2000 (Rel 2).....£306.25
Word Star 2000 Plus.....£368.75

DATABASE

Reflex 1512.....£60.82
VP Info.....£86.08
Card Box.....£52.13
PC Promise.....£60.82
Tas Plus.....£63.47
Dbase 2 1512.....£103.47
Dbase 2 (IBM).....£297.60
Dbase 3 Plus.....£418.75

INTEGRATED SYSTEMS

Ability.....£98.26
First Choice.....£149.00
PC-Four (PSION).....£69.95
Smart System.....Call
Framework 2.....£406.25
Symphony.....£490.00

FINANCIAL PLANNING

Supercalc 3.10 1512.....£60.82
VP-Planner.....£86.08
Supercalc 4.....£250.00
Javelin.....£410.00
Multiplan.....£150.00

MODEMS AND COMMS

WS4000 V21/V23 AA/AD.....£149.95
WS4000 V21/V23 V22 AA/AD.....£399.95
WS3000 V21/V23 AA/AD.....£295.00
LINNETT V21/V23 AA/AD.....£135.00
UNITY INTERNAL 2123 AA-AD.....£215.00
AMSTRAD INTERNAL V21/V23.....£150.00

ALL EXCLUDE VAT

ADDON CARDS

EGA CARD.....£223.75
CGA CARD.....£63.00
MBA CARD.....£85.00
MULTIFUNCTION CARD.....£140.00

WHAT ELSE

Floppy disks/Floppy disk boxes/Books/Rams/
and Roms/Joysticks Cables/Listing paper and
Labels/Mouse for most Computers/Ribbons/
Calculators/and of course software for all our
range of computers.

NEW PRODUCT LINE

PSION ORGANISER
SPECIALIST CALCULATOR
NEC MULTISYNC MONITORS
OPUS COMPUTERS

ALL PRODUCTS EXCLUDE VAT

MONITORS

Philips 8501 Colour.....£156.48
Philips 8533 Colour.....£273.85
Philips BM7502 Green.....£78.25
Eizo ER3010WL B/W.....£109.52
Zenith 1230 Green.....£82.56
Zenith 1220 Amber.....£91.26

WE ALSO STOCK 3SL AKHTER, OPUS, ATARI PCS. ALSO TANDON TARGET

PERSONAL EXPORT SPECIALISTS

Export to over 60 countries in 1986
Please add 15% VAT to all prices
Delivery: Free to UK mainland for orders over
£100

MANCHESTER

Easy Access from the
M56, M6, M62, M63, M602

MIGHTY MICRO BULLETIN BOARD

Ring 061 224 8117
Ring for prices/orders/leave messages Upload/Download free
DDM software Any modem with 300/300 1200/75 and TTY
software Online from 7pm to 8am Mon-Sat/All day Sunday

In a Class on its own



This little lot ask more of their IBM-compatibles in a day than most users demand in a year. But then this is London's Polytechnic of the South Bank, one of Britain's leading institutes of science and technology.

Here wordprocessing and data storage, financial management, and computer-aided design, networking and terminal emulation are all in a day's work.

So you can be sure that when the Polytechnic chose the PC II Turbo from Opus—almost 200 of them in fact—it was only after a great deal of study.

Even with a starting price of £499 the PC II Turbo faced some cheaper competitors but, when it came to speed, compatibility and expandability, it proved to be in a class of its own. Now it's in every class from electronic engineering to administrative studies and from computer services to humanities and social sciences.

With its NEC V20 processor the PC II Turbo is up to three times as fast as the IBM PC/XT and its switchable from 4.77 to 8 MHz Turbo processing at the flick of a keyboard. You can choose high resolution monochrome, colour or EGA systems, single or dual disc drives, 1 Megabyte RAM expansion or 20 Megabyte Winchester. And if you think our options could teach the competition a lesson or two, you'll find the PC II Turbo's standard features a real education.

- NEC V20 Super Processor ● 360K Floppy Disk Drive
- Hercules-compatible Graphics Card ● High Resolution Monochrome Monitor ● Quality AT-Style keyboard
- Highly Compatible BIOS ● 256K of RAM Expandable to 1 Mb creating 384K RAM disk ● 8 Expansion Slots
- Keyboard Security Lock ● Parallel Printer and Joystick Interfaces ● Real Time Clock/Calendar with Battery Back-Up ● 150 Watt UL-Approved Power Supply
- Comprehensive User Manual ● 12-Month Guarantee.
- Now available with new maths co-processor option.



Should you need more than our 12-month free warranty, we'll even offer you a low-cost on-site maintenance option.

Like South Bank Polytechnic we're sure you'll take a close look at the competition, their options and availability. When you have, call Opus on **0737 65080** and hear about our guaranteed 72-hour delivery. We offer special education and government discounts and welcome dealer and export enquiries. Price quoted exclusive of VAT and carriage.

PC II TURBO

Opus Supplies Ltd,
55 Ormside Way,
Holmethorpe Industrial Estate,
Redhill, SURREY RH1 2LW.

Opus.

IBM is a trademark of International Business Machines Corporation.

NEW BABY AT TURBO COMPATIBLES FOR UNDER £1000

Now only
£975

NEW
LOW
PRICES

full working system,
no hidden extras

COMPUTER SYSTEM:

- * 80286/8 Mother Board
- * 6/10 Mhz switchable
- * 640k RAM, expandable to 1Mb on board
- * Phoenix bios,
- * 8 Expansion slots
- * Hercules compatible graphics card
- * Parallel port, 4 serial ports (3 opt)
- * 200W power supply
- * Keyboard
- * Geared for multi user application

AT-1 Computer System, 1.2Mb floppy, mono monitor **£975**

AT-2 Computer system, 1.2Mb floppy, colour RGB Monitor (colour/green/amber switchable). **£1175**

AT-3 Computer System, 20Mb Hard disk, 1.2Mb floppy, Mono Monitor **£1395**

AT-4 Computer system, 20Mb Hard disk, 1.2Mb floppy, colour RGB Monitor, (colour/green/amber switchable). **£1595**

AT-EGA Computer system, 20Mb Hard disk, 1.2Mb floppy, EGA graphics card, EGA Monitor (colour/green/amber switchable). **£1795**

XT compatible range available CALL for PRICES

7 DAYS TRIAL PERIOD OR MONEY BACK

NEW PRODUCTS NEWS

New range of XTAT Compatible computers to be launched at the
PC USER SHOW

See us at Stand Number 44B

ALL WELCOME

Upgrade Kits ☆ Special Offer ☆

20 Mb Hard disk + controller for XT	£339
30Mb Hard disk + controller for XT	£465
Hercules compatible graphics card + mono monitor (amber) with swivel base	£169
EGA Card (emulates EGA/CGA/Hercules) + EGA monitor (Packard Bell)	£575
40Mb Internal tape streamer	£595

accessories

● RS232C card	£27.50
● Switching power supply for XT, 150W	£75.00
● XT hard disk controller	£95.00
● Serial card (support 4 ports)	£95.00
● 360k floppy disk drive for XT	£69.00
● Genius mouse (MS Systems compatible)	£75.00
● 20Mb hard disk drive	£250.00
● H/Res mono/graphic printer adaptor (Hercules compatible)	£75.00

CALL for complete add on cards and accessories prices

ALL PRICES EXCLUDE VAT

Dealers and educational ENQUIRIES WELCOME



AJP Business Computers Ltd.

South Bank Technopark,
90 London Road, London SE1 6LN.

Tel: 01-922 8849

Telex: 946240 CWEASY G Ref: 19015840.

FLEXIBILITY! LCD PORTABLE

Choice of 3 Standard Main Boards

8088, 8088-2, 80286

We have been specialist manufacturers of computer cases (PC XT/Baby AT/AT) since 1985. And we offer highly competitive quality and service, our ADD-ON CARD, CPU BOARDS and 16 Bit DESK-TOP Computers all come with one year warranty.

Now we release our newest product: L.C.D. Portable 16-Bit Microcomputer CKD and SKD are available, and OEM orders most welcome.

Contact us today for details!!

SPECIFICATIONS:

Main Board: Standard size of 8088 and 8088-2; Small size of 80286
Storage Device: Two 5-1/4" 1/2" Height, or three 3-1/2" 1/2" Height.
Display: Using improved LCD (Liquid Crystal Display). 640x200 Dots, 80x25 Characters
Power Supply: 180 watts, 110/220V, auto-switchable
Keyboard: 84 Keys, XT/AT auto-switchable
Expansion Slot: 3 Slots (Two 5-1/4" drivers), 5 Slots (Two 3-1/2" drivers)
Dimensions: 400(W) x 240(H) x 207(D) mm
Weight: 9 Kgs for a complete system
Legal BIOS & MS-DOS 3.2 & GW Basic 3.2 Licensed

King Power

**KING POWER COMPUTER
ACCESSORIES CO., LTD.**

No. 52, Lane 308, Sec. 3, Hoping E. Rd.,
Taipei, Taiwan, R.O.C. FAX: 2-7339796

TLX: 20204 KINGPOWR

TEL: 02-7339555 (4 Lines)



THE ELEGANT DESIGN FOR BABY AT

MODEL: S-102 FOR AT & 386AT 536mm(W) x 415mm(D) x 155mm(H)



S-108

S-107

S-102

Security and Multifunction Keyboard Case

- High-impact plastic case, shielded against water vapor and dust.
- With key lock device, protected from unauthorized access.
- 3 disk holders for easy management.
- Attached book stand on the cover of case.



We also have a factory for manufacturing switching power supplier.

MODEL: 107

- DIMENSION: 490mm(W) x 415mm(D) x 155mm(H)
- CAPACITY: FDD x 2
HDD x 1 or 2 (OPTIONAL)
TAPE CASSETTE x 1
SLOTS x 8

- SWITCHING POWER SUPPLY: XT TYPE or AT TYPE
- MAIN BOARD: AT BABY TAPE or XT TURBO TYPE (OPTIONAL)

MODEL: 108

- DIMENSION: 410mm(W) x 415mm(D) x 155mm(H)
- CAPACITY: FDD x 1
HDD x 1
TAPE CASSETTE x 1
SLOTS x 8

- SWITCHING POWER SUPPLY: CUBE TYPE (150 or 180 Watt)
- MAIN BOARD: AT BABY TYPE or XT TURBO TYPE

Welcome write us directly for further detailed informations!



SUN'S ENTERPRISES CO., LTD.
HUA CHI ENTERPRISES CO., LTD.

No. 9, LANE 10, SEC. 3, SHUANG SHYR ROAD,
PANCHIAO, TAIPEI, TAIWAN, R.O.C. FAX: 886-2-2511438
TEL: (02) 2525995 TLX: 33263 SUNS

MFG & EXPORTOR

WE MUST BE MAD!

TO SELL DISKS AT PRICES THIS LOW
SUPERIOR QUALITY UNBRANDED DISKS

All our unbranded disks are the produce of to Manufac-
turers. They are not seconds! They are guaranteed for life
and certified error free.

	5 1/4	10's	25	50	100	250	500
DSDD 48TPI	7.00	12.50	23.00	44.00	100.00	195.00	
DSDD 96TPI	7.50	14.00	26.00	50.00	115.00	225.00	

Supplied with hub rings, sleeves, labels
and write protect tabs. 10's are supplied in
plastic library cases.

	3 1/2	10's	25	50	100	250
DSDD 135TPI	18.00	36.00	70.00	130.00	320.00	

Supplied with labels. 10's supplied in
plastic library cases.

OPUS BRANDED DISKS

Opus 5 1/4" DSDD 48TPI	£9.50 per box of 10
Opus 5 1/4" DSDD 96TPI	£12.40 per box of 10
Opus 5 1/4" HD (IBM AT)	£18.40 per box of 10
Opus 3 1/2" DSDD 135TPI	£20.30 per box of 10

PLASTIC LIBRARY CASES

Box to hold 10 x 5 1/4"	£1.70
Box to hold 50 x 5 1/4"	£10.00
Box to hold 10 x 3 1/2"	£2.40
Box to hold 90 x 3 1/2"	£11.00

All prices include VAT/P&P (UK only)
Government, educational and company orders welcome
Trade and Export enquiries welcome

RUNNYMEDE COMPUTER HARDWARE LTD
IMPERIAL COURT, STATION PARADE, VIRGINIA WATER,
SURREY GU25 4DH

TEL: 09904-2877 TLX: 846224/LASERV

DON'T FORGET 5% DISCOUNT FOR CHEQUE WITH ORDER!

BONDWELL MASTER DEALER OFFICIAL DEALERS * AMIGA * AMSTRAD * ATARI

COMPUTERS

Commodore AMIGA 2000 1Mb RAM and Colour Monitor	1395.00
Commodore AMIGA 1000 512Kb RAM and Colour Monitor	807.83
Commodore AMIGA 500 512Kb RAM + Integ disk drive	460.00
Commodore AMIGA 500 + 1081 Colour monitor	738.26
Amstrad PC1512 Series + on-site maintenance	from 449.00
Amstrad PC1512 DMM + DMP3000 + Wordstar 1512 + Supercalc 3	699.00
Amstrad PCW8256 Word Processor System	369.00
Atari 1040STF with 1 Mb drive, Mouse and Mono Monitor	539.00
Atari 1040STF with 1 Mb drive, Mouse and Colour monitor	765.00
Atari 520STFM with mouse, 0.5 Mb drive and TV op	309.00
Atari 520STFM with Hi Res Mono Monitor	385.00
Atari 520STM + SF354 + SM125 + Mouse + 1st Word	359.00
Atari 520STM (Mouse £21.70)	199.00
Bondwell 8 Lapheld 512k RAM 720k Drive Recharge Batt	649.00
Bondwell 18 Transportable 640k Ram dual 5.25" drives	649.00
Bondwell 38 Professional PC 4.77/8 Mhz	599.00
Bondwell 38 with 20 Mb Winchester	950.00
Psion Organiser CM Hand Held Diary/Clock/Alarm/Computer	7.00
Psion Organiser XP 16 Kb expandable to 128 Kb RAM	109.00
Psion Hardware/Software Add-ons	Phone

PRINTERS

Citizen 120D dot Matrix 120/25cps	164.35
Citizen 120D for Commodore 64/128	169.57
Commodore MPS1000 Dot Matrix 100/20cps	219.00
Okimate 20 Ribbon Transfer Colour Printer	159.00
SBC TP180-9 Dot Mat 180/36cps	199.00
Star NL10 (various interfaces) 120/25cps	216.52

MONITORS

Atari High Res Mono Monitor	119.00
Atari Med Res Colour Monitor	319.00
Commodore 1901 Col 14"	251.30
Philips 8833 (new) 14" col RGB/Comp Med Res	251.30
Philips BM7502 Green 12" Comp Video + sound	72.00

DISK DRIVES

Ataria 0.5 Mb Disk Drive	119.00
Atari 1 Mb Disk Drive	15.00
Atari 20 Mb had Disk	55.00
Cumana CSA354 1Mb Disk Drive for Atari ST	179.00
Cumana CDA358 x 1Mb Dual Drive for Atari ST	209.00
Scribecard 30Mb PC Disk Drive on a card	399.00

Please add 15% VAT to above prices
CARRIAGE £8, EXPRESS DELIVERY £12, Software & Small Items FREE.

Delta Pi Software Ltd



8 Ruswarp Lane, WHITBY, N. Yorks. YO2 1ND.
Tel: 0947 600065 (9am-7pm)

EXPORT AND OVERSEAS VISITORS

ALL MAKES OF MICRO
COMPUTERS, PRINTERS,
PERIPHERALS AND SOFTWARE
SUPPLIED AT DISCOUNT PRICES

AMSTRAD ● SINCLAIR
● COMMODORE ● ATARI
● ACORN ● PC COMPATIBLES
● STAR ● BROTHER ● NEC
AND ALL POPULAR MAKES

MICROGOLD

UNICOM HOUSE
182 ROYAL COLLEGE STREET,
LONDON NW1 9NN

FAX: (1) 2672062
TELEX: 295932 UNICOM G
TELEPHONE: 01-482 1711



THE PEGASUS SPECIALISTS SINGLE & MULTI-USER

MAIL ORDER — From £145 + VAT per Module

HELPLINE — Telephone Support

TRAINING COURSES — Nationwide

SYSTEM SET-UP & INSTALLATION

ESTABLISHMENT OF NOMINAL CODES

SUPPORTING SPREADSHEETS

SPECIAL PROGRAMS DESIGNED & WRITTEN

ACCOUNTING SYSTEMS CONSULTANCY

Special services for Silicon Office, Delta, Supercalc,
Multiplan, Visicalc, Lotus 1-2-3, Wordcraft.

APPROVED PEGASUS XENIX & DEVELOPMENT CENTRE

WE PROVIDE END USER & DEALER SUPPORT.

For Further Details call Rugby (0788) 73855
or write:—

PEG ASSOCIATES, FREEPOST, VICTORIA HOUSE,
50 ALBERT STREET, RUGBY CV21 2BR



SINCLAIR PRODUCTS AND CAMBRIDGE COMPUTERS



Spectrum 128k Plus Two computer: without joystick and software pack £148 (£150) £180, with joystick and software pack £158 (£162) £194. Blank micro-drive cartridges for the QL and the spectrum £2.50 (£3) £4. QL floppy disc interface (see Cumana disc drive section for suitable drives) £86 (£84) £94. Spectrum floppy disc interface (see Cumana section for suitable disc drives) £76 (£76) £86. Spectrum centronics printer interface and cable £46 (£42) £47. Cambridge computers 288 £297 (£271) £299 (Sinclair are about to raise the price, so please check before ordering). Mains adaptor £15 (£17) £22. 128k ram cartridge £65 (£57) £62.

ATARI COMPUTERS



All ST computers come with a mouse and software. Atari 1040STF without monitor £542 (£529) £569. Atari 1040STF with b/w monitor £637 (£638) £728. New Atari 520STFM with built in disk drive (512k RAM) £363 (£360) £400. Atari 520STFM + (1000k ram) £452 (£445) £485. Atari 520STFM with b/w monitor £458 (£470) £560. Cumana 1000k disc drives for the 520STFM: single £136 (£136) £152, dual £242 (£236) £260. Atari 500k ST disc drives £119 (£129) £135. Atari ST monochrome monitor £137 (£147) £195. Atari 12" medium resolution ST colour monitor £368 (£362) £413. Centronics printer cable for the ST range £16 (£16) £20. We offer good discounts on most ST software for example: Hisoft DEVPAK £43 (£41) £45. Metacombo Lattice C £84 (£75) £79. Computer Concepts Fast Basic £84 (£75) £79. LDW asic ST, new basic compiler £63 (£58) £62.

Pson Chess £22 (£22) £26. Sublogic flight Simulator 2 £43 (£41) £45. Starglider £22 (£22) £26. Atari 130 XE Computer + Game £95 (£99) £120. Atari 130XE + disc drive + 1029 printer + software £313 (£315) £373. Atari cassette recorder £34 (£38) £48. Atari 1020 4 colour printer £93 (£94) £114. Atari 1029

dot matrix printer £118 (£124) £151. Atari 1050 disk drive with DOS 3 £118 (£124) £151.

AMSTRAD PRODUCTS

We can supply a wide range of software for the 1512, the PCW8256 and the PCW8512 — write for a quote. New Amstrad 1512 IBM Personal Computer Clones: 1512 computer with single disc drive and b/w monitor £499 (£499) £606, dual disc b/w £619 (£614) £621, single colour £669 (£655) £762, dual colour £771 (£745) £852, 20Mb hard disk b/w £1102 (£1138) £1178. Special summer package offer: if ordered with monochrome dual 1512 or colour 20Mb HD 1512 or monochrome 20Mb HD 1512 we will supply a DMP3000 printer + supercalc 3 + wordstar 1512 for £134 (£140) £173. DMP3000 printer £190 (£193) £226. FD3 £166 (£173) £204. HD10 £467 (£430) £490. HD20 £575 (£540) £600. Amstrad CPC464 computers: colour £291 (£320) £404, green £197 (£235) £316. Amstrad 6128: colour £391 (£420) £500, green £291 (£320) £404. Amstrad PCW8256 £440 (£464) £571. Amstrad PCW8512 £554 (£577) £684. Amstrad DMP2000 printer £166 (£171) £204. Extra disk drive for Amstrad 6128 £99 (£105) £136. Amstrad DD1 Disc Drive £155 (£156) £186. Amstrad joystick £11 (£12) £16.

COMMODORE COMPUTERS

Commodore Amiga A500 Computer £533 (£524) £574. Modulator £25 (£25) £35. Amiga A500 with 1080 colour monitor £848 (£839) £946. Commodore 128 computer + software + joystick £223 (£223) £265. Commodore 128D £518 (£499) £539. 1571 disc drive £276 (£269) £285. Commodore 64c computer £185 (£185) £210. Commodore 64c computer with mouse, cassette-recorder and software £239 (£242) £272. Converter to allow the use of most ordinary mono cassette recorders with the Commodore 128 and Commodore 64 £9.78 (£9) £11. Commodore MPS1000 printer £269 (£262) £296. 1541C disk drive £194 (£192) £208.

PRINTERS

Epson LX86 without tractor £276 (£275) £309, with tractor for £300 (£298) £342. Star NL10 £235 (£234) £270. Interfaces for NL10 £37 (£35) £37. Brother M1109 £220 (£224) £265. Shinwa C11 CPA80 + £208 (£210) £247. Cannon PW1080A £303 (£298) £338. Microperipherals MP165 £219 (£223) £265. CUMANA 3.5" AND 5.25" CASSED DISK DRIVES WITH CABLE AND POWER SUPPLY. 40/80 track switchable double sided to suit floppy disc interfaces of the Sinclair QL, Sinclair Spectrum and BBC B 3.5" drives: single £134 (£134) £156, dual £224 (£219) £251. 5.25" drives: single £172 (£169) £199, dual £310 (£306) £347.

SWANLEY ELECTRONICS

The Computer Export Specialists.

Dept PCW, 32 Goldsel Rd., Swanley, Kent BR8 8EZ, England

Tel: SWANLEY (0322) 64851. We give an additional discount of 2% to UK personal callers who pay cash. Official orders welcome. UK prices are shown first and include post and VAT. The second price in brackets is for export customers in Europe and includes insured airmail postage. The third price is for export customers outside Europe (Including Australia etc) and includes insured airmail postage.

STOP!

WE'VE GOT THE PRICES YOU NEED!

WHY PAY MORE?

CLIPPER	352	RRP 595
DATAEASE	385	RRP 545
DBASE II	265	RRP 395
DBASE III PLUS	339	RRP 595
DELTA 4. PRO	365	RRP 545
FRAMEWORK II	325	RRP 550
FREELANCE PLUS	249	RRP 395
GENIFFER 3	219	RRP 295
JAVELIN	166	RRP 245
LOTUS 1-2-3 2.01	235	RRP 395
LOTUS MANUSCRIPT	249	RRP 395
MS MOUSE	125	RRP 175
MS WORD 3.1	239	RRP 425
MULTIMATE	194	RRP 395
MULTIMATE ADV	259	RRP 495
PARADOX	325	RRP 550
QUICKSILVER	299	RRP 460
RAPID FILE	200	RRP 275
SAMNA IV	371	RRP 550
SMART 3.1	365	RRP 695
SUPERCALC 4	199	RRP 396
SUPERPROJECT PLUS	255	RRP 495
SYMPHONY 1.2	335	RRP 550
TURBO BASIC	55	RRP 70
WORD PERFECT 4.2	249	RRP 425
WORDCRAFT 3	309	RRP 475
WORDSTAR 2000 PLUS	275	RRP 549
WORDSTAR 2000 2.0	224	RRP 465
WORDSTAR PRO 4.0	193	RRP 399
XCHANGE	235	RRP 495

- This is a small selection — call for details!
- Fast delivery!
- Friendly professional service!
- Credit accounts available!
- Government/export orders welcomed!

0480 · 53044/413122

Elite Computer Systems

UNIT 2 · HALCYON COURT · ST MARGARET'S WAY
HUNTINGDON · CAMBS PE18 6DG

Prices shown are for IBM/compatibles. All prices subject to carriage and VAT and are correct at time of going to press

PSION PC FOUR

WORD PROCESSING

PC-QUILL

- Easy on-screen editing: fast search and replace. Display reflects print-out with complete range of type emphasis.
- Full text and page formatting facilities. Automatic page numbering. Headers and footers.
- Disk-based files permit massive documents.
- Mail merge — from file keyboard.
- Plus many, many more invaluable features.

DATABASE

PC-ARCHIVE

- Up to 64k records per file, 255 fields per record, 255 characters per field. Any number of files up to the system capacity can be used at a time.
- Direct commands or powerful structured database language.
- Fast access. Fields redefinable at any time. Flexible file ordering, using up to four different fields.
- Format designer for screen and printed page.

SPREADSHEET

PC-ABACUS

- 999 rows, 255 columns, with efficient memory usage.
- Columns, rows and cells identified by textual content.
- Full format control.
- Split windows for examining different areas.
- Full range of functions and conversions with string handling and condition-testing facilities.

GRAPHICS

PC-EASEL

- Interactive entry and design. Choice of high resolution 3D bars, line graphs, pi-charts.
- Built in or user definable text and design elements.
- Vertical and horizontal annotation. Automatic insertion of keys and labels, and scaling of axes.
- Operates under MS-DOS or GEM and supports IBM colour graphics adaptor and Hercules graphics card.

INTEGRATED SOFTWARE

FOR THE AMSTRAD 1512 & PC COMPATIBLES

ALL FOR **£69.00** + VAT



TRANSFORM LTD.



24 West Oak, Beckenham, Kent BR3 2EZ 01-658 6350

NORTHWEST COMPUTER SUPPLIES (PCC LTD)

82 School Lane, Didsbury, MANCHESTER M20 0RY
Tel: 061-434 9747 MicroLink 72: MAG003



BORLAND/TURBO PASCAL

Turbo Pascal V3 with 8087 & BCO	49	Sidekick Unprotected	49
Turbo Database Toolbox (Isam etc)	37	Travelling Sidekick	49
Turbo Tutor NEW V2	23	Sidekick and Travelling Sidekick	67
Special — Turbo Pascal/Toolbox/Tutor	105	Turbo Lighting (Spell + Thesaurus)	49
Special — Turbo Pascal/Tutor/Edt/Graph/Grp	190	Lightning Word Wizard	37
Graphics Toolbox (IBM compats only)	37	Turbo REFLEX: the analyst database	79
Turbo Editor Toolbox	37	Turbo Reflex WORKSHOP	49
Turbo GameWorks (inc CHESS prog)	37	Prolog	49
Holiday Special (Editor/Workbooks)	69	Prolog — Toolbox	49
Turbo 'C' (check avail)	85	Eureka — Numerical Maths	49
Turbo Basic (check avail)	49	Superkey	49

IBM or Apple Mac versions only

MODEMS/COMMS SOFTWARE/MICROLINK

MODEMS (AUTO ANS/DIAL)		COMMS SOFTWARE	
Pace Linnet (V21/V23 Buff)	119	Datatalc 3.27 (Prestel Graph/Kermit)	119
Pace Series 4 (V21/V23)	235	Crosstalk 3.6 (inc Kermit)	99
Pace Series 4 (V21/V22/V23)	379	Mirror (Similar to Crosstalk)	Call
Pace Series 4 (V21/V22/V23/V22Bis)	469	DIALUP Comms (with EPAD and Prestel)	89
WS4000 V21/V23 (V21/V23 Buff)	149		
Steebek Quattro (all speeds + ARQ)	695		
Migent — portable	Call		

SELECTED SOFTWARE PC/MS DOS

RBASE System V (new super version)	465	Norton Utilities/Commander	67/39
Obase III Plus	295/399	ADVANCED Norton Utilities	99
Flying Start	55	VP-Planner/VP Info	69/69
Q&A (512k vers)	245	Sideways/Ready	42/54
PC Promise (IBM version)	145	GW-Basic (with Hi-Res & Col Graphics)	95
Prodsign II	225	Wordstar (new vers 4) Professional	289
Persoft Smartterm Emulators VT220/VT240		Jot	42
Tek 4014	125/185/139	Hitchhikers Guide to the Galaxy	23
IOS 3.1 (most compats/Dos 3.2)	57/72	ZORK 1, 2 or 3 (Adventure)	each 19
GEM Draw or Desktop/Write/Paint	105	Infocom games — either 19 or 23	
Microsoft Windows	79	BBC Basic for IBM Compats (SUPERB)	95
Microsoft Quick GW-Basic compiler	79	XEROX Ventura Publisher (IBM vers)	795
Lattice 'C' Compiler	245	Able One/Ability	85/90
		Other Software prices	Call

MEMORY/MICE/CO-PROCESSORS

MEMORY UPGRADES (IBM's etc)		8087's 5Mhz/8Mhz/10Mhz	130/180/295
64k DRAMS (256k)	40	Microsoft Mouse (Serial or Bus)	149
256k DRAMS (512k)	59	Mouse Systems Mouse	145

UNIX/XENIX for AT's

MicroPort System V v 2.2		Informix SQL for Microport	795
Operating System (2 users)	166	Informix C/SQL Development	595
Software Development	132	Informix 4GL version	1200
Text Processing	132	Santa Cruz Xenix (Multi User)	595
All of the above	365	Text Processing	195
Multi User Licence	160	(all of above)	1295
Merge OS/2DOS as a UNIX job	132		

Send for UNIX/XENIX lists
Free Postage & Packing (UK only). Manufacturer's Guarantees
All prices plus VAT at 15% (except EXPORT) Payment with all orders — Please

COMPUTER EQUIPMENT

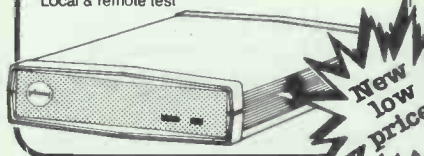
Lowest cost brand new bargains

PLESSEY Model T24 V22/V22 bis MODEM.

Compact automatic modem featuring the latest technology & the highest possible data rate over the ordinary phone system. Offers:

- *Both V22 & V22 bis compatibility
- *1200/2400 Baud operation with auto bit rate recognition
- *Operates on both ordinary phone line (PSTN) or private circuit (PC)
- *Auto call & auto answer (V25 compatible)
- *British Telecom approved
- *Duplex operation allowing simultaneous transmission & reception of data at 2400 Baud in both directions over a single phone line
- *Compact size: 9" x 9" x 2 1/2"
- *Local & remote test

£350.00



New low prices

HITACHI Model 305S/SX 3" disc drives. With SHUGART compatible interface (34 way edge connector) & suitable for BBC with DFS, AMSTRAD 664/6128, TATUNG EINSTEIN & many others. Will usually replace 5 1/4" drives directly. 250k (double density unformatted) per side reversible; 40 track; standard power connector for 12V & 5V; overall power consumption typically 3.7W. Supplied **BRAND NEW** with connector pin-out details etc. but uncased without PSU. Data cables are available for AMSTRAD & BBC (£7.50) and an Installation pack including data & power cables with instructions is available for the **TATUNG EINSTEIN** (£12.00)

£24.95



ITT SCRIBE III WORD PROCESSING

SYSTEM. Professional system originally selling at around £6000 without printer. Now offered with software included & a variety of different options available. This system is available from us **ALL BRAND NEW** at the cost of current budget systems, but with office-quality performance & features.

SOFTWARE INCLUDED:

- *DATABASE — allows information storage & retrieval by user-selectable criteria
- *EDITING — including easy reformatting, global search & replace, save & move, cursor control etc.
- *AUTOMATIC LETTERWRITING — with merge, glossary file for much used phrases etc.
- *MATHS FUNCTIONS — screen maths allows addition of rows, columns & complete tables
- *PROGRAMMABLE COMMANDS — allows format changes, accessing record block files, prompts etc.
- *HELP FILES — quicker to use than the comprehensive manual supplied
- *BASIC COMPILER

HARDWARE INCLUDED:

- *SCREEN/WORKSTATION — dual processor (16 bit TI 9995 & Z80H) with 128k memory, 12" green screen 25 x 80 character display with slow scrolling, QUME printer interface
- *KEYBOARD — low-profile keyboard additionally has 43 clearly marked dedicated function keys
- *DISC DRIVES — dual SHUGART 5 1/4" DSDD drives each 430k capacity formatted

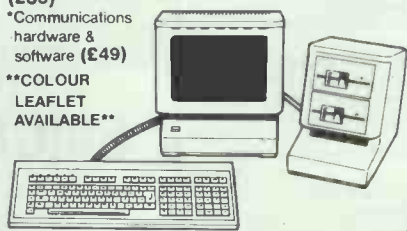
£290.00

OPTIONS:

- *10mbyte MiniScribe WINCHESTER disc drive (£149)
- *NEC Model 7700 55cps daisy wheel printer (£390)
- *128k additional memory with spelling check software (£35)

- *Communications hardware & software (£49)

- **COLOUR LEAFLET AVAILABLE**



TOSHIBA Model T300 system (semi-compatible with IBM PC).

With 6mHz 8086 processor, 192KB RAM (easily upgraded to 256KB), single half-height 5 1/4" floppy disc drive (640KB), high resolution green display, serial & parallel interfaces. Included are MS-DOS Ver. 2, MICROSOFT T-BASIC, good manuals & comprehensive diagnostic disc. Available options include a colour monitor and memory extension.

BRAND NEW. £249.00

AS ABOVE, but with dual floppy disc drives. **£295.00**

TOSHIBA Model T100 CP/M system. With 64KB RAM, dual 500k (unformatted) 5 1/4" floppy disc drives, serial & parallel interfaces & MICROSOFT BASIC in ROM. **BRAND NEW. £149.00**

VICTOR SpeedPac 286 IBM PC

ACCELERATOR. Half-wide 80286 accelerator card for IBM PC or PCXT, VICTOR VPC, and compatibles. Features 8KB cache memory & 7.2mHz 80286 processor. Offers AT/Personal System 2 performance for a fraction of the cost. Runs up to 7.5 times faster.

£199.00

CANON Model A-1300 twin 5 1/4" disc drives.

Cased **BRAND NEW** half height drives, DSDD, 80 track, 640KB per drive, SHUGART compatible interface. Without PSU per pair. **£99.50**

FUJITSU Model M2230AS 5 1/4"

WINCHESTER disc drives. 6.66 MB capacity (unformatted), 16/32 sectors, 320 cylinders, with ST506 interface. **BRAND NEW. £75.00**

*VAT & CARRIAGE must be added to all items. Carriage is £3.00 + VAT for 3" disc drives; otherwise, please enquire.

*All equipment offered here has been bought by us as new surplus from manufacturers & OEMs; often in large quantities. Items offered are full-specification equipment, but may not be the current model. We aim to offer the best value available anywhere, and all items in this advertisement are guaranteed for 6 months.

MATMOS Ltd., 1 Church Street, Cuckfield, W. Sussex RH17 5JZ. (0444) 414484/454377
COMPUTER APPRECIATION, 111 Northgate, Canterbury, Kent CT1 1BH. (0227) 470512 TELEX 966134 COMPAP

matmos & COMPUTER APPRECIATION

SHAREWARE

★★★ A MARKETING REVOLUTION ★★★

Quality professional software for the Amstrad PC1512 and other compatibles.
Price covers medium, VAT & postage. Documentation on disk where appropriate.

"SINGLE DISCS AS SHOWN. ANY 5 for £25; 10 for £39; 20 for £65"

DATABASES

- 5 - PC-File £7.99
17 - Easyfile/Envelope Printer/Spellchecker £5.75
13 - Filexpress £5.75
14 - Genealogy £7.99
700 - U-MIND £6.99
701 - WAMPUM £5.75
702 - WAMPUM documentation £5.75
- Superior database management
2 disk system. Graphical representation on screen and printer
Generates (GWBASIC) programs. Other utilities on disk include
a disk editor and sector formatter.
dBase III clone. Menu driven.
You'll need this.

EDUCATIONAL

- 807 - Educate I £8.99 ("B")
1026 - Teacher's Grades £7.99
- This software is supported by registration by Freeway within the UK. (COUNTS AS 3 DISKS)
Personal Finances organised.
Handles Stock/Invoicing/Debtors.

FINANCE

- 1A - FREEWAY UK Sales/Purchase Ledgers d/w Invoicing and
- FREEWAY UK Payroll £15
21 - Time & Money £7.99
22 - CashTrac £7.99
26 - Retail Point of Sale £7.99

GAMES Please note that you need a Colour Graphics Card (Amstrads OK.)

- 800 - PC-Chess £7.99
801 - Games I £8.99
802 - Pinball Games £8.99
803 - Bushido £6.99
804 - Games II £7.99 ("B")
805 - Colossal Adventure £7.99
806 - Fun Music Programs £6.99
807 - Games III (Strategy) £8.99
- Graphical simulation.
incl. Frogger, Diggle, Paratroop, Willy, Rogue, Sopwith, Superb Value.
These are the best. 3 machines emulated brilliantly!
Very fast so a special program is supplied to slow 8 mhz. computers down!
As good as most martial arts games!
Golf, American Football, Archery, Blackjack & lots more.
Incredibly long text adventure with very good parser capability.
A jukebox of medleys!
Backgammon/Strategic US Battle Game (Maps etc.)/Big Rig (strategy game based on trucking).

LANGUAGES

- 406 - CHASM £7.99
408 - Forth £7.99
409 - Small "C" / Newsweep £7.99
410 - Xisp £7.99
7 - Prolog £7.99
503 - Pascal Compilers £7.99
501 - Mini Ada £7.99
25 - Macro Assembler £7.99
502 - P-Basic/PC-Prof. £8.99
- 2 disk set contains CHASM Assembler with documentation and novices primer on disk.
C/w documentation and editor.
One a subset of Turbo, everything but disk I/O/one is Tiny Pascal/one is Visible Pascal - built in editor/debugger.
Needs Turbo Pascal (from us less 15% discount!)
Not only a Basic/GWBasic clone but it includes a super hands-on training course.

"ALL SAGE Software less 15% plus £2 postage"

Please send cheque/postal order or Access/Visa to:-

Shareware Marketing, Dept. PCW, 87 High Street, Tonbridge, Kent

0732 358125

UTILITIES & Useful Programs

- 9 - PC-Deskmate £6.95
11 - Critical Path Management £7.99
400 - Z80 Emulators £5.75
403 - Screen Creation £5.75
414 - Functon Key Editor £5.75
413 - Undelete/Sector editor £5.75
415 - Utilities £6.99
416 - Mailing List £5.75
10 - PROCOMM £7.99
418 - Esti-Bid £25
417 - Opus £15
31 - QwertyWP £7.99
- My personal favourite resident utility. I prefer it to Sidekick as it doesn't foul up other programs so much!
Produces Gantt charts. Handles over 1000 tasks. With CPM.
2 programs. One is Z80mu for 8086/8088 machines and the other is for NEC V20/30 machines. Run CP/M software.
Set up entry screens for use with Basic and other programs.
This saves all the hassle of worrying about field names and screen editing. Handles data entry. Brilliant!
Undelete simply undeletes deleted files! "Also run 2 programs at once"
Many useful utilities includes super disk doctor program.
Clipboard compiled dBase mailing list program. Rather large. Set up with USA address fields. Does not need dBase to run.
Version 2.6 of this famous Comms program.
5 disk estimating and job costing package. (counts as 5 disks).
3 disk bulletin board system (Counts as 3).
This is possibly the best program ever for novices. Includes a comprehensive hands-on training course.

GRAPHICS

- 900 - Dancad 3D £7.99
901 - Draftsman £7.99
- Drawing, wire frame, graphing & animation. Needs 640K. Memory upgrade available for Amstrads from us at £25 + VAT.
Easy fitting.
Produces pie, exploded pie, stacked bar, line & scatter charts directly or imported.

WORDPROCESSORS & WP UTILITIES

- 3 - PC-Write £7.99
6 - PC-Outline £7.99
8 - Galaxy £7.99
15 - Chiwriter £5.75
16 - PC-Style £5.75
17 - PC-Spell £5.75
18 - Fogfin, Tally etc £5.75
30 - Print Enhance £7.99
- Version 2.6 of this superb program. Maths/foreign chrs. Edit two documents. Brilliant help screens. Memory residency. 300 printers (incl. Laser), etc. Simple graphics. This is the version prior to that marketed by SageSoft for £99 + VAT.
Famous memory resident outline processor a la Brainstorm.
Superb Wordstar - like wordprocessor. Pull down menus. Very fast.
Fascinating and easy to use wordprocessor that has 11 different fonts both on screen and on printer. These include Greek, Maths, Helvetic, joined together etc. If you don't have NLQ then no problem as this will probably make your printer do it!
Analyse your writing style.
Spell-checker (ASCII files only - ie. PC-Write).
Various utilities for analysing your text incl. word, line sentence counter. Indexer.
Enables ordinary dot matrix printers to print in high quality.

SPREADSHEETS & UTILITIES

- 4 - PC-Calc £7.99
19 - Freecalc £7.99
20 - Statistical Analysis £7.99
401 - Sideways Print £5.75
600 - Turbo-Calc £7.99
601 - AS-EASY-AS £7.99
- Lotus feel-a-like
Includes Multiple Correlation
Includes Multiple Correlation.
Menu driven. OK for Lotus files.
20,000 cells, bar graphs (poor). Also features Galaxy style text-editor!
Amazing Lotus feel-alike spreadsheet with numerous facilities including decent graphics, macros, text import, reports.

All items marked "B" require P-Basic or GW-Basic (see under Languages).

BUFFERED SMART SWITCHES

- BOTH PRINTERS PRINTING DIFFERENT DOCUMENTS SIMULTANEOUSLY
- SOFTWARE CONTROL • OVERRIDE SWITCH • RESET & MULTIPLE COPY FUNCTION • EXPANDABLE • SIMULTANEOUS DATA INPUT • AUTO SELECT

ACS - AUTO COMPUTER SELECT • SI - SIMULTANEOUS INPUT • C - COPY • SPS - SOFTWARE PRINTER SELECT

CENTRONICS

- PB-DP (64K) • 1 Centronics input and 2 output soft select with 64K buffer expandable to 256K. • C/SPS £249
PB-4-2 (256K) • 4 Centronics input and 2 output with 256K buffer. ACS/C/SPS £345
PB-6-2 (256K) • 6 Centronics input and 2 output with 256K buffer. ACS/SI £495
PB-7-1 (256K) • 7 Centronics input and 1 output with 256K buffer. ACS/SI £445

SERIAL

- SB-4-2 (256K) • 4 Serial input and 2 serial output with 16K buffer at each input & a total of 256K memory. ACS/SI/C/SPS £415
SB-7-1 (256K) • 7 Serial input and 1 serial output with buffer at each input and a total of 256K memory expandable to 1MB. ACS/SI £595

UNIVERSAL BUFFER

- SERIAL & PARALLEL INPUT AND OUTPUT • X ON AND X OFF SOFT AND DTR HARD HANDSHAKE • CENTRONICS • 2 FRONT PANEL T SWITCH INPUT AND OUTPUT • COPY • RESET • EXPANDABLE TO 256K • UB (64K) £220

SMART AUTOMATIC SWITCHES

- AUTO COMPUTER SELECT • SERVICE • REQUEST LED INDICATION • MANUAL OVERRIDE SWITCH • UNSERVICED COMPUTER RECEIVES BUSY

CENTRONICS

- MP-401 • 4 Centronics input and 1 Centronics output £150
MP-801 • 8 Centronics input and 1 Centronics output £200

SERIAL

- MS-401 • 4 Serial input and 1 serial output £180
MS-801 • 8 Serial input and 1 serial output £230

INTELLIGENT PRINTER BUFFERS

- SELF-TEST FUNCTION • BUFFER/PRINTER READY INDICATOR • BUFFER RAM STATUS INDICATOR • RESET AND MULTIPLE COPY FUNCTION • BUFFER BYPASS SWITCH

- PB (64) • 1 Centronics input and 1 Centronics output with 64K buffer £140
PB-2 (64) • Above with 2 way manual switch to connect 2 micros to 1 printer or vice versa £185

- PB (256) • 1 Centronics input and 1 Centronics output £190
PB-2 (256) • Above with 2 way manual switch to connect 2 micros to 1 printer or vice versa £235

ACCESSORIES

- KSM 101 • Serial RS232 to parallel converter with PSU £65
KSM 104 • Parallel to serial RS232 converter with PSU £70
KSM 110 • Multi-link serial RS232 switch selectable cable £24

CUSTOM CABLE-MAKING SERVICE AVAILABLE

CABLES (6ft long)

- KPC 104R • Ribbon Cable 36pin-36pin £12.00
KPC 104 F6 • Flex Cable 36pin-36pin £16.00
KPC 105-6 • Flex IBM Parallel printer cable £15.00
KPC-105-10 • Flex IBM Parallel printer cable £17.00
KPC-106 • Flex (25 lines) 25pin-25pin £14.00
KSC-101 • Flex (10 lines) 25pin-25pin £12.00

Add postage: Switches & Buffer £4.00 each, & cable £0.75 each + 15% VAT

KEYZONE COMPUTER PRODUCTS LTD

U14, Acton Business Centre,
School Road, London NW10 6TD
Telephone 01-965 1684/1804 Telex 8813271 GECOMS G



4 WAY AUTO PRINTER SHARER FOR ONLY £99



SPEC: MP401 4 way Auto-switch with 25 wayD type parallel I/O suitable for IBM & Compatible machines.

OTHER PRODUCTS AVAILABLE:

MECHANICAL

- | | | | |
|------------------|--------|------------------|--------|
| 2 WAY 25D TYPE | 39.95 | 2 WAY CENTRONICS | £49.95 |
| 3 WAY 25D TYPE | £46.95 | 3 WAY CENTRONICS | £67.95 |
| 4 WAY 25D TYPE | £55.00 | 4 WAY CENTRONICS | £77.95 |
| 2 WAY X OVER 25D | £55.79 | 2 WAY X OVER 36C | £81.95 |

AUTO-SWITCH

- | | | | |
|-------------|---------|----------------|---------|
| MP401 4 WAY | £99 | PB64 64K RAM | £122.95 |
| MP801 8 WAY | £153.95 | PB256 256K RAM | £195.00 |

BUFFERS

LINE CONVERTERS

- | | | | |
|--------------------|--------|--------------------|--------|
| SERIAL TO PARALLEL | £69.00 | PARALLEL TO SERIAL | £69.00 |
|--------------------|--------|--------------------|--------|

TO ORDER PLEASE SEND CHEQUES BUT ADD VAT & £3 P&P
DEALER AND EXPORT ENQUIRIES WELCOME

BRIGDEN TECHNOLOGY

0322 331984

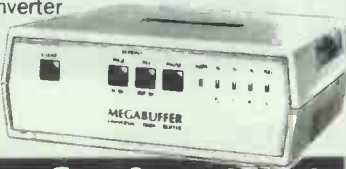
UNIT24 ERITH BUSINESS CENTRE
ERITH HIGH ST, ERITH, KENT DA8 1QY

How to make sure your Printer doesn't slow your PC down.

Without a Megabuffer your Printer can slow-down the rate your PC outputs to the rate your Printer prints. Turning a 5 minute print file into half-an-hour. Which means that the PC can be out of action for long periods. Merely outputting. With a Megabuffer the PC outputs at its top speed into the Megabuffer memory, the PC is then released for further work, and the Printer prints at its own rate from the Megabuffer memory.

- Allows you to use your PC more
- Can emulate special plotter handshake protocols
- Compatible with most computers, printers and plotters: IBM & compatibles, AMSTRAD, HP, ACT, SHARP, EPSON, CALCOMP and many more
- Can cut PC output time to one sixth or less.
- Software-independent
- Data Buffer and interface converter
- Pause, 'reprint page' and multiple copy facilities

Full range of memory sizes for every application: 64K **£160**, 128K **£216**, 256K **£278**, 512K **£388**, 1MB **£586**.



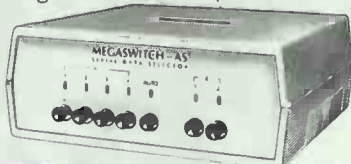
See us on stand 66J at the PC user show

Flexible Interfacing that keeps them all talking

Eliminate miles of spaghetti and all those 'T' and 'X' switches with a simple Megaswitch which allows your PC to instantly connect to a selection of printers and plotters.

MEGASWITCH AS — Serial Data Selector

- Single unit multiplexer and demultiplexer
- 2K data buffer
- RS-232 and RS-422 versions
- Can operate as RS-232/RS-422 converter
- Diagnostic output
- Megabuffer compatible
- Multiplexer — Ideal for printer sharing. 4 inputs and 2 outputs. Can automatically select any channel supplying data
- Demultiplexer — Ideal for driving several different printers from a PC. 2 inputs and 4 outputs
- Software and manual selection. Downloadable code translation tables.
- Hardware and XON/XOFF handshakes (RS-232) **£189**



INPUT UP TO **5 PCs**



MEGASWITCH S — RS232 Serial Selector

- Connects any of 5 inputs to either of 2 outputs
- Universally compatible — works with all baud rates and handshake arrangements
- LED indication of data flow
- Use it with a Megabuffer for additional time saving **£99**

OUTPUT UP TO **2 PRINTERS PLOTTERS**

RINGDALE PERIPHERALS

11 Decoy Road, Worthing, West Sussex BN14 8ND
Telephone (0903) 213131
Telex 265871 REF: JBC2021

UK delivery £3/UNIT, cables from £15. VAT extra Dealer and Export Enquiries welcome

NETWORKS ARE A NIGHTMARE

Networking Is complicated, expensive and difficult to understand and implement!

This has been the traditional view but now there's EASYNET, the reliable and inexpensive network that keeps computers in touch. EASYNET is different from other, more expensive systems because it works by enhancing the operating system of the PC's you're already using - C/PM, MS DOS or PC DOS. There's no central file server or expensive cable. Installation is as simple as plugging in a phone. With EASYNET, the people in your office can share modems, printers, hard disks and other resources to get the information they need quickly and efficiently.

**EASYNET for
£350.00
per station.**

Supports C/PM, PC DOS, MS DOS

Shared Resources (Printers, Disk Drives, Modems)

NO Dedicated File or Printer Servers

Flexible print Queue and Spooling

High Speed Communications (1.5Mb.p.s.)

Efficient Bus Topology and Low Cost Twisted Pair Cable

Up to 200 Stations Per Network

User, Group and Global security access

Interstation Messaging

Very easy to Install and Use

EASYNET STARTER KITS ARE £695 (+VAT)

This includes:
Software, 2 x Plug in Cards, Cabling kit & Documentation

EASYNET

The Low Cost, High performance LAN Solution

Send for further information to:

LOGOTRON

Dales Brewery, Gwydir Street, Cambridge CB1 2LJ. (0223) 323656

PC/AT COMPATIBLES

BREAKING THE PRICE BARRIER!!!!!!
MANUFACTURED IN THE UNITED KINGDOM
USING HIGHEST QUALITY JAPANESE PRODUCTS

PC/XT £380
PC/XT, 20MB,
MONITOR TTL £780

★ 8088/V20 ★ 640k
★ "NEC" FLOPPY DRIVE ★ "SERIAL/PARALLEL" PRINTER PORT
★ HERCULES GRAPHICS DISPLAY ADAPTOR ★ KEYBOARD NUMS +
CAPS LOCK ★ 8 SLOTS ★ FLAT SCREEN MONITOR



AT/TURBO £949
WITH 20MB
MONITOR £1280

★ DYNAMIC SPEED CONTROL ★
★ 80286 6/8/12 MHZ ★ 512K RAM EXPANDABLE TO 1M
★ LEGAL BIOS ★ FLOPPY DRIVE 1.2M
★ PRINTER PORT ★ GRAPHICS DISPLAY ADAPTOR ★ AT STYLE KEYBOARD
WITH SEPARATE CURSOR PAD

★ NEW 386 TURBO £2900 ★

MONITOR, 20MB HARD DISK, 640K RAM, 1.2MB FLOPPY KEYBOARD, DOS 3.2

ALL SYSTEMS ARE TOTALLY COMPATIBLE

HIGHEST TTL MONITOR £69 20MB HARD DISK £299

BILINGUAL SYSTEMS EXPORT ORDERS WELCOME

12 MONTHS WARRANTY AND SUPPORT INCLUDED PRICES EXCLUDING VAT
FOR ORDERS AND ENQUIRIES PLEASE CONTACT



C.A.S. COMPUTER POINT LTD
51A DARTMOUTH ROAD, LONDON SE2W
TEL: 01-708 3775/01708 2734
TLX: 8952387 ANSWER G

ADMICRA

 An **AAAA** Company

AMSTRAD
Tandon
ATARI

 Roland **GG**
AUTOCAD

 AUTHORISED
DEALER

**MANNESMANN
TALLY**
TAXAN
AMSTRAD
PC1512 from £449 inc. FREE 640K Upgrade
Opus. PCII
from £499
Tandon PCX & PCA SUPPLIED WITH 12 MONTHS FREE ON-SITE MAINTENANCE
BASIC AUTOCAD SYSTEM

Opus System 4 (20Mb, 1MB RAM) 720 x 348 resolution mono parallel & serial ports. Basic Autocad, Summouse, Hitachi A3 plotter

£1799
ADVANCED AUTOCAD SYSTEM

Tandon PCA20 (20MB, 1MB RAM) 720 x 348 resolution on 14" screen, 1 parallel & 2 serial ports Autocad plus ADE 2 & 3. Cherry A3 digitiser, Roland DPX2000 A2 plotter and stand

£6599

 We can tailor Autocad systems to your requirements due to our extremely wide range of support peripherals (see below) **Installation and training.** Please call for details.

VIKING ULTRA HIGH REVOLUTION 19" DISPLAY. Ideal for Desk Top Publishing & CAD PLEASE CALL
ALLOY MULTI-USER Turn your XT/AT into a Novell compatible multi-user system from **£1199 per station**
ATARI 1040 ST Mono
£559
Multitech 910 Small footprint 80286, 10MHz 20Mb Monographics 1P & 25 — Superb value **£1395**
HARD DISK & MEMORY UPGRADES

IBM & Compatibles 20MB	£359
IBM & Compatibles 30MB Hardcard	£379
Sanyo Memory upgrade to 256K + RAM disk + 25% extra disk capacity	£65
Amstrad PC 1512 upgrade to 640k	£29

APRICOT ADD ONS

512k Memory Board	£115
20Mb Hard Disk Upgrade	£695
Hi Res Mono Monitor for Portable	£109

PRINTER PROMOTIONS

PANASONIC 1081	£169
MP 165	£189
STAR NL10	£215
EPSON LX800	£219
EPSON FX800/1000	£319/£399
M. TALLY MT85/86	£299/£399
EPSON EX800/1000	£399/£539
NEC P6/P7	£409/£499
EPSON LQ800/1000	£459/£619
JUKI 6100	£259
QUENDATA 1120	£169
HP LASERJET 2	£2195

SHEETFEEDERS

Please Call

ACCOUSTIC HOODS

Please Call

PRINTER BUFFERS

Serial/parallel in/out 8K-2MB from £79

★ New ★ All Purpose X-buffer — Please call

FANFOLD PAPER All sizes available eg

11" x 9 1/2" 60gm	£9.75	(2000 sheets)
12" x 9 1/4" 60gm	£11.69	(2000 sheets)
A4 Clean Edge — 70gm	£15.95	(2000 sheets)
— 85gm	£9.30	(1000 sheets)
11" x 14 1/2" 60gm	£13.50	(2000 sheets)

Delivery £2.65 (fixed) + £1 per box.

Extra £1 per order for items marked *

LABELS 89mm x 36mm from £3.25/1000.
70mm x 36mm from £2.95/1000
Please call for other sizes.

RIBBONS for all printers eg

EPSON FX, MX, RX 80/100	£2.49/£3.75
EPSON LX 80	£2.95
JUKI 6100 single strike	£1.15
SHINWA/M. TALLY MT80	£3.79
KAGA/CANON	£3.99
QUME MS4	£2.65
APPLE IMAGEWRITER	£3.35

PRINTWHEELS from £3.95

Delivery 95p any Quantity ribbons/printwheels

SOFTWARE SPECIALS

VENTURA DTP	£695
Supercalc 4	£195
VP Planner	£65
VP Info	£65
Perfect Writer 2	£99
Wordcraft 3.0 (IBM)	£349
Wordstar 2000	£225
Wordstar Prof 4	£299
Word Perfect	£265
Turbo Pascal (8087+BCD)	£55
Turbo Reflex	£79
CADpower	£259
Turbocad	£299
CADD inc. mouse	£169
Autosketch	£79
Ability-Integrated Package	£79
Moneypower	£79
Sage Financial Controller	£249

PLOTTERS — DIGITISERS etc.

Hitachi 672 A3	£449
Roland 880A A3	* £679
Roland 885 A3	£929
Hewlett Packard 7570 A A1	£4495
Roland DPX2000 A2	** £2495
Graphtec GP9001 A0	£6,195
Summasketch 12" x 12" digitiser	£395
Cherry A3 digitiser	£495
Logimouse Plus	£85
Summouse with GEM + Write & Paint (IBM)	£179
* inc FREE 11k buffer	
** inc stand	

DISKS — POST FREE Packed in tens No quibble guarantee

Prices for ONE box. All extra boxes — 10% EXTRA DISCOUNT

5 1/4"	DYSAN	SONY	PRECISION
SSDD	£13.40	£11.90	£8.90
DSDD	£16.90*	£14.90	£10.90
DSQD	£23.90	£17.90	£13.90
HD1.6MB	£29.90	£27.90	—

*** DYSAN DSDD — 1 EXTRA DISK PLUS LIBRARY CASE**
SONY 3.5" SS £16.90 DS £23.90

SONY PLAIN LABEL UNBOXED — PLEASE DEDUCT £2

AMSOFT 3"	LOCKABLE	40 3 1/2" DISKS £7.95
£28.90	DISK BOXES	70 5 1/4" DISKS £9.95

Official Government/Educational Authority orders welcomed.

Please add 15% VAT to all prices (inc. carriage) Limited space precludes listing of our full range of products.

Please telephone if you do not see the item you require

ADVANCED MICROCOMPUTER APPLICATIONS LTD 1ST/2ND FLOORS
40, HIGH ROAD, BEESTON NOTTINGHAM NG9 2JP Tel: 0602 252627
ADMICRA
 An **AAAA** Company

NEW

80386



£4650

Including EGA Monitor

- * 80386 at 16Mhz
- * 1Mb Ram Expandable 2Mb on board
- * 40Mb Hard Disk Drive
- * 1.2 Floppy Disk Drive
- * Maths Co-processor Socket
- * 8 Slots
- * EGA Display Card
- * 14" EGA Monitor
- * Parallel Printer Port
- * RS232 Communications Port
- * Calendar Clock
- * 200 Watt Power Supply
- * Enhanced Keyboard with 101 keys
- * MS-Dos 3.x

PC, XT, & AT.

AT—6,8,10Mhz

£1429

2 x 1.2Mb Drives

£1675

20Mb & 1 x 1.2Mb Drives

PC & XT—4.77 & 8Mhz

£625

2 x 360Kb Drives

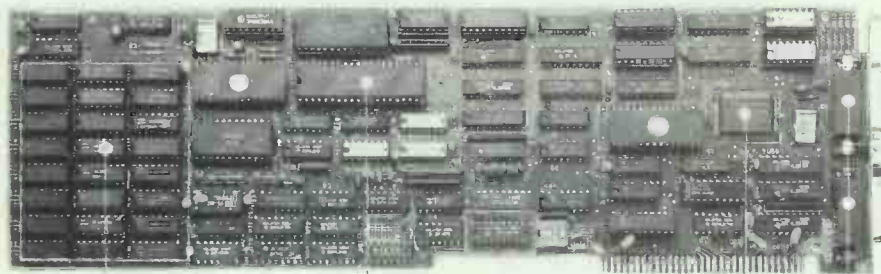
£995

20Mb & 1 x 360Kb Drives



- * PC & XT 8088-2 at 4.77 or 8Mhz
- * AT 80286 at 6,8 or 10Mhz
- * 640Kb Ram (Expandable to 1Mb on AT)
- * Maths Co-Processor Socket
- * 8 Slots
- * Hercules compatible Monographic Display Card
- * Parallel Printer Port
- * RS232 Communications Port
- * Calendar Clock
- * 150 watt Power Supply PC & XT
- * 180 watt Power Supply AT
- * 14" Tilt & Swivel Monochrome Monitor
- * Turbo Switch, Activity LED's & Reset on Front Panel
- * MS-Dos 3.x

OURS 88



RAM: 256K expandable To 704K

CPU: CMOS 8088 with 6.67Mhz

VLSI: Color IC

15 PIN D-Type Connection

£616

Complete with Dual Frequency 14" Monitor, Cables & Keyboard.

- * NEC V20 at 6.67 Mhz
- * 256Kb Ram expandable to 740Kb
- * Parallel Printer Port
- * RS232 Communications Port
- * Disk and Peripheral Sharing
- * File Lock Protection
- * Cabling to Maximum Length of 200ft.
- * NORTON SI 2.4
- * Requires MS—Dos 3.x

The OURS88 Expansion Card is a breakthrough in PC/AT Technology, offering significant saving when compared with additional PC's or Networked Work Stations. Utilising a Single Slot to perform the Network function of a full Computer it provides convenient operation of both data and any combination of peripherals.

Barbatan Limited

35-38 High Street, Bristol. BS1 2AW
Telephone: Bristol, (0272) 213928
Fax (0272) 213541

All prices quoted exclude VAT

DEALER ENQUIRIES INVITED

★ ★ SYSTEM ZONE HAS WHAT YOU NEED ★ ★

TURBO — AT SYSTEM from £965

- Intel 80286/10 processor
- 6/10MHz Switchable
- 640KB RAM, expandable to 1Mb
- HDD/FDD controller
- 2 serial/1 parallel port
- 8 expansion slots
- PHOENIX BIOS
- ONE 1.2Mb floppy drive
- Keyboard (84key)
- 200W power supply

TURBO — AT SYSTEM (ABOVE):

- + mono monitor and graphics/printer adapter (Hercules)
- + colour monitor and colour graphics/printer adapter
- + 20Mb Hard disk, mono monitor and adapter
- + 20Mb Hard disk, colour monitor and adapter
- + 20Mb Hard disk, EGA monitor & enhanced Graphics adapter

£965
£1165
£1295
£1555
£1775

TURBO — XT SYSTEM from £555

- Intel 8088-2 processor
- 4.77/8MHz switchable
- 640KB RAM on board
- PHOENIX BIOS
- 8 expansion slots
- Multi-I/O card: clock, 2 serial/1 parallel ports, 2 DS/DD floppy drive ports
- 360KB floppy drive
- 20Mb Hard disk drive
- Keyboard (84 key)
- 150W power supply

TURBO — XT SYSTEM (ABOVE):

- + mono monitor & graphics/printer adapter (Hercules)
- + colour monitor & colour graphics/printer adapter
- + EGA monitor & enhanced graphics adapter

£795
£1095
£1395

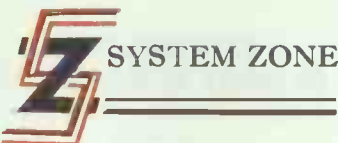
ACCESSORIES & ADD-ON CARDS

- TURBO-AT motherboard 6/10MHz switchable £549
- TURBO-XT motherboard 4.77/MHz switchable £199
- 2 serial/1 parallel card £79
- 20Mb Hard disk drive £275
- 40Mb Hard disk drive £650
- XT Hard disk controller £95
- FDD/HDD controller for AT £210
- 360KB floppy disk drive £79
- 1.2Mb floppy disk drive £149
- Floppy disk controller with cables £39
- Multi I/O card with cables £75
- 3Mb multi I/O card £299
- 2.5Mb RAM expansion card £139
- EGA graphics card £199

- 12" mono monitor + Hi/res mono graphic/printer adapter £169
- 14" col monitor + Hi/res col graphics/printer adapter £425
- 14" EGA monitor (TVM) + EGA card £575
- 40Mb internal tape streamer £595
- Dot matrix and daisywheel printers (most makes) from £199

Please call for full price list — Prices exclude VAT

DEALER AND EDUCATIONAL ENQUIRIES WELCOME



SYSTEM ZONE COMPUTERS LTD
108 HUGHENDEN ROAD,
HIGH WYCOMBE,
BUCKS HP13 5DU
Tel: (0494) 461 400



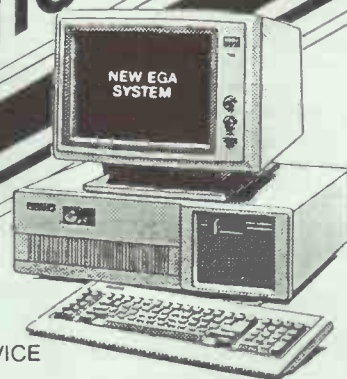
Special Offer Valid Until 30/8/87

£57.50 inc. VAT
+ £2.50 pp

ICAMS GB LTD.
SOFTWARE

Southbank Technopark, 90, London Road, London SE1 6LN
Telephone: 01-922 8834
Cheques or postal orders

**More EGA AUTO SWITCHING
Less money.**



NETWORKING SERVICE AVAILABLE

TANDON	PCA 20 EGA	£1900	Call us for a COMPETITIVE
TANDON	PCA 30 EGA	£2095	QUOTE on any other
TANDON	PCA 40 EGA	£2395	configuration —
TANDON	PCA 70 EGA	£2995	01-992-2415

Transputec can supply a full range of peripherals to meet your requirements. We provide full Hot-Line support for all our customers regardless of purchase size. All systems are fully installed & supplied with 6mth warranty.

T R A N S P U T E C

PERSONAL COMPUTERS

LIMITED

TRANSPUTEC LTD 64 HIGH STREET ACTON LONDON W3 TEL 01 992 2415

AT COMPATIBLES
FROM ONLY **£845**

**LOWEST PRICES FOR
AT COMPATIBLE
EGA SYSTEMS**
starting from **£1145**

	ASI PC-AT 6-8 MHz	ASI PC-AT 8-10 MHz	ASI PC-AT 6-10 MHz
HI-RESOLUTION MONOCHROME MONITOR (HERCULES Compatible) 1.2Mb FLOPPY DRIVE	£ 845	£ 895	£ 945
20Mb HARD DISK (40ms access time)	£1295	£1345	£1395
44Mb HARD DISK (28ms access time) can be formatted to 66Mb	£1595	£1645	£1695

COLOUR UPGRADE
Colour Graphics Card & RGB Monitor
(16 colours) **add £150**

EGA ENHANCEMENT
EGA Card (256k) + EGA
Monitor (Swivel Base) 64 colours (640 x 350) **add £300**

ASI PC-AT SPECIFICATION

- ★ 640k RAM expandable to 1MB
- ★ 8 Expansion slots
- ★ 1 Parallel, 2 Serial, games port
- ★ Calendar Clock with battery
- ★ Micropro "Easy" Word Processor
- ★ Utilises high quality Japanese components

HI-GRADE
HI-GRADE
HI-GRADE

COMPUTERS LTD.

13 KENTISH TOWN RD,
LONDON NW1 8NH
Telex: 262563 XENON G

**7 DAYS TRIAL PERIOD
OR MONEY BACK GUARANTEE**

Please phone for confirmation
of prices
ALL PRICES EXCLUDE VAT

ALSO AVAILABLE

ASI PC-XT's 4.77/8MHz **£795.00**
ASI PC-XT's 4.77/10MHz **£895.00**
With specifications similar to that of the ASI PC-AT plus
20Mb Hard Disk (Microscience)

ADD-ON CARDS

★ Serial RS-232 card	£25.00
★ Serial, Parallel & Games I/O Board (PC-AT)	£45.00
★ Colour Graphics Card (PC-XT/AT)	£60.00
★ Mono Graphics/Printer Adaptor (Hercules compatible)	£65.00
★ PRISMA Enhanced Graphics Adaptor	£145.00
★ Multi-IO Card (FDD/Serial/Parallel/Clock/Games Port)	£65.00
★ 384k Multifunction Card 384k RAM (PC-XT)	£139.00
★ 2Mb memory Expansion Card PC/AT QK	£105.00
★ 3Mb Multifunction Board with Lotus/Intel EMS (Enhanced Memory System) Solution QK	£159.00
★ Monopack Card (PC-AT/XT) Graphics/Serial/Parallel/Clock/Light Pen/Games Port	£99.00
★ Adaptec RLL Hard Disk Controller	£135.00
★ HD/FD Controller with cables (Western Digital)	£155.00
★ Flycom 1200C V21, V22 Modem	£150.00
★ Local Area Network card with software	£225.00
★ Monochrome/Colour Graphics dual display card	£69.00
★ Hi Res EGA Card (640 x 480) 16-64 Colours	£325.00

ACCESSORIES

★ 44Mb (28ms) Hard Disk with Disk Manager s/w	£675.00
★ 20Mb (40ms) Hard Disk (Microscience)	£375.00
★ RGB Colour Monitor (16 colours)	£245.00
★ EGA Monitor swivel base (64 colours [640 x 350])	£345.00
★ Mouse	£45.00
★ High quality 165cps (35 NLQ) Dot Matrix Printer	£180
★ Parallel Printer Lead	£8.00

APRICOT SYSTEMS

Apricot Xi 10Mb HD	£795
Apricot PC 2 x 720k	£595
Apricot Fi 1 x 720k with software	£485

**EDUCATIONAL AND
DEALER ENQUIRIES
WELCOMED**

01-482 4024

Thinking of PLAYING THE STOCKMARKET..... then consider one of the INVESTMENT ANALYSTS from Synergy Software

SHAREMASTER (IBM PC/Amstrad PC1512 & Compatibles,
Amstrad PCW 8256/8512 & BBC Micro)

ShareMaster is the ultimate investment analyst, charting and
reporting system for the BBC and Amstrad PCW computers. A
more powerful IBM/Amstrad PC1512 version is now available.

Designed for the small or professional investor, ShareMaster is a
powerful integrated system used for predicting the mood and
direction of the stockmarket and analysing investment
performance. The package employs a comprehensive range of
advanced predictive and analytical measures to help you
improve the timing and success of investment decisions.

ShareMaster can analyse share
prices, unit trusts, currencies,
trade options, commodities or any
other time based series and offers
facilities not found in commercial systems costing
many times its purchase price.

MAIN FEATURES ...

*Charting facilities include
logarithmic/linear scaling, point &
figure, linear regression,
exponential curve smoothing,
correlation, relative strength,
comparisons, momentum, Rate of
Change oscillators, moving averages, highs, lows, trendlines etc.

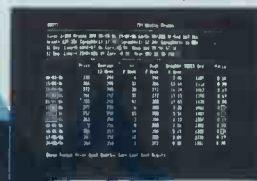
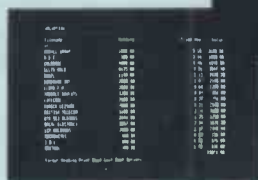
*Profit Analysis facilities include Valuation, Performance
Reporting, Single Share and Portfolio profit analysis, etc.

*Numerical analysis facilities include a variety of indicators,
comparisons and statistics for any selected price range.

ShareMaster has extensive database and file management
features including Company Profile, Transaction Reporting, File
Import & full editing facilities.



1. Share Price Editor
2. Real Database
3. Graphical Analysis
4. Portfolio & Real-time
5. Profit Analysis
6. Transaction Reporting
7. System Overview



These are only a fraction of the facilities offered by ShareMaster.
ASK FOR OUR FREE COMPREHENSIVE BROCHURE.

ShareMaster is exceptionally easy to use and is supplied with a 96
page operating manual which includes sections on interpreting
the indicators provided and their use in investment strategy.

We are confident that no investment package can match
ShareMaster in terms of facilities, performance, flexibility, ease of
use and price. We firmly believe that every owner of ShareMaster
will find it an indispensable investment aid and probably the
best investment you will ever make.

Also available SHARE
ANALYSER (BBC Micro only)

'excellent — very highly
recommended' — Which?
Software Guide.

'an excellent program' — Micro
User.

An easy to use budget reporting,
analysis and charting package
designed for the small investor.
Ask for our FREE brochure.

ORDER FORM — BBC orders: please state 40 or 80 track, Dealer enquiries welcome.
Prices include VAT and first class post. Orders despatched within 24 hours.
Overseas orders send price inc. VAT for immediate airmail despatch.
Cheque, Access, Visa and official educational orders accepted.

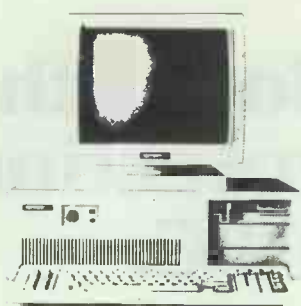
Please state computer type	Please tick
ShareMaster — all BBC & Amstrad PCW computers	☐ £99.95
ShareMaster — IBM PC/Amstrad PC1512 & Compatibles	☐ £149.95
ShareAnalys — BBC B, B+ & Master computers	☐ £24.95



Send cheque, P.O. etc to Synergy Software, Dept YA3, 7 Hillside Road, Harpenden,
Herts AL5 4BS. (Tel. 05827-2977).

SIERRA Computer Consultants Ltd.

TANDON, OLIVETTI, JUKI, PEGASUS, SAGE



SPECIAL OFFERS

PCX 10 640k
Juki D/W Printer
Word Processing
All for £1795

PCA 20 640k
Epson Printer
EGA/ECD
All for £2495

PCA 40 1MB
Epson FX105
EGA/ECD
4 User Systems
All for £4795

SPECIAL OFFERS

M24 20mb 640k
Lotus 123
All for £2715

M24SP 20mb 640k
Full A/Cs Package
All for £2745

M20 20mb 640k
Colour System
Laserjet Printer
All for £4895

MISC. SPECIAL OFFERS

Hardware

AMSTRAD 1512 Twin Floppy	POA
AMSTRAD 1512 hd 20 Colour	POA
Twin Serial Boards	£50
EGA/ECD (screen & board)	£595

Epson FX800 Printer	£376
Epson FX1000 Printer	£481
Epson EX1000 Printer	£652

Juki 6200 D/W Printer	£525
-----------------------	------

MEMTEC INT. Tape Streamer	£595
---------------------------	------

Software Packages

Lotus 123	£269
Symphony	£362
Smart System V3	£398
Dbase III Plus	£372
SAGE A/Cs Plus	£175
SAGE Bookkeeper	£85
SAGE Payroll	£85

The above are just a sample of the products available. Please Telephone for Specific Quotation. Telephone: 0705-504874.

SIERRA COMPUTER CONSULTANTS LTD. The Sanderson Centre, Lees Lane, Gosport, Hants.

If you have an IBM or Amstrad PC or compatible, then you need:

The Executive Organiser

4 Powerful Programs combine to create one of the most powerful
Organiser Packages on the market today.

Personal Accounting

Gives you up to the minute facts about your financial position at any time. Keeps separate accounts of your banking, cash transactions and credit card payments. Allows 36 individual expenditure accounts, 12 bank accounts and 12 credit card accounts — as well as the cash account. You can set up Standing Orders, make transfers between bank accounts and output the numerous statements and reports to screen, printer or to a disk file.

Phone Book

Computerised phone book offering extensive facilities such as — Input, Amendment and Deletion of entries, Finding a particular name and phone number, automatic sorting of names and addresses, outputting of pages or complete directories of names, addresses and phone numbers to printer.

Database Manager

Powerful disk based Database literally packed with features — such as — Multi level Searching and Sorting, Text, Number, Date and Integer field types, Marking and Calculating facilities, plus powerful Report Generator for Line Reports and multi label Mail Labels

Financial Diary

All the features of the best Desktop Diary — plus much more. Enter up to 15 items per day and have them automatically sorted into time order. Add your expenses and have them totalled in separate categories. Speed search for entries, then mark them for future manipulation or reporting. Includes Calendar and powerful Report Generator.

All this is available in a single package at just:
£49.95 inc. VAT

Total Office Software Limited

Debden Green, Saffron Walden
Essex CB11 3LX Tel: 0371 830014
All credit cards accepted

Also available: Small Business Accounting

Flexible computerised Accounting System designed to handle the usual day to day finances of Small Businesses. Features: Control accounts for Debtors Creditors, Bank and Cash. 135 Nominal Accounts. Trial Balance, P & L and Balance Sheet. Price £29.95 inc. VAT.

You've bought an Amstrad™ PC with a hard disc.

We can back-up your decision with the AM20 – Cristie's data protection system for the Amstrad™ PC.

If you are using your computer for business or other serious purposes, the information you have stored on it can be very valuable. Just imagine if that information were to disappear. It can happen by hard disc failure, by an accident such as fire or theft, or by simply pressing the wrong button.

The AM20 can protect you against that happening.

The AM20 is:-

- Easy to install and use;
- Compact and portable;
- Economical to share as it requires no controller card;
- Very flexible with a wealth of user options;
- Based on a tried and tested system already on sale for the IBM (TM) PC;
- Designed, manufactured and supported in the UK.



**10 MBytes from £399
20 MBytes from £499**

Cristie

15 years experience in manufacturing computer peripherals.

Cristie Electronics Limited, Bonds Mill, Bristol Road,
Stonehouse, Gloucestershire GL10 3RF
Telephone: (Sales line) 045382 – 8824; (Switchboard) 045382 – 3611
Telex: 43551 Cristy G; Fax: 045382 – 5768

The Tandata Tm722 Modem

FAST AS LIGHTNING AND NO THUNDERING GREAT MISTAKES

Tandata Tm722

By any standard the Tandata Tm722 is quite a remarkable new modem.

Designed for today's high speed data comms requirements, the Tm722 provides communications with error correction at 2400bps (V22bis) with automatic fall back to 1200bps (V22). What's more, it also offers the kind of built-in reliability that enables us to back it with an unprecedented 2-year warranty.

The Tm722's many features make it the ideal modem for a wide variety of dial-up communications applications—from file transfer and accessing on-line databases, to wide area networks and even remote operation.

Its compatibility with Hayes AT and other V22bis modems make it particularly easy-to-operate with commonly used comms software programmes.

With all that it has to offer you'll no doubt be surprised to learn that at under £500 the Tm722 actually costs no more than many modems with V22 only.

And if that's not enough to whet your appetite, there's more.

By calling our Tm722 test database, you can try out 2400bps error corrected comms at first hand. Alternatively, you may qualify for our special loan scheme for selected customers.

To find out more about the Tm722, contact your local dealer or speak to us direct.

APPROVED
for use with
telecommunications systems
run by British
Telecommunications
in accordance with the
conditions in the
instructions for use



Tandata

COMMUNICATIONS

Albert Road North, Malvern, Worcs WR14 2TL.
Telephone: 0684 892421. Telex: 337617 Tandat G
Prestel *799# Telecom Gold 81: TAN001
A Division of Tandata Holdings plc.

*What's the best buy in
Personal computers
for business?*

*What's the ideal
software package?*

*Which
peripherals?*

*What
about
net-
working?*

*Is it IBM
compatible?*

Help!!

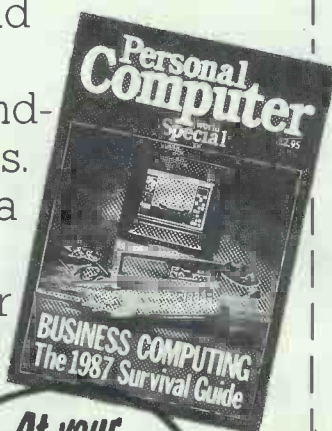
*What about
Desk-Top
publishing?*

If you're in the dark about any area of business computing, you need Personal Computer World's 1987 Business Computing Survival Guide.

It takes an illuminating — and entertaining — look at the world of business computing, with in-depth reviews, comments and comparisons.

It's written by a hand-picked team of experts. And it'll set you back a mere £2.95.

So send off for your copy today. And see business computing in a new light.



*At your
newsagent
now!*

PRIORITY ORDER FORM

Please send me a copy of Business Computing — The 1987 Survival Guide costing £2.95. Simply complete this order form and return with your remittance to the address stated. No postage is required.

Please Tick

☐ I enclose a cheque made payable to Personal Computer World for £2.95.

Please charge ☐ Visa ☐ Access ☐ American Express

CARD NO:

EXPIRY DATE:

SIGNED

NAME

JOB TITLE

COMPANY

ADDRESS

Please send this order with your remittance to Personal Computer World, Subscription Dept, FREEPOST 25, 32-34 Broadwick Street, London W1E 6EZ.

TECHNOLOGY SO ADVANCED ...

MEMORY

- * 512Kbytes RAM (520ST-M, FM)
- * 1024Kbytes RAM (1040ST-F)
- * 192Kbytes ROM
- * 128Kbytes external plug-in ROM option

ARCHITECTURE

- * Motorola 68000 Central Processing Unit (CPU) with a clock speed of 8MHz
- * 16-bit external data bus
- * 32-bit internal data bus
- * 24-bit address bus
- * 8x32-bit data & address registers
- * 7 levels of interrupts
- * 56 instructions
- * 14 addressing modes
- * 5 data types
- * DMA (Direct Memory Access)
- * real time clock as standard

GRAPHICS

- * full bit-mapped display
- * palette of 512 colours
- Using Atari Monitors (on 520 & 1040):
- * 640x400 high resolution - monochrome
- * 640x200 medium resolution - 4 colours
- * 320x200 low resolution - 16 colours
- * 80 column text display (40 col low res)
- Using Domestic TV (on 520):
- * 640x200 medium resolution - 4 colours
- * 320x200 low resolution - 16 colours
- * 40 columns x 25 line text display

SOUND AND MUSIC

- * 3 programmable sound channels
- * frequency programmable 30KHz - 125KHz
- * programmable volume
- * wave & dynamic envelope shaping
- * programmable attack, decay, sustain, release
- * Musical Instrument Digital Interface (MIDI)
- * MIDI allows connection of synthesizers etc.

STANDARD SOFTWARE

- * GEM desktop + TOS operating system
- * ST BASIC Interpreter/language system

MOUSE

- * high precision
- * 2 button control
- * free with 520ST-FM/1040ST-F
- * non slip ball motion sensor
- * removable ball for easy cleaning

INPUT/OUTPUT

- * MIDI out (5 pin DIN) 31.25K baud
- * MIDI in (5 pin DIN) 31.25K baud
- * audio out : 1.0V DC peak to peak, 10K ohm
- * audio in : 1.0V DC peak to peak, 10K ohm
- * RGB monitor 1.0V DC, 75 ohm
- * mono monitor 1.0V DC, 75 ohm
- * mono horizontal scan rate 35.7KHz
- * mono vertical scan rate 71.2KHz
- * sync 5V DC (active low) 3.3K ohm
- * modem/serial RS232C, 50 to 19,200 baud
- * floppy disk 250 Kbits/s
- * hard disk 11.3 Mbits/s
- * mouse standard Atari connector
- * joystick standard Atari connector
- * cartridge port 128K capacity
- * RF output (520ST-FM) for TV use

OPERATING SYSTEM

- * TOS with GEM environment in ROM
- * Hierarchical file structure with sub-directories and path names
- * user interface via GEM, with self explanatory command functions
- * multiple windows + icons
- * window resizing, re-positioning and erasing
- * drop down menus (selected by mouse)
- * GEM virtual device interface

COMMUNICATIONS

- * RS-232C serial modem port
- * 8-bit parallel printer port
- * MIDI port (also for networking use)
- * VT52 terminal emulation

KEYBOARD

- * standard QWERTY typewriter format
- * 95 full stroke keys
- * 10 function keys
- * 18 key numeric keypad + cursor keys
- * variable auto-repeat & key click response
- * keyboard processor reduces CPU overhead

... IT'S AFFORDABLE

ONLY FROM SILICA

Finally, there's a personal computer that not only solves problems like other computers, but also solves the one problem that other computers have created. Affordability. Silica Shop are pleased to present the ST range of personal/business computers from Atari. The ST was designed utilizing the most recent breakthroughs in semiconductor technology, producing a personal computer that performs tasks with fewer parts. Which means it costs less to make. And less to buy. The latest ST computers now include built-in power supplies and built-in disk drives. The TOS operating system and GEM window environment are now on ROM chips which are already installed in the ST keyboard. This enables automatic instant booting when you switch on. Silica Shop are pleased to offer the complete Atari ST range. Our mail order department is situated in Sidcup and we have 4 retail outlets at Sidcup, Orpington, Lion House (Tottenham Court Rd) and Selfridges (Oxford Street). We have eight years experience of Atari products, longer than any other UK company, and are well established as the UK's No.1 Atari specialist. With a group turnover of over £5 million and in excess of 70 staff, we provide unbeatable service and support. We provide several facilities which you will find invaluable during your Atari computing life and most of these facilities are available ONLY FROM SILICA. We suggest that you read through what we have to offer, before you decide where to purchase your Atari ST.

FREE STARTER KIT - Only From Silica

When you purchase any Atari ST keyboard, you will not only receive the best value for money computer on the market, but you will also receive the following from Atari Corporation as part of the package:

- * BASIC Language Disk
- * BASIC Manual
- * ST Owners Manual
- * TOS/GEM on ROM

If you buy your ST from Silica Shop, you will also receive:

- * NEOchrome - colour graphics program
- * 1st Word - Word Processor

In addition, we at Silica would like to see you get off to a flying start with your new computer, so we have put together a special ST STARTER KIT worth over £100, which we are giving away FREE OF CHARGE with every ST computer purchased at our normal retail prices. This kit is available ONLY FROM SILICA and is aimed at providing users with a valuable introduction to the world of computing. We are continually upgrading the ST Starter Kit, which contains public domain and other licensed software, as well as books, magazines and accessories all relevant to ST computing. Return the coupon below for full details.

DEDICATED SERVICING - Only From Silica

At Silica Shop, we have a dedicated service department of five full time Atari trained technical staff. This team is totally dedicated to Atari computer products. Their accumulated knowledge, skill and experience makes them second to none in their field. You can be sure that any work carried out by them is of the highest standard. A standard of servicing which we believe you will find ONLY FROM SILICA. In addition to providing full servicing facilities for Atari ST computers (both in and out of warranty), our team is also able to offer memory and modulator upgrades to ST computers.

1Mb RAM UPGRADE: Our upgrade on the standard Atari 520ST-M or 520ST-FM keyboard will increase the memory from 512K to a massive 1024K. It has a full 1 year warranty and is available from Silica at an additional retail price of only £36.95 (VAT = £100).

TV MODULATOR UPGRADE: Silica can upgrade the 1040ST-F to include a TV modulator so that you can then use it with your TV set. This is an internal upgrade and does not involve any untidy external boxes. A cable to connect your ST to any domestic TV is included in the price of the upgrade which is only £49 (inc VAT). The upgrade is also available for early 520ST computers at the same price.

THE FULL STOCK RANGE - Only From Silica

We aim to keep stocks of all Atari related products and our warehouse carries a stock of £4 million. We import many software titles direct from the USA and you will find that we have new releases in advance of many of our competitors. Unlike dealers who may only stock selected titles, we have the full range. In addition, we carry a complete line of all books which have been written about the Atari ST. A range as wide as ours is something you will find is available ONLY FROM SILICA.

AFTER SALES SUPPORT - Only From Silica

Rest assured that when you buy your ST from Silica Shop, you will be fully supported. Our free mailings give news of releases and developments. This will help to keep you fully up to date with what's happening in the Atari market. And in addition, our sales staff are at the end of a telephone line to service all of your Atari requirements. If you purchase an ST from Silica and would like any programming or technical advice, we have a full time technical support team to help you get the best from your computer. Because we have both the staff and the systems specifically dedicated to providing after sales service on Atari ST computers, we are confident that our users enjoy an exceptionally high level of support. This can be received ONLY FROM SILICA.

FREE CATALOGUES - Only From Silica

At Silica Shop, we recognise that serious users require an in-depth information service, which is why we mail free newsletters and price lists to our ST owners. These are up to 48 pages long and are crammed with technical details as well as special offers and product descriptions. If you have already purchased an ST and would like to have your name added to our mailing list, please complete the coupon & return it to us. The information service is available ONLY FROM SILICA.

FREE OVERNIGHT DELIVERY - From Silica

Most orders are processed through our computer within 24 hours of receiving them. Most hardware orders are sent by the overnight METRO courier service FREE OF CHARGE to customers within the UK. This method helps to ensure minimum delay and maximum protection.

PRICE MATCH - Only From Silica

We hope that the combination of our low prices, FREE UK delivery service, FREE Starter Kit and FREE after sales support will be enough to make you buy your Atari equipment from Silica Shop. If however, there is something you wish to purchase, and you find one of our competitors offering it at a lower price, then please contact our sales department, providing us with our competitor's name, address and telephone number. If our competitor has the goods in stock, we will normally match the offer (on a 'same product - same price basis') and still provide you with our normal free delivery. We realise that we are not the only company who will match a competitor's price. However, if you come to us for a price match, you will also be entitled to our after sales service, including free newsletters and technical support. This makes our price match promise rather special, something you will receive ONLY FROM SILICA. We don't want you to go anywhere else for your Atari products. So shop at Silica, the UK's No.1 Atari Specialist.

SIDCUP (& Mail Order) 01-309 1111
1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX

LONDON 01-580 4839
Lion House (1st floor), 227 Tottenham Court Rd, London, W1

LONDON 01-629 1234 ext 3677
Selfridges (1st floor), Oxford Street, London, W1A 1AB

520ST-M

The affordability of Atari computers is reflected in the price of the 520ST-M keyboard, which is a mere £259 (inc VAT). This version of the ST comes with 512K RAM, as well as a modulator and lead for direct connection to any domestic TV. The price does not include a mouse. In addition, when you buy your 520ST-M from Silica, you will also receive the FREE Silica ST Starter Kit. During 1987, many software houses will be producing games software on ROM cartridges, which will plug directly into the cartridge slot on the 520ST-M keyboard, giving instant loading without the expense of purchasing a disk drive. With the enormous power of the ST, you can expect some excellent titles to be produced, making this the ultimate games machine! If your requirement is for a terminal, then the 520ST-M can fulfill this role too. Leads are available to connect the ST to a variety of monitors, and with the imminent introduction of terminal software on ROM cartridge, the ST provides a low price terminal for business use. If you wish to take advantage of the massive range of disk software available for the ST range, you will need to purchase a disk drive. Atari have two floppy disk drives available, a 1/4 Mbyte model £149 and a 1Mbyte model £199. Full details of these drives, as well as the Atari 20Mbyte hard disk are available on request. If required at a later date, the mouse may be purchased separately.

£259

520ST-FM

The 520ST-FM with 512K RAM and free mouse, represents a further breakthrough by Atari Corporation in the world of high power, low cost personal computing. This model is the latest addition to the ST family, and is not only powerful, but compact. It is priced at only £399 (inc VAT) a level which brings it within the reach of a whole new generation of computer enthusiasts. When purchased from us, it comes with the FREE Silica ST Starter Kit - see paragraph on the left. To make the 520ST-FM ready for use straight away, Atari have built into the keyboard a 1/4 megabyte disk drive for information storage and retrieval, allowing you easy access to the massive range of disk based software which is available for the ST. This new computer comes with all the correct cables and connections you will need to plug it straight into any standard domestic television set. You do not therefore have to purchase an Atari monitor. If you do require a monitor however, these are available with the 520ST in the following money saving packages:

- 520ST-FM Keyboard Without Monitor - £399 (inc VAT)
- 520ST-FM Keyboard + High res mono monitor - £499 (inc VAT)
- 520ST-FM Keyboard + Low res colour monitor - £499 (inc VAT)
- 520ST-FM Keyboard + Med res colour monitor - £599 (inc VAT)

Because the 520ST-FM has its own power transformer built into the keyboard, there are no messy external adaptors to clutter up your desk space. You are left with only one mains lead, serving both the disk drive and the computer. You couldn't ask for a more stylish and compact unit.

£399

1040ST-F

For the businessman and the more serious home user, Atari have their most powerful model, the 1040ST-F with 1024K RAM. This low cost powerhouse can be introduced into a business environment as a stand-alone system, or can support a mainframe computer as a terminal. The 1040ST-F not only features twice as much memory as the 520ST-FM, but also includes a more powerful built-in disk drive. The drive featured on the 1040ST-F is a one megabyte double sided model. The extra memory facility of the 1040ST-F makes it ideal for applications such as large databases or spreadsheets. Like the 520ST-FM, the 1040ST-F has a mains transformer built into the console to give a compact and stylish unit with only one mains lead. The 1040ST-F is also supplied from Silica Shop with a free software package and ST STARTER KIT. In the USA, the 1040ST-F has been sold with a TV modulator like the 520ST-FM. However, for the UK market, Atari are manufacturing the 1040ST-F solely with business use in mind and it does not currently include an RF modulator, this means that you cannot use it with a domestic TV (Silica Shop do offer a modulator upgrade for only £49). The 1040ST-F keyboard costs only £599 (inc VAT) and, unless a modulator upgrade is fitted, will require an Atari or third party monitor. There are three Atari monitors available and the prices for the 1040 with these monitors are as follows:

- 1040ST-F Keyboard Without Monitor - £599 (inc VAT)
- 1040ST-F Keyboard + High res mono monitor - £699 (inc VAT)
- 1040ST-F Keyboard + Low res col monitor - £799 (inc VAT)
- 1040ST-F Keyboard + Med res col monitor - £899 (inc VAT)

The 1040ST-F comes with a mouse controller and includes 1Mbyte of RAM. It has a 1Mbyte double sided disk drive and mains transformer, both built into the keyboard to give a compact and stylish unit, with only one mains lead.

£599

ATARI

ST

To: Silica Shop Ltd, Dept PCW 0787, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX

PLEASE SEND ME FREE LITERATURE ON THE ATARI ST

Mr/Mrs/Ms: Initials: Surname:

Address:

Postcode:

Do you already own a computer
If so, which one do you own?



COLOURJET 132

HIGH PERFORMANCE COLOUR INK JET PRINTER

(compatible with IBM pc, BBC micro etc.)

- ★ PRINTS ALL 64 SCREEN COLOURS FROM CGA AND EGA*
- ★ EMULATES OTHER PRINTERS (A1210, PJ1080A and QUADJET)
- ★ OVERHEAD TRANSPARENCY PRINTING
- ★ 80 + 132 COLUMN OPERATION, A4 WIDTH
- ★ UP TO 1280 DOTS/LINE ADDRESSABLE
- ★ FULL VIDEOTEX CAPABILITY
- ★ OPTIONAL BUFFERED RS232 (INTERNAL)
- ★ HIGHLY VERSATILE

ULTRA
LOW
NOISE

LIST PRICE
£569+VAT

* using optional Integrex software.



INTEGREX LTD CHURCH GRESLEY, BURTON ON TRENT,
STAFFS DE11 9PT
Tel (0283) 215432
Telex 341727 INTEGX

Special Offers on Macintosh Products

A Selection of Excellent Value Products for your Macintosh

	Price Ex VAT	Inc VAT
WORKS: Microsoft Spreadsheet, Database, W/P, Comms	245.00	281.75
MORE: Living Videotext The Successor to ThinkTank 512	275.00	316.25
RAGTIME: Orange Micro A Complete Desktop Publishing Program	249.00	286.35
LASERSEE: Infosphere For Laser-Spooling to disk - per User	99.00	113.85
INTERMAIL: Internet Send Messages and Files on AppleTalk (5-10 Users)	349.00	401.35
COMICWORKS: Macromind Design Your own Comics and Storyboards	60.00	69.00
GRAPHICWORKS: Mindscape Low Cost Publishing on your Mac	60.00	69.00
MAC PLUS CARRY CASE Holds Mac Plus, Keyboard and Hard Disk	39.90	45.88
IMAGewriter // CARRY CASE Matching Carry Case for Imagewriter & Cables	36.50	41.97
SONY 400K 3.5" Disks Box of Ten Sony Single-Sided Disks	17.30	19.90
SONY 800K 3.5" Disks Box of Ten Sony Double-Sided Disks	26.00	29.90
POSTAGE per Item	1.74	2.00
Telephone Orders - Monday to Friday: 9.30am-6.00pm Credit Cards Welcome		

Apple Authorised Apple Dealer

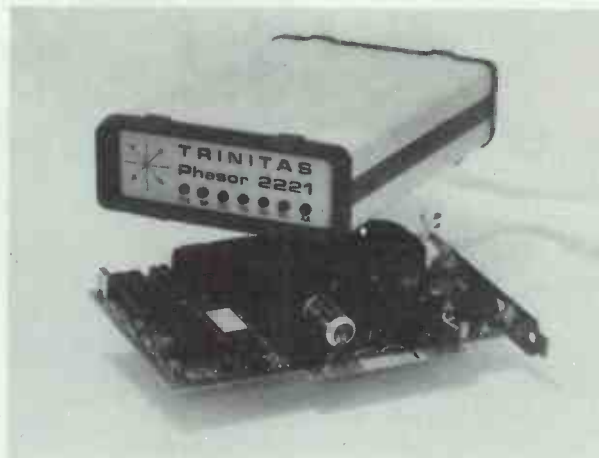
STIRLING MICROSYSTEMS

The Specialist Centre for Apple Macintosh Systems

231 Baker Street, London NW1 6XE

01-935 5262

MODEMS FOR THE PROFESSIONAL



BABT APPROVED

Standard features of The Phasor 2221 and PCM 2221 Modems:

- * Speed Seeking (Answer and Dial)
- * Speed Buffering
- * Compact and Reliable
- * Built in logon macros
- * Low Power Requirement
- * Self Test Facility
- * Passworded Auto Answer
- * Battery Backup for Registers, Macros and Number Store
- * CCITT 1200 Full Duplex (V22)
- * CCITT 300 Full Duplex (V21)
- * BELL 103 (Originate only)
- * Intelligent
- * Truly HAYES Compatible
- * Auto Dial (Pulse and Tone)
- * Auto Answer (Multiple Modes)
- * Internal Phone Number Store with Dial by Name Feature

PRICE: £295 + VAT

Contact: TRINITAS LTD., 2-10 Camden Road,
Ipswich, Suffolk IP3 8JW. Tel: (0473) 721006
Gold Mailbox 72: MAG3096

Telex: 265871 MONREF G quoting 72: MAG3096

HAYES IS A TRADEMARK OF THE HAYES CORPORATION

AMSTRAD

PC 1512SD Mono	£516.35
PC 1512DD Mono	£642.85
PC 1512SD Colour	£711.85
PC 1512DD Colour	£838.35
PC 1512HD20 Mono	£1033.85
PC 1512HD20 Colour	£1229.35
WORDSTAR	£79.35
REFLEX	£79.35
SUPERCALC	£79.35



PRINTERS

CANON	
PW1080A	£286.35
A55	£516.35
EPSON	
LX80	£240.35
FX800	£435.85
LQ800	£573.85
JUKI	
6100	£286.35
6200	£516.35

MONITORS

MICROVITEC	
1431	£193.20
1451	£251.85
1431 AP	£251.85
1451 AP	£286.35
KAGA/ TAXAN 12"	
	£113.85
PHILIPS 7502	
	£90.85

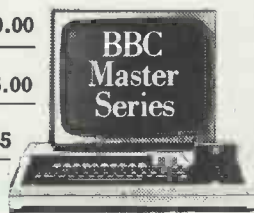
**PART
EXCHANGE
YOUR BBC B
FOR
ANYTHING WE
CARRY IN
STOCK**

**PLEASE PHONE
FOR DETAILS
ON WHAT YOU
CAN EXPECT
FOR YOUR OLD
COMPUTER**

BBC MASTER

MASTER PRICES

MASTER 128	£449.00
TURBO UPGRADE	£125.00
512 UPGRADE	£228.85



CUMANA DISK SYSTEMS

CSX100	£102.35	CS 400S	£159.85
CSX 400S	£136.85	CD 800S	£274.85

SPECIAL OFFER AMSTRAD PC 1512

Double Disc Drive
Mono Monitor • DMP3000 Printer
Wordstar and Supercalc
£803.85

ALL PRICES INCLUDE VAT

BARGAIN BASEMENT TO CLEAR

APRICOT F2 + MONITOR + MOUSE	£458.85
APPLE 2e DISK DRIVES	£148.35
APPLE 128K MACINTOSH	£458.85

COMP SHOP PRICE PROMISE

We guarantee to match the price on equipment offered from stock through any other supplier.

Educational enquiries and orders welcome. Quotations given.

One year warranty on all products.

COMP SHOP was established in 1978 and has continually offered the best in micro computers to discerning customers.

We sell only computers and peripherals, and therefore can offer the support many other shops cannot.



14 Station Road, New Barnet, Hertfordshire, EN5 1QW
(Close to New Barnet BR Station - Moorgate Line)
Telephone: 01-441 2922 (Sales) 01-449 6596 Telex: 298755 TELCOM G
OPEN (BARNET) - 10am - 7pm - Monday to Saturday

NEW BRANCH ALSO AT
311 London Road, Camberley, Surrey, GU15 3HE
Telephone: (0276) 22877/28212

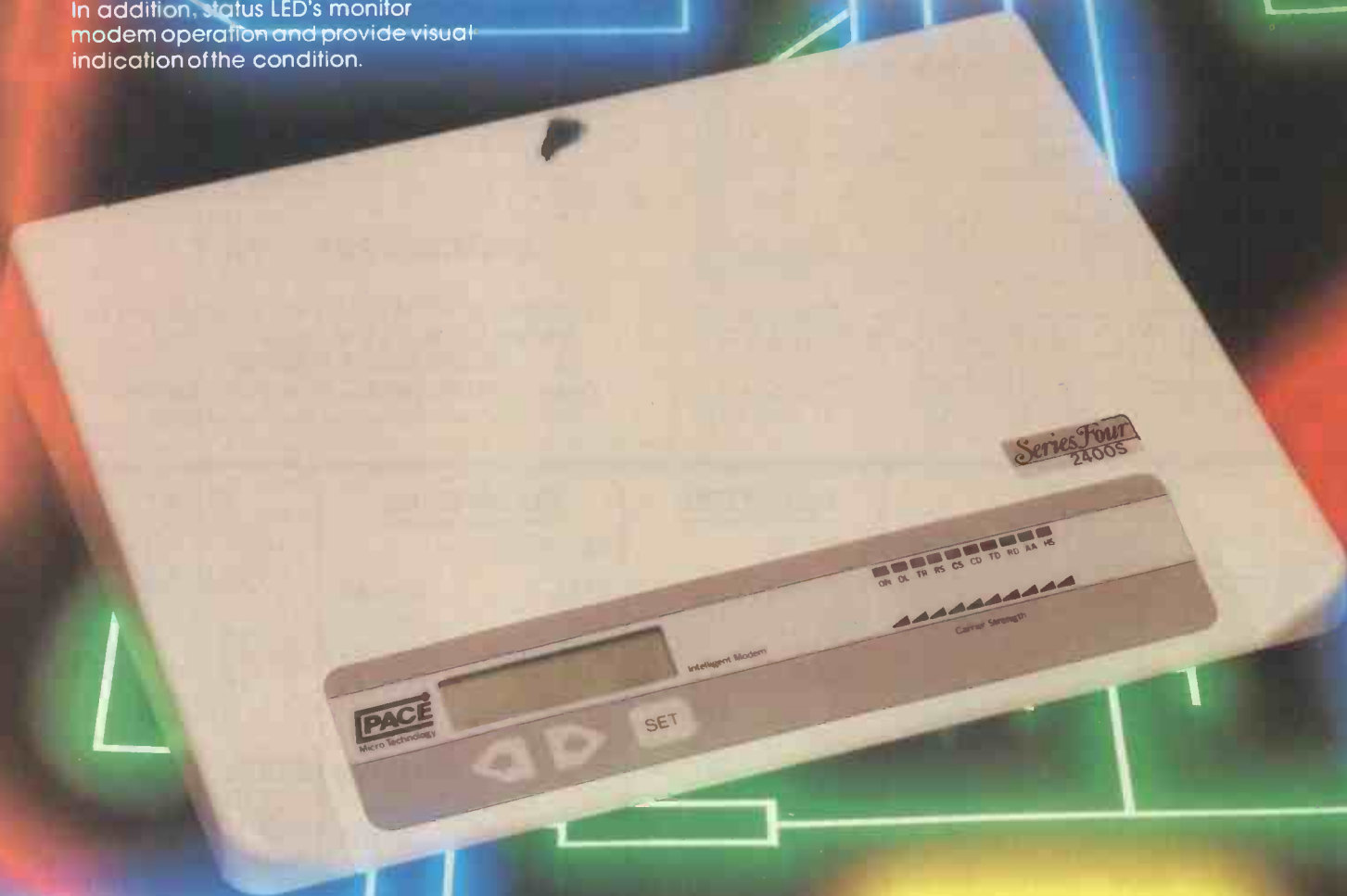
Series Four V21, V23, V22, V22bis Data Modems

The last word in Micro-communications

Once in a while a truly exceptional product reaches the market place. When the first modem appeared for a micro computer in the seventies, it transformed the role of the micro. Now the Modem has come of age with the introduction of Series Four the range of intelligent modems from Pace.

All Series Four models include as standard V21/V23 CCITT capability coupled with microprocessor control, automatic dialling and answering. Hayes compatibility and standard ports for RS-232C, telephone, and parallel printer connection.

A 32 character LCD display and three 'touch' controls are used to relay messages about call progress to display time, date etc and to simplify programming of the modem via the Hayes commands. In addition, status LED's monitor modem operation and provide visual indication of the condition.



Multiple baud rates are supported by all Series Four models with 300/300, 4200/75 and 75/1200 rates being available for use with standard viewdata and low speed full duplex systems. For more exacting requirements the Series Four 1200S will support 1200 baud full duplex (V22), and the Series Four 2400S will provide 2400 baud full duplex (V22 bis) operation.

Some of the features of the new Series Four modems are:

- Multiple baud rates (upgradeable)
- Auto dial/auto answer
- Microprocessor control
- Inbuilt date/time clock
- Automatic speed buffering
- Automatic baud rate detection
- Hayes compatibility
- Auto re-dial
- Dial tone detect
- Multiple baud rates (upgradeable)
- Call progress monitoring
- Printer port
- Unattended printing of incoming data
- 32 character LCD display
- Tone dialling
- Comprehensive 'help' command pages
- Visual line condition indication

The features offered by the new Pace Series Four modems are too numerous to detail fully here, a comprehensive fact sheet is available free on request.



PACE Micro Technology
 Allerton Road, Bradford, West Yorkshire.
 Tel. 0274 488211 Telex No. 51338
 Prestel Mailbox No. 274 729306
 Telecom Gold Mailbox No. 79: PCE 001 Int. Tel. No. +44 274 488211

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

COMPLEX

NEVER BEATEN ON PRICE

MULTISOFT ACCOUNTS

Single User £199 per module

Support and Multi User Software available

Comart Quad plus financial controller super price POA

Single user £275 per module

Amstrad Deal twin floppy mono plus 300 Printer + Wordstar + Super Calc.....	£649
Amstrad 1512 Mono (20Mb Seagate) 640k Memory	£760
Amstrad Colour 1512 (20Mb Seagate) 640k Memory	£899
Amstrad 128k memory upgrade	£29

COMPUTERS

Amstrad PCW 8256.....	£379
Amstrad PCW 8512.....	£479
BBC Master.....	£389
BBC Master Compac.....	£347
BBC Master Compac + Green screen.....	£434
BBC Master Compac + Colour Monitor.....	£544

ATARI

520STIM.....	£205
520STFM.....	£305
520STIM + mono monitor.....	£390
520STFM + Philips colour.....	£556
520STFM + Philips colour Hi-Res.....	£556
1040STF + mono.....	£356
1040STF + Philips colour.....	£722
1040STF + Philips colour Hi-Res.....	£722

COMMODORE

Amiga 500.....	POA
Amiga 500 modulator.....	£25
Amiga II.....	£949
Amiga II.....	£949
Amiga 2000 1Mb.....	POA
Amiga Bridge + 5 1/4.....	POA
PC Double Disk Drive.....	£799
PC One Disk Drive 20Mb.....	£1099
AT 20Mb 1.2 Disk Drive 20Mb.....	£1775

EPSON PC

PC Twin D/D mono mon. 256.....	£799
PC Single D/D 20Mb mono mon. 256.....	£1199
Colour monitor add.....	£325

VICTOR

Victor machines.....	POA
----------------------	-----

OLIVETTI

M24 1 D/D.....	£949
M24 2 D/D.....	£1025
M24 20Mb (Olivetti).....	£1350
M24 20Mb (Seagate).....	£1250
M24 30Mb (Seagate).....	£1450
M24 SP.....	£1499
M28 20Mb H/D.....	£1999
M28 20Mb + T/S.....	£2499
M28 40Mb.....	£2549
M28 40 Mb + T/S.....	£2999
All machines come with Keyboard.....	£58
Monitor and MS-DOS, M24's 640k colour monitor £250 extra.....	

SPERRY

HT 100.....	£1050
HT 200.....	£1150
HT 250.....	£1340
HT 300.....	£1775
HT 400.....	£1425
HT 450.....	£1715
HT 500.....	£2100
HT Standard keyboard.....	£85
HT Professional keyboard.....	£149
Parallel Printer port.....	£58
(required for HT 250, 300, 450 & 500).....	
Micro IT 1200 20Mb Standard or AT keyboard 512k and green monitor.....	£2250
Full IT 1200 44Mb, Standard or AT keyboard 512k and green monitor.....	£2730

AMSTRAD PC

10D Mono.....	£423
20D Mono.....	£522
10D Colour.....	£567
20D Colour.....	£666
20Mb Mono.....	£833
20Mb Colour.....	£977
20Mb upgrade for Amstrad PC (fitted if required).....	£345

BONDWELL PC

88 Portable.....	£679
818 Portable.....	£599
834 20D 640k.....	£499
836 20Mb 640k.....	£849
838/220 640k.....	£699
838/3 20Mb 640k.....	£999
BW39.....	POA
Colour Monitor add.....	£199

SBC

SBC 40.....	£525
SBC 55.....	£699
SBC 55 20Mb.....	£899
SBC At 30Mb 1.20D green screen 6.82 Mhz.....	£1499
SBC At 30Mb 1.20D colour 6.8 + 12 Mhz.....	£1675
SBC At 30Mb 1.20D ega colour 6.8 + 12 Mhz.....	£1849
Free 12 months a sight maintenance with all Bondwells + SBC measures.....	

TANDON

PCX.....	£625
PCX 10.....	£699
PCX 20.....	£725

GOVERNMENT AND EDUCATIONAL ORDERS WELCOME, EXPORT ENQUIRIES WELCOME STANDARD DELIVERY £5 AND NEXT DAY £9.50 ADD 15% TO ORDER TOTAL

Complex House, 28 Bradgate Road,
Hinckley LE10 1LA
(0455) 635583
Manchester 061-976 3763



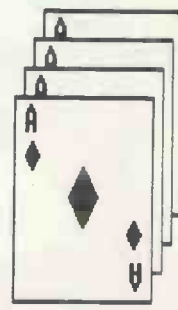
-PROJECTS-
Presents

PC PONTOON & PC POKER

Features include

- Menu driven front end
- Load/Save options
- Hi-lo in Poker
- Colour/Mono display option

For Amstrad 1512 and all IBM compatibles.



Please send me _____ copy(s) of PC POKER
_____ copy(s) of PC PONTOON
At only £8.95 each

Make cheques/postal orders payable to PC PROJECTS

Name : _____
Address : _____
Address : _____
Post code : _____

Send to PC PROJECTS, PROJECT HOUSE, 21 PALERMO ROAD,
HARRLESDEN, LONDON NW10 5YK

HOMIEVIEW

Atari 400, 800, 600XL, 800XL, 130XL, 520ST, 1040ST (callers welcome) 8 Bit Software.
All latest software stocked, ring for details.

The Director Video Program for
Video film hire and rental

Dealer for
AST PRODUCTS

ST HARDWARE

1040STFM including Hi-Res b/w monitor	£699.00
1040STF Keyboard only (incl. mouse)	£599.00
1 Pack A 520 STM incl. 1/2Mb Atari drive, mouse, 1st Word	£349.00
2 Pack B 520 STM incl. 1/2Mb Atari drive, mouse, 1st Word, incl. High-Res B/W monitor	£449.00
3 Pack C 520 STM 1Mb drive, mouse and 1st Word	£399.00
4 Pack D 520 STM 1Mb drive, mouse, 1st Word incl. High-Res B/W and Hi-Res b/w monitor	£499.00

Blank Disks 3.5 DS/DD	£17.50 for 10
Blank Disks 3.5 DS/DD	£22.50 for 10
Mitsubishi 3.5 DS/DD	£28.50 for 10
Maxell 3.5 DS/DD	£28.50 for 10

Enquiries welcome call in or phone with any problems for friendly advice regardless of where purchased. Phone orders sent same day. Open 7 days a week; Mon, Tues, Wed, Fri and Sat Open til 8pm; Thurs til 6.30pm. Sun 11am-3pm.

HOMIEVIEW BBs
(01-692 7767) 300/300 1200/1200
BBS Enquiries only
8 bit none parity 1 stop bit.
10pm-10am



Prices include VAT and FREE P&P on most items — Overseas orders welcome
CALL FOR BEST PRICES. CREDIT CARD 24 hour Answer Service
HOTLINE 01-691 0207
RING HOMIEVIEW NOW
296 Brockley Road, Brockley, London SE4 2RA

I would like to order:

- 1
- 2
- 3
- 4
- 5

Name _____

Address _____

Tel No. _____

Please send orders and make cheques/PO's payable to:
Homeview, 296 Brockley Road, Brockley London SE4 2RA

Cut-Price Disks from Direct Disk Supplies

from only £9.99 for 25 disks delivered to your door



Offer 1

3.5" disks in FREE plastic library boxes.

Quantity	SS (includes plastic library box)	DS
10 disks	14.99	16.99
20 disks	28.99	33.49
50 disks	69.99	79.99
100 disks	129.99	149.99
200 disks	249.99	289.99
250 disks	299.99	359.99
500 disks	589.99	699.99

Made in Japan by a leading manufacturer, our single and double sided disks are fully tested and certified to 135tpi.

Don't forget - the price includes VAT, delivery and library boxes!

N.B. If you don't need boxes on quantities of 100 or more, then phone and ask for our special trader prices for BULK disks.

**ALL PRICES INCLUDE VAT
& DELIVERY TO YOUR DOOR! -
NO HIDDEN EXTRAS**

Offer 2

New from DDS

Total Price (No extras!)

£ 9.99	25 disks
£ 19.48	50 disks
£ 37.99	100 disks
£ 74.99	200 disks
£ 93.99	250 disks
£185.99	500 disks
£299.99	1000 disks

Don't forget - No extras

**Super Savers
on
Single Sided**

It'll twist your tongue,
but not your pocket!

Offer 5

at Cash 'N' Carry prices

SSDD-48tpi	744	20 disks	£24.99
DSDD-48tpi	745	20 disks	£28.99
DSDD-96tpi	747	20 disks	£35.99

3M - The Brand Leaders

If it's quality, reliability and security, then it's 3M. Direct Disk Supplies always give the best price. In fact it's so special that the minimum quantity is 20 disks.

Remember VAT and delivery are included - No extras from DDS

Offer 4

'Rainbows'
25 Universal 96 tpi coloured
disks, 5 disks of each of five
different colours.

Code your files and programs using DDS 'Rainbows'. Without doubt the best quality and value coloured disk on the market.

£ 18.99	25 disks
£ 35.99	50 disks
£ 69.99	100 disks
£129.99	200 disks
£149.99	250 disks
£279.99	500 disks

**Cash 'n Carry
prices on
disks from
Direct Disk
Supplies**

Same day despatch - at no extra cost

Offer 3

Premium Universals

Not only are all our universal disks individually certified to 96tpi but they are now prepared to an even higher specification to ensure fewer problems, high reliability and value for money. Plus, of course, our Lifetime Warranty. Disks are packed in 25s complete with envelopes, labels and write protect tabs.

£ 14.99	25 disks
£ 26.99	50 disks
£ 49.99	100 disks
£ 96.99	200 disks
£119.99	250 disks
£219.99	500 disks
£379.99	1000 disks

- ★ Full spec Higrade disks, made to 75% clipping level
- ★ Life-time no quibble warranty
- ★ Hub-rings on 5.25" disks
- ★ Label sets and envelopes included
- ★ No extras - VAT and delivery included

Offer 7

CF2 3" Disks - (reversible only)

Box of branded disks
(usually Maxell or Amsoft)

£ 26.99	10 Disks
£ 52.99	20 Disks
£119.99	50 Disks
£229.98	100 Disks

Please remember price includes VAT & delivery.

Offer 6

Box clever

10-Disk plastic library boxes
3.5" Easiview (Strong flip-top plastic box)
£7.99 - 6 boxes
5.25" Vislon-10 (Clear front) £7.99 - 6 boxes

Lockable Boxes

Smoked acrylic with dividers & 2 keys. Price includes VAT & postage.

3.5"	40/50 disk box	£ 9.99
	80/90 disk box	£13.99
5.25"	50 disk box	£ 9.99
	100 disk box	£13.99

**DDS
do it
again.**

Bargain Box.

Have no doubts - these prices are the business.

Price per order qty.	Approx price per
(SSDD 48 or 96tpi)	disk ex-VAT
please specify)	(info only)
20 disks	£ 10.99 .48
40 disks	£ 19.99 .44
60 disks	£ 28.99 .42
80 disks	£ 36.99 .40
100 disks	£ 42.99 .38
200 disks	£ 82.99 .36
500 disks	£199.99 .35
1000 disks	£389.99 .34

DDS offer you branded SCOTCH (made by 3M) at prices below other people's plain label disks. They're certified & tested error-free by 3M, branded disks in tyvek envelopes with re-inforced hubs, labels & WP tabs are also included. We only have a limited stock, and so it's first come, first served. A saving not to be missed!

Offer 8

'Flippies' Best value item.

£ 18.99	25 disks
£ 35.99	50 disks
£ 69.99	100 disks
£129.99	200 disks
£149.99	250 disks
£279.99	500 disks

Reversible disks have a notch on either side and 2 index holes in the jacket. The disk itself is tested double-sided up to 96tpi. So save money and use both sides. Again, disks are packed in 25's with labels and tabs.

How to order

1. DIAL-A-DISK ON 01-979 7811, and give your ACCESS or VISA number and expiry date.
2. Send your cheque etc. to Direct Disk Supplies Ltd.,
3. Official Orders, Bona-fide orders from Universities, Colleges, Schools, Charities, etc are very welcome.
4. Cash orders, no minimum value.

Account orders, minimum value £30.



Direct Disk Supplies Ltd.

Dept PCW , FREEPOST, 129 High Street, Hampton Hill, Middlesex TW12 1BR



SPECIALISTS IN BUSINESS SOFTWARE

SKY FOX £13.95

1040STF + SM125 (Mono)	£627.15
1040STF + SC1224 (Colour)	£895.96
520 STFM	£358.35
520 STM + SF354 D/D + SM125 + 1st Word	£418.28
SF314 1Mb Disc Drive	£179.16
SH204 20Mb Hard Disc	£537.56
SMM804 Dot Matrix Printer	£179.16
SM125 Monochrome Monitor	£134.35
SC1224 Colour Monitor	£358.35

SPECIALIST IN SAGESOFT ST ACCOUNTING SOFTWARE

Sage Bookkeeper	£112.00
Sage Accountant	£170.00
Sage Accountant Plus	£228.00

Whatever your type of business we can install a complete system to meet your requirements

SPECIALIST IN APPLICATION SOFTWARE, HABA, KUMA ETC

Full range of software available. Educational, Government and Export orders accepted

When it comes to computers **ATARI** means **BUSINESS**



Video & Software

(Inside Osprey Business Computers)

5 The Bridge, Wealdstone, Middlesex, HA3 5AB

Tel: 01-861 2407

ALL PRICES INCLUDE VAT



COMPUTER COMPANION SERIES

Business Applications

Easy-to-use guides covering the main features of popular business software packages.

☐	dBASE III Companion Peter Gosling	0 948825 05 7	☐
☐	Book-keeping with Pegasus Dick Waller	0 948825 11 1	☐
☐	SuperCalc 3 Companion Peter Gosling	0 948825 01 4	☐
☐	WordStar 2000 Companion Joanna Gosling	0 948825 06 5	☐

Only £5.95 each

Available from your local bookseller or tick box and return this advert directly to:

Paradigm Publishing Ltd, FREEPOST, Brookhampton Lane, Kineton, Warwick CV35 0BR Tel: (0926) 640606

Cheque with order £..... or Access/Visa

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Name

Address

☐ Please send complete catalogue.

PAR 042

Dealers enquiries welcome.

Paradigm Publishing Ltd

Looking for AT/XT at the most competitive prices in the UK market? The Alphatronics XT and AT, manufactured in Taiwan, have sold in thousands throughout the world under various brands. The XT already has 2000 successful corporate sales under its belt in the UK. Phone with your preferred spec for a quote.

XT **ALPHATRONICS** **AT**

640k Turbo
20Mb

ALPHA add on cards combine Japanese excellence in quality assurance with the competitiveness of Taiwanese pricing:

PC/XT expansion: Colour graphic/printer card £79 ★★ Hercules Monographic/printer card £79 ★★ I/O plus card (printer/1 optional /2 serial/game/clock) £69 ★★ 384KB multifunction (RS232/printer/clock/game) £89 ★★ 384KB memory expansion £79 ★★ Serial port £29.

PC/AT expansion: Enhanced Graphic Adaptor £160 ★★ 3.5Mb memory expansion card (start address selectable, uses 256DRAM) £95 ★★ 2.5Mb multifunction card (parallel/serial all fully assignable LPT1/2 COM1/2/3/4 start address selectable) £99. POWER

150 WXT power supply £79; 225W AT power supply £145

Enquiries to:

(North/Midlands): Alphatronics, Wolverley House, 18 Digbeth, Birmingham B5 6BJ. 021 643 9866

(South/London): GUARDIAN DATA SYSTEMS Ltd, Guardian House, Borough Road, GODALMING GU7 2AE. 04868 25585/8

EUREKA

A DATABASE MANAGEMENT SYSTEM

designed so that the non-technical user can benefit from all its powerful features.

- ★ 40 commands available.
- ★ Up to 256 fields per record.
- ★ Character, date and numeric fields.
- ★ Up to 65535 records per database.
- ★ Extensive context sensitive on-screen help.
- ★ Optional help customisation package to edit the help text and add extra personal topics.
- ★ On-screen design of database record layouts, labels and reports.
- ★ Automatic sorting on any two fields.
- ★ Powerful selection criteria.
- ★ Find any record in less than one second.
- ★ Flexible label generator.
- ★ Comprehensive report generator allows totals, sub-totals and averages on numeric fields.
- ★ Command file execution for routine chores.
- ★ Transfer records between databases.
- ★ Export/Import data to/from ASCII files.
- ★ Mail merge capability.
- ★ Full MS-DOS 2 pathname support.
- ★ Available on 5 1/4 in. 360k disk for IBM PC and compatibles, 3 1/2 in. S/S disk for Apricot PC/Xi.

Eureka system and manual

£99 + VAT

Help customisation package

£10 + VAT

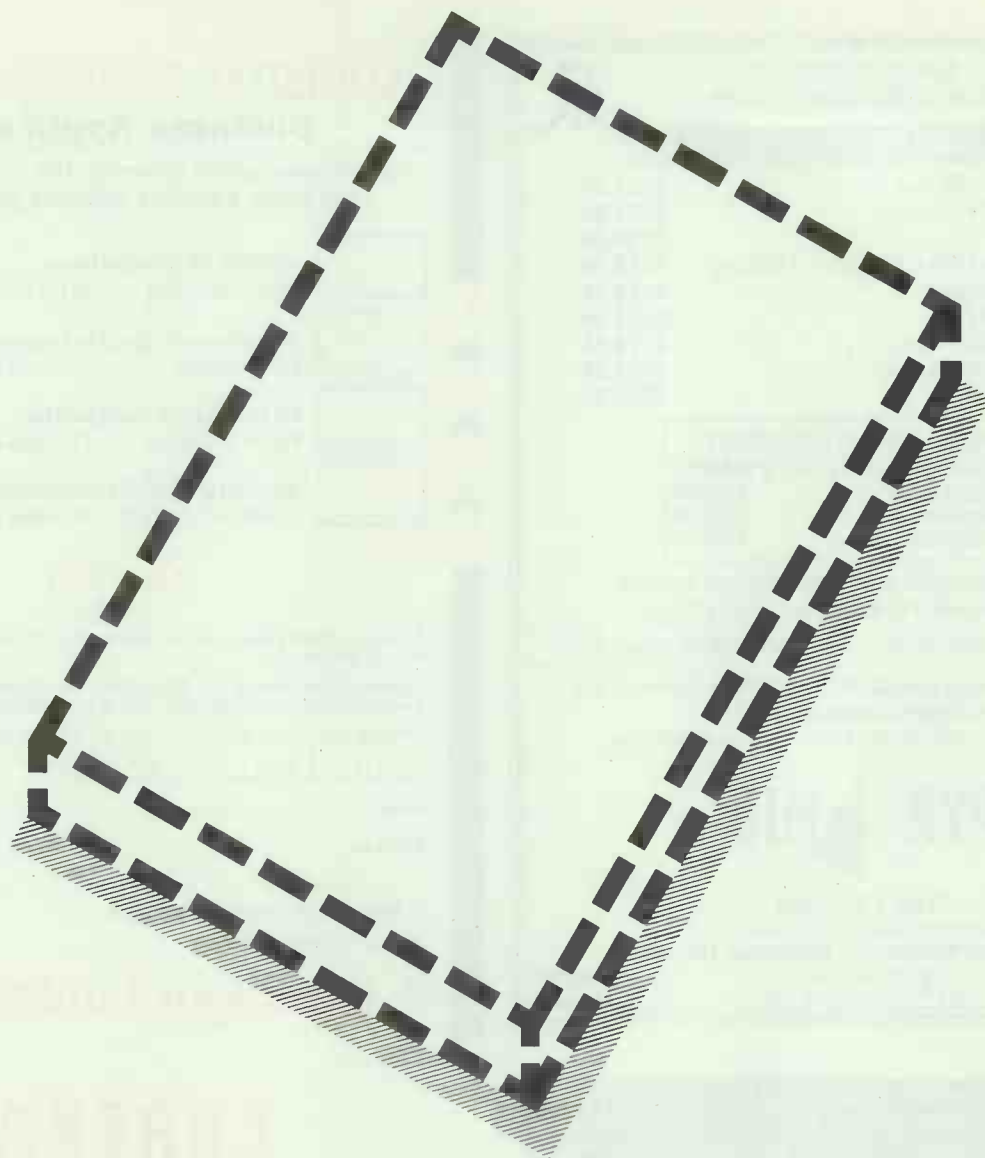
Trial disk with on-disk manual

£10 + VAT

Full specification sheet available from

Solent Software

65 HIGH OAKS CLOSE, LOCKS HEATH, SOUTHAMPTON HANTS, SO3 6SX. Telephone: 04895 89218



Your Missing Link

Please send me _____ copy/copies of The DataComms Book. I enclose a cheque/card no. for £29.95 including p&p with this order **Saving £5** on the published price.

PCW6-87

Name _____

Company Name _____

Address _____

Telephone No. _____

Signature _____ Date _____

Card No. _____ ☐ Access ☐ Barclaycard

Send to VNU Business Publications BV, Directories Booksales Dept, **Freepost 25**, London W1E 6EZ, Telephone 01-439 4242.

The DataComms Book is your missing link to the data communications industry. This comprehensive book, from the publishers of The Computer User's Year Book is the newest and best guide to this increasingly complex area of computing.

Link up to Comms Equipment – get the full technical specifications on the complete range of datacomms equipment so vital for computer managers and communications specialists.

Link up to Comms Services – make sure you know of the essential services available from network developers, consultants and recruitment and training companies plus On-line services.

Link up to Comms Users – pinpoint the top 1300 comms sites in the UK.

Don't miss out on the missing link to data comms. Order The DataComms Book today.



DESKTOP PUBLISHING

WITH PUBLISHING PARTNER™ ON THE ATARI ST



1 WHAT IS DESKTOP PUBLISHING?

Desktop Publishing is a method by which documents can be produced using a computer, software and a printer. These documents are near professional appearance and cost only a fraction of the price which you might otherwise pay to a designer, artwork studio and printer. Because the 'middle men' are eliminated from the production process, desktop publishing allows the user to retain total control over his or her documents, making last minute updates without panic and without incurring extra charges for 'rush' work.

2 WHAT CAN I USE IT FOR?

As we all make use of the printed word in one way or another in our daily lives, the applications for Desktop Publishing are all around us. If you belong to a club or society or if you run your own business, the possibilities are endless! Our list of example applications will give you some other ideas.

Advertisements	Distribution Leaflets	Q/Head Transparencies
Application Forms	Faire Programmes	Personal Cards
Brochures	Invitation Cards	Personal Letterheads
Business Contracts	Invoices	Presentations
Charts & Tables	Labels	Price Lists
Club Certificates	Menus	Special Offer Leaflets
Club Newsletters	Office Forms	Technical Sheets
Dance Tickets	Order Forms	Work Estimates

3 PUBLISHING PARTNER

Publishing Partner, from SoftLogik Corp™, includes all of the features which you would expect in a good Desktop Publishing package. It combines word processing, page layout and graphics facilities all in one program, allowing you to create 'stunning' documents on your Atari ST. First you can do a rough page design and start adding blocks of copy. See how it fits. See how it looks. See how it flows onto the next page. Make some changes. Try a different type style, or a different size, or some borders, some shapes, or even some pictures. Because Publishing Partner incorporates WYSIWYG (What You See is What You Get), you'll see instantly if your new idea works or not. The computer's screen will show you just how the page will look when it prints - no more guesswork. You can adjust fonts, character sizes and even character spacing, anytime and anywhere on the page. Watch an ordinary letter transform into a professional looking piece right before your eyes, as you experiment with mixing graphics and text. And, when you want to see a 'hard copy' of your masterpiece, just send it to any one of the printers which the program supports (the list is growing all the time).



SoftLogik Corp™

SoftLogik Corp™ was set up in the USA by Shawn Fogle and Deron Kazmaier to produce quality desktop publishing software with uncompromising power and features. Publishing Partner was developed after 1½ years of research, working with typesetters and printers and the results achieved are outstanding.

4 SIMPLE, POWERFUL, AFFORDABLE

Printing and publishing is a fairly complex business which takes years of training and experience to master. You wouldn't think so with Publishing Partner, which takes full advantage of the ST's user friendly GEM environment. It is so user friendly and easy to understand, most people find they can produce their first document without even opening the fully comprehensive 159 page manual which accompanies the program. Using the mouse to manipulate the self explanatory pull down menus and windows, you can be up and running in no time, creating a variety of documents quickly and easily. In addition, the flexibility of Publishing Partner allows you to choose between mouse or keyboard operation, whichever suits your personal preference. Although simple to use, Publishing Partner is by no means a simple program. Quite the contrary. Behind the user friendliness of GEM, lies a most complex and powerful publishing tool. The combination of Publishing Partner and Atari's powerful low-cost ST computers has brought an affordable alternative to the desktop publishing systems currently available from Atari's competitors.

5 THOUSANDS OF TYPE STYLES

This is no exaggeration. Unlike most other desktop publishing software packages, which offer you 2 or 3 different fonts, Publishing Partner gives you true flexibility of over 4,000 type styles per font. Publishing Partner offers you 14 variations of each font:

BACKSLANT	MIRROR	STRIKE THROUGH
BOLD	OUTLINE	TALL
DOUBLE U/L	REVERSED	UNDERLINE
ITALICS	SHADOW	UPSIDE DOWN
LIGHT		WIDE

And you can 'mix and match' any number and combination of styles to your own requirements. The total number of possible permutations is over 4,000. And that's not all, each style can be used in any one of 216 sizes in one point increments from 1 point to 216 points! All this is achievable on an unexpanded 520ST with just 512K RAM! Other competing packages require 1024K RAM just to get the larger sizes above 72 point and still can't match all of the variations available.

Publishing Partner is a trade mark of SoftLogik Corp™.

6 WORD PROCESSING

Publishing Partner contains the power and features that you would expect to find on a dedicated word processing package. In addition it includes facilities which a professional typesetting machine would offer. For example the program can cope with 216 different type sizes, with over 4,000 style variations of each one. The following are some of the facilities you will find within the capabilities of Publishing Partner:

- * Adjust margins for any column
- * Change block to uppercase or lowercase
- * Change margin indents
- * Character spacing from -128 to +127
- * Copy text to and from the buffer
- * GEM based
- * Import and export files
- * Insert and delete pages
- * Justifies right/left/centred as you type
- * Justifies to the character/word
- * Kerning from -128 to +127
- * Line spacing/leading in ½ points from -64 to +57
- * Link columns together
- * Macros
- * Manual Hyphenation
- * Merge files together
- * Optional grid & ruler display
- * Over 4,000 type style variations of each font
- * Page numbering
- * Pica, Inches or Centimetre measuring system
- * Print to paper vertically or horizontally
- * Read & merge any ASCII file
- * Search and replace
- * Tabs for charts/tables
- * Unlimited headers & footers
- * User definable page size
- * User variable superscript/subscript characters

7 PAGE LAYOUT

Whatever you require, custom logos, unique borders, unusual letterheads etc. Publishing Partner is your solution. After all, it was specially designed by professionals who realize that there's more to your computer than just typing letters.

- * Accurate to 3 decimal places
- * Adjust character size from 1 to 216 points
- * Auto text flow between columns
- * Change columns on finished page
- * Display 15%-1500% of original size
- * Display actual size
- * Display multiple pages/rulers/text routing
- * Layout multiple columns
- * Print to disk
- * Set auto text routing
- * Snap to guides
- * Superimpose text on tint or tint on text

SEEING IS BELIEVING

We have already told you how powerful Publishing Partner is and how easy it is to use. However, the recipients of your finished work will only be able to gauge the package by the end results of your work. The true test of any Desktop Publishing software is in the output. It produces and it is here that Publishing Partner excels. With its graphics capabilities and the thousands of type styles it produces, there is no end to the design possibilities which you can create. And, with drivers for a variety of printers, including Postscript at no extra charge, you can be sure that you will be able to output in the quality your work deserves. The output quality is truly remarkable. But don't just take our word for it. Before you go any further with your enquiries into Desktop Publishing, return the coupon below for samples of Publishing Partner's output on a variety of printers. We will also send you details and prices of each printer as well as further information on Publishing Partner and the Atari range of ST computers. We don't expect you to take our word for it. We want you to see for yourself how Publishing Partner outshines the competition. So, complete and return the coupon today. Remember, SEEING IS BELIEVING!

8 GRAPHICS

Not only can you load any Degas, N-Vision, Neochrome or digitized pictures into your Publishing Partner files, you can also enlarge or reduce them for an exact fit. Or, you can copy just a section of a picture and then paste it into your document as many times as you want. You can still go back and resize it at any time or crop it to delete unwanted areas. *3 types of line ends, square/rounded/pointed *7 types of line which are all editable *7 weight lines ranging from ½pt to 6pt *40 fill patterns each with a border option making a total of 80 fill options *Ability to produce separations for 2 colours *Copy graphics to and from clipboard *Cut, paste, copy or crop graphics *Import graphics from third party graphic programs such as Degas, Neochrome, N-Vision or any art program that produces compatible ASCII files *Select colours to use and print with *Toolbox features include: Circles, ellipses, boxes, rounded corner boxes, horizontal/vertical lines, diagonal lines, polygons and free hand drawing

9 OUTSTANDING OUTPUT

Publishing Partner is a unique program with a large variety of printer drivers for both laser and dot matrix printers. Dot matrix is supported in both 80 column and 132 column mode, so you could even produce a tabloid width newspaper (11½" wide) on a wide body printer. Drivers are also available for the new technology 24 pin dot matrix printers which can give a fine resolution of 360x360 compared with laser printers at 300x300. The current drivers (included FREE with the program) are as follows with new ones being written on a weekly basis:

9 PIN DOT MATRIX (Various Res)

* Atari SMM804	* Mannesman Spirit-80
* Blue Chip M120/10	* NEC 8023
* Cal Abco Legend 880	* Panasonic KXP
* C Itoh Prowriter	* Star Gemini & SG

9 PIN DOT MATRIX (240x216 Res)

* Citizen MSP	* Mannesman Tally MT
* Epson RX/FX/EX	* Star NX/SD

18 PIN DOT MATRIX (240x288 Res)

* Okidata Microline 292	* Okidata Microline 293
-------------------------	-------------------------

24 PIN DOT MATRIX (360x180 Res)

* C Itoh C-715	* Epson SQ
* Epson LQ	* Toshiba P321

24 PIN DOT MATRIX (360x360 Res)

* NEC P6/P7	* NEC XL new series
-------------	---------------------

LASER PRINTERS (300x300 Res)

- * Centronics PP-8 in Epson or H.P. Laserjet mode 1½Mb RAM
- * Any other H.P. Laserjet compatible with 1½Mb RAM
- * QMS PS800 or Apple LaserWriter - Postscript
- * Any other Postscript compatible printer

OFFICIAL UK VERSION

The official UK version of Publishing Partner has a pound (£) sign as a standard part of its character set. Other versions have also been imported unofficially from the USA and have a dollar (\$) sign instead of a £ sign. These versions will not be supported by the UK distributors or their dealers. The UK version also contains clip art, different fonts and a full range of printer drivers. Ensure that you buy the official UK version, not an unofficial import with incorrect characters.

£139.00

(+VAT=£159.85)

Publishing Partner is available from Atari ST Dealers throughout the UK. If your local dealer does not have Publishing Partner in stock, it can be obtained by mail order (Postage & Packaging free) from:

SILICA SHOP Ltd, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX Tel: 01-309 1111

INFORMATION REQUEST FORM

To: Silica Shop Ltd, UPDAT 0687, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA 14 4DX

Please send me further details on: **DESKTOP PUBLISHING**

Mr/Mrs/Ms: Initials: Surname:

Address:

Postcode:

I am interested in the Atari ST
I already own an Atari ST

☐ PCW 0787





KIRIN PRICE GUIDE

AMSTRAD**Canon****CITIZEN****EPSON****IBM****MULTIFUNCTION BOARDS**

Card with 640K on board	£142.00
256K Memory Board	£85.00
384K Memory Board	£119.00
AST Advantage 1.4Mb	£390.00
AST Rampage 1.5Mb	£490.00
PC-Express 8086, 8087 (option)	£440.00
Orchid Tiny Turbo 80286	£390.00
Maths Co-Pro 80875 MHz	£110.00
Maths Co-Pro 80287 8MHz	£225.00

COMMUNICATION BOARDS

IRMA Board	£785.00
ATACHMATE	£998.00
PCOX/Standard	£580.00
PCOX Plus	£850.00
PCOX/3720 PC	£1250.00
PCOX/Standard Remote	£425.00
PCOX/3720 PC Remote	£950.00

KEYBOARDS

Keytronics 5150 (83 Keys)	£130.00
Keytronics 5151 (99 Keys)	£195.00
EECO 8600 for AT/PC/XT (84 Keys)	£99.00

EGA CARDS

SWT SIGMA 256K	£195.00
Everex Enhancer 256K	£210.00
Paradise Auto Switch 256K	£275.00
GENOA with own B10S 256K	£245.00

**OLIVETTI COMPUTERS — MAIN DEALER**

Special This Month M19 512K 360K FDD	£750.00
Hi-Res Mono & Keyboard	
M24 2 x 360K FDD 640K MEM	
Hi-Res Mono & Keyboard	£1245.00
M24SP 20Mb 640K RAM 10MHz Mono & Keyboard	£1752.00
M28 20Mb 1.2Mb FDD 512K	£2470.00
LEASING — FINANCE AVAILABLE	

COMPAQ

Compaq Desk-Pro Model 3	£1665.00
Compaq Desk-Pro 286 Model 40	£2705.00
Compaq Desk-Pro 386 Model 70	£4799.00

AMSTRAD COMPUTERS

PC1512SD	£449.00
PC1512DD	£559.00
PC1512HD 10Mb	£799.00
PC1512HD 20Mb	£899.00

Colour Monitor £275.00 extra

All softwares available including SAGE Soft and others.

Please ring for quote.

MONOGRAPHIC CARDS

Hercules Compatible	£89.00
Hercules Graphic Card	£149.00
GENOA Spectrum (132 Column)	£139.00

COLOUR CARDS

Paradise Short Card	£92.00
Hercules Compatible 1/2 Card	£65.00

HARD DISKS & CARDS

Seagate 20Mb Upgrade Kit	£298.00
NEC 20Mb Upgrade Kit	£350.00
NEC 40Mb Disk Drive	£420.00
Mini Scribe 20Mb Hard Card	£350.00
WD Filecard 20Mb	£450.00
PLUS Hardcard 20Mb	£595.00
Mini Scribe 30Mb Hard Card	£385.00
1.0 Mega Bernoulli Box 10 + 10	£1995.00
1.0 Mega Bernoulli Box 20 + 20	£2750.00
1.0 Mega 20 + 20 Plus 80Mb Disk	£3250.00
1.0 Mega 10Mb Cartridges	£52.00
1.0 Mega 20Mb Cartridges	£60.00
1.0 Mega IBM Interface Card	£125.00

TAPE BACK-UP

Maynard 20Mb Portable	£766.00
Maynard 60Mb Portable	£966.00
Maynard 20MN Internal	£575.00
Maynard 60Mb Internal	£850.00
Genoa 20Mb External (TEAC Drive)	£875.00
Genoa 60Mb External	£989.00
Genoa 20Mb Internal (TEAC Drive)	£730.00
Genoa 60Mb Internal	£790.00

TERMINALS

WYSE 30	£315.00
WYSE 50	£385.00
WYSE 60	£455.00

PRINTERS

Citizen 120D	£165.00
Citizen MSP25	£412.00
Epson LX86	£210.00
Epson FX85	£323.00
Epson FX1000	£410.00
Epson LQ800	£456.00
Juki 5510	£267.00
Juki 5520	£347.00
Juki 6100	£255.00
Juki 6200	£444.00
Canon A-50	£289.00
Canon A-55	£360.00
Star NL-10	£185.00
Star NB-15	£750.00
Panasonic P1080	£180.00
Panasonic P1092	£284.00
Panasonic P1592	£365.00

IBM

PC XT SDD	£1298.00
PC XT DDD	£1376.00
PC XT Fixed Disk Drive	£1526.00
PC AT (enhanced)	£2628.00
PC AT (expended)	£2950.00
PC Keyboard UK	£126.50
PC XTS E. Keyboard	£145.00
PC AT Keyboard UK	£157.00
Mono Monitor	£140.00
Colour Monitor	£373.00
ProPrinter	£347.00
Quietwriter/2	£1105.00

LASER PRINTERS

QMS K8 (KISS)	£1645.00
Canon LBP-8 A1	£1525.00
Canon LBP-8 A2	£2650.00
Canon A1-A2 Upgrade Board	£750.00
ACE CX-1 (Full IBM Graphics)	£2150.00
H-P Laserjet	£1550.00
H-P Laserjet Plus	£1995.00
Toner Cartridge	£64.00
TiOnmilLaser (15PPM)	£3300.00
Kyocera F1010	£2725.00
Kyocera F20-10	£3800.00

SOFTWARES

LOTUS, MICROSOFT, SAGE, MICROPRO, BORLAND, ASHTON-TATE DIGITAL RESEARCH ETC.

MODEM CARD

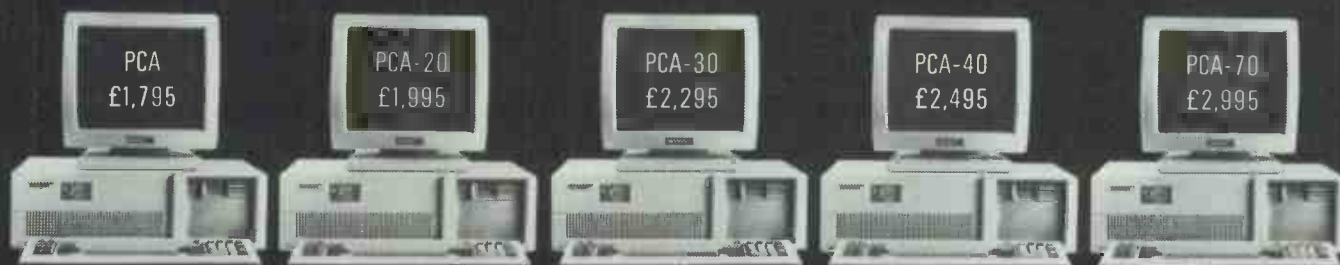
Special Modem for Amstrad PC1512	£129.00
Dowty Quatro Card V22 bis	£635.00
PC Com Quatro Card	£635.00
Miracle Tech WS4000	£150.00
Thorn EMI VX524	£380.00

MONITORS

ADI-DM14	£125.00
Eizo 8030 (RGB)	£320.00
Eizo 8042 (EGA)	£499.00
Tatung (EGA) 1380	£385.00
NEC Multi-Sync 14"	£485.00

KIRIN

**KIRIN COMPUTING SYSTEMS LTD • UNIT 69 •
ABBAY BUSINESS CENTRE • INGATE PLACE •
QUEENSTOWN ROAD • LONDON SW8 3NS •
TEL: 01-720 7722 • 720 5064 • TELEX: 946461**



The Tandon PCA range. We beefed them up then slaughtered the prices.

Recently we decided to add more meat to our AT compatible range.

So we fed them up with serial/parallel ports, Hercules compatible graphics and a megabyte of memory on the main board.

But we didn't change the prices. Until now.

Because now we've actually cut the cost of some of our computers. And that's by as much as 20%.

But not everything has changed.

Each computer is still compatible with the familiar, established industry standard.

And still has the reliability and expertise of the world's leading vertically integrated pc manufacturer behind it.

To find out more send us the coupon. It could kill off all your problems with computers.

Please send me more information on Tandon's low price, high quality PCA Range. Tandon (UK) Ltd. Freepost, Redditch, B97 4BR. Tel: (0527) 46800.

Name _____
Job Title _____
Company/Address _____
Postcode _____ Tel. _____
Nature of Business _____
No. of Employees _____
No. of installed PCs _____

PCW 7
Tandon



TOP 20 DESKTOP PUBLISHING SYSTEMS AT TOP 20 PRICES

	RETAIL	OUR PRICE
DTP COMPLETE SYSTEMS		
AMSTRAD PC1512		
10MB MONO COMPUTER		
CENTRONICS LASER PRINTER		
PAGEMAKER SOFTWARE	3398	3199
MACINTOSH 512K COMPUTER		
LASERWRITER PRINTER		
RAGTIME SOFTWARE	7239	5995
IBM PC OR COMPATIBLE SYSTEM ADD-ON		
CENTRONICS PP8 LASER		
PAGEMAKER SOFTWARE	2615	2399
LASER PRINTERS		
CANON LB8-8 A1	2595	1895
CANON LB8-8 A2	3850	2795
CANON LBP-CX+	2939	2350
2MB LASER INTERFACE		
MANNESMAN TALLY MT910	3195	2595
HP LASER JET PLUS	3518	2749
HP LASER 500	4295	3400
AST TURBO LASER	4150	2995
IMAGE SCANNERS		
CANON IX-12	1450	1045
SOFTWARE		
PAGEMAKER MAC & IBM	595	POA
MAC AUTHOR	199	169
MAC RAGTIME	299	239
MAC PUBLISHER II	175	136
MAC READY SET GO	169	149
XEROX VENTURE - IBM	795	669

PRICES SHOW EXCLUDE POST AND PACKING AND V.A.T. AND
ARE CORRECT AT TIME OF PRINTING

WHY PAY MORE?

- Call us for our famous eye-testing Price List with over 2,000 items inc: Apple, IBM, Apricot, Epsom software and hardware, printers, monitors, disks. All at great savings.
- Credit accounts for PLC companies, government depts, hospitals, local authorities, schools, colleges, universities.
- Fast delivery.
- Export a speciality.
- Quantity discounts.
- Professional advice.
- Hot-Line support on all products sold.

AC. INTERACTIVE

FREEPOST, LEAMINGTON SPA, WARWICKSHIRE
CV32 5HH, ENGLAND
0926-313345



PLEASE READ THIS

WHOLESALE PRICES TO YOU THE USER

★ BUY 5.25" DISKS

Plain label by leading manufacturers ie. R.P.S. Wabash etc.

	25	50	100	200	500
SS/SD 48tpi	£11.00	£20.00	£38.00	£69.00	£165.00
SS/DD 48tpi	£11.50	£22.00	£41.00	£74.00	£175.00
DS/DD 48tpi	£12.00	£23.00	£43.00	£83.00	£195.00
DS/DD 96tpi	£13.00	£24.00	£45.00	£85.00	£202.00

All above inc. envelopes, label sets and hub rings

UK MADE Library cases bought with above only £0.95 EACH

SPECIAL OFFER

Buy 100 SS/DD 48tpi Disks without envelopes for
ONLY £33.00

3.5" DS/DD DISKS

Plain label. Made in Japan

	10	20	50	100	200
£	18.00	30.00	72.00	135.00	265.00

LOCKABLE DISK BOXES AND LIBRARY CASES.

5.25" 10 Capacity Ref. VIS 10 Library case	£1.30	Discount for qty 10% for 3+ 20% for 6+ 25% for 12+
5.25" 50 Capacity Ref. YA50L	£8.50	
5.25" 100 Capacity Ref. YA100L	£10.00	
3.5" 10 Capacity Ref. MCS 10	£1.30	
3.5" 40 Capacity Ref. YA40L	£9.00	

ACCESSORIES

5.25" Head Cleaner + Fluid	£4.00	Discount for qty 10% for 3+ 20% for 6+ 25% for 12+
IBM - Centronics Printer Cable 2m	£11.00	
Printer Stand 80col. Smoked Plastic	£15.00	
VDU Tilt & Turn Table 25"x36" 12" Base	£10.00	
VDU Tilt & Turn Table 25"x36" 14" Base	£12.00	
VDU Anti-static Glass Screen Cleaner	£4.99	
Key Board & Plastics Cleaner	£5.50	
Complete 5.25" Computer Cleaning Kit inc. 5.25" head cleaner, VDU & Keyboard cleaners, Puffer Brush & Cloths	£13.80	

SPECIAL OFFERS

Buy 25 Disks + a 50 capacity lockable box for
ONLY £18.84

Buy 25 Disks + a 100 capacity lockable box for
ONLY £19.74

Buy 50 Disks + a 100 capacity lockable box for
ONLY £30.74

Please state which disks you require
i.e. SS/SD, SS/DD, DS/DD, - 48 tpi or 96 tpi

REMEMBER THE PRICE YOU SEE IS ALL
YOU PAY.
THEY INCLUDE VAT AND CARRIAGE

Cheque or Postal Order to:



Manor Court Supplies Ltd

Dept 7PCW, Glen Celyn House, Penybont,
Llandrindod Wells, Powys LD1 5SY
Telephone: 0597 87784 or 0597 87792

Orders accepted from educational & government depts.
Dealer enquiries invited.

Scandinavian countries please contact our agent for prices
Magnum Data, PO Box 627, N-5001 Bergen, Norway.

IS CORPORATE DATA LOCKED AWAY FROM YOUR DEPARTMENT?



If your department depends on the average PC you've got more chance breaking out of Wormwood Scrubs than breaking into the corporate data.

Honeywell Bull's new Departmental System with One Plus software gets you talking to virtually any other computer,

which beats solitary confinement.

And because the system is based on the new DPS6 PLUS, it gives you flexible growth and it comes with full office automation functions.

Which makes running an office easy work, not hard labour.

Honeywell Bull is jointly owned by Honeywell Inc., Groupe Bull and NEC.

For more details about one of the most comprehensive ranges of computer systems in the world, call 01-568 9191 and ask for the Information Desk.

And get time off for good behaviour.

• • • • **DESIGNED WELL** • • • • **BUILT WELL** • • • • **HONEYWELL BULL** • • • •



Modems for your PC...

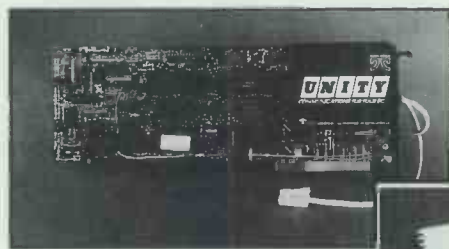
The Choice is Simple.

Dacom have developed a range of communication packages to give PC users access to today's wide range of communication services.

Each UNITY package comes complete with an internal auto-dialling modem to suit your application, DATATALK communications software and full documentation ...
the choice is simple.

UNITY

- V21 (300 BPS) + V23 (1200/75 BPS)
- Error correction
- Hayes compatibility
- Autoanswer/autodial
- Datatalk software



UNITY

Gold

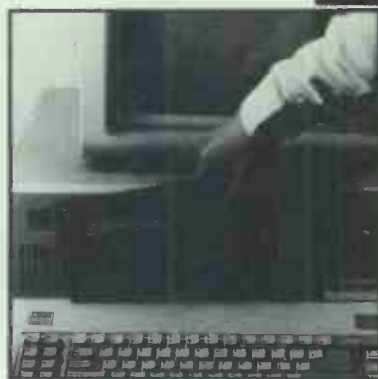
- V21 + V23 + V22 (1200/1200 BPS)
- Half card format
- Hayes compatibility
- Audio call monitor
- Complete package



UNITY

Quad

- V21 + V23 + V22 + V22 BIS (2400/2400 BPS)
- MNP error correction
- Extra asynchronous port
- Audio call monitor
- Complete with Datatalk



Dacom also supply a complimentary range of stand alone modems and communication equipment.

For details phone Dacom Systems now on (0908) 322322 and we will be pleased to discuss your individual requirements

UNITY

COMMUNICATIONS FOR YOUR P.C.

Trust Dacom to Communicate

Dacom Systems
Limited
26-27 Heathfield
Stacey Bushes
Milton Keynes
MK12 6HR
England
Tel: 0908 322322
Telex: 82477

SCREEN 1 **SUPERCALC 4**
SCREEN 2 **SUPERCALC 4**
SCREEN 3 **SUPERCALC 4**

Major networks get top supporting feature...

From wherever you're sitting you have to agree SuperCalc4 is now the UK's leading spreadsheet attraction.

Because the latest release sees SuperCalc4 become the first major integrated spreadsheet to support all the leading network protocols. It also now supports Lotus PIC files.

And SuperCalc4 has increased its international appeal. User selection of currency and date formats is among SuperCalc4's new, extended standalone features.

And while you save time and money through shared data and expensive peripherals, the price of SuperCalc4 stays the same.* You could say it's a shared experience where admission is free.

**COMPUTER
ASSOCIATES**
Software superior by design

Micro Products Division,
Edinburgh House, 43-51 Windsor Road,
Slough, Berkshire. SL1 2EQ

Tel: Slough (0753) 77733.

NOW SHOWING AT A SCREEN NEAR YOU

We invite you to take a look at the SuperCalc4 performance. For a working copy (IBM and compatibles) fill in this coupon and send to us today.

Name:

Position:

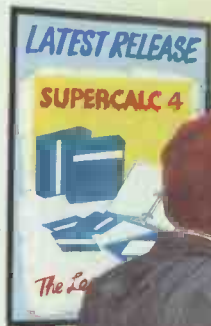
Company:

Address:

.....

.....

*Existing SC4 users can upgrade for £35.



SHARPEST VISION

SHARPEST PRICE **£399**



THE NEW OPUS EGA MONITOR AND CARD

The new enhanced graphics monitor system from Opus is proud to display something none of its rivals can emulate — a price tag of only £399+VAT. It's enough to turn even the most colourful computer display green with envy.

Opus offers you Britain's most affordable enhanced graphics upgrade — a 14" super high resolution EGA colour monitor and versatile IBM/Hercules-compatible enhanced graphics display board with 256K of display memory for under £400. Together they make a stunning combination and stunning graphics.

The Opus display card will emulate IBM's EGA, CGA and MDA boards as well as the Hercules

Monochrome Graphics Adaptor. So if you need 16 colours from a palette of 64 for computer-aided design and business graphics, or pin-sharp colour and monochrome text for wordprocessing and desktop publishing, it's all available. The Opus monitor offers maximum 640x350 resolution for rock-steady graphics and, like our EGA display board, it's covered by a full 12-month warranty.

So for the sharpest vision at the sharpest price call Opus today on **0737 65080**

We offer special education and government discounts and welcome dealer and export enquiries.

Opus Supplies Ltd, 53 Ormside Way, Holmethorpe Industrial Estate, Redhill, SURREY RH1 2LW.

Opus

IBM is trademark of International Business Machines Corporation.

Hercules is a trademark of Hercules Computer Technology

THE INSTITUTION OF
ANALYSTS & PROGRAMMERS



BUSINESS LEAFLET

The Council wishes to announce the preparation of a leaflet listing members' businesses which supply services relating to systems analysis and computer programming. The leaflet is intended for the many potential clients who request the Institution to recommend such services. Copies of the necessary data entry form have been posted to the known addresses of all members together with the 1987 Directory of Members and will be welcomed back as quickly as possible. Similarly, there is only a limited edition of the Directory which is already regarded as a valuable reference book so any member who has not received a copy (free to members, £17.50 including postage to non-members) is advised to inform the Records Department without delay.

The Institution of Analysts & Programmers is the principal association for professional systems analysts and computer programmers in the Free World. It is also the most highly regarded supplementary association for practising accountants, administrators, doctors, designers, engineers, lawyers, lecturers, mathematicians and scientists who use, develop and organise systems analysis and computer programming as a significant part of their professional undertakings.

A guide to the requirements and gradings of membership is available upon request to the Applications Officer either by letter or by telephone.

01-898 2385

The Institution Of Analysts & Programmers
GIBSON HOUSE, FOURTH CROSS ROAD, TWICKENHAM
MIDDLESEX, TW2 5EL, ENGLAND

Microsoft Authorised

QA=MS OS/2

The First Authorised Training Course

"The reason we gave QA our authorisation for this course was the unqualified success of the QA/Microsoft Windows course. We can rely on QA instructors to give software developers a thorough understanding of our new and extremely powerful operating system."

Phil Buggins, Technical Director of Microsoft Ltd.



QA Training Ltd., Cecily Hill Castle, Cirencester, Glos. GL7 2EF Tel. (0285) 5888

*MS OS 2 is a trademark of Microsoft Corporation

◆ DIAMOND COMPUTERS

01-445 4456 (4 lines)

◆ Supply of Systems and Peripherals

Tandon VICTOR

NorthStar Opus.

AMSTRAD PC1512

◆ On-site maintenance available for your PC's and Peripherals. Phone for quotations

◆ Training available in our newly equipped training centre.
Individual and company courses

◆ Multiuser and Network Solutions

◆ Industrial and Commercial Applications

◆ Bespoke Software Developments

"We have the expertise to look after you."

Diamond Computers Ltd
1390 High Road Whetstone
London N20 9BH
01-445 4456

4

Emmanuel St.

The AMSTRAD Computer Centre for Cambridge

• full support for all Amstrad micros
• technical advice • software

we know computers

1 Business & Professional
Tel: 0223 65335/4



Low-cost Systems
Tel: 0223 358264

4

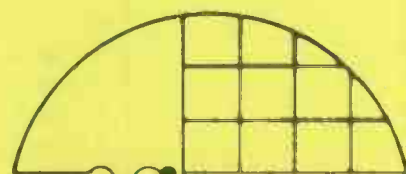
Cambridge Computer Store
1 & 4 Emmanuel Street, Cambridge



tra memory
tra expandability
tra flexibility



buffer



micro
control systems

- USER UPGRADEABLE TO 4096K MEMORY
- 4 FULLY ACTIVE INTERFACES
- COMPATIBLE WITH ALL MICRO-COMPUTER SYSTEMS
- SIMPLE TO USE BUT POWERFUL CAPABILITIES
- ERGONOMICAL DESIGN FOR DESK TOP CONVENIENCE

Micro Control Systems' X buffer allows users to connect previously incompatible hardware through its unique combination of 'crossover' Serial and Parallel switching interface and expandable memory capacity.

Thanks to its four interfaces – 2 input, 2 output – X buffer can be operated in several modes.

- 1 computer can use 2 printers/plotters.
- 2 computers share 1 printer/plotter.
- 2 independent 1-in/1-out buffers.
- 2-in/2-out crossover.

Data input can be redirected and can be used, for example, to send data to one output and a copy to another or, if a printer malfunctions, to direct output to the other. The COPY switch can be set to produce up to 255 copies, while the BYPASS switch

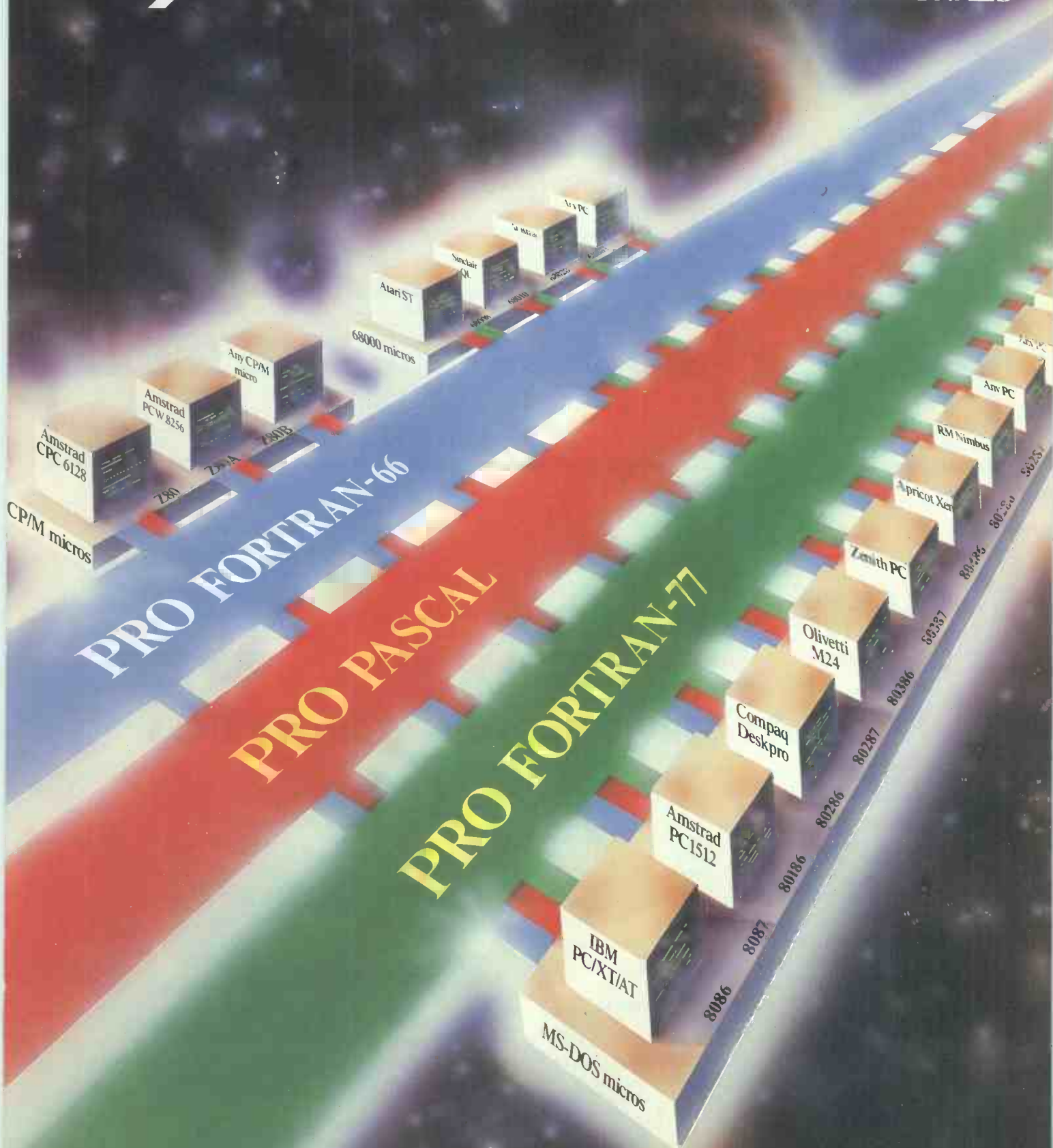
allows direct transmission to a printer or plotter, bypassing the buffer. Pressing the RESET button aborts any printout taking place but retains data held by the buffer. An added benefit is a 'Soft Mode' option which allows the computer to override the X buffer switch's instructions.

X buffer is user upgradeable to allow it to grow as an application demands. Simply by adding plug-in memory modules it is possible to equip the X buffer with a massive 4096K of usable memory at a fraction of the cost of other alternatives.

FREEPOST SANDIACRE NOTTINGHAM NG10 5BR
Name _____
Position _____
Company _____
Address _____
Phone _____
PCW5

Prospero Software

LANGUAGES FOR MICROCOMPUTER PROFESSIONALS

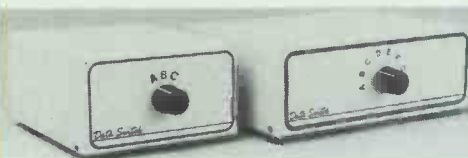


Prospero Software is dedicated to languages and to customer support.
For an opinion ask a colleague; for information call 01-741 8531 or write to
Prospero Software Ltd, 190 Castelnau, London SW13 9DII, England.

PRINTER SWITCHES

DIRECT from the MANUFACTURER

LINK TWO OR MORE MICROS TO ONE PRINTER,
PLOTTER, MODEM ETC. OR VICE VERSA.



- ROBUST METAL HOUSING
- ELECTRONICALLY TESTED
- 28 DAYS APPROVAL
- 12 MONTHS GUARANTEE
- OFFICIAL ORDERS ACCEPTED
- 24 HOUR DESPATCH

SERIAL DATA SWITCHES

RS 232/V24.25 way 'D' sockets

ALL 25 LINES

MODEL	SWITCH	PRICE
DV2	2 way	£59
DV3	3 way	£69
DV4	4 way	£79
DV5	5 way	£89
DVX	2 way cross-over	£79

LINES 1 to 8 & 20

DR2	2 way	£49
DR3	3 way	£57
DR4	4 way	£65
DR5	5 way	£73
DR8	8 way	£109
DRX	2 way cross-over	£65

9 way 'D' sockets ALL 9 LINES

DN2	2 way	£45
DN3	3 way	£52
DNX	2 way cross-over	£59

PARALLEL DATA SWITCHES

CENTRONICS.

36 way Amphenol sockets

MODEL	SWITCH	PRICE
DC2	2 way	£65
DC3	3 way	£79
DC4	4 way	£95
DC5	5 way	£109
DCX	2 way cross-over	£95

IBM PC.25 way 'D' sockets

DP2	2 way	£59
DP3	3 way	£69
DP4	4 way	£79
DP5	5 way	£89
DPX	2 way cross-over	£79

IEEE-488.24 way Amphenol sockets

DE2	2 way	£89
DE3	3 way	£109
DEX	2 way cross-over	£129

PLEASE ADD VAT AT 15%. ALL ITEMS CARRIAGE PAID

Trade, Educational & Export enquiries welcome. Cables also available. Ex stock & Custom built.



HOMESTEAD DATA PRODUCTS LTD

145 EDINBURGH AVENUE, SLOUGH. SL1 4UA
Fax (0753) 691037 Telex 846086 CABLIN-G

Tel: (0753) 691661



©1987

MICRO MINDER CONSULTANTS LTD

QUALITY SERVICE AT UNMATCHED PRICES

Computers

TANDON PCX10 10MB HD	£775
PCX20 20MB HD	£899
PCA20 20MB HD	£1435
PCA30 30MB HD	£1645
PCA40 40MB HD	£1795
PCA70 70MB HD	£2145
CGA, EGA SYSTEMS ALSO AVAILABLE	
AMSTRAD PC1512 HD20 MON	£879
PC1512 HD20 COL	£1049
KAYPRO 286i 20MB HD	£1575
30MB HD	£1750
386 40MB HD	£3750
AST PREMIUM 20MB HD	£1575
40MB HD	£1850
VICTOR V286 30MB HD	£1740
VPCII 30MB HD	£1299

including 1 yr on site warranty

Printers

EPSON LX 800	£205
FX800	£322
FX1000	£413
EX800	£415
EX1000	£558
LQ800	£470
LQ1000	£625
AMSTRAD DMP4000	£299
JUKI 6100	£270
6200	£415
STAR NL10	£225
SR10	£333
SR15	£393
HP LASERJET 2	£1965
CANON 8A1	£1599
OKI LASERLINE 6	£1599

Software

dBASE III PLUS	£375
dBXL (dBASE III CLONE)	£99
FRAMEWORK II	£350
JAVELIN	£380
LOTUS 123	£295
MULTIMATE ADVANTAGE	£299
PEGASUS SINGLE USER	£175
MULTI USER	£335
SMART V 3.1 INTEGRATED	£390
SYMPHONY	£389
SAGE FINANCIAL CONTR	£299
VENTURA	£675
WORDPERFECT	£275
WORDSTAR PROFESSIONAL	£235

CALL FOR PRICES OF HARDWARE AND
SOFTWARE NOT LISTED HERE
PRICES ARE CWO AND EXCLUDE VAT



01-870 4650/7431

68 Upper Richmond Road, London SW15 2RP.

S&S £10 SOFTWARE

SPECIAL OFFER - SEVEN OF OUR BESTSELLERS FOR ONLY £50

- UNDELETE** Lets you recover files that you have accidentally deleted from floppy or hard disc; also works in subdirectories. Works on all versions of DOS. £15 + VAT
- DOSMENU** A menu-driven front end for DOS, lets you choose any application (eg 123 or Word-Star) or DOS command with a single keystroke command from a menu
- FASTHELP*** You can design your own help screens, which are just a keystroke away, even when running a program. Also has cut-and-paste from one program to another
- QPRINT*** Lets your printer run while you use your PC for other jobs
- REDIRECT*** Lets you redirect the printer to a file
- SIDELINE** Prints your wide spreadsheet printouts sideways. Needs IBM graphics printer or EPSON or compatible
- TYPEWRITER** Turns your computer into a typewriter. Works with all printers

Send your orders to:
S&S Enterprises, Micro Division
31 Holloway Lane, Amersham
Bucks HP6 6DJ

PROGRAMS MARKED * ARE FOR IBM'S AND COMPATIBLES ONLY

THE DOS UTILITIES

- ALIAS*** Lets you use short abbreviations for long DOS commands. eg zd can stand for "dir*.ind/w/p"
- GRAFSHOT*** Dump the contents of a graphics screen to a file
- DOSREDIR*** Lets you redirect the 5 DOS devices (input, output, error, printer, comms) to a file. But it doesn't work if a program bypasses DOS
- SUPADU-PADIR** Used just like DIR, but keeps a master list of all your files on all your discs, and prints it out for reference
- BOOK*** Lets you have an on-line pop-up manual of up to 36 pages of information

DR SOLOMON'S DATA RECOVERY SERVICE

We recover deleted or corrupted files, corrupted, damaged or vanished disks, formatted hard disks. Its expensive but NO FIX-NO FEE. We can tackle ANYTHING

172 PROGRAMS NOW AVAILABLE
PLEASE PHONE FOR FREE CATALOGUE

THE WORD PROCESSING UTILITIES

- DWASCII** Converts DisplayWrite files to ASCII
- DIAGRAMMER** For designing diagrams on the screen, which can then be printed. Does not need a colour screen.
- EASYEDIT*** A full-screen editor, but with many wordprocessor facilities and windowing

THE PRINTER UTILITIES

- PRINTLOG*** Logs all parallel printer output to a file as well as sending it to the printer
- SERIALOG*** As above for serial printer
- REDSER*** Lets you redirect the serial printer to a file
- POUNDLPT** Makes your parallel printer do a pound sign even if it doesn't have one, by doing L, backspace, dash
- POUNDCOM** As above for serial printer
- QUALIPRINT** Lets a cheap dot matrix printer do high quality printing. Works with IBM, Epson and compatible printers
- 4 FONT SETS** Available for use with QUALIPRINT for business and decorative use (£10 each) or all four for £30)

ALL THESE PROGRAMS ARE NEW !!!

CHOOSE ANY FIVE FOR £40!

£10 & £15 Programs only

All programs cost £10.00 except where stated +VAT. You can buy a package of any nine programs for £65 or any five for £40. This offer only includes our £10 and £15 programs. PLEASE ADD VAT TO ALL ORDERS



S&S ENTERPRISES (AMERSHAM) LTD. (02403) 4201 & 28095

Advantage

The Independent Computer User Group

(PCW 1) 33 Malyns Close, Chinnor, Oxfordshire OX9 4EW.
Tel: 0844 52075

Our prices include Postage and VAT

MIXED SOFTWARE

- MIX C Compiler: full KR implementation with floats £29.95
- MIX C Trace — window programmed monitor & debugger £29.95
- MIX C Split Screen Editor: useful companion to MIX C £19.95
- MIX Assembler Utility: integrated masm assembler into C £6.95
- Example Discs: tutorial examples ready to compile £4.95

UTAH COMPILERS

- UTAH COBOL — One set compiler and run £34.95
- UTAH PASCAL — Floating points and indexed file I/O £34.95
- UTAH FORTRAN — with trace facility £34.95

BORLAND TURBO

- TURBO PASCAL fast card and comprehensive compiler £64.95
- TURBO TOOLBOXES database, graphics, editor each £49.95
- TURBO PASCAL TUTOR £29.95
- TURBO PROLOG £64.95
- TURBO BASIC £64.95
- TURBO C £64.95

HI SOFT SOFTWARE

- AZTEC C Prime the choice for the seasoned programmer £69.95
- FTL Modular — 2 fast convenient versatile £49.95
- FTL Editor/Toolkit full service to the editor £36.95
- NICE — 86 Comprehensive set of disc recovery programmes £27.95

OTHER ITEMS

- 10 Blank 5¼" DSDD 48tpi discs with labellers and tabs £6.95
- Catalogue on disc with games and utilities £2

The Advantage policy

- ★ All advertised items are normally in stock.
- ★ We aim to dispatch all orders by the next working day.
- ★ We refund payment if you are not satisfied for any reason.
- ★ Free catalogue on a disc for all orders.
- ★ Join our user group and obtain £2 off all items offered.

Order by post or telephone. Overseas please add £1 per item (except compilers — add £3)

PC SOFTWARE

Here is a selection of the most popular discs from our library of over 750 user supported and PD software. On-disc documentation is usually supplied with each program.

Each disc £6.95 (members £4.95).

- PC-Write-Multi function Word Processor box file size. 100 page on-disc manual.
- PC-Type (3 discs) powerful new WP with fast spelling checker.
- PC-File III (2 disc) new version of database.
- PC-CALC-Spreadsheet similar to 123 (64 column x 256 row). 30 page on-disc manual.
- Freeway accounts and payrolls (3 discs) popular British Package.
- PC TUTOR — Course in Computers and DOS.
- CASH TRAC — Household Budget Organiser.
- PRO COMM — Comprehensive Communications.
- PC Desk Team — more features than Desk Mate.
- ULTRA UTILITIES — Powerful disc Doctor with disc mappee, unerase, sector editor.
- BEST UTILITIES — Selective delete and copy, print spooler, file, browse, super type.
- BEST GAMES — Two classics — Space Invaders and Packman, plus Life, Bugs, Castle (adventure).
- ASSORTED GAMES — Pinball, Catch The Baby, frogger, Multi-Maze, War Game.
- ARCADE GAMES — 3 Demon, Donkey Kong, Golf, Fortune, Pango, Pitfall, Pyramid.
- PC — Chess — Full feature on-screen board.
- COLOSSAL CAVE ADVENTURE
- STAR TREK — Large graphics version.
- TRIVIA QUIZ — (2 discs)
- MONOPOLY — The board game on Computers.
- HANGMAN — Well presented graphics version.
- FUNNELS & BUCKETS — A fun learning maths game for over 7's.

INDEPENDENT USER GROUP

We run an active and expanding user group for PC1512 and PC Compatible owners. Members receive monthly newsletters and can deduct £2 off software offered by Advantage.

Annual Membership: £10.95 (UK) £13.95 (Europe) £16.95 (Resto of World).

ADVERTISERS INDEX

A			F			IBC			Silica Shop Ltd		
AJP Business Computers	218		Fortransoft	29		Micro Peripherals	171	Slough Computers	28 & 29	233	
ATT Corporation Ltd	8 & 9		Fraser Associates Ltd	82		Micro Rent	219	Sofkey Ltd	29		
Activision (UK) Ltd	23					Microgold	216	Softouch Computers	16		
Advanced Microcomputer Applications	225		G			Mighty Micro	69	Solent Software	239		
Algol Enterprise Co Ltd	164		Glen Lake Computer Ltd	56		Moor House Marketing	57,66,77	Stirling Microsystems	235		
Almo Computer System	26		Goto Computer	23		Morgan Computer Company	111	Surplus Computer Sales	39		
Altair Electronics Ltd	216		Greymatter	1		Mosaic Software Inc	49	Swanley Electronics	220		
Amstrad Computer Users Club	18					Mountaineer Ltd		Synergy Software	228		
Amstrad Consumer Electronics plc	34 & 35		H			N		System Science (Systematika)	62		
Apple Computer	88 & 89		HM Systems	157		Ness Industries Ltd	20	System Zone Computers Ltd	227		
Arnor Ltd	87		Hi Spec Systems Ltd	65		Newbridge Networks Ltd	IFC				
Atari International (UK) Ltd	116,117,119		Hi Voltage	36 & 37		Newtons Laboratories	24	T			
B			Hi-Grade Computers Ltd	228		North West Computer Supplies	221	TOS International	49		
Barbatan Ltd	226		Hisoft High Quality Microcomputers	16		Northern Technology Systems Ltd	43	Tandata Marketing Ltd	231		
Bath Computer Shack	26		Homesview	237				Taxan (UK) Ltd	79		
Borland International (UK) Ltd	72 & 73		Hua Chi Enterprises Co Ltd	219		O		Technomatic Ltd	32 & 33		
Brigden Technology	222					Olico Business Systems Ltd	28	Tetra Business Systems Ltd	90		
C			I			Omega PC	216	Thoughts & Crosses	53		
CAS	224		IBM (UK) Ltd	80 & 81		Optimum Technology Ltd	13	Total Office Software Ltd	229		
CI Cayman Ltd	239		ISC Ltd	4 & 5		Opus	139,206,207,217	Transform Ltd	221		
Cal Abco (UK) Ltd	51		Icans Software GB Ltd	227		Osiris Computers	17	Transputec	227		
Calend	OBC		Info Soft Systems Ltd	55		Osprey	239	Trinitas	235		
Canon (UK) Ltd	129		Inswell	149				Trisoft Ltd	14		
Card Devices Ltd	30		Integrex Ltd	234		P		Trojan	49		
Cherry Electrical Products	40		Intelligent Environments Ltd	59		PC Projects	237	U			
Compshop Ltd	235		Ico Ltd	62		Pace Software Supplies Ltd	236	Used Computer Sales	222		
Computacenter Ltd	11		J			Paradigm Publishing	239	V			
Computer Express Ltd	19		Jepssen Enterprise Co Ltd	178		Peartree Computers Ltd	60 & 61	Viglen Computer Supplies	67		
Computer Precision Ltd	27					Peg Associates	220				
Computers by Post	12		K			Piccadilly Micros	21	W			
Continuous Listing Paper	29		KK Stationery Ltd	69		Plus 5 Engineering Ltd	47	Werrington Computers Ltd	7		
Cristle Electronics Ltd	230		Keele Codes Ltd	6		Power Equipment Ltd	149	West One Galaxy Business Systems Ltd	22		
D			Keyzone Ltd	222		Proto Systems	39	Western Technology	28		
Data Dimension Maintenance Ltd	57		King Power Computer Accessories Co	218		R		Z			
Database Publications Ltd	64 & 103		Kudos Systems Ltd	84		RSC Ltd	10	Zorland	101		
Dell Computer Corporation	105 & 107		L			RSD Connections Ltd	69				
Delta PI Software	219		Leigh Computer Systems	237		Ragley Data Systems Ltd	43				
Digitask	18,42,46,48,52,54,165,171		Link Business Systems	15		Redwood Publishing	59				
Direct Disk Supplies	238		Logotron	223		Ringdale Engineering Company Ltd	223				
Dowty Information Systems	68		M			Roland (UK) Ltd	82				
E			Matmos Ltd	221		Rosco Ltd	38				
ELR International	161		Mekom Computer Products Ltd	123		Runnymede Computer Hardware	219				
Elite Computer Systems Ltd	220		Messiter Software	6		S					
Expertech Ltd	147		Micro General	163		Seltec	44 & 45				
			Micro Media	31		Sentinel Software Ltd	56 & 57				
						Sierra Computer Consultants Ltd	229				

MICROMART ADVERTISERS INDEX

A			D			M			R		
ACT Systems	199		Datavise Ltd	187		Manor Court Supplies Ltd	192	R-Tek Research	198		
AL Downloading Services	184		Delostar	204		Micro Concepts	186	Rational Solutions	205		
Abacom Computer Supplies	199					Micro-Tech	201	Rocket Field Computer Systems	187		
Alan Cohen Computer Consultants	189		E			Microcom Systems	202	Rugby Micro Spares	190		
Altek Instruments	188		Electronic Aids	204		Minerva Systems Ltd	186	Rule	184		
Analytical Engineers	197					Moby Computers	204				
Athene Consultants	190		G			Monas Overseas (UK) Ltd	199	S			
Audio Technica Ltd	200		Gould Computer Services	193		Mr Bonthay	183	Salt Disk Co	194		
B						Multiplex Computer Cabling Services	205	Screenwise	193		
BBD Computer Dust Covers	185		I			N		Startex	187		
Budget Typesetting Ltd	191		International Software Distribution	182		Nebulae	205	Structural Technology Ltd	198		
C			J			O		Suredata	198		
Carousel Tapes	200		John Holmes Computers	191		Oriole & Co	184	Syntax Systems	196		
Chips Computer Centre (Direct Data)	189		John Morrison (Micros) Ltd	186				T			
Computer Facilities	188					P		The Language Laboratory	183		
Compware	188		K			PB Electronics	200	Time Computers	203		
Cromwell Business Computers	185		KT Computers Ltd	185		Pace Electronics Ltd	183	Tyepro Ltd	196		
Cumbria Audio Video & Electrical	190		L			Pacific Computers (UK) Ltd	195	U			
			Leewood Developments Ltd	201		Paper Stat	203	UK Home Computers	201		
			Longworth	194		Polanka Video Ltd	189	W			
						Prima Brokers	194	Wight Scientific	196		
						Prospec Computer Systems	192				

PASCAL LIBRARIES

TURBO PASCAL LIBRARIES

Blaise Power Tools Plus	PC-DOS	£ 75
Blaise Turbo Asyn.Plus	PC-DOS	£ 75
Mathpak 87 (MS)	MS-DOS	£ 80
Paragon Supertools	PC-DOS	£ 55
RM Graph Nimbus +	MS-DOS	£ 49
Science & Eng.Tools	MS-DOS	£ 60
Report Builder	MS-DOS	£ 70
System Builder	MS-DOS	£ 90
Turbo Halo Univ.Graph.	PC-DOS	£110
T-Debug Plus	PC-DOS	£ 35
Turbo Database	CP/M & MS-DOS	£ 49
Turbo Editor Toolbox	PC-DOS	£ 49
Turbo Extender	PC-DOS	£ 55
Turbo Gameworks	PC-DOS	£ 35
Turbo Graphix Toolbox	PC-DOS	£ 49
Turbo Advantage (Lader)	MS-DOS	£ 60
Turbo Link Plus	PC-DOS	£ 65
Turbopower Utilities	PC-DOS	£ 60
Turbo Professional	PC-DOS	£ 45
Turbo Screen	CP/M,MS,PC-DOS	£ 65
Turbo Tutor	CP/M & MS-DOS	£ 29
TurboWINDOWS	PC-DOS	£ 50

BASIC LANGUAGE

New TURBO BASIC now provides competition for Quickbasic.

BASIC INTERPRETERS

BBC Basic (86)	PC-DOS	£ 95
BetterBASIC v2.1	PC-DOS	£150
Professional BASIC	PC-DOS	£ 70
TrueBASIC v2.0	PC-DOS	£115
Microsoft MS-BASIC	MS-DOS	£210
MEGABASIC v5.2	MS-DOS	£235

Dig.Res. CBASIC	CP/M-86	£290
MEGABASIC	CP/M-86	£235
MEGABASIC	MP/M-86	£365

BBC BASIC	Z80+CP/M-80	£ 95
Dig.Res. CBASIC	CP/M-80	£130
Microsoft MBASIC	CP/M-80	£ 60
MEGABASIC	CP/M-80	£195

BASIC COMPILERS

Microsoft QuickBASIC	PC-DOS	£ 60
Softaid MTBASIC	PC-DOS	£ 60
Turbo Basic	PC-DOS	£ 60
ZBASIC	PC-DOS	£ 75
Alcor Multi-Basic	MS-DOS	£ 85
Microsoft MS-BASIC	MS-DOS	£235
Dig.Res. CBASIC	MS-DOS	£390

Dig.Res. CBASIC	CP/M-86	£390
-----------------	---------	------

Dig.Res. CBASIC	CP/M-80	£435
ZBASIC	Z80+CP/M-80	£ 75
Softaid MTBASIC	Z80+CP/M-80	£ 60
Alcor Multi-Basic	Z80+CP/M-80	£ 85

LIBRARIES & UTILITIES

Database

CADSAM (source code)	MS-DOS	£ 75
Btrieve	MS-BASIC + MS-DOS	£190
Btrieve/N	MS-BASIC + MS-DOS	£460
Multikey	MS-BASIC + MS-DOS	£145

Graphics

Multi-Halo	MS-BASIC + MS-DOS	£185
GSS CGI Graph.Dev.Tkt	PC-DOS	£330

Sundries

Finally Quickbasic +	PC-DOS	£ 75
PANEL Screen Manager	MS-DOS	£100
Wiley Scientific Lib.	PC-DOS	£110
Quickbasic 8087 Pack	PC-DOS	£ 50

Tuning & Debugging

Betatoools Dev.System	PC-DOS	£100
Vicar	MS-DOS	£ 35

GENERAL PASCAL LIBRARIES

Blaise Tools (s'ce)(MS)	PC-DOS	£ 95
Blaise Tools 2 (s'ce)	PC-DOS	£ 80
Blaise Asynch (s'ce MS)	PC-DOS	£125
Btrieve	(MS) PC-DOS	£190
MetaWINDOWS	(MS) PC-DOS	£100
Multi-Halo	(MS) PC-DOS	£175
Blaise View Mngr.	(MS) PC-DOS	£205

Shark database (Propas)	MS-DOS	£250
Prospect Graphics (Pro)	MS-DOS	£ 70
Panel (Screen)	(MS) MS-DOS	£205

Shark database (Propas)	CP/M-86	£250
Prospect Graphics (Pro)	CP/M-86	£ 70

Shark database (Propas)	CP/M-80	£150
-------------------------	---------	------

PROLOG LANGUAGE

Arity Standard	PC-DOS	£ 85
Arity Prolog v4.0	PC-DOS	£260
Arity Interpreter+Compil.	PC-DOS	£585
Chalcedony Prolog /I	MS-DOS	£ 90
PROLOG Professnl.	MS-DOS	£225
Micro-PROLOG v3.1	MS-DOS	£ 75
Prolog-86 v2.01	MS-DOS	£115
Prolog-1 v2.2	MS-DOS	£299
Prolog-2 Personal	PC-DOS	£145
Prolog-2 Programmer	PC-DOS	£495
Prolog-2 Professional	PC-DOS	£995
Turbo-Prolog v1.1	PC-DOS	£ 60
ADA Educ.Prolog	MS-DOS	£ 45
ADA FS Prolog	MS-DOS	£ 55
ADA VMI Prolog	MS-DOS	£ 85
ADA VML Prolog	MS-DOS	£165

Prolog-1 v2.2	CP/M-86	£299
Micro-Prolog v3.1	CP/M-86	£ 75

Micro-prolog v3.1	CP/M-80	£ 60
Prolog-1 v2.2	CP/M-80	£225

DISK COPYING SERVICE

We can copy files to and from 400 disk formats including CP/M, CP/M-86, MS-DOS, PC-DOS, ISIS, APPLE, SIRIUS, BBC, TORCH, APRICOT, HP150, TRSDOS, DEC RT-11, IBM BEF, ATARI520, AMSTRAD.

Our charge is £10.00 + disk + VAT with discounts on small quantities and disks are normally despatched within 24hrs of receipt.

For more information call us.

PASCAL LANGUAGE

Marshall Pascal shows promise.
New 386 compiler from Metaware.

PASCAL INTERPRETERS

ALICE Pascal Intrprtr.	PC-DOS	£ 80
------------------------	--------	------

PASCAL COMPILERS

Marshall Pascal	MS-DOS	£150
Metaware Prof.Pascal	MS-DOS	£420
Metaware Prof.Pas/386	MS-DOS	£595
Microsoft Pascal v3.32	MS-DOS	£180
Oregon Pascal-2	MS-DOS	£360
Prospero Pascal v2.225	MS-DOS	£220
Turbo-Pascal	MS-DOS & PC-DOS	£ 60
Pecan P-Sys w.UCSD Pas.	IBM-PC	£ 80
Pecan P-Sys Pascal Prof.	IBM-PC	£155

Pro-Pascal v2.14	CP/M-86	£220
Turbo-Pascal v3.01	CP/M-86	£ 60

Pascal MT+ v5.6	CP/M-80	£ 99
Pascal MT+ v5.6.1	CP/M-80	£290
Pro-Pascal v2.18	CP/M-80	£220
Turbo-Pascal v3.01	CP/M-80	£ 49

MCC Pascal	ATARI ST	£ 75
Pecan P-Sys w.UCSD Pas	ATARI ST	£ 80
Pecan P-Sys w.UCSD Pas	APPLE][	£ 80

PROGRAMMING TOOLS

Ada Compilers	Algol Compilers
Assemblers	Assembler Libs.
Basic Compilers	Basic Interpreters
Basic Utilities	Basic Libraries
BCPL Compilers	C Compilers
C Interpreters	C Libraries
C Utilities	Cobol Compilers
Comms.Libraries	Cross Assemblers
Database Libs.	Debuggers
Dis-assemblers	Editors
Engineers Libs.	Expert Systems
Forth	Fortran Compilers
Fortran Libraries	Graphics Libraries
Icon	Linkers
Lisp	Modula-2
Nial Interpreters	OPS 5
Pascal Compilers	Pascal Libraries
Prolog	Screen Libraries
Smalltalk	Snobol

We stock many items for which there is no space in these advertisements.

MODULA-2 COMPILERS

New Farware compiler. FTL is an excellent value learning tool.

Pecan P-Sys. w.Mod-2	PC-DOS	£ 80
Farware Modula-2	MS-DOS	£ 75
FTL Modula-2	MS-DOS	£ 45
Interface M2-SDS	PC-DOS	£ 75
Interface M2-SDS-XP	PC-DOS	£185
Modula-2/86 Apprentice	PC-DOS	£ 90
Modula-2/86 Wizard	PC-DOS	£200
Modula Corp.PC Mod.2	PC-DOS	£150

Modula 2/86	CP/M-86	£410
-------------	---------	------

FTL Modula-2	Z80/CP/M-80	£ 45
Hochstrasser Mod.2	Z80/CP/M-80	£100
Turbo Modula-2	Z80/CP/M-80	£ 55
TDI Modula-2	ATARI 520ST	£ 75

MacModula-2	MACINTOSH	£100
-------------	-----------	------

FORTRAN COMPILERS

New V4.00 from Microsoft now mean four excellent 77's to choose from.

Lahey F77L v2.20	MS-DOS	£380
RM/FORTRAN 77 v2.11	MS-DOS	£400
MS-FORTRAN 77 v4	MS-DOS	£250
Pro Fortran 77 v1.16	MS-DOS	£320
Pro Fortran v2.144	MS-DOS	£220
Utah Fortran	MS-DOS	£ 35

Pro Fortran v1.25	CP/M-80	£220
Nevada Fortran v3.3	CP/M-80	£ 35

Pro Fortran 77	ATARI 520ST	£120
----------------	-------------	------

We have Fortran Graphics Libraries and Scientific Subroutines in stock.

PRICES AND DELIVERY

Prices do not include VAT or other local taxes but do include delivery in UK and Europe. Please check prices at time of order, ads are prepared some weeks before publication.

Order by phone with your credit card.

ADA COMPILERS

Recent products include AdaVantage, Artek Ada and Ada/Ed-C.

Ada/Ed-C	MS-DOS	£ 80
AdaVantage 1st release	PC-DOS	£125
Artek Ada v1.25	MS-DOS	£350
JANUS/Ada C-Pack	MS-DOS	£ 90
JANUS/Ada ED-Pack	MS-DOS	£285
JANUS/Ada D-Pack	MS-DOS	£825
JANUS/Ada S-Pack	MS-DOS	£2890

Augusta (with source)	CP/M-80	£ 75
JANUS/Ada C-Pack	CP/M-80	£ 80
JANUS/Ada D-Pack	CP/M-80	£260
Supersoft Ada	CP/M-80	£250

GREY MATTER

4 Prigg Meadow, Ashburton, Devon TQ13 7DF.
TEL. (0364) 53499

4 Prigg Meadow, Ashburton, Devon TQ13 7DF.
TEL. (0364) 53499

4 Prigg Meadow, Ashburton, Devon TQ13 7DF.
TEL. (0364) 53499

CHIP CHAT

Want a cheap 80386 machine? Ness Industries sent us a blurb about its new model with 512k RAM, two 32-bit slots and the usual drives and ports. The price? 'A highly competitive £295.'

'Gosh, Arfur. Get the motor out and we'll get a couple of dozen for 'er indoors.'

Let's hope that Ness' 386 machine is better than the two 286 machines it delivered to VNU (publisher of PCW). One didn't specify a destination and came with a keyboard with no 'I' but two 'Y's. The other had an Arabic keyboard — very useful here in the middle of Soho...

You've probably seen that advert where cyclists wearing hats straight out of Flash Gordon zoom round and round a race track, never stopping.

The advert is for Tandem whose fault-tolerant computers are having a big success at the moment. What we can't understand is why, if the advert is for Tandem, the company chose a race sponsored by another computer manufacturer — Apple — whose logo is clearly visible on the cyclists' shirts...

Talking of media exposure, we know who won the general election and it wasn't a political party. All over the place Zenith 181 laptops kept appearing on the television — on the SDP coach, on the analysis programs linking Norman Tebbit with Tory headquarters, and so on.

Mind you, we don't know what Zenith made of Tebbit's remark that he

'wasn't using a real computer, just a terminal linked to the real computer in his office...'

If you thought that MS-DOS was a Microsoft product, think again. MS-DOS 3.3 has yet to appear from Microsoft, yet we hear that IBM has a warehouse full of packaged products ready to go.

The hold-up at Microsoft's end?

Our mole tells us that IBM's corrections to MS-DOS were late back to Microsoft. Meanwhile IBM, having made sure the system worked on its own hardware, went into full production...

A little knowledge can lead to the most amazing nonsense. Applied Microsystems Technology informed us that its 16MHz AMT386 'gives a performance rating 18 times that of an IBM PC. (Norton SI 3.0).'

Now, come on chaps. Either it's 18 times as fast as an IBM PC or it's 3 times as fast. You can't have it both ways unless you've found a way of applying micro technology we've never heard of...

Desecration can be found in the games world too. Anita Sinclair revealed recently that the original version of her graphic adventure The Pawn was censored. Seems like Sir Clive took exception to one scene where, in order to proceed, the player had to rape one of the characters.

Didn't realise it was that sort of 'porn' Magnetic Scrolls was producing...

Fancy yourself as a PCW expert?

Do you fancy seeing your name in PCW? We're looking for people with expertise in personal computing to help us review the wide range of hardware and software products that grace our pages.

If you are well versed in a particular area of computing — be it programming, business applications, future technology or software development, and would like to put some of the latest products through their paces, why not drop us a line?

We'd like to know something of your computer interests and experience, as well as which areas you feel competent to write about.

We're not looking for people to write 'What I did on my holidays' type anecdotal stories, nor have we yet come across anyone who's offered us computer fiction that's worth printing. If you think you can persuade us otherwise in either area, you're welcome to have a go.

We pay for all articles published and have guidelines to help those nervous about meeting PCW's high standards of review writing.

Address all biographies, synopses and holiday snaps to: Derek Cohen, editor, Personal Computer World, 32-34 Broadwick Street, London W1A 2HG.



This month

Atari is doing well in the market with its ST capturing many sales from other home and small business machines. The desktop publishing system exclusively reviewed in this issue (page 96) could set the cat among the pigeons in another market dominated by high-priced products.

What makes it most interesting is that, as desktop publishing becomes cheaper and more accessible, we may see a burst of low-budget magazines and fanzines parallel to those which appeared when people started using photocopiers.

If your club has got in on the act, why not drop a copy to our user groups columnist

Rupert Steele?

It's gratifying to see how those power-mad keyboard junkies are having to spend less to get more. Hopefully, either Dell's low-cost high performance 286 machines or the 386 add-ins from Intel and Orchid will satisfy the insatiable for a few months. Frankly, if my fingers had to move any faster across the keyboard they'd need the streamlining of Concorde.

Finally, we're giving some money away... Well, to be precise we're saving you some. You will of course be going to the Personal Computer World Show at the end of September. If you collect the vouchers from the next two issues of PCW you can save yourself £1 off the admission price. And you thought we all had hearts as cold as silicon.

INTRODUCING THE TRITON

PERSONAL COMPUTER

For the first time, you can transfer your Texas Instruments TI-99/4A Home Computer to true IBM PC/XT compatibility.

The new Triton TURBO XT Strategy gives you 18 times more computing power, brings your 99/4A up to 256k of memory! Run thousands of IBM-PC compatible programs right from your Texas Instruments Home Computer keyboard! As soon as you turn it on, the TRITON TURBO XT gives you an 80-column display.

JUST PLUG IT IN. IT'S READY

EDUCATORS, PARENTS AND STUDENTS

The great advantage of the Triton is that you can use it with the office IBM PC/XT keyboard and mouse. The Triton PC/XT can be used as a desktop or a laptop.

THE OFFICE AT HOME

Just think of the incredible money it saves you will be able to spend. Buy a Triton PC/XT.

MORE FUN FOR THE WHOLE FAMILY

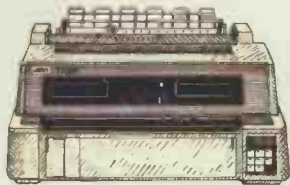
Just think of the incredible money it saves you will be able to spend. Buy a Triton PC/XT.

499

OK. Silly product time again. If you've got a Texas Instruments TI-99/4A lurking in the cupboard, you can turn it into a PC compatible. Easy really, you just buy a PC compatible from Triton along with the Bridge Box which lets you use your 99/4A as the keyboard and you're away.

The price in the US is a very reasonable \$499, though for the life of us we can't see where they've hidden the function keys and other essentials to PC computing.

Oh, alright, here's the phone number of the TI-99/4A user group as well: (0273) 503968 — after 7.30pm.



7200 NLQ MATRIX

The world's first multi-function, multi-wire, flat-bed printer. It allows you to print virtually any kind of business form. It gives quality print as well as colour and plotting facilities.

Speed: 324cps (Draft), 108cps (NLQ).
Columns: 136. **Compatibility:** IBM, Epson, or Diablo 630.
Price: £1625.



5510/5520 NLQ MATRIX

High speed, NLQ with full graphics mode and 3K memory. 5520 is the colour version.

Speed: 180cps (Draft), 30cps (NLQ).
Columns: 80. **Compatibility:** IBM & Epson.
Price: 5510 £329. 5520 £449.



6500 DAISYWHEEL

This new daisywheel is designed for heavy duty office use. It's very fast and includes parallel and serial interfaces.

Speed: 60cps. **Columns:** 132.
Compatibility: IBM & Diablo 630.
Price: £1299.



6300 DAISYWHEEL

Our best selling general purpose daisywheel printer. It's fast speed and low noise level make it ideal for the office.

Speed: 40cps. **Columns:** 132.
Compatibility: IBM & Diablo 630.
Price: £899.



6200 DAISYWHEEL

A popular wide bodied letter quality printer, perfect for the smaller office. Parallel or serial interface.

Speed: 30cps. **Columns:** 132.
Compatibility: IBM & Diablo 630.
Price: £579.



6100 DAISYWHEEL

The U.K.'s best selling daisywheel printer. 100 character wheel. 2K memory expandable to 8K.

Speed: 20cps. **Columns:** 110.
Compatibility: IBM & Diablo 630.
Price: £399.



6000 DAISYWHEEL

A letter quality printer designed for home use. 100 character wheel and either parallel or serial interface.

Speed: 10cps. **Columns:** 90.
Compatibility: IBM graphics printer.
Price: £199.



The Juki 7200. The first printer in the world that can print anything.

Well, when we say anything we mean virtually any kind of business document. Everything from the usual cut sheets, labels and continuous paper to multi-part sets, envelopes, business cards, airline tickets, freight bills, cheques, statements and ledger leaves.

This is due to its revolutionary flat bed design and three way feed system. Combine this with print quality to rival a laser and the option of colour, you have something no other machine can match.

On top of that we offer a full 2 year warranty* on all Juki printers. So, for more detailed information on any model call us now **for free** on 0800 521111.

Sole Distributor:

JUKI
The Master Printers

Micro Peripherals Ltd

Intec 2, Unit 3, Wade Road, Basingstoke, Hampshire RG24 0NE.

Telephone: 0256 473232. Telex: 859669 MICRO P G. Facsimile: 0256 461570.

Unit 5/6, Newhallhey Works, Newhallhey Road, Rawtenstall, Rossendale, Lancashire, BB4 6HL.

Telephone: 0706 211526. Facsimile: 0706 228166.

*Does not include printheads, ribbons and daisywheels.

All prices are RRP Ex VAT.

All trade marks are recognised.

Why waste time with BASIC, PASCAL or C when you can develop faster programs more quickly with PCL...

PCL is a major fourth generation high level language, implemented as the fastest interpreter on earth. It is specifically designed for the IBM PC/XT/AT and compatibles.

PCL gets the maximum performance out of its hardware. It combines the flexibility of an interpreter with an execution speed that puts most compilers to shame.

PCL is a well structured procedural language along the lines of C or Pascal but without the restrictions and idiosyncrasies of either. It is easier to learn yet offers considerably more features than both.

PCL has over 330 built-in functions, providing high level support for:

- ★ sophisticated windowing and menu building commands. Extremely fast screen displays
- ★ extended text-manipulation and scientific function set
- ★ array arithmetic
- ★ character and numeric sorting
- ★ powerful file I/O, directory and disk management
- ★ dynamic record structures
- ★ DOS command interface
- ★ RS232 communications up to 19200 Baud handled by built-in background tasks

...and much more.

Apart from its high level functions **PCL** also offers HEX and binary arithmetic and most standard assembler mnemonics. Arrays can make use of all DOS addressable memory. Decimal arithmetic to 16 digits. Automatic 8087/80287 support.

Any program can call on the **PCL** interpreter itself at run time and pass it one or more source lines for immediate execution. Useful for spread-sheets, data dictionaries etc.

Any application written in **PCL** can be made RAM-resident with a single command. It can then be invoked from any other application with just two key strokes. **PCL** can also be used as a RAM-resident full scientific calculator.

PCL is the ideal language for beginners and experts alike since it is easily learned and offers great programming power. **PCL** has a clear and simple syntax, without reserved words, and a block structure which encourages the writing of very readable programs. Extensive built-in debugging features help you to pinpoint errors, should your program ever go wrong.

You will find that program development is much quicker with **PCL** than with third generation languages where you have to waste time re-inventing the wheel. **PCL** allows you to concentrate on making sophisticated and extremely fast programs in record time.

Benchmarks, comparing TURBO PASCAL 3.0 with **PCL 2.0**

Description	PASCAL	PCL	
Empty loop x 10000	.25	.04	525%
BYTE Magazine decimal arithmetic Benchmark:	31.88	14.82	115%
With 8087:	6.29	6.09	3%
Display 24 lines of 80 characters on standard colour display:	2.7	.15	1700%
Mono or EGA display:	2.45	.04	6025%
Format & display 100 decimal numbers:	1.51	.42	260%
With 8087:	1.35	.25	440%
Convert 1000 decimals to character strings:	3.89	3.17	23%
With 8087:	2.87	1.04	176%
Convert 1000 character strings to decimals:	8.18	2.43	237%
With 8087:	3.48	1.12	211%
Catenate two 10 byte strings x 1000:	.58	.32	81%
String search x 1000	1.03	.28	268%
Sequential write, 1000x90 byte records	7.5	2.9	159%
Sequential read, 1000x90 byte records	7.4	2.5	196%

All timings are in seconds. They were taken on a standard IBM PC with PC DOS 3.1, a real-time clock and a 10MB hard disk.

Minimum system requirements: 256K RAM, mono or colour monitor, 1 disk drive, PC DOS or MS DOS version 2.1 or later.

PCL comes on a 5¼" diskette with a comprehensive manual including many programming examples. Not copy protected. 30 days money back guarantee.

PCL sample program to display a sorted list of all files on the current disk directory:

```
CHAR DIRECTORY[300,45]; X; INTEGER N
X=?DIR "**.*"; N=0
WHILE LEN X > 0 THEN DO
  N=N+1; DIRECTORY[N]=X; X=?DIR
ENDDO
DIM DIRECTORY,N; SORT DIRECTORY
? DIRECTORY
```

Order **PCL 2.0** for £100 (including VAT and UK postage) from:

CALEND

P.O. BOX 94

TWICKENHAM TW2 6DD

Telephone: 01 894 7409